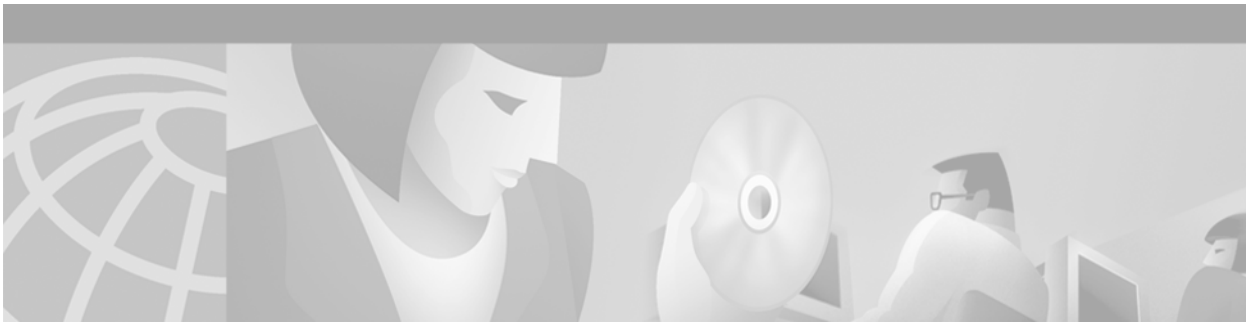


PPPoE on ATM

This feature module describes the PPP over Ethernet (PPPoE) on ATM feature. It includes information on the benefits of the new feature, supported platforms, supported standards, and the commands necessary to configure the PPPoE on ATM feature.

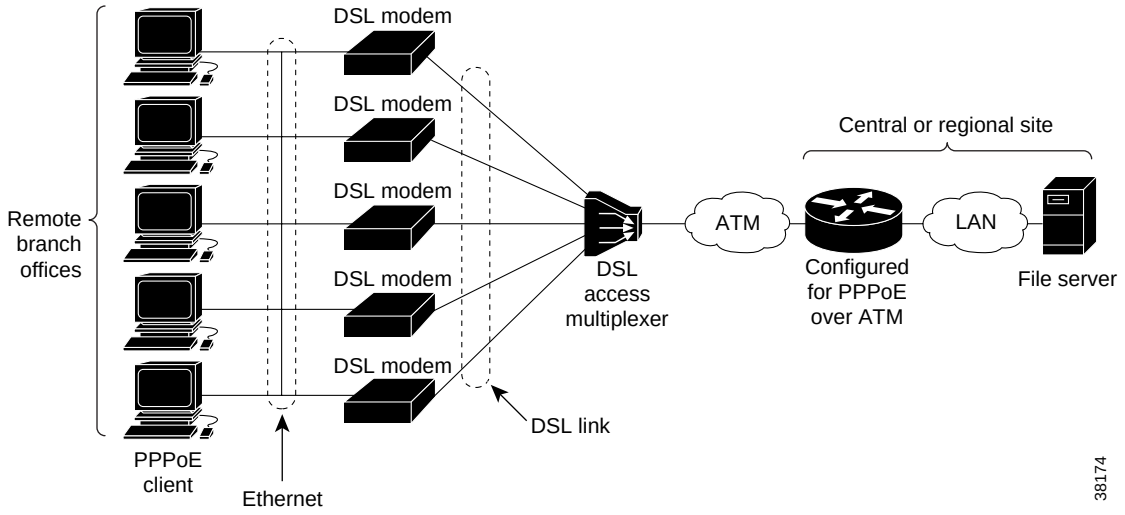
This document includes the following sections:

Feature Overview

The PPPoE on ATM feature provides the ability to connect a network of hosts over a simple bridging-access device to a remote access concentrator. With this model, each host utilizes its own PPPoE stack and the user is presented with a familiar user interface. Access control, billing and type of service can be done on a per-user, rather than a per-site, basis. Before a point-to-point connection over Ethernet can be provided, each PPP session must learn the Ethernet address of the remote peer and establish a unique session identifier. A unique session identifier is provided by the PPPoE Discovery Stage protocol.

Figure 1 shows a sample network topology using PPPoE on ATM.

Figure 1 PPPoE on ATM Sample Network Topology



PPPoE Stage Protocols

PPPoE has two distinct stage protocols. The stage protocols are listed and summarized in Table 1.

Table 1 PPPoE Stage Protocols

Stage Protocols	Description
Discovery Stage protocol	Remains stateless until a PPPoE session is established. Once the PPPoE session is established, both the host and the access concentrator *must* allocate the resources for a PPP virtual access interface.
PPP Session Stage protocol	Once the PPPoE session is established, sends PPPoE data as in any other PPP encapsulation.

There are four steps to the Discovery Stage:

1. Host broadcasts a PPPoE Active Discovery Initiation (PADI) packet.
2. When the access concentrator receives a PADI that it can serve, it replies by sending a PPPoE Active Discovery Offer (PADO) packet to the host.
3. Because the PADI was broadcast, the host may receive more than one PADO packet. The host looks through the PADO packets it receives and chooses one. The choice can be based on the AC name or the services offered. The host then sends a single PPPoE Active Discovery Request (PADR) packet to the access concentrator that it has chosen.
4. When the access concentrator receives a PADR packet, it prepares to begin a PPP session. It generates a unique SESSION_ID for the PPPoE session and replies to the host with a PPPoE Active Discovery Session-confirmation (PADS) packet.

When a host wishes to initiate a PPPoE session, it must first perform discovery to identify the Ethernet MAC address of the peer and establish a PPPOE SESSION_ID. Although PPP defines a peer-to-peer relationship, discovery is inherently a client/server relationship. In the discovery process, a host (the client) discovers an access concentrator (the server). Based on the network topology, there may be more than one access concentrator that the host can communicate with. The Discovery Stage allows the host to discover all access concentrators and then select one. When discovery is completed, both the host and the selected access concentrator have the information they will use to build their point-to-point connection over Ethernet.

Benefits

The PPPoE on ATM feature provides service-provider digital subscriber line (DSL) support. As service providers begin DSL deployments, two of their most significant goals are to ease and facilitate consumer end adoption and to preserve as much of the dialup model as possible. PPPoE serves to advance both of these goals by leveraging ethernet scale curves and embedded base (such as ATM NICs) and by preserving the point-to-point session used by internet service providers (ISPs) in today's dialup model.

Using a PPPoE client (available from RouterWare), a PPP session can be initiated on an Ethernet connected client through a standard ADSL modem. The session is transported over the ATM DSL link via RFC 1483 Ethernet bridged frames and can terminate either in the LAN emulation client (LEC) central office or the ISP point of presence (POP). The termination device can be an aggregation box such as the Cisco 6400 or a router such as the Cisco 7200 series platforms.

As customers deploy asymmetric DSL (ADSL), they will encounter the need to enable users to access remote-access concentrators via simple bridges connecting Ethernet and ATM networks.

Restrictions

The following restrictions apply when PPPoE on ATM is used:

- PPPoE will not be supported on Frame Relay.
- PPPoE will not be supported on actual Ethernet interfaces.
- PPPoE will not be supported on any other LAN interfaces such as FDDI and Token Ring.
- Fast switching is supported. PPP over Ethernet over RFC 1483 fibswitching will be supported for IP. All other protocols will be switched over process switching.
- Bridging is supported on the ATM permanent virtual connections (PVCs) running PPPoE.
- PPPoE will be supported on ATM PVCs compliant with RFC 1483 only.
- Only dial-in mode will be supported. Dial-out mode will not be supported.
- 2000 simultaneous PPP sessions are supported on the Cisco series 7200 with ATM Deluxe port adapters and on the Cisco series 6400 platforms only, both with 128 MB of DRAM.

Related Documents

- RFC 1483, *Multiprotocol Encapsulation over ATM Adaptation Layer 5*
- RFC 2364, *PPP over AAL5*
- RFC 2516, *A Method for Transmitting PPP over Ethernet (PPPoE)*

Supported Platforms

This feature is supported on the following platforms:

- Cisco 3600 series
- Cisco 4500 series
- Cisco 4700 series
- Cisco 6400 NRP
- Cisco 7200 series
- Cisco MC3810

Supported Standards, MIBs, and RFCs

Standards

None

MIBs

No new MIBs are supported by this feature.

For descriptions of supported MIBs and how to use MIBs, see the Cisco MIB web site on CCO at http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml.

RFCs

- RFC 1483, *Multiprotocol Encapsulation over ATM Adaptation Layer 5*
- RFC 2364, *PPP over AAL5*
- RFC 2516, *A Method for Transmitting PPP over Ethernet (PPPoE)*

Prerequisites

Before you can configure PPPoE on ATM, you need to configure a virtual private dial-up network (VPDN) group using the **accept dialin** command, enable PPPoE, and specify a virtual template for PPPoE sessions.

Configuration Tasks

See the following sections for configuration tasks for the PPPoE on ATM feature. Each task in the list indicates if the task is optional or required.

- Enabling PPP over ATM in a VPDN Group (Required)
- Creating and Configuring a Virtual Template (Optional)
- Specifying an ATM Subinterface (Optional)
- Creating an ATM PVC (Required)
- Enabling PPPoE on an ATM PVC (Required)

Enabling PPP over ATM in a VPDN Group

After you configure the Cisco router or access server for Ethernet encapsulation, you must configure the physical interface with the PVC and apply a virtual template with PPP encapsulation to the PVC that it applies to. To configure the physical interface that will carry the PPPoE session and link it to the appropriate virtual template interface, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	`Router(config)# vpdn enable`	Sets up the PPP over Ethernet discovery daemon.
Step 2	`Router(config-if)# vpdn group` *name*	Associates a VPDN group to a customer or VPDN profile.
Step 3	`Router(config-if)# accept dialin`	Creates an accept dial-in VPDN group.
Step 4	`Router(config-if)# protocol pppoe`	Specifies the VPDN group to be used to establish PPPoE sessions.
Step 5	`Router(config-if)# virtual-template` *template-number*	Specifies which virtual template will be used to clone virtual access interfaces.

Creating and Configuring a Virtual Template

Prior to configuring the ATM PVC for PPPoE on ATM, you typically create and configure a virtual template. To create and configure a virtual template, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	`Router(config)# interface virtual-template` *number*	Creates a virtual template, and enters interface configuration mode.
Step 2	`Router(config-if)# encapsulation ppp`	Enables PPP encapsulation on the virtual template.
Step 3	`Router(config-if)# ip unnumbered ethernet` *number*	Optionally, enables IP without assigning a specific IP address on the LAN.

Other optional configuration commands can be added to the virtual template configuration. For example, you can enable the PPP authentication on the virtual template using the **ppp authentication chap** command. Refer to the "Virtual Interface Template Service" chapter in the *Cisco IOS Dial Solutions Configuration Guide* for additional information about configuring the virtual template.

All PPP parameters are managed within the virtual template configuration. Configuration changes made to the virtual template are automatically propagated to the individual virtual access interfaces. Multiple virtual access interfaces can spawn from a single virtual template; hence, multiple PVCs can use a single virtual template.

Cisco IOS software supports up to 25 virtual template configurations. If greater numbers of tailored configurations are required, an authentication, authorization, and accounting (AAA) server may be employed. Refer to the "Per-User Configuration" chapter in the *Cisco IOS Dial Solutions Configuration Guide* for further information on configuring an AAA server.

If the parameters of the virtual template are not explicitly defined before the ATM PVC is configured, the PPP interface is brought up using default values from the virtual template identified. Some parameters (such as an IP address) take effect only if specified before the PPP interface comes up. Therefore, we recommend that you explicitly create and configure the virtual template before configuring the ATM PVC to ensure such parameters take effect. Alternatively, if parameters are specified after the ATM PVC has already been configured, you should issue a **shutdown** command followed by a **no shutdown** command on the ATM subinterface to restart the interface; this restart will cause the newly configured parameters (such as an IP address) to take effect.

Network addresses for the PPP-over-ATM connections are not configured on the main ATM interface or subinterface. Instead, these connections are configured on the appropriate virtual template or obtained via AAA.

The virtual templates support all standard PPP configuration commands; however, not all configurations are supported by the PPP-over-ATM virtual access interfaces. These restrictions are enforced at the time the virtual template configuration is applied (cloned) to the virtual access interface. These restrictions are described in the following paragraphs.

Only standard first-in, first-out (FIFO) queueing is supported when applied to PPP-over-ATM virtual access interfaces. Other types of queueing that are typically configured on the main interface are not (for example, fair queueing). If configured, these configuration lines are ignored when applied to a PPP-over-ATM interface.

Although Cisco Express Forwarding (CEF) switching is supported, fast switching, flow, and optimum switching are not; these configurations are ignored on the PPP-over-ATM virtual access interface. CEF is enabled by default for IP. All other protocol traffic will be processed switched.

Note The PPP reliable link that uses Link Access Procedure, Balanced (LAPB) is not supported.

Because an ATM PVC is configured for this feature, the following standard PPP features are not applicable and should not be configured:

- Asynchronous interfaces
- Dialup connections
- Callback on PPP

Specifying an ATM Subinterface

After you create a virtual template for PPPoE on ATM, specify a multipoint or point-to-point subinterface per PVC connection. To specify an ATM multipoint subinterface, use one of the following commands in global configuration mode:

Command	Purpose
Router# **interface atm** *slot/0.subinterface-number* **multipoint** | **point-to-point** or Router# **interface atm** *number.subinterface-number* **multipoint** | **point-to-point**	Specifies the ATM subinterface using the appropriate format of the **interface atm** command.[1] A **multipoint** subinterface is recommended for interface conservation. A **point-to-point** subinterface will greatly restrict the total number of PPPoE sessions you can have up.

1. Use the **interface atm** *slot*/**0** command with the ATM port adapter on the Cisco 7200 series router and the 1-port ATM-25 network module on the Cisco 2600 and 3600 series routers. Use the **interface atm** *number* command with the NPM on the Cisco 4500 and 4700 routers. Use **interface atm 0** on the Cisco MC3810.

Creating an ATM PVC

After you create a virtual template and specify an ATM subinterface, you must create an ATM PVC. To create an ATM PVC, use the following commands beginning in interface configuration mode:

	Command	Purpose
Step 1	Router(config)# **pvc** [*name*] *vpi/vci*	Creates an ATM PVC.
Step 2	Router(config-if)# **encapsulation aal5snap**	Specifies AAL5 SNAP for ATM encapsulation.

The peak rate value is typically identical to the average rate or some suitable multiple thereof.

The average rate value should be set to the line rate available at the remote site, because the remote line rate will typically have the lowest speed of the connection.

For example, if the remote site has a T1 link, set the line rate to 1.536 Mbps. Because the average rate calculation on the ATM PVC includes the cell headers, a line rate value plus 10 or 15 percent may result in better remote line utilization.

The burst size depends on the number of cells that can be buffered by receiving ATM switches and is coordinated with the ATM network connection provider. If this value is not specified, the default, which is the equivalent to one maximum length frame on the interface, is used.

Operations, Administration and Maintenance (OAM) F5 cell loopback is provided by the remote AXIS shelf so OAM may be enabled. However, PPPoE on ATM is not typically an end-to-end ATM connection, and therefore enabling OAM is not recommended.

Once you configure the router for PPPoE on ATM, the PPP subsystem starts and the router attempts to send a PPP configure request to the remote peer. If the peer does not respond, the router periodically goes into a “listen” state and waits for a configuration request from the peer. After a timeout (typically 45 seconds), the router again attempts to reach the remote router by sending configuration requests.

Enabling PPPoE on an ATM PVC

To enable PPPoE on an ATM PVC, use the following command in interface configuration mode:

Command	Purpose
`Router(config-if)# protocol pppoe`	Specifies the VPDN group to be used for establishing PPPoE sessions.

Configuration Example

This section provides the following configuration example:

- PPPoE on ATM

PPPoE on ATM

The following example configures PPPoE on ATM to accept dial-in PPPoE sessions. The virtual access interface for the PPP session is cloned form virtual template interface 1. On subinterface ATM 2/0.1, ATM PVC with VPI 0 and VCI 60 is configured with Logical Link Control (LLC)/Subnetwork Access Protocol (SNAP) encapsulation and is configured to run PPPoE. Bridged Ethernet protocol data units (PDUs) with destination MAC address set to the ATM interface MAC address and Ethernet type set to 0x8863 for that PVC are enqueued to the PPPoE discovery process. All bridged Ethernet PDUs with destination MAC address set to the ATM interface MAC address and Ethernet type set to 0x8864 coming in from that PVC are forwarded to the virtual access interface associated with the PPP session.

```
vpdn enable

vpdn-group 1
 accept dialin
  protocol pppoe
  virtual-template 1

interface atm 2/0.1 multipoint
  pvc 0/60
    encapsulation aal5snap
    protocol pppoe

interface virtual-template 1
  ip addr 10.0.1.2 255.255.255.0
  mtu 1492
```

For PPPoE virtual template interfaces, “mtu 1492” must be configured because Ethernet has a maximum payload size of 1500 bytes, the PPPoE header is 6 bytes, and PPP Protocol ID is 2 bytes.

Note Dial-out mode will not be supported.

Command Reference

This section documents new or modified commands. All other commands used with this feature are documented in the Cisco IOS Release 12.1 command reference publications.

List of new Cisco IOS Commands are as follows:

- **pppoe session-limit per-mac**
- **pppoe session-limit per-vc**

List of modified Cisco IOS Commands are as follows:

- **accept dialin**
- **protocol (VPDN)**
- **show atm pvc**
- **show vpdn**
- **virtual-template**
- **vpdn group**

accept dialin

To configure an LNS to accept tunneled PPP connections from a LAC and create an accept dialin VPDN subgroup, use the **accept dialin** VPDN group configuration command. To remove the accept dialin subgroup from a VPDN group, use the **no** form of this command.

accept dialin

no accept dialin

Syntax Description

This command has no keywords or arguments.

Defaults

Disabled

Command Modes

VPDN group

Command History

Release	Modification
11.3(5)AA	This command was introduced.
12.0(1)T	This command was implemented in Cisco IOS 12.0 T.
12.0(5)T	All keywords and arguments were removed and made into separate **accept dialin** subgroup commands.
12.1(1)T	This command was modified to support dial-in PPPoE calls.

Usage Guidelines

For a VPDN group to accept dialin calls, you must also configure the following commands:

- **terminate-from** VPDN group command
- **protocol** VPDN subgroup command
- **virtual-template** accept dialin command

Once an L2F or L2TP tunnel is established, both dial-in and dial-out calls can use the same tunnel.

This command replies to a dial in L2F or L2TP tunnel open request from the specified peer. Once the LNS accepts the request from a LAC, it uses the specified virtual template to clone new virtual access interfaces. This command replaces the **vpdn incoming** command used in Cisco IOS Release 11.3. The user interface will automatically be upgraded when you reload the router with a Cisco IOS Release 12.0 T or 11.3 AA image.

Typically, you need one VPDN group for each LAC. For an LNS that services many LACs, the configuration can become cumbersome; however, you can use the default VPDN group configuration if all the LACs will share the same tunnel attributes. An example of this scenario would be an LNS that services a large department with many Windows NT L2TP clients that are co-located with the LAC. Each of the Windows NT devices is an L2TP client and a LAC. Each of these devices will demand a tunnel to the LNS. If all the tunnels will share the same tunnel attributes you can use a default VPDN group configuration, which accelerated and simplifies the configuration process.

Note The **vpdn group** command must be configured with the **accept dialin** or **request dialin** command to be functional. The requester initiates a dial-in tunnel. The acceptor accepts a request for a dial-in tunnel.

Examples

The following example enables the LNS to accept an L2TP tunnel from a LAC named mugsy. A virtual access interface will be cloned from virtual-template 1:

```
vpdn-group 1
 accept dialin
  protocol l2tp
  virtual-template 1
 terminate-from hostname mugsy
```

If you do not use the **terminate-from** command, you automatically enable a default VPDN group, which allows all tunnels to share the same tunnel attributes:

```
vpdn-group 1
! Default L2TP VPDN group
 accept dialin
  protocol l2tp
  virtual-template 1
```

Related Commands

Command	Description
force-local-chap	Forces the LNS to reauthenticate the client.
lcp renegotiation	Allows the LNS to renegotiate the LCP on dial-in calls, using L2TP or L2F.
pppoe	Configures the router to accept dial-in PPPoE calls.
pre-clone	Enables a virtual template task to preclone virtual access interfaces.
protocol (VPDN)	Specifies the Layer 2 tunneling protocol that the VPDN subgroup will use.
request dialin	Configures a VPDN group to request L2F or L2TP tunnels to a home gateway and creates a request dial-in VPDN subgroup.
terminate-from	Specifies the host name of the remote LAC or LNS that will be required when accepting a VPDN tunnel.
virtual-template	Specifies which virtual template will be used to clone virtual access interfaces.

pppoe session-limit per-mac

To set the limit of sessions to be sourced from a MAC address, use the **pppoe session-limit per-mac** command in VPDN configuration mode.

pppoe session-limit per-mac *number*

Syntax Description

number	Number of sessions from customer premises equipment (cpe).

Defaults

100 sessions

Command Modes

VPDN configuration

Command History

Release	Modification
12.1(1)T	This command was introduced.

Examples

The following example sets a limit of 10 sessions to be sourced from a MAC address:

```
pppoe session-limit per-mac 10
```

Related Commands

Command	Description
pppoe session-limit per-vc	Sets the limit of sessions to be established over a VC.

pppoe session-limit per-vc

To set the limit of sessions to be established over a VC, use the **pppoe session-limit per-vc** command in VPDN configuration mode.

pppoe session-limit per-vc *number*

Syntax Description

number	Number of sessions from an ATM PVC.

Defaults

100 sessions

Command Modes

VPDN configuration

Command History

Release	Modification
12.1(1)T	This command was introduced.

Examples

The following example sets a limit of 10 sessions to be established over a VC:

```
pppoe session-limit per-vc 10
```

Related Commands

Command	Description
pppoe session-limit per-mac	Sets the limit of sessions to be sourced from a MAC address.

protocol (VPDN)

To specify the Layer 2 tunneling protocol (L2TP) that the VPDN subgroup will use, use the **protocol** (VPDN) subgroup command. To remove the protocol-specific configurations from a VPDN subgroup, use the **no** form of this command.

protocol {**l2f | l2tp | any | pppoe | tunnel**}

no protocol

Syntax Description

l2f	Enables the VPDN subgroup to establish L2F tunnels.
l2tp	Enables the VPDN subgroup to establish L2TP tunnels.
any	Enables the VPDN subgroup to establish either L2F or L2TP tunnels.
pppoe	Enables the VPDN subgroup to establish PPPoE sessions.

Defaults

Disabled

Command Modes

VPDN subgroup

Command History

Release	Modification
12.0(5)T	This command was introduced.
12.1(1)T	This command was modified to support the **pppoe** keyword.

Usage Guidelines

This command is required for all four of the VPDN subgroups.

L2TP is the only protocol that can be used for dial-out.

Changing the protocol will remove all the commands from the VPDN subgroup and any protocol-specific commands from the VPDN group configuration.

Examples

The following example configures vpdn group 1 to accept dial-in calls using L2F and request dial-out calls using L2TP:

```
vpdn-group 1
 accept dialin
  protocol l2f
  virtual-template 1
 request dialout
  protocol l2tp
  pool-member 1
 local name reuben
 terminate-from hostname cerise
 initiate-to ip 10.3.2.1
 l2f ignore-mid-sequence
 l2tp ip udp checksum
```

If you then use the **no protocol** (VPDN) command in request-dialout mode, the configuration will be changed to the following:

```
vpdn-group 1
 accept dialin
  protocol l2f
  virtual-template 1
 request dialout
 local name reuben
 terminate-from hostname cerise
 l2f ignore-mid-sequence
```

The following example configures vpdn group 1 to allow users to configure the router to accept dial-in PPPoE calls:

```
vpdn-group 1
 accept dialin
  protocol pppoe
  virtual-template 1
```

Note Users must first enter the **vpdn enable** command to set up the PPP over Ethernet discovery demon.

Related Commands

Command	Description
accept dialin	Configures an LNS to accept tunneled PPP connections from a LAC and create an accept dialin VPDN subgroup.
accept dialout	Accepts requests to tunnel L2TP dial-out calls and creates an accept dialout VPDN subgroup.
request dialin	Configures a VPDN group to request L2F or L2TP tunnels to a home gateway and creates a request dialin VPDN subgroup.
request dialout	Enables an LNS to request VPDN dial-out calls by using L2TP.

show atm pvc

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

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 character **(/)** 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 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 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.

Defaults

No default behavior or values.

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.

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 operations administration 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:

```
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:

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

```
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 2 describes significant fields shown in the displays.

Table 2 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.
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.

Table 2 show atm pvc Field Descriptions (continued)

Field	Description
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 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.
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.

Table 2 show atm pvc Field Descriptions (continued)

Field	Description
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. • 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.
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.

Table 2 show atm pvc Field Descriptions (continued)

Field	Description
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).
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 2 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 vpdn

To display information about active Level 2 Forwarding (L2F) protocol tunnel and message identifiers in a virtual private dialup network (VPDN), use the **show vpdn** EXEC command.

show vpdn [**session**][**packets**][**tunnel**][**all**]

Syntax Description

session	(Optional) Displays a summary of the status of all active tunnels.
packets	(Optional) Displays a summary of packets coming in and going out of a session.
tunnel	(Optional) Displays information about all active L2F and L2TP tunnels in summary-style format.
all	(Optional) Displays summary information about all active L2F and L2TP tunnels.

Defaults

No default behavior or values.

Command Modes

EXEC

Command History

Release	Modification
11.2	This command was introduced.
12.1(1)T	This command was modified to display Point-to-Point Protocol over Ethernet (PPPoE) session information. The following keywords were added: • **session** • **packets** • **all**

Usage Guidelines

If the **session**, **packet**, or **all** keywords are specified, the output of this command displays PPPoE session information.

PPPoE will be supported on ATM permanent virtual connections (PVCs) compliant with RFC 1483 only. Currently, PPPoE is not supported on frame relay, actual ethernet interfaces, and any other LAN interfaces such as FDDI and Token Ring.

Examples

The following is an example of output from the **show vpdn** command for L2F and L2TP sessions:

```
show vpdn

Active L2F tunnels
NAS Name   Gateway Name    NAS CLID   Gateway CLID   State
nas        gateway           4            2          open

L2F MIDs
Name                NAS Name    Interface    MID      State
phil@cisco.com       nas          As7          1       open
sam@cisco.com        nas          As8          2       open
```

Table 3 describes the fields shown in the **show vpdn** command display.

Table 3 show vpdn Field Descriptions

Field	Description
Active L2F tunnels	
NAS Name	Host name of the network access server, which is the remote termination point of the tunnel.
Gateway Name	Host name of the home gateway, which is local termination point of the tunnel.
NAS CLID	A number uniquely identifying the VPDN tunnel on the network access server.
Gateway CLID	A number uniquely identifying the VPDN tunnel on the gateway
State	Indicates whether the tunnel is open, opening, closing, or closed.
L2F MIDs	
Name	Username of the person from whom a protocol message was forwarded over the tunnel.
NAS Name	Host name of the network access server.
Interface	Interface from which the protocol message was sent.
MID	A number uniquely identifying this user in this tunnel.
State	Indicates status for the individual user in the tunnel. The states are: opening, open, closed, closing, and waiting_for_tunnel. The waiting_for_tunnel state means that the user connection is waiting until the main tunnel can be brought up before it moves to the opening state.

The following is an example of output from the **show vpdn** command for a PPPoE session:

```
show vpdn

%No active L2TP tunnels
%No active L2F tunnels

PPPoE Tunnel and Session Information Total tunnels 1 sessions 1
PPPoE Tunnel Information
Session count:1
PPPoE Session Information
SID        RemMAC          LocMAC       Intf    VASt    OIntf    VC
1       0010.7b01.2cd9  0090.ab13.bca8  Vi4     UP      AT6/0   0/104
```

The following is an example of output from the **show vpdn session** command for a PPPoE session:

```
show vpdn session

%No active L2TP tunnels
%No active L2F tunnels

PPPoE Session Information Total tunnels 1 sessions 1
PPPoE Session Information
SID        RemMAC          LocMAC       Intf     VASt     OIntf     VC
1       0010.7b01.2cd9  0090.ab13.bca8  Vi4      UP       AT6/0    0/104
```

Table 4 describes the fields shown in both the **show vpdn** and **show vpdn session** command displays.

Table 4 show vpdn and show vpdn session Field Descriptions

Field	Description
Session count	Number of sessions in PPPoE tunnel.
SID	Session ID for the PPPOE session.
RemMAC	Remote MAC address of the host.
LocMAC	Local MAC address of the router. It is the default MAC address of the router.
Intf	Virtual-Access interface associated with the PPP session.
VASt	Line Protocol state of the virtual-access interface.
OIntf	Outgoing interface
VC	VC on which PPPoE session is established.

The following is an example of output from the **show vpdn session packets** command for a PPPoE session:

```
show vpdn session packets

%No active L2TP tunnels
%No active L2F tunnels

PPPoE Session Information Total tunnels 1 sessions 1
PPPoE Session Information
SID      Pkts-In          Pkts-Out         Bytes-In         Bytes-Out
1        202333           202337           2832652          2832716
```

Table 5 describes the fields in the **show vpdn session packets** command display.

Table 5 show vpdn session packets Field Descriptions

Field	Description
SID	Session ID for the PPPOE session.
Pkts-In	Number of packets coming into the session.
Pkts-Out	Number of packets going out of this session.
Bytes-In	Number of bytes coming into the session.
Bytes-Out	Number of bytes going out of this session.

The following is an example of output from the **show vpdn tunnel** command for L2F and L2TP sessions:

```
show vpdn tunnel

L2TP Tunnel Information (Total tunnels=1 sessions=1)
LocID RemID Remote Name   State  Remote Address  Port  Sessions
2     10    wander        est    172.21.9.13     1701  1
L2F Tunnel
 NAS CLID HGW CLID NAS Name        HGW Name        State
 9         1        stella          acadia          open
                    172.21.9.4      172.21.9.232
```

Table 6 describes the fields in the **show vpdn tunnel** command display.

Table 6 show vpdn tunnel Field Descriptions

Field	Description
LocID	
RemID	
Remote Name	Host name of the home gateway, which is local termination point of the tunnel.
State	A number uniquely identifying the VPDN tunnel on the network access server.
Remote Address	
Port	
Sessions	
NAS CLID	A number uniquely identifying the VPDN tunnel on the network access server.
HGW CLID	A number uniquely identifying the VPDN tunnel on the gateway
NAS Name	Host name of the network access server.
HGW Name	Host name of the network
State	Indicates status for the individual user in the tunnel. The states are: opening, open, closed, closing, and waiting_for_tunnel. The waiting_for_tunnel state means that the user connection is waiting until the main tunnel can be brought up before it moves to the opening state.

The following is an example of output from the **show vpdn session all** command for a PPPoE session:

```
show vpdn session all

%No active L2TP tunnels
%No active L2F tunnels

PPPoE Session Information Total tunnels 1 sessions 1
session id:1
local MAC address:0090.ab13.bca8, remote MAC address:0010.7b01.2cd9
virtual access interface:Vi4, outgoing interface:AT6/0, vc:0/104
    202343 packets sent, 202339 received, 2832800 bytes sent, 2832736 received
```

This example output displays all accessible information about a PPPoE session. Table 7 describes the fields in the **show vpdn session all** command display.

Table 7 show vpdn session all Field Descriptions

Field	Description
Session ID	Session ID for the PPPOE session.
Local MAC address	Local MAC address of the router. It is the default MAC address of the router.
Remote MAC address	Remote MAC address of the host.
Virtual access interface	Virtual-Access interface associated with the PPP session.
Outgoing interface	Outgoing interface
VC	VC on which PPPoE session is established.

Related Commands

Command	Description
vpdn enable	Enables virtual private dialup networking on the router and informs the router to look for tunnel definitions in a local database and on a remote authorization server (home gateway), if one is present.
vpdn group	Associates a Virtual Private Dialup Network (VPDN) group to a customer or VPDN profile.
vpdn logging history failure	Enables the logging of failure events to the failure history table.

virtual-template

To specify which virtual template will be used to clone virtual-access interfaces, use the **virtual-template** accept-dialin command. To remove the virtual template from an accept-dialin VPDN subgroup, use the **no** form of this command.

virtual-template *template-number*

no virtual-template

Syntax Description

template-number	Number of the virtual template that will be used to clone virtual-access interfaces.

Defaults

Disabled

Command Modes

Accept-dialin mode

Command History

Release	Modification
12.0(5)T	This command was introduced.
12.1(1)T	An example of enabling PPPoE on ATM to accept dialin PPPoE sessions is added.

Usage Guidelines

Each accept-dialin group can only clone virtual-access interfaces using one virtual template. If you enter a second **virtual-template** command on an accept-dialin subgroup, it will replace the first **virtual-template** command.

You must first enable a tunneling protocol on the accept-dialin VPDN subgroup (using the **protocol** command) before you can enable the **virtual-template** command. Removing or modifying the **protocol** command will remove **virtual-template** command from the request-dialin subgroup.

Examples

The following example enables the LNS to accept an L2TP tunnel from a LAC named mugsy. A virtual-access interface will be cloned from virtual template 1:

```
vpdn-group 1
 accept dialin
  protocol l2tp
  virtual-template 1
 terminate-from hostname mugsy
```

The following example enables PPPoE on ATM to accept dialin PPPoE sessions. A virtual access interface for the PPP session is cloned from virtual template 1:

```
vpdn-group 1
 accept dialin
  protocol pppoe
  virtual-template 1
```

Related Commands

Command	Description
accept dialin	Specifies the LNS to use for authenticating, and the virtual template to use for cloning, new virtual access interfaces when an incoming L2TP tunnel connection is requested from a specific peer.

vpdn group

To associate a VPDN group to a customer or VPDN profile, use the **vpdn group** configuration command. Use the **no** form of this command to remove the VPDN group from a customer profile or VPDN profile.

vpdn group *name*

no vpdn group *name*

Syntax Description

name	Name of the VPDN group.

Defaults

No default behavior or values.

Command Modes

Customer profile configuration/VPDN profile configuration

Command History

Release	Modification
12.0(4)XI	This command was introduced.

Usage Guidelines

Use the **vpdn group** configuration command to associate a VPDN group to a customer or VPDN profile. You can count the sessions for an entire VPDN group under a single VPDN profile.

To add a VPDN group to a customer profile or VPDN profile, use either the **vpdn profile** or the **vpdn group** command:

- VPDN group under customer profile allows VPDN connections for this customer profile.
- VPDN groups under VPDN profile allows combined session counting over these VPDN groups.

Examples

Example 1

```
resource profile vpdn lggate
vpdn group ?
  WORD  Enter name of VPDN group
```

Example 2

```
resource profile customer customer1
vpdn group ?
  WORD  Enter name of VPDN group
```

Related Commands

Command	Description
resource-pool profile customer	Creates a customer profile.

Debug Commands

This section documents new or modified **debug** commands. All other commands used with this feature are documented in the Cisco IOS Release 12.1 command reference publications.

This section documents the new **debug** command related to the PPPoE on ATM feature.

List New IOS debug commands:

- **debug vpdn pppoe-data**
- **debug vpdn pppoe-error**
- **debug vpdn pppoe-events**
- **debug vpdn pppoe-packet**

debug vpdn pppoe-data

To display data packets of PPPoE sessions, use the **debug vpdn pppoe-data** command in EXEC mode. To disable the debugging output, use the **no** form of this command.

debug vpdn pppoe-data

no debug vpdn pppoe-data

Syntax Description

This command has no arguments or keywords.

Defaults

No default behavior or values.

Command History

Release	Modification
12.1(1)T	This command was introduced.

Usage Guidelines

The **debug vpdn pppoe-data** command displays a large number of debug messages and should generally only be used on a debug chassis with a single active session.

Examples

The following is an example of output from the **debug vpdn pppoe-data** command:

```
6d20h:%LINK-3-UPDOWN:Interface Virtual-Access1, changed state to up
6d20h:PPPoE:OUT
 contiguous pak, size 19
         FF 03 C0 21 01 01 00 0F 03 05 C2 23 05 05 06 D3
         FF 2B DA
6d20h:PPPoE:IN
 particle pak, size 1240
         C0 21 01 01 00 0A 05 06 39 53 A5 17 00 00 00 00
         00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
         00 00 00 00 00 00 00 00
6d20h:PPPoE:OUT
 contiguous pak, size 14
         FF 03 C0 21 02 01 00 0A 05 06 39 53 A5 17
6d20h:PPPoE:OUT
 contiguous pak, size 19
         FF 03 C0 21 01 02 00 0F 03 05 C2 23 05 05 06 D3
         FF 2B DA
6d20h:PPPoE:IN
 particle pak, size 1740
         C0 21 02 02 00 0F 03 05 C2 23 05 05 06 D3 FF 2B
         DA 00 80 C2 00 07 00 00 00 10 7B 01 2C D9 00 B0
         C2 EB 10 38 88 64 11 00
6d20h:PPPoE:OUT
 contiguous pak, size 30
         FF 03 C2 23 01 06 00 1A 10 99 1E 6E 8F 8C F2 C6
         EE 91 0A B0 01 CB 89 68 13 47 61 6E 67 61
```

```
6d20h:PPPoE:IN
 particle pak, size 3840
         C2 23 02 06 00 24 10 E6 84 FF 3A A4 49 19 CE D7
         AC D7 D5 96 CC 23 B3 41 6B 61 73 68 40 63 69 73
         63 6F 2E 63 6F 6D 00 00
6d20h:PPPoE:OUT
 contiguous pak, size 8
         FF 03 C2 23 03 06 00 04
6d20h:PPPoE:OUT
 contiguous pak, size 14
         FF 03 80 21 01 01 00 0A 03 06 65 65 00 66
6d20h:PPPoE:IN
 particle pak, size 1240
         80 21 01 01 00 0A 03 06 00 00 00 00 49 19 CE D7
         AC D7 D5 96 CC 23 B3 41 6B 61 73 68 40 63 69 73
         63 6F 2E 63 6F 6D 00 00
6d20h:PPPoE:OUT
 contiguous pak, size 14
         FF 03 80 21 03 01 00 0A 03 06 65 65 00 67
6d20h:PPPoE:IN
 particle pak, size 1240
         80 21 02 01 00 0A 03 06 65 65 00 66 00 04 AA AA
         03 00 80 C2 00 07 00 00 00 10 7B 01 2C D9 00 B0
         C2 EB 10 38 88 64 11 00
6d20h:PPPoE:IN
 particle pak, size 1240
         80 21 01 02 00 0A 03 06 65 65 00 67 49 19 CE D7
         AC D7 D5 96 CC 23 B3 41 6B 61 73 68 40 63 69 73
         63 6F 2E 63 6F 6D 00 00
6d20h:PPPoE:OUT
 contiguous pak, size 14
         FF 03 80 21 02 02 00 0A 03 06 65 65 00 67
6d20h:%LINEPROTO-5-UPDOWN:Line protocol on Interface Virtual-Access1,
changed state to up
6d20h:PPPoE:OUT
 contiguous pak, size 16
         FF 03 C0 21 09 01 00 0C D3 FF 2B DA 4C 4D 49 A4
6d20h:PPPoE:IN
 particle pak, size 1440
         C0 21 0A 01 00 0C 39 53 A5 17 4C 4D 49 A4 AA AA
         03 00 80 C2 00 07 00 00 00 10 7B 01 2C D9 00 B0
         C2 EB 10 38 88 64 11 00
6d20h:PPPoE:IN
 particle pak, size 1440
         C0 21 09 01 00 0C 39 53 A5 17 00 00 00 00 00 00
         00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
         00 00 00 00 00 00 00 00
```

Table 8 describes the fields in the displays.

Table 8 debug vpdn pppoe-data Field Descriptions

Field	Descriptions
6d20h:%LINK-3-UPDOWN:Interface Virtual-Access1, changed state to up	Virtual access interface 1 came up.
6d20h:PPPoE:OUT	The host delivered a PPPoE session packet to the access concentrator.
6d20h:PPPoE:IN	The access concentrator received a PPPoE session packet.

Table 8 debug vpdn pppoe-data Field Descriptions (continued)

Field	Descriptions
6d20h:%LINEPROTO-5-UPDOWN:Line protocol on Interface Virtual-Access1, changed state to up	Line protocol is up; the line can be used.
contiguous pak, size 19	Size 19 contiguous packet.
particle pak, size 1240	Size 1240 particle packet.

Related Commands

Command	Description
debug vpdn pppoe-error	Displays PPPoE protocol errors that prevent a session from being established or errors that cause an established session to be closed.
debug vpdn pppoe-events	Displays PPPoE protocol messages about events that are part of normal session establishment or shutdown.
debug vpdn pppoe-packet	Displays each PPPoE protocol packet exchanged.

debug vpdn pppoe-error

To display PPPoE protocol errors that prevent a session from being established or errors that cause an established sessions to be closed, use the **debug vpdn pppoe-error** command in EXEC mode. To disable the debugging output, use the **no** form of this command.

debug vpdn pppoe-error

no debug vpdn pppoe-error

Syntax Description

This command has no arguments or keywords.

Defaults

No default behavior or values.

Command History

Release	Modification
12.1(1)T	This command was introduced.

Examples

The following is a full list of error messages displayed by the **debug vpdn pppoe-error** command:

```
PPPOE:pppoe_acsys_err cannot grow packet
PPPoE:Cannot find PPPoE info
PPPoE:Bad MAC address:00b0c2eb1038
PPPOE:PADI has no service name tag
PPPoE:pppoe_handle_padi cannot add AC name/Cookie.
PPPoE:pppoe_handle_padi cannot grow packet
PPPoE:pppoe_handle_padi encap failed
PPPoE cannot create virtual access.
PPPoE cannot allocate session structure.
PPPoE cannot store session element in tunnel.
PPPoE cannot allocate tunnel structure.
PPPoE cannot store tunnel
PPPoE:VA221:No Session, Packet Discarded
PPPOE:Tried to shutdown a null session
PPPoE:Session already open, closing
PPPoE:Bad cookie:src_addr=00b0c2eb1038
PPPoE:Max session count on mac elem exceeded:mac=00b0c2eb1038
PPPoE:Max session count on vc exceeded:vc=3/77
PPPoE:Bad MAC address - dropping packet
PPPoE:Bad version or type - dropping packet
```

Table 9 describes the fields in the displays.

Table 9 debug vpdn pppoe-error Field Descriptions

Field	Descriptions
PPPOE:pppoe_acsys_err cannot grow packet	Asynchronous PPPoE packet initialization error.
PPPoE:Cannot find PPPoE info	The access concentrator sends a PADO to the host.
PPPoE:Bad MAC address:00b0c2eb1038	The host was unable to identify the Ethernet MAC address.

Table 9 debug vpdn pppoe-error Field Descriptions (continued)

Field	Descriptions
PPPOE:PADI has no service name tag	PADI requires a service name tag.
PPPoE:pppoe_handle_padi cannot add AC name/Cookie.	pppoe_handle_padi could not append AC name.
PPPoE:pppoe_handle_padi cannot grow packet	pppoe_handle_padi could not append packet.
PPPoE:pppoe_handle_padi encap failed	pppoe_handle_padi could not specify PPPoE on ATM encapsulation.
PPPoE cannot create virtual access.	PPPoE session unable to verify virtual access interface.
PPPoE cannot allocate session structure.	PPPoE session unable to allocate Stage Protocol.
PPPoE cannot store session element in tunnel.	PPPoE tunnel cannot allocate session element.
PPPoE cannot allocate tunnel structure.	PPPoE tunnel unable to allocate Stage Protocol.
PPPoE cannot store tunnel	PPPoE configuration settings unable to initialize a tunnel.
PPPoE:VA221:No Session, Packet Discarded	No sessions created. All packets dropped.
PPPOE:Tried to shutdown a null session	Null session shutdown.
PPPoE:Session already open, closing	PPPoE session already open.
PPPoE:Bad cookie:src_addr=00b0c2eb1038	PPPoE session unable to append new cookie.
PPPoE:Max session count on mac elem exceeded:mac=00b0c2eb1038	The maximum number of sessions exceeded the Ethernet MAC address.
PPPoE:Max session count on vc exceeded:vc=3/77	The maximum number of sessions exceeded the PVC connection.
PPPoE:Bad MAC address - dropping packet	The host was unable to identify the MAC address. Packet dropped.
PPPoE:Bad version or type - dropping packet	The host was unable to identify the encapsulation type.

Related Commands

Command	Description
debug vpdn pppoe-data	Displays data packets of PPPoE sessions.
debug vpdn pppoe-events	Displays PPPoE protocol messages about events that are part of normal session establishment or shutdown.
debug vpdn pppoe-packet	Displays each PPPoE protocol packet exchanged.

debug vpdn pppoe-events

To display PPPoE protocol messages about events that are part of normal session establishment or shutdown, use the **debug vpdn pppoe-events** command in EXEC mode. To disable the debugging output, use the **no** form of this command.

debug vpdn pppoe-events

no debug vpdn pppoe-events

Syntax Description

This command has no arguments or keywords.

Defaults

No default behavior or values.

Command History

Release	Modification
12.1(1)T	This command was introduced.

Examples

The following is an example of output from the **debug vpdn pppoe-events** command:

```
1w5d:IN PADI from PPPoE tunnel
1w5d:OUT PADO from PPPoE tunnel
1w5d:IN PADR from PPPoE tunnel
1w5d:PPPoE:VPN session created.
1w5d:%LINK-3-UPDOWN:Interface Virtual-Access2, changed state to up

1w5d:%LINEPROTO-5-UPDOWN:Line protocol on Interface Virtual-Access2, changed state to up
```

Table 10 describes the fields in the displays.

Table 10 debug vpdn pppoe-events Field Descriptions

Field	Descriptions
1w5d:IN PADI from PPPoE tunnel	The access concentrator receives a PADI packet from the PPPoE Tunnel.
1w5d:OUT PADO from PPPoE tunnel	The access concentrator sends a PADO to the host.
1w5d:IN PADR from PPPoE tunnel	The host sends a single PADR to the access concentrator that it has chosen.
1w5d:PPPoE:VPN session created.	The access concentrator receives the PADR packet and creates a VPN session.
1w5d:%LINK-3-UPDOWN:Interface Virtual-Access2, changed state to up	Virtual access interface 2 came up.
1w5d:%LINEPROTO-5-UPDOWN:Line protocol on Interface Virtual-Access2, changed state to up	Line protocol is up. The line can be used.

Related Commands

Command	Description
debug vpdn pppoe-data	Displays data packets of PPPoE sessions.
debug vpdn pppoe-error	Displays PPPoE protocol errors that prevent a session from being established or errors that cause an established session to be closed.
debug vpdn pppoe-packet	Displays each PPPoE protocol packet exchanged.

debug vpdn pppoe-packet

To display each PPPoE protocol packet exchanged, use the **debug vpdn pppoe-packet** command in EXEC mode.To disable the debugging output, use the **no** form of this command.

debug vpdn pppoe-packet

no debug vpdn pppoe-packet

Syntax Description

This command has no arguments or keywords.

Defaults

No default behavior or values.

Command History

Release	Modification
12.1(1)T	This command was introduced.

Usage Guidelines

The **debug vpdn pppoe-packet** command displays a large number of debug messages and should generally only be used on a debug chassis with a single active session.

Examples

The following is an example of output from the **debug vpdn pppoe-packet** command:

```
PPPoE control packets debugging is on

1w5d:PPPoE:discovery packet
 contiguous pak, size 74
         FF FF FF FF FF FF 00 10 7B 01 2C D9 88 63 11 09
         00 00 00 04 01 01 00 00 00 00 00 00 00 00 00 00
         00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ...
1w5d:OUT PADO from PPPoE tunnel
 contiguous pak, size 74
         00 01 09 00 AA AA 03 00 80 C2 00 07 00 00 00 10
         7B 01 2C D9 00 90 AB 13 BC A8 88 63 11 07 00 00
         00 20 01 01 00 00 01 02 00 04 41 67 6E 69 01 ...
1w5d:PPPoE:discovery packet
 contiguous pak, size 74
         00 90 AB 13 BC A8 00 10 7B 01 2C D9 88 63 11 19
         00 00 00 20 01 01 00 00 01 02 00 04 41 67 6E 69
         01 04 00 10 B7 4B 86 5B 90 A5 EF 11 64 A9 BA ...
```

Table 11 describes the fields in the displays.

Table 11 debug vpdn pppoe-packet Field Descriptions

Field	Descriptions
PPPoE control packets debugging is on	PPPoE debugging of packets is enabled.
1w5d:PPPoE:discovery packet	The host performs a discovery to initiate a PPPoE session.

Table 11 debug vpdn pppoe-packet Field Descriptions (continued)

Field	Descriptions
1w5d:OUT PADO from PPPoE tunnel	The access concentrator sends a PADO to the host.
1w5d:PPPoE:discovery packet	The host performs a discovery to initiate a PPPoE session.
contiguous pak, size 74	Size 74 contiguous packet.

Related Commands

Command	Description
debug vpdn pppoe-data	Displays data packets of PPPoE sessions.
debug vpdn pppoe-error	Displays PPPoE protocol errors that prevent a session from being established or errors that cause an established session to be closed.
debug vpdn pppoe-events	Displays PPPoE protocol messages about events that are part of normal session establishment or shutdown.

List of Terms

AAL5 - ATM Adaptation Layer 5
ADSL - Asymmetric Digital Subscriber Line
ATM - Asynchronous Transfer Mode
CPCS - Common Part of Convergence Sublayer
CPI - Common Part Indicator
CRC - Cyclic Redundancy Check
DSLAM - Digital Subscriber Line Access Multiplexer
FCS - Frame Check Sequence
IETF - Internet Engineering Task Force
ID - Identifier
IP - Internet Protocol
L2TP - Layer two Tunneling Protocol
LAN - Local Area Network
LLC - Logical Link Control
MAC - Media Access Control
PDU - Protocol Data Unit
PPP - Point to Point Protocol
PPPoE - Point to Point Protocol over Ethernet
PVC - Permanent Virtual Connection
VPDN- Virtual Private Dialup Network