

PPPoE on ATM

This feature module describes the PPP over Ethernet (PPPoE) on ATM feature. 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.

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Prerequisites for PPPoE on ATM

Before you can configure PPPoE on ATM, you need to specify a virtual template for the PPPoE sessions using the **virtual-template** command.

Restrictions for PPPoE on ATM

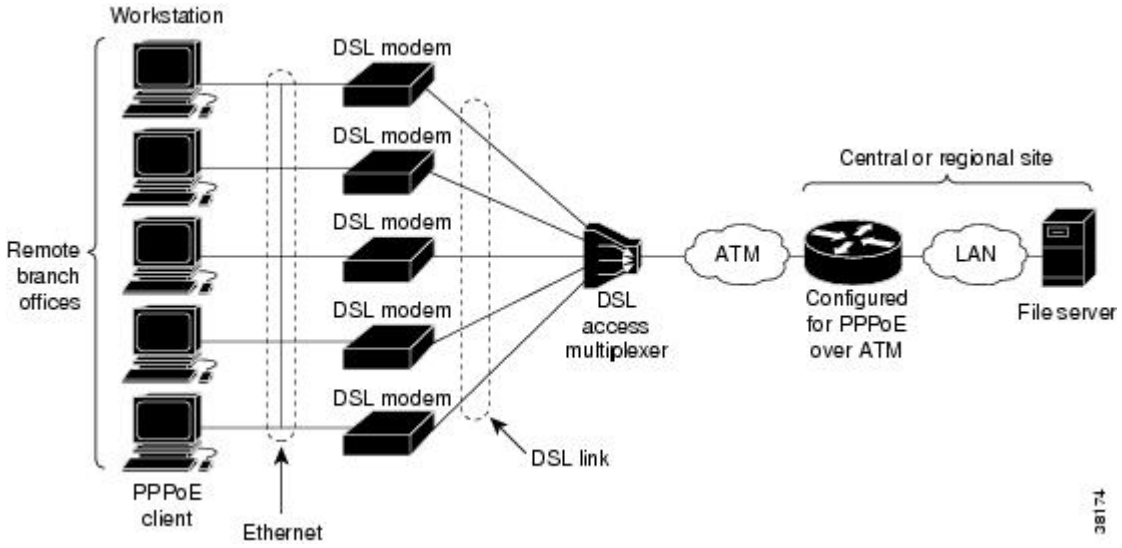
- PPPoE is not supported on Frame Relay.
- PPPoE over ATM AAl5Mux is not supported on ASR series 1000 routers. For more information, refer to the PPPoEoA over ATM AAL5Mux feature: http://www.cisco.com/en/US/docs/ios/bbdsl/configuration/guide/bba_pppoeoa_aal5mux.html
- PPPoE is not supported on any other LAN interfaces such as FDDI and Token Ring.
- Fast switching is supported. PPPoE over RFC 1483 fibswitching is supported for IP. All other protocols are switched over process switching.
- Bridging is supported on the ATM permanent virtual connections (PVCs) running PPPoE.
- PPPoE is supported on ATM PVCs compliant with RFC 1483 only.
- Only dial-in mode is supported. Dial-out mode will not be supported.

Information About PPPoE on ATM

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.

The figure below 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 the table below.

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 of PPPoE on ATM

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.

How to Configure PPPoE on ATM

Enabling PPP over ATM

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:

Note You can use the **virtual-template**, **sessions per-vc**, and **sessions per-mac** commands in any order.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **bba-group pppoe** {*group-name* | **global**}
4. **virtual-template** *template-number*
5. **sessions per-vc limit** *per-vc-limit* [**threshold** *threshold-value*]
6. **sessions per-mac limit** *per-mac-limit*
7. **exit**
8. **interface atm** *slot* / *subslot* / *port* [.*subinterface*][**point-to-point** | **multipoint**]
9. **ip address** *ip-address mask* [**secondary**]
10. **range** [*range-name*] **pvc** *start-vpi* / *start-vci end-vpi* / *end-vci*
11. **dbs enable** [**aggregated** | **maximum**]
12. Do one of the following:
    - **protocol pppoe group** {*group-name* | **global**}
    - or
    - **encapsulation aal5snap**
13. **create on-demand**
14. **end**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**bba-group pppoe** {*group-name*	**global**} **Example:** `Router(config)# bba-group pppoe pppoe-group`	Defines a PPPoE profile, and enters BBA group configuration mode. • The **global** keyword creates a profile that serves as the default profile for any PPPoE port that is not assigned a specific profile.
Step 4	**virtual-template** *template-number* **Example:** `Router(config-bba-group)# virtual-template 1`	Specifies which virtual template will be used to clone virtual access interfaces.

	Command or Action	Purpose
Step 5	**sessions per-vc limit** *per-vc-limit* [**threshold** *threshold-value*] **Example:** `Router(config-bba-group)# sessions max limit 1`	Configures the PPPoE global profile with the maximum number of PPPoE sessions permitted on a router and sets the PPPoE session-count threshold at which an Simple Network Management Protocol (SNMP) trap will be generated. **Note** This command applies only to the global profile.
Step 6	**sessions per-mac limit** *per-mac-limit* **Example:** `Router(config-bba-group)# sessions per-mac limit 4000`	Sets the maximum number of PPPoE sessions permitted per MAC address in a PPPoE profile.
Step 7	**exit** **Example:** `Router(config-bba-group)# exit`	Exits BBA group configuration mode and returns to global configuration mode.
Step 8	**interface atm** *slot* / *subslot* / *port* [.*subinterface*][**point-to-point** | **multipoint**] **Example:** `Router(config)# interface atm 1/0.1 multipoint`	Specifies the ATM interface and enters subinterface configuration mode.
Step 9	**ip address** *ip-address mask* [**secondary**] **Example:** `Router(config-subif)# ip address 192.0.10.2 255.255.255.0 secondary`	Sets a primary or secondary IP address for an interface.
Step 10	**range** [*range-name*] **pvc** *start-vpi* / *start-vci end-vpi* / *end-vci* **Example:** `Router(config-if)# range pvc 101/304 200/400`	Defines a range of ATM permanent virtual circuits (PVCs) and enters ATM range configuration mode.
Step 11	**dbs enable** [**aggregated** | **maximum**] **Example:** `Router(config-if-atm-range)# dbs enable`	Applies the Dynamic Subscriber Bandwidth Selection (DBS) QoS parameters.
Step 12	Do one of the following: • **protocol pppoe group** {*group-name* | **global**} • or • **encapsulation aal5snap**	Enables PPPoE sessions to be established on a PVC within a range. or Configures PPPoE autosense.

	Command or Action	Purpose

	Example:
	`Router(config-if-atm-range-pvc)# protocol pppoe group two`
	Example:
	Example:
	Example:
	`Router(config-if-atm-range-pvc)# encapsulation aal5snap`
		• If a PPPoE profile is not assigned to the PVC by using the **group** *group-name* option, the PVC will use the global PPPoE profile.

Step 13	**create on-demand** **Example:** `Router(config-if-atm-range)# create on-demand`	Configures ATM PVC autoprovisioning, which enables a range of PVCs to be created automatically on demand.
Step 14	**end** **Example:** `Router(config-if-atm-range)# end`	(Optional) Exits the ATM range configuration mode and returns to privileged EXEC mode.

Creating and Configuring a Virtual Template

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 the following commands:

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface atm** *slot* / *subslot* / *port* *.subinterface*] [**multipoint**| **point-to-point**]
4. **end**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable**	Enables privileged EXEC mode.

	Command or Action	Purpose
	Example: `Router> enable`	• Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface atm** *slot* / *subslot* / *port* *.subinterface*] [**multipoint**| **point-to-point**] **Example:** `Router# interface atm 6/0.110 multipoint`	Configures the ATM interface and enters subinterface configuration mode. • 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.
Step 4	**end** **Example:** `Router(config-subif)# end`	(Optional) Exits the subinterface configuration mode and returns to privileged EXEC mode.

Creating an ATM PVC

Enabling PPPoE on an ATM PVC

To enable PPPoE on an ATM PVC, use the following commands:

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface atm** *slot* / *subslot* / *port* [*.subinterface*] [**multipoint** | **point-to-point**]
4. **pvc** [*name*] *vpi* / *vci*
5. **pppoe max-sessions** *number-of-sessions* [**threshold-sessions** *number-of-sessions*]
6. **protocol pppoe**
7. **end**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:**	Enables privileged EXEC mode. • Enter your password if prompted.

	Command or Action	Purpose
	`Router> enable`	
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface atm** *slot* / *subslot* / *port* [*.subinterface*] [**multipoint** | **point-to-point**] **Example:** `Router(config)# interface atm 0/0/0.3 multipoint`	Configures the ATM interface and enters the subinterface configuration mode.
Step 4	**pvc** [*name*] *vpi* / *vci* **Example:** `Router(config-subif)# pvc 5/120`	Creates an ATM PVC and enters ATM VC configuration mode.
Step 5	**pppoe max-sessions** *number-of-sessions* [**threshold-sessions** *number-of-sessions*] **Example:** `Router(config-if-atm-vc)# pppoe max-sessions 5 threshold-sessions 3`	Sets the maximum number of PPPoE sessions that will be permitted on an ATM PVC, PVC range, VC class, or VLAN, and sets the PPPoE session-count threshold at which an SNMP trap will be generated.
Step 6	**protocol pppoe** **Example:** `Router(config-if-atm-vc)# protocol pppoe`	Enables PPPoE sessions to be established on ATM PVCs.
Step 7	**end** **Example:** `Router(config-if-atm-vc)# end`	(Optional) Exits the ATM VC configuration mode and returns to privileged EXEC mode.

Configuration Examples for PPPoE on ATM

PPPoE on ATM Example

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.

```
bba-group pppoe pppoe-group
```

```
 virtual-template 1
 sessions per-vc limit 1
 sessions per-mac limit 4000
interface atm 2/0.1 multipoint
 ip address 192.0.10.2 255.255.255.0 secondary
 range pvc 1/100 1/202
 pvc 0/60
  dbs enable
  encapsulation aal5snap
  protocol pppoe group two
  create on-demand
interface virtual-template 1
  ip addr 10.0.1.2 255.255.255.0
  mtu 1492
```

Where to Go Next

- If you want to enable PPP authentication on the virtual template using the **ppp authentication chap** command, refer to the "Configuring Virtual Template Interfaces" chapter in the *Cisco IOS Dial Solutions Configuration Guide* .
- If you want to configure an authentication, authorization, and accounting (AAA) server, refer to the "Configuring per-User Configuration" chapter in the *Cisco IOS Dial Solutions Configuration Guide* .

Additional References

The following sections provide references related to the PPPoE on ATM feature.

Related Documents

Related Topic	Document Title
Cisco IOS commands	
Broadband and DSL commands	*Cisco IOS Broadband Access Aggregation and DSL Command Reference*
Enabling PPP authentication on the virtual template	Configuring Virtual Template Interfaces
Configuring an AAA server	Configuring per-User Configuration
Configuring Broadband and DSL	*Cisco IOS XE Broadband Access Aggregation and DSL Configuration Guide*

Standards

Standard	Title
None	--

MIBs

MIB	MIBs Link
	To locate and download MIBs for selected platforms, Cisco IOS XE software releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

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

Technical Assistance

Description	Link
The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for PPPoE on ATM

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

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

Table 2: Feature Information for PPPoE on ATM

Feature Name	Releases	Feature Information
PPPoE on ATM	Cisco IOS XE Release 2.5	This feature was introduced on Cisco ASR 1000 Series Aggregation Services Routers. This feature module describes the PPP over Ethernet (PPPoE) on ATM feature. 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. The following commands were introduced or modified: **bba-group, protocol (VPDN)**, **virtual-template**.

Glossary

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