



PPPoE Profiles

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The PPPoE Profiles feature introduces PPP over Ethernet (PPPoE) profiles, which contain configuration information for a group of PPPoE sessions. Multiple PPPoE profiles can be defined on a device, allowing different virtual templates and other PPPoE configuration parameters to be assigned to different Ethernet interfaces, VLANs, and ATM permanent virtual circuits (PVCs).

History for the PPPoE Profiles Feature

Release	Modification
12.2(15)T	This feature was introduced.
12.3(7)XI3	The PPPoE Circuit-ID Tag Processing feature was integrated into Cisco IOS Release 12.3(7)XI3.
12.2(28)SB	This feature was integrated into Cisco IOS Release 12.2(28)SB.

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Restrictions for PPPoE Profiles

The PPPoE Profiles feature separates the configuration of PPPoE from virtual private dial-up network (VPDN). The legacy method of configuring PPPoE in VPDN groups is still permitted, but you cannot configure PPPoE profiles and PPPoE in VPDN groups simultaneously.

If a PPPoE profile is assigned to a PPPoE port (Ethernet interface, VLAN, or PVC), virtual circuit (VC) class, or ATM PVC range and the profile has not yet been defined, the port, VC class, or range will not have any PPPoE parameters configured and will not use parameters from the global group.

PPPoE session limits cannot be configured both in PPPoE profiles and directly on PPPoE ports simultaneously.

Information About PPPoE Profiles

To configure the PPPoE Profiles feature, you should understand the following concepts:

- [PPPoE Profiles, page 2](#)
- [Benefits of PPPoE Profiles, page 2](#)
- [PPPoE Circuit-ID Tag Processing, page 2](#)

PPPoE Profiles

PPPoE profiles contain configuration information for PPPoE sessions. Once a profile has been defined, it can be assigned to a PPPoE port (Ethernet interface, VLAN, or PVC), a VC class, or an ATM PVC range. PPPoE profiles can also be used for PPPoE sessions established by PPPoA/PPPoE autosense. Multiple PPPoE profiles can be created and assigned to different ports. A global PPPoE profile can also be created; it serves as the default profile for any port that has not been assigned a specific PPPoE profile.

Benefits of PPPoE Profiles

Before the introduction of this feature, PPPoE parameters were configured within a VPDN group. Configuring PPPoE in a VPDN group limited PPPoE configuration options because only one PPPoE VPDN group with one virtual template is permitted on a device. The PPPoE Profiles feature provides simplicity and flexibility in PPPoE configuration by separating PPPoE from VPDN configuration. The PPPoE Profiles feature allows multiple PPPoE profiles, each with a different configuration, to be used on a single device.

PPPoE Circuit-ID Tag Processing

The PPPoE Circuit-ID Tag Processing feature enables Ethernet-based access network services by providing a mechanism for a PPPoE Broadband Remote Access Server (BRAS) to map a subscriber's circuit ID (that is, the line ID) to a specific Ethernet interface.

A Digital Subscriber Line Multiplexer (DSLAM) can be configured to insert a unique circuit-ID tag into a PPPoE Active Discovery Initiation/PPPoE Active Discovery Request (PADI/PADR) frame. You can create a PPPoE profile to enable the PPPoE BRAS to process the vendor tag to send the circuit-ID portion of the tag (as NAS-Port-ID attribute 87) to the RADIUS server in all authentication, authorization, and accounting (AAA) access and accounting requests. You can also create a PPPoE profile to strip the vendor tag from outgoing PPPoE Active Discovery Offer (PADO) and PPPoE Active Discovery Session (PADS) frames.

How to Configure PPPoE Profiles

This section contains the following procedures. The first is required, and any one of the next four is required.

- [Defining a PPPoE Profile, page 3](#) (required)
- [Assigning a PPPoE Profile to an Ethernet Interface, page 5](#) (optional)
- [Assigning a PPPoE Profile to an ATM PVC, page 6](#) (optional)
- [Assigning a PPPoE Profile to an ATM PVC Range and PVC-in-Range, page 7](#) (optional)
- [Assigning a PPPoE Profile to an ATM VC Class, page 9](#) (optional)
- [Configuring PPPoE Circuit-ID Tag Processing, page 10](#) (optional)
- [Monitoring and Maintaining PPPoE Profiles, page 12](#) (optional)

Defining a PPPoE Profile

Perform this task to define a PPPoE profile.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **bba-group pppoe** {*group-name* | **global**}
4. **virtual-template** *template-number*
5. **sessions max limit** *number-of-sessions* [**threshold** *threshold-value*]
6. **sessions per-mac limit** *per-mac-limit*
7. **sessions per-vlan limit** *per-vlan-limit*
8. **sessions per-vc limit** *per-vc-limit* [**threshold** *threshold-value*]
9. **ac name** *name*
10. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	<p><code>enable</code></p> <p>Example: Router> enable</p>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> Enter your password if prompted.
Step 2	<p><code>configure terminal</code></p> <p>Example: Router# configure terminal</p>	<p>Enters global configuration mode.</p>
Step 3	<p><code>bba-group pppoe {group-name global}</code></p> <p>Example: Router(config)# bba-group pppoe global</p>	<p>Defines a PPPoE profile, and enters BBA group configuration mode.</p> <ul style="list-style-type: none"> The global keyword will create a profile that will serve as the default profile for any PPPoE port that is not assigned a specific profile.
Step 4	<p><code>virtual-template template-number</code></p> <p>Example: Router(config-bba-group)# virtual-template 1</p>	<p>Specifies which virtual template will be used to clone virtual access interfaces for all PPPoE ports that use this PPPoE profile.</p>
Step 5	<p><code>sessions max limit number-of-sessions [threshold threshold-value]</code></p> <p>Example: Router(config-bba-group)# sessions max limit 8000</p>	<p>Configures the PPPoE global profile with the maximum number of PPPoE sessions that will be permitted on a router and sets the PPPoE session-count threshold at which an SNMP trap will be generated.</p> <p>Note This command applies only to the global profile.</p>
Step 6	<p><code>sessions per-mac limit per-mac-limit</code></p> <p>Example: Router(config-bba-group)# sessions per-mac limit 2</p>	<p>Sets the maximum number of PPPoE sessions permitted per MAC address in a PPPoE profile.</p>
Step 7	<p><code>sessions per-vlan limit per-vlan-limit</code></p> <p>Example: Router(config-bba-group)# sessions per-vlan limit 200</p>	<p>Sets the maximum number of PPPoE sessions permitted per VLAN in a PPPoE profile.</p>
Step 8	<p><code>sessions per-vc limit per-vc-limit [threshold threshold-value]</code></p> <p>Example: Router(config-bba-group)# sessions per-vc limit 8</p>	<p>Sets the maximum number of PPPoE sessions permitted on a VC in a PPPoE profile, and sets the PPPoE session-count threshold at which an SNMP trap will be generated.</p>

	Command or Action	Purpose
Step 9	<code>ac name name</code> Example: Router(config-bba-group)# ac name user1	(Optional) Specifies the name of the access concentrator to be used in PPPoE Active Discovery Offers (PADO).
Step 10	<code>end</code> Example: Router(config-bba-group)# end	(Optional) Exits the configuration mode and returns to privileged EXEC mode.

Assigning a PPPoE Profile to an Ethernet Interface

Perform this task to assign a PPPoE profile to an Ethernet interface.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface ethernet number**
4. **pppoe enable [group group-name]**
5. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>enable</code> Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none">• Enter your password if prompted.
Step 2	<code>configure terminal</code> Example: Router# configure terminal	Enters global configuration mode.
Step 3	<code>interface ethernet number</code> Example: Router(config)# interface ethernet 0	Specifies an Ethernet interface and enters interface configuration mode.

	Command or Action	Purpose
Step 4	<code>pppoe enable [group group-name]</code> Example: Router(config-if)# pppoe enable group one	Enables PPPoE sessions on an Ethernet interface or subinterface. Note If a PPPoE profile is not assigned to the interface by using the group group-name option, the interface will use the global PPPoE profile.
Step 5	<code>end</code> Example: Router(config-if)# end	(Optional) Exits the configuration mode and returns to privileged EXEC mode.

Assigning a PPPoE Profile to an ATM PVC

Perform this task to assign a PPPoE profile to an ATM PVC.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface ATM number [point-to-point | multipoint]**
4. **pvc vplvci**
5. **protocol pppoe [group group-name]**
or
encapsulation aal5autoppp virtual-template number [group group-name]
6. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>enable</code> Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none">• Enter your password if prompted.
Step 2	<code>configure terminal</code> Example: Router# configure terminal	Enters global configuration mode.
Step 3	<code>interface ATM number [point-to-point multipoint]</code> Example: Router(config)# interface atm 5/0.1 multipoint	Specifies an ATM interface or subinterface and enters interface configuration mode.

	Command or Action	Purpose
Step 4	<code>pvc vpi/vci</code> Example: Router(config-if)# pvc 2/101	Creates an ATM PVC and enters ATM virtual circuit configuration mode.
Step 5	<code>protocol pppoe [group group-name]</code> or <code>encapsulation aal5autopp virtual-template number [group group-name]</code> Example: Router(config-if-atm-vc)# protocol pppoe group one or Example: Router(config-if-atm-vc)# encapsulation aal5autopp virtual-template 1 group one	Enables PPPoE sessions to be established on ATM PVCs. or Configures PPPoA/PPPoE autosense on the PVC. Note 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 6	<code>end</code> Example: Router(config-if-atm-vc)# end	(Optional) Exits the configuration mode and returns to privileged EXEC mode.

Assigning a PPPoE Profile to an ATM PVC Range and PVC-in-Range

Perform this task to assign a PPPoE profile to an ATM PVC range and PVC within a range.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface atm** *number* [**point-to-point** | **multipoint**]
4. **range** [*range-name*] **pvc** *start-vpi/start-vci end-vpi/end-vci*
5. **protocol pppoe** [**group** *group-name*]
or
encapsulation aal5autopp virtual-template *number* [**group** *group-name*]
6. **pvc-in-range** [*pvc-name*] [[*vpi*]/*vci*]
7. **protocol pppoe** [**group** *group-name*]
or
encapsulation aal5autopp virtual-template *number* [**group** *group-name*]
8. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	<p>enable</p> <p>Example: Router> enable</p>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	<p>configure terminal</p> <p>Example: Router# configure terminal</p>	<p>Enters global configuration mode.</p>
Step 3	<p>interface atm number [point-to-point multipoint]</p> <p>Example: Router(config)# interface atm 5/0.1 multipoint</p>	<p>Specifies an ATM interface or subinterface and enters interface configuration mode.</p>
Step 4	<p>range [range-name] pvc start-vpi/start-vci end-vpi/end-vci</p> <p>Example: Router(config-if)# range range-one pvc 100 4/199</p>	<p>Defines a range of PVCs and enables PVC range configuration mode.</p>
Step 5	<p>protocol pppoe [group group-name]</p> <p>or</p> <p>encapsulation aal5autopp virtual-template number [group group-name]</p> <p>Example: Router(config-if-atm-range)# protocol pppoe group one</p> <p>or</p> <p>Example: Router(config-if-atm-range)# encapsulation aal5autopp virtual-template 1 group one</p>	<p>Enables PPPoE sessions to be established on a range of ATM PVCs.</p> <p>or</p> <p>Configures PPPoA/PPPoE autosense.</p> <p>Note If a PPPoE profile is not assigned to the PVC range by using the group group-name option, the PVCs in the range will use the global PPPoE profile.</p>
Step 6	<p>pvc-in-range [pvc-name] [[vpi/]vci]</p> <p>Example: Router(config-if-atm-range)# pvc-in-range pvc1 3/104</p>	<p>Defines an individual PVC within a PVC range and enters PVC-in-range configuration mode.</p>

Command or Action	Purpose
<p>Step 7</p> <pre>protocol pppoe [group group-name]</pre> <p>or</p> <pre>encapsulation aal5autopp virtual-template number [group group-name]</pre> <p>Example: Router(cfg-if-atm-range-pvc)# protocol pppoe group two</p> <p>or</p> <p>Example: Router(cfg-if-atm-range-pvc)# encapsulation aal5autopp virtual-template 1 group one</p>	<p>Enables PPPoE sessions to be established on a PVC within a range.</p> <p>or</p> <p>Configures PPPoA/PPPoE autosense.</p> <p>Note 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.</p>
<p>Step 8</p> <pre>end</pre> <p>Example: Router(cfg-if-atm-range-pvc)# end</p>	<p>(Optional) Exits the configuration mode and returns to privileged EXEC mode.</p>

Assigning a PPPoE Profile to an ATM VC Class

Perform this task to assign a PPPoE profile to an ATM VC class.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **vc-class atm vc-class-name**
4. **protocol pppoe [group group-name]**
or
encapsulation aal5autopp virtual-template number [group group-name]
5. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	<p>enable</p> <p>Example: Router> enable</p>	<p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> Enter your password if prompted.
Step 2	<p>configure terminal</p> <p>Example: Router# configure terminal</p>	<p>Enters global configuration mode.</p>
Step 3	<p>vc-class atm vc-class-name</p> <p>Example: Router(config)# vc-class atm class1</p>	<p>Creates an ATM VC class and enters ATM VC class configuration mode.</p> <ul style="list-style-type: none"> A VC class can be applied to an ATM interface, subinterface, or VC.
Step 4	<p>protocol pppoe [group group-name]</p> <p>or</p> <p>encapsulation aal5autopp virtual-template number [group group-name]</p> <p>Example: Router(config-vc-class)# protocol pppoe group two</p> <p>or</p> <p>Example: Router(config-vc-class)# encapsulation aal5autopp virtual-template 1 group one</p>	<p>Enables PPPoE sessions to be established.</p> <p>or</p> <p>Configures PPPoA/PPPoE autosense.</p> <p>Note If a PPPoE profile is not assigned by using the group group-name option, the PPPoE sessions will be established with the global PPPoE profile.</p>
Step 5	<p>end</p> <p>Example: Router(config-vc-class)# end</p>	<p>(Optional) Exits the configuration mode and returns to privileged EXEC mode.</p>

Configuring PPPoE Circuit-ID Tag Processing

Perform this task to configure a PPPoE server to process the vendor tag in an incoming PADI/PADR frame. This configuration enables the PPPoE server to send the circuit-ID part of the tag to a remote RADIUS server in AAA access and accounting requests. Optionally, you can configure the PPPoE server to remove the vendor tag in outgoing PPPoE Active Discovery Offer (PADO) and PPPoE Active Discovery Session (PADS) frames by using the **vendor-tag circuit-id strip** command.

SUMMARY STEPS

- enable**
- configure terminal**

3. **bba-group pppoe** *[group-name]*
4. **vendor-tag circuit-id service**
5. **vendor-tag circuit-id strip**
6. **interface** *type number*
7. **encapsulation dot1Q** *vlan-id*
8. **pppoe-enable** *[group group-name]*
9. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none">• Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	Enters global configuration mode.
Step 3	bba-group pppoe <i>[group-name]</i> Example: Router(config)# bba-group pppoe pppoe-tag	Defines a PPPoE profile called “pppoe-tags” and enters BBA group configuration mode.
Step 4	vendor-tag circuit-id service Example: Router(config-bba-group)# vendor-tag circuit-id service	Enables the PPPoE server to process the vendor tag in incoming frames and send the circuit-ID part of the tag to a remote RADIUS server in AAA access and accounting requests.
Step 5	vendor-tag circuit-id strip Example: Router(config-bba-group)# vendor-tag circuit-id strip	(Optional) Enables the PPPoE server to remove the circuit-ID part of the vendor tag in outgoing PADO and PADS frames.
Step 6	interface <i>type number</i> Example: Router(config-bba-group)# interface FastEthernet 0/0.1	Specifies a FastEthernet interface and enters subinterface configuration mode.
Step 7	encapsulation dot1Q <i>vlan-id</i> Example: Router(config-subif)# encapsulation dot1Q 120	Enables IEEE 802.1Q encapsulation of traffic on the specified subinterface in a virtual LAN (VLAN), and defines the outer VLAN ID.

	Command or Action	Purpose
Step 8	<code>pppoe-enable [group group-name]</code> Example: Router(config-subif)# pppoe enable group pppoe-tag	Enables PPPoE sessions on the Fast Ethernet interface or subinterface and assigns the “pppoe-tags” PPPoE profile. Note If a PPPoE profile is not assigned to the interface by using the group group-name option, the interface will use the global PPPoE profile.
Step 9	<code>end</code> Example: Router(config-subif)# end	(Optional) Exits the configuration mode and returns to privileged EXEC mode.

Monitoring and Maintaining PPPoE Profiles

Perform this task to monitor and maintain PPPoE profiles.

SUMMARY STEPS

1. **enable**
2. **show pppoe session [all | packets]**
3. **clear pppoe {interface type number [vc {[vpi]vci | vc-name}] | rmac mac-addr [sid session-id] | all}**
4. **debug pppoe {data | errors | events | packets} [rmac remote-mac-address | interface type number [vc {[vpi]vci | vc-name}]]**

DETAILED STEPS

	Command or Action	Purpose
Step 1	<code>enable</code> Example: Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none">• Enter your password if prompted.
Step 2	<code>show pppoe session [all packets]</code> Example: Router# show pppoe session all	Displays information about active PPPoE sessions.

	Command or Action	Purpose
Step 3	<pre>clear pppoe {interface type number [vc {[vpi/]vci vc-name}] rmac mac-addr [sid session-id] all}</pre> <p>Example: Router# clear pppoe interface atm0/1.0</p>	Terminates PPPoE sessions.
Step 4	<pre>debug pppoe {data errors events packets} [rmac remote-mac-address interface type number [vc {[vpi/]vci vc-name}]}</pre> <p>Example: Router# debug pppoe events</p>	Displays debugging information for PPPoE sessions.

Configuration Examples for PPPoE Profiles

This section provides the following configuration example:

- [PPPoE Profiles Configuration Example, page 13](#)

PPPoE Profiles Configuration Example

The following example shows the configuration of three PPPoE profiles: “vpn1”, “vpn2”, and a global PPPoE profile. The profiles “vpn1” and “vpn2” are assigned to PVCs, VC classes, VLANs, and PVC ranges. Any Ethernet interface, VLAN, PVC, PVC range, or VC class that is configured for PPPoE but is not assigned either profile “vpn1” or “vpn2” (such as VC class “class-pppoe-global”) will use the global profile.

```
vpdn enable
!
vpdn-group 1
 request-dialin
  protocol l2tp
  domain vpn1
 initiate-to ip 10.12.1.64 priority 1
 local name NAS1-1
!
vpdn-group 2
 request-dialin
  protocol l2tp
  domain vpn2
 initiate-to ip 10.12.2.64 priority 1
 local name NAS1-2
!
virtual-template 1 pre-clone 20
virtual-template 2 pre-clone 20
!
bba-group pppoe global
 virtual-template 1
 sessions max limit 8000
 sessions per-vc limit 8
 sessions per-mac limit 2
!
bba-group pppoe vpn1
 virtual-template 1
```

```

    sessions per-vc limit 2
    sessions per-mac limit 1
    !
bba-group pppoe vpn2
    virtual-template 2
    sessions per-vc limit 2
    sessions per-mac limit 1
    !
vc-class atm class-pppoe-global
    protocol pppoe
    !
vc-class atm class-pppox-auto
    encapsulation aal5autoppp virtual-template 1 group vpn1
    !
vc-class atm class-pppoe-1
    protocol pppoe group vpn1
    !
vc-class atm class-pppoe-2
    protocol pppoe group vpn2
    !
interface Loopback1
    ip address 10.1.1.1 255.255.255.0
    !
interface ATM1/0.10 multipoint
    range range-pppoe-1 pvc 100 109
    protocol pppoe group vpn1
    !
interface ATM1/0.20 multipoint
    class-int class-pppox-auto
    pvc 0/200
    encapsulation aal5autoppp Virtual-Template1
    !
    pvc 0/201
    !
    pvc 0/202
    encapsulation aal5autoppp Virtual-Template1 group vpn2
    !
    pvc 0/203
    class-vc class-pppoe-global
    !
    !
interface Ethernet2/3.1
    encapsulation dot1Q 1
    pppoe enable group vpn1
    !
interface Ethernet2/3.2
    encapsulation dot1Q 2
    pppoe enable group vpn2
    !
interface ATM6/0.101 point-to-point
    ip address 10.12.1.63 255.255.255.0
    pvc 0/101
    !
interface ATM6/0.102 point-to-point
    ip address 10.12.2.63 255.255.255.0
    pvc 0/102
    !
interface Virtual-Template1
    ip unnumbered loopback 1
    no logging event link-status
    no keepalive
    peer default ip address pool pool-1
    ppp authentication chap
    !

```

```

interface Virtual-Template2
 ip unnumbered loopback 1
 no logging event link-status
 no keepalive
 peer default ip address pool pool-2
 ppp authentication chap
 !
ip local pool pool-1 10.10.1.1 255.255.255.255
ip local pool pool-2 10.10.2.1 255.255.255.255
!
```

Additional References

The following sections provide references related to PPPoE Profiles:

Related Documents

Related Topic	Document Title
PPPoA/PPPoE configuration tasks	“Configuring Broadband Access: PPP and Routed Bridge Encapsulation” chapter in <i>Cisco IOS Wide-Area Networking Configuration Guide</i> , Release 12.2
PPPoA/PPPoE commands	“Broadband Access: PPP and Routed Bridge Encapsulation Commands” chapter in <i>Cisco IOS Wide-Area Networking Command Reference</i> , Release 12.2
PPPoA/PPPoE autosense configuration	“PPPoA/PPPoE Autosense for ATM PVCs” Cisco IOS Release 12.2(4)T feature module
ATM PVC range configuration tasks	“Configuring ATM” chapter in <i>Cisco IOS Wide-Area Networking Configuration Guide</i> , Release 12.2
ATM PVC range commands	“ATM Commands” chapter in <i>Cisco IOS Wide-Area Networking Command Reference</i> , Release 12.2

Standards

Standards	Title
RFC 2516	<i>A Method for Transmitting PPP over Ethernet</i>

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
None	

Technical Assistance

Description	Link
The Cisco Technical Support & Documentation 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

Command Reference

This section documents modified commands.

- [ac name](#)
- [bba-group pppoe](#)
- [debug pppoe](#)
- [encapsulation \(ATM\)](#)
- [encapsulation dot1q](#)
- [pppoe enable](#)
- [protocol pppoe \(ATM VC\)](#)
- [sessions max limit](#)
- [sessions per-mac limit](#)
- [sessions per-vc limit](#)
- [sessions per-vlan limit](#)
- [vendor-tag circuit-id service](#)
- [vendor-tag circuit-id strip](#)
- [virtual-template \(BBA group\)](#)

ac name

To specify the name of the access concentrator to be used in PPPoE Active Discovery Offers (PADO), use the **ac name** command in BBA group configuration mode. To remove this specification, use the **no** form of this command.

ac name *name*

no ac name *name*

Syntax Description

<i>name</i>	Name of the access concentrator to be used in PADOs.
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Defaults

If the name of the access concentrator is not specified, the name of the router is used as the access concentrator name.

Command Modes

BBA group configuration

Command History

Release	Modification
12.2(15)T	This command was introduced.
12.3(7)XI3	This command was integrated into Cisco IOS Release 12.3(7)XI3.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.

Usage Guidelines

The **ac name** command allows you to advertise a unique access concentrator name other than the router name to PPPoE clients.

Examples

The following example shows the configuration of the name “region1” as the access concentrator name to be used in PADOs:

```
bba-group pppoe global
virtual-template 1
ac name region1
```

Related Commands

Command	Description
bba-group pppoe	Creates a PPPoE profile.

bba-group pppoe

To create a PPP over Ethernet (PPPoE) profile, use the **bba-group pppoe** command in global configuration mode. To delete a PPPoE profile, use the **no** form of this command.

bba-group pppoe { *group-name* | **global** }

no bba-group pppoe { *group-name* | **global** }

Syntax Description		
	<i>group-name</i>	Name of the PPPoE profile.
	global	PPPoE profile that serves as the default profile for any PPPoE port—Ethernet interface, VLAN, or permanent virtual circuit (PVC)—that has not been assigned a specific PPPoE profile.

Defaults A PPPoE profile is not configured.

Command Modes Global configuration

Command History	Release	Modification
	12.2(15)T	This command was introduced.
	12.3(7)XI3	This command was integrated into Cisco IOS Release 12.3(7)XI3.
	12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.

Usage Guidelines PPPoE profiles contain the configuration for a group of PPPoE sessions. Once a profile has been defined, it can be assigned to a PPPoE port (Ethernet interface, VLAN, or PVC), a virtual circuit (VC) class, or an ATM PVC range. PPPoE profiles can also be used with PPP over ATM (PPPoA)/PPPoE autosense. Multiple PPPoE profiles can be created and assigned to different ports.

The global PPPoE profile serves as the default profile for any port that has not been assigned a specific PPPoE profile.

Examples The following example shows the configuration of a global PPPoE profile and a profile called “vpn1”. PPPoE sessions established on PVCs that use the VC class “class-pppoe-global” will use the global profile. PVCs in the range “range-pppoe-1” will use the “vpn1” profile.

```
bba-group pppoe global
  virtual-template 1
  sessions max limit 8000
  sessions per-vc limit 8
  sessions per-mac limit 2
!
bba-group pppoe vpn1
  virtual-template 1
  sessions per-vc limit 2
  sessions per-mac limit 1
```

```

!
vc-class atm class-pppoe-global
  protocol pppoe
!
interface ATM1/0.10 multipoint
  range range-pppoe-1 pvc 100 109
  protocol pppoe group vpn1
!
interface ATM1/0.20 multipoint
  class-int class-pppoe-global
  pvc 0/200
    
```

Related Commands

Command	Description
encapsulation aal5autopp virtual-template	Enables PPPoA/PPPoE autosense.
pppoe enable	Enables PPPoE sessions on an Ethernet interface or subinterface.
protocol pppoe (ATM VC)	Enables PPPoE sessions to be established on PVCs.
sessions max limit	Configures a PPPoE global profile with the maximum number of PPPoE sessions permitted on a router and sets the PPPoE session-count threshold.
sessions per-mac limit	Sets the maximum number of PPPoE sessions allowed per MAC address in a PPPoE profile.
sessions per-vc limit	Sets the maximum number of PPPoE sessions to be established over a VC and sets the PPPoE session-count threshold.
sessions per-vlan limit	Sets the maximum number of PPPoE sessions per VLAN in a PPPoE profile.

debug pppoe

To display debugging information for PPP over Ethernet (PPPoE) sessions, use the **debug pppoe** command in privileged EXEC mode. To disable debugging output, use the **no** form of this command.

```
debug pppoe { data | errors | events | packets } [rmac remote-mac-address] interface type number
[vc {[vpi]/vci | vc-name}] [vlan vlan-id]]
```

```
no debug pppoe { data | errors | events | packets } [rmac remote-mac-address] |
interface type number [vc {[vpi]/vci | vc-name}] [vlan vlan-id]]
```

Syntax Description

data	Displays data packets of PPPoE sessions.
errors	Displays PPPoE protocol errors that prevent a session from being established, or displays errors that cause an established session to be closed.
events	Displays PPPoE protocol messages about events that are part of normal session establishment or shutdown.
packets	Displays each PPPoE protocol packet that is exchanged.
rmac <i>remote-mac-address</i>	(Optional) Remote MAC address. Debugging information for PPPoE sessions sourced from this address will be displayed.
interface <i>type number</i>	(Optional) Interface for which PPPoE session debugging information will be displayed.
vc	(Optional) Displays debugging information for PPPoE sessions for a specific permanent virtual circuit (PVC).
<i>vpi</i>	(Optional) ATM network virtual path identifier (VPI) for the PVC. In the absence of the slash (/) and a <i>vpi</i> value, the <i>vpi</i> value defaults to 0.
<i>vci</i>	(Optional) ATM network virtual channel identifier (VCI) for the PVC.
<i>vc-name</i>	(Optional) Name of the PVC.
vlan <i>vlan-id</i>	(Optional) IEEE 802.1Q VLAN identifier.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.2(13)T	This command was introduced. This command replaces the debug vpdn pppoe-data , debug vpdn pppoe-error , debug vpdn pppoe-events , and debug vpdn pppoe-packet commands available in previous Cisco IOS releases.
12.2(15)T	This command was modified to display debugging information on a per-MAC address, per-interface, and per-VC basis.
12.3(2)T	The vlan <i>vlan-id</i> keyword and argument were added.
12.3(7)XI3	This command was integrated into Cisco IOS Release 12.3(7)XI3.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.

Examples

The following examples show sample output from the **debug pppoe** command:

```
Router# debug pppoe events interface atm1/0.10 vc 101

PPPoE protocol events debugging is on
Router#
00:41:55:PPPoE 0:I PADI R:00b0.c2e9.c470 L:ffff.ffff.ffff 0/101 ATM1/0.10
00:41:55:PPPoE 0:O PADO, R:00b0.c2e9.c470 L:0001.c9f0.0c1c 0/101 ATM1/0.10
00:41:55:PPPoE 0:I PADR R:00b0.c2e9.c470 L:0001.c9f0.0c1c 0/101 ATM1/0.10
00:41:55:PPPoE :encap string prepared
00:41:55:[3]PPPoE 3:Access IE handle allocated
00:41:55:[3]PPPoE 3:pppoe SSS switch updated
00:41:55:[3]PPPoE 3:AAA unique ID allocated
00:41:55:[3]PPPoE 3:No AAA accounting method list
00:41:55:[3]PPPoE 3:Service request sent to SSS
00:41:55:[3]PPPoE 3:Created R:0001.c9f0.0c1c L:00b0.c2e9.c470 0/101 ATM1/0.10
00:41:55:[3]PPPoE 3:State REQ_NASPORT Event MORE_KEYS
00:41:55:[3]PPPoE 3:O PADS R:00b0.c2e9.c470 L:0001.c9f0.0c1c 0/101 ATM1/0.10
00:41:55:[3]PPPoE 3:State START_PPP Event DYN_BIND
00:41:55:[3]PPPoE 3:data path set to PPP
00:41:57:[3]PPPoE 3:State LCP_NEGO Event PPP_LOCAL
00:41:57:PPPoE 3/SB:Sent vtemplate request on base Vi2
00:41:57:[3]PPPoE 3:State CREATE_VA Event VA_RESP
00:41:57:[3]PPPoE 3:Vi2.1 interface obtained
00:41:57:[3]PPPoE 3:State PTA_BIND Event STAT_BIND
00:41:57:[3]PPPoE 3:data path set to Virtual Access
00:41:57:[3]PPPoE 3:Connected PTA

Router# debug pppoe errors interface atm1/0.10

PPPoE protocol errors debugging is on
Router#
00:44:30:PPPoE 0:Max session count(1) on mac(00b0.c2e9.c470) reached.
00:44:30:PPPoE 0:Over limit or Resource low. R:00b0.c2e9.c470 L:ffff.ffff.ffff 0/101
ATM1/0.10
```

Table 1 describes the significant fields shown in the displays.

Table 1 debug pppoe Field Descriptions

Field	Description
PPPoE	PPPoE debug message header.
0:	PPPoE session ID.
I PADI	Incoming PPPoE Active Discovery Initiation packet.
R:	Remote MAC address.
L:	Local MAC address.
0/101	Virtual path identifier (VPI)/virtual channel identifier (VCI) of the PVC.
ATM1/0.10	Interface type and number.
O PADO	Outgoing PPPoE Active Discovery Offer packet.
I PADR	Incoming PPPoE Active Discovery Request packet.

Table 1 *debug pppoe Field Descriptions (continued)*

Field	Description
[3]	Unique user session ID. The same ID is used for identifying sessions across different applications such as PPPoE, PPP, Layer 2 Tunneling Protocol (L2TP), and Subscriber Service Switch (SSS). The same session ID appears in the output for the show pppoe session , show sss session , and show vpdn session commands.
PPPoE 3	PPPoE session ID.
Created	PPPoE session is created.
O PADS	Outgoing PPPoE Active Discovery Session-confirmation packet.
Connected PTA	PPPoE session is established.
Max session count(1) on mac(00b0.c2e9.c470) reached	PPPoE session is rejected because of per-MAC session limit.

Related Commands

Command	Description
encapsulation aal5autopp virtual-template	Enables PPPoA/PPPoE autosense.
pppoe enable	Enables PPPoE sessions on an Ethernet interface or subinterface.
protocol pppoe (ATM VC)	Enables PPPoE sessions to be established on PVCs.
show pppoe session	Displays information about active PPPoE sessions.
show sss session	Displays Subscriber Service Switch session status.
show vpdn session	Displays session information about L2TP, L2F protocol, and PPPoE tunnels in a VPDN.

encapsulation (ATM)

To configure the ATM adaptation layer (AAL) and encapsulation type for an ATM virtual circuit (VC), VC class, VC, bundle, or permanent virtual circuit (PVC) range, use the **encapsulation** command in the appropriate mode. To remove an encapsulation type, use the **no** form of this command.

encapsulation { **aal2** | **aal5auto** | **aal5autopp** **virtual-template** *number* [**group** *group-name*] | **aal5ciscopp** **virtual-template** *number* | **aal5mux** *protocol* | **aal5nlpid** | **aal5snap** }

no encapsulation { **aal2** | **aal5auto** | **aal5autopp** **virtual-template** *number* [**group** *group-name*] | **aal5ciscopp** **virtual-template** *number* | **aal5mux** *protocol* | **aal5nlpid** | **aal5snap** }

Syntax Description	
aal2	AAL and encapsulation type for PVCs dedicated to AAL2 Voice over ATM.
aal5auto	AAL and encapsulation type for PPP over ATM (PPPoA) switched virtual circuits (SVCs). Enables an ATM SVC to use either aal5snap or aal5mux encapsulation options.
aal5autopp	Enables PPPoA/PPPoE autosense. PPPoA/PPPoE autosense enables a router to distinguish between incoming PPPoA and PPP over Ethernet (PPPoE) sessions and create virtual access for both PPP types based on demand.
virtual-template <i>number</i>	Number used to identify the virtual template.
group	(Optional) Specifies that a PPPoE profile will be used by PPPoE sessions on the interface.
<i>group-name</i>	(Optional) Name of the PPPoE profile to be used by PPPoE sessions on the interface.
aal5ciscopp	AAL and encapsulation type for Cisco PPP over ATM. Supported on ATM PVCs only.
aal5mux	AAL and encapsulation type for multiplex (MUX)-type VCs. A protocol must be specified when using this encapsulation type.
<i>protocol</i>	Protocol type being used by the MUX-encapsulated VC. Possible values for the <i>protocol</i> argument are as follows: <ul style="list-style-type: none"> • appletalk—AppleTalk protocol. • decnet—DECnet protocol. • frame-relay—Frame Relay-ATM Network Interworking (FRF.5) on the Cisco MC3810. • fr-atm-srv—Frame Relay-ATM Service Interworking (FRF.8) on the Cisco MC3810. • ip—IP protocol. • ipx—IPX protocol. • ppp virtual-template <i>number</i>—Internet Engineering Task Force (IETF)-compliant PPP over ATM. Use the virtual-template <i>number</i> options to identify the virtual template. Supported on ATM PVCs only. • voice—Voice over ATM.

aal5nlpid	AAL and encapsulation type that allows ATM interfaces to interoperate with High-Speed Serial Interfaces (HSSIs) that are using an ATM data service unit (ADSU) and running ATM-Data Exchange Interface (DXI). Supported on ATM PVCs only.
aal5snap	AAL and encapsulation type that supports Inverse ARP. Logical Link Control/Subnetwork Access Protocol (LLC/SNAP) precedes the protocol datagram.

Defaults

The global default encapsulation option is **aal5snap**. See the “Usage Guidelines” section for other default characteristics.

Command Modes

- ATM VC configuration (for an ATM PVC or SVC)
- VC-class configuration (for a VC class)
- Bundle configuration (for a VC bundle)
- PVC range configuration (for an ATM PVC range)
- PVC-in-range configuration (for an individual PVC within a PVC range)

Command History

Release	Modification
11.3T	This command was introduced.
12.0(3)T	This command was enhanced to provide encapsulation configuration for ATM VC bundles. The aal5mux frame and aal5mux voice keywords were added for the Cisco MC3810 series router.
12.0(7)XK	Support for the aal5mux voice option was added to Cisco 3600 series routers.
12.0(7)T	The aal5mux fr-atm-srv option was added for the Cisco MC3810 router. The aal5mux frame option was changed to aal5mux frame-relay .
12.1(1)XA	Support for the aal2 option was added to the Cisco MC3810 router.
12.1(3)T	The aal5auto option was added to provide encapsulation configuration for PPP over ATM SVCs.
12.1(5)XM	Support for the aal2 option was added to the Cisco AS5300 access server and Cisco 3600 multiservice platforms.
12.1(5)T	The aal5ciscoppp , aal5mux , and aal5snap options were made available in PVC range and PVC-in-range configuration modes.
12.2(2)T	This command was integrated into Cisco IOS Release 12.2(2)T.
12.1(1)DC1	The aal5autopp option was introduced on the Cisco 6400 universal access concentrator.
12.2(4)T	The aal5autopp option was implemented in Cisco IOS Release 12.2(4)T.
12.2(13)T	The apollo , vines , and xns values were removed as options for the <i>protocol</i> argument because Apollo Domain, Banyan VINES, and Xerox Network Systems are no longer supported in the Cisco IOS software.
12.2(15)T	The group option was added.
12.3(7)XI3	This command was integrated into Cisco IOS Release 12.3(7)XI3.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.

Usage Guidelines

**Note**

To configure Integrated Local Management Interface (ILMI), QSAAL, or Switched Multimegabit Data Service (SMDS) encapsulations for an ATM PVC, use the **pvc** command.

Use the **aal5mux** encapsulation option to dedicate the specified PVC to a single protocol; use the **aal5snap** encapsulation option to multiplex two or more protocols over the same PVC. Whether you select **aal5mux** or **aal5snap** encapsulation might depend on practical considerations, such as the type of network and the pricing offered by the network. If the pricing of the network depends on the number of PVCs set up, **aal5snap** might be the appropriate choice. If pricing depends on the number of bytes transmitted, **aal5mux** might be the appropriate choice because it has slightly less overhead.

Encapsulation for PPPoA

When configuring Cisco PPP over ATM, use the **aal5ciscopp** keyword and specify the virtual template number.

It is possible to implicitly create a virtual template when configuring Cisco PPP over ATM. In other words, if the parameters of the virtual template are not explicitly defined before you configure the ATM PVC, the PPP interface will be brought up using default values from the virtual template identified. However, some parameters (such as an IP address) take effect only if they are 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 that such parameters take effect.

If you specify virtual template parameters after the ATM PVC is configured, you should enter a **shutdown** command followed by a **no shutdown** command on the ATM subinterface to restart the interface, causing the newly configured parameters (such as an IP address) to take effect.

Configuring PPPoA/PPPoE Autosense

Use the **encapsulation aal5autopp virtual-template *template-number*** command to configure PPPoA/PPPoE autosense. PPPoA/PPPoE autosense enables a router to distinguish between incoming PPPoA and PPPoE sessions and create virtual access for both PPP types based on demand.

If a PPPoE profile is not specified by using the **group *group-name*** option, PPPoE sessions will be established using parameters from the global PPPoE profile. PPPoE profiles must be configured using the **bba-group pppoe** command.

**Note**

Do not use this command on a router that initiates PPPoA sessions.

Entering the **no encapsulation aal5autopp virtual-template** command will terminate the PPPoA or PPPoE session and detach the virtual-access interface from the PVC.

Configuring Encapsulation for VC Bundles

Before using this command to configure a VC bundle, enter the **bundle** subinterface configuration command to create a new bundle or modify an existing one and to enter bundle configuration mode.

A VC bundle can have only one encapsulation configured for it: either **aal5snap** or **aal5mux**.

Encapsulation Rules of Precedence

If the **encapsulation** command is not explicitly configured on an ATM PVC, SVC, or VC bundle, the VC inherits the following default configuration (listed in order of precedence from lowest to highest):

- Configuration of the **encapsulation** command in a VC class assigned to the PVC, PVC bundle, or SVC itself.

- Configuration of the **encapsulation** command in a VC class assigned to the ATM subinterface of the PVC, SVC, or VC bundle.
- Configuration of the **encapsulation** command in a VC class assigned to the ATM main interface of the PVC, SVC, or VC bundle.
- Global encapsulation option default: **aal5snap**

**Note**

When a VC is a member of a VC bundle, configuration using the **encapsulation** command in VC-class mode no longer applies to the VC. Bundle configuration takes precedence.

Configuring Encapsulation for a PVC Range

When a PVC range or an individual PVC within a PVC range is being configured, the following options are available:

- **encapsulation aal5ciscoppp**
- **encapsulation aal5mux**
- **encapsulation aal5snap**

Examples**MUX-Type Encapsulation on a VC Example**

The following example configures an ATM PVC with VPI 0 and VCI 33 for a MUX-type encapsulation using IP:

```
interface atm 1/0
  pvc 0/33
    encapsulation aal5mux ip
```

SNAP Encapsulation Example

The following example configures a bundle called “bundle1” for **aal5snap** encapsulation:

```
bundle bundle1
  encapsulation aal5snap
```

PPP over ATM SVCs Example

The following example configures an ATM SVC called “bundle1” with the encapsulation type **aal5auto**. Encapsulation type **aal5auto** enables the SVC to use PPP and either **aal5snap** or **aal5mux** encapsulation.

```
interface ATM 2/0/0
  svc bundle1
  encapsulation aal5auto
```

PPPoA/PPPoE Autosense Example

The following example enables PPPoA/PPPoE autosense on PVC 30/33. PPPoA sessions will use virtual template 1, and PPPoE sessions will use the global PPPoE profile.

```
interface ATM 0/0/0.33 multipoint
  pvc 30/33
    encapsulation aal5autopp virtual-template 1
  !
  bba-group pppoe global
  virtual-template 1
  sessions max limit 8000
  sessions per-vc limit 8
  sessions per-mac limit 2
```

AAL2 Voice over ATM Example

The following example configures a PVC to support AAL2 encapsulation for Voice over ATM:

```
interface ATM0.2 point-to-point
 pvc 2/200
  vbr-rt 760 760 100
  encapsulation aal2
```

Related Commands

Command	Description
bba-group pppoe	Creates a PPPoE profile.
broadcast	Configures broadcast packet duplication and transmission for an ATM VC class, PVC, SVC, or VC bundle.
class-vc	Assigns a VC class to an ATM PVC, SVC, or VC bundle member.
debug pppoe	Displays debugging information for PPPoE sessions.
inarp	Configures the Inverse ARP time period for an ATM PVC, VC class, or VC bundle.
oam retry	Configures parameters related to OAM management for an ATM PVC, SVC, VC class, or VC bundle.
protocol (ATM)	Configures a static map for an ATM PVC, SVC, VC class, or VC bundle and enables Inverse ARP or Inverse ARP broadcasts on an ATM PVC.

encapsulation dot1q

To enable IEEE 802.1Q encapsulation of traffic on a specified subinterface in a virtual LAN (VLAN), use the **encapsulation dot1q** command in interface range configuration mode or subinterface configuration mode. To disable IEEE 802.1Q encapsulation, use the **no** form of this command.

Interface Range Configuration Mode

encapsulation dot1q *vlan-id* [**native**]

no encapsulation dot1q

Subinterface Configuration Mode

encapsulation dot1q *vlan-id* **second-dot1q** { **any** | *vlan-id* / *vlan-id-vlan-id* [, *vlan-id-vlan-id*] }

no encapsulation dot1q *vlan-id* **second-dot1q** { **any** | *vlan-id* / *vlan-id-vlan-id* [, *vlan-id-vlan-id*] }

Syntax Description		
<i>vlan-id</i>		Virtual LAN identifier. The allowed range is from 1 to 4095. For the IEEE 802.1Q-in-Q VLAN Tag Termination feature, the first instance of this argument defines the outer VLAN ID, and the second and subsequent instances define the inner VLAN ID.
native		(Optional) Sets the VLAN ID value of the port to the value specified by the <i>vlan-id</i> argument. Note This keyword is not supported by the IEEE 802.1Q-in-Q VLAN Tag Termination feature.
second-dot1q		Supports the IEEE 802.1Q-in-Q VLAN Tag Termination feature by allowing an inner VLAN ID to be configured.
any		Sets the inner VLAN ID value to a number that is not configured on any other subinterface. Note The any keyword in the second-dot1q command is not supported on a subinterface configured for IPoQ-in-Q because IP routing is not supported on ambiguous subinterfaces.
-		Hyphen must be entered to separate inner and outer VLAN ID values that are used to define a range of VLAN IDs.
,		(Optional) Comma must be entered to separate each VLAN ID range from the next range.

Defaults IEEE 802.1Q encapsulation is disabled.

Command Modes Interface range configuration
Subinterface configuration

Command History

Release	Modification
12.0(1)T	This command was introduced.
12.1(3)T	The native keyword was added.
12.2(2)DD	Configuration of this command in interface range mode was introduced.
12.2(4)B	This command was integrated into Cisco IOS Release 12.2(4)B.
12.2(8)T	This command was integrated into Cisco IOS Release 12.2(8)T.
12.3(7)T	The second-dot1q keyword was added to support the IEEE 802.1Q-in-Q VLAN Tag Termination feature.
12.3(7)XI1	This command was integrated into Cisco IOS Release 12.3(7)XI and implemented on the Cisco 10000 series routers.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.

Usage Guidelines

Interface Range Configuration Mode

IEEE 802.1Q encapsulation is configurable on Fast Ethernet interfaces. IEEE 802.1Q is a standard protocol for interconnecting multiple switches and routers and for defining VLAN topologies.

Use the **encapsulation dot1q** command in interface range configuration mode to apply a VLAN ID to each subinterface within the range specified by the **interface range** command. The VLAN ID specified by the *vlan-id* argument is applied to the first subinterface in the range. Each subsequent interface is assigned a VLAN ID, which is the specified *vlan-id* plus the subinterface number minus the first subinterface number (VLAN ID + subinterface number – first subinterface number).



Note

The Cisco 10000 series router does not support the **interface range** command nor the interface range configuration mode.

Do not configure encapsulation on the native VLAN of an IEEE 802.1Q trunk without using the **native** keyword. (Always use the **native** keyword when *vlan-id* is the ID of the IEEE 802.1Q native VLAN.)

Subinterface Configuration Mode

Use the **second-dot1q** keyword to configure the IEEE 802.1Q-in-Q VLAN Tag Termination feature. Q-in-Q VLAN tag termination adds another layer of 802.1Q tag (called “metro tag” or “PE-VLAN”) to the 802.1Q tagged packets that enter the network. Double tagging expands the VLAN space, allowing service providers to offer certain services such as Internet access on specific VLANs for some customers and other types of services on other VLANs for other customers.

After a subinterface is defined, use the **encapsulation dot1q** command to add outer and inner VLAN ID tags to allow one VLAN to support multiple VLANs. You can assign a specific inner VLAN ID to the subinterface; that subinterface is unambiguous. Or you can assign a range or ranges of inner VLAN IDs to the subinterface; that subinterface is ambiguous.

Examples

The following example shows how to create the subinterfaces within the range 0.11 and 0.60 and apply VLAN ID 101 to the Fast Ethernet0/0.11 subinterface, VLAN ID 102 to Fast Ethernet0/0.12 (*vlan-id* = 101 + 12 – 11 = 102), and so on up to VLAN ID 150 to Fast Ethernet0/0.60 (*vlan-id* = 101 + 60 – 11 = 150):

```
Router(config)# interface range fastethernet0/0.11 - fastethernet0/0.60
Router(config-int-range)# encapsulation dot1q 101
```

The following example shows how to terminate a Q-in-Q frame on an unambiguous subinterface with an outer VLAN ID of 100 and an inner VLAN ID of 200:

```
Router(config)# interface gigabitethernet1/0/0.1
Router(config-subif)# encapsulation dot1q 100 second-dot1q 200
```

The following example shows how to terminate a Q-in-Q frame on an ambiguous subinterface with an outer VLAN ID of 100 and an inner VLAN ID in the range from 100 to 199 or from 201 to 600:

```
Router(config)# interface gigabitethernet1/0/0.1
Router(config-subif)# encapsulation dot1q 100 second-dot1q 100-199,201-600
```

Related Commands

Command	Description
encapsulation isl	Enables the ISL, which is a Cisco proprietary protocol for interconnecting multiple switches and maintaining VLAN information as traffic goes between switches.
encapsulation sde	Enables IEEE 802.10 encapsulation of traffic on a specified subinterface in VLANs.
interface range	Specifies multiple subinterfaces on which subsequent commands are executed at the same time.
show vlans dot1q	Displays information about 802.1Q VLAN subinterfaces.

pppoe enable

To enable PPP over Ethernet (PPPoE) sessions on an Ethernet interface or subinterface, use the **pppoe enable** command in the appropriate configuration mode. To disable PPPoE, use the **no** form of this command.

pppoe enable [**group** *group-name*]

no pppoe enable

Syntax Description	group	(Optional) Specifies that a PPPoE profile will be used by PPPoE sessions on the interface.
	<i>group-name</i>	(Optional) Name of the PPPoE profile to be used by PPPoE sessions on the interface.

Defaults PPPoE is disabled by default.

Command Modes Interface configuration
 VLAN configuration
 VLAN range configuration

Command History	Release	Modification
	12.1(2)T	This command was introduced.
	12.1(5)T	This command was modified to enable PPPoE on IEEE 802.1Q encapsulated VLAN interfaces.
	12.2(15)T	The group option was added.
	12.3(2)T	This command was implemented in VLAN configuration mode and VLAN range configuration mode.
	12.3(7)XI3	This command was integrated into Cisco IOS Release 12.3(7)XI3.
	12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.

Usage Guidelines If a PPPoE profile is not specified by using the **group** option, PPPoE sessions will be established using values from the global PPPoE profile. PPPoE profiles must be configured using the **bba-group pppoe** command.

Examples **PPPoE on an Ethernet Interface: Example**
 The following example enables PPPoE sessions on Ethernet interface 1/0. PPPoE sessions will be established using the PPPoE parameters in the global PPPoE profile.

```
Router(config)# interface ethernet 1/0
Router(config-if)# pppoe enable
!
```

```

Router(config)# bba-group pppoe global
Router(config-bba-group)# virtual-template 1
Router(config-bba-group)# sessions max limit 8000
Router(config-bba-group)# sessions per-vc limit 8
Router(config-bba-group)# sessions per-mac limit 2

```

PPPoE on an 802.1Q VLAN Subinterface: Example

The following example shows how to enable PPPoE on an 802.1Q VLAN subinterface. PPPoE sessions will be established using the PPPoE parameters in PPPoE profile “vpn1”.

```

Router(config)# interface ethernet 2/3.1
Router(config-if)# encapsulation dot1q 1
Router(config-if)# pppoe enable group vpn1
!
Router(config)# bba-group pppoe vpn1
Router(config-bba-group)# virtual-template 1
Router(config-bba-group)# sessions per-vc limit 2
Router(config-bba-group)# sessions per-mac limit 1

```

PPPoE on an 802.1Q VLAN Main Interface: Example

The following example shows how to configure PPPoE over a range of 802.1Q VLANs on Fast Ethernet interface 0/0. The VLAN range is configured on the main interface, and therefore each VLAN will not use up a separate subinterface.

```

Router(config)# interface fastethernet 0/0
Router(config-if)# no ip address
Router(config-if)# no ip mroute-cache
Router(config-if)# duplex half
Router(config-if)# vlan-range dot1q 20 30
Router(config-if-vlan-range)# pppoe enable group PPPOE
Router(config-if-vlan-range)# exit-vlan-config

```

Related Commands

Command	Description
bba-group pppoe	Creates a PPPoE profile.
debug pppoe	Displays debugging information for PPPoE sessions.
sessions max limit	Configures a PPPoE global profile with the maximum number of PPPoE sessions permitted on a router and sets the PPPoE session-count threshold.
sessions per-vlan limit	Specifies the maximum number of PPPoE sessions under each VLAN.

protocol pppoe (ATM VC)

To enable PPP over Ethernet (PPPoE) sessions to be established on permanent virtual circuits (PVCs), use the **protocol pppoe** command in the appropriate configuration mode. To disable PPPoE, use the **no** form of this command.

protocol pppoe [**group** *group-name*]

no protocol pppoe [**group** *group-name*]

Syntax Description	group	(Optional) Specifies a PPPoE profile to be used by PPPoE sessions on the interface.
	<i>group-name</i>	(Optional) Name of the PPPoE profile to be used by PPPoE sessions on the interface.

Defaults PPPoE is not enabled.

Command Modes ATM VC configuration
 ATM VC class configuration
 ATM PVC range configuration
 ATM PVC-in-range configuration

Command History	Release	Modification
	12.2(15)T	This command was introduced.
	12.3(7)XI3	This command was integrated into Cisco IOS Release 12.3(7)XI3.
	12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.

Usage Guidelines If a PPPoE profile is not specified by using the **group** option, PPPoE sessions will be established using values from the global PPPoE profile. PPPoE profiles must be configured using the **bba-group pppoe** command.

Examples The following example shows PPPoE configured in virtual circuit (VC) class “class-pppoe-global” and on the range of PVCs from 100 to 109. PVCs that use VC class “class-pppoe-global” will establish PPPoE sessions using the parameters configured in the global PPPoE profile. PVCs in the PVC range will use PPPoE parameters defined in PPPoE profile “vpn1”.

```
bba-group pppoe global
 virtual-template 1
  sessions max limit 8000
  sessions per-vc limit 8
  sessions per-mac limit 2
!
bba-group pppoe vpn1
 virtual-template 1
```

```

sessions per-vc limit 2
sessions per-mac limit 1
!
vc-class atm class-pppoe-global
protocol pppoe
!
interface ATM1/0.10 multipoint
range range-pppoe-1 pvc 100 109
protocol pppoe group vpn1
!
interface ATM1/0.20 multipoint
class-int class-pppoe-global
pvc 0/200
!
pvc 0/201
!
```

Related Commands

Command	Description
bba-group pppoe	Creates a PPPoE profile.
debug pppoe	Displays debugging information for PPPoE sessions.
sessions max limit	Configures a PPPoE global profile with the maximum number of PPPoE sessions permitted on a router and sets the PPPoE session-count threshold.
sessions per-mac limit	Sets the maximum number of PPPoE sessions allowed per MAC address in a PPPoE profile.
sessions per-vc limit	Sets the maximum number of PPPoE sessions to be established over a VC and sets the PPPoE session-count threshold.

sessions max limit

To configure the PPP over Ethernet (PPPoE) global profile with the maximum number of PPPoE sessions that will be permitted on a router and to set the PPPoE session-count threshold at which a Simple Network Management Protocol (SNMP) trap will be generated, use the **sessions max limit** command in BBA group configuration mode. To remove these settings, use the **no** form of this command.

sessions max limit *number-of-sessions* [**threshold** *threshold-value*]

no sessions max limit *number-of-sessions* [**threshold** *threshold-value*]

Syntax Description		
	<i>number-of-sessions</i>	Maximum number of PPPoE sessions that will be permitted on the router. The range is from 0 to the total number of interfaces on the router.
	threshold	(Optional) Sets the PPPoE session-count threshold at which an SNMP trap will be generated.
	<i>threshold-value</i>	(Optional) Number of PPPoE sessions that will cause an SNMP trap to be generated. The range is from 0 to the total number of interfaces on the router.

Defaults
 There is no default *number-of-sessions*.
 The default *threshold-value* is the configured *number-of-sessions*.

Command Modes
 BBA group configuration

Command History	Release	Modification
	12.2(15)T	This command was introduced.
	12.3(7)XI3	This command was integrated into Cisco IOS Release 12.3(7)XI3.
	12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.

Usage Guidelines
 This command can be used only in a global PPPoE profile.
 The **snmp-server enable traps pppoe** command must be configured in order for SNMP traps to be generated when the PPPoE session-count threshold is reached.

Examples
 The following example shows the global PPPoE profile configured with a maximum PPPoE session limit of 8000 sessions. The PPPoE session-count threshold is set at 7000 sessions, so when the number of PPPoE sessions on the router reaches 7000, an SNMP trap will be generated.

```
bba-group pppoe global
  virtual-template 1
  sessions max limit 8000 threshold 7000
  sessions per-vc limit 8
  sessions per-mac limit 2
```

Related Commands	Command	Description
	bba-group pppoe	Creates a PPPoE profile.
	sessions per-mac limit	Sets the maximum number of PPPoE sessions allowed per MAC address in a PPPoE profile.
	sessions per-vc limit	Sets the maximum number of PPPoE sessions permitted over a VC and sets the PPPoE session-count threshold.
	sessions per-vlan limit	Sets the maximum number of PPPoE sessions per VLAN in a PPPoE profile.
	snmp-server enable traps pppoe	Enables PPPoE session-count SNMP notifications.

sessions per-mac limit

To set the maximum number of PPP over Ethernet (PPPoE) sessions allowed per MAC address in a PPPoE profile, use the **sessions per-mac limit** command in BBA group configuration mode. To remove this setting, use the **no** form of this command.

sessions per-mac limit *per-mac-limit*

no sessions per-mac limit *per-mac-limit*

Syntax Description	<i>per-mac-limit</i>	Maximum number of PPPoE sessions that can be sourced from a MAC address. The default is 100 sessions.
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Defaults	100 sessions
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Command Modes	BBA group configuration
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Command History	Release	Modification
	12.2(15)T	This command was introduced.
	12.3(7)XI3	This command was integrated into Cisco IOS Release 12.3(7)XI3.
	12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.

Usage Guidelines

Use the **sessions per-mac limit** command to configure a PPPoE profile with the maximum number of PPPoE sessions that will be allowed per MAC address.

You cannot configure PPPoE session limits in PPPoE profiles and in VPDN groups simultaneously. You also cannot configure session limits in PPPoE profiles and directly on PPPoE ports (Ethernet interface, VLAN, or permanent virtual circuit (PVC)) simultaneously.

Examples

The following example show a limit of two PPPoE sessions per MAC address configured in the global PPPoE profile:

```
bba-group pppoe global
virtual-template 1
sessions max limit 8000 threshold-sessions 7000
sessions per-vc limit 8
sessions per-mac limit 2
```

Related Commands	Command	Description
	bba-group pppoe	Creates a PPPoE profile.
	sessions max limit	Configures a PPPoE global profile with the maximum number of PPPoE sessions that will be permitted on a router and sets the PPPoE session-count threshold.
	sessions per-vc limit	Sets the maximum number of PPPoE sessions to be established over a VC in a PPPoE profile and sets the PPPoE session-count threshold.
	sessions per-vlan limit	Sets the maximum number of PPPoE sessions per VLAN in a PPPoE profile.

sessions per-vc limit

To set the maximum number of PPP over Ethernet (PPPoE) sessions to be established over a virtual circuit (VC) in a PPPoE profile and to set the PPPoE session-count threshold at which a Simple Network Management Protocol (SNMP) trap will be generated, use the **sessions per-vc limit** command in BBA group configuration mode. To remove this specification, use the **no** form of this command.

sessions per-vc limit *per-vc-limit* [**threshold** *threshold-value*]

no sessions per-vc limit *per-vc-limit* [**threshold** *threshold-value*]

Syntax Description		
	<i>per-vc-limit</i>	Maximum number of PPPoE sessions that can be established over an ATM PVC. The default is 100.
	threshold	(Optional) Sets the PPPoE session-count threshold at which an SNMP trap will be generated.
	<i>threshold-value</i>	(Optional) Number of PPPoE sessions that will cause an SNMP trap to be generated.

Defaults
 Sessions: 100
 The default *threshold-value* is the *per-vc-limit*.

Command Modes
 BBA group configuration

Command History	Release	Modification
	12.2(15)T	This command was introduced.
	12.3(7)XI3	This command was integrated into Cisco IOS Release 12.3(7)XI3.
	12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.

Usage Guidelines
 Use the **sessions per-vc limit** command to configure a PPPoE profile with the maximum number of PPPoE sessions that will be allowed per VC.
 You cannot configure session limits in PPPoE profiles and directly on permanent virtual circuits (PVCs) simultaneously.
 The **snmp-server enable traps pppoe** command must be configured in order for SNMP traps to be generated when the PPPoE session-count threshold is reached.

Examples
 The following example shows a limit of eight PPPoE sessions per VC configured in the PPPoE profile “vpn1”:

```
bba-group pppoe vpn1
 virtual-template 1
 sessions per-vc limit 8
 sessions per-mac limit 2
```

Related Commands	Command	Description
	bba-group pppoe	Creates a PPPoE profile.
	sessions max limit	Configures a PPPoE global profile with the maximum number of PPPoE sessions that will be permitted on a router and sets the PPPoE session-count threshold.
	sessions per-mac limit	Sets the maximum number of PPPoE sessions allowed per MAC address in a PPPoE profile.
	sessions per-vlan limit	Sets the maximum number of PPPoE sessions per VLAN in a PPPoE profile.
	snmp-server enable traps pppoe	Enables PPPoE session-count SNMP notifications.

sessions per-vlan limit

To specify the maximum number of PPP over Ethernet (PPPoE) sessions permitted per VLAN in a PPPoE profile, use the **sessions per-vlan limit** command in BBA group configuration mode. To remove this specification, use the **no** form of this command.

sessions per-vlan limit *per-vlan-limit*

no sessions per-vlan limit *per-vlan-limit*

Syntax Description	<i>per-vlan-limit</i>	Maximum number of PPPoE sessions permitted under each VLAN. The default is 100.
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Defaults	Sessions: 100
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Command Modes	BBA group configuration
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Command History	Release	Modification
	12.2(15)T	This command was introduced.
	12.3(7)XI3	This command was integrated into Cisco IOS Release 12.3(7)XI3.
	12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.

Usage Guidelines	<p>Use the sessions per-vlan limit command to configure a PPPoE profile with the maximum number of PPPoE sessions that will be allowed per VLAN.</p> <p>You cannot configure session limits in PPPoE profiles and directly on VLANs simultaneously.</p>
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Examples	<p>The following example shows a limit of 200 PPPoE sessions per VLAN configured in the PPPoE profile “vpn1”:</p> <pre>bba-group pppoe vpn1 virtual-template 1 sessions per-vlan limit 200</pre>
-----------------	--

Related Commands	Command	Description
	bba-group pppoe	Creates a PPPoE profile.
	sessions max limit	Configures a PPPoE global profile with the maximum number of PPPoE sessions that will be permitted on a router and sets the PPPoE session-count threshold.

Command	Description
sessions per-mac limit	Sets the maximum number of PPPoE sessions allowed per MAC address in a PPPoE profile.
sessions per-vc limit	Sets the maximum number of PPPoE sessions to be established over a VC in a PPPoE profile and sets the PPPoE session-count threshold.

vendor-tag circuit-id service

To enable processing of the PPPoE Vendor-Specific tag in a PPPoE Active Discovery Request (PADR) packet, which extracts the Circuit-Id part of the tag and sends it to a AAA server as the NAS-Port-Id attribute in RADIUS access requests, use the **vendor-tag circuit-id service** command in BBA group configuration mode. To disable the command function (default), use the **no** form of this command.

vendor-tag circuit-id service

no vendor-tag circuit-id service

Syntax Description This command has no argument or keywords.

Command Default This command is disabled.

Command Modes BBA group configuration

Command History	Release	Modification
	12.4(4)T	This command was introduced.
	12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.

Usage Guidelines When this command is not enabled and the BRAS receives a packet with the Vendor-Specific tag attached, the tag is ignored and the session is allowed to come up. The Vendor-Specific tag is extracted and processed for its Circuit-Id part when the **vendor-tag circuit-id service** command is enabled under BBA group configuration mode. Once configured, the BRAS processes incoming PADR packets and sends the Circuit-Id tag to the AAA server as a NAS-Port-Id RADIUS attribute.

Examples In the following example, outgoing PADO and PADS packets will retain the incoming Vendor-Specific Line-Id tag:

```
bba-group pppoe pppoe-tag
  sessions per-mac limit 50
  vendor-tag circuit-id service

interface FastEthernet0/0.1
  encapsulation dot1Q 120
  pppoe enable group pppoe-tag
```

Related Commands	Command	Description
	vendor-tag circuit-id strip	Removes an incoming Vendor-Specific Line-Id tag from outgoing PADO and PADR packets.

vendor-tag circuit-id strip

To remove the incoming Vendor-Specific Line-Id tag from outgoing PADO and PADR (PPPoE Active Discovery Offer and Request) packets, use the **vendor-tag circuit-id strip** command in BBA group configuration mode. To disable the command function (default), use the **no** form of this command.

vendor-tag circuit-id strip

no vendor-tag circuit-id strip

Syntax Description This command has no arguments or keywords.

Command Default This command is disabled.

Command Modes BBA group configuration

Release	Modification
12.4(4)T	This command was introduced.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.

Usage Guidelines Outgoing packets from basic rate access (BRA) will have a digital subscriber line access multiplexer (DSLAM) inserted Line-Id tag when the **vendor-tag circuit-id service** command is configured. DSLAM should strip the tag from the packet assembler/disassembler (PAD) outgoing packets. If the DSLAM cannot strip the tag, the BRAS must remove it before sending out the packets. When the **vendor-tag circuit-id strip** command is configured, the BRAS removes the incoming Vendor-Specific Line-Id tag from the outgoing packets.

Outgoing PADO and PADS packets from the BRAS will have the DSLAM-inserted Circuit-Id tag. DSLAM should strip the tag out of PADO and PADS packets. If the DSLAM cannot strip off the tag, the BRAS should remove it before sending the packets out, and this is accomplished using the **vendor-tag circuit-id strip** command.

Examples In the following example, the BRAS will strip off incoming Vendor-Specific Line-Id tags from outgoing PADO and PADS packets:

```
bba-group pppoe pppoe-rm-tag
 sessions per-mac limit 50
 vendor-tag circuit-id service
 vendor-tag circuit-id strip
```

```
interface FastEthernet0/0.1
 encapsulation dot1Q 120
 pppoe enable group pppoe-tag
```

Related Commands	Command	Description
	vendor-tag circuit-id service	Enables processing of the PPPoE Vendor-Specific tag in a PADR packet so the Circuit-Id part can be sent to a AAA server as the NAS-Port-Id attribute in RADIUS access requests.

virtual-template (BBA group)

To configure a PPPoE profile with a virtual template to be used for cloning virtual access interfaces, use the **virtual-template** command in BBA group configuration mode. To remove the virtual template from a PPPoE profile, use the **no** form of this command.

virtual-template *template-number*

no virtual-template *template-number*

Syntax Description	<i>template-number</i>	Identifying number of the virtual template that will be used to clone virtual-access interfaces.
---------------------------	------------------------	--

Defaults	A virtual template is not specified.
-----------------	--------------------------------------

Command Modes	BBA group configuration
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Command History	Release	Modification
	12.2(15)T	This command was introduced.
	12.3(7)XI3	This command was integrated into Cisco IOS Release 12.3(7)XI3.
	12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.

Usage Guidelines	Each PPPoE profile can clone virtual-access interfaces using only one virtual template. If you enter a second virtual-template command in a PPPoE profile, it will replace the first virtual-template command.
-------------------------	--

You can configure different PPPoE profiles to use different virtual templates. You can also configure multiple PPPoE profiles to use the same virtual template.

Examples	The following example shows the configuration of two PPPoE profiles:
-----------------	--

```
bba-group pppoe vpn1
 virtual-template 1
 sessions per-vc limit 2
 sessions per-mac limit 1
!
bba-group pppoe vpn2
 virtual-template 2
 sessions per-vc limit 2
 sessions per-mac limit 1
!
```

Related Commands

Command	Description
bba-group pppoe	Creates a PPPoE profile.

Glossary

BRAS—Broadband Remote Access Server.

PADI—PPPoE Active Discovery Initiation.

PADO—PPPoE Active Discovery Offer.

PADR—PPPoE Active Discovery Request.

PADS—PPPoE Active Discovery Session.

PPPoA—PPP over ATM.

PPPoE—PPP over Ethernet.

PPPoE port—Any Ethernet interface, VLAN, or ATM virtual circuit configured for PPPoE.

PVC—permanent virtual circuit. Virtual circuit that is permanently established.

SNMP—Simple Network Management Protocol. Network management protocol used almost exclusively in TCP/IP networks. SNMP provides a means to monitor and control network devices and to manage configurations, statistics collection, performance, and security.

VPDN—virtual private dialup network. Network that extends remote access to a private network using a shared infrastructure. VPDNs use Layer 2 tunnel technologies to extend the Layer 2 and higher parts of the network connection from a remote user across an ISP network to a private network.

VPN—Virtual Private Network. Network that enables IP traffic to travel securely over a public TCP/IP network by encrypting all traffic from one network to another.

VSF—vendor-specific function.



Note

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