MPLS Label Distribution Protocol (LDP)

Feature History

Release	Modification
12.0(10)ST	This feature was introduced in Cisco IOS Release 12.0(10)ST, incorporating a new set of multiprotocol label switching (MPLS) CLI commands implemented for use with Cisco routers and switches. The CLI commands in this release reflected standard MPLS IETF command syntax and terminology, thus facilitating the orderly transition from a network using the Tag Distribution Protocol (TDP) to one using the Label Distribution Protocol (LDP). With respect to TDP, the MPLS CLI commands associated with this release were of three types: a) new CLI commands altogether for support of new MPLS/LDP functionality; b) functionally equivalent, but syntactically different, MPLS/LDP commands; and c) functionally and syntactically equivalent MPLS/LDP commands.
12.0(14)ST	This feature was integrated into Cisco IOS Release 12.0(14)ST. This release introduced several new MPLS CLI commands, provided support for MPLS VPNs by means of a new ***vrf*** *vpn-name* parameter in certain existing commands, and modified other commands to ensure consistent interpretation of associated *prefix-access-list* arguments by Cisco IOS.
12.1(2)T	This feature was integrated into Cisco IOS 12.1(2)T. Also, the **debug mpls atm-ldp api**, **debug mpls atm-ldp routes**, and **debug mpls atm-ldp states** commands were modified.
12.1(8a)E	This feature was integrated into Cisco IOS Release 12.1(8a)E.
12.2(2)T	This feature was integrated into Cisco IOS Release 12.2(2)T.
12.2(4)T	This feature was integrated into Cisco IOS Release 12.2(4)T. Also, support was added for Cisco MGX 8850 and MGX 8950 switches equipped with a Cisco MGX RPM-PR card, and the VPI range in the **show mpls atm-ldp bindings** and **show mpls ip binding** commands was changed to 4095.
12.0(21)ST	This feature was integrated into Cisco IOS Release 12.0(21)ST. This release introduced the **mpls ldp neighbor implicit-withdraw** command**.**
12.0(22)S	This feature was integrated into Cisco IOS Release 12.0(22)S. This release introduced the **mpls ldp neighbor targeted-session** command and the **interface** keyword for the **mpls ldp advertise-labels** command.

This document describes the use of the Multiprotocol Label Switching (MPLS) Label Distribution Protocol (LDP), which enables peer label switch routers (LSRs) in an MPLS network to exchange label binding information for supporting hop-by-hop forwarding along normally routed paths. The document includes the following sections:

Feature Overview

The Cisco MPLS LDP, as standardized by the Internet Engineering Task Force (IETF) and as enabled by Cisco IOS software, allows the construction of highly scalable and flexible IP Virtual Private Networks (VPNs) that support multiple levels of services. LDP sessions with those peers for the purpose of exchanging label binding information.

MPLS LDP enables one LSR to inform another LSR of the label bindings it has made. Once a pair of routers communicate the LDP parameters, they establish a label-switched path (LSP). MPLS LDP enables LSRs to distribute labels along normally routed paths to support MPLS forwarding. This method of label distribution is also called hop-by-hop forwarding. With IP forwarding, when a packet arrives at a router the router looks at the destination address in the IP header, performs a route lookup, and forwards the packet to the next hop. With MPLS forwarding, when a packet arrives at a router the router looks at the incoming label, looks up the label in a table, and then forwards the packet to the next hop. MPLS LDP is useful for applications that require hop-by-hop forwarding, such as MPLS VPNs.

LDP provides a standard methodology for hop-by-hop, or dynamic label, distribution in an MPLS network by assigning labels to routes that have been chosen by the underlying Interior Gateway Protocol (IGP) routing protocols. The resulting labeled paths, called label switch paths (LSPs), forward label traffic across an MPLS backbone to particular destinations. These capabilities enable service providers to implement MPLS-based IP VPNs and IP+ATM services across multivendor MPLS networks.

LDP provides the means for LSRs to request, distribute, and release label prefix binding information to peer routers in a network. LDP enables LSRs to discover potential peers and to establish LDP sessions with those peers for the purpose of exchanging label binding information.

From an historical and functional standpoint, LDP is a superset of the Cisco prestandard Tag Distribution Protocol (TDP), which also supports MPLS forwarding along normally routed paths. For those features that LDP and TDP share in common, the pattern of protocol exchanges between network routing

platforms is identical. The differences between LDP and TDP for those features supported by both protocols are largely embedded in their respective implementation details, such as the encoding of protocol messages.

This release of LDP, which supports both the LDP and TDP protocols, provides the means for transitioning an existing network from a TDP environment to an LDP environment. Thus, you can run LDP and TDP simultaneously on any router platform. The routing protocol that you select can be configured on a per-interface basis for directly connected neighbors and on a per-session basis for nondirectly connected (targeted) neighbors. In addition, an LSP across an MPLS network can be supported by LDP on some hops and by TDP on other hops.

Benefits

LDP is an IETF standards tracking protocol. The primary benefit of LDP over the prestandard TDP protocol is that the former increases the number of platforms on which MPLS interoperability can be achieved.

Related Features and Technologies

The MPLS Label Distribution Protocol is used in conjunction with the following:

- Multiprotocol Label Switching (MPLS)
- Cisco Express Forwarding (CEF)
- MPLS Traffic Engineering
- MPLS Class of Service
- MPLS Egress NetFlow Accounting
- AAL5 Transport over MPLS
- MPLS VPNs

Related Documents

For additional information about MPLS functionality running on routers or switches in a network, consult the following documentation:

- *Multiprotocol Label Switching on Cisco Routers*
- *MPLS Class of Service (CoS)*
- *MPLS Traffic Engineering and Enhancements*
- *MPLS Egress Netflow Accounting*
- *AAL5 Transport Over MPLS*
- *MPLS Virtual Private Networks (VPNs)*

Supported Platforms

LDP is supported on the following platforms:

- Cisco 2600 series routers
- Cisco 3600 series routers
- Cisco 4000 series routers
- Cisco 7200 series routers
- Cisco 7500 series routers
- Cisco 12000 series router

The MPLS Label Distribution Protocol is also supported on the Cisco MGX 8850 with the Cisco MGX 8850 Route Processor Module (RPM-PR).

Determining Platform Support Through Cisco Feature Navigator

Cisco IOS software is packaged in feature sets that support specific platforms. To get updated information regarding platform support for this feature, access Cisco Feature Navigator. Cisco Feature Navigator dynamically updates the list of supported platforms as new platform support is added for the feature.

Cisco Feature Navigator is a web-based tool that enables you to determine which Cisco IOS software images support a specific set of features and which features are supported in a specific Cisco IOS image. You can search by feature or release. Under the release section, you can compare releases side by side to display both the features unique to each software release and the features in common.

Cisco Feature Navigator is updated regularly when major Cisco IOS software releases and technology releases occur. For the most current information, go to the Cisco Feature Navigator home page at the following URL:

http://www.cisco.com/go/fn

Availability of Cisco IOS Software Images

Platform support for particular Cisco IOS software releases is dependent on the availability of the software images for those platforms. Software images for some platforms may be deferred, delayed, or changed without prior notice. For updated information about platform support and availability of software images for each Cisco IOS software release, refer to the online release notes or, if supported, Cisco Feature Navigator.

Supported Standards, MIBs, and RFCs

Standards

No new or modified standards are supported by this feature.

MIBS

This feature supports the IETF draft document entitled *LDP Specification, draft-ietf-mpls-ldp-08.txt*.

To obtain lists of supported MIBs by platform and Cisco IOS release, and to download MIB modules, go to the Cisco MIB website on Cisco.com at the following URL:

http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml

RFCs

The LDP implementation supporting the MPLS LDP MIB fully complies with the provisions of Section 10 of RFC 2026, which, in effect, states that the implementation of LDP is recommended for network devices that perform MPLS forwarding along normally routed paths, as determined by destination-based routing protocols.

Prerequisites

Label switching on a router requires that Cisco Express Forwarding (CEF) be enabled on that router. Refer to the chapters on CEF in the following documents for configuration information:

- *Cisco IOS Switching Services Release 12.2*
- *Cisco IOS Command Reference Release 12.2*

Configuration Tasks

In most situations, the use of LDP is associated with a router or a switch interface. To configure LDP to operate in an MPLS network with such an interface, you must:

- Configuring LDP (required)
- Verifying LDP Configuration (optional)

Configuring LDP

To configure use of LDP for an interface or interfaces, use the following commands beginning in user EXEC mode:

	Command	Purpose
Step 1	`Router# configure terminal`	Enables configuration mode.
Step 2	`Router(config)# ip cef [distributed]`	Configures Cisco Express Forwarding.
Step 3	`Router(config)# interface interface`	Specifies the interface to configure.
Step 4	`Router(config-if)# mpls ip`	Configures MPLS hop-by-hop forwarding for a specified interface.
Step 5	`Router(config-if)# mpls label protocol ldp`	Configures the use of LDP for a specific interface. Sets the default label distribution protocol for the specified interface to be LDP, overriding any default set by the global **mpls label protocol** command.
Step 6	`Router# configure terminal` `Router(config)# mpls label protocol ldp`	Configures the use of LDP on all interfaces. Sets the default label distribution protocol for all interfaces to be LDP.

Note MPLS requires CEF.

Note The **mpls ip** command is equivalent to the **tag-switching ip** command. For more information about the **mpls ip** command, see Table 3.

Note Targeted sessions are usually not configured explicitly. For example, configuring **mpls ip** for a traffic engineering tunnel interface initiates establishment of a targeted session with the tunnel tail end.

Verifying LDP Configuration

To verify LDP configuration for an interface, issue the following commands:

Step 1 To verify that the interfaces in question have been configured to use LDP, use the **show mpls interfaces** command:

```
Router# show mpls interfaces

Interface              IP         Tunnel   Operational
Ethernet1/1/1          Yes (tdp)  No       No
Ethernet1/1/2          Yes (tdp)  Yes      No
Ethernet1/1/3          Yes (tdp)  Yes      Yes
POS2/0/0               Yes (tdp)  No       No
ATM0/0.1               Yes (tdp)  No       No          (ATM labels)
ATM3/0.1               Yes (ldp)  No       Yes         (ATM labels)
ATM0/0.2               Yes (tdp)  No       Yes
```

Step 2 To verify that the interface is up and sending LDP Discovery Hello messages (as opposed to TDP Hello messages), use the **show mpls ldp discovery** command:

```
Router# show mpls ldp discovery

Local LDP Identifier:
    118.1.1.1:0
Discovery Sources:
Interfaces:
       POS2/0 (ldp): xmit/recv
           LDP Id: 155.0.0.55:0
       Tunnel1 (ldp): Targeted -> 133.0.0.33
Targeted Hellos:
       118.1.1.1 -> 133.0.0.33 (ldp): active, xmit/recv
           LDP Id: 133.0.0.33:0
       118.1.1.1 -> 168.7.0.16 (tdp): passive, xmit/recv
           TDP Id: 168.7.0.16:0
Router#
```

Step 3 To verify the acceptance of the configuration commands, you can issue the **show run** command.

Note If you issue the **show run** command as part of the verification process, the commands you entered by typing **mpls** . . . may be shown as **tag-switching** . . . (see the "Saving Configurations: MPLS/Tag Switching Commands" section.

Saving Configurations: MPLS/Tag Switching Commands

A number of configuration commands with both MPLS and tag switching forms will be supported during the transition from a tag switching environment to a standards-based MPLS environment. For example, the **mpls ip** command is equivalent to the **tag-switching ip** command.

Refer to Table 2 and Table 3 in the "CLI Command Summary" section for a complete list of commands related to LDP that have both MPLS and tag switching forms.

For commands that support both MPLS and tag switching forms, the tag switching form will be written to saved configurations during the transition period from TDP to LDP. Suppose, for example, that you configured an LC-ATM interface on a router by means of the following commands:

```
Router# configure terminal
Router(config)# interface ATM3/0.1 mpls
Router(config-if)# ip unnumbered Loopback0
router(config-if)# mpls ip
Router(config-if)# mpls label protocol ldp
```

In this example, the **interface ATM3/0.1 mpls** command and the **mpls ip** command have tag switching forms. After you enter these commands and save this configuration or display the running configuration with the **show running** command, the commands saved or displayed would appear as follows:

```
interface ATM3/0.1 tag-switching
ip unnumbered Loopback0
tag-switching ip
mpls label protocol ldp
```

Writing the tag switching form of commands with both MPLS and tag switching forms to the saved configuration makes it possible for you to use a router software image that supports LDP to:

- Modify and write interface configurations
- At a later time, use interface configurations created by the LDP image with an earlier software version that does not support LDP

For the above example, older software that supports TDP, but not LDP, would be able to interpret all of the interface configuration commands, except for the **mpls label protocol** command. The older software would generate a warning message about the unrecognized command; nevertheless, the image would bring up the interface configured to run TDP.

Configuration Examples

This section provides the following configuration information:

- LDP Configuration Overview
- Configuring LDP for Packet Interfaces Example
- Configuring LDP for Label-Controlled ATM Interfaces Example
- Configuring LDP for Targeted Sessions Example

LDP Configuration Overview

The next three sections describe aspects of MPLS LDP that will help you understand the configuration examples that follow later for packet interfaces, ATM interfaces, and targeted sessions.

Label Bindings, Label Spaces, and LDP Identifiers

An LDP *label binding* is an association between a destination prefix and a label. The label used in a label binding is allocated from a set of possible labels called a *label space*.

LDP supports two types of label spaces:

- Interface-specific—An interface-specific label space uses interface resources for labels. For example, label-controlled ATM (LC-ATM) interfaces use virtual path identifiers/virtual circuit identifiers (VPIs/VCIs) for labels. Depending on its configuration, an LDP platform may support zero, one, or more interface-specific label spaces.
- Platform-wide—An LDP platform supports a single platform-wide label space for use by interfaces that can share the same labels. For Cisco platforms, all interface types except LC-ATM use the platform-wide label space.

LDP uses a 6-byte quantity called an *LDP Identifier* (or *LDP ID*) to name label spaces. The LDP convention is: a) the first four bytes of the LDP ID identify the LSR that owns the label space; and b) the last two bytes identify the label space within the LSR. For the platform-wide label space, the last two bytes of the LDP ID are always both 0.

The Cisco convention is that the first four bytes of an LDP ID is a platform IP address called the LDP router ID. The last two bytes are called the local label space ID. The display representation for an LDP ID takes the following form:

<LDP router ID> : <local label space ID>

The following are examples of this form:

133.0.0.33:0, 167.3.0.54:3

The LDP router ID is determined as described below. For purposes of this discussion, "S" represents the set of interfaces that are up and have IP addresses, while "I" represents the interface specified by the **mpls ldp router-id** command, if any.

a. If interface I is in S, then the IP address of interface I is the LDP router ID.
b. Otherwise, if there is a loopback interface in S, the largest IP address of the loopback addresses in S is the LDP router ID.
c. Otherwise, the largest IP address of the interfaces in S is the LDP router ID.

LDP Discovery

LDP discovery is a mechanism that reduces the amount of per-peer configuration required for LDP by enabling an LSR to discover potential LDP peers.

An LSR engages in discovery by periodically transmitting LDP Hello messages to signal its desire to advertise label bindings. The LSR sends the LDP Hello messages as UDP packets to the well known LDP port (646).

LDP defines two types of discovery:

- *Basic* discovery—Used to discover directly connected LDP LSRs. For basic discovery, an LSR sends Hellos messages to the "all routers on this subnet" multicast address on interfaces for which LDP has been configured.
- *Extended* discovery—Used between nondirectly connected LDP LSRs. For extended discovery, an LSR sends targeted Hello messages to a specific IP address.

The Hello messages carry the LDP ID of the label space that the sending LSR wants to advertise, as well as other information.

When an LSR receives an LDP Hello message from another LSR, it considers that LSR and the specified label space to be "discovered." After two LSRs discover each other in this manner, they attempt to establish an LDP session (as described in the next section).

LDP TCP Connections and Session Establishment

LDP label distribution between two LSRs requires establishment of an LDP session. LSRs that have discovered each other establish an LDP session by:

- Opening a TCP connection to be used to distribute label bindings.

  For Cisco platforms, an LSR will use either its LDP router ID or the IP source address of its discovery Hello messages as the IP address for its endpoint of the TCP connection. The address it intends to use is specified to its LSR peer in the Hello messages it sends.

  To establish the TCP connection, each LSR must have IP connectivity (that is, a route) to the IP address for the other LSR's endpoint for the connection.
- Negotiating parameters for the LDP session.

  Such parameters include the label distribution method (Downstream Unsolicited or Downstream on Demand) and other parameters.

After successfully opening the session TCP connection and agreeing to parameters for the session, LDP label distribution begins.

Configuring LDP for Packet Interfaces Example

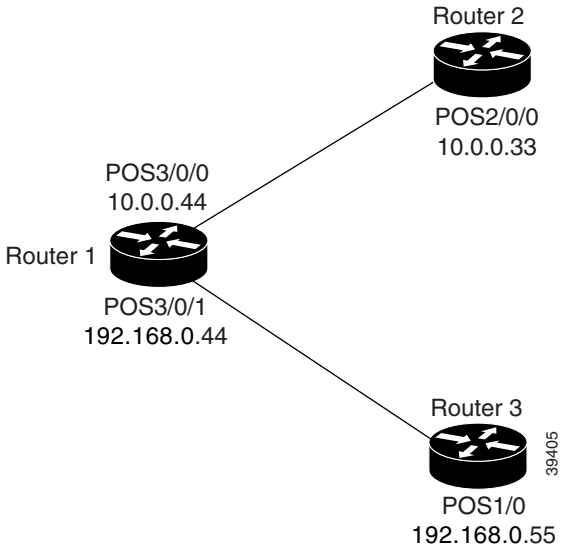
Figure 1 shows a sample network for configuring the use of LDP for packet interfaces.

Note ATM point-to-point subinterfaces are considered "packet" interfaces when configuring LDP. ATM MPLS subinterfaces (and tag switching subinterfaces) are considered LC-ATM interfaces when configuring LDP (see the next section).

The three router configurations that follow accomplish the following:

- Enable MPLS hop-by-hop forwarding for the POS links between Router 1 and Router 2 and between Router 1 and Router 3.
- Configure the use of LDP for label distribution between Router 1 and Router 2.
- Configure the use of TDP (the default) for label distribution between Router 1 and Router 3.
- Configure a loopback interface and IP address for each LSR that can be used as the LDP router ID component of the LSR's LDP ID.

Figure 1 Configuration of LDP for Packet Interfaces



Note The configuration examples below show only the commands related to configuring LDP for Router 1, Router 2, and Router 3 in the sample network shown in Figure 1.

Router 1 Configuration

```
ip cef distributed!Assumes R1 supports distributed CEF

interface Loopback0!Loopback interface for LDP ID.
ip address 131.25.0.11 255.255.255.255

interface POS3/0/0
ip address 34.0.0.44 255.0.0.0
mpls ip !Enable hop-by-hop MPLS forwarding
mpls label protocol ldp!Use LDP for this interface

interface POS3/0/1
ip address 45.0.0.44 255.0.0.0
mpls ip!Enable hop-by-hop MPLS forwarding
    !Uses TDP (the default)
```

Router 2 Configuration

```
ip cef distributed!Assumes R2 supports distributed CEF

interface Loopback0!Loopback interface for LDP ID.
ip address 131.25.0.22 255.255.255.255

interface POS2/0/0
ip address 34.0.0.33 255.0.0.0
mpls ip!Enable hop-by-hop MPLS forwarding
mpls label protocol ldp!Use LDP for this interface
```

Router 3 Configuration

```
ip cef!Assumes R3 does not support
    !distributed CEF

interface Loopback0!Loopback interface for LDP ID.
ip address 131.25.0.33 255.255.255.255

interface POS1/0
ip address 45.0.0.55 255.0.0.0
mpls ip!Enable hop-by-hop MPLS forwarding
    !Uses TDP (the default)
```

The LDP configuration for Router 1 uses the interface **mpls label protocol ldp** command because some of its interfaces use LDP and some use TDP. Another way to configure Router 1 is to use the global **mpls label protocol ldp** command to configure LDP as the default protocol for interfaces and use the interface **mpls label protocol tdp** command to configure TDP for the POS3/0/1 link to Router 3. This alternative way to configure Router 1 is shown below:

Router 1 Configuration

```
ip cef distributed!Assumes R1 supports distributed CEF

mpls label protocol ldp!Use LDP for the default protocol

interface Loopback0!Loopback interface for LDP ID.
ip address 131.25.0.11 255.255.255.255

interface POS3/0/0
ip address 34.0.0.44 255.0.0.0
mpls ip !Enable hop-by-hop MPLS forwarding
    !Use LDP (configured i/f default)

interface POS3/0/1
ip address 45.0.0.44 255.0.0.0
mpls ip!Enable hop-by-hop MPLS forwarding
mpls label protocol tdp!Use TDP for this interface
```

The configuration of Router 2 also uses the interface **mpls label protocol ldp** command. If all of its interfaces are to use LDP, then the global **mpls label protocol ldp** could be used without any interface **mpls label protocol** commands.

Note Use of the **mpls ip** command on an interface triggers the transmission of discovery Hello messages for the interface.

Note When two platforms are directly connected by multiple packet links, the same label distribution protocol (LDP or TDP) must be configured for all of the packet interfaces connecting the platforms.

Note If a loopback IP address has been configured, it will be selected as the router ID component of the local LDP ID unless the loopback interface has been explicitly shut down or the **mpls ldp router-id** command has been used to specify that some other interface should be preferred when determining the LDP router ID. Configuring a loopback interface and IP address on each router is not a requirement for LDP; however, doing so helps ensure a stable LDP ID for the router because the state of loopback addresses does not change, except in response to explicit configuration action.

Note If you use a loopback interface, make sure that the IP address for the loopback interface is configured with a /32 network mask. In addition, make sure that the routing protocol in use is configured to advertise the corresponding /32 network.

Configuring LDP for Label-Controlled ATM Interfaces Example

The commands required to configure LDP for a LC-ATM interface depend upon the type of interface in use.

There are three different types of LC-ATM interfaces:

- Interface type 1—LC-ATM interfaces on a router.
- Interface type 2—LC-ATM interfaces on an ATM switch that runs routing and MPLS control plane software. The Cisco 8540 is an example of such an ATM switch.
- Interface type 3—LC-ATM interfaces on an ATM switch whose MPLS operation is controlled by a label switch controller (LSC). The BPX and MGX are examples of such ATM switches.

The following example illustrates the configuration of LDP for LC-ATM interfaces of types 1 and 2.

The example is based on the network topology shown in Figure 2, which incorporates a router and an ATM switch connected by means of an ATM link.

Configuring LDP for a router ATM interface is a two-step process:

1. Creating an MPLS subinterface for the ATM interface
2. Configuring LDP for the MPLS subinterface

Configuring LDP for an ATM interface on an ATM switch that is running routing and MPLS control plane software (LC-ATM interface type 2) is similar to configuring LDP for a packet interface.

Figure 2 Configuration of LDP for LC-ATM Interfaces

In the following sample configurations, the use of LDP is configured for the ATM link between Router 1 and Switch 1 (see Figure 2).

Router 1 Configuration:

```
ip cef distributed!Assumes R1 supports distributed CEF

interface Loopback0
 ip address 133.0.0.33 255.255.255.255

interface ATM3/0.1 mpls!Create the MPLS sub-interface
 ip unnumbered Loopback0!Use IP address of loopback
    !interface 0 for this interface
mpls ip!Enable hop-by-hop MPLS forwarding
mpls label protocol ldp!Use LDP for this interface
```

Switch 1 Configuration:

```
interface Loopback0
 ip address 121.0.0.21 255.255.255.255

interface ATM1/1/1
 ip unnumbered Loopback0!Use IP address of loopback
    !interface 0 for this interface
mpls ip!Enable hop-by-hop MPLS forwarding
mpls label protocol ldp!Use LDP for this interface
```

Note The use of unnumbered interfaces is not required for LDP, but it is recommended.

Configuring LDP for Targeted Sessions Example

Some situations require a label distribution session between platforms that are not directly connected. For example, when you issue the **mpls ip** command on an MPLS traffic engineering tunnel interface, a label distribution session must be established between the tunnel head end and the tail end platforms. Such a session is called a targeted session.

Session establishment for targeted sessions is supported by targeted Hello messages sent between the platforms. Normally the transmission of targeted Hello messages is triggered by some configuration action for the application that requires the targeted session. For example, using the **mpls ip** command on an MPLS traffic engineering tunnel initiates the transmission of targeted Hello messages from the tunnel head end platform to the tunnel tail end platform.

You can use the **mpls ldp neighbor targeted** command to improve label convergence time for directly connected neighbor LSRs when the link(s) directly connecting them are down. When the links between the neighbor LSRs are up, both link and targeted Hellos maintain the LDP session. If the links between the neighbor LSRs go down, the targeted Hellos maintain the session allowing the LSRs to retain labels learned from each other. When a link directly connecting the LSRs comes back up, the LSRs can immediately reinstall labels for forwarding use without having to reestablish their LDP session and exchange labels.

Unlike LDP sessions for directly connected peers, targeted sessions are asymmetrical. One peer initiates the session by transmitting targeted Hello messages that carry a “send targeted Hello messages in response” request. This request causes the target peer to respond with targeted Hello messages if its configuration permits it to do so.

The exchange of targeted Hello messages between two nondirectly connected neighbors, N1 and N2, may occur in the following ways:

- N1 may initiate the transmission of targeted Hello messages carrying a response request to N2, and N2 may send targeted Hello messages in response if its configuration permits. In this situation, N1 is considered to be *active* and N2 is considered to be *passive*.
- N1 and N2 may both be configured to initiate the transmission of targeted Hello messages to each other. In this situation, both are considered to be *active*. Both, one, or neither N1 nor N2 can also be *passive*, depending on whether they have been configured to respond to requests for targeted Hello messages from each other.

The default behavior of an LSR is to ignore requests from other LSRs to send targeted Hello messages. You can configure an LSR to respond to requests for targeted Hello messages by issuing the **mpls ldp discovery targeted-hellos accept** command.

The protocol used for a targeted session is controlled by the active LSR in the following sense: a passive LSR that is permitted to respond to requests from an active LSR will do so using the protocol of the received targeted Hello messages.

For applications in which targeted sessions are associated with interfaces, you can use the **mpls label protocol** global and interface configuration commands to specify the protocol for a given interface. For example, the following commands establish an LDP targeted session with the tunnel tail end route:

```
interface Tunnel1
tunnel destination 133.0.0.33
mpls ip
mpls label protocol ldp
```

Tunnel1 is an MPLS traffic engineering tunnel interface.

The output of the **show mpls ldp discovery** command provides the following information for targeted Hello messages:

- The protocol being used for each targeted LSR.
- The characteristics of the discovery activity with the targeted LSR. This includes whether the local LSR is active (an initiator of targeted Hello messages that carry a response request), passive (a responder of requests for targeted Hello messages from the other LSR), or both.

Consider the following output from the **show mpls ldp discovery** command:

```
Router# show mpls ldp discovery

Local LDP Identifier:
    118.1.1.1:0
Discovery Sources:
Interfaces:
       POS2/0 (ldp): xmit/recv
           LDP Id: 155.0.0.55:0
       Tunnel1 (ldp): Targeted -> 133.0.0.33
Targeted Hellos:
       118.1.1.1 -> 133.0.0.33 (ldp): active, xmit/recv
           LDP Id: 133.0.0.33:0
       118.1.1.1 -> 168.7.0.16 (tdp): passive, xmit/recv
           TDP Id: 168.7.0.16:0
Router#
```

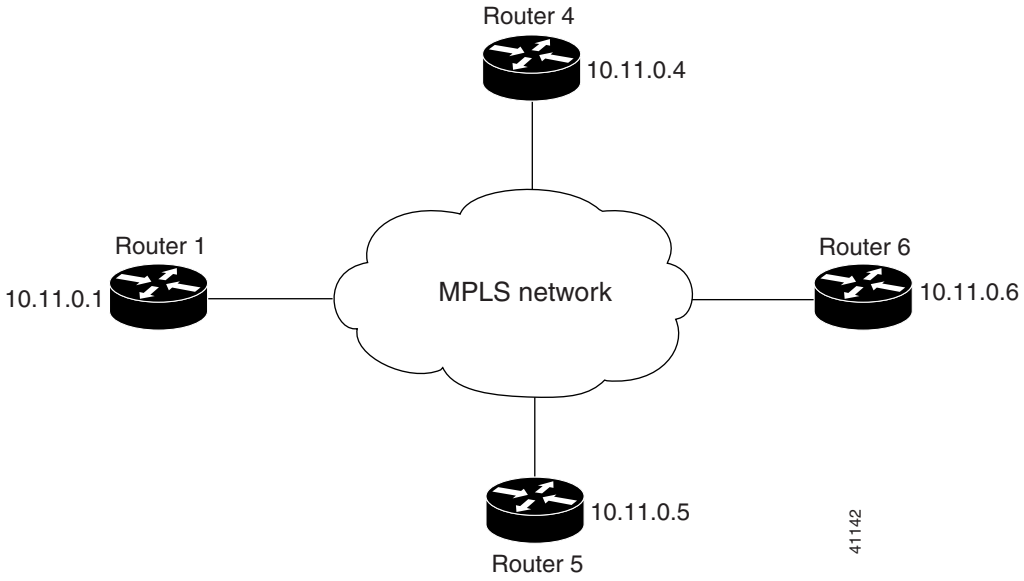
This command output indicates that:

- The local LSR (118.1.1.1) is sending LDP link Hello messages on interface POS2/0 and has discovered neighbor 155.0.0.55.
- The local LSR is sending LDP targeted Hello messages associated with interface Tunnel1 to target 133.0.0.33. The LSR uses LDP for the target because the LSR was configured to do so by means of the **mpls label protocol ldp** command.
- The local LSR is active for targeted discovery activity with 133.0.0.33; this means that the targeted Hello messages it sends to 133.0.0.33 carry a response request. This LSR is active due to the configuration of an application (**mpls ip** on Tunnel1, for example) that requires an LDP session with the nondirectly connected LSR 133.0.0.33.
- The local LSR is not passive for the discovery activity with 133.0.0.33 because: a) the targeted Hello messages it receives from 133.0.0.33 do not carry a response request, or b) the Local LSR has not been configured to respond to such requests.
- The local LSR is sending TDP directed Hello messages to the target LSR 168.7.0.16. This LSR uses TDP because the Hello messages received from the target LSR 168.7.0.16 were TDP directed Hello messages.

- The local LSR is passive in discovery activity with LSR 168.7.0.16. This means that the directed Hello messages it receives from LSR 168.7.0.16 carry a response request and that the local LSR has been configured by means of the **mpls ldp discovery targeted-hello accept** command to respond to such requests from LSR 168.7.0.16.
- The local LSR is not active in discovery activity with LSR 168.7.0.16 because no application that requires an LDP session with LSR 168.7.0.16 has been configured on the local LSR.

The following examples illustrate the configuration of platforms for targeted sessions using the sample network shown in Figure 3. Note that Routers 1, 4, 5, and 6 in this sample network are not directly connected to each other.

Figure 3 Sample Network for Configuring LDP for Targeted Sessions



The configuration examples presented below accomplish the following:

a. Use of LDP for targeted sessions between Router 1 and Router 4. The configurations below require that Router 1 and Router 4 both be active.
b. Use of LDP for targeted sessions between Router 1 and Router 6. The configurations below require that Router 1 be active and allow Router 6 to be passive.
c. Use of TDP (the default) for targeted sessions between Router 1 and platforms other than Routers 4 and 6 (for example, between Router 1 and Router 5). The configuration for Router 5 requires it to be active in such sessions.

These examples assume that the active ends of the targeted sessions are associated with tunnel interfaces, such as MPLS traffic engineering tunnels. They show only the commands related to configuring the use of LDP targeted sessions. The examples do not show configuration of the applications that initiate the targeted sessions.

Router 1 Configuration

```
ip cef distributed!Assumes Router1 supports distributed CEF

interface Loopback0!Loopback interface for LDP ID.
ip address 131.25.0.11 255.255.255.255
```

```
interface Tunnel14!Tunnel to Router 4 requiring label distribution
tunnel destination 131.11.0.4!Tunnel endpoint is Router 4
mpls label protocol ldp!Use LDP for session with Router 4
... !Other configuration for Tunnel14

interface Tunnel15!Tunnel to Router 5 requiring label distribution
tunnel destination 131.11.0.5!Tunnel endpoint is Router 5
... !Other configuration for Tunnel15

interface Tunnel16!Tunnel to Router 6 requiring label distribution
tunnel destination 131.11.0.6!Tunnel endpoint is Router 6
mpls label protocol ldp!Use LDP for session with Router 6
... !Other configuration for Tunnel16
```

For Router 1, the default label protocol for interfaces is TDP because there is no global **mpls label protocol ldp** command. This requires that the configuration for tunnel interfaces Tunnel14 and Tunnel16 include **mpls label protocol ldp** commands to specify use of LDP for targeted sessions associated with these interfaces. Since TDP is desired for the targeted session with Router 5, there is no need to include an **mpls label protocol tdp** command as part of the Tunnel15 configuration because the default protocol for interfaces on Router 1 is TDP.

Router 4 Configuration

```
ip cef distributed!Assumes Router 4 supports distributed CEF

mpls label protocol ldp!Use LDP as default for all interfaces

interface Loopback0!Loopback interface for LDP ID.
ip address 131.25.0.44 255.255.255.255

interface Tunnel41!Tunnel to Router 1 requiring label distribution
tunnel destination 131.11.0.1!Tunnel endpoint is Router 1
... !Other configuration for Tunnel41
```

For Router 4, the global **mpls label protocol ldp** command makes it unnecessary to explicitly specify LDP as part of the configuration for the Tunnel41 targeted session with Router 1.

Router 5 Configuration

```
ip cef!Assumes Router 5 doesn't support dist. CEF

interface Loopback0!Loopback interface for LDP ID.
ip address 131.25.0.55 255.255.255.255

interface Tunnel51!Tunnel to Router 1 requiring label distribution
tunnel destination 131.11.0.1!Tunnel endpoint is Router 1
... !Other configuration for Tunnel51
```

Router 5 must use TDP for all targeted sessions it participates in as an active router because its configuration contains neither the global **mpls label protocol ldp** command nor the interface **mpls label protocol ldp** command.

Router 6 Configuration

```
ip cef distributed!Assumes Router 6 supports distributed CEF

interface Loopback0!Loopback interface for LDP ID.
ip address 131.25.0.66 255.255.255.255

mpls ldp discovery targeted-hellos accept from LDP_SOURCES
    !Respond to requests for targeted hellos
    !from sources permitted by acl LDP_SOURCES
```

```
ip access-list standard LDP_SOURCES!Define acl for targeted hello sources.
permit 131.11.0.1!Accept targeted hello request from Router 1.
deny any!Deny requests from other sources.
```

By default, a router cannot be a passive neighbor in targeted sessions. Therefore, Router 1, Router 4, and Router 5 can only be active neighbors in any targeted sessions they are part of because their configuration does not permit them to be passive. The **mpls ldp discovery targeted-hello accept** command permits Router 6 to be a passive target in targeted sessions with Router 1. Router 6 can also be an active neighbor in targeted sessions, although the example does not include such a configuration.

Transitioning a Network from TDP to LDP

The software for this release facilitates the orderly transition of a network that uses TDP to one that uses LDP. Key software features supporting this transition to LDP include the following:

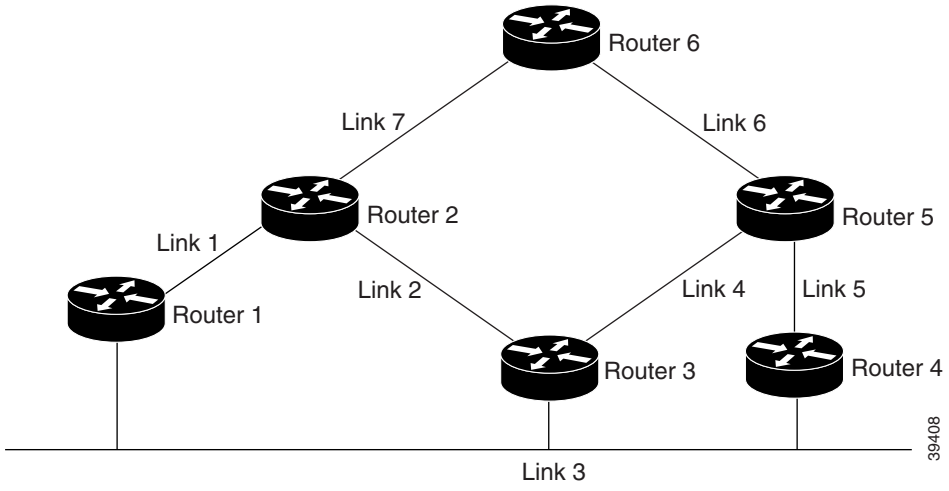
- LDP and TDP are both supported and can operate simultaneously on a given platform.
- The protocol to be used for directly connected peers is configurable on a per-interface basis.
- The protocol to be used for nondirectly connected peers is configurable on a per-session basis.
- A label-switched path (LSP) across an MPLS network can be signaled by LDP on some hops and by TDP on other hops.

These software features enable a staged transition from TDP to LDP on a link-by-link or a targeted session-by-session basis.

In considering the steps involved in configuring the simple network shown in Figure 4 to use LDP, assume that the following conditions apply:

- TDP is currently used for label distribution throughout the network.
- Each link has been enabled by means of the **tag-switching ip** command**.**
- Tag/label distribution sessions are required between the following nondirectly connected platforms:
  - Router 1 (active via Tunnel15) and Router 5 (active via Tunnel51)
  - Router 1 (active via Tunnel16) and Router 6 (passive)

Figure 4 Sample Network for Transitioning from TDP to LDP



To accomplish the transition from TDP to LDP for the network topology shown in Figure 4, perform the following steps:

Step 1 Convert the label distribution for Link 1 from TDP to LDP by invoking the **mpls label protocol ldp** command on Router 1 and Router 2 for their interfaces to Link 1.

Verify proper MPLS operation.

Step 2 Convert the label distribution between Router 1 and Router 3 for the Ethernet link from TDP to LDP by invoking the **mpls label protocol both** command on Router 1 and Router 3 for their interfaces to Link 3.

The **mpls label protocol both** command enables Router 1 and Router 3 to use LDP or TDP for label distribution sessions with neighbors directly connected to Link 3 (with a preference for LDP). The resulting configuration establishes:

- An LDP session between Router 1 and Router 3
- A TDP session between Router 1 and Router 4
- A TDP session between Router 3 and Router 4

Verify proper MPLS operation.

Step 3 Convert the label distribution for Link 2 from TDP to LDP by invoking the **mpls label protocol ldp** command on Router 2 and Router 3 for their interfaces to Link 2.

Verify proper MPLS operation.

Step 4 Convert the label distribution for Link 4 and Link 5 from TDP to LDP by invoking the **mpls label protocol ldp** command on Router 3, Router 4, and Router 5 for the interfaces to Link 4 and Link 5.

Verify proper MPLS operation. You can do so in two separate steps, if desired—one for Link 4 and one for Link 5.

Step 5 Convert the label distribution for Link 6 and Link 7 from TDP to LDP by invoking the **mpls label protocol ldp** command on Router 2, Router 5, and Router 6 for the interfaces to Link 6 and Link 7.

Verify proper MPLS operation. You can do so in two separate steps, if desired—one for Link 6 and one for Link 7.

Step 6 Complete the conversion for Link 3 started in Step 2 by invoking the **mpls label protocol ldp** command on Router 4 for Link 3, and also on Router 1 and Router 3 for Link 3.

Verify proper MPLS operation.

Note The **mpls label protocol both** command in Step 2 enables both LDP and TDP discovery to occur for Router 1 and Router 3 on Link 3. Since TDP is no longer required by any of the routers connected to Link 3, replacing that command with the **mpls label protocol ldp** command disables TDP discovery on Router 1 and Router 3, leaving only LDP discovery enabled on Router 1, Router 3, and Router 4.

Step 7 Convert the targeted label distribution between Router 1 and Router 5 from TDP to LDP.

To do so, add the **mpls label protocol ldp** command to the configuration of Tunnel15 on Router 1. This assumes that Router 5, which is passive for targeted sessions between Router 1 and Router 5, has previously been configured to accept targeted Hello messages from Router 1 via the **mpls ldp discovery targeted-hello accept** command.

Verify proper MPLS operation.

Step 8 Convert the targeted label distribution between Router 1 and Router 6 from TDP to LDP by adding the **mpls label protocol ldp** command to the configurations of Tunnel16 on Router 1 and Tunnel61 Router 6.

Verify proper MPLS operation.

This step completes the transition of the network from TDP to LDP.

At this point, you could make the following additional changes to "clean up" each of the configurations:

1. Add the global **mpls label protocol ldp** command to each configuration.
2. Remove all interface **mpls label protocol ldp** commands from each configuration.

CLI Command Summary

The CLI commands described in this document fall into three categories:

- CLI commands introduced initially in Cisco IOS 12.0(10)ST and 12.0(14)ST) for new LDP functionality (see Table 1)—These commands support new MPLS LDP functionality and are not derived from any existing TDP commands.
- Functionally equivalent, but syntactically different, LDP commands (see Table 2)—These commands, although derived from existing TDP commands, have a command syntax that differs in some respects from their corresponding TDP counterparts. For example, some commands in this category incorporate new keywords or parameters that are specific to MPLS LDP functionality.
- Functionally and syntactically equivalent LDP commands (see Table 3)—These commands were not only derived from existing TDP commands, but they also preserve the basic syntax of their TDP counterparts in implementing new MPLS LDP functionality.

Table 1 New CLI Commands Being Introduced in this Release for LDP Functionality

Command	Description
debug mpls atm-ldp failure	Displays failure information about the LC-ATM.
debug mpls ldp backoff	Displays information about the label distribution protocol (LDP) backoff mechanism parameters
mpls label protocol (global configuration)	Specifies the default label distribution protocol for the platform.
mpls label protocol (interface configuration)	Specifies the label distribution protocol to be used on a given interface.
mpls ldp address-message	Specifies advertisement of platform addresses to a label-controlled ATM (LC-ATM) LDP peer.
mpls ldp advertise-labels old-style	Causes the interpretation of the **for** *prefix-access-list* for **mpls ldp advertise-labels** commands to be interpreted according to the method used in earlier software versions.
mpls ldp backoff	Configures parameters for the LDP backoff mechanism.
mpls ldp discovery transport-address	Specifies the transport address advertised in LDP Discovery Hello messages sent on an interface.
mpls ldp explicit-null	Causes a router to advertise an Explicit Null label in situations where it would normally advertise an Implicit Null label.

Table 1 New CLI Commands Being Introduced in this Release for LDP Functionality (continued)

Command	Description
mpls ldp loop-detection	Enables the LDP optional loop detection mechanism.
mpls ldp neighbor implicit-withdraw	Configures the advertisement of a new label for a Forwarding Equivalence Class (FEC) without the withdrawal of the previously advertised label
mpls ldp neighbor password	Configures a password key for use with the TCP Message Digest 5 (MD5) Signature Option for the session TCP connection with the specified neighbor.
mpls ldp neighbor targeted	Configures the use of LDP for "targeted" sessions.
mpls ldp router-id	Specifies a preferred interface for determining the LDP router ID.
show mpls ip binding	Displays specified information about label bindings learned by LDP.
show mpls ldp backoff	Displays information about the configured session setup backoff parameters and any potential LDP peers with which session setup attempts are being throttled.

Table 2 LDP Commands with Syntactic Structure Different from Corresponding TDP Commands

LDP Command	Corresponding TDP Command	Description
mpls ldp advertise-labels	**tag-switching advertise-tags**	Controls the distribution of locally assigned (incoming) labels by means of LDP.
mpls ldp atm control-mode	**tag-switching atm allocation-mode**	Controls the mode used for handling label binding requests on LC-ATM interfaces.
mpls ldp atm vc-merge	**tag-switching atm vc-merge**	Controls whether the vc-merge (multipoint-to-point) capability is supported for unicast label VCs.
mpls ldp maxhops	**tag-switching atm maxhops**	Limits the number of hops permitted in an LSP established by the Downstream on Demand method of label distribution.
debug mpls ldp advertisements	**debug tag-switching tdp advertisements**	Displays information about the advertisement of labels and interface addresses to LDP peers. Incorporates two new keywords/parameters.
debug mpls ldp bindings	**debug tag-switching tdp bindings**	Displays information about addresses and label bindings learned from LDP peers by means of LDP downstream unsolicited label distribution. Incorporates two new keywords/parameters.
debug mpls ldp messages	**debug tag-switching tdp pies sent**	Displays specific information (such as message type, source, and destination) regarding LDP messages sent to and received from LDP peers. Incorporates several new keywords/parameters.
debug mpls ldp session io	**debug tag-switching tdp pies received**	Displays the contents of LDP messages sent to and received from LDP peers. Incorporates two new keywords/parameters.
debug mpls ldp session state-machine	**debug tag-switching tdp session state-machine**	Displays information about state transitions for LDP sessions. Incorporates one new keyword/parameter.

Table 2 LDP Commands with Syntactic Structure Different from Corresponding TDP Commands (continued)

LDP Command	Corresponding TDP Command	Description
debug mpls ldp transport connections	**debug tag-switching tdp transport connections**	Displays information about the TCP connections used to support LDP sessions. Incorporates two new keywords/parameters.
debug mpls ldp transport events	**debug tag-switching tdp transport events**	Displays information about events related to the LDP peer discovery mechanism. Incorporates two new keywords/parameters.

Table 3 LDP Commands with Same Syntactic Structure as Corresponding TDP Commands

LDP Command	Corresponding TDP Command	Description
debug mpls atm-ldp api	**debug tag-switching atm-tdp api**	Displays information about the VCI allocation of label VCs (LVCs), label-free requests, and cross-connect requests.
debug mpls atm-ldp routes	**debug tag-switching atm-tdp routes**	Displays information about the state of the routes for which VCI requests are being made.
debug mpls atm-ldp states	**debug tag-switching atm-tdp states**	Displays information about LVC state transitions as they occur.
debug mpls ldp peer state-machine	**debug tag-switching tdp peer state-machine**	Displays information about state transitions for LDP sessions.
debug mpls ldp targeted-neighbors	**debug tag-switching tdp directed-neighbors**	Displays information about the target neighbor mechanism.
mpls ip (global configuration)	**tag-switching ip (global configuration)**	Enables MPLS forwarding of IPv4 packets along normally routed paths for the platform.
mpls ip (interface configuration)	**tag-switching ip (interface configuration)**	Enables MPLS forwarding of IPv4 packets along normally routed paths for a particular interface.
mpls ldp discovery	**tag-switching tdp discovery**	Configures the interval between transmission of consecutive LDP discovery Hello messages, or the hold time for a discovered LDP neighbor, or the neighbors from which requests for targeted Hello messages may be honored.
mpls ldp holdtime	**tag-switching tdp holdtime**	Changes the time for which an LDP session is maintained in the absence of LDP messages from the session peer.
show mpls atm-ldp bindings	**show tag-switching atm-tdp bindings**	Displays specified entries from the ATM LDP label binding database.
show mpls atm-ldp bindwait	**show tag-switching atm-tdp bindwait**	Displays the number of bindings waiting for label assignments from a remote MPLS ATM switch.
show mpls atm-ldp capability	**show tag-switching atm-tdp capability**	Displays the MPLS ATM capabilities negotiated with LDP neighbors for LC-ATM interfaces.
show mpls atm-ldp summary	**show tag-switching atm-tdp summary**	Displays summary information about all the entries in the ATM label binding database.

Table 3 LDP Commands with Same Syntactic Structure as Corresponding TDP Commands (continued)

LDP Command	Corresponding TDP Command	Description
show mpls interfaces	**show tag-switching interfaces**	Displays information about one or more or all interfaces that are configured for label switching.
show mpls ldp bindings	**show tag-switching tdp bindings**	Displays the contents of the label information base (LIB).
show mpls ldp discovery	**show tag-switching tdp discovery**	Displays the status of the LDP discovery process.
show mpls ldp neighbor	**show tag-switching tdp neighbor**	Displays the status of LDP sessions.
show mpls ldp parameters	**show tag-switching tdp parameters**	Displays current LDP parameters.

Command Reference

This section describes the following MPLS debugging, configuration, and display commands:

- **debug mpls atm-ldp api**
- **debug mpls atm-ldp failure**
- **debug mpls atm-ldp routes**
- **debug mpls atm-ldp states**
- **debug mpls ldp advertisements**
- **debug mpls ldp backoff**
- **debug mpls ldp bindings**
- **debug mpls ldp messages**
- **debug mpls ldp peer state-machine**
- **debug mpls ldp session io**
- **debug mpls ldp session state-machine**
- **debug mpls ldp targeted-neighbors**
- **debug mpls ldp transport connections**
- **debug mpls ldp transport events**
- **mpls ip (global configuration)**
- **mpls ip (interface configuration)**
- **mpls label protocol (global configuration)**
- **mpls label protocol (interface configuration)**
- **mpls ldp address-message**
- **mpls ldp advertise-labels**
- **mpls ldp advertise-labels old-style**
- **mpls ldp atm control-mode**
- **mpls ldp atm vc-merge**
- **mpls ldp backoff**
- **mpls ldp discovery**
- **mpls ldp discovery transport-address**
- **mpls ldp explicit-null**
- **mpls ldp holdtime**
- **mpls ldp loop-detection**
- **mpls ldp maxhops**
- **mpls ldp neighbor implicit-withdraw**
- **mpls ldp neighbor password**
- **mpls ldp neighbor targeted**
- **mpls ldp router-id**
- **show mpls atm-ldp bindings**

- show mpls atm-ldp bindwait
- show mpls atm-ldp capability
- show mpls atm-ldp summary
- show mpls interfaces
- show mpls ip binding
- show mpls ldp backoff
- show mpls ldp bindings
- show mpls ldp discovery
- show mpls ldp neighbor
- show mpls ldp parameters

debug mpls atm-ldp api

To display information about the virtual channel identifier (VCI) allocation of label virtual circuits (LVCs), label-free requests, and cross-connect requests, use the **debug mpls atm-ldp api** command in privileged EXEC mode. To disable this feature, use the **no** form of this command.

debug mpls atm-ldp api

no debug mpls atm-ldp api

Syntax Description

This command has no arguments or keywords.

Defaults

This command has no default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.1CT	This command was introduced.
12.1(2)T	This command was modified.
12.0(10)ST	This command was modified to reflect MPLS IETF command syntax and terminology.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

Use the **debug mpls atm-ldp api** command in conjunction with the **debug mpls atm-ldp routes** and **debug mpls atm-ldp states** command to display more complete information about an LVC.

Examples

The following shows sample output from the **debug mpls atm-ldp api** command:

```
Router# debug mpls atm-ldp api

Tailend Router Free label Req 167.50.0.0 on ATM0/0.2 VPI/VCI 1/674
 TAGATM_API: received label free request
             interface: ATM0/0.2  dir: in  vpi: 1  vci: 674
 TAGATM_API: completed label free
             interface: ATM0/0.2  vpi: 1  vci: 674
             result: TAGATM_OK
```

Table 4 describes the significant fields shown in the display.

Table 4 debug mpls atm-ldp api Field Descriptions

Field	Description
TAGATM_API	Subsystem that displays the message.
interface	Interface used by the driver to allocate or free VPI/VCI resources.
dir	Direction of the VC: • In—Input or receive VC • Out—Output VC
vpi	Virtual path identifier.
vci	Virtual channel identifier.
result	The return error code from the driver API.

Related Commands

Command	Description
debug mpls atm-ldp states	Displays information about LVC state transitions as they occur.

debug mpls atm-ldp failure

To display failure information about the LC-ATM, use the **debug mpls atm-ldp failure** command in privileged EXEC mode. Use the **no** form of the command to disable this feature.

debug mpls atm-ldp failure

no debug mpls atm-ldp failure

Syntax Description

This command has no arguments or keywords.

Defaults

This command has no default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.2(8)T	This command was introduced.
12.0(21)ST	The command was integrated into Cisco IOS 12.0(21)ST.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

Use the **debug mpls atm-ldp failure** command to display failure information about the LC-ATM. This command is useful for determining failure cases. This command displays only failure information, unlike the **debug mpls atm-ldp api** command, which displays all API events.

Examples

This section shows sample output from the **debug mpls atm-ldp failure** command.

The following failure message displays during a race condition where the LC-ATM attempts to allocate label virtual circuits (LVCs) on an interface where MPLS has been disabled.

```
Router# debug mpls atm-ldp failure

TAGATM_API_FAILURE: allocate_tag_req on ATM1/0/0 tagsw not enabled
```

The following failure message displays when the LC-ATM fails to deallocate the output leg LVC of a cross connect.

```
Router# debug mpls atm-ldp failure

TAGATM_API_FAILURE: connDeAllocateHalfLeg returned false interface: ATM1/0/0
vpi: 1  vci: 48

The following failure message displays when a cross connect cannot be installed on the
switching fabric. The result code is also provided.

Router# debug mpls atm-ldp failure

TAGATM_API_FAILURE: setup_xconn_req InstallSvcXconn failed result
```

The following message displays when attempts to establish a cross connect fail. The result describes the reason for the failure.

```
Router# debug mpls atm-ldp failure

TCATM-4-XCONNECT_FAILED: 10.254.13.237/32 for ATM0/1/2 ATM1/0/0
TAGATM_API: x-conn setup request completed
             input interface: ATM0/1/2  vpi: 1  vci: 48
            output interface: ATM1/0/0  vpi: 2  vci: 2038
            result = TAGATM_FAIL
Xconnect setup response for 10.254.13.215: failure, 8
```

The following message displays when attempts to remove a cross connect fail. The result describes why the cross connect cannot be removed.

```
Router# debug mpls atm-ldp failure

TCATM-4-XCONNECT_REMOVE_FAILED: Remove XConnect API failed for ATM1/0/12 1/894
-> ATM1/0/13 1/528
TAGATM_API: x-conn remove request completed
             input interface: ATM1/0/12  vpi: 1  vci: 894
            output interface: ATM1/0/13  vpi: 1  vci: 528
            result = TAGATM_FAIL
```

Related Commands

Command	Description
debug mpls atm-ldp api	Displays all driver API events.

debug mpls atm-ldp routes

To display information about the state of the routes for which virtual circuit identifier (VCI) requests are being made, use the **debug mpls atm-ldp routes** command in privileged EXEC mode. To disable this feature, use the **no** form of this command.

debug mpls atm-ldp routes

no debug mpls atm-ldp routes

Syntax Description

This command has no arguments or keywords..

Defaults

This command has no default behavior or values.

Command Modes

Privileged EXEC

Command History

Command	Modification
11.1CT	This command was introduced.
12.1(2)T	This command was modified.
12.0(10)ST	This command was modified to reflect MPLS IETF command syntax and terminology.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

When there are many routes and system activities (that is, shutting down interfaces, learning new routes, and so forth), the **debug mpls atm-ldp routes** command displays extensive information that might interfere with system timing. Most commonly, this interference affects normal label distribution protocol (LDP) operation. To avoid this problem, you can increase the LDP hold time by means of the **mpls ldp holdtime** command.

Examples

The following shows sample output from the **debug mpls atm-ldp routes** command:

```
Router# debug mpls atm-ldp routes

CleanupRoutes,not deleting route of idb ATM0/0.2,rdbIndex 0
tcatmFindRouteTags,153.7.0.0/16,idb=ATM0/0.2,nh=134.111.102.98,index=0
AddNewRoute,153.7.0.0/16,idb=ATM0/0.2
CleanupRoutes,153.7.0.0/16
CleanupRoutes,not deleting route of idb ATM0/0.2,rdbIndex 0
tcatmFindRouteTags,153.8.0.0/16,idb=ATM0/0.2,nh=134.111.102.98,index=0
AddNewRoute,153.8.0.0/16,idb=ATM0/0.2
CleanupRoutes,153.8.0.0/16
CleanupRoutes,not deleting route of idb ATM0/0.2,rdbIndex 0
```

```
tcatmFindRouteTags,153.9.0.0/16,idb=ATM0/0.2,nh=134.111.102.98,index=0
AddNewRoute,153.9.0.0/16,idb=ATM0/0.2
CleanupRoutes,153.9.0.0/16
CleanupRoutes,not deleting route of idb ATM0/0.2,rdbIndex 0
tcatmFindRouteTags,153.10.0.0/16,idb=ATM0/0.2,nh=134.111.102.98,index=0
AddNewRoute,153.10.0.0/16,idb=ATM0/0.2
CleanupRoutes,153.10.0.0/16
CleanupRoutes,not deleting route of idb ATM0/0.2,rdbIndex 0
tcatmFindRouteTags,153.11.0.0/16,idb=ATM0/0.2,nh=134.111.102.98,index=0
AddNewRoute,153.11.0.0/16,idb=ATM0/0.2
CleanupRoutes,153.11.0.0/16
```

Table 5 describes the significant fields in the display.

Table 5 debug mpls atm-ldp routes Field Descriptions

Field	Description
CleanupRoutes	Cleans up the routing table after a route has been deleted.
not deleting route of idb ATM0/0.2	The route cleanup event has not removed the specified route.
rdbIndex	Index identifying the route.
tcatmFindRouteTags	Request a VC for the route.
idb	The internal descriptor for an interface.
nh	Next hop for the route.
index	Identifier for the route.
AddNewRoute	Action of adding routes for a prefix or address.

Related Commands

Command	Description
mpls ldp holdtime	Changes the time an LDP session is maintained in the absence of LDP messages from the session peer.

debug mpls atm-ldp states

To display information about label virtual circuit (LVC) state transitions as they occur, use the **debug mpls atm-ldp states** command in privileged EXEC mode. To disable this feature, use the **no** form of this command.

debug mpls atm-ldp states

no debug mpls atm-ldp states

Syntax Description

This command has no arguments or keywords.

Defaults

This command has no default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.1CT	This command was introduced.
12.1(2)T	This command was modified.
12.0(10)ST	This command was modified to reflect MPLS IETF command syntax and terminology.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

When there are many routes and system activities (such as shutting down interfaces, learning new routes, and so forth), the **debug mpls atm-ldp states** command outputs extensive information that might interfere with system timing. Most commonly, this interference affects normal label distribution protocol (LDP) operation. To avoid this problem, you should increase the LDP hold time by means of the **mpls ldp holdtime** command.

Examples

The following shows sample output from the **debug mpls atm-ldp states** command:

```
Router# debug mpls atm-ldp states

Transit Output 166.35.0.0 VPI/VCI 1/67 Active -> XmitRelease NoPath
Transit Input 166.35.0.0 VPI/VCI 1/466 Active -> ApiWaitParentLoss ParentLoss
Transit Input 166.35.0.0 VPI/VCI 1/466 ApiWaitParentLoss -> ParentWait ApiSuccess
Transit Input 166.35.0.0 VPI/VCI 1/466 ParentWait -> XmitWithdraw NoPath
Transit Input 166.35.0.0 VPI/VCI 1/466 XmitWithdraw -> XmitWithdraw Transmit
Transit Input 166.35.0.0 VPI/VCI 1/466 XmitWithdraw -> NonExistent Release
Transit Input 166.35.0.0 VPI/VCI 1/466 NonExistent -> NonExistent ApiSuccess
```

Table 6 describes the significant fields shown in the display.

Table 6 debug mpls atm-ldp states Field Descriptions

Field	Description
Transit Output	Output side of an LVC.
VPI/VCI	VC value.
Transit Input	Input side of an LVC.

Related Commands

Command	Description
mpls ldp holdtime	Changes the time an LDP session is maintained in the absence of LDP messages from the session peer.

debug mpls ldp advertisements

To display information about the advertisement of labels and interface addresses to label distribution protocol (LDP) peers, use the **debug mpls ldp advertisements** command in privileged EXEC mode. To disable this feature, use the **no** form of this command.

debug mpls ldp advertisements [**peer-acl** *acl*] [**prefix-acl** *acl*]

no debug mpls ldp advertisements [**peer-acl** *acl*] [**prefix-acl** *acl*]

Syntax Description

peer-acl *acl*	(Optional) Limits the displayed advertisements to those for LDP peers permitted by the access control list (*acl*).
prefix-acl *acl*	(Optional) Limits the displayed advertisements to those for prefixes permitted by the access control list (*acl*).

Defaults

Displays information about advertisements to all LDP peers for all prefixes.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.1CT	This command was introduced.
12.0(10)ST	This command was modified to reflect MPLS IETF command syntax and terminology.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

Use this command to monitor the label and address advertisements to LDP peers.

Use the **peer-acl** or **prefix-acl** options separately or together to limit the information display to specific LDP peers and/or specific prefixes.

Note This command monitors advertisement of non-LC-ATM labels (generic labels) only. Use the **debug mpls atm-ldp** command to monitor LC-ATM activity.

Examples

The following shows sample output from the **debug mpls ldp advertisements** command:

```
Router# debug mpls ldp advertisements

tagcon: peer 144.0.0.44:0 (pp 0x60E105BC): advertise 130.77.0.33
tagcon: peer 144.0.0.44:0 (pp 0x60E105BC): advertise 133.0.0.33
tagcon: peer 144.0.0.44:0 (pp 0x60E105BC): advertise 34.0.0.33
tagcon: peer 144.0.0.44:0 (pp 0x60E105BC): advertise 103.0.0.33
```

```
tagcon: peer 144.0.0.44:0 (pp 0x60E105BC): advertise 35.0.0.33
tagcon: peer 144.0.0.44:0 (pp 0x60E105BC): advertise 38.0.0.33
tagcon: peer 144.0.0.44:0 (pp 0x60E105BC): advertise 34.0.0.0/8, label 3 (#2)
tagcon: peer 144.0.0.44:0 (pp 0x60E105BC): advertise 203.0.7.7/32, label 24 (#4)
tagcon: peer 144.0.0.44:0 (pp 0x60E105BC): advertise 35.0.0.0/8, label 3 (#8)
tagcon: peer 144.0.0.44:0 (pp 0x60E105BC): advertise 103.0.0.0/8, label 3 (#10)
tagcon: peer 144.0.0.44:0 (pp 0x60E105BC): advertise 138.1.0.0/16, label 26 (#14)
tagcon: peer 144.0.0.44:0 (pp 0x60E105BC): advertise 155.0.0.55/32, label 27 (#16)
tagcon: peer 144.0.0.44:0 (pp 0x60E105BC): advertise 38.0.0.0/8, label 3 (#18)
tagcon: peer 144.0.0.44:0 (pp 0x60E105BC): advertise 212.10.1.0/24, label 30 (#24)
tagcon: peer 144.0.0.44:0 (pp 0x60E105BC): advertise 59.0.0.0/8, label 32 (#28)
tagcon: peer 144.0.0.44:0 (pp 0x60E105BC): advertise 144.0.0.44/32, label 33 (#30)
tagcon: peer 144.0.0.44:0 (pp 0x60E105BC): advertise 106.0.0.0/8, label 34 (#32)
tagcon: peer 144.0.0.44:0 (pp 0x60E105BC): advertise 133.0.0.33/32, label 3 (#34)
tagcon: peer 144.0.0.44:0 (pp 0x60E105BC): advertise 45.0.0.0/8, label 39 (#36)
```

Table 7 describes the significant fields shown in the display.

Table 7 debug mpls ldp advertisements Field Descriptions

Field	Description
tagcon:	Identifies the source of the message as the label control subsystem.
peer a.b.c.d:e	LDP identifier of the peer to which the advertisement was targeted.
(pp 0xnnnnnnnn)	Identifier for the data structure used to represent the peer at the label distribution level. Useful for correlating debug output.
advertise X	Identifies what was advertised to the peer—either an interface address (“a.b.c.d”) or label binding (“a.b.c.d/m, label t (#n)”).
(#n)	For a label binding advertisement, the sequence number of the label information base (LIB) modification that made it necessary to advertise the label.

Related Commands

Command	Description
debug mpls ldp bindings	Displays information about changes to the LIB used to keep track of label bindings learned from LDP peers through LDP downstream label distribution.
show mpls ip binding	Displays specified information about label bindings learned by LDP.
show mpls ldp neighbor	Displays the status of LDP sessions.

debug mpls ldp backoff

To display information about the label distribution protocol (LDP) backoff mechanism parameters, use the **debug mpls ldp backoff** command in privileged EXEC mode. To disable this feature, use the **no** form of this command.

debug mpls ldp backoff

no debug mpls ldp backoff

Syntax Description

This command has no arguments or keywords.

Defaults

This command has no default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(10)ST	This command was introduced.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

Use this command to monitor backoff parameters configured for LDP sessions.

Examples

The following shows sample output from the **debug mpls ldp backoff** command:

```
Router# debug mpls ldp backoff

LDP session establishment backoff debugging is on

Router#

Jan 6 22:31:13.012: ldp: Backoff peer ok: 12.12.12.12:0; backing off; threshold/count 8/6
Jan 6 22:31:13.824: ldp: Backoff peer ok: 12.12.12.12:1; backing off; threshold/count 8/6
Jan 6 22:31:17.848: ldp: Backoff peer ok: 12.12.12.12:0; backing off; threshold/count 8/6
Jan 6 22:31:18.220: ldp: Backoff peer ok: 12.12.12.12:1; backing off; threshold/count 8/6
Jan 6 22:31:21.908: ldp: Backoff peer ok: 12.12.12.12:0; backing off; threshold/count 8/6
Jan 6 22:31:22.980: ldp: Backoff peer ok: 12.12.12.12:1; backing off; threshold/count 8/6
Jan 6 22:31:25.724: ldp: Backoff peer ok: 12.12.12.12:0; backing off; threshold/count 8/7
Jan 6 22:31:26.944: ldp: Backoff peer ok: 12.12.12.12:1; backing off; threshold/count 8/7
Jan 6 22:31:30.140: ldp: Backoff peer ok: 12.12.12.12:0; backing off; threshold/count 8/7
Jan 6 22:31:31.932: ldp: Backoff peer ok: 12.12.12.12:1; backing off; threshold/count 8/7
Jan 6 22:31:35.028: ldp: Backoff peer ok: 12.12.12.12:0; backing off; threshold/count 8/7
Jan 6 22:31:35.788: ldp: Backoff peer ok: 12.12.12.12:1; backing off; threshold/count 8/7
```

```
Jan 6 22:31:39.332: ldp: Update backoff rec: 12.12.12.12:0, threshold = 8, tbl ents 2
Jan 6 22:31:39.640: ldp: Update backoff rec: 12.12.12.12:1, threshold = 8, tbl ents 2
```

Table 8 describes the significant fields shown in the display.

Table 8 debug mpls ldp backoff Field Descriptions

Field	Description
ldp	Identifies the Label Distribution Protocol.
Backoff peer ok: a.b.c.d:n	Identifies the LDP peer for which a session is being delayed because of a failure to establish a session due to incompatible configuration.
backing off;	Indicates that a session setup attempt failed and the LSR is delaying its next attempt (that is, is backing off).
threshold/count x/y	Identifies a set threshold (x) and a count (y) that represents the time that has passed since the last attempt to set up a session with the peer. The count is incremented every 15 seconds until it reaches the threshold. When the count equals the threshold, a fresh attempt is made to set up an LDP session with the peer.
Update backoff rec	Indicates that the backoff period is over and that it is time for another attempt to set up an LDP session.
threshold = x	Indicates the backoff time of x*15 seconds, for the next LDP session attempt with the peer.
tbl ents 2	Indicates unsuccessful attempts to set up an LDP session with two different LDP peers. In this example, attempts to set up sessions with LDP peers 12.12.12.12:0 and 12.12.12.12:1 are failing.

Related Commands

Command	Description
mpls ldp backoff	Configures session setup delay parameters for the LDP backoff mechanism.
show mpls ldp backoff	Displays information about the configured session setup backoff parameters and any potential LDP peers with which session setup attempts are being throttled.

debug mpls ldp bindings

To display information about addresses and label bindings learned from label distribution protocol (LDP) peers by means of LDP downstream unsolicited label distribution, use the **debug mpls ldp bindings** command in privileged EXEC mode. To disable this feature, use the **no** form of this command.

debug mpls ldp bindings [**peer-acl** *acl*] [**prefix-acl** *acl*]

no debug mpls ldp bindings [**peer-acl** *acl*] [**prefix-acl** *acl*]

Syntax Description

peer-acl *acl*	(Optional) Limits the displayed binding information to that learned from LDP peers permitted by the access control list (*acl*).
prefix-acl *acl*	(Optional) Limits the displayed binding information to that learned for prefixes permitted by the access control list (*acl*).

Defaults

Displays information about all bindings learned from all LDP peers.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.1CT	This command was introduced.
12.0(10)ST	This command was modified to reflect MPLS IETF command syntax and terminology.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

Use this command to monitor label bindings and label switch router (LSR) addresses learned from LDP peers.

Note This command monitors non-LC-ATM labels (generic labels) only. Use the **debug mpls atm-ldp** command to monitor LC-ATM activity.

Examples

The following shows sample output from the **debug mpls ldp bindings** command:

```
Router# debug mpls ldp bindings

tagcon:tibent(34.0.0.0/8):created; find route tags request
tagcon:tibent(34.0.0.0/8):label 3 (#2) assigned
tagcon:tibent(203.0.7.7/32):created; find route tags request
tagcon:tibent(203.0.7.7/32):label 24 (#4) assigned
tagcon:tibent(144.0.0.44/32):created; find route tags request
```

```
tagcon:tibent(144.0.0.44/32):label 33 (#30) assigned
tagcon:tibent(106.0.0.0/8):created; find route tags request
tagcon:tibent(106.0.0.0/8):label 34 (#32) assigned
tagcon:tibent(133.0.0.33/32):created; find route tags request
tagcon:tibent(133.0.0.33/32):label 3 (#34) assigned
tagcon:tibent(45.0.0.0/8):created; find route tags request
tagcon:tibent(45.0.0.0/8):label 39 (#36) assigned
tagcon:Assign peer id; 144.0.0.44:0:id 0
tagcon:144.0.0.44:0:144.0.0.44 added to addr<->ldp ident map
tagcon:144.0.0.44:0:34.0.0.44 added to addr<->ldp ident map
tagcon:144.0.0.44:0:45.0.0.44 added to addr<->ldp ident map
tagcon:tibent(144.0.0.44/32):rem label 3 from 144.0.0.44:0 added
tagcon:tibent(34.0.0.0/8):label 3 from 144.0.0.44:0 added
tagcon:tibent(45.0.0.0/8):label 3 from 144.0.0.44:0 added
tagcon:tibent(107.0.0.0/8):created; remote label learned
tagcon:tibent(107.0.0.0/8):label 55 from 144.0.0.44:0 added
tagcon:tibent(203.0.7.7/32):label 209 from 144.0.0.44:0 added
tagcon:tibent(133.0.0.33/32):label 207 from 144.0.0.44:0 added
```

Table 9 describes the significant fields shown in the display.

Table 9 debug mpls ldp bindings Field Descriptions

Field	Description
tagcon:	Identifies the source of the message as the label control subsystem.
tibent(network/mask)	Destination that has a label binding change.
created; reason	An LIB entry has been created for the specified destination for the indicated reason.
rem label ...	Describes a change to the label bindings for the specified destination. The change is for a label binding learned from the specified LDP peer.
lcl label ...	Describes a change to a locally assigned (incoming) label for the specified destination.
(#n)	Sequence number of the modification to the LIB corresponding to the local label change.
a.b.c.d:n: e.f.g.h added to addr<->ldp ident map	The address e.f.g.h has been added to the set of addresses associated with LDP identifier a.b.c.d:n.

Related Commands

Command	Description
show mpls ldp bindings	Displays the contents of the LIB.

debug mpls ldp messages

To display specific information (such as message type, source, and destination) regarding label distribution protocol (LDP) messages sent to and received from LDP peers, use the **debug mpls ldp messages** command in privileged EXEC mode. To disable this feature, use the **no** form of this command.

debug mpls ldp messages {**sent | received**} [**all**] [**peer-acl** *acl*]

no debug mpls ldp messages {**sent | received**} [**all**] [**peer-acl** *acl*]

Syntax Description

sent	Displays LDP messages sent to LDP peers permitted by the access control list (acl).
received	Displays LDP messages received from LDP peers permitted by the access control list (acl).
all	(Optional) Displays all LDP messages sent to and received from LDP peers (including periodic KeepAlive messages) permitted by the access control list (acl).
peer-acl *acl*	(Optional) Limits the messages displayed for LDP peers in accordance with the access control list (acl).

Defaults

All messages sent (for **sent** keyword) or received (for **received** keyword) are displayed except for periodic KeepAlive messages.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.1CT	This command was introduced.
12.0(10)ST	This command was modified to reflect MPLS IETF command syntax and terminology.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

LDP requires periodic transmission of KeepAlive messages. If you do not specify the **all** option, periodic KeepAlive messages are not displayed.

Examples

The following shows sample output from the **debug mpls ldp messages received** command:

```
Router# debug mpls ldp messages received
Router# debug mpls ldp messages sent

ldp: Rcvd init msg from 144.0.0.44 (pp 0x0)
ldp: Sent init msg to 144.0.0.44:0 (pp 0x0)
```

```
ldp: Sent keepalive msg to 144.0.0.44:0 (pp 0x0)
ldp: Rcvd keepalive msg from 144.0.0.44:0 (pp 0x0)
ldp: Sent address msg to 144.0.0.44:0 (pp 0x610F00E0)
ldp: Sent label mapping msg to 144.0.0.44:0 (pp 0x610F00E0)
ldp: Sent label mapping msg to 144.0.0.44:0 (pp 0x610F00E0)
ldp: Sent label mapping msg to 144.0.0.44:0 (pp 0x610F00E0)
ldp: Rcvd address msg from 144.0.0.44:0 (pp 0x610F00E0)
ldp: Rcvd label mapping msg from 144.0.0.44:0 (pp 0x610F00E0)
ldp: Rcvd label mapping msg from 144.0.0.44:0 (pp 0x610F00E0)
ldp: Rcvd label mapping msg from 144.0.0.44:0 (pp 0x610F00E0)
ldp: Rcvd label mapping msg from 144.0.0.44:0 (pp 0x610F00E0)
ldp: Rcvd label mapping msg from 144.0.0.44:0 (pp 0x610F00E0)
ldp: Rcvd label mapping msg from 144.0.0.44:0 (pp 0x610F00E0)
ldp: Rcvd label mapping msg from 144.0.0.44:0 (pp 0x610F00E0)
```

Table 10 describes the significant fields shown in the display.

Table 10 debug mpls ldp messages received Field Descriptions

Field	Description
ldp:	Identifies the source of the displayed information as LDP.
Rcvd xxx msg Sent xxx msg	Type of message received or sent.
from a.b.c.d	Host that sent the message. Used in the early stages of the opening of an LDP session, when the LDP identifier is not yet known.
from a.b.c.d:e to a.b.c.d:e	LDP identifier of the peer that sent the message or to which the message was sent.
(pp 0xnnnnnnnn)	Identifies the data structure used to represent the peer at the label distribution level. Useful for correlating debug output.

Related Commands

Command	Description
debug mpls ldp session io	Displays the contents of LDP messages sent to and received from LDP peers.

debug mpls ldp peer state-machine

To display information about state transitions for label distribution protocol (LDP) sessions, use the **debug mpls ldp peer state-machine** command in privileged EXEC mode. To disable this feature, use the **no** form of this command.

debug mpls ldp peer state-machine

no debug mpls ldp peer state-machine

Syntax Description

This command has no arguments or keywords.

Defaults

This command has no default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.1CT	This command was introduced.
12.0(10)ST	This command was modified to reflect MPLS IETF command syntax and terminology.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

LDP manages peer sessions by means of two coupled state machines:

- A low-level state machine that deals with session establishment and shutdown
- A high-level state machine that deals with setting up and shutting down label advertisement

Use the **debug mpls ldp session state-machine** command to monitor the lower-level session state machine.

Use the **debug mpls ldp peer state-machine** command to monitor the higher-level session state machine.

Examples

The following shows sample output from the **debug mpls ldp peer state-machine** command:

```
Router# debug mpls ldp peer state-machine

tagcon: start session TCP timers for 144.0.0.44:0 (pp 0x610EEC84)
tagcon: Enqueue peer up work for 144.0.0.44:0 (pp 0x610EEC84)
tagcon: peer 144.0.0.44:0 (pp 0x610EEC84): Event unsol open
    unsol op pdg -> estab
tagcon: Send initial advertisements to peer 144.0.0.44:0
tagcon: Initial address advertisement to peer 144.0.0.44:0
tagcon: Initial label advertisement to peer 144.0.0.44:0
```

. . .

```
tagcon: peer 144.0.0.44:0 (pp 0x610EEC84): Event down
    estab -> destroyed
tagcon: peer 144.0.0.44:0 (pp 0x610EEC84): Event cleanup done
    destroyed -> non-ex
```

Table 11 describes the significant fields shown in the display.

Table 11 debug mpls ldp peer state-machine Field Descriptions

Field	Description
tagcon:	Identifies the source of the message as the label control subsystem.
a.b.c.d:e	LDP identifier of the peer for the session with the state change.
(pp 0xnnnnnnnn)	Address of the data structure used to represent the peer at the label distribution level. This address is useful for correlating debug output.
Event *E*	Event causing the state change.
s1 -> s2	State of the LDP session has changed from state s1 to state s2.

Related Commands

Command	Description
show mpls ldp neighbor	Displays the status of LDP sessions.
debug mpls ldp session io	Displays information about LDP messages sent to or received from LDP peers.

debug mpls ldp session io

To display the contents of label distribution protocol (LDP) messages sent to and received from LDP peers, use the **debug mpls ldp session io** command in privileged EXEC mode. To disable this feature, use the **no** form of this command.

debug mpls ldp session io [**all**] [**peer-acl** *acl*]

no debug mpls ldp session io [**all**] [**peer-acl** *acl*]

Syntax Description

all	(Optional) Includes the contents of periodic KeepAlive messages in the displayed message output to LDP peers.
peer-acl *acl*	(Optional) Limits the displayed message output to those LDP peers permitted by the access control list (acl).

Defaults

Displays the contents of LDP messages sent and received except for periodic KeepAlive messages.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.1CT	This command was introduced.
12.0(10)ST	This command was modified to reflect MPLS IETF command syntax and terminology.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

Displays the contents of all messages sent and received except for periodic KeepAlive messages.

Examples

The following shows sample output from the **debug mpls ldp session io** command:

```
Router# debug mpls ldp session io all

ldp: Rcvd init msg from 144.0.0.44 (pp 0x0)
ldp: LDP init msg: PDU hdr: LDP Id: 144.0.0.44:0; Msg Contents:
  0x00 0x01 0x00 0x20 0x90 0x00 0x00 0x2C 0x00 0x00 0x02 0x00 0x00 0x16 0x00 0x00
  0x10 0x21 0x05 0x00 0x00 0x0E 0x00 0x01 0x00 0xB4 0x00 0x00 0x00 0x00 0x85 0x00
  0x00 0x21 0x00 0x00
ldp: Sent init msg to 144.0.0.44:0 (pp 0x0)
ldp: LDP init msg: PDU hdr: LDP Id: 133.0.0.33:0; Msg Contents:
  0x00 0x01 0x00 0x20 0x85 0x00 0x00 0x21 0x00 0x00 0x02 0x00 0x00 0x16 0x00 0x00
  0x06 0x32 0x05 0x00 0x00 0x0E 0x00 0x01 0x00 0xB4 0x00 0x00 0x00 0x00 0x90 0x00
  0x00 0x2C 0x00 0x00
ldp: Sent keepalive msg to 144.0.0.44:0 (pp 0x0)
ldp: LDP keepalive msg: PDU hdr: LDP Id: 133.0.0.33:0; Msg Contents:
```

```
  0x00 0x01 0x00 0x0E 0x85 0x00 0x00 0x21 0x00 0x00 0x02 0x01 0x00 0x04 0x00 0x00
  0x06 0x33
ldp: Rcvd keepalive msg from 144.0.0.44:0 (pp 0x0)
ldp: LDP keepalive msg: PDU hdr: LDP Id: 144.0.0.44:0; Msg Contents:
  0x00 0x01 0x00 0x0E 0x90 0x00 0x00 0x2C 0x00 0x00 0x02 0x01 0x00 0x04 0x00 0x00
  0x10 0x22
ldp: Sent address msg to 144.0.0.44:0 (pp 0x610ECDD0)
ldp: LDP address msg: PDU hdr: LDP Id: 133.0.0.33:0; Msg Contents:
  0x00 0x01 0x00 0x34 0x85 0x00 0x00 0x21 0x00 0x00 0x03 0x00 0x00 0x2A 0x00 0x00
  0x06 0x34 0x01 0x01 0x00 0x22 0x00 0x01 0x02 0x00 0x00 0xA3 0x82 0x42 0x00 0x21
  0x82 0x4D 0x00 0x21 0x85 0x00 0x00 0x21 0x22 0x00 0x00 0x21 0x67 0x00 0x00 0x21
  0x23 0x00 0x00 0x21 0x26 0x00 0x00 0x21
ldp: Sent label mapping msg to 144.0.0.44:0 (pp 0x610ECDD0)
ldp: LDP label mapping msg: PDU hdr: LDP Id: 133.0.0.33:0; Msg Contents:
  0x00 0x01 0x00 0x22 0x85 0x00 0x00 0x21 0x00 0x00 0x04 0x00 0x00 0x18 0x00 0x00
  0x06 0x36 0x01 0x00 0x00 0x08 0x02 0x00 0x01 0x20 0xCB 0x00 0x07 0x07 0x02 0x00
  0x00 0x04 0x00 0x00 0x00 0x18
ldp: Rcvd address msg from 144.0.0.44:0 (pp 0x610ECDD0)
ldp: LDP address msg: PDU hdr: LDP Id: 144.0.0.44:0; Msg Contents:
  0x00 0x01 0x00 0x24 0x90 0x00 0x00 0x2C 0x00 0x00 0x03 0x00 0x00 0x1A 0x00 0x00
  0x10 0x23 0x01 0x01 0x00 0x12 0x00 0x01 0x90 0x00 0x00 0x2C 0x02 0x00 0x00 0xA4
  0x22 0x00 0x00 0x2C 0x2D 0x00 0x00 0x2C
ldp: Rcvd label mapping msg from 144.0.0.44:0 (pp 0x610ECDD0)
ldp: LDP label mapping msg: PDU hdr: LDP Id: 144.0.0.44:0; Msg Contents:
  0x00 0x01 0x00 0x22 0x90 0x00 0x00 0x2C 0x00 0x00 0x04 0x00 0x00 0x18 0x00 0x00
  0x10 0x24 0x01 0x00 0x00 0x08 0x02 0x00 0x01 0x20 0x90 0x00 0x00 0x2C 0x02 0x00
  0x00 0x04 0x00 0x00 0x00 0x03
```

Table 12 describes the significant fields shown in the display.

Table 12 debug mpls ldp session io Field Descriptions

Field	Description
ldp:	Identifies the source of the message as LDP.
Rcvd xxx msg	Indicates that a message of the specified type has been received.
from a.b.c.d	Host to which the message has been sent. Used in the early stages of the opening of an LDP session when the LDP identifier is not yet known.
Sent xxx msg	Indicates that a message of the specified type has been sent.
to a.b.c.d	Host to which the message has been sent. Used in the early stages of the opening of an LDP session when the LDP identifier is not yet known.
to a.b.c.d:e	LDP identifier of the peer to which the message has been sent.
(pp 0xnnnnnnnn)	Identifies the data structure used to represent the peer at the label distribution level. Useful for correlating debug output.
LDP xxx msg	Type of message that has been sent.
PDU hdr: LDP Id: a.b.c.d:e	LDP identifier of the sender included in the LDP protocol data unit (PDU) header.
Msg contents: 0xnn ... 0xnn	Contents of the message represented as a sequence of bytes.

Related Commands

Command	Description
debug mpls ldp session state-machine	Displays information about state transitions for LDP sessions.

debug mpls ldp session state-machine

To display information about state transitions for label distribution protocol (LDP) sessions, use the **debug mpls ldp session state-machine** command in privileged EXEC mode. To disable this feature, use the **no** form of this command.

debug mpls ldp session state-machine [**peer-acl** *acl*]

no debug mpls ldp session state-machine [**peer-acl** *acl*]

Syntax Description

peer-acl *acl*	(Optional) Limits the displayed information to that for LDP peers permitted by the access control list (*acl*).

Defaults

This command has no default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.1CT	This command was introduced.
12.0(10)ST	This command was modified to reflect MPLS IETF command syntax and terminology.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

LDP manages peer sessions by means of two coupled-state machines:

- A low-level state machine that deals with session establishment and shutdown
- A high-level state machine that deals with setting up and shutting down label advertisement

Use the **debug mpls ldp session state-machine** command to monitor the lower-level session state machine.

Use the **debug mpls ldp peer state-machine** command to monitor the higher-level session state machine.

Examples

The following shows sample output from the **debug mpls ldp session state-machine** command:

```
Router# debug mpls ldp session state-machine

ldp: ptcl_adj:144.0.0.44(0x610EED30): Non-existent -> Role pasv
ldp: create ptcl_adj: tp = 0x610EED30, ipaddr = 144.0.0.44
ldp: ptcl_adj:144.0.0.44(0x610EED30): Event: Xport opened;
    Role pasv -> Role pasv
ldp: ptcl_adj:34.0.0.44(0x610EED30): Event: Rcv Init;
    Role pasv -> Init rcvd pasv
ldp: ptcl_adj:34.0.0.44(0x610EED30): Event: Rcv KA;
    Init rcvd pasv -> Oper
ldp: ptcl_adj:unknown(0x610EED30): Event: Xport closed;
    Oper -> Non-existent
```

Table 13 describes the significant fields shown in the display.

Table 13 debug mpls ldp session state-machine Field Descriptions

Field	Description
ldp:	Identifies the source of the message as LDP.
ptcl_adj:a.b.c.d	Identifies the network address of the LDP peer.
(0xnnnnnnnn)	Identifies the data structure used to represent the peer at the protocol level. Useful for correlating debug output.
Event: *E*	Event that caused the state transition.
s1 -> s2	State of the LDP session has changed from state s1 to state s2.

Related Commands

Command	Description
debug mpls ldp peer state-machine	Displays information about state transitions for LDP sessions.

debug mpls ldp targeted-neighbors

To display information about the target neighbor mechanism, use the **debug mpls ldp targeted-neighbors** command in privileged EXEC mode. This mechanism establishes label distribution protocol (LDP) adjacencies to peers that are not directly adjacent, such as peers at either end of a tunnel. To disable this feature, use the **no** form of this command.

debug mpls ldp targeted-neighbors

no debug mpls ldp targeted-neighbors

Syntax Description

This command has no arguments or keywords.

Defaults

This command has no default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.1CT	This command was introduced.
12.0(10)ST	This command was modified to reflect MPLS IETF command syntax and terminology.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

Platforms that are not directly connected may engage in LDP label distribution (for example, to support two-level labeling across an LSP tunnel).

An LDP session between nondirectly connected label switch routers (LSRs) is called a targeted session and is supported by LDP extended discovery which uses targeted Hello messages sent to specific IP addresses.

An LSR (Router 1) attempting to initiate an LDP targeted session with another LSR (Router 2) sends targeted Hello messages sent to a specific IP address of Router 2. If the configuration of Router 2 permits it to respond to targeted Hello messages from Router 1, it does so, and the LDP session can be established. In this situation, Router 1 is said to be an active LSR for the targeted session because it initiated the targeted Hello messages; Router 2 is said to be a passive LSR for the session because it responded to them.

As with LDP sessions between two directly connected LSRs, it is possible for a targeted session to be the result of multiple discovery activities which are targeted to different IP addresses for the same LSR. In addition, it is possible for both LSRs in a targeted session to be active and for both to be passive.

The debug messages enabled by **debug mpls ldp targeted-neighbors** report activity relating to targeted sessions.

Examples

The following shows sample output from the **debug mpls ldp targeted-neighbors** command:

```
Router# debug mpls ldp targeted-neighbors

ldp-trgtnbr: 144.0.0.44 Req active
ldp-trgtnbr: 144.0.0.44 allocated
ldp-trgtnbr: 144.0.0.44 Set peer start; flags 0x0
ldp-trgtnbr: 144.0.0.44 Defer peer cleanup; cleancnt 1
ldp-trgtnbr: 144.0.0.44 Set peer finished; flags 0xF
ldp-trgtnbr: 144.0.0.44 ref count incremented to 1
ldp-trgtnbr: 144.0.0.44 Release active; ref count decremented to 0
ldp-trgtnbr: 144.0.0.44 Clear peer start; flags 0xF
ldp-trgtnbr: 144.0.0.44 Undefer cleanup start; clearcnt 0, flags 0xC
ldp-trgtnbr: 144.0.0.44 Undefer cleanup finish; clearcnt 0, flags 0x8
ldp-trgtnbr: 144.0.0.44 Clear peer finished; flags 0x8
ldp-trgtnbr: 144.0.0.44 freed
```

Table 14 describes the significant fields shown in the display.

Table 14 debug mpls ldp targeted-neighbors Field Descriptions

Field	Description
ldp-trgtnbr:	Identifies this as an LDP targeted neighbor debug statement.
144.0.0.44	IP address for the targeted neighbor.

Related Commands

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

debug mpls ldp transport connections

To display information about the Transmission Control Protocol (TCP) connections used to support label distribution protocol (LDP) sessions, use the **debug mpls ldp transport connections** command in privileged EXEC mode. To disable this feature, use the **no** form of this command.

debug mpls ldp transport connections [**peer-acl** *acl*] [**interface** *interface*]

no debug mpls ldp transport connections [**peer-acl** *acl*] [**interface** *interface*]

Syntax Description

peer-acl *acl*	(Optional) Limits the displayed information to that for LDP peers permitted by the access control list (acl).
interface *interface*	(Optional) Limits the displayed information to that for the specified interface.

Defaults

Display information about LDP TCP connection activity for all peers and all interfaces.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.1CT	This command was introduced.
12.0(10)ST	This command was modified to reflect MPLS IETF command syntax and terminology.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

Use this command to monitor LDP activity relating to the establishment of the transport (TCP) connection for LDP sessions.

When two devices establish a TCP connection for an LDP session, the device with the larger transport address plays an active role and the other plays a passive role. The active device attempts to establish a TCP connection to the well-known LDP port at the passive device. The passive device waits for the connection to the well-known port to be established.

Examples

The following shows sample output from the **debug mpls ldp transport connections** command:

```
Router# debug mpls ldp transport connections

Debug output at active peer:

ldp: Opening listen port 646 for 144.0.0.44, 34.0.0.44
ldp: Open LDP listen TCB 0x60E105BC; lport = 646; fhost = 144.0.0.44
ldp: Add listen TCB to list; tcb 0x60E105BC; addr 144.0.0.44
```

```
ldp: Incoming ldp conn 133.0.0.33:646 <-> 144.0.0.44:11042
ldp: create ptcl_adj: tp = 0x610ECD64, ipaddr = 144.0.0.44

Debug output at passive peer:

ldp: Opening ldp conn; adj 0x60BAC33C, 144.0.0.44 <-> 133.0.0.33
ldp: ldp conn is up; adj 0x60BAC33C, 144.0.0.44:11042 <-> 133.0.0.33:646
```

Table 15 describes the significant fields shown in the display.

Table 15 debug mpls ldp transport connections Field Descriptions

Field	Description
ldp:	Identifies the source of the message as LDP.
adj 0xnnnnnnnn	Identifies the data structure used to represent the peer at the transport level. Useful for correlating debug output.
a.b.c.d -> p.q.r.s	Indicates a TCP connection between a.b.c.d and p.q.r.s.
a.b.c.d:x -> p.q.r.s:y	Indicates a TCP connection between a.b.c.d, port x and p.q.r.s, port y.

Related Commands

Command	Description
debug mpls ldp transport events	Prints information about the events related to the LDP peer discovery mechanism.

debug mpls ldp transport events

To display information about events related to the label distribution protocol (LDP) peer discovery mechanism, use the **debug mpls ldp transport events** command in privileged EXEC mode. This mechanism is used to determine the devices with which you wish to establish LDP sessions. To disable this feature, use the **no** form of this command.

debug mpls ldp transport events [**peer-acl** *acl*] [**interface**]

no debug mpls ldp transport events [**peer-acl** *acl*] [**interface**]

Syntax Description

peer-acl *acl*	(Optional) Limits the displayed information to that for LDP peers permitted by the access control list (acl).
interface	(Optional) Limits the displayed information to that for the specified interface.

Defaults

Displays information about LDP discovery activity for all peers and all interfaces.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.1CT	This command was introduced.
12.0(10)ST	This command was modified to reflect MPLS IETF command syntax and terminology.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

Use this command to monitor LDP discovery activity.

This command might generate a great deal of output. Use the **peer-acl** option or **interface** option, or both, to limit the output to peers or interfaces of interest.

Note The command includes all of the output generated by the **debug mpls ldp transport connection** command.

Examples

The following shows sample output from the **debug mpls ldp transport events** command:

```
Router# debug mpls ldp transport events

ldp: enabling ldp on Ethernet1/1/1
ldp: Set intf id: intf 0x611D684C, Ethernet1/1/1, not lc-atm, intf_id 0
```

```
ldp: Set intf id: intf 0x617C5638, ATM0/0.2, not lc-atm, intf_id 0
ldp: Send ldp hello; ATM3/0.1, src/dst 8.1.1.1/224.0.0.2, inst_id 1, tcatm
ldp: Rcvd ldp hello; ATM3/0.1, from 203.0.7.7 (203.0.7.7:2), intf_id 1, opt 0x8, tcatm
ldp: Send ldp hello; Ethernet1/1/1, src/dst 138.1.0.88/224.0.0.2, inst_id 0
ldp: Rcvd ldp hello; Ethernet1/1/1, from 10.105.0.9 (7.1.1.1:0), intf_id 0, opt 0xC
ldp: ldp Hello from 10.105.0.9 (7.1.1.1:0) to 224.0.0.2, opt 0xC
ldp: New adj 0x617C5EBC from 10.105.0.9 (7.1.1.1:0), Ethernet1/1/1
ldp: Opening ldp conn; adj 0x617C5EBC, 8.1.1.1 <-> 7.1.1.1
ldp: ldp conn is up; adj 0x617C5EBC, 8.1.1.1:11013 <-> 7.1.1.1:646
ldp: Send ldp hello; ATM3/0.1, src/dst 8.1.1.1/224.0.0.2, inst_id 1, tcatm
ldp: Rcvd ldp hello; ATM3/0.1, from 203.0.7.7 (203.0.7.7:2), intf_id 1, opt 0x8, tcatm
ldp: Send ldp hello; Ethernet1/1/1, src/dst 138.1.0.88/224.0.0.2, inst_id 0
ldp: Rcvd ldp hello; Ethernet1/1/1, from 10.105.0.9 (7.1.1.1:0), intf_id 0, opt 0xC
...
ldp: Send ldp hello; Ethernet1/1/1, src/dst 138.1.0.88/224.0.0.2, inst_id 0
ldp: Send ldp hello; ATM3/0.1, src/dst 8.1no tag ip
.0.2, inst_id 1, tcatm
ldp: disabling ldp on Ethernet1/1/1
ldp: Hold timer expired for adj 0x617C5EBC, will close conn
ldp: Closing ldp conn 8.1.1.1:11013 <-> 7.1.1.1:646, adj 0x617C5EBC
ldp: Adjacency 0x617C5EBC, 10.105.0.9 timed out
ldp: Adj 0x617C5EBC; state set to closed
ldp: Rcvd ldp hello; ATM3/0.1, from 203.0.7.7 (203.0.7.7:2), intf_id 1, opt 0x8, tcatm
ldp: Ignore Hello from 10.105.0.9, Ethernet1/1/1; no intf
```

Table 16 describes the significant fields shown in the display.

Table 16 debug mpls ldp transport events Field Descriptions

Field	Description
ldp:	Identifies the source of the message as LDP.
adj 0xnnnnnnnn	Identifies the data structure used to represent the peer at the transport level. Useful for correlating debug output.
a.b.c.d (p.q.r.s:n)	Network address and LDP identifier of the peer.
intf_id	Interface identifier (non-zero for LC-ATM interfaces; 0 otherwise).
opt 0xn	Bits that describe options in the LDP discovery Hello packet: • 0x1—Targeted Hello option • 0x2—Send targeted Hello option • 0x4—Transport address option • 0x8—LDP Hello message (as opposed to TDP Hello message)

Related Commands

Command	Description
show mpls ldp discovery	Displays the status of the LDP discovery process.
debug mpls ldp transport connections	Displays information about the TCP connections used to support LDP sessions.

mpls ip (global configuration)

To enable MPLS forwarding of IPv4 packets along normally routed paths for the platform, use the **mpls ip** command in global configuration mode. To disable this feature, use the **no** form of this command.

mpls ip

no mpls ip

Syntax Description

This command has no arguments or keywords.

Defaults

Label switching of IPv4 packets along normally routed paths is enabled for the platform.

Command Modes

Global configuration

Command History

Release	Modification
12.0(10)ST	This command was introduced.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

MPLS forwarding of IPv4 packets along normally routed paths (sometimes called dynamic label switching) is enabled by this command. For a given interface to perform dynamic label switching, this switching function must be enabled for the interface as well as for the platform.

The **no** form of this command stops dynamic label switching for all platform interfaces regardless of the interface configuration; it also stops distribution of labels for dynamic label switching. However, the **no** form of this command does not affect the sending of labeled packets through label switch path (LSP) tunnels.

For an LC-ATM interface, the **no** form of this command prevents the establishment of label virtual circuits (LVCs) originating at, terminating at, or passing through the platform.

Examples

The following example shows that dynamic label switching is disabled for the platform, and all label distribution is terminated for the platform:

```
Router(config)# no mpls ip
```

Related Commands

Command	Description
mpls ip (interface configuration)	Enables MPLS forwarding of IPv4 packets along normally routed paths for the associated interface.

mpls ip (interface configuration)

To enable MPLS forwarding of IPv4 packets along normally routed paths for a particular interface, use the **mpls ip** command in interface configuration mode. To disable this feature, use the **no** form of this command.

mpls ip

no mpls ip

Syntax Description

This command has no arguments or keywords.

Defaults

MPLS forwarding of IPv4 packets along normally routed paths for the interface is disabled.

Command Modes

Interface configuration

Command History

Release	Modification
12.0(10)ST	This command was introduced.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

MPLS forwarding of IPv4 packets along normally routed paths is sometimes called dynamic label switching. If dynamic label switching has been enabled for the platform when this command is issued on an interface, label distribution for the interface begins with the periodic transmission of neighbor discovery Hello messages on the interface. When the outgoing label for a destination routed through the interface is known, packets for the destination are labeled with that outgoing label and forwarded through the interface.

The **no** form of this command causes packets routed out through the interface to be sent unlabeled; this form of the command also terminates label distribution for the interface. However, the **no** form of the command does not affect the sending of labeled packets through any LSP tunnels that might use the interface.

For an LC-ATM interface, the **no** form of this command prevents the establishment of label virtual circuits (LVCs) beginning at, terminating at, or passing through the interface.

Examples

The following example shows that label switching is enabled on the specified Ethernet interface:

```
Router(config)# configure terminal
Router(config-if)# interface e0/2
Router(config-if)# mpls ip
```

Related Commands

Command	Description
mpls ldp maxhops	Limits the number of hops permitted in an LSP established by the Downstream on Demand method of labe distribution.
show mpls interfaces	Displays information about one or more interfaces that have been configured for label switching.

mpls label protocol (global configuration)

To specify the default label distribution protocol (LDP) for a platform, use the global **mpls label protocol** command in global configuration mode. To restore the image default, use the **no** form of this command.

mpls label protocol { **ldp** | **tdp** }

no mpls label protocol

Syntax Description

ldp	Specifies that LDP is the platform default label distribution protocol.
tdp	Specifies that Tag Distribution Protocol (TDP) is the platform default label distribution protocol.

Defaults

If no protocol is explicitly configured by the global **mpls label protocol** command, TDP is the default label distribution protocol for the platform.

Command Modes

Global configuration

Command History

Release	Modification
12.0(10)ST	This command was introduced.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

If neither the global **mpls label protocol ldp** command nor the interface **mpls label protocol ldp** command is used, all label distribution sessions will use TDP.

To force all label distribution sessions to use LDP, use the global **mpls label protocol ldp** command and no interface **mpls label protocol** commands.

Examples

The following command establishes LDP as the label distribution protocol for the platform:

```
Router(config)# mpls label protocol ldp
```

Related Commands

Command	Description
show mpls interfaces	Displays information about one or more or all interfaces that are configured for label switching.

mpls label protocol (interface configuration)

To specify the label distribution protocol to be used on a given interface, use the **mpls label protocol** command in interface configuration mode. To disable this feature, use the **no** form of this command.

mpls label protocol {**ldp** | **tdp** | **both**}

no mpls label protocol

Syntax Description

ldp	Specifies that the label distribution protocol (LDP) is to be used on the interface.
tdp	Specifies that the tag distribution protocol (TDP) is to be used on the interface.
both	Specifies that both label distribution protocols are to be supported on the interface.

Defaults

If no protocol is explicitly configured for an interface, the default label distribution protocol for the platform is used. To set the platform default protocol, use the global **mpls label protocol** command.

Command Modes

Interface configuration

Command History

Release	Modification
12.0(10)ST	This command was introduced.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

To successfully establish a session for label distribution for a link connecting two label switch routers (LSRs), the link interfaces on the LSRs must be configured to use the same label distribution protocol. If there are multiple links connecting two LSRs, all of the link interfaces connecting the two LSRs must be configured to use the same protocol.

The **both** option is intended for use with interfaces to multiaccess networks, such as Ethernet and FDDI, where some peers might use LDP and others use TDP. When you specify the **both** option, the LSR sends both LDP and TDP discovery Hello messages and responds to both types of messages.

Examples

The following command establishes LDP as the label distribution protocol for the interface:

```
Router(config-if)# mpls label protocol ldp
```

Related Commands

Command	Description
show mpls interfaces	Displays information about one or more or all interfaces that are configured for label switching.

mpls ldp address-message

To specify advertisement of platform addresses to an LC-ATM label distribution protocol (LDP) peer, use the **mpls ldp address-message** command in interface configuration mode. To disable this feature, use the **no** form of this command.

mpls ldp address-message

no mpls ldp address-message

Syntax Description

This command has no arguments or keywords.

Defaults

Do not send LDP Address and Address Withdraw messages to LC-ATM LDP peers.

Command Modes

Interface configuration

Command History

Release	Modification
12.0(10)ST	This command was introduced.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

The LDP specification includes Address and Address Withdraw messages used by a label switch router (LSR) to advertise its addresses to its peers.

An LSR uses the addresses it learns from peers when operating in Downstream Unsolicited label advertisement mode to convert between route next hop addresses (found in the LSR routing table) and peer LDP identifiers.

The ability to map between the IP address and the peer LDP identifier is required so that

- When the MPLS forwarding engine (the label forwarding information base (LFIB)) asks for labels for a given destination prefix/next hop address, the LSR can find the label learned (if any) from the next hop. The LSR maintains learned labels in its label information base (LIB) tagged by the LDP ID of the advertising LSR.
- When the LSR learns a label for destination prefix P from an LDP peer, it can determine if that peer (known to the LSR by its LDP identifier) is currently the next hop for P.

In principle, an LSR operating in Downstream On Demand (DoD) mode for an LC-ATM interface does not need this information for two reasons:

- The LSR should know from the routing table the next hop interface.
- Only one DoD peer exists per LC-ATM interface.

Consequently, Cisco platforms do not normally send Address and Address Withdraw messages to LC-ATM peers.

Some LDP implementations might require the information learned in Address and Address Withdraw messages for LC-ATM. The **mpls ldp address-message** command is provided to enable interoperability with implementation vendors that require Address messages for LC-ATM.

Note Cisco platforms always advertise their addresses in Address and Address Withdraw messages for LDP sessions operating in Downstream Unsolicited label advertisement mode.

Examples

The following is an example use of the **mpls ldp address-message** command:

```
Router(config-if)# mpls ldp address-message
```

Related Commands

Command	Description
show mpls interfaces	Displays information about one or more or all interfaces that are configured for label switching.

mpls ldp advertise-labels

To control the distribution of locally assigned (incoming) labels by means of label distribution protocol (LDP), use the **mpls ldp advertise-labels** command in global configuration mode. This command is used to control which labels are advertised to which LDP neighbors. To disable this feature, use the **no** form of this command.

mpls ldp advertise-labels [**vrf** *vpn-name*] [**interface** *interface* | **for** *prefix-access-list* [**to** *peer-access-list*]]

no mpls ldp advertise-labels [**vrf** *vpn-name*] [**interface** *interface* | **for** *prefix-access-list* [**to** *peer-access-list*]]

Syntax Description

vrf *vpn-name*	(Optional) Specifies the VPN routing/forwarding instance (*vpn-name*) for label advertisement.
interface *interface*	(Optional) Specifies an interface (*interface*) for label advertisement of an interface address.
for *prefix-access-list*	(Optional) Specifies which destinations should have their labels advertised.
to *peer-access-list*	(Optional) Specifies which LDP neighbors should receive label advertisements. An LSR is identified by its router ID, which consists of the first 4 bytes of its 6-byte LDP identifier.

Defaults

The labels of all destinations are advertised to all LDP neighbors.

If the **vrf** keyword is not specified, this command applies to the default routing domain.

If the **interface** keyword is not specified, no label is advertised for the interface address.

Command Modes

Global configuration

Command History

Release	Modification
11.1CT	This command was introduced.
12.0(10)ST	This command was modified to reflect MPLS IETF command syntax and terminology.
12.0(14)ST	This command was modified to reflect MPLS VPN support for LDP and to make the command consistent with the way Cisco IOS software interprets the *prefix-access-list* argument.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.(22)S. The **interface** *interface* keyword and argument was added to this command.

Usage Guidelines

To prevent the distribution of any locally assigned labels, use the **no mpls ldp advertise-labels** command with no optional parameters. To reenable the distribution of all locally assigned labels to all LDP neighbors, use the **mpls ldp advertise-labels** command with no optional parameters.

You can execute multiple **mpls ldp advertise-labels** commands. In the aggregate, such commands determine how the LSR advertises local labels. The following rules describe the effects of multiple commands:

1. Every **mpls ldp advertise-labels** command has a *(prefix acl, peer acl)* pair associated with it. The access list pair associated with the **mpls ldp advertise-labels** command (in the absence of both the **for** and **to** keywords) is *(none, none)*; the access list pair associated with the **mpls ldp advertise-labels for** *prefix acl* command (in the absence of the **to** keyword) is *(prefix-acl, none)*.
2. A given prefix can have, at most, one *(prefix acl, peer acl)* pair that "applies" to it, as described below:
   a. A given (*prefix acl, peer acl*) pair "applies" to a prefix only if the *prefix acl* "matches" the prefix. A match occurs if the *prefix acl* permits the prefix.
   b. If more than one *(prefix acl, peer acl)* pair from multiple **mpls ldp advertise-labels** commands matches a prefix, the *(prefix acl, peer acl)* pair in the first such command (as determined by the **show running** command**)** "applies" to the prefix.
3. When an LSR is ready to advertise a label for a prefix, the LSR:
   a. Determines whether a *(prefix acl, peer acl)* pair applies to the prefix.
   b. If none applies, and if the **no mpls ldp advertise-labels** command has been configured, the label for the prefix is not advertised to any peer; otherwise, the label is advertised to all peers.
   c. If a *(prefix acl, peer acl)* pair applies to the prefix, and if the *prefix acl* "denies" the prefix, the label is not advertised to any peer.
   d. If the *prefix acl* "permits" the prefix and the *peer acl* is *none* (that is, the command that "applies" to the prefix is an **mpls ldp advertise-labels for** *prefix acl* command without the **to** keyword), then the label is advertised to all peers.
   e. If the *prefix acl* "permits" the prefix and there is a *peer acl*, then the label is advertised to all peers permitted by the *peer acl*.

Note The **mpls ldp advertise-labels** command has no effect on an LC-ATM interface. Such an interface behaves as though this command had not been executed.

Normally, LDP advertises labels only for IP prefixes that are in the routing table. You can use the **mpls ldp advertise-labels interface** command to force LDP to advertise a label for a prefix constructed from an interface address and a 32-bit mask. Such a prefix is not usually in the routing table.

Examples

In the following example, the router is configured to advertise no locally assigned labels to any LDP neighbors.

```
Router(config)# no mpls ldp advertise-labels
```

In the following example, the router is configured to advertise to all LDP neighbors only the labels for networks 10.101.0.0 and 10.221.0.0.

```
Router(config)# ip access-list standard pfx-filter
Router(config-std-nacl)# permit 10.101.0.0 0.0.255.255
```

```
Router(config-std-nacl)# permit 10.221.0.0 0.0.255.255
Router(config-std-nacl)# exit

Router(config)# mpls ldp advertise-labels for pfx-filter

Router(config)# no mpls ldp advertise-labels
```

In the following example, the router is configured to advertise the label for network 59.0.0.0 only to LSR 155.0.0.55, the label for network 35.0.0.0 only to LSR 133.0.0.33, and the labels for all other prefixes to all LSRs.

```
Router(config)# ip access-list standard pfx-filter1
Router(config-std-nacl)# permit 59.0.0.0
Router(config-std-nacl)# exit

Router(config)# ip access-list standard lsr-filter1
Router(config-std-nacl)# permit 155.0.0.55
Router(config-std-nacl)# exit

Router(config)# ip access-list standard pfx-filter2
Router(config-std-nacl)# permit 35.0.0.0
Router(config-std-nacl)# exit

Router(config)# ip access-list standard lsr-filter2
Router(config-std-nacl)# permit 133.0.0.33
Router(config-std-nacl)# exit

Router(config)# mpls ldp advertise-labels for pfx-filter1 to lsr-filter1
Router(config)# mpls ldp advertise-labels for pfx-filter2 to lsr-filter2
```

The output of the **show mpls ip binding detail** command includes the *(prefix acl, peer acl)* pairs that apply to each prefix. For this example, the applicable pairs are as shown below:

```
Router# show mpls ip binding detail
Advertisement spec:
    Prefix acl = pfx-filter1; Peer acl = lsr-filter1
    Prefix acl = pfx-filter2; Peer acl = lsr-filter2

  35.0.0.0/8, rev 109
    in label:     16
        Advertised to:
        133.0.0.33:0
    out label:    imp-null  lsr: 155.0.0.55:0     inuse
    out label:    imp-null  lsr: 133.0.0.33:0
    Advert acl(s): Prefix acl pfx-filter2, Peer acl lsr-filter2
  59.0.0.0/8, rev 108
    in label:     imp-null
        Advertised to:
        155.0.0.55:0
    out label:    16        lsr: 155.0.0.55:0
    out label:    19        lsr: 133.0.0.33:0
    Advert acl(s): Prefix acl pfx-filter1, Peer acl lsr-filter1
  113.0.0.33/32, rev 98
    out label:    imp-null  lsr: 133.0.0.33:0
  114.0.0.44/32, rev 99
    in label:     imp-null
        Advertised to:
        155.0.0.55:0          133.0.0.33:0
  133.0.0.33/32, rev 101
    in label:     20
        Advertised to:
        155.0.0.55:0          133.0.0.33:0
    out label:    19        lsr: 155.0.0.55:0
    out label:    imp-null  lsr: 133.0.0.33:0     inuse
```

```
  144.0.0.44/32, rev 103
    in label:     imp-null
        Advertised to:
        155.0.0.55:0           133.0.0.33:0
    out label:    20         lsr: 155.0.0.55:0
    out label:    18         lsr: 133.0.0.33:0
  155.0.0.55/32, rev 104
    in label:     17
        Advertised to:
        155.0.0.55:0           133.0.0.33:0
    out label:    imp-null   lsr: 155.0.0.55:0     inuse
    out label:    17         lsr: 133.0.0.33:0
Router#
```

In the following example, the **vrf** keyword is specified to configure label advertisement in the VPN routing/forwarding instance named *vpn1*.

```
Router(config)# mpls ldp advertise-labels vrf vpn1 for pfx-filter1 to lsr-filter1

Router(config)# mpls ldp advertise-labels vrf vpn1 for pfx-filter2 to lsr-filter2
```

The following example uses the **interface** keyword to configure label advertisement for a /32 prefix constructed from the IP address of interface ethernet1/1:

```
Router(config)# mpls ldp advertise-labels interface ethernet1/1
```

Related Commands

Command	Description
mpls ldp advertise-labels old-style	Uses method of earlier software releases to interpret the **for** *prefix-access-list* parameter for the **mpls ldp advertise-labels** command.
show mpls ip binding detail	Shows detailed information about label bindings, including the access lists, if any, controlling which local labels are advertised to which LDP neighbors.

mpls ldp advertise-labels old-style

To cause the interpretation of the **for** *prefix-access-list parameter* for **mpls ldp advertise-labels** commands to be interpreted according to the method used in earlier Cisco IOS software versions, use the **mpls ldp advertise-labels old-style** command in global configuration mode. To disable this feature, use the **no** form of this command.

mpls ldp advertise-labels [**vrf** *vpn-name*] **old-style**

no mpls ldp advertise-labels [**vrf** *vpn-name*] **old-style**

Syntax Description

vrf *vpn-name*	(Optional) Specifies the VPN routing/forwarding instance (*vpn-name*) for label advertisement.

Defaults

If this command is not specified, the **for** *prefix-access-list* parameter in any **mpls ldp advertise-labels** commands is interpreted according to the rules specified under the "Usage Guidelines" heading for the **mpls ldp advertise-labels** command.

If the **vrf** *vpn-name* parameter is not specified, this command applies to the default routing domain.

Command Modes

Global configuration

Command History

Release	Modification
12.0(14)ST	This command was introduced to reflect MPLS VPN support for LDP and to cause the **for** *prefix-access-list* parameter in the command to be interpreted in the same way as in earlier Cisco IOS releases.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

The method for interpreting the **for** *prefix-access-list* parameter in **mpls ldp advertise-labels** commands is defined by Rule 2.a under the "Usage Guidelines" heading described in the **mpls ldp advertise-labels** command. This Rule 2.a follows normal access list conventions.

However, earlier Cisco IOS software versions used a different method for interpreting the **for** *prefix-access-list* parameter in **mpls ldp advertise-labels** commands. For those earlier software versions, Rule 2.a read as follows:

2. A given prefix can have, at most, one *(prefix acl, peer acl)* pair that "applies" to it.

a. A given *(prefix acl, peer acl)* pair "applies" to a prefix only if the *prefix acl* "matches" the prefix. A match occurs if the *prefix acl* explicitly permits or denies the prefix by means of a **permit** or **deny** command. A *prefix acl* that contains a **permit any** or **deny any** command matches any prefix.

This earlier Rule 2.a departed from normal access list conventions in that:

- An explicit **deny** (including a **deny any**) that matches the prefix causes the (*prefix acl*, *peer acl*) pair to apply to the prefix.
- Explicit **deny any** and implicit **deny any** (which all access lists have) have different effects, in that the explicit **deny any** causes the access list pair to apply to all prefixes, but the implicit **deny any** has no effect.

Use the **mpls ldp advertise-labels old-style** command to force the use of the old-style method of interpreting the **for** *prefix-access-list* parameter used by earlier software versions if the following apply:

- A configuration developed for use with earlier software versions depends on this previous method for interpreting the **for** *prefix-access-list* parameter in **mpls ldp advertise-labels** commands.
- It is inconvenient to update the configuration to work with Rule 2.a as it appears under the "Usage Guidelines" heading described in the **mpls ldp advertise-labels** command.

Examples

The following command causes the old-style method of interpreting the **for** *prefix-access-list* parameter to be used in executing **mpls ldp advertise-labels** commands:

```
Router# mpls ldp advertise-labels old-style
```

In the following example, the **vrf** keyword is specified to configure label advertisement in the VPN routing/forwarding instance named *vpn1*.

```
Router(config)# mpls ldp advertise-labels vrf vpn1 old-style
Router(config)#
```

Related Commands

Command	Description
mpls ldp advertise-labels	Controls the distribution of locally assigned labels by means of LDP.

mpls ldp atm control-mode

To control the mode used for handling label binding requests on LC-ATM interfaces, use the **mpls ldp atm control-mode** command in global configuration mode. To disable this feature, use the **no** form of this command.

mpls ldp atm control-mode {**ordered** | **independent**}

no mpls ldp atm control-mode {**ordered** | **independent**}

Syntax Description

ordered	Delays a label binding in response to a Label Request message from a label distribution protocol (LDP) neighbor until a label binding has been received from the next hop LDP neighbor for the destination in question.
independent	Returns a label binding immediately in response to a Label Request message from an LDP neighbor. Any packets for the destination in question are discarded by the label switch router (LSR) until a label binding from the next hop LSR has been received.

Defaults

The default is **ordered** control mode.

Command Modes

Global configuration

Command History

Release	Modification
11.1CT	This command was introduced.
12.0(10)ST	This command was modified to reflect MPLS IETF command syntax and terminology.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

Use of ordered control mode by an ATM device acting as a transit LSR in an ATM cloud ensures that the device will receive labeled packets to forward only after it has learned the outgoing labels required by MPLS to forward the packets. Ordered control mode relieves the device of the burden of reassembling cells into packets that must be forwarded by means of the normal (non-MPLS) packet forwarding or discard mechanisms.

Use of independent control mode on ATM transit LSRs might slightly reduce the time an ATM edge router must wait to use an ATM label switched path (LSP) it has initiated. Independent control mode eliminates the need for the edge router to wait for the Label Request/Label Mapping signaling to traverse the ATM cloud from edge router ingress to egress and back before it can send packets into the LSP. However, there is a risk that an ATM transit device might receive labeled packets before it has learned the outgoing labels required for MPLS forwarding, thus forcing the transit device to reassemble the cells into a packet that it is likely to discard.

Examples

In the following example, the mode for handling LDP Label Request messages is set to “independent” for the platform:

```
Router# mpls ldp atm control-mode independent
```

mpls ldp atm vc-merge

To control whether the vc-merge (multipoint-to-point) capability is supported for unicast label virtual circuits (LVCs), use the **mpls ldp atm vc-merge** command in global configuration mode. To disable this feature, use the **no** form of this command.

mpls ldp atm vc-merge

no mpls ldp atm vc-merge

Syntax Description

This command has no arguments or keywords.

Defaults

The ATM-VC merge capability is enabled by default if the hardware supports this feature; otherwise, the feature is disabled.

Command Modes

Global configuration

Command History

Release	Modification
11.1CT	This command was introduced.
12.0(10)ST	This command was modified to reflect MPLS IETF command syntax and terminology.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

Use of VC merge helps conserve ATM labels by allowing incoming LSPs from different sources for the same destination to be merged onto a single outgoing VC.

Examples

In the following example, the ATM-VC merge capability is disabled:

```
Router# no mpls ldp atm vc-merge
```

Related Commands

Command	Description
show mpls atm-ldp capability	Displays the ATM MPLS capabilities negotiated with LDP neighbors for LC-ATM interfaces.

mpls ldp backoff

To configure parameters for the label distribution protocol (LDP) backoff mechanism, use the **mpls ldp backoff** command in global configuration mode. To disable this feature, use the **no** form of this command.

mpls ldp backoff *initial-backoff maximum-backoff*

no mpls ldp backoff *initial-backoff maximum-backoff*

Syntax Description

initial-backoff	Number from 5 to 2147483, inclusive, that defines the initial backoff value in seconds. The default is 15 seconds.
maximum-backoff	Number from 5 to 2147483, inclusive, that defines the maximum backoff value in seconds. The default value is 120 seconds.

Defaults

The initial backoff value is 15 seconds and grows to a maximum value of 120 seconds.

Command Modes

Global configuration

Command History

Release	Modification
12.0(10)ST	This command was introduced.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

The LDP backoff mechanism prevents two incompatibly configured label switch routers (LSRs) from engaging in an unthrottled sequence of session setup failures. For example, an incompatibility arises when two neighboring routers attempt to perform LC-ATM (label-controlled ATM) but the two are using different ranges of VPI/VCI values for labels.

If a session setup attempt fails due to an incompatibility, each LSR delays its next attempt (that is, backs off), increasing the delay exponentially with each successive failure until the maximum backoff delay is reached.

The default settings correspond to the lowest settings for initial and maximum backoff values defined by the LDP protocol specification. You should change the settings from the default values only if such settings result in undesirable behavior.

Examples

The following command shows how to set the initial backoff delay to 30 seconds and the maximum backoff delay to 240 seconds:

```
Router(config)# mpls ldp backoff 30 240
```

Related Commands

Command	Description
show mpls ldp backoff	Displays information about the configured session setup backoff parameters and any potential LDP peers with which session setup attempts are being throttled.
show mpls ldp parameters	Displays current LDP parameters.

mpls ldp discovery

To configure the interval between transmission of consecutive label distribution protocol (LDP) Discovery Hello messages, or the hold time for a discovered LDP neighbor, or the neighbors from which requests for targeted Hello messages may be honored, use the **mpls ldp discovery** command in global configuration mode. To disable this feature, use the **no** form of this command.

mpls ldp discovery {**hello** {**holdtime** | **interval**} *seconds* | **targeted-hello** {**holdtime** | **interval**} *seconds* | **accept** [**from** *acl*]}

no mpls ldp discovery {**hello** {**holdtime** | **interval**} | **targeted-hello** {**holdtime** | **interval**} | **accept** [**from** *acl*]}

Syntax Description

hello	Configures the intervals and hold times for directly connected neighbors.
holdtime	Defines the period of time a discovered LDP neighbor is remembered without receipt of an LDP Hello message from the neighbor. The default is 15 seconds.
interval	Defines the period of time between the sending of consecutive Hello messages. The default is 5 seconds.
seconds	Defines the hold time or interval in seconds.
targeted-hello	Configures the intervals and hold times for neighbors that are not directly connected (for example, LDP sessions that run between the endpoints of an LSP tunnel).
accept	Configures the router to respond to requests for targeted Hello messages from all neighbors or from neighbors specified by the optional *acl* argument.
from *acl*	(Optional) The IP access list that specifies the neighbor from which requests for targeted Hello messages may be honored.

Defaults

The default value for the **holdtime** keyword is 15 seconds for link Hello messages and 45 seconds for targeted Hello messages.

The default value for the **interval** keyword is 5 seconds.

Requests for targeted Hello messages are not accepted from any neighbor.

Command Modes

Global configuration

Command History

Release	Modification
11.1CT	This command was introduced.
12.0(10)ST	This command was modified to reflect MPLS IETF command syntax and terminology.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

When the discovery hold time elapses for a neighbor discovered on an interface or for a neighbor discovered by means of a targeted Hello message, the record associating the neighbor with that interface or that targeted Hello message source is discarded. If an LDP session exists with a neighbor, but a discovery record no longer exists for that neighbor, the LDP session is terminated.

Setting the hold time too high causes LDP to be slow in detecting link outages; setting the hold time too low might cause LDP to terminate sessions when a Hello message is dropped during traffic bursts on a link.

The exchange of targeted Hello messages between two nondirectly connected neighbors (N1 and N2) may occur in the following ways:

- N1 may initiate the transmission of targeted Hello messages to N2, and N2 may send targeted Hello messages in response. In this situation, N1 is considered to be active and N2 is considered to be passive.

  N1's targeted Hello messages carry a request that N2 send targeted Hello messages in response. To respond, N2's configuration must permit it to respond to N1. The **mpls ldp discovery targeted-hello accept** command is used to configure whether N1 may respond to requests for targeted Hello messages.

- N1 and N2 may both be configured to initiate the transmission of targeted Hello messages to each other. In this situation, both are active.

  Both, one, or neither of N1 and N2 may be passive, depending on whether they have been configured to respond to requests for targeted Hello messages from the other.

Note Normally, active transmission of targeted Hello messages by a router is triggered by some configuration action, such as an **mpls ip** command on a traffic engineering tunnel interface.

Examples

In the following example, the period of time for which a neighbor discovered on an interface is remembered if no Hello messages are received is set to 30 seconds:

```
Router# configure terminal
Router(config)# mpls ldp discovery hello holdtime 30
```

The following example configures the router to respond to requests for targeted Hello messages from neighbors 157.13.0.23 and 168.73.0.18:

```
Router(config)# ip access standard TRGT_ACCEPT
Router(config-nacl)# permit 157.13.0.23
Router(config-nacl)# permit 168.73.0.18
Router(config-nacl)# exit
Router(config)# mpls ldp discovery targeted-hello accept from TRGT_ACCEPT
```

Related Commands

Command	Description
mpls ldp holdtime	Changes the time for which an LDP session is maintained in the absence of LDP messages from the session peer.
show mpls ldp discovery	Displays the status of the LDP discovery process.
show mpls ldp neighbor	Displays the status of LDP sessions.
show mpls ldp parameters	Displays current LDP parameters.

mpls ldp discovery transport-address

To specify the transport address advertised in label distribution protocol (LDP) Discovery Hello messages sent on an interface, use the **mpls ldp discovery transport-address** command in interface configuration mode. To disable this feature, use the **no** form of this command.

mpls ldp discovery transport-address {**interface** | *IP address*}

no mpls ldp discovery transport-address

Syntax Description

interface	Specifies that the interface IP address should be advertised as the transport address.
IP address	Specifies that the IP address should be advertised as the transport address.

Defaults

The default behavior when this command has not been issued for an interface depends on the interface type.

Unless the interface is a label-controlled ATM (LC-ATM) interface, LDP advertises its LDP Router ID as the transport address in LDP Discovery Hello messages sent from the interface.

If the interface is an LC-ATM interface, no transport address is explicitly advertised in LDP Discovery Hello messages sent from the interface.

Command Modes

Interface configuration

Command History

Release	Modification
12.0(14)ST	This command was introduced.
12.2(2)T	This command was integrated into Cisco IOS Release 12.2(2)T.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

The establishment of an LDP session between two routers requires a session TCP connection by which label advertisements can be exchanged between the routers. To establish the session TCP connection, each router must know the transport address (IP address) of the other router.

The LDP discovery mechanism provides the means for a router to advertise the transport address for its end of a session TCP connection. The transport address advertisement itself may be explicit, in which case it appears as part of the contents of Discovery Hello messages sent to the peer, or implicit, in which case it does not, and the peer uses the source IP address of received Hello messages for the peer's transport address.

The **mpls ldp discovery transport-address** command provides the means to modify the default behavior described above. When the **interface** keyword is specified, LDP advertises the IP address of the interface in LDP Discovery Hello messages sent from the interface. When the *IP address* argument is specified, LDP advertises the specified IP address in LDP Discovery Hello messages sent from the interface.

Note When a router has multiple links connecting it to its peer device, the router must advertise the same transport address in the LDP Discovery Hello messages it sends on all such interfaces.

Examples

The following example specifies that the LDP transport address for interface pos2/0 should be the interface IP address; it also specifies that the IP address 145.22.0.56 of interface pos3/1 should be the LDP transport address.

```
Router(config#) interface pos2/0
Router(config-if)# mpls ldp discovery transport-address interface
Router(config#) interface pos3/1
Router(config-if)# mpls ldp discovery transport-address 145.22.0.56
```

Related Commands

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

mpls ldp explicit-null

To cause a router to advertise an Explicit Null label in situations where it would normally advertise an Implicit Null label, use the **mpls ldp explicit-null** command in global configuration mode. To disable this feature, use the **no** form of this command.

mpls ldp explicit-null [**for** *prefix-acl* | **to** *peer-acl* | **for** *prefix-acl* **to** *peer-acl*]

no mpls ldp explicit-null

Syntax Description

for *prefix-acl*	(Optional) Specifies prefixes for which Explicit Null should be advertised in place of Implicit Null.
to *peer-acl*	(Optional) Specifies LDP peers to which Explicit Null should be advertised in place of Implicit Null.

Defaults

The default behavior is to advertise Implicit Null for directly connected routes unless the command **mpls ldp explicit-null** has been executed.

Command Modes

Global configuration

Command History

Release	Modification
12.0(10)ST	This command was introduced.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

Normally, label distribution protocol (LDP) advertises an Implicit Null label for directly connected routes. The Implicit Null label causes the previous hop (penultimate) router to do penultimate hop popping. Situations exist where it might be desirable to prevent the penultimate router from performing penultimate hop popping and to force it to replace the incoming label with the Explicit Null label.

When you issue the **mpls ldp explicit-null** command, Explicit Null is advertised in place of Implicit Null for directly connected prefixes permitted by *prefix-acl* to peers permitted by *peer-acl*.

If you do not specify the *prefix-acl* argument in the command, Explicit Null is advertised in place of Implicit Null for all directly connected prefixes.

If you do not specify the *peer-acl* argument in the command, Explicit Null is advertised in place of Implicit Null to all peers.

Examples

The following command shows how to cause Explicit Null to be advertised for all directly connected routes to all LDP peers:

```
Router(config)# mpls ldp explicit-null
```

The following command sequence shows how to cause Explicit Null to be advertised for directly connected route 137.5.0.0 to all LDP peers and Implicit Null to be advertised for all other directly connected routes:

```
Router(config)# mpls ldp explicit-null
Router(config)# ip access-list standard adv-exp-null
Router(config-std-nacl)# permit 137.5.0.0
Router(config-std-nacl)# deny any
Router(config-std-nacl)#
```

Related Commands

Command	Description
show mpls ip binding	Displays specified information about label bindings learned by LDP.

mpls ldp holdtime

To change the time for which an label distribution protocol (LDP) session is maintained in the absence of LDP messages from the session peer, use the **mpls ldp holdtime** command in global configuration mode. To disable this feature, use the **no** form of this command.

mpls ldp holdtime *seconds*

no mpls ldp holdtime *seconds*

Syntax Description

seconds	Number from 15 to 2147483, that defines the time, in seconds, an LDP session is maintained in the absence of LDP messages from the session peer. The default is 180.

Defaults

The default value for the *seconds* argument is 180.

Command Modes

Global configuration

Command History

Release	Modification
11.1CT	This command was introduced.
12.0(10)ST	This command was modified to reflect MPLS IETF command syntax and terminology.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

When an LDP session is established between two LSRs, the hold time used for the session is the lower of the values configured on the two LSRs.

Examples

The following example shows how to configure the hold time of LDP sessions for 30 seconds:

```
Router# mpls ldp holdtime 30
```

Related Commands

Command	Description
show mpls ldp parameters	Displays current LDP parameter.
show mpls atm-ldp bindings	Displays specified entries from the ATM label binding database.

mpls ldp loop-detection

To enable the label distribution protocol (LDP) optional loop detection mechanism, use the **mpls ldp loop-detection** command in global configuration mode. To disable this feature, use the **no** form of this command.

mpls ldp loop-detection

no mpls ldp loop-detection

Syntax Description

This command has no optional keywords or arguments.

Defaults

LDP loop detection is disabled.

Command Modes

Global configuration

Command History

Release	Modification
12.0(10)ST	This command was introduced.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

The LDP loop detection mechanism is intended for use in networks of non-TTL (time-to-live) decrementing devices (for example, ATM switches) that are incapable of fairly allocating device resources among traffic flows.

When configured, the LDP loop detection mechanism is used with the Downstream on Demand method of label distribution, supplementing the Downstream on Demand hop count mechanism to detect looping LSPs that might occur during routing transients. When looping LSPs are detected, the loop is not set up.

Examples

The following command sets the LDP loop detection mechanism on:

```
Router(config)# mpls ldp loop-detection
```

Related Commands

Command	Description
mpls ldp maxhops	Limits the number of hops permitted in an LSP established by the Downstream on Demand method of label distribution.

mpls ldp maxhops

To limit the number of hops permitted in a label switched path (LSP) established by the Downstream on Demand method of label distribution, use the **mpls ldp maxhops** command in global configuration mode. To disable this feature, use the **no** form of this command.

mpls ldp maxhops *number*

no mpls ldp maxhops

Syntax Description

number	Number from 1 to 255, inclusive, that defines the maximum hop count. The default is 254.

Defaults

The default is 254 hops.

Command Modes

Global configuration

Command History

Release	Modification
11.1CT	This command was introduced.
12.0(10)ST	This command was modified to reflect MPLS IETF command syntax and terminology.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

When an ATM label switch router (LSR) initiates a request for a label binding, it sets the hop count value in the Label Request message to 1. Subsequent ATM-LSRs along the path to the edge of the ATM label switching region increment the hop count before forwarding the Label Request message to the next hop.

When an ATM LSR receives a Label Request message, it does not send a Label Mapping message in response, nor does it propagate the request to the destination next hop if the hop count value in the request equals or exceeds the maxhops value. Instead, the ATM LSR returns an error message that specifies that the maximum allowable hop count has been reached. This threshold is used to prevent forwarding loops in the setting up of label switch paths across an ATM region.

Examples

The following example shows how to set the hop count limit to 10:

```
Router(config)# mpls ldp maxhops 10
```

Related Commands

Command	Description
mpls ldp router-id	Specifies a preferred interface for determining the LDP router ID.
show mpls atm-ldp bindings	Displays specified entries from the ATM label binding database.
show mpls ip binding	Displays specified information about label bindings learned by LDP.

mpls ldp neighbor implicit-withdraw

To configure the advertisement of a new label for a Forwarding Equivalence Class (FEC) without the withdrawal of the previously advertised label, use the **mpls ldp neighbor implicit-withdraw** command in global configuration mode. To disable this option for the specified neighbor, use the **no** form of this command.

mpls ldp neighbor [**vrf** *vpn-name*] *ip-addr* **implicit-withdraw**

no mpls ldp neighbor [**vrf** *vpn-name*] *ip-addr* [**implicit-withdraw**]

Syntax Description

vrf *vpn-name*	(Optional) VPN routing/forwarding instance for the specified neighbor.
ip-addr	Router ID (IP address) that identifies a neighbor.

Defaults

When the **vrf** keyword is not specified in this command, the label distribution protocol (LDP) neighbor is configured in the default routing domain.

If this command is not configured, when it is necessary for LDP to change the label it has advertised to a neighbor for some prefix, it will withdraw the previously advertised label before advertising the new label to the neighbor.

For the **no** form of the command, if the **implicit-withdraw** keyword is not specified, all configuration information for the specified neighbor reverts to the defaults and the neighbor record is deleted.

Command Modes

Global configuration

Command History

Release	Modification
12.0(21)ST	This command was modified to add the **implicit-withdraw** keyword.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

By default, in Cisco IOS Release 12.0(21)ST and later, LDP withdraws the previously advertised label using a withdraw message before advertising a new label for a FEC. In Cisco IOS releases prior to 12.0(21)ST, LDP did not withdraw a previously advertised label before advertising a new label for a FEC. In these older releases, the new label advertisement served as an implied withdraw and LDP did not send a withdraw message. To cause LDP to operate as it did in releases before Cisco IOS 12.0(21)ST, that is, LDP will advertise a new label for a FEC without first withdrawing the previously advertised label, use the **implicit-withdraw** keyword with this command.

```
Router(config)# mpls ldp neighbor 10.10.10.10 implicit-withdraw
```

Using the **implicit-withdraw** keyword avoids the overhead of label withdraw and label release message exchanges.

To disable the **implicit-withdraw** option, use the **no** form of the command with the **implicit-withdraw** keyword. This returns the router to the default, which requires that LDP withdraw the previously advertised label for a FEC before advertising a new label.

```
Router(config)# no mpls ldp neighbor 10.10.10.10 implicit-withdraw
```

Examples

In the following example, LDP does not send a label-withdraw message to the neighbor whose router ID is 10.10.10.10 when a need exists to change the previously advertised label for a FEC:

```
Router(config)# mpls ldp neighbor 10.10.10.10 implicit-withdraw
```

Related Commands

Command	Description
mpls ldp neighbor password	Configures a password key for computing MD5 checksums for the session TCP connection with the specified neighbor.
mpls ldp neighbor targeted	Sets up a targeted session with the specified neighbor.

mpls ldp neighbor password

To configure a password key for computing MD5 checksums for the session Transmission Control Protocol (TCP) connection with the specified neighbor, use the **mpls ldp neighbor password** command in global configuration mode. To disable this option for the specified neighbor, use the **no** form of this command.

mpls ldp neighbor [**vrf** *vpn-name*] *ip-addr* **password** [*0-7*] *pswd-string*

no mpls ldp neighbor [**vrf** *vpn-name*] *ip-addr* [**password** [*0-7*] *pswd-string*]

Syntax Description

vrf *vpn-name*	(Optional) VPN routing/forwarding instance for the specified neighbor.
ip-addr	Router ID (IP address) that identifies a neighbor.
0-7	(Optional) The [0-7] encryption option is not supported for this release.
pswd-string	Password key to be used for computing MD5 checksums for the session TCP connection with the specified neighbor.

Defaults

Unless the TCP MD5 Signature Option is explicitly configured with the **password** *pswd-string* keyword and argument for session TCP connections, the option is not used.

When the **vrf** keyword is not specified in this command, the label distribution protocol (LDP) neighbor is configured in the default routing domain.

For the **no** form of the command, if the **password** keyword is not specified, all configuration information for the specified neighbor reverts to the defaults and the neighbor record is deleted.

Command Modes

Global configuration

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(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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

You can invoke authentication between two LDP peers, verifying each segment sent on the TCP connection between the peers. To do so, you must configure authentication on both LDP peers using the same password; otherwise, the peer session is not established.

The authentication capability uses the MD5 (Message Digest 5) algorithm. MD5, an algorithm used in conjunction with SNMP, verifies the integrity of the communication, authenticates the origin of the message, and checks for timeliness.

Invoking the **mpls ldp neighbor password** command causes the generation and checking of the MD5 digest for every segment sent on the TCP connection.

Configuring a password for an LDP neighbor causes an existing LDP session to be torn down and a new session to be established.

If a router has a password configured for a neighbor, but the neighbor router does not have a password configured, a message such as the following appears on the console while the two routers attempt to establish an LDP session:

```
%TCP-6-BADAUTH: No MD5 digest from [peer's IP address]:11003 to [local router's
IP address]:179
```

Similarly, if the two routers have different passwords configured, a message such as the following appears on the console:

```
%TCP-6-BADAUTH: Invalid MD5 digest from [peer's IP address]:11004 to [local router's
IP address]:179
```

Examples

In the following example, the string onethirty9 is configured as the password key for use with MD5 for the neighbor whose router ID is 139.27.0.15:

```
Router(config)# mpls ldp neighbor 139.27.0.15 password onethirty9
```

In the following example, the string cisco is configured as the password for use with MD5 for the LDP neighbor having router ID 4.4.4.4 in the VPN routing/forwarding instance named vpn1:

```
Router(config)# mpls ldp neighbor vrf vpn1 4.4.4.4 password cisco
```

Related Commands

Command	Description
mpls ldp neighbor implicit-widthdraw	Configures the advertisement of a new label for a FEC without the withdrawal of the previously advertised label.
mpls ldp neighbor targeted	Sets up a targeted session with the specified neighbor.

mpls ldp neighbor targeted

To set up a targeted session with the specified neighbor, use the **mpls ldp neighbor targeted** command in global configuration mode. To disable this option for the specified neighbor, use the **no** form of this command.

mpls ldp neighbor [**vrf** *vpn-name*] *ip-addr* **targeted** [*ldp* | *tdp*]

no mpls ldp neighbor [**vrf** *vpn-name*] *ip-addr* [**targeted** [*ldp* | *tdp*]]

Syntax Description

vrf *vpn-name*	(Optional) VPN routing/forwarding instance for the specified neighbor.
ip-addr	Router ID (IP address) that identifies a neighbor.
ldp	(Optional) Specifies the Label Distribution Protocol (LDP) as the label protocol for the targeted session.
tdp	(Optional) Specifies the Tag Distribution Protocol (TDP) as the label protocol for the targeted session.

Defaults

When the **targeted** keyword is not specified, a targeted session is not set up with the neighbor.

For the **no** form of the command if the **targeted** keyword is not specified all configuration information for the specified neighbor reverts to the defaults and the neighbor record is deleted.

Command Modes

Global configuration

Command History

Release	Modification
12.0(22)S	This command was introduced.

Usage Guidelines

If you do not specify the label protocol for the targeted session, the label protocol specified with the **mpls label protocol** command is used. If the **mpls label protocol** command is not configured, then TDP is used for the targeted session.

Use the **mpls ldp neighbor targeted** command when you need to set up a targeted session and other means of establishing targeted sessions do not apply, such as configuring **mpls ip** on a traffic engineering (TE) tunnel or configuring Any Transport over MPLS (AToM) virtual circuits (VCs). For example, you would use this command to set up a targeted session between directly connected MPLS LSRs when MPLS label forwarding convergence time is an issue.

The **mpls ldp neighbor targeted** command can improve label convergence time for directly connected neighbor LSRs when the link(s) directly connecting them are down. When the links between the neighbor LSRs are up, both the link and targeted Hellos maintain the LDP session. If the links between the neighbor LSRs go down, the targeted Hellos maintain the session, allowing the label switch routers (LSRs) to retain labels learned from each other. When a link directly connecting the LSRs comes back up, the LSRs can immediately reinstall labels for forwarding use without having to reestablish their LDP session and exchange labels.

Examples

In the following example, the router sets up a targeted session with the neighbor 10.10.10.10 using TDP as the label protocol:

```
Router(config)# mpls ldp neighbor 10.10.10.10 targeted
```

In the following example, the router sets up a targeted session with the neighbor 10.10.10.10 using LDP as the label protocol:

```
Router(config)# mpls label protocol ldp

Router(config)# mpls ldp neighbor 10.10.10.10 targeted
```

Another way to set up a targeted session using LDP without changing the default label protocol is as follows:

```
Router(config)# mpls ldp neighbor 10.10.10.10 targeted ldp
```

Related Commands

Commands	Description
mpls ldp neighbor implicit-widthdraw	Configures the advertisement of a new label for a FEC without the withdrawal of the previously advertised label.
mpls ldp neighbor password	Configure a password key for computing MD5 checksums for the session TCP connection with the specified neighbor.

mpls ldp router-id

To specify a preferred interface for determining the label distribution protocol (LDP) router ID, use the **mpls ldp router-id** command in global configuration mode. To disable this feature, use the **no** form of this command.

mpls ldp router-id *interface* [*force*]

no mpls ldp router-id

Syntax Description

interface	Causes the IP address of the specified interface to be used as the LDP router ID, provided that the interface is operational.
force	(Optional) Alters the behavior of the **mpls ldp router-id** command, as described in the "Usage Guidelines" section.

Defaults

If the **mpls ldp router-id** command is not executed, the LDP router ID is determined as follows:

a. The IP addresses of all operational interfaces are examined.

b. If these IP addresses include loopback interface addresses, the largest such loopback address is selected as the LDP router ID.

c. Otherwise, the largest IP address pertaining to an operational interface is selected as the LDP router ID.

Command Modes

Global configuration

Command History

Release	Modification
12.0(10)ST	This command was introduced.
12.0(14)ST	The *force* argument was 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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

The normal (default) method for determining the LDP router ID may result in a router ID that is not usable in certain situations. For example, an IP address selected as the LDP router ID might not be advertisable by the routing protocol to a neighboring router. The **mpls ldp router-id** command provides a means for specifying an interface whose IP address is to be used as the LDP router ID. The specified interface must be operational in order for its IP address to be used as the LDP router ID.

When executed without the *force* argument, the **mpls ldp router-id** command modifies the method for determining the LDP router ID by causing selection of the IP address of the specified *interface* (provided that the interface is operational) the next time it is necessary to select an LDP router ID. The effect of

the command is delayed until the next time it is necessary to select an LDP router ID, which is typically the next time the interface whose address is the current LDP router ID is shut down or the address itself is deconfigured.

When executed with the *force* argument, the effect of the **mpls ldp router-id** command depends on the current state of the specified *interface*:

a. If the interface is up (operational) when the **mpls ldp router-id** *force* command is issued and if its IP address is not currently the LDP router ID, the LDP router ID is forcibly changed to the IP address of the interface. This forced change in the LDP router ID tears down any existing LDP sessions, releases label bindings learned via the LDP sessions, and interrupts MPLS forwarding activity associated with the bindings.

b. If the interface is down when the **mpls ldp router-id** *force* command is issued, when the interface transitions to up, the LDP router ID is forcibly changed to the IP address of the interface. This forced change in the LDP router ID tears down any existing LDP sessions, releases label bindings learned via the LDP sessions, and interrupts MPLS forwarding activity associated with the bindings.

Examples

The following example shows that the pos2/0/0 interface has been specified as the preferred interface for use in determining the LDP router ID. The IP address of such a specified interface is used as the LDP router ID.

```
Router(config)# mpls ldp router-id pos2/0/0
```

Related Commands

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

show mpls atm-ldp bindings

To display specified entries from the ATM label binding database, use the **show mpls atm-ldp bindings** command in privileged EXEC mode. The ATM label binding database contains entries for label VCs on LC-ATM interfaces.

show mpls atm-ldp bindings [*network* {*mask* | *length*}] [**local-label** *vpi vci*] [**remote-label** *vpi vci*] [**neighbor** *interface*]

Syntax Description

network	(Optional) Defines the destination network number.
mask	(Optional) Defines the network mask in the form A.B.C.D (destination prefix).
length	(Optional) Defines the mask length (1 to 32).
local-label *vpi vci*	(Optional) Selects the label values assigned by this router. (VPI range is 0 to 4095. VCI range is 0 to 65535.)
remote-label *vpi vci*	(Optional) Selects the label values assigned by the other router. (VPI range is 0 to 4095. VCI range is 0 to 65535.)
neighbor *interface*	(Optional) Selects the label values assigned by the neighbor on a specified interface.

Defaults

The entire ATM label binding database is displayed if no optional arguments or keywords are specified.

Note To display information about entries in the label binding database for interfaces other than ATM interfaces, use the **show mpls ip binding** command.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.1CT	This command was introduced.
12.0(10)ST	This command was modified to reflect MPLS IETF command syntax and terminology.
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 for this command was extended to 4095.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

Command output can show a summary of entries from the entire database, or the output can be limited to a subset of entries based on the following:

- Specific prefix
- Specific virtual circuit (VC) label value
- Specific assigning interface

Note This command displays ATM label bindings learned by LDP or TDP.

Note The command **show mpls ip binding** includes the output generated by **show mpls atm-ldp bindings** as well as information about label bindings for packet interfaces.

Examples

The following shows sample output from the **show mpls atm-ldp bindings** command:

```
Router# show mpls atm-ldp bindings

 Destination: 10.24.0.0/24
    Tailend Router ATM1/0.1 1/39 Active, VCD=3
 Destination: 10.15.0.15/32
    Tailend Router ATM1/0.1 1/33 Active, VCD=4
 Destination: 203.0.7.7/32
    Headend Router ATM1/0.1 (2 hops) 1/34  Active, VCD=810
```

The following is sample output from the **show mpls atm-ldp bindings** command on an ATM switch:

```
Router# show mpls atm-ldp bindings

Destination: 150.0.0.0/16
    Tailend Switch ATM0/0/3 1/35 Active -> Terminating Active
Destination: 4.4.4.4/32
    Transit ATM0/0/3 1/33 Active -> ATM0/1/1 1/33 Active
```

Table 17 describes the significant fields shown in the display.

Table 17 show mpls atm-ldp bindings Field Descriptions

Field	Description
Destination	Destination (network/mask).
Headend Router Tailend Router Tailend Switch Transit	Indicates types of VCs. Options include the following: • Tailend—VC that terminates at this platform • Headend—VC that originates at this router • Transit—VC that passes through a switch
ATM1/0.1	Interface.
1/35	VPI/VCI.
Active	Indicates VC state. Options include the following: • Active—Set up and working • Bindwait—Waiting for a response • Remote Resource Wait—Waiting for resources (VPI/VCI space) to be available on the downstream device • Parent Wait—Transit VC input side waiting for output side to become active
VCD=2	Virtual circuit descriptor number.

show mpls atm-ldp bindwait

To display the number of bindings waiting for label assignments from a remote MPLS ATM switch, use the **show mpls atm-ldp bindwait** command in privileged EXEC mode.

show mpls atm-ldp bindwait

Syntax Description

This command has no arguments or keywords.

Defaults

This command has no default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(5)T	This command was introduced.
12.2(4)T	This command was updated to reflect the MPLS IETF terminology.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

Use this command to display information about virtual circuits (VCs) in the bindwait state.

Examples

The following shows sample output from the **show mpls atm-ldp bindwait** command:

```
Router# show mpls atm-ldp bindwait

Waiting for bind on ATM1/0.2
  3.3.3.1/32          3.3.3.1/32          3.3.3.2/32
  3.3.3.2/32          3.3.3.3/32          3.3.3.3/32
  3.3.3.4/32          3.3.3.4/32          3.3.3.5/32
  3.3.3.5/32          3.3.3.6/32          3.3.3.6/32
  3.3.3.7/32          3.3.3.7/32          3.3.3.8/32
  3.3.3.8/32          3.3.3.9/32          3.3.3.9/32 ...

end
```

If everything is working properly, this command does not display any output.

Related Commands

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

show mpls atm-ldp capability

To display the MPLS ATM capabilities negotiated with label distribution protocol (LDP) neighbors for LC-ATM interfaces, use the **show mpls atm-ldp capability** command in privileged EXEC mode.

show mpls atm-ldp capability

Syntax Description

This command has no arguments or keywords.

Defaults

This command always displays all the MPLS ATM capabilities negotiated with all the LDP neighbors.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.1CT	This command was introduced.
12.0(10)ST	This command was modified to reflect MPLS IETF command syntax and terminology.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

When two label switch routers (LSRs) establish an LDP session, they negotiate parameters for the session, such as the range of virtual path identifiers (VPIs) and virtual channel identifiers (VCIs) that will be used as labels.

This command displays the MPLS ATM capabilities negotiated by LDP or the Tag Distribution Protocol (TDP).

Examples

The following shows sample output from the **show mpls atm-ldp capability** command:

```
Router# show mpls atm-ldp capability

               VPI           VCI           Alloc   Odd/Even  VC Merge
ATM0/1/0       Range         Range         Scheme  Scheme    IN   OUT
  Negotiated   [100 - 101]   [33 - 1023]   UNIDIR            -    -
  Local        [100 - 101]   [33 - 16383]  UNIDIR            EN   EN
  Peer         [100 - 101]   [33 - 1023]   UNIDIR            -    -

               VPI           VCI           Alloc   Odd/Even  VC Merge
ATM0/1/1       Range         Range         Scheme  Scheme    IN   OUT
  Negotiated   [201 - 202]   [33 - 1023]   BIDIR             -    -
  Local        [201 - 202]   [33 - 16383]  UNIDIR  ODD       NO   NO
  Peer         [201 - 202]   [33 - 1023]   BIDIR   EVEN      -    -
```

Table 18 describes the significant fields shown in the display.

Table 18 show mpls atm-ldp capability Field Descriptions

Field	Description
VPI Range	Minimum and maximum numbers of VPIs supported on this interface.
VCI Range	Minimum and maximum numbers of VCIs supported on this interface.
Alloc Scheme	Indicates the applicable allocation scheme, as follows: • UNIDIR—Unidirectional capability indicates that the peer can, within a single VPI, support binding of the same VCI to different prefixes on different directions of the link. • BIDIR—Bidirectional capability indicates that within a single VPI, a single VCI can appear in one binding only. In this case, one peer allocates bindings in the even VCI space, and the other in the odd VCI space. The system with the lower LDP identifier assigns even-numbered VCIs. The negotiated allocation scheme is UNIDIR, only if, both peers have UNIDIR capability. Otherwise, the allocation scheme is BIDIR. **Note** These definitions for *unidirectional* and *bidirectional* are consistent with normal ATM usage of the terms; however, they are exactly opposite from the definitions for them in the IETF LDP specification.
Odd/Even Scheme	Indicates whether the local device or the peer is assigning an odd- or even-numbered VCI when the negotiated scheme is BIDIR. It does not display any information when the negotiated scheme is UNIDIR.
VC Merge	Indicates the type of virtual circuit (VC) merge support available on this interface. There are two possibilities, as follows: IN—Indicates the input interface merge capability. IN accepts the following values: • EN—The hardware interface supports VC merge, and VC merge is enabled on the device. • DIS—The hardware interface supports VC merge and VC merge is disabled on the device. • NO—The hardware interface does not support VC merge. OUT—Indicates the output interface merge capability. OUT accepts the same values as the input merge side. The VC merge capability is meaningful only on ATM switches. This capability is not negotiated.
Negotiated	Indicates the set of options that both LDP peers have agreed to share on this interface. For example, the VPI or VCI allocation on either peer remains within the negotiated range.
Local	Indicates the options supported locally on this interface.
Peer	Indicates the options supported by the remote LDP peer on this interface.

Related Commands

Command	Description
mpls ldp atm vc-merge	Controls whether the vc-merge (multipoint-to-point) is supported for unicast label VCs.

show mpls atm-ldp summary

To display summary information about all the entries in the ATM label binding database, use the **show mpls atm-ldp summary** command in privileged EXEC mode.

show mpls atm-ldp summary

Syntax Description

This command has no arguments or keywords.

Defaults

This command has no default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.1CT	This command was introduced.
12.0(10)ST	This command was modified to reflect MPLS IETF command syntax and terminology.
12.2(2)T	This command was integrated into Cisco IOS Release 12.2(2)T.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

Use this command to display dynamic ATM accounting information.

Examples

The following shows sample output from the **show mpls atm-ldp summary** command:

```
Router# show mpls atm-ldp summary

Total number of destinations: 406

ATM label bindings summary
interface      total   active  local   remote  Bwait   Rwait   IFwait
ATM0/0/0       406     406     404     2       0       0       0
ATM0/0/1       406     406     3       403     0       0       0
```

Table 19 describes the significant fields shown in the display.

Table 19 show mpls atm-ldp summary Field Descriptions

Field	Description
Total number of destinations:	Number of known destination address prefixes.
interface	Name of an interface with associated ATM label bindings.
total	Total number of ATM labels on this interface.

Table 19 show mpls atm-ldp summary Field Descriptions (continued)

Field	Description
active	Number of ATM labels in an "active" state that are ready to use for data transfer.
local	Number of ATM labels assigned by this LSR on this interface.
remote	Number of ATM labels assigned by the neighbor LSR on this interface.
Bwait	Number of bindings that are waiting for a label assignment from the neighbor label switch router (LSR).
Rwait	Number of bindings that are waiting for resources (VPI/VCI space) to be available on the downstream device.
IFwait	Number of bindings that are waiting for learned labels to be installed for switching use.

Related Commands

Command	Description
show isis database verbose	Displays the requested entries from the ATM LDP label binding database.

show mpls interfaces

To display information about one or more or all interfaces that are configured for label switching, use the **show mpls interfaces** command in privileged EXEC mode.

show mpls interfaces [**vrf** *vpn-name*] [*interface*] [**detail**]

show mpls interfaces [**all**]

Syntax Description

vrf *vpn-name*	(Optional) Displays information about the interfaces that have been configured for label switching for the specified Virtual Private Network (VPN) routing/forwarding instance *(vpn-name)*.
interface	(Optional) Defines the interface about which to display label switching information.
detail	(Optional) Displays detailed label switching information for the specified interface.
all	(Optional) When the **all** keyword is specified alone in this command, information about the interfaces configured for label switching is displayed for all VPNs, including the VPNs in the default routing domain.

Defaults

If no optional keyword or argument is specified in this command, summary information is displayed for each interface that has been configured for label switching in the default routing domain.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.1CT	This command was introduced.
12.0(10)ST	This command was modified to reflect MPLS IETF command syntax and terminology.
12.0(14)ST	This command was modified to reflect MPLS VPN support for LDP.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

This command shows MPLS information about the specified interface, or about all the interfaces for which MPLS has been configured.

Examples

The following shows sample output generated by the **show mpls interfaces** command:

```
Router# show mpls interfaces

Interface              IP         Tunnel   Operational
```

```
Ethernet1/1/1          Yes (tdp)  No       No
Ethernet1/1/2          Yes (tdp)  Yes      No
Ethernet1/1/3          Yes (tdp)  Yes      Yes
POS2/0/0               Yes (tdp)  No       No
ATM0/0.1               Yes (tdp)  No       No          (ATM labels)
ATM3/0.1               Yes (ldp)  No       Yes         (ATM labels)
ATM0/0.2               Yes (tdp)  No       Yes
```

Note If an interface uses LC-ATM procedures, the associated line in the display is flagged with the notation (ATM labels).

Table 20 describes the significant fields shown in the display.

Table 20 show mpls interfaces Field Descriptions

Field	Description
Interface	Interface name.
IP	"Yes" if IP label switching (sometimes called hop-by-hop label switching) has been enabled on this interface.
Tunnel	"Yes" if LSP tunnel labeling has been enabled on this interface.
Operational	Operational state. "Yes" if labeled packets can be sent over this interface. Labeled packets can be sent over an interface if an MPLS protocol is configured on the interface and required Layer 2 negotiations have occurred.

The following is sample output from the **show mpls interfaces** command when you specify the **detail** keyword:

```
Router# show mpls interfaces detail

Interface Ethernet1/1/1:
        IP labeling enabled (tdp)
        LSP Tunnel labeling not enabled
        MPLS operational
        MPLS turbo vector
        MTU = 1500
Interface POS2/0/0:
        IP labeling enabled (ldp)
        LSP Tunnel labeling not enabled
        MPLS not operational
        MPLS turbo vector
        MTU = 4470
Interface ATM3/0.1:
        IP labeling enabled (ldp)
        LSP Tunnel labeling not enabled
        MPLS operational
        MPLS turbo vector
        MTU = 4470
        ATM labels: Label VPI = 1
                Label VCI range = 33 - 65535
                Control VC = 0/32
```

The following is sample output from the **show mpls interfaces** command when you specify the **all** keyword:

```
Router# show mpls interfaces all

Interface              IP            Tunnel   Operational
ATM1/1/0.1             Yes (tdp)     No       Yes

VRF vpn1:
ATM3/0/0.1             Yes (ldp)     No       Yes

VRF vpn2:
ATM3/0/0.2             Yes (ldp)     No       Yes

VRF vpn3:
ATM3/0/0.3             Yes (ldp)     No       Yes

VRF vpn4:
ATM3/0/0.4             Yes (ldp)     No       Yes

VRF vpn5:
ATM3/0/0.5             Yes (ldp)     No       Yes

VRF vpn6:
Interface              IP            Tunnel   Operational
ATM3/0/0.6             Yes (ldp)     No       Yes

VRF vpn7:
ATM3/0/0.7             Yes (ldp)     No       Yes

VRF vpn8:
ATM3/0/0.8             Yes (ldp)     No       Yes

VRF vpn9:
ATM3/0/0.9             Yes (ldp)     No       Yes

VRF vpn10:
ATM3/0/0.10            Yes (ldp)     No       Yes

VRF vpn11:
ATM3/0/0.11            Yes (ldp)     No       Yes

VRF vpn12:
ATM3/0/0.12            Yes (ldp)     No       Yes
   .
   .
   .
```

Related Commands

Command	Description
mpls ip (global configuration)	Enables MPLS forwarding of IPv4 packets along normally routed paths for the platform.
mpls ip (interface configuration)	Enables MPLS forwarding of IPv4 packets along normally routed paths for a particular interface.
mpls label protocol (global configuration)	Specifies the default label distribution protocol for a platform.
mpls label protocol (interface configuration)	Specifies the label distribution protocol to be used on a given interface.

Command	Description
mpls traffic-eng tunnels (global configuration)	Enables MPLS traffic engineering tunnel signaling on a device.
mpls traffic-eng tunnels (interface configuration)	Enables MPLS traffic engineering tunnel signaling on an interface.

show mpls ip binding

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

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

show mpls ip binding summary

Syntax Description

vrf *vpn-name*	(Optional) Displays the label bindings for the specified VPN routing/forwarding instance (*vpn-name*).
network	(Optional) Defines the destination network number.
mask	Defines the network mask, written as A.B.C.D.
length	Defines the mask length (1 to 32 characters).
longer-prefixes	(Optional) Selects any prefix that matches the *mask* with *length* to 32.
local-label atm *vpi vci*	(Optional) Displays entry with locally assigned ATM label that matches the specified ATM label value. (VPI range is 0 to 4095. VCI range is 0 to 65535.)
local-label *label - label*	(Optional) Displays entries with locally assigned label(s) that match the specified label value(s). Use the *label - label* argument to indicate the 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. (VPI range is 0 to 4095. VCI range is 0 to 65535.)
remote-label *label - label*	(Optional) Displays entries with remotely assigned label(s) learned from neighbor routers that match the specified label value(s). Use the *label - label* argument to indicate the label range.
neighbor *address*	(Optional) Displays label bindings assigned by the selected neighbor.
local	(Optional) Displays the local label bindings.
interface *interface*	(Optional) Displays label bindings associated with the specified interface (for LC-ATM only).
generic	(Optional) Displays only generic (non-LC-ATM) label bindings.
atm	(Optional) Displays only LC-ATM label bindings.
summary	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(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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

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

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

Examples

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

```
Router# show mpls ip binding

  34.0.0.0/8
        in label:     20
        out label:    26        lsr: 155.0.0.55:0
        out vc label: 1/80      lsr: 203.0.7.7:2      ATM1/0.8
                      Active    ingress 3 hops (vcd 49)
  45.0.0.0/8
        in label:     25
        in vc label:  1/36      lsr: 203.0.7.7:2      ATM1/0.8
                      Active    egress (vcd 55)
        out label:    imp-null  lsr: 155.0.0.55:0     inuse
  66.66.0.66/32
        in label:     26
        in vc label:  1/39      lsr: 203.0.7.7:2      ATM1/0.8
                      Active    egress (vcd 58)
        out label:    16        lsr: 155.0.0.55:0     inuse
  133.0.0.33/32
        in label:     23
        out label:    22        lsr: 155.0.0.55:0
        out vc label: 1/83      lsr: 203.0.7.7:2      ATM1/0.8
                      Active    ingress 3 hops (vcd 52)
  144.0.0.44/32
        in label:     61
        out label:    27        lsr: 155.0.0.55:0     inuse
```

```
  150.88.0.0/16
        in label:     28
        in vc label:  1/40      lsr: 203.0.7.7:2      ATM1/0.8
                      Active    egress (vcd 59)
        out label:    imp-null  lsr: 155.0.0.55:0     inuse
  166.47.0.0/16
        in label:     33
        in vc label:  1/46      lsr: 203.0.7.7:2      ATM1/0.8
                      Active    egress (vcd 65)
        out label:    imp-null  lsr: 155.0.0.55:0     inuse
  194.44.44.0/24
        in label:     24
        in vc label:  1/37      lsr: 203.0.7.7:2      ATM1/0.8
                      Active    egress (vcd 56)
        out label:    imp-null  lsr: 155.0.0.55:0     inuse
Router#
```

In the following example, a request is made for the display of the label binding information for prefix 194.44.44.0/24:

```
Router# show mpls ip binding 194.44.44.0 24

  194.44.44.0/24
        in label:     24
        in vc label:  1/37      lsr: 203.0.7.7:2      ATM1/0.8
                      Active    egress (vcd 56)
        out label:    imp-null  lsr: 155.0.0.55:0     inuse
Router#
```

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

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

  166.253.0.0/16
        in label:     58
        out label:    imp-null  lsr: 155.0.0.55:0     inuse
Router#
```

The following example shows the label bindings for the VPN routing/forwarding instance named vpn1:

```
Router# show mpls ip binding vrf vpn1

3.3.0.0/16
        in label:    117
        out label:   imp-null  lsr:14.14.14.14:0
  13.13.13.13/32
        in label:    1372
        out label:   268       lsr:14.14.14.14:0
  14.14.14.14/32
        in label:    118
        out label:   imp-null  lsr:14.14.14.14:0
  15.15.15.15/32
        in label:    1370
        out label:   266       lsr:14.14.14.14:0
  16.16.16.16/32
        in label:    8370
        out label:   319       lsr:14.14.14.14:0
  18.18.18.18/32
        in label:    21817
        out label:   571       lsr:14.14.14.14:0
```

```
30.2.0.0/16
      in label:    6943
      out label:   267       lsr:14.14.14.14:0
30.3.0.0/16
      in label:    2383
      out label:   imp-null  lsr:14.14.14.14:0
30.4.0.0/16
      in label:    77
      out label:   imp-null  lsr:14.14.14.14:0
30.5.0.0/16
      in label:    20715
      out label:   504       lsr:14.14.14.14:0
30.7.0.0/16
      in label:    17
      out label:   imp-null  lsr:14.14.14.14:0
30.10.0.0/16
      in label:    5016
      out label:   269       lsr:14.14.14.14:0
30.13.0.0/16
      in label:    76
      out label:   imp-null  lsr:14.14.14.14:0
```

Table 21 describes the significant fields shown in the display.

Table 21 show mpls ip binding Field Descriptions

Field	Description
a.b.c.d/n	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 MPLS forwarding, that is, it is installed in the MPLS forwarding table (the label forwarding information base (LFIB)).
in vc label	Incoming MPLS ATM label. This is the local virtual path identifier/virtual circuit identifier (VPI/VCI) assigned by the LSR as the incoming label for the destination and advertised to the upstream LSR(s).
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.
ATM1/0.8	The ATM interface with which the MPLS ATM label is associated.

Table 21 show mpls ip binding Field Descriptions (continued)

Field	Description
Active	State of the label VC (LVC) associated with the destination prefix. Options include the following: • Active. The label virtual circuit (LVC) is 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 n	Virtual circuit descriptor number for the LVC.
ingress n hops	Indicates whether the LSR is an ingress, transit, or egress node for the destination. Options include the following: • Ingress n 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 example 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 22 describes the significant fields shown in the display.

Table 22 show mpls ip binding summary Field Descriptions

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.

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 backoff

To display information about the configured session setup backoff parameters and any potential label distribution protocol (LDP) peers with which session setup attempts are being throttled, use the **show mpls ldp backoff** command in user EXEC or privileged EXEC mode.

show mpls ldp backoff

Syntax Description

This command has no arguments or keywords.

Defaults

This command has no default behavior or values.

Command Modes

User EXEC
Privileged EXEC

Command History

Release	Modification
12.0(10)ST	This command was introduced.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Examples

The following shows sample output from the **show mpls ldp backoff** command:

```
Router# show mpls ldp backoff

LDP initial/maximum backoff: 30/240 sec
Backoff table: 2 entries
LDP Id              Backoff(sec)   Waiting(sec)
144.0.0.44:0        60             30
155.0.0.55:0        120            90
```

Table 23 describes the significant fields shown in the display.

Table 23 show mpls ldp backoff Field Descriptions

Field	Description
LDP initial/maximum backoff	Indicates the configured backoff parameters in seconds.
Backoff table	Contains a list of discovered LDP neighbors for which session setup is being delayed because of previous failures to establish a session due to incompatible configuration. The backoff table incorporates the following information: • LDP Id—Identifies the LDP neighbors. • Backoff (sec)—Shows the amount of time that session setup is being delayed. • Waiting (sec)—Shows the approximate amount of time that session setup has been delayed.

Related Commands

Command	Description
mpls ldp backoff	Configures session setup delay parameters for the LDP backoff mechanism.

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** *vpn-name*] [*network* {*mask* | *length*} [**longer-prefixes**]] [**local-label** *label* [- *label*]] [**remote-label** *label* [- *label*]] [**neighbor** *address*] [**local**]

Syntax Description

vrf *vpn-name*	(Optional) Displays the label bindings for the specified VPN routing/forwarding instance (*vpn-name*).
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* argument to indicate the label range.
remote-label *label - label*	(Optional) Displays entries matching the label values assigned by a neighbor router. Use the *label - label* argument to indicate the label range.
neighbor *address*	(Optional) Displays the label bindings assigned by the selected neighbor.
local	(Optional) Displays 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 MPLS IETF command syntax and terminology.
12.0(14)ST	This command was modified to reflect MPLS VPN support for LDP.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

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

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, as well as information about label bindings for LC-ATM interfaces.

Examples

The following shows 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

34.0.0.0/8, rev 9
        local binding:  label: imp-null
        remote binding: lsr: 155.0.0.55:0, label: 17
        remote binding: lsr: 66.66.0.66:0, label: 18
        remote binding: lsr: 144.0.0.44:0, label: imp-null
  45.0.0.0/8, rev 17
        local binding:  label: 19
        remote binding: lsr: 155.0.0.55:0, label: imp-null
        remote binding: lsr: 66.66.0.66:0, label: 16
        remote binding: lsr: 144.0.0.44:0, label: imp-null
  66.66.0.66/32, rev 19
        local binding:  label: 20
        remote binding: lsr: 155.0.0.55:0, label: 19
        remote binding: lsr: 66.66.0.66:0, label: imp-null
        remote binding: lsr: 144.0.0.44:0, label: 18
  103.0.0.0/8, rev 11
        local binding:  label: imp-null
  130.77.0.0/16, rev 23
        local binding:  label: 22
        remote binding: lsr: 155.0.0.55:0, label: 22
        remote binding: lsr: 144.0.0.44:0, label: 21
        remote binding: lsr: 66.66.0.66:0, label: 20
  140.66.0.0/16, rev 96
        remote binding: lsr: 66.66.0.66:0, label: imp-null
  155.0.0.55/32, rev 29
        local binding:  label: 25
        remote binding: lsr: 155.0.0.55:0, label: imp-null
        remote binding: lsr: 144.0.0.44:0, label: 24
        remote binding: lsr: 66.66.0.66:0, label: 24
  166.45.0.0/16, rev 33
        local binding:  label: 27
        remote binding: lsr: 155.0.0.55:0, label: imp-null
        remote binding: lsr: 66.66.0.66:0, label: 26
        remote binding: lsr: 144.0.0.44:0, label: 26
  166.46.0.0/16, rev 35
        local binding:  label: 28
        remote binding: lsr: 155.0.0.55:0, label: imp-null
        remote binding: lsr: 66.66.0.66:0, label: 27
        remote binding: lsr: 144.0.0.44:0, label: 27
.
.
.
```

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) 144.0.0.44 for network 166.0.0.0 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 166.0.0.0 8 longer-prefixes neighbor 144.0.0.44

  166.44.0.0/16, rev 31
        remote binding: lsr: 144.0.0.44:0, label: 25
  166.45.0.0/16, rev 33
        remote binding: lsr: 144.0.0.44:0, label: 26
  166.245.0.0/16, rev 71
        remote binding: lsr: 144.0.0.44:0, label: 45
  166.246.0.0/16, rev 73
        remote binding: lsr: 144.0.0.44:0, label: 46
.
.
.
```

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

```
Router# show mpls ldp bindings vrf vpn1

3.3.0.0/16, rev 164
        local binding: label:117
        remote binding:lsr:14.14.14.14:0, label:imp-null
  13.13.13.13/32, rev 1650
        local binding: label:1372
        remote binding:lsr:14.14.14.14:0, label:268
  14.14.14.14/32, rev 165
        local binding: label:118
        remote binding:lsr:14.14.14.14:0, label:imp-null
  15.15.15.15/32, rev 1683
        local binding: label:1370
        remote binding:lsr:14.14.14.14:0, label:266
  16.16.16.16/32, rev 775
        local binding: label:8370
        remote binding:lsr:14.14.14.14:0, label:319
  18.18.18.18/32, rev 1655
        local binding: label:21817
        remote binding:lsr:14.14.14.14:0, label:571
  30.2.0.0/16, rev 1653
        local binding: label:6943
        remote binding:lsr:14.14.14.14:0, label:267
  30.3.0.0/16, rev 413
        local binding: label:2383
        remote binding:lsr:14.14.14.14:0, label:imp-null
  30.4.0.0/16, rev 166
        local binding: label:77
        remote binding:lsr:14.14.14.14:0, label:imp-null
  30.5.0.0/16, rev 1429
        local binding: label:20715
        remote binding:lsr:14.14.14.14:0, label:504
  30.7.0.0/16, rev 4
        local binding: label:17
        remote binding:lsr:14.14.14.14:0, label:imp-null
  30.10.0.0/16, rev 422
        local binding: label:5016
        remote binding:lsr:14.14.14.14:0, label:269
.
.
.
```

Table 24 describes the significant fields shown in the display.

Table 24 show mpls ldp bindings Field Descriptions

Field	Description
a.b.c.d/n	IP prefix and mask for a particular destination (network/mask).
rev	Revision number (rev) that is used internally to manage label distribution for this destination.
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.

Related Commands

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

show mpls ldp discovery

To display the status of the label distribution protocol (LDP) discovery process, use the **show mpls ldp discovery** command in user EXEC or privileged EXEC mode. This command generates a list of interfaces over which the LDP discovery process is running.

show mpls ldp discovery [**vrf** *vpn-name*]

show mpls ldp discovery [**all**]

Syntax Description

vrf *vpn-name*	(Optional) Displays the neighbor discovery information for the specified VPN routing/forwarding instance (*vpn-name*).
all	(Optional) When the **all** keyword is specified alone in this command, the command displays LDP discovery information for all VPNs, including those in the default routing domain.

Defaults

This command displays neighbor discovery information for the default routing domain if an optional argument 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 modified to reflect MPLS IETF command syntax and terminology.
12.0(14)ST	This command was modified to reflect MPLS VPN support for LDP.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Usage Guidelines

This command displays neighbor discovery information for LDP or Tag Distribution Protocol (TDP).

Examples

The following shows sample output from the **show mpls ldp discovery** command:

```
Router# show mpls ldp discovery

Local LDP Identifier:
    8.1.1.1:0
Discovery Sources:
    Interfaces:
        Ethernet1/1/3 (ldp): xmit/recv
            LDP Id: 177.73.0.77:0
```

```
            LDP Id: 144.0.0.44:0
            LDP Id: 155.0.0.55:0
        ATM3/0.1 (ldp): xmit/recv
            LDP Id: 203.0.7.7:2
        ATM0/0.2 (tdp): xmit/recv
            TDP Id: 119.1.0.1:1
Targeted Hellos:
        8.1.1.1 -> 133.0.0.33 (ldp): active, xmit/recv
            LDP Id: 133.0.0.33:0
        8.1.1.1 -> 168.7.0.16 (tdp): passive, xmit/recv
            TDP Id: 133.0.0.33:0
Router#
```

The following shows sample output from the **show mpls ldp discovery all** command, which shows the interfaces engaged in LDP discovery activity for all the VPN routing/forwarding instances, including those in the default routing domain. In this example, note that the same neighbor LDP ID (14.14.14.14) appears in all the listed VRF interfaces, highlighting the fact that the same IP address can coexist in different VPN routing/forwarding instances.

```
Router# show mpls ldp discovery all

Local LDP Identifier:
    12.12.12.12:0
    Discovery Sources:
    Interfaces:
        ATM1/1/0.1 (tdp):xmit/recv
            TDP Id:11.11.11.11:0
VRF vpn1:Local LDP Identifier:
    30.7.0.2:0
    Discovery Sources:
    Interfaces:
        ATM3/0/0.1 (ldp):xmit/recv
            LDP Id:14.14.14.14:0
VRF vpn2:Local LDP Identifier:
    30.13.0.2:0
    Discovery Sources:
    Interfaces:
        ATM3/0/0.2 (ldp):xmit/recv
            LDP Id:14.14.14.14:0
VRF vpn3:Local LDP Identifier:
    30.15.0.2:0
    Discovery Sources:
    Interfaces:
        ATM3/0/0.3 (ldp):xmit/recv
            LDP Id:14.14.14.14:0
VRF vpn4:Local LDP Identifier:
    30.17.0.2:0
    Discovery Sources:
    Interfaces:
        ATM3/0/0.4 (ldp):xmit/recv
            LDP Id:14.14.14.14:0
VRF vpn5:Local LDP Identifier:
    30.19.0.2:0
    Discovery Sources:
    Interfaces:
        ATM3/0/0.5 (ldp):xmit/recv
            LDP Id:14.14.14.14:0
VRF vpn6:Local LDP Identifier:
    30.21.0.2:0
    Discovery Sources:
    Interfaces:
        ATM3/0/0.6 (ldp):xmit/recv
            LDP Id:14.14.14.14:0
```

```
VRF vpn7:Local LDP Identifier:
    30.23.0.2:0
    Discovery Sources:
    Interfaces:
        ATM3/0/0.7 (ldp):xmit/recv
            LDP Id:14.14.14.14:0
VRF vpn8:Local LDP Identifier:
    30.25.0.2:0
    Discovery Sources:
    Interfaces:
        ATM3/0/0.8 (ldp):xmit/recv
            LDP Id:14.14.14.14:0
VRF vpn9:Local LDP Identifier:
    30.27.0.2:0
    Discovery Sources:
    Interfaces:
        ATM3/0/0.9 (ldp):xmit/recv
            LDP Id:14.14.14.14:0
VRF vpn10:Local LDP Identifier:
    30.29.0.2:0
    Discovery Sources:
    Interfaces:
        ATM3/0/0.10 (ldp):xmit/recv
            LDP Id:14.14.14.14:0
VRF vpn11:Local LDP Identifier:
    30.31.0.2:0
    Discovery Sources:
    Interfaces:
        ATM3/0/0.11 (ldp):xmit/recv
            LDP Id:14.14.14.14:0
VRF vpn12:Local LDP Identifier:
    30.33.0.2:0
    Discovery Sources:
    Interfaces:
        ATM3/0/0.12 (ldp):xmit/recv
            LDP Id:14.14.14.14:0
VRF vpn13:Local LDP Identifier:

Router#
```

Table 25 describes the significant fields shown in the display.

Table 25 show mpls ldp discovery Field Descriptions

Field	Description
Local LDP Identifier	The LDP identifier for the local router. An LDP identifier is a 6-byte construct displayed in the form "IP address:number." By convention, the first four bytes of the LDP identifier constitute the router ID; integers, starting with 0, constitute the final two bytes of the IP address:number construct.
Interfaces	Lists the interfaces that are engaging in LDP discovery activity, described below: • The xmit field—Indicates that the interface is transmitting LDP discovery Hello packets. • The recv field—Indicates that the interface is receiving LDP discovery Hello packets. • The (ldp) or (tdp) field—Indicates the label distribution protocol configured for the interface. The LDP (or TDP) identifiers indicate the LDP (or TDP) neighbors discovered on the interface.
Targeted Hellos	Lists the platforms to which targeted Hello messages are being sent, as described below: • The xmit, recv, (ldp), and (tdp) fields are as described above for the Interfaces field. • The active field indicates that this LSR has initiated targeted Hello messages. • The passive field indicates that the neighbor LSR has initiated targeted Hello messages and that this LSR is configured to respond to the targeted Hello messages from the neighbor. **Note** The entry for a given target platform may indicate both active and passive.

Related Commands

Command	Description
mpls label protocol (global configuration)	Specifies the label distribution protocol (LDP or TDP) to be used on a platform.
mpls label protocol (interface configuration)	Specifies the label distribution protocol (LDP or TDP) to be used on a given interface.
show mpls interfaces	Displays information about one or more interfaces that have been configured for label switching.
show mpls ldp neighbor	Displays the status of LDP sessions.

show mpls ldp neighbor

To display the status of label distribution protocol (LDP) sessions, issue the **show mpls ldp neighbor** command in user EXEC or privileged EXEC mode.

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

Syntax Description

vrf *vpn-name*	(Optional) Displays the LDP neighbors for the specified VPN routing/forwarding instance (*vpn-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.
all	(Optional) When the **all** keyword is specified alone in this command, the command displays LDP neighbor information for all VPNs, including those in the default routing domain.

Defaults

This command displays information about LDP neighbors for the default routing domain if the 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 modified to reflect MPLS IETF command syntax and terminology.
12.0(14)ST	This command was modified to reflect MPLS VPN support for LDP.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

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 shows sample output from the **show mpls ldp neighbor** command:

```
Router# show mpls ldp neighbor

Peer LDP Ident: 203.0.7.7:2; Local LDP Ident 8.1.1.1:1
        TCP connection: 203.0.7.7.11032 - 8.1.1.1.646
        State: Oper; Msgs sent/rcvd: 5855/6371; Downstream on demand
        Up time: 13:15:09
        LDP discovery sources:
          ATM3/0.1
Peer LDP Ident: 7.1.1.1:0; Local LDP Ident 8.1.1.1:0
        TCP connection: 7.1.1.1.646 - 8.1.1.1.11006
        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:
          2.0.0.29        7.1.1.1         59.0.0.199      212.10.1.1
          10.205.0.9
Router#
```

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

```
Router# show mpls ldp neighbor vrf vpn10

Peer LDP Ident:14.14.14.14:0; Local LDP Ident 30.29.0.2:0
        TCP connection:14.14.14.14.646 - 30.29.0.2.11384
        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:
          3.3.36.9        30.7.0.1        14.14.14.14     30.13.0.1
          30.15.0.1       30.17.0.1       30.19.0.1       30.21.0.1
          30.23.0.1       30.25.0.1       30.27.0.1       30.29.0.1
          30.31.0.1       30.33.0.1       30.35.0.1       30.37.0.1
          30.39.0.1       30.41.0.1       30.43.0.1       30.45.0.1
          30.47.0.1       30.49.0.1       30.51.0.1       30.53.0.1
          30.55.0.1       30.57.0.1       30.59.0.1       30.61.0.1
          30.63.0.1       30.65.0.1       30.67.0.1       30.69.0.1
          30.71.0.1       30.73.0.1       30.75.0.1       30.77.0.1
          30.79.0.1       30.81.0.1       30.83.0.1       30.85.0.1
          30.87.0.1       30.89.0.1       30.91.0.1       30.93.0.1
          30.95.0.1       30.97.0.1       30.99.0.1       30.101.0.1
          30.103.0.1      30.105.0.1      30.107.0.1      30.109.0.1
          30.4.0.2        30.3.0.2
Router#
```

The following shows sample output from the **show mpls ldp neighbor all** command, which displays the LDP neighbor information for all VPN routing/forwarding instances, including those in the default routing domain. In this example, note that the same neighbor LDP ID (14.14.14.14) appears in all the listed VRF interfaces, highlighting the fact that the same IP address can coexist in different VPN routing/forwarding instances.

```
Router# show mpls ldp neighbor all

Peer TDP Ident:11.11.11.11:0; Local TDP Ident 12.12.12.12:0
        TCP connection:11.11.11.11.711 - 12.12.12.12.11003
        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:
          3.3.38.3        30.1.0.2        11.11.11.11
VRF vpn1:
    Peer LDP Ident:14.14.14.14:0; Local LDP Ident 30.7.0.2:0
        TCP connection:14.14.14.14.646 - 30.7.0.2.11359
        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:
          3.3.36.9        30.7.0.1        14.14.14.14     30.13.0.1
          30.15.0.1       30.17.0.1       30.19.0.1       30.21.0.1
          30.23.0.1       30.25.0.1       30.27.0.1       30.29.0.1
          30.31.0.1       30.33.0.1       30.35.0.1       30.37.0.1
          30.39.0.1       30.41.0.1       30.43.0.1       30.45.0.1
          30.47.0.1       30.49.0.1       30.51.0.1       30.53.0.1
          30.55.0.1       30.57.0.1       30.59.0.1       30.61.0.1
          30.63.0.1       30.65.0.1       30.67.0.1       30.69.0.1
          30.71.0.1       30.73.0.1       30.75.0.1       30.77.0.1
          30.79.0.1       30.81.0.1       30.83.0.1       30.85.0.1
          30.87.0.1       30.89.0.1       30.91.0.1       30.93.0.1
          30.95.0.1       30.97.0.1       30.99.0.1       30.101.0.1
          30.103.0.1      30.105.0.1      30.107.0.1      30.109.0.1
          30.4.0.2        30.3.0.2
VRF vpn2:
    Peer LDP Ident:14.14.14.14:0; Local LDP Ident 30.13.0.2:0
        TCP connection:14.14.14.14.646 - 30.13.0.2.11361
        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:
          3.3.36.9        30.7.0.1        14.14.14.14     30.13.0.1
          30.15.0.1       30.17.0.1       30.19.0.1       30.21.0.1
          30.23.0.1       30.25.0.1       30.27.0.1       30.29.0.1
          30.31.0.1       30.33.0.1       30.35.0.1       30.37.0.1
          30.39.0.1       30.41.0.1       30.43.0.1       30.45.0.1
          30.47.0.1       30.49.0.1       30.51.0.1       30.53.0.1
          30.55.0.1       30.57.0.1       30.59.0.1       30.61.0.1
          30.63.0.1       30.65.0.1       30.67.0.1       30.69.0.1
          30.71.0.1       30.73.0.1       30.75.0.1       30.77.0.1
          30.79.0.1       30.81.0.1       30.83.0.1       30.85.0.1
          30.87.0.1       30.89.0.1       30.91.0.1       30.93.0.1
          30.95.0.1       30.97.0.1       30.99.0.1       30.101.0.1
          30.103.0.1      30.105.0.1      30.107.0.1      30.109.0.1
          30.4.0.2        30.3.0.2
VRF vpn3:
    Peer LDP Ident:14.14.14.14:0; Local LDP Ident 30.15.0.2:0
        TCP connection:14.14.14.14.646 - 30.15.0.2.11364
```

```
        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:
          3.3.36.9        30.7.0.1        14.14.14.14     30.13.0.1
          30.15.0.1       30.17.0.1       30.19.0.1       30.21.0.1
          30.23.0.1       30.25.0.1       30.27.0.1       30.29.0.1
          30.31.0.1       30.33.0.1       30.35.0.1       30.37.0.1
          30.39.0.1       30.41.0.1       30.43.0.1       30.45.0.1
          30.47.0.1       30.49.0.1       30.51.0.1       30.53.0.1
          30.55.0.1       30.57.0.1       30.59.0.1       30.61.0.1
          30.63.0.1       30.65.0.1       30.67.0.1       30.69.0.1
          30.71.0.1       30.73.0.1       30.75.0.1       30.77.0.1
          30.79.0.1       30.81.0.1       30.83.0.1       30.85.0.1
          30.87.0.1       30.89.0.1       30.91.0.1       30.93.0.1
          30.95.0.1       30.97.0.1       30.99.0.1       30.101.0.1
          30.103.0.1      30.105.0.1      30.107.0.1      30.109.0.1
          30.4.0.2        30.3.0.2
VRF vpn4:
    Peer LDP Ident:14.14.14.14:0; Local LDP Ident 30.17.0.2:0
        TCP connection:14.14.14.14.646 - 30.17.0.2.11366
        State:Oper; Msgs sent/rcvd:1199/802; Downstream

Router#
```

Table 26 describes the significant fields shown in the display.

Table 26 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 the LDP session has existed.

Table 26 show mpls ldp neighbor Field Descriptions (continued)

Field	Description
LDP discovery sources	Source(s) 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.

show mpls ldp parameters

To display current label distribution protocol (LDP) parameters, use the **show mpls ldp parameters** command in user EXEC or privileged EXEC mode.

show mpls ldp parameters

Syntax Description

This command has no arguments or keywords.

Defaults

This command has no default behavior or values.

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 MPLS IETF command syntax and terminology.
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.
12.0(22)S	This command was integrated into Cisco IOS Release 12.0(22)S.

Examples

The following shows sample output from the **show mpls ldp parameters** command:

```
Router# show mpls ldp parameters

Protocol version: 1
Downstream label pool: min label 16; max label 100000
Session hold time: 180 sec; keep alive interval: 60 sec
Discovery hello: holdtime: 15 sec; interval: 5 sec
Discovery targeted hello: holdtime: 180 sec; interval: 5 sec
LDP for targeted sessions; peer acl: 1
LDP initial/maximum backoff: 30/240 sec
Router#
```

Table 27 describes the significant fields shown in the display.

Table 27 show mpls ldp parameters Field Descriptions

Field	Description
Protocol version	Indicates the version of LDP running on the platform.
Downstream label pool	Describes the range of labels available for the platform to assign for label switching purposes. The available labels range from the smallest label value (min label) to the largest label value (max label), with a modest number of labels at the low end of the range (reserved labels) reserved for diagnostic purposes.
Session hold time	Indicates the time that an LDP session is to be maintained with an LDP peer without receiving LDP traffic or an LDP keepalive message from the peer.
keep alive interval	Indicates the interval of time between consecutive transmissions of LDP keepalive messages to an LDP peer.
Discovery hello	Indicates the amount of time to remember that a neighbor platform wants an LDP session without receiving an LDP Hello message from the neighbor (hold time), and the time interval between the transmission of consecutive LDP Hello messages to neighbors (interval).
Discovery targeted hello	Indicates the amount of time to remember that a neighbor platform wants an LDP session when: 1. The neighbor platform is not directly connected to the router. 2. The neighbor platform has not sent an LDP Hello message. This intervening interval is known as hold time. Also indicates the time interval between the transmission of consecutive Hello messages to a neighbor not directly connected to the router.
LDP for targeted sessions	Reports the parameters that have been set by the **show mpls atm-ldp bindings** command.
LDP initial/maximum backoff	Reports the parameters that have been set by the **mpls ldp backoff** command.

Related Commands

Command	Description
mpls ldp holdtime	Changes the time for which an LDP session is maintained in the absence of LDP messages from the session peer.

Glossary

ATM-LSR—A label switch router with a number of LC-ATM interfaces. The router forwards the cells among these interfaces using labels carried in the VPI/VCI field of the ATM cell header.

ATM edge LSR—A router that is connected to the ATM-LSR cloud through LC-ATM interfaces. The ATM edge LSR adds labels to unlabeled packets and strips labels from labeled packets.

CoS—class of service. A feature that provides scalable, differentiated types of service across an MPLS network.

label—A short fixed-length label that tells switching nodes how to forward data (packets or cells).

label-controlled ATM interface (LC-ATM interface)—An interface on a router or switch that uses label distribution procedures to negotiate label VCs.

label edge router (LER)—A router that performs label imposition.

label imposition—The action of putting the first label on a packet.

label switch—A node that forwards units of data (packets or cells) on the basis of labels.

label-switched path (LSP)—A sequence of hops (Router 0...Router n) in which a packet travels from R0 to Rn by means of label switching mechanisms. A label-switched path can be chosen dynamically, based on normal routing mechanisms, or it can be configured manually.

label-switched path (LSP) tunnel—A configured connection between two routers, in which label switching techniques are used for packet forwarding.

label switch router (LSR)—A Layer 3 router that forwards a packet based on the value of a label encapsulated in the packet.

label VC (LVC)—An ATM virtual circuit that is set up through ATM LSR label distribution procedures.

LDP—Label Distribution Protocol. The protocol used to distribute label bindings to LSRs.

LFIB—label forwarding information base. The data structure used by switching functions to switch labeled packets.

LIB—label information base. A database used by an LSR to store labels learned from other LSRs, as well as labels assigned by the local LSR.

MPLS—Multiprotocol Label Switching. An emerging industry standard that defines support for MPLS forwarding of packets along normally routed paths (sometimes called MPLS hop-by-hop forwarding).

tail-end—The downstream, received end of a tunnel.

traffic engineering—The techniques and processes used to cause routed traffic to travel through the network on a path other than the one that would have been chosen if standard routing methods had been applied.

traffic engineering tunnel—A label-switched tunnel that is used for traffic engineering. Such a tunnel is set up through means other than normal Layer 3 routing; it is used to direct traffic over a path different from the one that Layer 3 routing would cause the tunnel to take.

virtual channel identifier (VCI)—A 16-bit field in the header of an ATM cell. The VCI, together with the VPI, is used to identify the next destination of a cell as it passes through a series of ATM switches on its way to its destination. ATM switches use the VPI/VCI fields to identify the next network VCL that a cell needs to transit on its way to its final destination.

virtual channel link (VCL)—Connection between two ATM devices.

virtual path identifier (VPI)—An 8-bit field in the header of an ATM cell. The VPI, together with the VCI, identifies the next destination of a cell as it passes through a series of ATM switches on its way to its destination. ATM switches use the VPI/VCI fields to identify the next VCL that a cell needs to transit on its way to its final destination.