



Troubleshooting Enhancements for Multilink PPP over ATM Link Fragmentation and Interleaving

The Troubleshooting Enhancements for Multilink PPP over ATM Link Fragmentation and Interleaving enhance the output of the **show atm pvc**, **show multilink ppp**, and **show interfaces virtual-access** commands to display multilink PPP (MLP) over ATM link fragmentation and interleaving (LFI) information. This feature also introduces the **debug atm lfi** command, which can be used to display MLP over ATM LFI debugging information.

Feature History for Troubleshooting Enhancements for Multilink PPP over ATM LFI

Release	Modification
12.3(7)T	This feature was introduced.
12.2(27)SBA	This feature was integrated into Cisco IOS Release 12.2(27)SBA.

Finding Support Information for Platforms and Cisco IOS Software Images

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How to Troubleshoot Multilink PPP over ATM LFI

This section contains the following procedure:

- [Troubleshooting Multilink PPP over ATM LFI, page 2](#)

Troubleshooting Multilink PPP over ATM LFI

Perform this task to display information about multilink PPP over ATM LFI connections.

Prerequisites

This task assumes that you have configured multilink PPP over ATM LFI in your network. For information about how to configure multilink PPP over ATM LFI, see the [“Additional References” section on page 3](#).

SUMMARY STEPS

1. **enable**
2. **show atm pvc vpi/vci**
3. **show ppp multilink** [**active** | **inactive** | **interface** *bundle-interface* | [**username** *name*] [**endpoint** *endpoint*]]
4. **show interfaces virtual-access** [*type number*]
5. **debug atm lfi**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	show atm pvc vpi/vci Example: Router# show atm pvc 15/200	Displays traffic, management, and MLP over ATM LFI information for the specified PVC.
Step 3	show ppp multilink [active inactive interface <i>bundle-interface</i> [username <i>name</i>] [endpoint <i>endpoint</i>]] Example: Router# show ppp multilink username blue	Displays bundle information for MLP bundles.

	Command or Action	Purpose
Step 4	<code>show interfaces virtual-access number</code> Example: <code>Router# show interfaces virtual-access 3</code>	Displays status, traffic data, and configuration information about a specified virtual access interface. Display will indicate if the interface is a member of a multilink PPP bundle.
Step 5	<code>debug atm lfi</code> Example: <code>Router# debug atm lfi</code>	Displays MLP over ATM LFI debug information.

Examples

See the [show atm pvc](#), [show ppp multilink](#), [show interfaces virtual-access](#), and [debug atm lfi](#) command pages for examples of output and descriptions of the fields in the output.

Additional References

The following sections provide references related to multilink PPP over ATM LFI.

Related Documents

Related Topic	Document Title
LFI for multilink PPP configuration tasks	“Configuring Link Fragmentation and Interleaving for Multilink PPP” chapter in the <i>Cisco IOS Quality of Service Solutions Configuration Guide</i> , Release 12.2
LFI for ATM virtual circuits configuration tasks	“Configuring Link Fragmentation and Interleaving for Frame Relay and ATM Virtual Circuits” chapter in the <i>Cisco IOS Quality of Service Solutions Configuration Guide</i> , Release 12.2
Multilink PPP over ATM LFI commands	<i>Cisco IOS Quality of Service Solutions Command Reference</i> , Release 12.3 T
Multilink PPP configuration tasks	“PPP Configuration” section in the <i>Cisco IOS Dial Technologies Configuration Guide</i> , Release 12.3
Multilink PPP commands	<i>Cisco IOS Dial Technologies Command Reference</i> , Release 12.3 T
ATM configuration tasks	“WAN Protocols” section in the <i>Cisco IOS Wide-Area Networking Configuration Guide</i> , Release 12.3
ATM commands	<i>Cisco IOS Wide-Area Networking Command Reference</i> , Release 12.3 T

MIBs

MIBs	MIBs Link
No new or modified MIBs are supported by this feature.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

Technical Assistance

Description	Link
Technical Assistance Center (TAC) home page, containing 30,000 pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	http://www.cisco.com/public/support/tac/home.shtml

Command Reference

This section documents new and modified commands only.

- [debug atm lfi](#)
- [show atm pvc](#)
- [show interfaces virtual-access](#)
- [show ppp multilink](#)

debug atm lfi

To display multilink PPP (MLP) over ATM link fragmentation and interleaving (LFI) debug information, use the **debug atm lfi** command in privileged EXEC mode. To disable debugging output, use the **no** form of this command.

debug atm lfi

no debug atm lfi

Syntax Description This command has no arguments or keywords.

Command Modes Privileged EXEC

Command History	Release	Modification
	12.3(7)T	This command was introduced.
	12.2(27)SBA	This command was integrated into Cisco IOS Release 12.2(27)SBA.

Examples The following examples show output from the **debug atm lfi** command. Each example is preceded by an explanation of the output.

- The following output indicates that the packet has dequeued from the per-VC queue that is associated with the virtual circuit (VC):
00:17:27: MLP-ATM(Virtual-Access3) pak dequeued from per VC Q 15/200,qcount:0
- The following output indicates that the packet is enqueued on the per-VC queue associated with the VC:
00:17:27: MLP-ATM(Virtual-Access3) pak enqueued to per VC Q 15/200, qcount:0
- The following output indicates that the packet has dequeued from the MLP bundle queue:
00:17:27: MLP-ATM(Virtual-Access3) pak dequeued from MP Bundle 15/200, qcount:0
- The following output indicates that PPP over ATM (PPPoA) encapsulation cannot be added to the packet for some reason:
00:17:27: MLP-ATM(Virtual-Access3) encapsulation failure - dropping packet
- The following output indicates that the VC could not be found on the virtual access interface associated with the PPPoA session:
00:17:27: MLP-ATM(Virtual-Access3) No VC to transmit- dropping packet
- When a permanent virtual circuit (PVC) has been deleted, the following output indicates that MLP has been deconfigured successfully:
00:17:27: MLP-ATM(Virtual-Access3) mlp de-configured for PVC 15/200
- If the changing of any PVC parameters requires re-creation of the PVC, the following output is generated during the re-creation of the PVC:

debug atm lfi

```
00:17:27: MLP-ATM(Virtual-Access3) MLPoATM re-configured for PVC 15/200
```

- The following output indicates that the MLP over ATM structure associated with a VC has failed to allocate memory:

```
00:17:27: MLP-ATM(Virtual-Access3) Memory allocation error
```

- The following output is generated when MLP over ATM is first configured on a PVC:

```
00:17:27: MLP-ATM(Virtual-Access3) MLPoATM configured for PVC 15/200
```

Related Commands

Command	Description
show multilink ppp	Displays bundle information for MLP bundles.

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 [.subinterface-number multipoint]] [ppp]
```

Syntax Description		
<i>vpi/vci</i>	(Optional) ATM virtual path identifier (VPI) and virtual channel identifier (VCI) numbers. The absence of the slash character (/) and a <i>vpi</i> value causes the <i>vpi</i> value to default to 0.	
<i>name</i>	(Optional) Name of the PVC.	
interface atm <i>interface-number</i>	(Optional) Displays all PVCs on the specified ATM interface. To determine the appropriate form of the <i>interface-number</i> argument, consult your ATM network module, port adapter, or router documentation.	
<i>.subinterface-number</i>	(Optional) Subinterface number in the range from 1 to 4294967293. The dot (.) is required as a separator between <i>interface-number</i> and <i>subinterface-number</i> .	
multipoint	(Optional) Multipoint subinterface.	
ppp	(Optional) Displays each PVC configured for PPP over ATM.	

Command Modes	Privileged EXEC
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Command History	Release	Modification
	11.3T	This command was introduced.
	12.1(1)T	This command was modified to display PPPoE status.
	12.2(4)T	This command was modified to display only PVCs that are attached to a virtual access interface. Before this modification, all PVCs that were configured with PPPoA or PPPoE were displayed.
	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.
	12.2(15)T	This command was integrated into Cisco IOS Release 12.2(15)T.
	12.3(7)T	This command was modified to display information about multilink PPP over ATM link fragmentation and interleaving for ATM PVCs.
	12.0(30)S	This command was modified to display information about OAM loopback detection.
	12.2(27)SBA	This command was integrated into Cisco IOS Release 12.2(27)SBA.

Usage Guidelines	If the <i>vpi/vci</i> or <i>name</i> 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.
------------------	---

If the *vpi/vci* or *name* argument is specified, the output of this command is the same as that of 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.

If the **interface atm interface-number** option is included in the command, all PVCs under that interface or subinterface are displayed.

Examples

The following is sample output from the **show atm pvc** command. The output is the same as that of the **show atm vc** command, but only the configured PVCs are displayed.

```
Router# show atm pvc
```

Interface	VCD/ Name	VPI	VCI	Type	Encaps	Peak Kbps	Avg/Min Kbps	Burst 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
OAM Loop detection: Disabled
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 in this example 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
```

```
OAM Loop detection: Disabled
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
```

Interface	VCD/ Name	VPI	VCI	Type	Encaps	Peak Kbps	Avg/Min Kbps	Burst 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

The following is sample output for the **show atm pvc** command for a PVC that is a member of a multilink PPP bundle:

```
Router# show atm pvc 15/200
```

```
ATM4/0.10000:VCD:16, VPI:15, VCI:200
UBR, PeakRate:149760 (353208 cps)
AAL5-LLC/SNAP, etype:0x0, Flags:0xC20, VCmode:0x0, Encapsz:12
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 Managed
OAM Loop detection: Disabled
ILMI VC status:Not Managed
VC TxRingLimit:40 particles
VC Rx Limit:800 particles
InARP frequency:15 minutes(s)
Transmit priority 6
InPkts:347, OutPkts:399, InBytes:6268, OutBytes:7728
InCells:347, OutCells:399
InPRoc:7, OutPRoc:228
InFast:338, OutFast:169, InAS:0, OutAS:0
InPktDrops:0, OutPktDrops:0/0/0 (holdq/outputq/total)
InCellDrops:0, OutCellDrops:0
InByteDrops:0, OutByteDrops:0
CrcErrors:0, SarTimeOuts:0, OverSizedSDUs:0, LengthViolation:0, CPIErrors:0
Out CLP=1 Pkts:0, Cells:0
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
PPP:Virtual-Access3 from Virtual-Template1
PPPoA Current State = LOCALLY_TERMINATED
PPPoA Latest Event = Vaccess Up
```

```

PPPoA Latest Error = None
PPPoA Session ID = 7
PPPoA Handle = 0x4D000006, SSS Handle = 0x00000000
Switch Handle = 0xB5000006, PPP Handle = 0xD700000A
AAA Unique ID = 0x00000007, AIE Handle = 0xE7000006
PVC belongs to Multilink PPP Bundle Virtual-Access4 as a PPPoA member link
Packets in VC Holdq:0 , Particles in VC Tx Ring:0

```

The following is sample output from the **show atm pvc** command with loopback detection mode through OAM enabled:

```

Router# show atm pvc 4/100

ATM1/0: VCD: 4, VPI: 4, VCI: 100
UBR, PeakRate: 149760
AAL5-LLC/SNAP, etype:0x0, Flags: 0xC20, VCmode: 0x0
!
OAM frequency: 10 second(s), OAM retry frequency: 1 second(s)
OAM up retry count: 3, OAM down retry count: 5
OAM Loopback status: OAM Received
OAM VC state: Verified
OAM Loop detection: Enabled ! Indicates that loopback mode detection is enabled.
!
ILMI VC state: Not Managed
VC is managed by OAM.
InARP frequency: 15 minutes(s)
Transmit priority 4
InPkts: 0, OutPkts: 0, InBytes: 0, OutBytes: 0
InPRoc: 0, OutPRoc: 0, Broadcasts: 0
InFast: 0, OutFast: 0, InAS: 0, OutAS: 0
InPktDrops: 0, OutPktDrops: 0
CrcErrors: 0, SarTimeOuts: 0, OverSizedSDUs: 0
Out CLP=1 Pkts: 0
OAM cells received: 27
F5 InEndloop: 27, F5 InSegloop: 0, F5 InAIS: 0, F5 InRDI: 0
OAM cells sent: 27
F5 OutEndloop: 27, F5 OutSegloop: 0, F5 OutAIS: 0, F5 OutRDI: 0
OAM cell drops: 3
Status: UP

```

The following is sample output from the **show atm pvc** command when loopback mode has been detected:

```

Router# show atm pvc 4/100

ATM1/0: VCD: 4, VPI: 4, VCI: 100
UBR, PeakRate: 149760
AAL5-LLC/SNAP, etype:0x0, Flags: 0xC20, VCmode: 0x0
!
OAM frequency: 10 second(s), OAM retry frequency: 1 second(s)
OAM up retry count: 3, OAM down retry count: 5
OAM Loopback status: OAM Sent
OAM VC state: Not Verified
OAM Loop detection: Enabled, Detected ! Indicates that loopback mode has been detected on
this interface.
!
ILMI VC state: Not Managed
VC is managed by OAM.
InARP frequency: 15 minutes(s)
Transmit priority 4
InPkts: 0, OutPkts: 0, InBytes: 0, OutBytes: 0
InPRoc: 0, OutPRoc: 0, Broadcasts: 0
InFast: 0, OutFast: 0, InAS: 0, OutAS: 0
InPktDrops: 0, OutPktDrops: 0

```

```

CrcErrors: 0, SarTimeOuts: 0, OverSizedSDUs: 0
Out CLP=1 Pkts: 0
OAM cells received: 20
F5 InEndloop: 20, F5 InSegloop: 0, F5 InAIS: 0, F5 InRDI: 0
OAM cells sent: 20
F5 OutEndloop: 20, F5 OutSegloop: 0, F5 OutAIS: 0, F5 OutRDI: 0
OAM cell drops: 1
Status: DOWN, State: NOT_VERIFIED

```

Table 1 describes significant fields shown in the displays.

Table 1 *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—PVC created as a result of PVC discovery. - PVC-L—The corresponding peer of this PVC could not be found on the switch. - PVC-M—Some or all of the QoS¹ parameters of this PVC fail to match those 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	Maximum number of ATM cells that the VC can send at peak rate.
Sts or Status	Status of the VC connection: - UP—The connection is enabled for data traffic. - DOWN—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 the State field later in this table. - INACTIVE—The interface is down.
Connection Name	Name of the PVC.

Table 1 *show atm pvc Field Descriptions (continued)*

Field	Description
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: • 0x40—SVC • 0x20—PVC • 0x10—ACTIVE • 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
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 transmission of AIS cells.
OAM frequency	Number of seconds between transmission of OAM loopback cells.
OAM retry frequency	Frequency (in seconds) at which end-to-end F5 loopback cells should be sent when a change in state (up or down) is being verified. For example, if a PVC is up and a loopback cell response is not received after the value of the <i>frequency</i> argument (in seconds) specified using the oam-pvc command, loopback cells are sent at the value of the <i>retry-frequency</i> argument to determine 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.

Table 1 *show atm pvc Field Descriptions (continued)*

Field	Description
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.
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 a bad correlation tag.
OAM VC state	This field will have one of the following states for this VC: - AIS²/RDI³—The VC received AIS/RDI cells. End-to-end F5 OAM loopback cells are not sent in this state. - 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 that 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.
OAM Loop detection	Status of loopback detection mode through OAM: - Disabled—Automatic loopback detection is disabled. - Enabled—Automatic loopback detection is enabled. - Detected—Loopback mode is detected on an ATM interface.
ILMI VC state	This field will have one of the following states for this VC: - Not Managed—VC is not being managed by ILMI⁴. - 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 (ARP) 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.

Table 1 *show atm pvc Field Descriptions (continued)*

Field	Description
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.
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 OutRDI	Number of F5 OAM RDI cells sent.
OAM cell drops	Number of OAM cells dropped (or flushed).

Table 1 *show atm pvc Field Descriptions (continued)*

Field	Description
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.
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.
PPPoA Current State	State of the PPPoA session associated with the VC.
PPPoA Latest Event	The latest event that occurred on the PPPoA session associated with the VC.
PPPoA Latest Error	The latest error that occurred on the PPPoA session associated with the VC.
PPPoA Session ID	PPPoA session identifier of the PPPoA session associated with the VC.
PPPoA Handle	PPPoA context handle.
SSS Handle	SSS handle for PPPoA session associated with the VC.
Switch Handle	SSS handle for switch management.
PPP Handle	Handle associated with the PPP context.

Table 1 *show atm pvc Field Descriptions (continued)*

Field	Description
AAA Unique ID	Unique identifier associated with the AAA session.
AIE Handle	Access IE handle for the PPPoA session.
Packets in VC Holdq	Number of packets in the hold queue of the VC.
Particles in VC Tx Ring	Number of particles in the Tx ring of the VC.

1. QoS = quality of service
2. AIS = alarm indication signal
3. RDI = remote defect identification
4. ILMI = Interim Local Management Interface

show interfaces virtual-access

To display status, traffic data, and configuration information about a specified virtual access interface, use the **show interfaces virtual-access** command in privileged EXEC mode.

show interfaces virtual-access *number* [**configuration**]

Syntax Description

<i>number</i>	Number of the virtual access interface.
configuration	(Optional) Restricts output to configuration information.

Command Modes

Privileged EXEC

Command History

Release	Modification
11.2 F	This command was introduced.
11.3	The configuration keyword was added.
12.3(7)T	The output for this command was modified to indicate if the interface is a member of a multilink PPP bundle.
12.2(27)SBA	This command was integrated into Cisco IOS Release 12.2(27)SBA.

Usage Guidelines

To identify the number of the vty on which the virtual access interface was created, enter the **show users** EXEC command.



Tip

The counts of output packet bytes as reported by the L2TP access server (LAC) to the RADIUS server in the accounting record do not match those of a client. The following paragraphs describe how the accounting is done and how you can determine the correct packet byte counts.

Packet counts for client packets in the input path are as follows:

- For packets that are process-switched, virtual access input counters are incremented by the coalescing function by the PPP over Ethernet (PPPoE) payload length.
- For packets that are fast-switched, virtual access input counters are incremented by the fast-switching function by the formula:

$$\text{PPPoE payload length} + \text{PPP address\&control bytes} = \text{PPPoE payload length} + 2$$

- For packets that are Cisco Express Forwarding (CEF)-switched, virtual access input counters are incremented by the CEF switching function by the formula:

$$\text{IP len} + \text{PPP encapbytes (4)} = \text{PPPoE payload length} + 2$$

Packet counts for client packets in the output path are as follows:

- For packets that are process-switched by protocols other than PPP, virtual access output counters are incremented in the upper layer protocol by the entire datagram, as follows:

$$\text{Size} = \text{PPPoE payload} + \text{PPPoE hdr (6)} + \text{Eth hdr (14)} + \text{SNAP hdr (10)} + \text{media hdr (4 for ATM)}$$

- For packets process-switched by PPP Link Control Protocol (LCP) and Network Control Protocol (NCP), virtual access output counters are incremented by PPP, as follows:
PPP payload size + 4 bytes of PPP hdr
- For packets that are CEF fast-switched, virtual access counters are incremented by the PPPoE payload size.

Accounting is done for PPPoE, PPPoA PTA and L2X as follows:

- For PPPoE PPP Termination Aggregation (PTA), the PPPoE payload length is counted for all input and output packets.
- For PPPoE L2X on a LAC, the PPPoE payload length is counted for all input packets. On an L2TP Network Server (LNS), the payload plus the PPP header (address + control + type) are counted.
- For PPP over ATM (PPPoA) PTA i/p packets, the payload plus the PPP address plus control bytes are counted. For PPPoA PTA o/p packets, the payload plus PPP address plus control plus ATM header are counted.
- For PPPoA L2X on a LAC for i/p packets, the payload plus PPP addr plus cntl bytes are counted. For PPPoA L2X on a LNS, the payload plus PPP header (address + control + type) are counted.

Examples

The following is sample output from the **show interfaces virtual-access** command:

```
Router# show interfaces virtual-access 3

Virtual-Access3 is up, line protocol is up
  Hardware is Virtual Access interface
  MTU 1500 bytes, BW 149760 Kbit, DLY 1000000 usec,
    reliability 255/255, txload 1/255, rxload 1/255
  Encapsulation PPP, LCP Open, multilink Open
  Link is a member of Multilink bundle Virtual-Access4
  PPPoATM vaccess, cloned from Virtual-Template1
  Vaccess status 0x44
  Bound to ATM4/0.10000 VCD:16, VPI:15, VCI:200, loopback not set
  DTR is pulsed for 5 seconds on reset
  Last input never, output never, output hang never
  Last clearing of "show interface" counters 00:57:37
  Input queue:0/75/0/0 (size/max/drops/flushes); Total output drops:0
  Queueing strategy:fifo
  Output queue:0/40 (size/max)
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
    676 packets input, 12168 bytes, 0 no buffer
    Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
    0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
    676 packets output, 10140 bytes, 0 underruns
    0 output errors, 0 collisions, 0 interface resets
    0 output buffer failures, 0 output buffers swapped out
    0 carrier transitions
```

Table 2 describes the significant fields shown in the display.

Table 2 *show interfaces virtual-access Field Descriptions*

Field	Description
Virtual-Access ... is {up down administratively down}	Indicates whether the interface is currently active (whether carrier detect is present), is inactive, or has been taken down by an administrator.
line protocol is {up down administratively down}	Indicates whether the software processes that handle the line protocol consider the line to be usable (that is, whether keepalives are successful).
Hardware is	Type of interface. In this case, the interface is a dynamically created virtual access interface that exists on a vty line.
Internet address interface is unnumbered	IP address or IP unnumbered for the line. If unnumbered, the output lists the interface and IP address to which the line is assigned (Ethernet0 at 10.0.21.14 in this example).
MTU	Maximum transmission unit for packets on the virtual access interface.
BW	Bandwidth of the virtual access interface, in kbps.
DLY	Delay of the virtual access interface, in microseconds.
reliability	Reliability of the virtual access interface as a fraction of 255 (255/255 is 100 percent reliability), calculated as an exponential average over five minutes.
load	Load on the virtual access interface as a fraction of 255 (255/255 is completely saturated), calculated as an exponential average over five minutes. The calculation uses the value from the bandwidth interface configuration command.
Encapsulation	Encapsulation method assigned to the virtual access interface.
loopback	Test in which signals are sent and then directed back toward the source at some point along the communication path. Used to test network interface usability.
keepalive	Interval set for keepalive packets on the interface. If keepalives have not been enabled, the message is "keepalive not set."
DTR	Data terminal ready. An RS232-C circuit that is activated to let the DCE know when the DTE is ready to send and receive data.
LCP open closed req sent	Link Control Protocol (for PPP only; not for SLIP). LCP must come to the open state before any useful traffic can cross the link.
Open IPCP IPXCP ATCP	IPCP is the IP control protocol for PPP, IPXCP is the IPX control protocol for PPP, and ATCP is the AppleTalk control protocol for PPP. The network control protocol (NCP) is negotiated after the LCP opens. The NCP must come into the open state before useful traffic can cross the link.

Table 2 *show interfaces virtual-access Field Descriptions (continued)*

Field	Description
Last input	Number of hours, minutes, and seconds since the last packet was successfully received by a virtual access interface. This value indicates when a dead interface failed.
output	Number of hours, minutes, and seconds since the last packet was successfully transmitted by a virtual access interface.
output hang	Number of hours, minutes, and seconds (or never) since the virtual access interface was last reset because of a transmission that took too long. When the number of hours in any of the “last” fields exceeds 24 hours, the number of days and hours is displayed. If that field overflows, asterisks are displayed.
Last clearing	Time at which the counters that measure cumulative statistics (such as number of bytes transmitted and received) were last reset to zero. Note that variables that might affect routing (for example, load and reliability) are not cleared when the counters are cleared. Asterisks (***) indicate that the elapsed time is too large to be displayed. Zeros (0:00:00) indicate that the counters were cleared more than 2^{31} ms (and less than 2^{32} ms) ago.
Input queue, drops	Number of packets in input queues. Each number is followed by a slash, the maximum size of the queue, and the number of packets dropped on account of a full queue.
Queueing strategy	Type of queueing selected to prioritize network traffic. The options are first-come-first-served (FCFS) queueing, weighted fair queueing, priority queueing, and custom queueing.
Output queue	Number of packets in output queues. Each number is followed by a slash, the maximum size of the queue, and the number of packets dropped on account of a full queue.
Conversations	Number of weighted fair queueing conversations.
Reserved Conversations	Number of reserved weighted fair queueing conversations. The example shows the number of allocated conversations divided by the number of maximum allocated conversations. In this case, there have been 0 reserved conversations.
Five minute input rate, Five minute output rate	Average number of bits and packets transmitted per second in the last five minutes.
packets input	Total number of error-free packets received by the system.
bytes	Total number of bytes, including data and MAC encapsulation, in the error-free packets received by the system.

Table 2 *show interfaces virtual-access Field Descriptions (continued)*

Field	Description
no buffer	Number of received packets discarded because there was no buffer space in the main system. Compare with ignored count. Broadcast storms on Ethernets and bursts of noise on serial lines are often responsible for no-input-buffer events.
broadcasts	Total number of broadcast or multicast packets received by the virtual access interface.
runt	Number of packets that are discarded because they are smaller than the medium's minimum packet size.
giants	Number of packets that are discarded because they exceed the medium's maximum packet size.
input errors	Total number of no-buffer, runts, giants, cyclic redundancy checks (CRCs), frame, overrun, ignored, and abort counts. Other input-related errors can also increment the count, so that this sum might not balance with the other counts.
CRC	Counter that reflects when the cyclic redundancy checksum generated by the originating LAN station or far-end device does not match the checksum calculated from data received. On a LAN, this often indicates noise or transmission problems on the LAN interface or the LAN bus. A high number of CRCs is usually the result of collisions or a station transmitting bad data. On a serial link, CRCs often indicate noise, gain hits, or other transmission problems on the data link.
frame	Number of packets received incorrectly having a CRC error and a noninteger number of octets. On a serial line, this is usually the result of noise or other transmission problems.
overrun	Number of times the serial receiver hardware was unable to hand received data to a hardware buffer because the input rate exceeded the receiver's ability to handle the data.
ignored	Number of received packets ignored by the virtual access interface because the interface hardware ran low on internal buffers. These buffers are different from the system buffers mentioned in the description of the no buffer field. Broadcast storms and bursts of noise can cause the "ignored" count to be incremented.
abort	Illegal sequence of one bits on a virtual access interface. This usually indicates a clocking problem between the virtual access interface and the data link equipment.
packets output	Total number of messages transmitted by the system.
bytes	Total number of bytes, including data and MAC encapsulation, transmitted by the system.
underruns	Number of times that the far-end transmitter has been running faster than the near-end communication server's receiver can handle. Underruns may never be reported on some virtual access interfaces.

Table 2 *show interfaces virtual-access Field Descriptions (continued)*

Field	Description
output errors	Sum of all errors that prevented the final transmission of datagrams out of the virtual access interface being examined. Note that this might not balance with the sum of the enumerated output errors, because some datagrams might have more than one error, and others might have errors that do not fall into any of the tabulated categories.
collisions	Number of packets colliding.
interface resets	Number of times a virtual access interface has been completely reset. A reset can happen if packets queued for transmission were not sent within several seconds. Resetting can be caused by a malfunctioning modem that is not supplying the transmit clock signal or by a cable problem. If the system notices that the carrier detect line of a virtual access interface is up, but the line protocol is down, it periodically resets the interface in an effort to restart it. Interface resets can also occur when a virtual access interface is looped back or shut down.
output buffer failures	Number of outgoing packets dropped from the output buffer.
output buffers swapped out	Number of times that the output buffer was swapped out.
carrier transitions	Number of times that the carrier detect (CD) signal of a virtual access interface has changed state. Indicates modem or line problems if the CD line changes state often. If data carrier detect (DCD) goes down and comes up, the carrier transition counter increments two times.

Related Commands

Command	Description
show users	Displays information about the active lines on the router.

show ppp multilink

To display bundle information for Multilink PPP (MLP) bundles, use the **show ppp multilink** command in privileged EXEC mode.

show ppp multilink [**active** | **inactive** | **interface** *bundle-interface* | [**username** *name*] [**endpoint** *endpoint*]]

Syntax Description		
active	(Optional)	Displays information about active multilink bundles only.
inactive	(Optional)	Displays information about inactive multilink bundles only.
interface <i>bundle-interface</i>	(Optional)	Name of a bundle interface. Displays information for the specified bundle interface.
username <i>name</i>	(Optional)	Username of a peer. Displays information for all multilink bundles that have the specified peer username.
endpoint <i>endpoint</i>	(Optional)	Endpoint discriminator of a peer. Displays information for all multilink bundles that have the specified endpoint discriminator.

Command Modes	Privileged EXEC
---------------	-----------------

Command History	Release	Modification
	11.2	This command was introduced.
	12.2(13)T	This command was modified to include per-class information when Multiclass Multilink PPP (MCMP) is negotiated. The <i>bundle-interface</i> argument was added.
	12.3(7)T	The following keywords were added to enable information to be displayed for bundles that have specific parameters: active , inactive , username , endpoint .
	12.2(27)SBA	This command was integrated into Cisco IOS Release 12.2(27)SBA.

Examples

The following is sample output from the **show ppp multilink** command when no bundles are on a system:

```
Router# show ppp multilink
```

```
No active bundles
```

The following is sample output when a single MLP bundle (named bundle1) is on a system:

```
Router# show ppp multilink
```

```
Bundle bundle1, 3 members, first link is BRI0: B-channel 1
0 lost fragments, 8 reordered, 0 unassigned, sequence 0x1E/0x1E rcvd/sent
```

The following is sample output when two active bundles are on a system.

```
Router# show ppp multilink
```

```
Bundle bundle1, 3 members, first link is BRI0: B-Channel 1
```

show ppp multilink

```

    0 lost fragments, 8 reordered, 0 unassigned, sequence 0x1E/0x1E rcvd/sent
Bundle bundle2, 4 members, first link is BRI2: B-Channel 1
    0 lost fragments, 28 reordered, 0 unassigned, sequence 0x12E/0x12E rcvd/sent

```

The following example shows output when a stack group has been created. On stack group member systema, the MLP bundle named bundle1 has bundle interface Virtual-Access4. Two child interfaces are joined to this bundle interface. The first is a local PRI channel (serial 0:4), and the second is an interface from stack group member systemb.

```

Router# show ppp multilink

Bundle bundle1 2 members, Master link is Virtual-Access4
0 lost fragments, 0 reordered, 0 unassigned, 100/255 load
0 discarded, 0 lost received, sequence 40/66 rcvd/sent
members 2
  Serial0:4
  systemb:Virtual-Access6      (10.1.1.1)

```

The following is sample output when the PPP Bandwidth Allocation Control Protocol (BACP) is enabled for the multilink bundle:

```

Router# show ppp multilink

Bundle bundle1, 1 member, Master link is Virtual-Access1
Bundle under BAP control
Dialer Interface is Dialer1
    0 lost fragments, 0 reordered, 0 unassigned, sequence 0x0/0x0 rcvd/sent
    0 discarded, 0 lost received, 1/255
Member links: 1
BRI0:1

Discriminators Local Remote
BRI0:1                24      1

```

Table 3 describes the significant fields shown in the display.

Table 3 *show ppp multilink Field Descriptions with PPP BACP Enabled*

Field	Description
Bundle	Configured name of the multilink bundle.
member	Number of interfaces in the group.
Master link is	Multilink bundle virtual interface.
Bundle under BAP control	Multilink bundle is controlled and bandwidth is allocated by BACP.
Dialer Interface is	Name of the interface that dials the calls.
load	Load on the link in the range from 1/255 to 255/255 (255/255 is a 100 percent load).
Member links	Number of child interfaces.
BRI0:1	Identity of the child interface. Link 1 is using physical interface BRI 0:1.
Discriminators Local Remote	Link Control Protocol (LCP) link discriminators, which are identifiers negotiated for each link in the bundle. This information is specific to BACP. BACP uses these discriminators to determine which link to drop during negotiations.

The following is sample output when MCMP is negotiated on a virtual access interface named Virtual-Access3:

```
Router# show ppp multilink interface Virtual-Access3

Virtual-Access3, bundle name is bundle1
Bundle up for 01:59:35, 1/255 load, 2 receive classes, 2 transmit classes
Receive buffer limit 12192 bytes per class, frag timeout 1524 ms
Dialer interface is Dialer1
!
Receive Class 0:
0/0 fragments/bytes in reassembly list
0 lost fragments, 0 reordered
0/0 discarded fragments/bytes, 0 lost received
0x0 received sequence
!
Receive Class 1:
0/0 fragments/bytes in reassembly list
0 lost fragments, 0 reordered
0/0 discarded fragments/bytes, 0 lost received
0x0 received sequence
!
Transmit Class 0:
0x8 sent sequence
!
Transmit Class 1:
0x0 sent sequence
!
Member links: 1 (max not set, min not set)
BR2/0:1, since 01:59:35, 80 weight, 72 frag size
```

Table 4 describes the significant fields shown in the display when MCMP is enabled.

Table 4 *show ppp multilink Field Descriptions with MCMP Enabled*

Field	Description
bundle name is	Configured name of the multilink bundle.
Bundle up for	Time (in hh:mm:ss) for which the bundle has been up.
load	Load on the link in the range from 1/255 to 255/255 (255/255 is a 100 percent load).
receive classes, transmit classes	Number of data classes defined for the multilink bundle.
Receive buffer limit	Maximum number of bytes that will be buffered for reassembly for each class of data.
frag timeout	Time, in milliseconds (ms), for which the router will wait for the expected sequence number to arrive after receiving an out-of-order fragment.
Receive Class 0	Information about Class 0 (normal data) packets received by the router.
Receive Class 1	Information about Class 1 (high-priority) packets received by the router.
Transmit Class 0	Information about Class 0 (normal data) packets sent by the router.
Transmit Class 1	Information about Class 1 (high-priority) packets sent by the router.
fragments/bytes in reassembly list	Number of fragments and bytes currently buffered and awaiting reassembly.

Table 4 *show ppp multilink Field Descriptions with MCMP Enabled (continued)*

Field	Description
lost fragments	Number of fragments that have been lost.
reordered	Number of fragments that have been reordered.
discarded fragments/bytes	Number of fragments and bytes that have been discarded. This usually occurs only if the fragment is a part of a packet for which one or more fragments were lost.
lost received	Number of fragments that arrived after they were declared lost.
Member links	Number of child interfaces.
BR2/0:1	Identity of the child interface.
since	Time (in hh:mm:ss) for which the interface has been active.
weight	Relative weight of the link (calculated as bandwidth x fragment delay). This value is used to calculate the fragment size and for load balancing. Each fragment should be less than or equal to the weight, including all link layer headers.
frag size	Fragment size of packets sent over the link, not including link layer headers. The difference between the weight and the fragment size indicates how much link layer overhead is being calculated for each fragment.

The following sample output displays information about all the active multilink bundles.

Router# **show ppp multilink active**

```
Virtual-Access4, bundle name is 7200-4
Endpoint discriminator is 7200-4
Bundle up for 00:31:26, 1/255 load
Receive buffer limit 12192 bytes, frag timeout 1000 ms
  0/0 fragments/bytes in reassembly list
  0 lost fragments, 0 reordered
  0/0 discarded fragments/bytes, 0 lost received
  0x0 received sequence, 0x0 sent sequence
Member links:1 (max not set, min not set)
  Vi3, since 00:31:26
  PPPoATM link, ATM PVC 15/200 on ATM4/0.10000
  Packets in ATM PVC Holdq:0 , Particles in ATM PVC Tx Ring:1
```

[Table 5](#) describes the significant fields shown in the display when information for all active bundles is displayed.

Table 5 *show ppp multilink Field Descriptions for Active Bundles*

Field	Description
bundle name is	Configured name of the multilink bundle.
Endpoint discriminator	Identifies the MLP bundle to which the PPPoA session is associated.
Bundle up for	Time (in hh:mm:ss) for which the bundle has been up.
1/255 load	Load on the link in the range from 1/255 to 255/255 (255/255 is a 100 percent load).

Table 5 *show ppp multilink Field Descriptions for Active Bundles (continued)*

Field	Description
Receive buffer limit	Maximum number of bytes that will be buffered for reassembly for each class of data.
frag timeout	Time, in milliseconds (ms), for which the router will wait for the expected sequence number to arrive after receiving an out-of-order fragment.
fragments/bytes in reassembly list	Number of fragments and bytes currently buffered and awaiting reassembly.
lost fragments	Number of fragments that have been lost.
reordered	Number of fragments that have been reordered.
discarded fragments/bytes	Number of fragments and bytes that have been discarded. This usually occurs only if the fragment is a part of a packet for which one or more fragments were lost.
lost received	Number of fragments that arrived after they were declared lost.
received sequence	Sequence number of the last MLP packet received.
sent sequence	Sequence number of the last MLP packet sent.
Member links	Number of child interfaces.
Vi3	Identity of the child interface.
since	Time (in hh:mm:ss) for which the interface has been active.
Packets in ATM PVC Holdq	Number of packets in the ATM PVC hold queue.
Particles in ATM PVC Tx Ring	Number of particles in transmission ring of the ATM PVC.

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