MPLS AToM — Commands

This document contains new and revised commands for the MPLS AToM. All other commands used with MPLS AToM are documented in the Cisco IOS Release 12.2 command reference publications.

The following sections are included in this document:

- Documentation Specifics
- New and Revised Commands

Documentation Specifics

This documentation set includes the following sections:

- *Start Here: MPLS AToM: Transport, Platform, and Release Specifics*
- *MPLS AToM: Overview*
- *MPLS AToM: Configuring*
- *MPLS AToM: Commands* (this document)

Note *Start Here: MPLS AToM: Transport, Platform, and Release Specifics* details the features that are supported in each release and on each platform. Not all MPLS AToM features are supported in each Cisco IOS software release for each platform. Read the entirechapter before reading the other chapters.

The other chapters provide overview, configuration, and command reference information for MPLS AToM features.

New and Revised Commands

- connect (Frame Relay)
- debug acircuit
- debug condition
- debug frame-relay events
- debug mpls l2transport ipc
- debug mpls l2transport packet

- debug mpls l2transport signaling
- debug mpls l2transport vc
- encapsulation (Any Transport over MPLS)
- mpls l2transport route
- oam-ac emulation-enable
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- show mpls l2transport hw-capability
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connect (Frame Relay)

To define connections between Frame Relay permanent virtual circuits (PVCs), use the **connect** command in global configuration mode. To remove connections, use the **no** form of this command.

connect *connection-name interface dlci* {*interface dlci* | **l2transport**}

no connect *connection-name interface dlci* {*interface dlci* | **l2transport**}

Syntax Description

connection-name	A name for this connection.
interface	Interface on which a PVC connection will be defined.
dlci	Data-link connection identifier (DLCI) number of the PVC that will be connected.
l2transport	Specifies that the PVC will not be a locally switched PVC, but will be tunneled over the backbone network.

Defaults

No default behavior or values.

Command Modes

Global configuration

Command History

Release	Modification
12.1(2)T	This command was introduced.
12.0(23)S	This command was updated with the **l2transport** keyword.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.

Usage Guidelines

When frame Relay switching is enabled, the **connect** command creates switched PVCs in Frame Relay networks.

Examples

The following example shows how to enable Frame Relay switching and define a connection called frompls1 with a DLCI 100 on serial interface 5/0.

```
PE1_router(config)# connect frompls1 Serial5/0 1000 l2transport
```

Related Commands

Command	Description
frame-relay switching	Enables PVC switching on a Frame Relay DCE or NNI.
mpls l2transport route	Enables routing of Frame Relay packets over a specified VC.

debug acircuit

To display errors and events that occur on the attachment circuits (the circuits between the provider edge (PE) and customer edge (CE) routers), use the **debug acircuit** command in privileged EXEC mode. To disable this debugging output, use the **no** form of this command.

debug acircuit {**error** | **event**}

no debug acircuit {**error** | **event**}

Syntax Description

error	Displays any errors that occurred on any of the attachment circuits.
event	Displays any event messages for the attachment circuits, including messages about state transitions, interface transitions, and message events.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(23)S	This command was introduced.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.

Usage Guidelines

An attachment circuit connects a PE router to a CE router. A router can have many attachment circuits. The attachment circuit manager controls all the attachment circuits from one central location. Therefore, when you enable the debug messages for the attachment circuit, you receive information about all the attachment circuits.

Examples

The following is sample output from the **debug acircuit event** command when you enable an interface:

```
Router# debug acircuit event

*Jan 28 15:19:03.070: ACLIB: ac_cstate() Handling circuit UP for interface Se2/0
*Jan 28 15:19:03.070: ACLIB [11.0.1.1, 200]: pthru_intf_handle_circuit_up() calling
acmgr_circuit_up
*Jan 28 15:19:03.070: ACLIB [11.0.1.1, 200]: Setting new AC state to Ac-Connecting
*Jan 28 15:19:03.070: ACMGR: Receive <Circuit Up> msg
*Jan 28 15:19:03.070: Se2/0 ACMGR: circuit up event, SIP state chg down to connecting,
action is service request
*Jan 28 15:19:03.070: Se2/0 ACMGR: Sent a sip service request
*Jan 28 15:19:03.070: ACLIB [11.0.1.1, 200]: AC updating switch context.
*Jan 28 15:19:03.070: Se2/0 ACMGR: Rcv SIP msg: resp connect forwarded, hdl 9500001D,
l2ss_hdl 700001E
*Jan 28 15:19:03.070: Se2/0 ACMGR: service connected event, SIP state chg connecting to
connected, action is respond forwarded
*Jan 28 15:19:03.070: ACLIB: pthru_intf_response hdl is 9500001D, response is 1
*Jan 28 15:19:03.070: ACLIB [11.0.1.1, 200]: Setting new AC state to Ac-Connected
```

The following is sample output from the **debug acircuit event** command when you disable an interface:

```
Router# debug acircuit event
```

```
*Jan 28 15:25:57.014: ACLIB: SW AC interface INTF-DOWN for interface Se2/0
*Jan 28 15:25:57.014: ACLIB [11.0.1.1, 200]: Setting new AC state to Ac-Idle
*Jan 28 15:25:57.014: ACLIB: SW AC interface INTF-DOWN for interface Se2/0
*Jan 28 15:25:57.014: Se2/0 ACMGR: Receive <Circuit Down> msg
*Jan 28 15:25:57.014: Se2/0 ACMGR: circuit down event, SIP state chg connected to end,
action is service disconnect
*Jan 28 15:25:57.014: Se2/0 ACMGR: Sent a sip service disconnect
*Jan 28 15:25:57.014: ACLIB [11.0.1.1, 200]: AC deleting switch context.
*Jan 28 15:25:59.014: %LINK-5-CHANGED: Interface Serial2/0, changed state to
administratively down
*Jan 28 15:25:59.014: ACLIB: ac_cstate() Handling circuit DOWN for interface Se2/0
*Jan 28 15:26:00.014:%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial2/0, changed
state to down
```

debug condition

To limit output for some debugging commands based on specified conditions, use the **debug condition** command in privileged EXEC mode. To removed the specified condition, use the **no** form of this command.

debug condition {**username** *username* | **called** *dial-string* | **caller** *dial-string* | ***vcid*** *vc-id* | ***ip*** *ip-address*}

no debug condition {*condition-id* | **all**}

Syntax Description

username *username*	Generates debugging messages for interfaces with the specified username.
called *dial-string*	Generates debugging messages for interfaces with the called party number.
caller *dial-string*	Generates debugging messages for interfaces with the calling party number.
vcid *vc-id*	Generates debugging messages for the VC ID specified.
ip *ip-address*	Generates debugging messages for the IP address specified.
condition-id	Removes the condition indicated.
all	Removes all debugging conditions, and conditions specified by the **debug condition interface** command. Use this keyword to disable conditional debugging and reenable debugging for all interfaces.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.3(2)AA	This command was introduced.
12.0(23)S	This command was integrated into Cisco IOS Release 12.0(23)S. This command was updated with the **vcid** and **ip** keywords to support the debugging of Any Transport over MPLS (AToM) messages.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.

Defaults

All debugging messages for enabled protocol-specific **debug** commands are generated.

Usage Guidelines

Use the **debug condition** command to restrict the debug output for some commands. If any **debug condition** commands are enabled, output is only generated for interfaces associated with the specified keyword. In addition, this command enables debugging output for conditional debugging events. Messages are displayed as different interfaces meet specific conditions.

If multiple **debug condition** commands are enabled, output is displayed if at least one condition matches. All the conditions do not need to match.

The **no** form of this command removes the debug condition specified by the condition identifier. The condition identifier is displayed after you use a **debug condition** command or in the output of the **show debug condition** command. If the last condition is removed, debugging output resumes for all interfaces. You will be asked for confirmation before removing the last condition or all conditions.

Not all debugging output is affected by the **debug condition** command. Some commands generate output whenever they are enabled, regardless of whether they meet any conditions. The commands that are affected by the **debug condition** commands are generally related to dial access functions, where a large amount of output is expected. Output from the following commands is controlled by the **debug condition** command:

- **debug aaa** {**accounting** | **authorization** | **authentication**}
- **debug dialer** {**events** | **packets**}
- **debug isdn** {**q921** | **q931**}
- **debug modem** {**oob** | **trace**}
- **debug ppp** {**all** | **authentication** | **chap** | **error** | **negotiation** | **multilink events** | **packet**}

Examples

Example 1

In the following example, the router displays debugging messages only for interfaces that use a username of fred. The condition identifier displayed after the command is entered identifies this particular condition.

```
Router# debug condition username fred
Condition 1 set
```

Example 2

The following example specifies that the router should display debugging messages only for VC 1000:

```
Router# debug condition vcid 1000
Condition 1 set
01:12:32: 1000 Debug: Condition 1, vcid 1000 triggered, count 1
01:12:32: 1000 Debug: Condition 1, vcid 1000 triggered, count 1
```

Other debugging commands are enabled, but they will only display debugging for VC 1000.

```
Router# debug mpls l2transport vc event
AToM vc event debugging is on
Router# debug mpls l2transport vc fsm
AToM vc fsm debugging is on
```

The following commands shut down the interface where VC 1000 is established.

```
Router(config)# interface s3/1/0
Router(config-if)# shut
```

The debugging output shows the change to the interface where VC 1000 is established.

```
01:15:59: AToM MGR [13.13.13.13, 1000]: Event local down, state changed from established
to remote ready
01:15:59: AToM MGR [13.13.13.13, 1000]: Local end down, vc is down
01:15:59: AToM SMGR [13.13.13.13, 1000]: Processing imposition update, vc_handle 6227BCF0,
update_action 0, remote_vc_label 18
01:15:59: AToM SMGR [13.13.13.13, 1000]: Imposition Disabled
01:15:59: AToM SMGR [13.13.13.13, 1000]: Processing disposition update, vc_handle
6227BCF0, update_action 0, local_vc_label 755
01:16:01:%LINK-5-CHANGED: Interface Serial3/1/0, changed state to administratively down
01:16:02:%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/1/0, changed state to
down
```

Related Commands

Command	Description
debug condition interface	Limits output for some debugging commands based on the interfaces.

debug frame-relay events

To display debugging information about Frame Relay Address Resolution Protocol (ARP) replies on networks that support a multicast channel and use dynamic addressing, use the **debug frame-relay events** command in privileged EXEC mode. To disable debugging output, use the **no** form of this command.

debug frame-relay events

no debug frame-relay events

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.3	This command was introduced.
12.0(23)S	This command was integrated into Cisco IOS Release 12.0(23)S for the Frame Relay over MPLS feature.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.

Usage Guidelines

This command is useful for identifying the cause of end-to-end connection problems during the installation of a Frame Relay network or node.

Note Because the **debug frame-relay events** command does not generate much output, you can use it at any time, even during periods of heavy traffic, without adversely affecting other users on the system.

Examples

The following is sample output from the **debug frame-relay events** command:

```
Router# debug frame-relay events

Serial2(i): reply rcvd 172.16.170.26 126
Serial2(i): reply rcvd 172.16.170.28 128
Serial2(i): reply rcvd 172.16.170.34 134
Serial2(i): reply rcvd 172.16.170.38 144
Serial2(i): reply rcvd 172.16.170.41 228
Serial2(i): reply rcvd 172.16.170.65 325
```

As the output shows, the **debug frame-relay events** command returns one specific message type. The first line, for example, indicates that IP address 172.16.170.26 sent a Frame Relay ARP reply; this packet was received as input on serial interface 2. The last field (126) is the data-link connection identifier (DLCI) to use when communicating with the responding router.

For Frame Relay over MPLS, the following is sample output for the **debug frame-relay events** command. The command output shows the status of the VCs.

```
Router# debug frame-relay events
Frame Relay events debugging is on
```

This example shows the messages that are displayed when you shut the core-facing interface on a PE router:

```
04:40:38:%SYS-5-CONFIG_I: Configured from console by consolenf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)# interface hssi2/0
Router(config-if)# shut

04:40:43:%OSPF-5-ADJCHG: Process 10, Nbr 12.12.12.12 on Hssi2/0 from FULL to DOWN,
Neighbor Down: Interface down or detached
04:40:43: FRoMPLS [12.12.12.12, 100]: PW pvc_status set INACTIVE
04:40:43: FRoMPLS [12.12.12.12, 100]: Setting pw segment DOWN
04:40:43: FRoMPLS [12.12.12.12, 100]: Setting connection DOWN
04:40:43: FRoMPLS [12.12.12.12, 101]: PW pvc_status set INACTIVE
04:40:43: FRoMPLS [12.12.12.12, 101]: Setting pw segment DOWN
04:40:43: FRoMPLS [12.12.12.12, 101]: Setting connection DOWN
04:40:45:%LINK-5-CHANGED: Interface Hssi2/0, changed state to administratively down
04:40:46:%LINEPROTO-5-UPDOWN: Line protocol on Interface Hssi2/0, changed state to down
```

This example shows the messages that are displayed when you enable the core-facing interface on a PE router:

```
Router(config-if)# no shut

04:40:56:%LINK-3-UPDOWN: Interface Hssi2/0, changed state to up
04:40:57:%LINEPROTO-5-UPDOWN: Line protocol on Interface Hssi2/0, changed state to up
04:41:06:%OSPF-5-ADJCHG: Process 10, Nbr 12.12.12.12 on Hssi2/0 from LOADING to FULL,
Loading Done
04:41:19: FRoMPLS [12.12.12.12, 100]: PW pvc_status set ACTIVE
04:41:19: FRoMPLS [12.12.12.12, 100]: Setting pw segment UP
04:41:19: FRoMPLS [12.12.12.12, 101]: PW pvc_status set ACTIVE
04:41:19: FRoMPLS [12.12.12.12, 101]: Setting pw segment UP
```

This example shows the messages that are displayed when you shut the edge-facing interface on a PE router:

```
Router(config)# interface pos4/0
Router(config-if)# shut

04:42:50: FRoMPLS [12.12.12.12, 100]: acmgr_circuit_down
04:42:50: FRoMPLS [12.12.12.12, 100]: Setting connection DOWN
04:42:50: FRoMPLS [12.12.12.12, 100]: PW pvc_status set INACTIVE
04:42:52:%LINK-5-CHANGED: Interface POS4/0, changed state to administratively down
04:42:53:%LINEPROTO-5-UPDOWN: Line protocol on Interface POS4/0, changed state to down
```

This example shows the messages that are displayed when you enable the edge-facing interface on a PE router:

```
Router(config)# interface pos4/0
Router(config-if)# no shut

04:43:20:%LINK-3-UPDOWN: Interface POS4/0, changed state to up
c72-33-2(config-if)#
04:43:20: FRoMPLS [12.12.12.12, 100]: Local up, sending acmgr_circuit_up
04:43:20: FRoMPLS [12.12.12.12, 100]: PW nni_pvc_status set ACTIVE
04:43:20: FRoMPLS [12.12.12.12, 100]: PW pvc_status set ACTIVE
04:43:20: FRoMPLS [12.12.12.12, 100]: Setting pw segment UP
```

debug mpls l2transport ipc

To display the interprocessor communication (IPC) messages exchanged between distributed platforms, such as the Cisco 12000 series router and the Cisco 7500 series routers, use the **debug mpls l2transport ipc** command in privileged EXEC mode. To disable this debugging output, use the **no** form of this command.

debug mpls l2transport ipc

no debug mpls l2transport ipc

Syntax Description

This command has no arguments or keywords.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(23)S	This command was introduced.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.

Usage Guidelines

You can issue this command either from the line card or the route processor to log AToM updates to or from line cards. This command applies only to platforms that support distributed mode.

Examples

The following is sample output from the **debug mpls l2transport ipc** command:

```
Router# debug mpls l2transport ipc
AToM ipc debugging is on
*May 27 23:56:04.699 UTC: AToM SMGR: Repopulating line card 255
*May 27 23:56:04.699 UTC: AToM SMGR [17.17.17.17, 1101]: Sending Imposition update to slot
255
*May 27 23:56:04.699 UTC: AToM SMGR [17.17.17.17, 1101]: Imposition being done on ingress
interface
*May 27 23:56:04.699 UTC: AToM SMGR [17.17.17.17, 1101]: Sending disposition update to
slot 255
*May 27 23:56:04.699 UTC: AToM SMGR [17.17.17.17, 1101]: Distributing disposition info to
all linecards
*May 27 23:56:04.699 UTC: AToM SMGR [17.17.17.17, 701]: Sending Imposition update to slot
255
*May 27 23:56:04.699 UTC: AToM SMGR [17.17.17.17, 701]: Imposition being done on ingress
interface
*May 27 23:56:04.699 UTC: AToM SMGR [17.17.17.17, 701]: Sending disposition update to slot
255
*May 27 23:56:04.699 UTC: AToM SMGR [17.17.17.17, 701]: Distributing disposition info to
all linecards
*May 27 23:56:04.699 UTC: AToM SMGR [17.17.17.17, 1201]: Sending Imposition update to slot
255
*May 27 23:56:04.699 UTC: AToM SMGR [17.17.17.17, 1201]: Imposition being done on ingress
interface
*May 27 23:56:04.699 UTC: AToM SMGR [17.17.17.17, 1201]: Sending disposition update to
slot 255
```

```
*May 27 23:56:04.699 UTC: AToM SMGR [17.17.17.17, 1201]: Distributing disposition info to
all linecards
```

debug mpls l2transport packet

To display information about the status of Any Transport over MPLS (ATOM) switched packets, use the **debug mpls l2transport packet** command in privileged EXEC mode. To disable debugging output, use the **no** form of this command.

debug mpls l2transport packet {**data** |**error**}

no debug mpls l2transport packet {**data** | **error**}

Syntax Description

data	Displays (in hex) the AToM switched packets for imposition and disposition. This can help validate that packets are flowing between the CE routers. Also, you can display the packets to check the format of the data or the data itself.
error	Displays AToM switching errors, such as the reason that packets cannot be switched. This can help identify why data is not being transported.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(23)S	This command was introduced.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.

Usage Guidelines

Use this command sparingly, because the command output can be overwhelming.

For platforms that support distributed switching, the command displays output only for packets switched by the central route processor module. Packets switched autonomously by the linecards are not displayed. For example, packets switched by Versatile Interface Processors (VIPs) on the Cisco 7500 router are not displayed.

Examples

The following is sample output from the **debug mpls l2transport packet** commands for a PPP over MPLS configuration:

```
Router# debug mpls l2transport packet data
AToM packet data debugging is on

Router# debug mpls l2transport packet error
AToM packet errors debugging is on

Router# show debug
AToM:
  AToM packet data debugging is on
  AToM packet errors debugging is on

*Mar 24 23:29:30.495: ATOM-PPP Switching: check features failed.
*Mar 24 23:29:30.495: ATOM-PPP Switching (Fast) Imposition Packet data: experimental bits
are 0
*Mar 24 23:29:30.495: 0F 00 88 47 00 01 10 FF 00 01 51 02 00 00 00 00
*Mar 24 23:29:30.495: 00 FD C0 01 01 01 C0 4B 41 73 F4 00 01 00 02 CC
```

```
*Mar 24 23:29:30.495: 66 51 88 B4 CE 73 39 00 00 40 00 88 03 02 00 70
*Mar 24 23:29:30.495: 23 30 00 04 3C 61 83 C0 00 06 00 06 94 CC A7 23
*Mar 24 23:29:30.495: 49 84 D8 33 17 8C F2 60 00 11 9E 80 00 50 08 08
*Mar 24 23:29:30.495: 86 69 39 98 CD E2 02 49 B8 E9 9D 0D C6 53 A1 DC
*Mar 24 23:29:30.495: DE 72 35 88 09 E7 0C 60 61 3A 1A 4D C6 71 01 4C
*Mar 24 23:29:30.495: F2 73 CC 06 DC 38 6F 33 66 83 09 C8 CA 20 05 12
*Mar 24 23:29:30.495: 49 E5 31 00 A0 E8 6D 14 88 06 E3 21 80 C3 31 E4
*Mar 24 23:29:30.495: 28 21 E4 21 69 28 A6 2D 26 8A 45 82 02 B6 FC 39
*Mar 24 23:29:30.499: D8 60 A3 62 B1 60 A5 80
*Mar 24 23:29:31.835: ATOM-L2 Switching Disposition Packet data:
*Mar 24 23:29:31.835: FF 03 00 FD C0 04 8A 57 FF FF FF FF FF FF FF FF
*Mar 24 23:29:31.835: FF FF FB 14 B0 00

*Mar 24 23:29:49.423: ATOM-L2 Switching Disposition Packet data:
*Mar 24 23:29:49.423: FF 03 C0 21 01 11 00 0F 03 05 C2 23 05 05 06 5F
*Mar 24 23:29:49.423: 23 35 D4
*Mar 24 23:29:49.435: ATOM-PPP Switching: check features failed.
*Mar 24 23:29:49.435: ATOM-PPP Switching (Fast) Imposition Packet data: experimental bits
are 0
*Mar 24 23:29:49.435: 0F 00 88 47 00 01 10 FF 00 01 61 02 00 15 00 00
*Mar 24 23:29:49.435: C0 21 01 2F 00 0F 03 05 C2 23 05 05 06 5F CC 5F
*Mar 24 23:29:49.435: E5
*Mar 24 23:29:49.435: ATOM-PPP Switching: check features failed.
*Mar 24 23:29:49.435: ATOM-PPP Switching (Fast) Imposition Packet data: experimental bits
are 0
*Mar 24 23:29:49.435: 0F 00 88 47 00 01 10 FF 00 01 61 02 00 15 00 00
*Mar 24 23:29:49.435: C0 21 02 11 00 0F 03 05 C2 23 05 05 06 5F 23 35
*Mar 24 23:29:49.435: D4
*Mar 24 23:29:49.443: ATOM-L2 Switching Disposition Packet data:
*Mar 24 23:29:49.443: FF 03 C0 21 02 2F 00 0F 03 05 C2 23 05 05 06 5F
*Mar 24 23:29:49.443: CC 5F E5
*Mar 24 23:29:49.447: ATOM-L2 Switching Disposition Packet data:
*Mar 24 23:29:49.447: FF 03 C2 23 01 D0 00 1C 10 45 59 13 1A 92 FD 93
*Mar 24 23:29:49.447: 01 A2 CF B6 FB 3A 04 46 93 63 65 32 2D 67 73 72
*Mar 24 23:29:49.451: ATOM-PPP Switching: check features failed.
*Mar 24 23:29:49.451: ATOM-PPP Switching (Fast) Imposition Packet data: experimental bits
are 0
*Mar 24 23:29:49.451: 0F 00 88 47 00 01 10 FF 00 01 61 02 00 22 00 00
*Mar 24 23:29:49.451: C2 23 01 F5 00 1C 10 F1 98 35 3F 79 F2 1A 15 10
*Mar 24 23:29:49.451: B4 C0 73 D7 B1 9F 2A 63 65 31 2D 67 73 72
*Mar 24 23:29:49.455: ATOM-PPP Switching: check features failed.
*Mar 24 23:29:49.455: ATOM-PPP Switching (Fast) Imposition Packet data: experimental bits
are 0
*Mar 24 23:29:49.455: 0F 00 88 47 00 01 10 FF 00 01 61 02 00 22 00 00
*Mar 24 23:29:49.455: C2 23 02 D0 00 1C 10 56 4A 32 5B 99 55 D5 CF 44
*Mar 24 23:29:49.455: FC D3 D9 3F CC 8C A8 63 65 31 2D 67 73 72
*Mar 24 23:29:49.463: ATOM-L2 Switching Disposition Packet data:
*Mar 24 23:29:49.463: FF 03 C2 23 02 F5 00 1C 10 45 84 E4 E5 DD C0 5F
*Mar 24 23:29:49.463: FD 2F 37 63 9A 3D 03 7B B9 63 65 32 2D 67 73 72
*Mar 24 23:29:49.463: ATOM-L2 Switching Disposition Packet data:
*Mar 24 23:29:49.463: FF 03 C2 23 03 D0 00 04
*Mar 24 23:29:49.471: ATOM-PPP Switching: check features failed.
*Mar 24 23:29:49.471: ATOM-PPP Switching (Fast) Imposition Packet data: experimental bits
are 0
*Mar 24 23:29:49.471: 0F 00 88 47 00 01 10 FF 00 01 61 02 00 0A 00 00
*Mar 24 23:29:49.471: C2 23 03 F5 00 04
*Mar 24 23:29:49.471: ATOM-PPP Switching: check features failed.
*Mar 24 23:29:49.471: ATOM-PPP Switching (Fast) Imposition Packet data: experimental bits
are 0
*Mar 24 23:29:49.471: 0F 00 88 47 00 01 10 FF 00 01 61 02 00 10 00 00
*Mar 24 23:29:49.471: 80 21 01 0B 00 0A 03 06 78 01 01 78
*Mar 24 23:29:49.475: ATOM-PPP Switching: check features failed.
```

debug mpls l2transport signaling

To display information about the Any Transport over MPLS (AToM) signaling protocol, use the **debug mpls l2transport signaling** command in privileged EXEC mode. To disable debugging output, use the **no** form of this command.

debug mpls l2transport signaling {**event** | **message**}

no debug mpls l2transport signaling {**event** | **message**}

Syntax Description

event	Displays AToM signaling events.
message	Displays AToM signaling status messages.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(23)S	This command was introduced.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.

Examples

The following is sample output from the **debug mpls l2transport signaling** command:

```
Router# debug mpls l2transport signaling event
AToM LDP event debugging is on

Router# debug mpls l2transport signaling message
AToM LDP message debugging is on

Router# show debugging
AToM:
  AToM LDP event debugging is on
  AToM LDP message debugging is on

*Mar 24 23:10:55.611: AToM LDP [9.9.9.9]: Allocate LDP instance
*Mar 24 23:10:55.611: AToM LDP [9.9.9.9]: Opening session, 1 clients
*Mar 24 23:10:56.063: %SYS-5-CONFIG_I: Configured from console by console
*Mar 24 23:10:56.583: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed
state to up
*Mar 24 23:11:00.539: AToM LDP [9.9.9.9]: Session is up
*Mar 24 23:11:00.539: AToM LDP [9.9.9.9]: Peer address change, add 1.1.1.100
*Mar 24 23:11:00.539: AToM LDP [9.9.9.9]: Peer address change, add 46.1.1.6
*Mar 24 23:11:00.539: AToM LDP [9.9.9.9]: Peer address change, add 9.9.9.9
*Mar 24 23:11:00.539: AToM LDP [9.9.9.9]: Peer address change, add 57.1.1.6
*Mar 24 23:11:00.539: AToM LDP [9.9.9.9]: Sending label mapping msg
vc type 7, cbit 1, vc id 50, group id 6, vc label 21, status 0, mtu 1500
*Mar 24 23:11:00.539: AToM LDP [9.9.9.9]: Received label mapping msg, id 113
vc type 7, cbit 1, vc id 50, group id 6, vc label 21, status 0, mtu 1500
```

debug mpls l2transport vc

To display information about the status of the AToM VCs, use the **debug mpls l2transport vc** command in privileged EXEC mode. To disable debugging output, use the **no** form of this command.

debug mpls l2transport vc {**event** | **fsm**}

no debug mpls l2transport vc {**event** | **fsm**}

Syntax Description

event	Displays AToM event messages about the VCs.
fsm	Displays the finite state machine.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(23)S	This command was introduced.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.

Usage Guidelines

You can issue this command from the line card or route processor.

Examples

The following is sample output from the **debug mpls l2transport vc** commands:

```
Router# debug mpls l2transport vc event
AToM vc event debugging is on

Router# debug mpls l2transport vc fsm
AToM vc fsm debugging is on

Router# show debugging
AToM:
  AToM vc event debugging is on
  AToM vc fsm debugging is on

*Mar 24 23:17:24.371: AToM MGR [9.9.9.9, 50]: Event provision, state changed from idle to
provisioned
*Mar 24 23:17:24.371: AToM MGR [9.9.9.9, 50]: Provision vc
*Mar 24 23:17:24.371: AToM SMGR [9.9.9.9, 50]: Requesting VC create, vc_handle 61A09930
*Mar 24 23:17:24.371: AToM MGR [9.9.9.9, 50]: Event local up, state changed from
provisioned to local standby
*Mar 24 23:17:24.371: AToM MGR [9.9.9.9, 50]: Update local vc label binding
*Mar 24 23:17:24.371: AToM SMGR [9.9.9.9, 50]: sucessfully processed create request
*Mar 24 23:17:24.875: %SYS-5-CONFIG_I: Configured from console by console
*Mar 24 23:17:25.131: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial3/0, changed
state to up

*Mar 24 23:17:28.567: AToM MGR [9.9.9.9, 50]: Event ldp up, state changed from local
standby to local ready
*Mar 24 23:17:28.567: AToM MGR [9.9.9.9, 50]: Advertise local vc label binding
```

```
*Mar 24 23:17:28.567: AToM MGR [9.9.9.9, 50]: Event remote up, state changed from local
ready to establishing
*Mar 24 23:17:28.567: AToM MGR [9.9.9.9, 50]: Remote end up
*Mar 24 23:17:28.567: AToM MGR [9.9.9.9, 50]: Event remote validated, state changed from
establishing to established
*Mar 24 23:17:28.567: AToM MGR [9.9.9.9, 50]: Validate vc, activating data plane
*Mar 24 23:17:28.567: AToM SMGR [9.9.9.9, 50]: Processing imposition update, vc_handle
61A09930, update_action 3, remote_vc_label 21
*Mar 24 23:17:28.567: AToM SMGR [9.9.9.9, 50]: Imposition Programmed, Output Interface:
PO5/0
*Mar 24 23:17:28.567: AToM SMGR [9.9.9.9, 50]: Processing disposition update, vc_handle
61A09930, update_action 3, local_vc_label 22
*Mar 24 23:17:28.571: AToM SMGR: Processing TFIB event for 9.9.9.9
*Mar 24 23:17:28.571: AToM SMGR [9.9.9.9, 50]: Imposition Programmed, Output Interface:
PO5/0
```

encapsulation (Any Transport over MPLS)

To configure the ATM adaptation layer (AAL) for an Any Transport over MPLS (AToM) ATM permanent virtual circuit (PVC), use the **encapsulation** command in AToM-VC configuration mode. To remove an encapsulation from an AToM PVC, use the **no** form of this command.

encapsulation *layer-type*

no encapsulation *layer-type*

Syntax Description

layer-type	The adaptation layer type. Possible values are: **aal5—**ATM adaptation layer 5 **aal0—**ATM adaptation layer 0

Defaults

The default encapsulation is AAL5.

Command Modes

AToM VC configuration

Command History

Release	Modification
12.0(23)S	This command was introduced.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.

Usage Guidelines

The **pvc** command and the **encapsulation** command work together. How you use the commands for AToM is slightly different than for all other applications. The following table shows the differences in how the commands are used:

Other Applications	AToM
`pvc 1/100` `  encapsulation aal5snap`	`pvc 1/100 l2transport` `  encapsulation aal5`

The following list highlights the differences:

- **pvc** command**:** For most applications, you create a PVC by using the **pvc** *vpi/vci* command. For AToM, you must add the **l2transport** keyword to the **pvc** command. The *l2transport* keyword enables the PVC to transport Layer 2 packets.
- **encapsulation** command**:** The **encapsulation** command for AToM has only two keyword values: **aal5** or **aal0**. You cannot specify an encapsulation type. In contrast, the **encapsulation aal5** command you use for most other applications requires you to specify the encapsulation type, such as **aal5snap**.
- **pvc** command and **encapsulation** command**:** The AToM **encapsulation** command works only with the **pvc** command. You cannot create switched virtual circuits or VC bundles to transport Layer 2 packets. You can only use PVCs to transport Layer 2 packets.

When you use the **aal5** keyword, incoming cells (except OAM cells) on that PVC are treated as AAL5 encapsulated packets. The router reassembles the packet from the incoming cells. The router does not check the contents of the packet, so it does not need to know the encapsulation type (such as aal5snap, aal5mux, and so on). After imposing the MPLS label stack, the router sends the reassembled packet over the MPLS core network.

When you use the **aal0** keyword, the router strips the header error control (HEC) byte from the cell header and adds the MPLS label stack. The router sends the cell over the MPLS core network.

Examples

The following example shows how to configure a PVC to transport AAL5 packets for AToM:

```
pvc 1/100 l2transport
  encapsulation aal0
```

Related Commands

Command	Description
pvc	Creates or assigns a name to an ATM PVC.
encapsulation aal5	Configures AAL encapsulation type for an ATM PVC.

mpls l2transport route

To enable routing of Any Transport over MPLS (AToM) packets over a specified virtual circuit (VC), use the **mpls l2transport route** command in the appropriate command mode. To delete the VC, use the **no** form of this command on both routers.

mpls l2transport route *destination vc-id*

no mpls l2transport route *destination vc-id*

Syntax Description

destination	Specifies the Label Distribution Protocol (LDP) IP address of the remote provider edge (PE) router.
vc-id	Assigns a VC ID to the virtual circuit between two PE routers.

Defaults

No default behavior or values.

Command Modes

Depending on the AToM transport type you are configuring, you use the **mpls l2transport route** command in one of the following command modes:

Transport Type	Command Mode
ATM AAL5 and Cell Relay	ATM VC configuration mode
Ethernet VLAN	Subinterface configuration mode
Frame Relay	Connect submode
HDLC and PPP	Interface configuration mode

Command History

Release	Modification
12.1(8a)E	This command was introduced.
12.0(21)ST	This command was integrated into Cisco IOS Release 12.0(21)ST.
12.0(23)S	This command was integrated into Cisco IOS Release 12.0(23)S.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.

Usage Guidelines

An MPLS VC runs across an MPLS cloud to connect interfaces on two provider edge (PE) routers.

Use this command on each PE router to route packets across the MPLS cloud to the interface of the other PE router. Specify the LDP IP address of the other PE router for the *destination* parameter. Do not specify the IP address of the router from which you are issuing the command.

You can choose any number for the VC ID. However, the VC ID must be unique per pair of routers. Therefore, in large networks, it may be necessary to track the VC ID assignments to ensure that a VC ID does not get assigned twice.

Examples

The following examples show some implementations of the command. Two routers are named PE1 and PE2, which establish a VC to transport packets. PE1 has IP address 172.16.0.1, and PE2 has IP address 192.168.0.1. The VC ID is 50.

ATM AAL5 over MPLS Example

At PE1, you issue the following commands:

```
PE1_Router(config)# interface atm5/0.100
PE1_Router(config-if)# pvc 1/200
PE1_Router(config-atm-vc)# encapsulation aal5
PE1_Router(config-atm-vc)# mpls l2transport route 192.168.0.1 50
```

At PE2, you issue the following commands:

```
PE2_Router(config)# interface atm5/0.100
PE2_Router(config-if)# pvc 1/200
PE2_Router(config-atm-vc)# encapsulation aal5
PE2_router(config-atm-vc)# mpls l2transport route 172.16.0.1 50
```

ATM Cell Relay over MPLS Example

At PE1, you issue the following commands:

```
PE1_Router(config)# interface atm5/0.100
PE1_Router(config-if)# pvc 1/200 l2transport
PE1_Router(config-atm-vc)# encapsulation aal0
PE1_Router(config-atm-vc)# mpls l2transport route 192.168.0.1 50
```

At PE2, you issue the following commands:

```
PE2_Router(config)# interface atm5/0.100
PE2_Router(config-if)# pvc 1/200 l2transport
PE2_Router(config-atm-vc)# encapsulation aal0
PE2_router(config-atm-vc)# mpls l2transport route 172.16.0.1 50
```

Ethernet over MPLS Example

At PE1, you issue the following commands:

```
PE1_router(config)# interface GigabitEthernet1/0.2
PE1_Router(config-subif)# encapsulation dot1Q 200
PE1_Router(config-subif)# mpls l2transport route 192.168.0.1 50
```

At PE2, you issue the following commands:

```
PE2_router(config)# interface GigabitEthernet2/0.1
PE2_Router(config-subif)# encapsulation dot1Q 200
PE2_Router(config-subif)# mpls l2transport route 172.16.0.1 50
```

Frame Relay over MPLS Example

At PE1, you issue the following commands:

```
PE1_router(config)# connect frompls1 Serial5/0 1000 l2transport
PE1_router(config-fr-pw-switching)# mpls l2transport route 192.168.0.1 50
```

At PE2, you issue the following commands:

```
PE2_router(config)# connect frompls2 Serial2/0 102 l2transport
PE2_router(config-fr-pw-switching)# mpls l2transport route 172.16.0.1 50
```

HDLC over MPLS Example

At PE1, you issue the following commands:

```
PE1_router(config)# interface Serial3/0
```

```
PE1_router(config-if)# encapsulation hdlc
PE1_router(config-if)# mpls l2transport route 192.168.0.1 50
```

At PE2, you issue the following commands:

```
PE2_router(config)# interface Serial1/0
PE2_router(config-if)# encapsulation hdlc
PE2_router(config-if)# mpls l2transport route 172.16.0.1 50
```

PPP over MPLS Example

At PE1, you issue the following commands:

```
PE1_router(config)# interface Serial3/0
PE1_router(config-if)# encapsulation ppp
PE1_router(config-if)# mpls l2transport route 192.168.0.1 50
```

At PE2, you issue the following commands:

```
PE2_router(config)# interface Serial1/0
PE2_router(config-if)# encapsulation ppp
PE2_router(config-if)# mpls l2transport route 172.16.0.1 50
```

oam-ac emulation-enable

To enable Operation, Administration, and Maintenance (OAM) cell emulation on ATM adaptation layer 5 (AAL5) over Multiprotocol Label Switching (MPLS), use the **oam-ac emulation-enable** command in the ATM VC configuration mode on both provider edge (PE) routers. To disable OAM cell emulation, use the **no** form of this command on both routers.

oam-ac emulation-enable [*ais-rate*]

no oam-ac emulation-enable [*ais-rate*]

Syntax Description

ais-rate	(Optional) The rate (in seconds) at which the AIS cells should be sent. The range is 0 - 60 seconds. If you specify 0, no AIS cells are sent. The default is 1 second, which means that one AIS cell is sent every second.

Defaults

By default OAM cell emulation is disabled. If you enable OAM cell emulation without specifying an AIS rate, the default is to send one AIS cell every second..

Command Modes

ATM VC configuration mode

Command History

Release	Modification
12.0(23)S	This command was introduced.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.

Usage Guidelines

This command is only applicable to AAL5 over MPLS and is not supported with ATM Cell Relay over MPLS.

This command is only available when you specify the **pvc** *vpi/vci* **l2transport** command.

Examples

The following example shows how to enable OAM cell emulation on an ATM PVC.

```
Router# interface ATM 1/0/0
Router(config-if)# pvc 1/200 l2transport
Router(config-atm-vc)# oam-ac emulation-enable
```

The following example sets the rate at which an AIS cell is sent to every 30 seconds:

```
Router (config-atm-vc)# oam-ac emulation-enable 30
```

Related Commands

Command	Description
show atm pvc	Displays all ATM PVCs and traffic information.

pvc

To create or assign a name to an ATM permanent virtual circuit (PVC), to specify the encapsulation type on an ATM PVC, and to enter interface-ATM-VC configuration mode, use the **pvc** command in interface or subinterface configuration mode. To remove an ATM PVC, use the **no** form of this command.

pvc [*name*] *vpi*/*vci* [**ces** | **ilmi** | **qsaal** | **smds** | **l2transport**]

no pvc [*name*] *vpi*/*vci* [**ces** | **ilmi** | **qsaal** | **smds** | **l2transport**]

Syntax Description

name	(Optional) The name of the PVC or map. The name can be up to 16 characters long.
vpi/	ATM network virtual path identifier (VPI) for this PVC. The absence of the slash (/) and a *vpi* value defaults the *vpi* value to 0. **Value Ranges** 0 to 255 except for the following routers: • Cisco 4500 and 4700 routers: 0 to 1 less than the quotient of 8192 divided by the value set by the **atm vc-per-vp** command • Cisco 2600 and 3600 series routers using Inverse Multiplexing for ATM (IMA): 0 to 15, 64 to 79, 128 to 143, and 192 to 207 The arguments *vpi* and *vci* cannot both be set to 0; if one is 0, the other cannot be 0.
vci	ATM network virtual channel identifier (VCI) for this PVC. This value ranges from 0 to 1 less than the maximum value set for this interface by the **atm vc-per-vp** command. Typically, lower values 0 to 31 are reserved for specific traffic (for example, F4 OAM, SVC signaling, ILMI, and so on) and should not be used. The VCI is a 16-bit field in the header of the ATM cell. The VCI value is unique only on a single link, not throughout the ATM network, because it has local significance only. The arguments *vpi* and *vci* cannot both be set to 0; if one is 0, the other cannot be 0.
ces	(Optional) Circuit Emulation Service encapsulation. This keyword is available on the OC-3/STM-1 ATM Circuit Emulation Service network module only.
ilmi	(Optional) Sets up communication with the Interim Local Management Interface (ILMI); the associated *vpi* and *vci* values ordinarily are 0 and 16, respectively.
qsaal	(Optional) A signaling-type PVC used for setting up or tearing down SVCs; the associated *vpi* and *vci* values ordinarily are 0 and 5, respectively.
smds	(Optional) Encapsulation for SMDS networks. If you are configuring an ATM PVC on the ATM Interface Processor (AIP), you must configure AAL3/4SMDS using the **atm aal aal3/4** command before specifying **smds** encapsulation. If you are configuring an ATM network processor module (NPM), the **atm aal aal3/4** command is not required. SMDS encapsulation is not supported on the ATM port adapter.
l2transport	(Optional) Used to specify that the PVC is switched and not terminated.

Defaults

No PVC is defined. When a PVC is defined, the global default of the **encapsulation** command applies (*aal-encap* = **aal5snap**).

Command Modes Interface or subinterface configuration

Command History

Release	Modification
11.3 T	This command was introduced.
12.1(2)T	The following modifications were made: • The ranges for the VPI were increased for Cisco 2600 and Cisco 3600 series routers using IMA. • The **ces** keyword was added for configuring CES encapsulation when using the OC-3/STM-1 ATM Circuit Emulation Service network module on Cisco 2600 and Cisco 3600 series routers.
12.0(23)S	The **l2transport** keyword was added.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.

Usage Guidelines

Creating and Configuring PVCs

The **pvc** command replaces the **atm pvc** command, which, although still supported and available, will become obsolete in the near future. Use the **pvc** command to configure a single ATM VC only, not a VC that is a bundle member. We recommend that you use the **pvc** command in conjunction with the **encapsulation** and **random-detect attach** commands instead of the **atm pvc** command.

The **pvc** command creates a PVC and attaches it to the VPI and VCI specified. Both the *vpi* and *vci* arguments cannot be simultaneously specified as 0; if one is 0, the other cannot be 0.

When configuring an SVC, use the **pvc** command to configure the PVC that handles SVC call setup and termination. In this case, specify the **qsaal** keyword. See the "Examples" section.

ATM PVC Names

Once you specify a *name* for a PVC, you can reenter interface-ATM-VC configuration mode by simply entering the **pvc** *name* command. You can remove a PVC and any associated parameters by entering **no pvc** *name* or **no pvc** *vpi*/*vci*.

Note After configuring the parameters for an ATM PVC, you must exit the interface-ATM-VC configuration mode in order to create the PVC and enable the settings.

Encapsulation Types on ATM PVCs

Specify CES, ILMI, QSAAL, or SMDS as the encapsulation type on an ATM PVC. (To configure other encapsulation types, see the **encapsulation** command.)

Configuring CES encapsulation on a PVC is equivalent to creating a constant bit rate (CBR) class of service.

Rate Queues

The Cisco IOS software dynamically creates rate queues as necessary to satisfy the requests of the **pvc** commands.

Default Configurations

If **ilmi**, **qsaal**, or **smds** encapsulation is not explicitly configured on the ATM PVC, the PVC inherits the following default configuration (listed in order of precedence):

- Configuration of the **encapsulation** command in a VC class assigned to the PVC itself.
- Configuration of the **encapsulation** command in a VC class assigned to the ATM subinterface of the PVC.
- Configuration of the **encapsulation** command in a VC class assigned to the ATM main interface of the PVC.
- Global default: The global default of the **encapsulation** command applies (*aal-encap* = **aal5snap**).

Examples

The following example creates a PVC with VPI 0 and VCI 16, and communication is set up with the ILMI:

```
pvc cisco 0/16 ilmi
 exit
```

The following example creates a PVC used for ATM signaling for an SVC. It specifies VPI 0 and VCI 5:

```
pvc cisco 0/5 qsaal
 exit
```

The following example configures the PVC called "cisco" to use class-based weighted fair queueing (CBWFQ). It attaches a policy map called "policy1" to the PVC. The classes the make up "policy1" determine the service policy for the PVC:

```
pvc cisco 0/5
 service-policy output policy1
 vbr-nrt 2000 2000
 encap aal5snap
```

Related Commands

Command	Description
atm vc-per-vp	Sets the maximum number of VCIs to support per VPI.
pvc-bundle	Adds a PVC to a bundle as a member of the bundle and enters bundle-vc configuration mode in order to configure that PVC bundle member.

show atm pvc

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

show atm pvc [*vpi*/*vci* | *name* | **interface atm** *interface-number*] [**ppp**]

Syntax Description

vpi/*vci*	(Optional) The ATM virtual path identifier (VPI) and virtual channel identifier (VCI) numbers. The absence of the slash (**/**) and a *vpi* value defaults the *vpi* value to 0.
name	(Optional) Name of the PVC.
interface atm *interface-number*	(Optional) Interface number or subinterface number of the PVC. Displays all PVCs on the specified interface or subinterface. The *interface-number* argument uses one of the following formats, depending on which 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 NPM on Cisco 4500 and 4700 routers: *number*[**.***subinterface-number* **multipoint**] For a description of these arguments, refer to the **interface atm** command.
ppp	(Optional) Displays each PVC configured for PPP over ATM.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.3T	This command was introduced.
12.1(1)T	This command was modified to display PPPoE status.
12.0(23)S	This command was modified to display OAM cell emulation status for Any Transport over MPLS (AToM).
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.

Usage Guidelines

If the *vpi*/*vci* or *name* argument is not specified, the output of this command is the same as that of the **show atm vc** command, but only the configured PVCs are displayed. See the first sample output in the "Examples" section.

If the *vpi*/*vci* or *name* argument is specified, the output of this command is the same as the **show atm vc** *vcd* command, with extra information related to PVC management including connection name, detailed states, and Operation, Administration, and Maintenance (OAM) counters. See the second and third sample output in the "Examples" section.

If the **interface atm** *interface-number* option is included in the command, all PVCs under that interface or subinterface are displayed. See the third sample output in the "Examples" section.

Examples

The following is sample output from the **show atm pvc** command:

```
Router# show atm pvc

           VCD/                                      Peak      Avg/Min   Burst
Interface  Name   VPI   VCI   Type   Encaps      Kbps         Kbps   Cells      Sts
2/0        1        0     5    PVC     SAAL    155000       155000               UP
2/0        2        0    16    PVC     ILMI    155000       155000               UP
2/0.2      101      0    50    PVC     SNAP    155000       155000               UP
2/0.2      102      0    60    PVC     SNAP    155000       155000             DOWN
2/0.2      104      0    80    PVC     SNAP    155000       155000               UP
2/0        hello    0    99    PVC     SNAP      1000                            UP
```

The following is sample output from the **show atm pvc** command with the *vpi*/*vci* argument specified:

```
Router# show atm pvc 0/41

ATM2/0: VCD: 3, VPI: 0, VCI: 41
UBR, PeakRate: 155000
AAL5-LLC/SNAP, etype:0x0, Flags: 0xC20, VCmode: 0x0
OAM frequency: 0 second(s), OAM retry frequency: 1 second(s), OAM retry frequency: 1
second(s)
OAM up retry count: 3, OAM down retry count: 5
OAM Loopback status: OAM Disabled
OAM VC state: Not Managed
ILMI VC state: Not Managed
InARP frequency: 15 minutes(s)
InPkts: 31759, OutPkts: 26497, InBytes: 2356434, OutBytes: 1589743
InPRoc: 15785, OutPRoc: 26472, Broadcasts: 0
InFast: 20, OutFast: 20, InAS: 15954, OutAS: 6
OAM cells received: 0
F5 InEndloop: 0, F5 InSegloop: 0, F5 InAIS: 0, F5 InRDI: 0
F4 InEndloop: 0, F4 InSegloop: 0, F4 InAIS: 0, F4 InRDI: 0
OAM cells sent: 0
F5 OutEndloop: 0, F5 OutSegloop: 0, F5 OutRDI: 0
F4 OutEndloop: 0, F4 OutSegloop: 0, F4 OutRDI: 0
OAM cell drops: 0
Status: UP
PPPOE enabled.
```

The following sample output from the **show atm pvc** command displays OAM cell emulation statistics, which are marked by exclamation points:

```
router# show atm pvc 5/500

ATM4/1/0.200: VCD: 6, VPI: 5, VCI: 500
UBR, PeakRate: 1
AAL5-LLC/SNAP, etype:0x0, Flags: 0x34000C20, VCmode: 0x0
OAM Cell Emulation: enabled, F5 End2end AIS Xmit frequency: 1 second(s) !!!
OAM frequency: 0 second(s), OAM retry frequency: 1 second(s)
OAM up retry count: 3, OAM down retry count: 5
OAM Loopback status: OAM Disabled
OAM VC state: Not ManagedVerified
ILMI VC state: Not Managed
```

```
InPkts: 564, OutPkts: 560, InBytes: 19792, OutBytes: 19680
InPRoc: 0, OutPRoc: 0
InFast: 4, OutFast: 0, InAS: 560, OutAS: 560
InPktDrops: 0, OutPktDrops: 0
CrcErrors: 0, SarTimeOuts: 0, OverSizedSDUs: 0
Out CLP=1 Pkts: 0
OAM cells received: 26
F5 InEndloop: 0, F5 InSegloop: 0, F5 InAIS: 0, F5 InRDI: 26
OAM cells sent: 77
F5 OutEndloop: 0, F5 OutSegloop: 0, F5 OutAIS: 77, F5 OutRDI: 0  !!!
OAM cell drops: 0
Status: UP
```

The following is sample output from the **show atm pvc** command with the ATM subinterface specified:

```
Router# show atm pvc interface atm 2/0.2

           VCD/                                        Peak      Avg/Min   Burst
Interface  Name   VPI   VCI   Type   Encaps     Kbps         Kbps   Cells       Sts
2/0.2      101     0    50    PVC      SNAP   155000       155000              UP
2/0.2      102     0    60    PVC      SNAP   155000       155000            DOWN
2/0.2      104     0    80    PVC      SNAP   155000       155000              UP
```

Table 13 describes significant fields shown in the displays.

Table 13 show atm pvc Field Descriptions

Field	Description
Interface	Interface and subinterface slot and port.
VCD/Name	Virtual connection descriptor (virtual connection number). The connection name is displayed if a name for the VC was configured using the **pvc** command.
VPI	Virtual path identifier.
VCI	Virtual channel identifier.
Type	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 QoS parameters of this PVC mismatch that of the corresponding peer on the switch.
Encaps	Type of ATM adaptation layer (AAL) and encapsulation.
Peak or PeakRate	Kilobits per second sent at the peak rate.
Avg/Min or Average Rate	Kilobits per second sent at the average rate.
Burst Cells	Value that equals the maximum number of ATM cells the VC can send at peak rate.
Sts or 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. See a description of the different values for this field listed later in this table. • INACTIVE indicates that the interface is down.

Table 13 show atm pvc Field Descriptions (continued)

Field	Description
Connection Name	The name of the PVC.
UBR, UBR+, or VBR–NRT	• UBR—Unspecified bit rate QoS is specified for this PVC. See the **ubr** command for further information. • UBR+—Unspecified bit rate QoS is specified for this PVC. See the **ubr+** command for further information. • VBR–NRT—Variable bit rate—Non real-time QoS rates are specified for this PVC. See the **vbr-nrt** command for further information.
etype	Encapsulation type.
Flags	Bit mask describing VC information. The flag values are summed to result in the displayed value: • 0x20—PVC • 0x40—SVC • 0x0—AAL5-SNAP • 0x1—AAL5-NLPID • 0x2—AAL5-FRNLPID • 0x3—AAL5-MUX • 0x4—AAL3/4-SMDS • 0x5—QSAAL • 0x6—ILMI • 0x7—AAL5-LANE • 0x9—AAL5-CISCOPPP • 0x10—ACTIVE
virtual-access	Virtual access interface identifier.
virtual-template	Virtual template identifier.
VCmode	AIP-specific or NPM-specific register describing the usage of the VC. This register contains values such as rate queue, peak rate, and AAL mode, which are also displayed in other fields.
OAM Cell emulation	The status of the OAM cell emulation functionality. It is either enabled or disabled.
F5 end2end AIS xmit frequency	Number of seconds between sending AIS cells.
OAM frequency	Number of seconds between sending OAM loopback cells.
OAM retry frequency	The frequency (in seconds) that end-to-end F5 loopback cells should be sent when a change in up/down state is being verified. For example, if a PVC is up and a loopback cell response is not received after the value of the *frequency* argument (in seconds) specified using the **oam-pvc** command, then loopback cells are sent at the value of the *retry-frequency* argument to verify whether the PVC is down.
OAM up retry count	Number of consecutive end-to-end F5 OAM loopback cell responses that must be received in order to change a PVC state to up. Does not apply to SVCs.
OAM down retry count	Number of consecutive end-to-end F5 OAM loopback cell responses that are not received in order to change a PVC state to down or tear down an SVC.

Table 13 show atm pvc Field Descriptions (continued)

Field	Description
OAM Loopback status	Status of end-to-end F5 OAM loopback cell generation for this VC. This field will have one of the following values: • OAM Disabled—End-to-end F5 OAM loopback cell generation is disabled. • OAM Sent—OAM cell was sent. • OAM Received—OAM cell was received. • OAM Failed—OAM reply was not received within the frequency period or contained bad correlation tag.ssss.
OAM VC state	This field will have one of the following states for this VC: • AIS/RDI—The VC received AIS/RDI cells. End-to-end F5 OAM loopback cells are not sent in this state. • AIS Out — The VC is sending out AIS cells. OAM loopback cells and replies are not sent in this state. Incoming AIS cells are replied with RDI cells, but the state does not change. • Down Retry—An OAM loopback failed. End-to-end F5 OAM loopback cells are sent at retry frequency to verify that the VC is really down. After down-count unsuccessful retries, the VC goes to the Not Verified state. • Not Managed—VC is not being managed by OAM. • Not Verified—VC has not been verified by end-to-end F5 OAM loopback cells. AIS and RDI conditions are cleared. • Up Retry—An OAM loopback was successful. End-to-end F5 OAM loopback cells are sent at retry frequency to verify the VC is really up. After up-count successive and successful loopback retries, the VC goes to the Verified state. • Verified—Loopbacks are successful. AIS/RDI cell was not received.
ILMI VC state	This field will have one of the following states for this VC: • Not Managed—VC is not being managed by ILMI. • Not Verified—VC has not been verified by ILMI. • Verified—VC has been verified by ILMI.
VC is managed by OAM/ILMI	VC is managed by OAM or ILMI.
InARP frequency	Number of minutes for the Inverse Address Resolution Protocol (IARP) time period.
InPkts	Total number of packets received on this VC. This number includes all fast-switched and process-switched packets.
OutPkts	Total number of packets sent on this VC. This number includes all fast-switched and process-switched packets.
InBytes	Total number of bytes received on this VC. This number includes all fast-switched and process-switched bytes.
OutBytes	Total number of bytes sent on this VC. This number includes all fast-switched and process-switched bytes.
InPRoc	Number of process-switched input packets.
OutPRoc	Number of process-switched output packets.

Table 13 show atm pvc Field Descriptions (continued)

Field	Description
Broadcasts	Number of process-switched broadcast packets.
InFast	Number of fast-switched input packets.
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	Total number of OAM cells received on this VC.
F5 InEndloop	Number of end-to-end F5 OAM loopback cells received.
F5 InSegloop	Number of segment F5 OAM loopback cells received.
F5 InAIS	Number of F5 OAM AIS cells received.
F5 InRDI	Number of F5 OAM RDI cells received.
F4 InEndloop	Number of end-to-end F4 OAM loopback cells received.
F4 InSegloop	Number of segment F4 OAM loopback cells received.
F4 InAIS	Number of F4 OAM AIS cells received.
F4 InRDI	Number of F4 OAM RDI cells received.
OAM cells sent	Total number of OAM cells sent on this VC.
F5 OutEndloop	Number of end-to-end F5 OAM loopback cells sent.
F5 OutSegloop	Number of segment F5 OAM loopback cells sent.
F5 OutAIS	Number of F5 OAM AIS cells sent
F5 OutRDI	Number of F5 OAM RDI cells sent.
OAM cell drops	Number of OAM cells dropped (or flushed).
PVC Discovery	• NOT_VERIFIED—This PVC is manually configured on the router and not yet verified with the attached adjacent switch. • WELL_KNOWN—This PVC has a VCI value of 0 through 31. • DISCOVERED—This PVC is learned from the attached adjacent switch via ILMI. • MIXED—Some of the traffic parameters for this PVC were learned from the switch via ILMI. • MATCHED—This PVC is manually configured on the router, and the local traffic shaping parameters match the parameters learned from the switch. • MISMATCHED—This PVC is manually configured on the router, and the local traffic shaping parameters do not match the parameters learned from the switch. • LOCAL_ONLY—This PVC is configured locally on the router and not on the remote switch.
Status	When the Status field indicates UP, the VC is established. When the Status field indicates DOWN, refer to the State field for further information about the VC state.

Table 13 show atm pvc Field Descriptions (continued)

Field	Description
State	When the Status field is UP, this field does not appear. When the Status field is DOWN or INACTIVE, the State field will appear with one of the following values: • NOT_VERIFIED—The VC has been established successfully; waiting for OAM (if enabled) and ILMI (if enabled) to verify that the VC is up. • NOT_EXIST—VC has not been created. • HASHING_IN—VC has been hashed into a hash table. • ESTABLISHING—Ready to establish VC connection. • MODIFYING—VC parameters have been modified. • DELETING—VC is being deleted. • DELETED—VC has been deleted. • NOT_IN_SERVICE—ATM interface is shut down.
PPP:	For PPP over ATM, indicates the virtual access interface number and virtual template number being used.

show mpls l2transport binding

To display VC label binding information, use the **show mpls l2transport binding** command in EXEC mode.

show mpls l2transport binding [*vc-id* | *ip-address* | **local-label** *number* | **remote-label** *number*}

Syntax Description

vc-id	(Optional) Displays VC label binding information for the specified VC.
ip-address	(Optional) Displays VC label binding information for the specified VC destination.
local-label *number*	(Optional) Displays VC label binding information for the specified local assigned label.
remote-label *number*	(Optional) Displays VC label binding information for the specified remote assigned label.

Command Modes

EXEC

Command History

Release	Modification
12.0(23)S	This command was introduced.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(15)T	This command was integrated into Cisco IOS Release 12.2(15)T.
12.0(27)S	This command was updated to display AToM Virtual Circuit Connection Verification (VCCV) information.
12.2(18)SXE	This command was integrated into Cisco IOS Release 12.2(18)SXE.
12.2(30)S	This command was updated to display Connectivity Verification (CV) type capabilities.

Examples

The following example shows the VC label binding information for Cisco IOS Releases 12.0(27)S and 12.2(18)SXE and later:

```
Router# show mpls l2transport binding

Destination Address: 10.0.0.203,  VC ID: 1
    Local Label:  16
        Cbit: 1,    VC Type: Ethernet,    GroupID: 0
        MTU: 1500,   Interface Desc: n/a
        VCCV Capabilities: Type 1, Type 2
    Remote Label: 16
        Cbit: 1,    VC Type: Ethernet,    GroupID: 0
        MTU: 1500,   Interface Desc: n/a
        VCCV Capabilities: Type 1, Type 2
```

The following examples shows the VC label binding information for Cisco IOS Release 12.2(30)S and later:

```
Router# show mpls l2transport binding

Destination Address: 5.5.5.51,  VC ID: 108
    Local Label:  16
        Cbit: 1,    VC Type: Ethernet,    GroupID: 0
        MTU: 1500,   Interface Desc: n/a
        VCCV: CC Type: CW [1], RA [2]
              CV Type: LSPV [2]
    Remote Label: 16
        Cbit: 1,    VC Type: Ethernet,    GroupID: 0
        MTU: 1500,   Interface Desc: n/a
        VCCV: CC Type: RA [2]
              CV Type: LSPV [2]
```

The output of the command changed between Cisco IOS Releases. The following table maps the older output to the new output:

Output in Cisco IOS Releases 12.0(27)S and 12.2(18)SXE	Output In Cisco IOS Release 12.2(30)S
VCCV Capabilities	VCCV: CC Type
Type 1	CW [1]
Type 2	RA [2]

Table 14 describes the significant fields shown in the display.

Table 14 show mpls l2transport binding Field Descriptions

Field	Description
Destination Address	The IP address of the remote router's interface that is at the other end of the VC.
VC ID	The virtual circuit identifier assigned to one of the interfaces on the router.
Local Label	The VC label that a router signals to its peer router, which is used by the peer router during imposition.
Remote Label	The disposition VC label of the remote peer router.
Cbit	The control word bit. If it is set, the value is 1.
VC Type	The type of VC, such as Frame Relay, Ethernet, ATM, and so on.
Group ID	The group ID assigned to the local or remote VCs.
MTU	The maximum transmission unit assigned.
Interface Desc	Interface parameters, if applicable.

Table 14 show mpls l2transport binding Field Descriptions (continued)

Field	Description
VCCV Capabilities	(Cisco IOS Releases 12.0(27)S and 12.2(18)SXE and later) AToM VCCV information. This field displays how an AToM VCCV packet is identified. • Type 1—The Protocol ID field of in the AToM Control Word (CW) identified the AToM VCCV packet. • Type 2—An MPLS Router Alert (RA) Level above the VC label identified the AToM VCCV packet. Type 2 is used for VC types that do not support or do not interpret the AToM Control Word.
VCCV: CC Type	(Cisco IOS Releases 12.2(30)S and later) The types of Control Channel (CC) processing that are supported. The number indicates the position of the bit that was set in the received octet. The following values can be displayed: • CW [1]—Control Word • RA [2]—Router Alert • TTL [3]—Time to Live • Unkn [*x*]—Unknown
CV Type	(Cisco IOS Releases 12.2(30)S and later) The type of Connectivity Verification (CV) packets that can be processed in the control channel of the MPLS pseudowire. The number indicates the position of the bit that was set in the received octet. • ICMP [1]—Internet Control Management Protocol (ICMP) is used to verify connectivity. • LSPV [2]—LSP Ping is used to verify connectivity. • BFD [3]—Bidirectional Forwarding Detection is used to verify connectivity for more than one pseudowire. • Unkn [*x*]—A CV type was received that could not be interpreted.

Related Commands

Command	Description
show mpls l2transport hw-capability	Displays the transport types and their supported capabilities.

show mpls l2transport hw-capability

To display the transport types supported on an interface, use the **show mpls l2transport hw-capability** command in privileged EXEC mode.

show mpls l2transport hw-capability interface *type number*

Syntax Description

interface	Displays information for the specified interface.
type number	The type and number of the interface. For example, serial6/0.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(23)S	This command was introduced.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.
12.2(15)T	This command was integrated into Cisco IOS Release 12.2(15)T.
12.0(27)S	This command was updated to display AToM Virtual Circuit Connection Verification (VCCV) information.
12.2(18)SXE	This command was integrated into Cisco IOS Release 12.2(18)SXE.
12.2(30)S	This command was updated to display VCCV type capabilities.

Usage Guidelines

This command can help you determine the interface to use for the various transport types. Use this command to check that core-facing and edge-facing interfaces can accommodate the different transport types.

Examples

The following is partial sample output from the **show mpls l2transport hw-capability** command for Cisco IOS Releases 12.0(23)S, 12.2(14)S, and 12.2(15)T and later. For more information on the fields, see Table 15.

```
Router# show mpls l2transport hw-capability interface serial5/1

Interface Serial5/1

Transport type FR DLCI
  Core functionality:
    MPLS label disposition supported
    Control word processing supported
    Sequence number processing not supported
  Edge functionality:
    MPLS label imposition supported
    Control word processing supported
    Sequence number processing not supported
.
.
.
```

Note These examples show only a portion of the output. The command displays the the capabilities of every transport type.

The following is partial sample output from the **show mpls l2transport hw-capability** command for Cisco IOS Releases 12.0(27)S and 12.2(18)SXE and later. This output shows VCCV data under the Core Functionality section. Type 1 means that the AToM Control Word identified the AToM VCCV packet. For more information on the fields, see Table 15.

```
Transport type FR DLCI
  Core functionality:
    MPLS label disposition supported
    Control word processing supported
    Sequence number processing not supported
    VCCV CC Type 1 processing supported

  Edge functionality:
    MPLS label imposition supported
    Control word processing supported
    Sequence number processing not supported
.
.
.
```

The following is partial sample output from the **show mpls l2transport hw-capability** command for Cisco IOS Releases 12.2(30)S and later. The VCCV output shows that AToM Control Word (CW) identified the AToM VCCV packet. For more information on the fields, see Table 15.

```
Transport type FR DLCI
  Core functionality:
    MPLS label disposition supported
    Control word processing supported
    Sequence number processing not supported
    VCCV CC Type CW [1] processing supported

  Edge functionality:
    MPLS label imposition supported
    Control word processing supported
    Sequence number processing not supported
.
.
.
```

The output of the command changed between Cisco IOS Releases. The following table maps the older output to the new output:

Output in Cisco IOS Releases 12.0(27)S and 12.2(18)SXE and later	Output In Cisco IOS Release 12.2(30)S
VCCV CC processing supported	VCCV CC processing supported
Type 1	Type CW [1]

Table 15 describes the significant fields shown in the display.

Table 15 show mpls l2transport hw-capability Field Descriptions

Field	Description
Transport type	Indicates the transport type.
Core functionality	Displays the functionalities that the core-facing interfaces support, such as label disposition, and control word and sequence number processing.
VCCV CC Type processing supported	Displays whether the core-facing interfaces support Control Word processing, or Router Alert Processing. (Cisco IOS Releases 12.0(27)S and 12.2(18)SXE and later) • Type 1—The Protocol ID field of in the AToM Control Word (CW) identified the AToM VCCV packet. (Cisco IOS Releases 12.2(30)S and later) • CW [1]—Control Word • Unkn [*x*]—Unknown. The number indicates the position of the bit that was set in the received octet.
Edge functionality	Displays the functionalities that the edge-facing interfaces support, such as label disposition, and control word and sequence number processing.

show mpls l2transport summary

To display summary information about virtual circuits (VCs) that have been enabled to route Any Transport over MPLS (AToM) Layer 2 packets on a router, use the **show mpls l2transport summary** command in EXEC mode.

show mpls l2transport summary

Syntax Description

This command has no arguments or keywords.

Command Modes

EXEC

Command History

Release	Modification
12.0(23)S	This command was introduced.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.

Examples

The following sample output shows summary information about the VCs that have been enabled to transport Layer 2 packets:

```
Router# show mpls l2transport summary

Destination address: 172.16.24.12  Total number of VCs: 60
0 unknown, 58 up, 0 down, 2 admin down
5 active vc on MPLS interface PO4/0
```

Table 16 describes the fields shown in the output.

Table 16 show mpls l2transport summary Field Descriptions

Field	Description
Destination address	The IP address of the remote router to which the VC has been established.
Total number of VCs	The number of VCs that have been established.
unknown	The number of VCs that are in an unknown state.
up	The number of VCs that are operational.
down	The number of VCs that are not operational.
admindown	The number of VCs that have been disabled.

show mpls l2transport vc

To display information about Any Transport over MPLS (AToM) virtual circuits (VCs) that have been enabled to route Layer 2 packets on a router, use the **show mpls l2transport vc** command in EXEC mode.

show mpls l2transport vc [**vcid** *vc-id*] | [*vc-id-min vc-id-max*] [**interface** *name* [*local-circuit-id*]] [**destination** *ip-address* | *name*] [**detail**]

Syntax Description

vcid	(Optional) The VC ID assigned to the router.
vc-id	(Optional) The VC ID.
vc-id-min and *vc-id-max*	(Optional) The VCs that are assigned the range of VC IDs that you specify. The range is from 1 to 4,294,967,295. (This argument is primarily for legacy implementations.)
interface	(Optional) The interface or subinterface of the router that has been enabled to transport Layer 2 packets. This keyword lets you display information about the VCs that have been assigned VC IDs on that interface or subinterface.
name	(Optional) The name of the interface or subinterface.
local-circuit-id	(Optional) The number assigned to the local circuit. This argument value applies only to the following transport types: • For Frame Relay, enter the DCLI of the PVC. • For ATM AAL5 and Cell Relay, enter the VPI/VCI of the PVC. • For Ethernet VLANs, enter the VLAN number.
destination	(Optional) Information about the VCs that have been assigned VC IDs for the remote router you specify.
ip-address	(Optional) The IP address of the remote router.
name	(Optional) The name assigned to the remote router.
detail	(Optional) Detailed information about the VCs that have been assigned VC IDs.

Command Modes

EXEC

Command History

Release	Modification
12.1(8a)E	This command was introduced.
12.0(21)ST	This command was integrated into Cisco IOS Release 12.0(21)ST.
12.0(23)S	This command was updated to include the **interface** and **destination** keywords.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.

Examples

The output of the commands varies, depending on the type of Layer 2 packets being transported over the AToM VCs.

The following example shows information about the interfaces and VCs that have been configured to transport various Layer 2 packets on the router:

```
Router# show mpls l2transport vc

Local intf     Local circuit      Dest address    VC ID      Status
-------------  ------------------ --------------- ---------- ----------
Se5/0          FR DLCI 55         13.0.0.1        55         UP
AT4/0          ATM AAL5 0/100     13.0.0.1        100        UP
AT4/0          ATM AAL5 0/200     13.0.0.1        200        UP
AT4/0.300      ATM AAL5 0/300     13.0.0.1        300        UP
```

Table 17 describes the significant fields displayed in the output.

Table 17 show mpls l2transport vc Field Descriptions

Field	Description
Local intf	The interface on the local router that has been enabled to transport Layer 2 packets.
Local circuit	The type and number (if applicable) of the local circuit. The output shown in this column varies, according to transport type: • For Frame Relay, the output shows the DCLI of the PVC. • For ATM cell relay and AAL5, the output shows the VPI/VCI of the PVC. • For Ethernet VLANs, the output shows the VLAN number. • For PPP and HDLC, the output shows the interface number.
Dest address	The IP address of the remote router's interface that is the other end of the VC.
VC ID	The virtual circuit identifier assigned to one of the interfaces on the router.
Status	The status of the VC. The status can be one of the following: UP—The VC is in a state where it can carry traffic between the two VC endpoints. A VC is up when both imposition and disposition interfaces are programmed. • The disposition interfaces is programmed if the VC has been configured and the client interface is up. • The imposition interface is programmed if the disposition interface is programmed and we have a remote VC label and an IGP label. The IGP label can be implicit null in a back-to-back configuration. (An IGP label means there is an LSP to the peer.) DOWN—The VC is not ready to carry traffic between the two VC endpoints. Use the **detail** keyword to determine the reason that the VC is down. ADMIN DOWN—The VC has been disabled by a user.

The following example shows information about VCs that have been configured to transport Layer 2 packets:

```
Router# show mpls l2transport vc detail

Local interface: local interface up, line protocol up, local circuit 16 up
Destination address: 13.13.13.13, VC ID: 100, VC status: up
    Tunnel label: imp-null, next hop point2point
    Output interface: PO0/1/0, imposed label stack {16}
  Create time: 00:16:44, last status change time: 00:15:45
  Signaling protocol: LDP, peer 13.13.13.13:0 up
    MPLS VC labels: local 16, remote 16
    Group ID: local 12, remote 1
    MTU: local 1500, remote 1500
    Remote interface description:
  Sequencing: receive disabled, send disabled
  VC statistics:
    packet totals: receive 56, send 55
    byte totals:   receive 10181, send 10569
    packet drops:  receive 0, send 0
```

Table 18 describes the significant fields displayed in the output.

Table 18 show mpls l2transport vc detail Field Descriptions

Field	Description
Local interface	The interface on the local router that has been enabled to transmit and receive Layer 2 packets. The interface varies, depending on the transport type. The output also shows the status of the interface.
line protocol	The status of the line protocol on the edge-facing interface.
local circuit	The type, number (if applicable) and status of the local circuit. The output varies, depending on the transport type: • For Frame Relay, the output shows the DCLI of the PVC. • For ATM cell relay and AAL5, the output shows the VPI/VCI of the PVC. • For Ethernet VLANs, the output shows the VLAN number.
Destination address	The IP address of the remote router specified for this VC. You specify the destination IP address as part of the **mpls l2transport route** command.
VC ID	The virtual circuit identifier assigned to the interface on the router.
VC status	The status of the VC. The status can be one of the following: UP—The VC is in a state where it can carry traffic between the two VC endpoints. A VC is up when both imposition and disposition interfaces are programmed. • The disposition interface is programmed if the VC has been configured and the client interface is up. • The imposition interface is programmed if the disposition interface is programmed and a remote VC label and an IGP label exist. The IGP label can be an implicit null in a back-to-back configuration. (An IGP label means there is a LSP to the peer.) DOWN—The VC is not ready to carry traffic between the two VC endpoints. ADMIN DOWN—The VC has been disabled by a user.

Table 18 show mpls l2transport vc detail Field Descriptions

Field	Description
Tunnel label	An IGP label used to route the packet over the MPLS backbone to the destination router with the egress interface. The first part of the output displays the type of label. The second part of output displays the route information. The tunnel label information can display any of the following states: imp-null: The P router is absent and the tunnel label will not be used. Alternatively, imp-null can signify traffic engineering tunnels between the PE routers. unassigned: The label has not been assigned. no route: The label is not in the routing table. no adjacency: The adjacency for the next hop is missing. not ready, no route: An IP route for the peer does not exist in the routing table. not ready, not a host table: The route in the routing table for the remote peer router is not a host route. not ready, CEF disabled: CEF is disabled. not ready, LFIB disabled: The MPLS switching subsystem is disabled. not ready, LFIB entry present: The tunnel label exists in the LFIB, but the VC is down.
Output interface	The interface on the remote router that has been enabled to transmit and receive Layer 2 packets.
imposed label stack	Summary of the MPLS label stack used to direct the VC to the PE router.
Create time	The time when the VC was provisioned.
last status change time	The last time the VC state changed.
Signaling protocol	The type of protocol used to send the MPLS labels. The output also shows the status of the peer router.
MPLS VC labels	The local VC label is a disposition label, which determines the egress interface of an arriving packet from the MPLS backbone. The remote VC label is a disposition VC label of the remote peer router.
Group ID	The local group ID is used to group VCs locally. The remote group ID is used by the peer to group several VCs.
MTU	The maximum transmission unit specified for the local and remote interfaces.
Remote interface description	The interface on the remote router that has been enabled to transmit and receive Layer 2 packets.
Sequencing	This field describes whether sequencing of out-of-order packets is enabled or disabled.
packet totals	The number of packets sent and received. Received packets are those AToM packets received from the MPLS core. Sent packets are those AToM packets sent to the MPLS core. This does not include dropped packets.

Table 18 show mpls l2transport vc detail Field Descriptions

Field	Description
byte totals	The number of packets sent and received from the core-facing interface, including the payload, VC label, and AToM control word (if present).
packet drops	The number of packets that were dropped as they were sent or received from the core-facing interface.