Providing Protocol Support for Broadband Access Aggregation of PPP over ATM Sessions

PPP over ATM enables a high-capacity central site router with an ATM interface to terminate multiple remote PPP connections. PPP over ATM provides security validation per user, IP address pooling, and service selection capability.

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Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table.

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.

Prerequisites for Providing Protocol Support for Broadband Access Aggregation of PPP over ATM Sessions

- You must understand the concepts described in the "Understanding Broadband Access Aggregation" module.
- Optionally you may perform the preparation tasks in the "Preparing for Broadband Access Aggregation" module

Restrictions for Providing Protocol Support for Broadband Access Aggregation of PPP over ATM Sessions

PPP over ATM cannot be configured on IETF-compliant Logical Link Control (LLC) encapsulated PPP over ATM.

Information About Providing Protocol Support for Broadband Access Aggregation of PPP over ATM Sessions

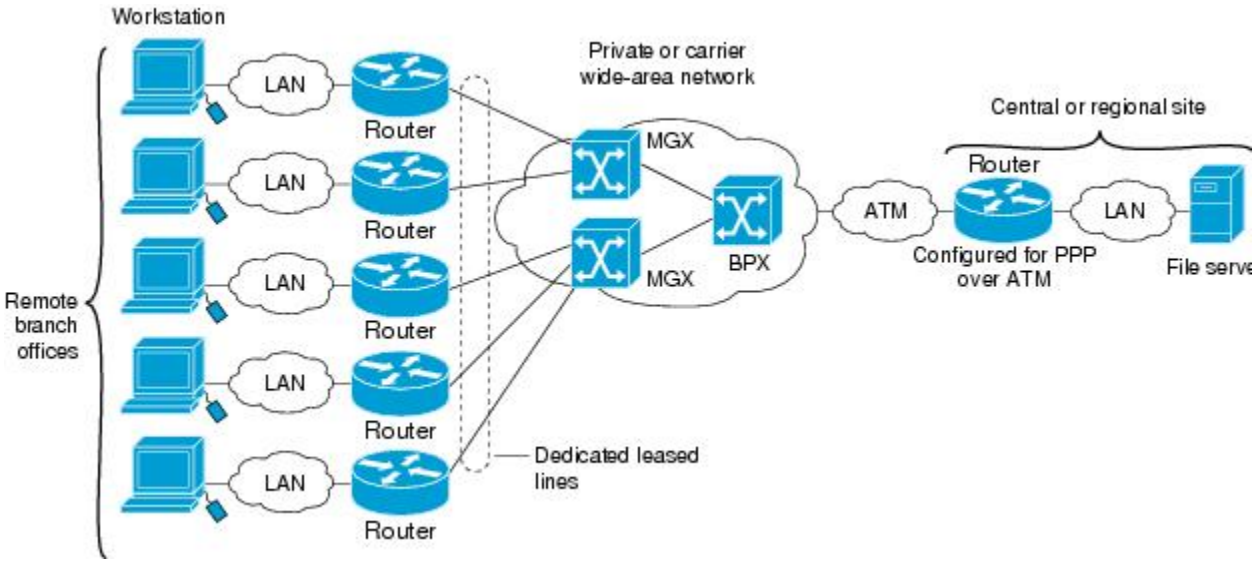
PPP over ATM Configuration Scenario

PPP over ATM can be configured on all platforms running Cisco IOS Release 12.1 or later.

Note All forms of PPP over ATM are supported on the ATM port adapters, except for the PA-A1 ATM port adapter for Cisco IOS Release 12.1. All forms of PPP over ATM are now supported on the enhanced ATM port adapter for Cisco IOS Release 12.1 or later.

The figure below shows a typical scenario for using Cisco-proprietary PPP over ATM.

Figure 1: PPP-over-ATM Network Environment



Note If you need to configure the Cisco MGX 8220 shelf for frame forwarding at the remote sites, refer to the Cisco MGX 8220 Command Supplement for command line instructions or the Cisco StrataView Plus Operations Guide for StrataView Plus instructions. If you configure the MGX using the command line interface, use the **addport** and **addchan** commands and select frame forwarding for the *port-type* and *chan-type* arguments, respectively.

Virtual Access Interface

When you configure PPP over ATM, a logical interface known as a *virtual access interface* associates each PPP connection with an ATM VC. You can create this logical interface by configuring an ATM permanent virtual circuit (PVC) or switched virtual circuit (SVC). This configuration encapsulates each PPP connection in a separate PVC or SVC, allowing each PPP connection to terminate at the router ATM interface as if received from a typical PPP serial interface.

The virtual access interface for each virtual circuit (VC) obtains its configuration from a virtual interface template (virtual template) when the VC is created. Before you create the ATM VC, it is recommended that you create and configure a virtual template as described in the "Preparing for Broadband Access Aggregation" module.

Once you have configured the router for PPP over 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.

The virtual access interface is associated with the VC after LCP negotiation completes. When the PPP session goes down, the virtual access interface is no longer associated with the VC and is returned to the pool of free virtual-access interfaces.

If you set a keepalive timer of the virtual template on the interface, the virtual access interface uses the PPP echo mechanism to verify the existence of the remote peer.

The following three types of PPP over ATM connections are supported:

- IETF-compliant MUX encapsulated PPP over ATM
- IETF-compliant LLC encapsulated PPP over ATM
- Cisco-proprietary PPP over ATM

Autosense for ATM PVCs

The PPPoA/PPPoE autosense for ATM PVCs feature enables a router to distinguish between incoming PPP over ATM (PPPoA) and PPP over Ethernet (PPPoE) over ATM sessions and to create virtual access based on demand for both PPP types.

Note The PPPoA/PPPoE autosense for ATM PVCs feature is supported on SNAP-encapsulated ATM PVCs only. It is not supported on MUX-encapsulated PVCs.

Benefits of Autosense for ATM PVCs

Autosense for ATM PVCs provides resource allocation on demand. For each permanent virtual circuit (PVC) configured for both PPPoA and PPPoE, certain resources (including one virtual-access interface) are allocated upon configuration, regardless of the existence of a PPPoA or PPPoE session on that PVC. With the autosense for ATM PVCs, resources are allocated for PPPoA and PPPoE sessions only when a client initiates a session, thus reducing overhead on the network access server (NAS).

How to Provide Protocol Support for Broadband Access Aggregation of PPP over ATM Sessions

Configuring IETF-Compliant MUX Encapsulated PPP over ATM

Internet Engineering Task Force (IETF)-compliant multiplexer (MUX) encapsulated PPP over ATM, also known as null encapsulation, allows you to configure PPP over ATM using a VC multiplexed encapsulation mode. This feature complies with IETF RFC 2364 entitled PPP over AAL5.

You can configure ATM PVCs for IETF-compliant MUX encapsulated PPP over ATM on either point-to-point or multipoint subinterfaces. Multiple PVCs on multipoint subinterfaces significantly increase the maximum number of PPP-over-ATM sessions running on a router. You can configure IETF-compliant MUX encapsulated PPP over ATM over a single ATM PVC or an ATM PVC range.

IETF-compliant PPP over ATM is not supported on ATM SVCs and can only be applied to PVCs.

The IETF-compliant PPP over ATM feature was designed to support installations with AppleTalk Data Stream Protocol (ADSL) circuits. For an example of using ADSL termination, see the ADSL Termination Example, on page 23.

Perform this task to configure IETF-compliant MUX Encapsulated PPP over ATM.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. Do one of the following:
   - **interface atm** *slot/port.subinterface-number* **point-to-point**
   -
   - or
   - **interface atm** *number.subinterface-number* **point-to-point**
   -
   -
   - **interface atm** *slot/port.subinterface-number* **multipoint**
   -
   -
   - **interface atm** *number.subinterface-number* **multipoint**
4. Do one of the following:
   - **pvc** [*name*] *vpi* / *vci*
   -
   -
   - **range** [*range-name*] **pvc** *start-vpi* / *start-vci end-vpi* / *end-vci*
5. **encapsulation aal5mux ppp virtual-template** *number*

DETAILED STEPS

	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.

	Command or Action	Purpose

Step 3	Do one of the following:
	• **interface atm** *slot/port.subinterface-number* **point-to-point**
	•
	• or
	• **interface atm** *number.subinterface-number* **point-to-point**
	•
	•
	• **interface atm** *slot/port.subinterface-number* **multipoint**
	•
	•
	• **interface atm** *number.subinterface-number* **multipoint**
	
	Example:
	`Router(config)# interface atm 6/0.200 point-to-point`
	
	Example:
	
	Example:
	
	Example:
	`Router(config)# interface atm 1/0/0.4 multipoint`
		Specifies the ATM point-to-point or multipoint subinterface using the appropriate format of the **interface atm** command.[1]

Step 4	Do one of the following: • **pvc** [*name*] *vpi* / *vci* • • • **range** [*range-name*] **pvc** *start-vpi* / *start-vci end-vpi* / *end-vci* **Example:** `Router(config-subif)# pvc cisco 0/5` **Example:**	Configures the PVC or a range of PVCs.

	Command or Action	Purpose

	Example:
	`or`
	Example:
	`Router(config-subif)# range range1 pvc 1/200 1/299`	

Step 5	**encapsulation aal5mux ppp virtual-template** *number*
	Example:
	`Router(config-subif-atm-vc)# encapsulation aal5mux ppp virtual-template 3`
	Example:
	`or`
	Example:
	`Router(config-subif-atm-range) encapsulation aal5mux ppp virtual-template 3`
		Configures VC multiplexed encapsulation on a PVC or PVC range.

[1] To determine the correct form of the interface atm command, consult your ATM network module, port adapter, or router documentation.

Configuring IETF-Compliant LLC Encapsulated PPP over ATM

IETF-compliant LLC encapsulated PPP over ATM allows you to configure PPP over ATM with LLC encapsulation. It accommodates Frame Relay-to-ATM service interworking (Frame Relay Forum standard FRF.8). There is no equivalent VC multiplexed encapsulation mode for Frame Relay; therefore, LLC encapsulation is required for Frame Relay-to-ATM networking. This version of PPP over ATM also enables you to carry multiprotocol traffic. For example, a VC will carry both PPP and IPX traffic.

The figure below shows Frame Relay-to-ATM interworking.

Figure 2: Frame Relay-to-ATM Interworking

You can configure ATM PVCs for IETF-compliant LLC encapsulated PPP over ATM on either point-to-point or multipoint subinterfaces. Multiple PVCs on multipoint subinterfaces significantly increase the maximum number of PPP-over-ATM sessions running on a router.

You can also configure IETF-compliant LLC encapsulated PPP over ATM in a VC class and apply this VC class to an ATM VC, subinterface, or interface. For information about configuring a VC class, refer to the section "Configuring VC Classes" in the module "Configuring ATM."

Note Depending on whether you configure IETF-compliant LLC encapsulated PPP over ATM directly on a PVC or interface, your PVC will inherit the configuration that takes highest precedence. For a description of the inheritance hierarchy, see the **protocol** command in the Cisco IOS Wide-Area Networking Command Reference Guide.

Perform this task to configure IETF-compliant LLC encapsulated PPP over ATM on a PVC or range of PVCs.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. Do one of the following:
   - **interface atm** *slot/port.subinterface-number* **point-to-point**
   - or
   - **interface atm** *number.subinterface-number* **point-to-point**
   - **interface atm** *slot/port.subinterface-number* **multipoint**
   - or
   - **interface atm** *number.subinterface-number* **multipoint**
4. Do one of the following:
   - **pvc** [*name*] *vpi* / *vci*
   - **range** [*range-name*] **pvc** *start-vpi* / *start-vci end-vpi*/*end-vci*
5. **encapsulation aal15snap**
6. protocol ppp virtual-template *number*

DETAILED STEPS

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

	Command or Action	Purpose
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.

Step 3	Do one of the following:
	• **interface atm** *slot/port.subinterface-number* **point-to-point**
	• or
	• **interface atm** *number.subinterface-number* **point-to-point**
	• **interface atm** *slot/port.subinterface-number* **multipoint**
	• or
	• **interface atm** *number.subinterface-number* **multipoint**
	
	Example:
	`Router(config)# interface atm 6/0.200 point-to-point`
	
	Example:
	`Router(config)# interface atm 1/0/0.4 multipoint`
		Specifies the ATM point-to-point or multipoint subinterface using the appropriate format of the **interface atm** command.[2]

Step 4	Do one of the following:
	• **pvc** [*name*] *vpi* / *vci*
	• **range** [*range-name*] **pvc** *start-vpi* / *start-vci end-vpi*/*end-vci*
	
	Example:
	`Router(config-subif)# pvc cisco 0/5`
	
	Example:
	`or`
	
	Example:
	`Router(config-subif)# range range1 pvc 1/200 1/299`
		Configures the PVC or a range of PVCs.

Step 5	**encapsulation aal15snap** **Example:** `Router(config-subif-atm-vc)# encapsulation aal15snap`	Configures LLC SNAP encapsulation on the PVC or range of PVCs.[3]

	Command or Action	Purpose
	Example: or **Example:** `Router(config-subif-atm-range)#` **encapsulation aal15snap**	

Step 6	protocol ppp virtual-template *number*
	Example:
	`Router(config-subif-atm-vc)# protocol ppp virtual-template 2`
	Example:
	or
	Example:
	`Router(config-subif-atm-range)# protocol ppp virtual-template 2`
		Configures IETF PPP over ATM LLC encapsulation on the PVC or range of PVCs.

[2] To determine the correct form of the interface atm command, consult your ATM network module, port adapter, or router documentation.

[3] "SNAP encapsulation" is a misnomer here, since this encapsulation configures both LLC and SNAP encapsulation on the VC. If SNAP encapsulation is not configured at a lower inheritance level, or another type of encapsulation is configured at a lower inheritance level, you will have to configure both SNAP and the protocol ppp command to ensure that PPP over ATM with LLC encapsulation is configured on your VC.

Configuring Cisco-Proprietary PPP over ATM PVCs

You can configure ATM PVCs for Cisco-proprietary PPP over ATM on either point-to-point or multipoint subinterfaces. Configuring multiple PVCs on multiple subinterfaces significantly increases the maximum number of PPP-over-ATM sessions running on a router. Remote branch offices must have Cisco-proprietary PPP over ATM configured on PPP-compatible devices interconnecting directly to Cisco's ATM Switch Interface Shelf (AXIS) equipment through a leased-line connection. The shelves provide frame forwarding encapsulation and are terminated on BPX cores prior to connecting to a Cisco 7500 series router.

Perform this task to configure Cisco-proprietary PPP over ATM on a PVC or range of PVCs.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. Do one of the following:
   - **interface atm** *slot/port.subinterface-number* **point-to-point**
   -
   - or
   - **interface atm number .** *subinterface-number* **point-to-point**
   -
   -
   - **interface atm** *slot/port.subinterface-number* **multipoint**
   -
   -
   - **interface atm** *number.subinterface-number* **multipoint**
4. Do one of the following:
   - **pvc** [*name*] *vpi* / *vci*
   -
   -
   - **range** [*range-name*] **pvc** *start-vpi* / *start-vci end-vpi* / *end-vci*
5. **encapsulation aal5ciscoppp virtual-template** *number*

DETAILED STEPS

	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	Do one of the following: • **interface atm** *slot/port.subinterface-number* **point-to-point** •	Specifies the ATM point-to-point or multipoint subinterface using the appropriate format of the **interface atm** command.[4]

	Command or Action	Purpose

	• or
	• **interface atm number . *subinterface-number* point-to-point**
	•
	•
	• **interface atm *slot/port.subinterface-number* multipoint**
	•
	•
	• **interface atm *number.subinterface-number* multipoint**
	
	Example:
	`Router(config)# interface atm 6/0.200 point-to-point`
	
	Example:
	
	Example:
	
	Example:
	`Router(config)# interface atm 1/0/0.4 multipoint`	

Step 4	Do one of the following:
	• **pvc** [*name*] *vpi* / *vci*
	•
	•
	• **range** [*range-name*] **pvc** *start-vpi* / *start-vci end-vpi* / *end-vci*
	
	Example:
	`Router(config-subif)# pvc cisco 0/5`
	
	Example:
	
	Example:
	`or`
		Configures the PVC or a range of PVCs.

	Command or Action	Purpose
	Example: `Router(config-subif)# range range1 pvc 1/200 1/299`	

Step 5	**encapsulation aal5ciscoppp virtual-template** *number*
	Example:
	`Router(config-subif-atm-vc)# encapsulation aal5ciscoppp virtual-template 4`
	Example:
	Example:
	`or`
	Example:
	`Router(config-subif-atm-range)# encapsulation aal5ciscoppp virtual-template 3`
		Configures Cisco-proprietary PPP over ATM encapsulation on a PVC or PVC range.

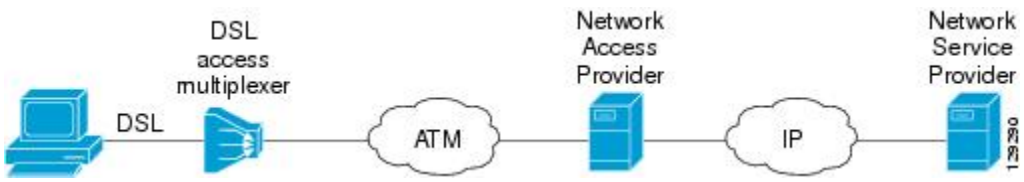
4 To determine the correct form of the interface atm command, consult your ATM network module, port adapter, or router documentation.

Configuring SVCs for NAPs and NSPs

When PPP over ATM is configured over an SVC rather than a PVC, an ATM SVC is established using a configured ATM address each time an end user initiates a connection to a Network Access Provider (NAP) or Network Service Provider (NSP). A PPP session is then established over the SVC. By using PPP, the NAPs and NSPs can authenticate users and provide suitable access to the various services being offered. Whereas PVCs require that services and destination addresses be predetermined, using PPP over ATM SVCs allows users to choose services and the quality of those services dynamically on the basis of the destination address.

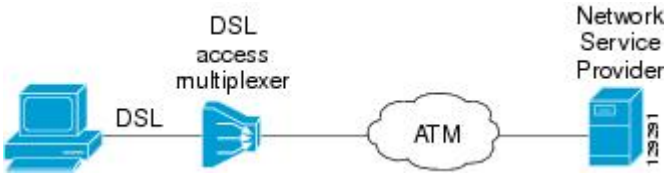
The figure below shows a typical network topology for PPP over ATM SVCs terminating at an NAP.

Figure 3: PPP over ATM SVC Terminating at a Network Access Provider



The figure below shows a typical network topology of PPP over ATM SVCs terminating at an NSP.

Figure 4: PPP over ATM SVC Terminating at a Network Service Provider



The PPP over ATM SVCs feature works by associating each PPP session with a virtual-access interface. Each virtual-access interface is associated with an SVC. The SVCs use static maps that hold information about the encapsulation type and virtual template number. A single static map can accept multiple PPP over ATM SVC calls.

Perform this task to configure PPP over an ATM SVC.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. Do one of the following:
   - **interface atm** *slot/port.subinterface-number* **point-to-point**
   -
   - or
   - **interface atm** *number.subinterface-number* **point-to-point**
   -
   -
   - **interface atm** *slot/port.subinterface-number* **multipoint**
   -
   -
   - **interface atm** *number.subinterface-number* **multipoint**
4. **svc** [*name*]
5. **encapsulation aal5auto**
6. **protocol ppp virtual-template** *number*
7. **max vc** *number*
8. **max bandwidth** *kbps*
9. **exit**
10. **exit**
11. **atm nsap-address** *nsap-address*
12. exit
13. **show atm svc**
14. **show atm svc ppp**

DETAILED STEPS

	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	Do one of the following:
	• **interface atm** *slot/port.subinterface-number* **point-to-point**
	•
	• or
	• **interface atm** *number.subinterface-number* **point-to-point**
	•
	•
	• **interface atm** *slot/port.subinterface-number* **multipoint**
	•
	•
	• **interface atm** *number.subinterface-number* **multipoint**
	
	Example:
	`Router(config)# interface atm 6/0.200 point-to-point`
	
	Example:
	
	Example:
	
	Example:
	`Router(config)# interface atm 1/0/0.4 multipoint`
		Specifies the ATM point-to-point or multipoint subinterface using the appropriate format of the **interface atm** command.[5]

	Command or Action	Purpose
Step 4	**svc** [*name*] **Example:** `Router(config-subif)# svc cisco`	Configures the SVC.
Step 5	**encapsulation aal5auto** **Example:** `Router(config-subif-atm-vc)# encapsulation aal5auto`	Specifies encapsulation auto, which allows the SVC to use either aal5snap or aal5mux encapsulation types.
Step 6	**protocol ppp virtual-template** *number* **Example:** `Router(config-subif-atm-vc)# protocol ppp virtual-template 6`	Specifies that PPP is established over the ATM SVC using the configuration from the specified virtual template.
Step 7	**max vc** *number* **Example:** `Router(config-subif-atm-vc)# max vc 5`	Specifies the maximum number of SVCs that can be established using the current configuration.
Step 8	**max bandwidth** *kbps* **Example:** `Router(config-subif-atm-vc)# max bandwidth 564`	Specifies the total amount of bandwidth available to all SVCs in the current configuration.
Step 9	**exit** **Example:** `Router(config-subif-atm-vc)# exit`	Exits VC configuration mode and returns to subinterface configuration mode.
Step 10	**exit** **Example:** `Router(config-subif)# exit`	Exits subinterface configuration mode and returns to interface configuration mode.
Step 11	**atm nsap-address** *nsap-address* **Example:** `Router(config)# atm nsap-address AB.CDEF.01.234567.890A.BCDE.F012.3456.7890.1234.12`	Sets the network service access point (NSAP) address for the ATM interface.

	Command or Action	Purpose
Step 12	exit **Example:** `Router(config)# exit`	Exits configuration mode and returns to EXEC command mode.
Step 13	**show atm svc** **Example:** `Router# show atm svc`	Displays all ATM SVCs and traffic information.
Step 14	**show atm svc ppp** **Example:** `Router# show atm svc ppp`	Displays information about each SVC configured for PPP over ATM.

[5] To determine the correct form of the interface atm command, consult your ATM network module, port adapter, or router documentation.

Configuring PPPoA Autosense for a Single PVC

Perform the following task to configure PPPoA/PPPoE autosense on a PVC.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. Do one of the following:
   - **interface atm** *slot/port.subinterface-number* **point-to-point**
   -
   - or
   - **interface atm number .** *subinterface-number* **point-to-point**
   -
   -
   - **interface atm** *slot/port.subinterface-number* **multipoint**
   -
   -
   - **interface atm** *number.subinterface-number* **multipoint**
4. **pvc** [*name*] *vpi/vci*
5. **encapsulation aal5autoppp virtual-template** *number*

DETAILED STEPS

	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	Do one of the following:
	• **interface atm** *slot/port.subinterface-number* **point-to-point**
	•
	• or
	• **interface atm number .** *subinterface-number* **point-to-point**
	•
	•
	• **interface atm** *slot/port.subinterface-number* **multipoint**
	•
	•
	• **interface atm** *number.subinterface-number* **multipoint**
	
	Example:
	`Router(config)# interface atm 6/0.200 point-to-point`
	
	Example:
	
	Example:
	
	Example:
	`Router(config)# interface atm 1/0/0.4 multipoint`
		Specifies the ATM point-to-point or multipoint subinterface using the appropriate format of the **interface atm** command.[6]

	Command or Action	Purpose
Step 4	**pvc** [*name*] *vpi*/*vci* **Example:** `Router(config-subif)# pvc cisco 0/5`	Configures the PVC.
Step 5	**encapsulation aal5autoppp virtual-template** *number* **Example:** `Router(config-subif-atm-vc)# encapsulation aal5ciscoppp virtual-template 1`	Configures PPPoA/PPPoE autosense. Also specifies the virtual template interface to use to clone the new virtual-access interface for PPP session on this PVC.

6 To determine the correct form of the interface atm command, consult your ATM network module, port adapter, or router documentation.

Configuring PPPoA Autosense for a VC Class

Use the following procedure to configure PPPoA/PPPoE autosense on a VC class.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **vc-class atm** *vc-class-name*
4. **encapsulation aal5autoppp virtual-template** *number*
5. **exit**
6. Do one of the following:
   - **interface atm** *slot/port.subinterface-number* **point-to-point**
   -
   - or
   - **interface atm** *number* **.** *subinterface-number* **point-to-point**
   -
   -
   - **interface atm** *slot/port.subinterface-number* **multipoint**
   -
   -
   - **interface atm** *number.subinterface-number* **multipoint**
7. **class-int** *vc-class-name*

DETAILED STEPS

	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	**vc-class atm** *vc-class-name* **Example:** `Router(config)# vc-class atm class3`	Creates and names a map class.
Step 4	**encapsulation aal5autoppp virtual-template** *number* **Example:** `Router(config-vc-class)# encapsulation aal5ciscoppp virtual-template 1`	Configures PPPoA/PPPoE autosense. Also specifies the virtual template interface to use to clone the new virtual-access interface for PPP session on this PVC.
Step 5	**exit** **Example:** `Router(config-vc-class)# exit`	Returns to global configuration mode.
Step 6	Do one of the following: • **interface atm** *slot/port.subinterface-number* **point-to-point** • • or • **interface atm** *number* **.** *subinterface-number* **point-to-point** • • • **interface atm** *slot/port.subinterface-number* **multipoint** • • • **interface atm** *number.subinterface-number* **multipoint**	Specifies the ATM point-to-point or multipoint subinterface using the appropriate format of the **interface atm** command.[7]

	Command or Action	Purpose

	Example:
	`Router(config)# interface atm 6/0.200 point-to-point`
	Example:
	Example:
	Example:
	`Router(config)# interface atm 1/0/0.4 multipoint`	

Step 7	**class-int** *vc-class-name* **Example:** `Router(config-subif)# class-int class3`	Applies the VC class to all VCs on the ATM interface or subinterface.

[7] To determine the correct form of the interface atm command, consult your ATM network module, port adapter, or router documentation.

Verifying PPPoA Autosense for ATM PVCs

Use the following procedure to verify PPPoA/PPPoE autosense.

SUMMARY STEPS

1. **show atm pvc** [**ppp**]
2. **show caller**
3. **show interface virtual access** *number*
4. **show user**
5. **show vpdn**

DETAILED STEPS

Step 1 **show atm pvc** [**ppp**]

After the client at the other end of the PVC has initiated a PPPoA session, use this command to check that the PVC contains the PPPoA session.

Step 2 **show caller**

Use this command to:

- View individual users and consumed resources on the NAS.
- Inspect active call statistics for large pools of connections. (The **debug** commands produce too much output and tax the CPU too heavily.)
- Display the absolute and idle times for each user. The current values for both of these settings are displayed on the TTY line and the asynchronous interface. Users that have been idle for unacceptably long periods of time can be easily identified. By using this information, you can define time-out policies and multiple grades of services for different users.

Example:

```
Router# show caller
Line      User                  Service       Active
  con 0     -                     TTY           00:08:21
  BR0:1     hatteras              PPP           00:00:14
  Vi1       hatteras              PPP   Bundle  00:00:13
```

Step 3 **show interface virtual access** *number*

Displays information about the virtual-access interface, link control protocol (LCP), protocol states, and interface statistics:

Example:

```
Router# show interface virtual access Virtual-Access3
Virtual-Access3 is up, line protocol is up
```

Step 4 **show user**

Displays information about the active lines on the router.

Example:

```
Router# show user

Line User Host(s) Idle Location * 2 vty 0 idle 00:00:00 bru-cse-058.cisco.com tty 2/01 ww Async
interface 00:00:01 PPP: 12.12.12.3
```

Step 5 **show vpdn**

Displays information about active Level 2 Forwarding (L2F) Protocol tunnel and message identifiers in a virtual private dial-up network (VPDN).

Example:

```
Router# 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
router1@cisco.com       nas          As7          1       open
router2@cisco.com        nas          As8          2       open
```

Configuration Examples for Configuring PPP over ATM

IETF-Compliant MUX Encapsulated PPP over ATM Configuration Examples

This section provides the following examples for configuring IETF-compliant PPP over ATM:

IETF-Compliant PPP over ATM with Different Traffic-Shaping Parameters Example

PVCs with different PPP-over-ATM traffic-shaping parameters can be configured on the same subinterface. In the following example, three PVCs are configured for PPP over ATM on subinterface ATM 2/0.1. PVC 0/60 is configured with IETF-compliant PPP over ATM encapsulation. Its traffic-shaping parameter is an unspecified bit rate with peak cell rate at 500 kbps. PVC 0/70 is also configured with IETF-compliant PPP over ATM encapsulation, but its traffic-shaping parameter is nonreal-time variable bit rate, with peak cell rate at 1 Mbps, sustainable cell rate at 500 kbps, and burst cell size of 64 cells. PVC 0/80 is configured with the Cisco-proprietary PPP over ATM encapsulation. Its traffic-shaping parameter is an unspecified bit rate with peak cell rate at 700 kbps. For further information, refer to the Configuring IETF-Compliant MUX Encapsulated PPP over ATM, on page 4 earlier in this module.

```
interface atm 2/0.1 multipoint
 pvc 0/60
  encapsulation aal5mux ppp virtual-template 3
   ubr 500
  exit


pvc 0/70
 encapsulation aal5mux ppp virtual-template 3
 vbr-nrt 1000 500 64
  exit
pvc 0/80
 encapsulation aal5ciscoppp virtual-template 3
 ubr 700
 exit
```

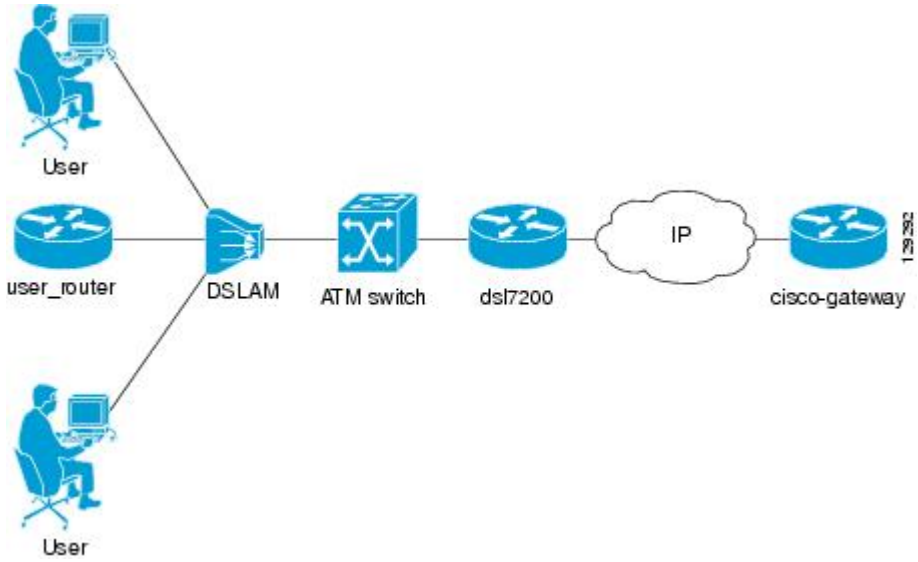
ADSL Termination Example

The IETF-Compliant PPP over ATM feature was designed to support installations with asymmetric digital subscriber line (ADSL) circuits. The figure below illustrates a topology for ADSL termination. This topology allows you to establish a PPP connection to a Cisco 7200 series router.

The example also illustrates the use of PPP tunneling using L2TP to provide VPDN services, in this case for the domain cisco.com. Thus, a user who logs in as bob2257@cisco.com is automatically tunneled to IP address 10.1.2.3. (See the module "Configuring Virtual Private Networks" in the *Cisco IOS VPDN Configuration Guide* for details about setting up VPDN services.)

An example of the commands that you might enter for the user_router, dsl7200, and cisco-gateway (as shown in the figure below) are described below. For further information, refer to the Configuring IETF-Compliant MUX Encapsulated PPP over ATM, on page 4 earlier in this module.

Figure 5: ADSL Termination



user_router Configuration

```
interface virtual-template 1
ip address negotiated
ppp chap hostname user_router@cisco.com
ppp chap password 0 cisco
exit


interface atm 0
pvc 0/40
encapsulation aal5mux ppp virtual-template 1
exit
exit
```

dsl7200 Configuration

```
username user_router@cisco.com password 0 cisco
username dsl7200 password 0 cisco
vpdn enable
vpdn-group 1
request dialin l2tp ip 10.2.1.1 domain cisco.com
interface virtual-template 1
ppp authentication chap
exit
interface atm 2/0
pvc 0/40
encapsulation aal5mux ppp virtual-template 1
exit
exit
```

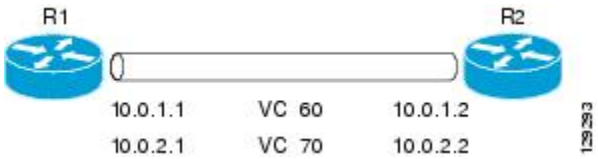
cisco-gateway Configuration

```
username cisco_gateway password 0 cisco
username user_router@cisco.com password 0 cisco
vpdn enable
vpdn-group 1
accept dialin l2tp virtual-template 1 remote dsl7200
interface loopback 0
ip address 10.0.1.1 255.255.255.0
exit
interface virtual-template 1
ip unnumbered loopback 0
peer default ip address pool pool-1
exit
ip local pool pool-1 10.1.2.1 10.1.2.254
```

Two Routers with Back-to-Back PVCs Example

The figure below illustrates an ATM interface with two PPP sessions over two PVC session connections. (See the module "PPP Configuration" in the *Cisco IOS Dial Technologies Configuration Guide* for details on PPP configuration.) The sample commands following the figure below establish the back-to-back router configuration. For further information, refer to the Configuring IETF-Compliant MUX Encapsulated PPP over ATM, on page 4 earlier in this module.

Figure 6: Two Routers with Back-to-Back PVCs



R1 Configuration

```
interface atm 2/0
atm clock internal
pvc 0/60
encapsulation aal5mux ppp virtual-template 1
ubr 90
exit
pvc 0/70
encapsulation aal5mux ppp virtual-template 2
vbr-nrt 90 50 1024
exit
interface virtual-template 1
ip address 10.0.1.1 255.255.255.0
interface virtual-template 2
ip address 10.0.2.1 255.255.255.0
exit
```

R2 Configuration

```
interface atm 2/0.1 multipoint
pvc 0/60
encapsulation aal5mux ppp virtual-template 1
ubr 90
exit
pvc 0/70
encapsulation aal5mux ppp virtual-template 2
vbr-nrt 90 50 1024
exit
```

```
exit
interface virtual-template 1
ip address 10.0.1.2 255.255.255.0
exit
interface virtual-template 2
ip address 10.0.2.2 255.255.255.0
```

Multiplexed Encapsulation Using VC Class Example

In the following example, PVC 0/60 is configured on subinterface ATM 2/0.1 with a VC class attached to it. For details on creating and applying a VC class, see the section "Configuring VC Classes" in the module "Configuring ATM." By rule of inheritance, PVC 0/60 runs with IETF-compliant PPP over ATM encapsulation using the configuration from interface virtual-template 1. Its parameter is an unspecified bit rate with peak cell at 90 kbps.

```
interface atm 2/0.1
pvc 0/60
class-vc pvc-ppp
exit
exit
vc-class atm pvc-ppp
encapsulation aal5mux ppp virtual-template 1
ubr 90
exit
```

IETF-Compliant LLC Encapsulated PPP over ATM Configuration Examples

This section provides the following examples for configuring IETF-compliant LLC encapsulated PPP over ATM:

Configuring IETF-Compliant PPP over ATM LLC Encapsulation Example

This example shows how to configure IETF PPP over ATM LLC encapsulation in the VC class called ppp-default. The VC class specifies virtual template 1 from which to spawn PPP interfaces, SNAP encapsulation (the default), and a UBR class traffic type at 256 kbps. When the VC class ppp-default is configured on interface 0.1, PVC 0/70 inherits these properties. PVC 0/80 overrides virtual template 1 in the VC class and uses virtual template 2 instead. PVC 0/90 also overrides virtual template 1 and uses virtual template 3 instead. In addition, PVC 0/90 uses a VC multiplexed encapsulation and a UBR class traffic type at 500 kbps. For further information, refer to the IETF-Compliant LLC Encapsulated PPP over ATM Configuration Examples, on page 26.

```
interface atm 0.1 multipoint
class-int ppp-default
!
pvc 0/70
exit
!
pvc 0/80
protocol ppp virtual-template 2
exit
!
pvc 0/90
encapsulation aal5mux ppp virtual-template 3
ubr 500
exit
exit
!
vc-class atm ppp-default
```

```
protocol ppp virtual-template 1
ubr 256
exit
```

Overriding a Virtual Template for IETF-Compliant PPP over ATM Example

This example illustrates how to use inheritance to override a virtual template configuration for muxppp or ciscoppp encapsulation options. For PVC 5/505, since the encapsulation option at that level is ciscoppp virtual template 1, as specified in the VC class called muxppp, the **protocol ppp virtual-template 2** command overrides only the virtual-template configuration. For further information, refer to the IETF-Compliant LLC Encapsulated PPP over ATM Configuration Examples, on page 26.

```
interface atm 2/0
class-int muxppp
!
pvc 5/505
protocol ppp virtual-template 2
exit
!
muxppp
encapsulation aal5ciscoppp virtual-template 1
exit
```

Disabling IETF-Compliant PPP over ATM LLC Encapsulation on a Specific VC Example

This example shows how to limit the configuration of a particular LLC encapsulated protocol to a particular VC. First, we see that the VC class called "ppp" is configured with IETF PPP over ATM with LLC encapsulation and virtual template 1. This VC class is then applied to ATM interface 1/0/0. By configuring SNAP encapsulation by itself on PVC 0/32, you disable IETF PPP over ATM with LLC encapsulation on this particular PVC; PVC 0/32 will only carry IP. For further information, refer to the IETF-Compliant LLC Encapsulated PPP over ATM Configuration Examples, on page 26.

```
interface atm 1/0/0
class-int ppp
exit
!
interface atm 1/0/0.100 point-to-point
description IP only VC
ip address 10.1.1.1 255.255.255.0
pvc 0/32
encapsulation aal5snap
exit
exit
!
vc-class atm ppp
encapsulation aal5snap
protocol ppp virtual-template 1
exit
```

Cisco Proprietary-PPP-over-ATM Example

The following example shows how to configure Cisco-proprietary PPP over ATM to use PPP unnumbered link and Challenge Handshake Authentication Protocol (CHAP) authentication. For further information, refer to the Configuring Cisco-Proprietary PPP over ATM PVCs, on page 10.

```
configure terminal
!
interface virtual-template 2
```

```
 encapsulation ppp
 ip unnumbered ethernet 0/0
 ppp authentication chap
!
interface atm 2/0.2 point-to-point
 pvc 0/34
 encapsulation aal5ciscoppp virtual-template 2
 exit
```

PPP over an ATM SVC Configuration Example

In the following example, ATM interface 2/0/0 is configured to accept ATM SVC calls whose called party address is 47.00918100000000400B0A2501.0060837B4740.00. The same ATM NSAP address can be configured on other physical ATM interfaces as well. When a PPP session is established, a virtual-access interface is created and cloned with the configuration from virtual template 1. All PPP sessions established on this ATM interface will use the IP address of loopback interface 0. A maximum of 100 SVCs can be established using this configuration. SVCs established using this configuration cannot take up more than 50 Mbps in total bandwidth.

```
interface ATM 2/0/0
 svc anna
  encapsulation aal5auto
  protocol ppp virtual-template 1
  max vc 100
  max bandwidth 50000
 atm nsap 47.00918100000000400B0A2501.0060837B4740.00
!
interface virtual-template 1
 ip unnumbered loopback 0
!
interface loopback 0
 ip address 10.7.1.1 255.255.255.0
```

PPPoA PPPoE Autosense on an ATM PVC Example

In the following example, the NAS is configured with PPPoA/PPPoE autosense for ATM PVCs on PVC 30/33:

```
!
! Configure PPP Autosense
!
interface ATM 0/0/0.33 multipoint
 pvc 30/33
  encapsulation aal5autoppp Virtual-Template1
!
! Configure PPPoE
!
vpdn enable
vpdn-group 1
 accept dialin
  protocol pppoe
  virtual-template 1
!
ip cef
interface virtual-template 1
 ip unnumbered fastethernet 0/0/0
 ip route-cache cef
!
interface fastethernet 0/0/0
 ip address 10.1.1.1 255.255.255.0
!
! Enable precloning for virtual-template 1
```

```
!
virtual-template 1 pre-clone 2000
```

PPPoA PPPoE Autosense on a VC Class Example

In the following example, the NAS is configured with PPPoA/PPPoE autosense on the VC class called MyClass. MyClass applies PPPoA/PPPoE autosense to all PVCs on the ATM 0/0/0.99 interface.

```
!
! Configure PPP Autosense
!
vc-class ATM MyClass
 encapsulation aal5autoppp Virtual-Template1
!
interface ATM 0/0/0.99 multipoint
  class-int MyClass
  no ip directed-broadcast
  pvc 20/40
  pvc 30/33
!
! Configure PPPoE
!
vpdn enable
vpdn-group 1
 accept dialin
  protocol pppoe
  virtual-template 1
!
ip cef
interface virtual-template 1
  ip unnumbered fastethernet 0/0/0
  ip route-cache cef
!
interface fastethernet 0/0/0
 ip address 10.1.1.1 255.255.255.0
!
! Enable precloning for virtual-template 1
!
virtual-template 1 pre-clone 2000
!
```

PPPoA PPPoE Autosense on Multiple VC Classes and Virtual Templates Example

Note Effective with Cisco IOS Release 12.2(28)SB, the **pppoe limit per-mac** and **pppoe limit per-vc** commands are replaced by the **sessions per-mac limit** and **sessions per-vc limit** commands, respectively, in bba-group configuration mode. See the **sessions per-mac limit** and **sessions per-vc limit** commands for more information.

In the following example, PPPoA and PPPoE sessions are handled separately by two virtual templates.

```
ip cef
vpdn enable
!
vpdn-group 1
 accept-dialin
  protocol pppoe
  virtual-template 1
pppoe limit per-mac 1
```

```
pppoe limit per-vc 1
!
virtual-template 1 pre-clone 1500
virtual-template 2 pre-clone 1000
!
interface ATM0/0/0.3 multipoint
 no ip directed-broadcast
 class-int pppauto
!
interface ATM0/0/0.9 multipoint
 ip address 10.16.40.1 255.255.0.0
 no ip directed-broadcast
!
interface Virtual-Template1
 ip unnumbered ATM0/0/0.9
 ip route-cache cef
 no ip directed-broadcast
 peer default ip address pool pool-1
 ppp authentication pap
!
interface Virtual-Template2
 ip unnumbered ATM0/0/0.9
 ip route-cache cef
 no ip directed-broadcast
 peer default ip address pool pool-2
 ppp authentication chap
!
interface fastethernet 0/0/0
 ip address 10.1.1.1 255.255.255.0
!
vc-class atm pppauto
 encapsulation aal5autoppp Virtual-Template2
!
```

Note Whenever possible, it is preferable to configure PPPoA and PPPoE to use the same virtual template. Using separate virtual templates leads to the inefficient use of virtual access because the maximum number of virtual-access interfaces will have to be precloned twice: once for PPPoE and once for PPPoA. If PPPoA and PPPoE use the same virtual template, the maximum number of virtual-access interfaces can be precloned once and used for PPPoA and PPPoE as needed.

Where to Go Next

If you want to identify a physical subscriber line for RADIUS communication with a RADIUS server, refer to the "Identifying a Physical Subscriber Line for RADIUS Access and Accounting" module.

Additional References

The following sections provide references related to providing protocol support for broadband access aggregation of PPP over ATM sessions.

Related Documents

Related Topic	Document Title
Broadband access aggregation concepts	Understanding Broadband Access Aggregation

Related Topic	Document Title
Broadband access aggregation preparation tasks	Preparing for Broadband Access Aggregation

Standards

Standards	Title
Frame Relay Forum standard FRF.8	*Frame Relay to ATM Internetworking*

MIBs

MIBs	MIBs Link
None	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

RFCs

RFCs	Title
RFC 2364	*PPP over AAL5*

Technical Assistance

Description	Link
The Cisco Technical Support website contains thousands of 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/techsupport

Feature Information for Providing Protocol Support for Broadband Access Aggregation of PPP over ATM Sessions

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 . An account on Cisco.com is not required.

Table 1: Feature Information for Providing Protocol Support for Broadband Access Aggregation of PPP over ATM Sessions

Feature Name	Releases	Feature Configuration Information
PPP over ATM	12.1(1)	PPP over ATM enables a high-capacity central site router with an ATM interface to terminate multiple remote PPP connections. PPP over ATM provides security validation per user, IP address pooling, and service selection capability.
PPPoA/PPPoE Autosense for ATM PVCs	12.2(4)T 12.2(4)T3	The PPPoA/PPPoE autosense for ATM PVCs feature enables a router to distinguish between incoming PPP over ATM (PPPoA) and PPP over Ethernet (PPPoE) over ATM sessions and to create virtual access based on demand for both PPP types.