MPLS High Availability: Command Changes

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This feature module details changes to commands that are required to support updates to the Multiprotocol Label Switching (MPLS) High Availability (HA) feature.

In Cisco IOS Releases 12.2(25)S, 12.2(28)SB, 12.2(33)SRA, and 12.2(33)SXH, the MPLS control plane software is enhanced to work in MPLS HA environments. The changes made the control plane software more modular, which helps MPLS support MPLS HA applications. Some of the control plane software changes also made MPLS more scalable and flexible.

Changes to the MPLS Forwarding Infrastructure (MFI) and the Cisco Express Forwarding component introduced new commands and changed other existing commands. MFI replaced the Label Forwarding Information Base (LFIB) and is responsible for managing MPLS data structures used for forwarding.

Finding Feature Information in This Module

Your Cisco IOS software release may not support all of the features documented in this module. To reach links to specific feature documentation in this module and to see a list of the releases in which each feature is supported, use the "Feature Information for MPLS High Availability: Command Changes" section on page 35.

Finding Support Information for Platforms and Cisco IOS and Catalyst OS Software Images

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

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Information About MPLS High Availability: Command Changes

Before using MPLS High Availability features, you should understand the following concepts:

MPLS Replacement Commands for Tag-Switching Commands

Starting with Cisco IOS Releases 12.2(25)S, 12.2(28)SB, 12.2(33)SRA and 12.2(33)SXH, all tag-switching commands are obsoleted and are replaced with MPLS command versions. When you enter an obsolte tag-switching command, such as **tag-switching ip**, you receive the following message:

```
% Command accepted but obsolete, unreleased, or unsupported; see documentation
```

Use the MPLS version of the command instead, such as **mpls ip.**

Support for the tag-switching versions of commands will cease in a future release.

Configuration files that use the tag-switching version of the commands continue to operate. However, running configurations will display the new MPLS versions of the commands.

New Command Defaults

Starting with Cisco IOS Releases 12.2(25)S, 12.2(28)SB, 12.2(33)SRA and 12.2(33)SXH, Label Distribution Protocol (LDP) is the default protocol. In other releases and trains, the default label distribution protocol is Tag Distribution Protocol (TDP). See the **mpls label protocol** (global configuration) command in the *NSF/SSO—MPLS LDP and MPLS LDP Graceful Restart* feature for more information.

MPLS MTU Command Changes

The **mpls mtu** command has changed over the course of the several releases, starting in Cisco IOS Release 12.2(25)S. This section documents the changes implemented in Cisco IOS Release 12.2(25)S. For information about the changes implemented in Cisco IOS Releases 12.2(27)SBC and later releases, see the *MPLS MTU Command Changes* feature.

In Cisco IOS Release 12.2(25)S, if the interface MTU is less than 1524 bytes, you can set the maximum MPLS MTU to 24 bytes more than the interface MTU. For example, if the interface MTU is set to 1510 bytes, then you can set the maximum MPLS MTU to 1534 bytes (1510 + 24).

Note Although you can set the MPLS MTU to a value greater than the MPLS MTU, it is recommended that you keep the MPLS MTU less than or equal to the interface MTU to prevent the hardware from dropping packets. A best practice is to set the interface MTU of the core-facing interface to a value greater than either the IP MTU or interface MTU of the edge-facing interface.

If the interface MTU is greater than or equal to 1524 bytes, then you can set the maximum MPLS MTU as high as the interface MTU. For example, if the interface MTU is set to 1600 bytes, then you can set the MPLS MTU to a maximum of 1600 bytes. If you set the MPLS MTU higher than the interface MTU, traffic is dropped.

For interfaces that do not allow you to configure the interface MTU value and the interface MTU is 1500 bytes, the MPLS MTU range is 64 to 1524 bytes.

If you upgrade to Cisco IOS Release 12.2(25)S from an earlier release and you have an MPLS MTU setting that does not conform to these guidelines, the MPLS MTU setting is not accepted by the system. If this happens, reconfigure the MPLS MTU setting to conform to the guidelines.

Deleted Commands

The following commands are no longer available in Cisco IOS Releases 12.2(25)S, 12.2(28)SB, 12.2(33)SRA, and 12.2(33)SXH:

- **debug mpls adjacency**
- **debug mpls lfib cef**
- **debug mpls lfib enc**
- **debug mpls lfib lsp**
- **debug mpls lfib state**
- **debug mpls lfib struct**
- **debug mpls lfib fast-reroute**

Replaced Commands

Table 1 lists the commands that use the term tag-switching. Starting with Cisco IOS Releases 12.2(25)S, 12.2(28)SB, 12.2(33)SRA, and 12.2(33)SXH, these commands have been updated with MPLS terminology. Although the tag-switching versions of the commands are obsoleted, the tag-switching commands continue to work, but are not documented.

Please use the MPLS versions of the commands. If you issue a tag-switching command, you receive the following error:

```
% Command accepted but obsolete, unreleased, or unsupported; see documentation
```

For information about any of the MPLS commands in Table 1 and Table 2, see the *Cisco IOS Release 12.4 MPLS Command Reference.*

Table 1 alphabetically lists the MPLS commands used by the Cisco 7500 series routers that replaced the tag-switching commands.

Table 1 Cisco 7500 Series—MPLS Commands That Replaced Tag-Switching Commands

This MPLS Command Replaces	This Tag-Switching Command
debug mpls atm-cos	debug tag-switching atm-cos
debug mpls atm-ldp api	debug tag-switching atm-tdp api
debug mpls atm-ldp routes	debug tag-switching atm-tdp routes
debug mpls atm-ldp states	debug tag-switching atm-tdp states
debug mpls events	debug tag-switching events
debug mpls ldp advertisements	debug tag-switching tdp advertisements
debug mpls ldp bindings	debug tag-switching tdp bindings
debug mpls ldp messages	debug tag-switching tdp pies
debug mpls ldp peer state-machine	debug tag-switching tdp peer state-machine
debug mpls ldp session io	debug tag-switching tdp session io
debug mpls ldp session state-machine	debug tag-switching tdp session state-machine
debug mpls ldp targeted-neighbors	debug tag-switching tdp directed-neighbors
debug mpls ldp transport connections	debug tag-switching tdp transport connections
debug mpls ldp transport events	debug tag-switching tdp transport events
debug mpls traffic-eng tunnels events	debug tag-switching tsp-tunnels events
debug mpls traffic-eng tunnels labels	debug tag-switching tsp-tunnels tagging
debug mpls traffic-eng tunnels signalling	debug tag-switching tsp-tunnels signalling
debug mpls xtagatm cross-connect	debug tag-switching xtagatm cross-connect
debug mpls xtagatm errors	debug tag-switching xtagatm errors
debug mpls xtagatm events	debug tag-switching xtagatm events
debug mpls xtagatm vc	debug tag-switching xtagatm vc
mpls atm control-vc	tag-switching atm control-vc
mpls atm cos	tag-switching atm cos
mpls atm disable-headend-vc	tag-switching atm disable-headend-vc
mpls atm multi-vc	tag-switching atm multi-vc
mpls atm vpi	tag-switching atm vpi
mpls atm vp-tunnel	tag-switching atm vp-tunnel
mpls cos-map	tag-switching cos-map
mpls ip (global configuration)	tag-switching ip (global configuration)
mpls ip (interface configuration)	tag-switching ip (interface configuration)
mpls ip default-route	tag-switching ip default-route
mpls ip propagate-ttl	tag-switching ip propagate-ttl
mpls label range	tag-switching tag-range downstream
mpls ldp advertise-labels	tag-switching advertise-tags
mpls ldp atm control-mode	tag-switching atm allocation-mode

Table 1 Cisco 7500 Series—MPLS Commands That Replaced Tag-Switching Commands (continued)

This MPLS Command Replaces	This Tag-Switching Command
mpls ldp atm vc-merge	tag-switching atm vc-merge
mpls ldp discovery	tag-switching tdp discovery
mpls ldp holdtime	tag-switching tdp holdtime
mpls ldp maxhops	tag-switching atm maxhops
mpls mtu	tag-switching mtu
mpls prefix-map	tag-switching prefix-map
mpls request-labels for	tag-switching request-tags for
mpls traffic-eng tunnels	tag-switching tsp-tunnels
show mpls atm-ldp bindings	show tag-switching atm-tdp bindings
show mpls atm-ldp bindwait	show tag-switching atm-tdp bindwait
show mpls atm-ldp capability	show tag-switching atm-tdp capability
show mpls atm-ldp summary	show tag-switching atm-tdp summary
show mpls cos-map	show tag-switching cos-map
show mpls forwarding-table	show tag-switching forwarding-table show tag-switching forwarding vrf
show mpls interfaces	show tag-switching interfaces
show mpls ldp bindings	show tag-switching tdp bindings
show mpls ldp discovery	show tag-switching tdp discovery
show mpls ldp neighbors	show tag-switching tdp neighbors
show mpls ldp parameters	show tag-switching tdp parameters
show mpls prefix-map	show tag-switching prefix-map
show mpls traffic-eng tunnels	show tag-switching tsp-tunnels
tunnel mode mpls traffic-eng	tunnel mode tag-switching

Table 2 alphabetically lists the MPLS commands used by the Cisco 10000 series routers that replaced the tag-switching commands.

Table 2 Cisco 10000 Series—MPLS Commands That Replaced Tag-Switching Commands

This MPLS Command Replaces	This Tag-Switching Command
debug mpls events	debug tag-switching events
debug mpls ldp advertisements	debug tag-switching tdp advertisements
debug mpls ldp bindings	debug tag-switching tdp bindings
debug mpls ldp messages	debug tag-switching tdp pies
debug mpls ldp peer state-machine	debug tag-switching tdp peer state-machine
debug mpls ldp session io	debug tag-switching tdp session io
debug mpls ldp session state-machine	debug tag-switching tdp session state-machine
debug mpls ldp targeted-neighbors	debug tag-switching tdp directed-neighbors

Table 2 Cisco 10000 Series—MPLS Commands That Replaced Tag-Switching Commands (continued)

This MPLS Command Replaces	This Tag-Switching Command
debug mpls ldp transport connections	debug tag-switching tdp transport connections
debug mpls ldp transport events	debug tag-switching tdp transport events
debug mpls traffic-eng tunnels events	debug tag-switching tsp-tunnels events
debug mpls traffic-eng tunnels labels	debug tag-switching tsp-tunnels tagging
debug mpls traffic-eng tunnels signalling	debug tag-switching tsp-tunnels signalling
mpls ip (global configuration)	tag-switching ip (global configuration)
mpls ip (interface configuration)	tag-switching ip (interface configuration)
mpls ip default-route	tag-switching ip default-route
mpls ip propagate-ttl	tag-switching ip propagate-ttl
mpls label range	tag-switching tag-range downstream
mpls ldp advertise-labels	tag-switching advertise-tags
mpls ldp discovery	tag-switching tdp discovery
mpls ldp holdtime	tag-switching tdp holdtime
mpls ldp maxhops	tag-switching atm maxhops
mpls mtu	tag-switching mtu
mpls prefix-map	tag-switching prefix-map
mpls request-labels for	tag-switching request-tags for
mpls traffic-eng tunnels	tag-switching tsp-tunnels
show mpls forwarding-table	show tag-switching forwarding-table show tag-switching forwarding vrf
show mpls interfaces	show tag-switching interfaces
show mpls ldp bindings	show tag-switching tdp bindings
show mpls ldp discovery	show tag-switching tdp discovery
show mpls ldp neighbors	show tag-switching tdp neighbors
show mpls ldp parameters	show tag-switching tdp parameters
show mpls prefix-map	show tag-switching prefix-map
show mpls traffic-eng tunnels	show tag-switching tsp-tunnels
tunnel mode mpls traffic-eng	tunnel mode tag-switching

How to Configure MPLS High Availability: Command Changes

There are no cofiguration tasks for this feature.

Configuration Examples for MPLS High Availability: Command Changes

There are no configuration examples for this feature.

Additional References

The following sections provide references related to the MPLS High Availability feature.

Related Documents

Related Topic	Document Title
MPLS HA for VPNS	*NSF/SSO-MPLS VPN*
MPLS HA for LDP	*NSF/SSO-MPLS LDP and MPLS LDP Graceful Restart*
MPLS HA and other applications	*MPLS High Availability: Overview*
Stateful switchover	*Stateful Switchover*
MPLS Label Distribution Protocol	*MPLS Label Distribution Protocol (LDP)*
Cisco nonstop forwarding	*Cisco Nonstop Forwarding*
MPLS MTU command changes implemented in Cisco IOS Releases 12.2(27)SBC and later releases.	*MPLS MTU Command Changes*
Cisco IOS Release 12.4 commands	*Cisco IOS Release 12.4 MPLS Command Reference*

Standards

Standard	Title
None	—

MIBs

MIB	MIBs Link
None	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

RFC	Title
None	—

Technical Assistance

Description	Link
The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password. If you have a valid service contract but do not have a user ID or password, you can register on Cisco.com.	http://www.cisco.com/techsupport

Command Reference

This section documents only commands that are new or modified.

- **debug mpls packets**
- **mpls mtu**
- **show atm vc**
- **show mpls forwarding-table**
- **show tech-support mpls**

debug mpls packets

To display Multiprotocol Label Switching (MPLS) labeled packets switched by the host router, use the **debug mpls packets** command in privileged EXEC mode. To disable debugging output, use the **no** form of this command.

debug mpls packets [*interface*]

no debug mpls packets [*interface*]

Syntax Description

interface	(Optional) The interface or subinterface name.

Defaults

The debug output displays all labeled packets, regardless of the interface.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.1CT	This command was introduced.
12.1(3)T	This command was modified for new MPLS terminology and syntax.
12.2(25)S	The command ouput was enhanced to display MPLS high availability information.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB and implemented on the Cisco 10000 series routers.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

The optional interface parameter restricts the display to only those packets received or sent on the indicated interface or subinterface.

Note Use this command with care because it generates output for every packet processed. Furthermore, enabling this command causes fast and distributed label switching to be disabled for the selected interfaces. To avoid adversely affecting other system activity, use this command only when traffic on the network is at a minimum.

Examples

The following is sample output from the **debug mpls packets** command:

```
Router# debug mpls packets

TAG: Hs3/0: recvd: CoS=0, TTL=254, Tag(s)=27
TAG: Hs0/0: xmit: (no tag)

TAG: Hs0/0: recvd: CoS=0, TTL=254, Tag(s)=30
```

```
TAG: Hs3/0: xmit: CoS=0, TTL=253, Tag(s)=27
```

Table 3 describes the significant fields shown in the display.

Table 3 debug mpls packets Field Descriptions

Field	Description
Hs0/0	The identifier for the interface on which the packet was received or sent.
recvd	Packet received.
xmit	Packet transmitted.
CoS	Class of Service field from the packet label header.
TTL	Time to live field from the packet label header.
(no tag)	Last label was popped off the packet and sent unlabeled.
Tag(s)	A list of labels on the packet, ordered from the top of the stack to the bottom.

Cisco 10000 Series Example

The following is sample output from the **debug mpls packets** command:

```
Router# debug mpls packets

Gi6/0/0: rx: Len 118 Stack {30 6 255} - ipv4 data
Gi6/1/1: tx: Len 118 Stack {22 6 254} - ipv4 data
```

Related Commands

Command	Description
show mpls forwarding-table	Displays the contents of the MPLS forwarding table.

mpls mtu

To set the per-interface Multiprotocol Label Switching (MPLS) maximum transmission unit (MTU) for labeled packets, use the **mpls mtu** command in interface configuration mode. To restore the default, use the **no** form of this command.

mpls mtu [**override**] *bytes*

no mpls mtu

Syntax Description

override	(Optional) Allows you to set the MPLS MTU value higher than the interface MTU value on interfaces (such as Ethernet) that have a default interface MTU value of 1580 or less. The **override** keyword is not available for interface types that do not have a default MTU value of 1580 or less. **Note** The **override** keyword is supported in Cisco IOS Release 12.2(27)SBC and later releases.
bytes	The MTU in bytes includes the label stack in the value.

Defaults

The default MPLS MTU is the MTU configured for the interface.

Command Modes

Interface configuration

Command History

Release	Modification
11.1CT	This command was introduced.
12.1(3)T	This command was modified to incorporate new MPLS terminology.
12.2(25)S	The command changed the maximum allowable MPLS MTU values. See the "Usage Guidelines for Cisco IOS Release 12.2(25)S" section for more information.
12.2(27)SBC	The command changed so that you cannot set the MPLS MTU value larger than the interface MTU value. The **override** keyword was introduced. See the "Usage Guidelines for Cisco IOS Release 12.2(27)SBC and Later Releases" section for more information.
12.(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

Usage Guidelines for Cisco IOS Release 12.2(25)S

If the interface MTU is less than 1524 bytes, you can set the maximum MPLS MTU to 24 bytes more than the interface MTU. For example, if the interface MTU is set to 1510 bytes, then you can set the maximum MPLS MTU to 1534 bytes (1510 + 24).

Note Although you can set the MPLS MTU to a value greater than the MPLS MTU, it is recommended that you keep the MPLS MTU less than or equal to the interface MTU to prevent the hardware from dropping packets. A best practice is to set the interface MTU of the core-facing interface to a value greater than either the IP MTU or interface MTU of the edge-facing interface.

If the interface MTU is greater than or equal to 1524 bytes, then you can set the maximum MPLS MTU as high as the interface MTU. For example, if the interface MTU is set to 1600 bytes, then you can set the MPLS MTU to a maximum of 1600 bytes. If you set the MPLS MTU higher than the interface MTU, traffic is dropped.

For interfaces that do not allow you to configure the interface MTU value and the interface MTU is 1500 bytes, the MPLS MTU range is 64 to 1524 bytes.

If you upgrade to Cisco IOS Release 12.2(25)S from an earlier release and you have an MPLS MTU setting that does not conform to these guidelines, the MPLS MTU setting is not accepted by the system. If this happens, reconfigure the MPLS MTU setting to conform to the guidelines.

Usage Guidelines for Cisco IOS Release 12.2(27)SBC and Later Releases

In Cisco IOS Releases 12.2(27)SBC and later releases, you cannot set the MPLS MTU value larger than the interface MTU value:

- If you attempt to set the MPLS MTU value higher than the interface MTU value, the software displays the following error, which reminds you to set the interface MTU to a higher value before you set the MPLS MTU value:

  ```
  % Please increase interface mtu to xxxx and then set mpls mtu
  ```

- If you have an interface with a default interface MTU value of 1580 or less (such as an Ethernet interface), the **mpls mtu** command provides the **override** keyword, which allows you to set the MPLS MTU value higher than the interface MTU value. The **override** keyword is not available for interface types that do not have a default interface MTU value of 1580 or less.

Note The **override** keyword is supported in Cisco IOS Releases 12.2(27)SBC and 12.2(28)SB and later releases.

- If you have configuration files with MPLS MTU values that are larger than the interface MTU values and you upgrade to Cisco IOS Release 12.2(27)SBC or a later release, the software does not change the MPLS MTU value. When you reboot the router, the software accepts whatever values are set for the MPLS MTU and the interface MTU. However, it is recommended that you make the MPLS MTU values lower than the interface MTU values. The following error message is displayed during system initialization:

  ```
  Setting the mpls mtu to xxxx on interface x/x, which is higher than the interface MTU
  xxxx. This could lead to packet forwarding problems including packet drops.
  ```

- Changing the interface MTU can also modify the IP MTU, Connectionless Network Service (CLNS) MTU, and other MTU values, if they depend on the value of the interface MTU. The Open Shortest Path First (OSPF) routing protocol requires that the IP MTU values match on both ends of the link. Similarly, the Intermediate System-to-Intermediate System (IS-IS) routing protocol requires that the CLNS MTU values match on both ends of the link. If the values on both ends of the link do not match, IS-IS or OSPF cannot complete its initialization.

General Usage Guidelines

- ATM interfaces cannot accommodate packets that exceed the Segmentation and Reassembly (SAR) buffer size, because labels are added to the packet. The *bytes* argument refers to the number of bytes in the packet before the addition of any labels. If each label is 4 bytes, the maximum value of bytes on an ATM interface is the physical MTU minus 4**x* bytes, where *x* is the number of labels expected in the received packet.
- If a labeled IPv4 packet exceeds the MPLS MTU size for the interface, Cisco IOS software fragments the packet. If a labeled non-IPv4 packet exceeds the MPLS MTU size, the packet is dropped.
- All devices on a physical medium must have the same MPLS MTU value in order for MPLS to interoperate.
- The MTU for labeled packets for an interface is determined as follows:
  - If the **mpls mtu** *bytes* command has been used to configure an MPLS MTU, the MTU for labeled packets is the *bytes* value.
  - Otherwise, the MTU for labeled packets is the default MTU for the interface.
- Because labeling a packet makes it larger due to the label stack, you may want the MPLS MTU to be larger than the interface MTU or IP MTU in order to prevent the fragmentation of labeled packets, which would not be fragmented if they were unlabeled. In Cisco IOS Release 12.2(25)S and later releases, the MPLS MTU cannot be larger than the interface MTU.
- Changing the interface MTU value (using the **mtu** interface configuration command) can affect the MPLS MTU of the interface. If the MPLS MTU value is the same as the interface MTU value (this is the default), and you change the interface MTU value, the MPLS MTU value will automatically be set to this new MTU as well. However, the reverse is not true; changing the MPLS MTU value has no effect on the interface MTU.

Examples

The following commands set the interface MTU value and MPLS MTU value for a serial interface:

```
interface Serial4/0
 mtu 1520
 ip unnumbered Loopback0
 mpls mtu 1510
 mpls traffic-eng tunnels
 mpls ip
 serial restart-delay 0
 ip rsvp bandwidth 2000 2000
```

The following example sets the maximum labeled packet size for the FastEthernet interface to 1508, which is common in an MPLS core carrying MPLS Virtual Private Network (VPN) traffic:

```
interface Fastethernet0
  mpls mtu override 1508
```

Related Commands

Command	Description
mtu	Sets the MTU size for the interface.

show atm vc

To display all ATM permanent virtual circuits (PVCs) and switched virtual circuits (SVCs) and traffic information, use the **show atm vc** command in privileged EXEC mode.

show atm vc [*vcd* | **interface** *interface-number*]

Syntax Description

vcd	(Optional) Specifies the virtual circuit descriptor (VCD) about which to display information.
interface *interface-number*	(Optional) Interface number or subinterface number of the PVC or SVC. Displays all PVCs and SVCs on the specified interface or subinterface. The *interface-number* uses one of the following formats, depending on what router platform you are using: • For the ATM Interface Processor (AIP) on Cisco 7500 series routers; for the ATM port adapter, ATM-CES port adapter, and enhanced ATM port adapter on Cisco 7200 series routers; for the 1-port ATM-25 network module on Cisco 2600 and 3600 series routers: *slot*/**0**[**.***subinterface-number* **multipoint**] • For the ATM port adapter and enhanced ATM port adapter on Cisco 7500 series routers: *slot*/*port-adapter*/**0**[**.***subinterface-number* **multipoint**] • For the network processing module (NPM) on Cisco 4500 and Cisco 4700 routers: *number*[**.***subinterface-number* **multipoint**] For a description of these arguments, refer to the **interface atm** command.

Command Modes

Privileged EXEC

Command History

Release	Modification
10.0	This command was introduced.
11.1CA	Information about VCs on an ATM-CES port adapter was added to the command output.
12.0(5)T	Information about VCs on an extended Multiprotocol Label Switching (MPLS) ATM interface was added to the command output.
12.2(25)S	Information about packet drops and errors was added to the command output.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB and implemented on the Cisco 10000 series routers.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Usage Guidelines

If no value is specified for the *vcd* argument, the command displays information for all PVCs and SVCs. The output is in summary form (one line per virtual circuit).

VCs on the extended MPLS ATM interfaces do not appear in the **show atm vc** command output. Instead, the **show xtagatm vc** command provides a similar output that shows information only on extended MPLS ATM VCs.

Examples

The following is sample output from the **show atm vc** command when no *vcd* value is specified. The status field is either ACTIVE or INACTIVE.

```
Router# show atm vc

Interface     VCD   VPI   VCI Type  AAL/Encaps     Peak   Avg.  Burst Status
ATM2/0          1     0     5  PVC  AAL5-SAAL     155000 155000    93 ACTIVE
ATM2/0.4        3     0    32  SVC  AAL5-SNAP     155000 155000    93 ACTIVE
ATM2/0.65432   10    10    10  PVC  AAL5-SNAP     100000  40000    10 ACTIVE
ATM2/0         99     0    16  PVC  AAL5-ILMI     155000 155000    93 ACTIVE
ATM2/0.105    250    33    44  PVC  AAL5-SNAP     155000 155000    93 ACTIVE
ATM2/0.100    300    22    33  PVC  AAL5-SNAP     155000 155000    93 ACTIVE
ATM2/0.12345 2047   255 65535  PVC  AAL5-SNAP         56     28  2047 ACTIVE
```

The following is sample output from the **show atm vc** command when a *vcd* value is specified for a circuit emulation service (CES) circuit:

```
Router# show atm vc 2

ATM6/0: VCD: 2, VPI: 10, VCI: 10
PeakRate: 2310, Average Rate: 2310, Burst Cells: 94
CES-AAL1, etype:0x0, Flags: 0x20138, VCmode: 0x0
OAM DISABLED
InARP DISABLED
OAM cells received: 0
OAM cells sent: 334272
Status: ACTIVE
```

The following is sample output from the **show atm vc** command when a *vcd* value is specified, displaying statistics for that virtual circuit only:

```
Router# show atm vc 8

ATM4/0: VCD: 8, VPI: 8, VCI: 8
PeakRate: 155000, Average Rate: 155000, Burst Cells: 0
AAL5-LLC/SNAP, etype:0x0, Flags: 0x30, VCmode: 0xE000
OAM frequency: 0 second(s)
InARP frequency: 1 minute(s)
InPkts: 181061, OutPkts: 570499, InBytes: 757314267, OutBytes: 2137187609
InPRoc: 181011, OutPRoc: 10, Broadcasts: 570459
InFast: 39, OutFast: 36, InAS: 11, OutAS: 6
OAM cells received: 0
OAM cells sent: 0
Status: UP
```

The following is sample output from the **show atm vc** command when a *vcd* value is specified, AAL3/4 is enabled, an ATM Switched Multimegabit Data Service (SMDS) subinterface has been defined, and a range of message identifier numbers (MIDs) has been assigned to the PVC:

```
Router# show atm vc 1

ATM4/0.1: VCD: 1, VPI: 0, VCI: 1
PeakRate: 0, Average Rate: 0, Burst Cells: 0
AAL3/4-SMDS, etype:0x1, Flags: 0x35, VCmode: 0xE200
MID start: 1, MID end: 16
InPkts: 0, OutPkts: 0, InBytes: 0, OutBytes: 0
InPRoc: 0, OutPRoc: 0, Broadcasts: 0
```

```
InFast: 0, OutFast: 0, InAS: 0, OutAS: 0
```

The following is sample output from the **show atm vc** command when a *vcd* value is specified and generation of Operation, Administration, and Maintenance (OAM) F5 loopback cells has been enabled:

```
Router# show atm vc 7

ATM4/0: VCD: 7, VPI: 7, VCI: 7
PeakRate: 0, Average Rate: 0, Burst Cells: 0
AAL5-LLC/SNAP, etype:0x0, Flags: 0x30, VCmode: 0xE000
OAM frequency: 10 second(s)
InARP DISABLED
InPkts: 0, OutPkts: 0, InBytes: 0, OutBytes: 0
InPRoc: 0, OutPRoc: 0, Broadcasts: 0
InFast:0, OutFast:0, InAS:0, OutAS:0
OAM cells received: 0
OAM cells sent: 1
Status: UP
```

The following is sample output from the **show atm vc** command when a *vcd* value is specified, and there is an incoming multipoint virtual circuit:

```
Router# show atm vc 3

ATM2/0: VCD: 3, VPI: 0, VCI: 33
PeakRate: 0, Average Rate: 0, Burst Cells: 0
AAL5-MUX, etype:0x809B, Flags: 0x53, VCmode: 0xE000
OAM DISABLED
InARP DISABLED
InPkts: 6646, OutPkts: 0, InBytes: 153078, OutBytes: 0
InPRoc: 6646, OutPRoc: 0, Broadcasts: 0
InFast: 0, OutFast: 0, InAS: 0, OutAS: 0
interface =  ATM2/0, call remotely initiated, call reference = 18082
vcnum = 3, vpi = 0, vci = 33, state = Active
 aal5mux vc, multipoint call
Retry count: Current = 0, Max = 10
timer currently inactive, timer value = never
Root Atm Nsap address: DE.CDEF.01.234567.890A.BCDE.F012.3456.7890.1234.12
```

The following is sample output from the **show atm vc** command when a *vcd* value is specified, and there is an outgoing multipoint virtual circuit:

```
Router# show atm vc 6

ATM2/0: VCD: 6, VPI: 0, VCI: 35
PeakRate: 0, Average Rate: 0, Burst Cells: 0
AAL5-MUX, etype:0x800, Flags: 0x53, VCmode: 0xE000
OAM DISABLED
InARP DISABLED
InPkts: 0, OutPkts: 818, InBytes: 0, OutBytes: 37628
InPRoc: 0, OutPRoc: 0, Broadcasts: 818
InFast: 0, OutFast: 0, InAS: 0, OutAS: 0
interface =  ATM2/0, call locally initiated, call reference = 3
vcnum = 6, vpi = 0, vci = 35, state = Active
 aal5mux vc, multipoint call
Retry count: Current = 0, Max = 10
timer currently inactive, timer value = never
Leaf Atm Nsap address: DE.CDEF.01.234567.890A.BCDE.F012.3456.7890.1234.12
Leaf Atm Nsap address: CD.CDEF.01.234567.890A.BCDE.F012.3456.7890.1234.12
```

The following is sample output from the **show atm vc** command when a *vcd* value is specified and there is a PPP-over-ATM connection:

```
Router# show atm vc 1

ATM8/0.1: VCD: 1, VPI: 41, VCI: 41
PeakRate: 155000, Average Rate: 155000, Burst Cells: 96
AAL5-CISCOPPP, etype:0x9, Flags: 0xC38, VCmode: 0xE000
virtual-access: 1, virtual-template: 1
OAM DISABLED
InARP DISABLED
InPkts: 13, OutPkts: 10, InBytes: 198, OutBytes: 156
InPRoc: 13, OutPRoc: 10, Broadcasts: 0
InFast: 0, OutFast: 0, InAS: 0, OutAS: 0
OAM cells received: 0
OAM cells sent: 0
```

The following is sample output from the **show atm vc** command for IP multicast virtual circuits. The display shows the leaf count for multipoint VCs opened by the root. VCD 3 is a root of a multipoint VC with three leaf routers. VCD 4 is a leaf of some other router's multipoint VC. VCD 12 is a root of a multipoint VC with only one leaf router.

```
Router# show atm vc

           VCD/                                    Peak     Avg/Min     Burst
Interface  Name  VPI   VCI   Type     Encaps       Kbps      Kbps       Cells         Sts
0/0        1       0     5     PVC      SAAL      155000   155000       96           UP
0/0        2       0    16     PVC      ILMI      155000   155000       96           UP
0/0        3       0   124 MSVC-3      SNAP      155000   155000       96           UP
0/0        4       0   125   MSVC      SNAP      155000   155000       96           UP
0/0        5       0   126   MSVC      SNAP      155000   155000       96           UP
0/0        6       0   127   MSVC      SNAP      155000   155000       96           UP
0/0        9       0   130   MSVC      SNAP      155000   155000       96           UP
0/0        10      0   131    SVC      SNAP      155000   155000       96           UP
0/0        11      0   132 MSVC-3      SNAP      155000   155000       96           UP
0/0        12      0   133 MSVC-1      SNAP      155000   155000       96           UP
0/0        13      0   134    SVC      SNAP      155000   155000       96           UP
0/0        14      0   135 MSVC-2      SNAP      155000   155000       96           UP
0/0        15      0   136 MSVC-2      SNAP      155000   155000       96           UP
```

The following is sample output from the **show atm vc** command for an IP multicast virtual circuit. The display shows the owner of the VC and leaves of the multipoint VC. This VC was opened by IP multicast. The three leaf routers' ATM addresses are included in the display. The VC is associated with IP group address 10.1.1.1.

```
Router# show atm vc 11

ATM0/0: VCD: 11, VPI: 0, VCI: 132
PeakRate: 155000, Average Rate: 155000, Burst Cells: 96
AAL5-LLC/SNAP, etype:0x0, Flags: 0x650, VCmode: 0xE000
OAM DISABLED
InARP DISABLED
InPkts: 0, OutPkts: 12, InBytes: 0, OutBytes: 496
InPRoc: 0, OutPRoc: 0, Broadcasts: 12
InFast: 0, OutFast: 0, InAS: 0, OutAS: 0
OAM cells received: 0
OAM cells sent: 0
Status: ACTIVE, TTL: 2, VC owner: IP Multicast (10.1.1.1)
interface =  ATM0/0, call locally initiated, call reference = 2
vcnum = 11, vpi = 0, vci = 132, state = Active
 aal5snap vc, multipoint call
Retry count: Current = 0, Max = 10
timer currently inactive, timer value = 00:00:00
```

```
Leaf Atm Nsap address: 47.0091810000000002BA08E101.444444444444.02
Leaf Atm Nsap address: 47.0091810000000002BA08E101.333333333333.02
Leaf Atm Nsap address: 47.0091810000000002BA08E101.222222222222.02
```

The following is sample output from the **show atm vc** command where no VCD is specified and private VCs are present:

```
Router# show atm vc

AAL /          Peak    Avg.  Burst
Interface      VCD    VPI    VCI Type  Encapsulation  Kbps    Kbps  Cells Status
ATM1/0           1      0     40  PVC  AAL5-SNAP          0       0      0 ACTIVE
ATM1/0           2      0     41  PVC  AAL5-SNAP          0       0      0 ACTIVE
ATM1/0           3      0     42  PVC  AAL5-SNAP          0       0      0 ACTIVE
ATM1/0           4      0     43  PVC  AAL5-SNAP          0       0      0 ACTIVE
ATM1/0           5      0     44  PVC  AAL5-SNAP          0       0      0 ACTIVE
ATM1/0          15      1     32  PVC  AAL5-XTAGATM       0       0      0 ACTIVE
ATM1/0          17      1     34  TVC  AAL5-XTAGATM       0       0      0 ACTIVE
ATM1/0          26      1     43  TVC  AAL5-XTAGATM       0       0      0 ACTIVE
ATM1/0          28      1     45  TVC  AAL5-XTAGATM       0       0      0 ACTIVE
ATM1/0          29      1     46  TVC  AAL5-XTAGATM       0       0      0 ACTIVE
ATM1/0          33      1     50  TVC  AAL5-XTAGATM       0       0      0 ACTIVE
```

When you specify a VCD value and the VCD corresponds to that of a private VC on a control interface, the display output appears as follows:

```
Router# show atm vc 15

ATM1/0 33      1     50  TVC  AAL5-XTAGATM       0       0      0 ACTIVE
ATM1/0: VCD: 15, VPI: 1, VCI: 32, etype:0x8, AAL5 - XTAGATM, Flags: 0xD38
PeakRate: 0, Average Rate: 0, Burst Cells: 0, VCmode: 0x0
XTagATM1, VCD: 1, VPI: 0, VCI: 32
OAM DISABLED, InARP DISABLED
InPkts: 38811, OutPkts: 38813, InBytes: 2911240, OutBytes: 2968834
InPRoc: 0, OutPRoc: 0, Broadcasts: 0
InFast: 0, OutFast: 0, InAS: 0, OutAS: 0
OAM F5 cells sent: 0, OAM cells received: 0
Status: ACTIVE
```

Table 4 describes the fields shown in the displays.

Table 4 show atm vc Field Descriptions

Field	Description
Interface	Interface slot and port.
VCD/Name	Virtual circuit descriptor (virtual circuit number). The connection name is displayed if the VC was configured using the **pvc** command and the name was specified.
VPI	Virtual path identifier.
VCI	Virtual channel identifier.

Table 4 show atm vc Field Descriptions (continued)

Field	Description
Type	Type of virtual circuit, either PVC, SVC, TVC, or multipoint SVC (MSVC). • MSVC (with no *-x*) indicates that VCD is a leaf of some other router's multipoint VC. • MSVC-*x* indicates there are *x* leaf routers for that multipoint VC opened by the root. Type of PVC detected from PVC discovery, either PVC-D, PVC-L, or PVC-M. • PVC-D indicates a PVC created due to PVC discovery. • PVC-L indicates that the corresponding peer of this PVC could not be found on the switch. • PVC-M indicates that some or all of the Quality of Service (QoS) parameters of this PVC do not match those of the corresponding peer on the switch. • TVC indicates a Tag virtual circuit.
Encaps	Type of ATM adaptation layer (AAL) and encapsulation.
PeakRate	Kilobits per second sent at the peak rate.
Average Rate	Kilobits per second sent at the average rate.
Burst Cells	Value that equals the maximum number of ATM cells the virtual circuit can send at peak rate.
Status	Status of the VC connection. • UP indicates that the connection is enabled for data traffic. • DOWN indicates that the connection is not ready for data traffic. When the Status field is DOWN, a State field is shown. • INACTIVE indicates that the interface is down. • ACTIVE indicates that the interface is in use and active.
etype	Encapsulation type.

Table 4 show atm vc Field Descriptions (continued)

Field	Description
Flags	Bit mask describing virtual circuit information. The flag values are summed to result in the displayed value. 0x10000 ABR VC 0x20000 CES VC 0x40000 TVC 0x100 TEMP (automatically created) 0x200 MULTIPOINT 0x400 DEFAULT_RATE 0x800 DEFAULT_BURST 0x10 ACTIVE 0x20 PVC 0x40 SVC 0x0 AAL5-SNAP 0x1 AAL5-NLPID 0x2 AAL5-FRNLPID 0x3 AAL5-MUX 0x4 AAL3/4-SMDS 0x5 QSAAL 0x6 AAL5-ILMI 0x7 AAL5-LANE 0x8 AAL5-XTAGATM 0x9 CES-AAL1 0xA F4-OAM
VCmode	AIP-specific or NPM-specific register describing the usage of the virtual circuit. This register contains values such as rate queue, peak rate, and AAL mode, which are also displayed in other fields.
OAM frequency	Seconds between OAM loopback messages, or DISABLED if OAM is not in use on this VC.
InARP frequency	Minutes between Inverse Address Resolution Protocol (InARP) messages, or DISABLED if InARP is not in use on this VC.
virtual-access	Virtual access interface identifier.
virtual-template	Virtual template identifier.
InPkts	Total number of packets received on this virtual circuit. This number includes all fast-switched and process-switched packets.
OutPkts	Total number of packets sent on this virtual circuit. This number includes all fast-switched and process-switched packets.
InBytes	Total number of bytes received on this virtual circuit. This number includes all fast-switched and process-switched packets.
OutBytes	Total number of bytes sent on this virtual circuit. This number includes all fast-switched and process-switched packets.
InPRoc	Number of process-switched input packets.
OutPRoc	Number of process-switched output packets.
Broadcasts	Number of process-switched broadcast packets.
InFast	Number of fast-switched input packets.

Table 4 show atm vc Field Descriptions (continued)

Field	Description
OutFast	Number of fast-switched output packets.
InAS	Number of autonomous-switched or silicon-switched input packets.
OutAS	Number of autonomous-switched or silicon-switched output packets.
OAM cells received	Number of OAM cells received on this virtual circuit.
OAM cells sent	Number of OAM cells sent on this virtual circuit.
TTL	Time to live in ATM hops across the VC.
VC owner	IP Multicast address of the group.

Related Commands

Command	Description
atm nsap-address	Sets the NSAP address for an ATM interface using SVC mode.
show xtagatm vc	Displays information about the VCs on the extended MPLS ATM interfaces.

show mpls forwarding-table

To display the contents of the Multiprotocol Label Switching (MPLS) Label Forwarding Information Base (LFIB), use the **show mpls forwarding-table** command in privileged EXEC mode.

show mpls forwarding-table [*network* {*mask* | *length*} | **labels** *label* [**-** *label*] | **interface** *interface* | **next-hop** *address* | **lsp-tunnel** [*tunnel-id*]] [**vrf** *vrf-name*] [**detail**]

Syntax Description

network	(Optional) Destination network number.
mask	IP address of the destination mask whose entry is to be shown.
length	Number of bits in the mask of the destination.
labels *label* **-** *label*	(Optional) Displays only entries with the specified local labels.
interface *interface*	(Optional) Displays only entries with the specified outgoing interface.
next-hop *address*	(Optional) Displays only entries with the specified neighbor as the next hop.
lsp-tunnel	(Optional) Displays only entries with the specified label switched path (LSP) tunnel, or with all LSP tunnel entries.
tunnel-id	(Optional) Specifies the LSP tunnel for which to display entries.
vrf *vrf-name*	(Optional) Displays only entries with the specified VPN routing and forwarding (VRF) instance.
detail	(Optional) Displays information in long form (includes length of encapsulation, length of MAC string, maximum transmission unit (MTU), and all labels).

Command Modes

Privileged EXEC

Command History

Release	Modification
11.1CT	This command was introduced.
12.1(3)T	This command was updated with MPLS terminology and command syntax.
12.2(8)T	The command was modified to accommodate use of the MPLS experimental (EXP) level as a selection criterion for packet forwarding. The output display was modified to include a bundle adjacency field and exp (vcd) values when the optional **detail** keyword is specified.
12.0(22)S	IPv6 MPLS aggregate label and prefix information was added to the display.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.0(27)S	The command output was modified to include explicit-null label information.
12.2(25)S	The output was changed in the following ways: • The term “tag” was replaced with the term “label.” • The term “untagged” was replaced with the term “no label.”
12.0(29)S	This command was integrated into Cisco IOS Release 12.0(29)S.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB and implemented on the Cisco 10000 series routers.

Release	Modification
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Examples

The following is sample output from the **show mpls forwarding-table** command:

```
Router# show mpls forwarding-table

Local Outgoing      Prefix            Bytes label Outgoing       Next Hop
Label Label or VC   or Tunnel Id      switched  interface
26    No Label      10.253.0.0/16     0         Et4/0/0       10.27.32.4
28    1/33          10.15.0.0/16      0         AT0/0.1       point2point
29    Pop Label     10.91.0.0/16      0         Hs5/0         point2point
      1/36          10.91.0.0/16      0         AT0/0.1       point2point
30    32            10.250.0.97/32    0         Et4/0/2       10.92.0.7
      32            10.250.0.97/32    0         Hs5/0         point2point
34    26            10.77.0.0/24      0         Et4/0/2       10.92.0.7
      26            10.77.0.0/24      0         Hs5/0         point2point
35    No Label[T]   10.100.100.101/32 0         Tu301         point2point
36    Pop Label     10.1.0.0/16       0         Hs5/0         point2point
      1/37          10.1.0.0/16       0         AT0/0.1       point2point

[T]     Forwarding through a TSP tunnel.
        View additional labeling info with the 'detail' option
```

The following is sample output from the **show mpls forwarding-table** command when the IPv6 Provider Edge Router over MPLS feature is configured to allow IPv6 traffic to be transported across an IPv4 MPLS backbone. The labels are aggregated because there are several prefixes for one local label, and the prefix column contains “IPv6” instead of a target prefix.

```
Router# show mpls forwarding-table

Local Outgoing      Prefix            Bytes label Outgoing       Next Hop
Label Label or VC   or Tunnel Id      switched  interface
16    Aggregate     IPv6              0
17    Aggregate     IPv6              0
18    Aggregate     IPv6              0
19    Pop Label     192.168.99.64/30  0         Se0/0         point2point
20    Pop Label     192.168.99.70/32  0         Se0/0         point2point
21    Pop Label     192.168.99.200/32 0         Se0/0         point2point
22    Aggregate     IPv6              5424
23    Aggregate     IPv6              3576
24    Aggregate     IPv6              2600
```

The following is sample output from the **show mpls forwarding-table** command when you specify the **detail** keyword. If the MPLS EXP level is used as a selection criterion for packet forwarding, a bundle adjacency exp (vcd) field is included in the display. This field includes the EXP value and the corresponding virtual circuit descriptor (VCD) in parentheses. The line in the output that reads “No output feature configured” indicates that the MPLS egress NetFlow accounting feature is not enabled on the outgoing interface for this prefix.

```
Router# show mpls forwarding-table detail

Local Outgoing      Prefix            Bytes label Outgoing       Next Hop
label   label or VC     or Tunnel Id      switched  interface
16    Pop label       10.0.0.6/32       0         AT1/0.1       point2point
      Bundle adjacency exp(vcd)
      0(1) 1(1) 2(1) 3(1) 4(1) 5(1) 6(1) 7(1)
      MAC/Encaps=12/12, MTU=4474, label Stack{}
```

```
      00010000AAAA030000008847
      No output feature configured
17    18            10.0.0.9/32        0         AT1/0.1       point2point
      Bundle adjacency exp(vcd)
      0(1) 1(1) 2(1) 3(1) 4(1) 5(1) 6(1) 7(1)
      MAC/Encaps=12/16, MTU=4470, label Stack{18}
      00010000AAAA030000008847 00012000
      No output feature configured
18    19            10.0.0.10/32        0        AT1/0.1       point2point
      Bundle adjacency exp(vcd)
      0(1) 1(1) 2(1) 3(1) 4(1) 5(1) 6(1) 7(1)
      MAC/Encaps=12/16, MTU=4470, label Stack{19}
      00010000AAAA030000008847 00013000
      No output feature configured
19    17            10.0.0.0/8         0        AT1/0.1       point2point
      Bundle adjacency exp(vcd)
      0(1) 1(1) 2(1) 3(1) 4(1) 5(1) 6(1) 7(1)
      MAC/Encaps=12/16, MTU=4470, label Stack{17}
      00010000AAAA030000008847 00011000
      No output feature configured
20    20            10.0.0.0/8         0        AT1/0.1       point2point
      Bundle adjacency exp(vcd)
      0(1) 1(1) 2(1) 3(1) 4(1) 5(1) 6(1) 7(1)
      MAC/Encaps=12/16, MTU=4470, label Stack{20}
      00010000AAAA030000008847 00014000
      No output feature configured
21    Pop label       10.0.0.0/24        0        AT1/0.1       point2point
      Bundle adjacency exp(vcd)
      0(1) 1(1) 2(1) 3(1) 4(1) 5(1) 6(1) 7(1)
      MAC/Encaps=12/12, MTU=4474, label Stack{}
      00010000AAAA030000008847
      No output feature configured
22    Pop label       10.0.0.4/32         0        Et2/3         10.0.0.4
      MAC/Encaps=14/14, MTU=1504, label Stack{}
      000427AD10430005DDFE043B8847
      No output feature configured
```

The following is sample output from the **show mpls forwarding-table** command when you use the **detail** keyword. In this example, the MPLS egress NetFlow accounting feature is enabled on the first three prefixes, as indicated by the line in the output that reads “Feature Quick flag set.”

```
Router# show mpls forwarding-table detail

Local  Outgoing    Prefix            Bytes label  Outgoing   Next Hop
label    label or VC   or Tunnel Id      switched   interface
16     Aggregate   10.0.0.0/8[V]     0
        MAC/Encaps=0/0, MTU=0, label Stack{}
        VPN route: vpn1
        Feature Quick flag set
Per-packet load-sharing, slots: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
17     No label    10.0.0.0/8[V]      0          Et0/0/2    10.0.0.1
        MAC/Encaps=0/0, MTU=1500, label Stack{}
        VPN route: vpn1
        Feature Quick flag set
Per-packet load-sharing, slots: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
18     No label    10.42.42.42/32[V] 4185       Et0/0/2    10.0.0.1
        MAC/Encaps=0/0, MTU=1500, label Stack{}
        VPN route: vpn1
        Feature Quick flag set
Per-packet load-sharing, slots: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
19     2/33        10.41.41.41/32    0          AT1/0/0.1  point2point
        MAC/Encaps=4/8, MTU=4470, label Stack{2/33(vcd=2)}
        00028847 00002000
        No output feature configured
```

Cisco 10000 Series Examples

The following is sample output from the **show mpls forwarding-table** command:

```
Router# show mpls forwarding-table

Local   Outgoing      Prefix            Bytes Label   Outgoing   Next Hop
Label   Label or VC   or Tunnel Id      Switched      interface
16      Pop Label     10.0.0.0/8        0             Fa1/0/0    10.0.0.2
        Pop Label     10.0.0.0/8        0             Fa1/1/0    10.0.0.2
17      Aggregate     10.0.0.0/8[V]     570           vpn2
21      Pop Label     10.11.11.11/32    0             Fa1/0/0    10.0.0.2
22      Pop Label     10.12.12.12/32    0             Fa1/1/0    10.0.0.2
23      No Label      10.3.0.0/16[V]     0             Fa4/1/0   10.0.0.2
```

The following is Cisco 10000 series sample output from the **show mpls forwarding-table** command when you specify the **detail** keyword:

```
Router# show mpls forwarding-table detail

Local   Outgoing      Prefix            Bytes Label   Outgoing   Next Hop
Label   Label or VC   or Tunnel Id      Switched      interface
16      Pop Label     10.0.0.0/8        0             Fa1/0/0    10.0.0.2
        MAC/Encaps=14/14, MRU=1500, Label Stack{}
        000B45C93889000B45C930218847
        No output feature configured
        Pop Label     10.0.0.0/8        0             Fa1/1/0     10.0.0.2
        MAC/Encaps=14/14, MRU=1500, Label Stack{}
        000B45C92881000B45C930288847
        No output feature configured
17      Aggregate    10.0.0.0/8[V]      570           vpn2
        MAC/Encaps=0/0, MRU=0, Label Stack{}
        VPN route: vpn2
        No output feature configured
21      Pop Label     10.11.11.11/32     0            Fa1/0/0     10.0.0.2
        MAC/Encaps=14/14, MRU=1500, Label Stack{}
       000B45C93889000B45C930218847
       No output feature configured
```

Table 5 describes the significant fields shown in the displays.

Table 5 show mpls forwarding-table Field Descriptions

Field	Description
Local label	Label assigned by this router.
Outgoing Label or VC **Note** VC is not applicable to the Cisco 10000 series routers.	Label assigned by the next hop or virtual path identifier (VPI)/virtual channel identifier (VCI) used to get to next hop. The entries in this column are the following: • [T]—Means forwarding through an LSP tunnel. • No Label—Means that there is no label for the destination from the next hop or that label switching is not enabled on the outgoing interface. • Pop Label—Means that the next hop advertised an implicit NULL label for the destination and that the router popped the top label. • Aggregate—Means there are several prefixes for one local label. This entry is used when IPv6 is configured on edge routers to transport IPv6 traffic over an IPv4 MPLS network.
Prefix or Tunnel Id	Address or tunnel to which packets with this label are sent. **Note** If IPv6 is configured on edge routers to transport IPv6 traffic over an IPv4 MPLS network, "IPv6" is displayed here.
Bytes Label Switched	Number of bytes switched with this incoming label.
Outgoing interface	Interface through which packets with this label are sent.
Next Hop	IP address of the neighbor that assigned the outgoing label.
Bundle adjacency exp(vcd)	Bundle adjacency information. Includes the MPLS EXP value and the corresponding VCD.
MAC/Encaps	Length in bytes of the Layer 2 header and length in bytes of the packet encapsulation, including the Layer 2 header and label header.
MTU	MTU of the labeled packet.
Label Stack	All the outgoing labels. If the outgoing interface is transmission convergence (TC)-ATM, the VCD is also shown. **Note** TC-ATM is not supported on Cisco 10000 series routers.
00010000AAAA030000008847 00013000	The actual encapsulation in hexadecimal form. A space is shown between Layer 2 and the label header.

Explicit-Null Label Example

The following example shows output, including the explicit-null label = 0 (commented in bold), from the **show mpls forwarding-table** command on a CSC-PE router:

```
Router# show mpls forwarding-table
```

```
Local  Outgoing      Prefix            Bytes label  Outgoing   Next Hop
label  label or VC   or Tunnel Id      switched     interface
17     Pop label     10.10.0.0/32      0            Et2/0      10.10.0.1
18     Pop label     10.10.10.0/24     0            Et2/0      10.10.0.1
19     Aggregate     10.10.20.0/24[V]  0
20     Pop label     10.10.200.1/32[V] 0            Et2/1      10.10.10.1
21     Aggregate     10.10.1.1/32[V]   0
22     0             192.168.101.101/32[V]   \
                                       0            Et2/1      192.168.101.101
23     0             192.168.101.100/32[V]   \
                                       0            Et2/1      192.168.101.100
25     0             192.168.102.125/32[V] 0        Et2/1      192.168.102.125 !outlabel
value 0
```

Table 6 describes the significant fields shown in the display.

Table 6 show mpls forwarding-table Field Descriptions

Field	Description
Local label	Label assigned by this router.
Outgoing label or VC	Label assigned by the next hop or VPI/VCI used to get to next hop. The entries this column are the following: • [T]—Means forwarding through an LSP tunnel. • No label—Means that there is no label for the destination from the next hop or that label switching is not enabled on the outgoing interface. • Pop label—Means that the next hop advertised an implicit NULL label for the destination and that this router popped the top label. • Aggregate—Means there are several prefixes for one local label. This entry is used when IPv6 is configured on edge routers to transport IPv6 traffic over an IPv4 MPLS network. • 0—Means the explicit null label value = 0.
Prefix or Tunnel Id	Address or tunnel to which packets with this label are going. **Note** If IPv6 is configured on edge routers to transport IPv6 traffic over an IPv4 MPLS network, IPv6 is displayed here.
Bytes label switched	Number of bytes switched with this incoming label.
Outgoing interface	Interface through which packets with this label are sent.
Next Hop	IP address of the neighbor that assigned the outgoing label.

Related Commands

Command	Description
neighbor send-label	Enables a BGP router to send MPLS labels with BGP routes to a neighboring BGP router.
neighbor send-label explicit-null	Enables a BGP router to send MPLS labels with explicit-null information for a CSC-CE router and BGP routes to a neighboring CSC-PE router.

show tech-support mpls

To generate a report of all Multiprotocol Label Switching (MPLS)-related information, use the **show tech-support mpls** command in privileged EXEC mode.

show tech-support mpls [**vrf** *vrf-name*]

Syntax Description

vrf *vrf-name*	(Optional) Displays MPLS information about the specified VPN routing and forwarding (VRF) instance.

Command Modes

Privileged EXEC

Command History

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

Usage Guidelines

This command is useful when you contact technical support personnel with questions regarding MPLS. The **show tech-support mpls** command generates a series of reports. The **show tech-support mpls** command is equivalent to issuing the following commands:

MPLS Forwarding Information Commands

show adjacency detail
show cef drop show cef events
show cef not-cef-switched
show cef state
show interface accounting | exclude sab
show interfaces statistic | exclude sabl
show ip cef adjacency discard
show ip cef adjacency drop
show ip cef adjacency glean
show ip cef adjacency null
show ip cef adjacency punt
show ip cef detail internal
show ip cef inconsistency
show ip cef summary
show ip cef unresolved internal
show ip interfaces
show ip route
show ip traffic
show mpls forwarding-table detail
show mpls interfaces all
show mpls interfaces all internal

show mpls label range
show mpls static binding

MPLS Forwarding: Cell Mode (LC-ATM) Commands

Note These commands are not supported on Cisco 10000 series routers.

show atm vc
show controller vsi descriptor
show controller vsi session
show controller vsi status
show XTagATM cross-connect
show XTagATM cross-connect traffic
show XTagATM vc

MPLS Forwarding: Quality of Service (QoS) Commands

Note These commands are not supported on Cisco 10000 series routers.

show interfaces fair-queue
show interfaces mpls-exp
show interfaces precedence

MPLS Label Distribution Protocol (LDP) Commands

show mpls atm-ldp bindings
show mpls atm-ldp bindwait
show mpls atm-ldp capability
show mpls atm-ldp summary **<===== Not supported on Cisco 10000 series routers**
show mpls ip binding detail
show mpls ldp backoff
show mpls ldp discovery all detail
show mpls ldp neighbor all
show mpls ldp neighbor detail
show mpls ldp parameters

MPLS LDP: Stateful Switchover/Nonstop Forwarding (SSO/NSF) Support and Graceful Restart Commands

show mpls checkpoint label-binding
show mpls ldp checkpoint
show mpls ldp graceful-restart
show mpls ldp neighbor graceful-restart

MPLS Traffic Engineering Commands

show ip ospf database opaque-area
show ip ospf database opaque-link
show ip ospf mpls traffic-eng fragment

show ip ospf mpls traffic-eng link
show ip rsvp fast-reroute detail
show ip rsvp installed
show ip rsvp interface
show ip rsvp neighbor
show ip rsvp reservation
show ip rsvp sender
show isis mpls traffic-eng adjacency-log
show isis mpls traffic-eng advertisements
show isis mpls traffic-eng tunnel
show mpls traffic-end link-management interfaces
show mpls traffic-eng autoroute
show mpls traffic-eng fast-reroute database detail
show mpls traffic-eng fast-reroute log reroutes
show mpls traffic-eng forwarding adjacency
show mpls traffic-eng link-management admission-control
show mpls traffic-eng link-management advertisements
show mpls traffic-eng link-management bandwidth-allocation
show mpls traffic-eng link-management summary
show mpls traffic-eng topology
show mpls traffic-eng tunnels
show mpls traffic-eng tunnels brief
show mpls traffic-eng tunnels statics summary

MPLS VPN Commands

show ip bgp labels
show ip bgp neighbors
show ip bgp vpnv4 all
show ip bgp vpnv4 all labels
show ip bgp vpnv4 all summary
show ip vrf detail
show ip vrf interfaces
show ip vrf select

Any Transport over MPLS (AToM) Commands

show mpls l2transport binding
show mpls l2transport hw-capability
show mpls l2transport summary
show mpls l2transport vc detail

MPLS VPN VRF-Specific Commands

show ip bgp vpnv4 *vpn-name* **dampening flap-statistics**
show ip bgp vpnv4 *vpn-name* **labels**
show ip bgp vpnv4 *vpn-name* **peer-group**
show ip bgp vpnv4 *vpn-name* **summary**
show ip bgp vpnv4 vrf *vpn-name* **neighbors**
show ip vrf detail *vpn-name*

show ip vrf interfaces *vpn-name*
show ip vrf select *vpn-name*

MPLS VPN VRF-Specific Forwarding Commands

show ip cef vrf *vpn-name* **adjacency discard**
show ip cef vrf *vpn-name* **adjacency drop**
show ip cef vrf *vpn-name* **adjacency glean**
show ip cef vrf *vpn-name* **adjacency null**
show ip cef vrf *vpn-name* **adjacency punt**
show ip cef vrf *vpn-name* **inconsistency**
show ip cef vrf *vpn-name* **internal**
show ip cef vrf *vpn-name* **summary**
show ip route vrf *vpn-name*
show ip vrf interfaces *vpn-name*
show mpls forwarding-table vrf *vpn-name*
show mpls interface vrf*vpn-name* **detail**

MPLS LDP VRF-Specific Commands

show mpls ip binding vrf *vpn-name* **atm detail**
show mpls ip binding vrf *vpn-name* **detail**
show mpls ip binding vrf *vpn-name* **local**
show mpls ip binding vrf *vpn-name* **summary**
show mpls ldp discovery vrf *vpn-name* **detail**
show mpls ldp neighbor vrf *vpn-name* **detail**

MPLS LDP VRF Graceful Restart-Specific Commands

show mpls ldp neighbor vrf *vpn-name* **graceful-restart**

These commands are documented in individual feature modules or Cisco IOS Release 12.2 command references. Refer to the individual commands for information about the output these commands generate.

Examples

The following example displays an abbreviated version of the **show tech-support mpls** command output:

```
Router# show tech-support mpls

------------------ show version ------------------

Cisco IOS Software, 7300 Software (C7300-P-M), Version 12.2(27)SBC, RELEASE SOF)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2005 by Cisco Systems, Inc.
Compiled Sat 10-Sep-05 17:44 by ssearch
.
.
.
------------------ show running-config ------------------

Building configuration...

Current configuration : 1827 bytes
.
```

```
.
.
------------------ show mpls ldp graceful-restart ------------------

LDP Graceful Restart is disabled
Neighbor Liveness Timer: 120 seconds
Max Recovery Time: 120 seconds
Forwarding State Holding Time: 600 seconds
```

Related Commands

Command	Description
show tech-support	Displays the equivalent of the **show buffers**, **show controllers**, **show interfaces**, **show process**, **show process memory**, **show running-config**, **show stacks**, and **show version** commands.

Feature Information for MPLS High Availability: Command Changes

Table 7 lists the release history for this feature.

Not all commands may be available in your Cisco IOS software release. For release information about a specific command, see the command reference documentation.

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

Note Table 7 lists only the Cisco IOS software release that introduced support for a given feature in a given Cisco IOS software release train. Unless noted otherwise, subsequent releases of that Cisco IOS software release train also support that feature.

Table 7 Feature Information for MPLS High Availability: Command Changes

Feature Name	Releases	Feature Information
MPLS High Availability: Command Changes	12.2(25)S 12.2(28)SB 12.2(33)SRA 12.2(33)SXH	This feature explains the MPLS commands that have been modified for the MPLS High Availability feature. In 12.2(25)S, this feature was introduced on the Cisco 7500 series router. In 12.2(28)SB, support was added for the Cisco 10000 series router. In 12.2(33)SRA, support was added for the Cisco 7600 series router. In 12.2(33)SXH, this feature was integrated into Cisco IOS Release 12.2(33)SXH.