

PPPoE over VLAN Enhancements Configuration Limit Removal and ATM Support

The PPPoE over VLAN Enhancements: Configuration Limit Removal and ATM Support feature provides two enhancements to PPP over Ethernet (PPPoE) over IEEE 802.1Q VLAN functionality:

- It removes the requirement for each PPPoE VLAN to be created on a subinterface. Removal of this requirement increases the number of VLANs that can be configured on a router to 4000 VLANs per interface.
- It adds ATM permanent virtual circuit (PVC) support for PPPoE over VLAN traffic that uses bridged RFC 1483 encapsulation.

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Restrictions for PPPoE over VLAN Enhancements Configuration Limit Removal and ATM Support

- PPPoE over IEEE 802.1Q VLAN support can be configured without using subinterfaces on the PPPoE server only.
- ATM PVC support for PPPoE over IEEE 802.1Q VLANs can be configured only on the PPPoE server.
- It is not possible to shut down traffic for individual VLANs that are configured on the main interface. Individual VLANs that are configured on subinterfaces can be shut down.

- A VLAN range can be configured on a main interface at the same time that VLANs outside the range are configured on subinterfaces of the same main interface. However, you cannot configure a specific VLAN on the main interface and on a subinterface at the same time.
- PPPoE over VLAN Configuration on an interface is only supported for sessions that do not have Interface Descriptor Block (IDB). So this is not supported on ASR 1000 platforms.

Information About PPPoE over VLAN Configuration Limit Removal and ATM Support

To configure PPPoE over IEEE 802.1Q VLAN support on an interface rather than a subinterface, and to configure ATM support for PPPoE over IEEE 802.1Q VLANs, you should understand the following concepts:

PPPoE over VLAN Configuration Without Using Subinterfaces

The PPPoE over VLAN Enhancements: Configuration Limit Removal and ATM Support feature removes the requirement for each PPPoE VLAN to be created on a subinterface. Allowing more than one PPPoE VLAN to be configured on a main interface increases the number of VLANs that can be configured on a router to 4000 VLANs per interface.

Individual VLANs or a range of VLANs can be configured on an interface. You can configure a VLAN range on a main interface and at the same time configure VLANs outside the range on subinterfaces of the same interface.

PPPoE over VLAN Support on ATM PVCs

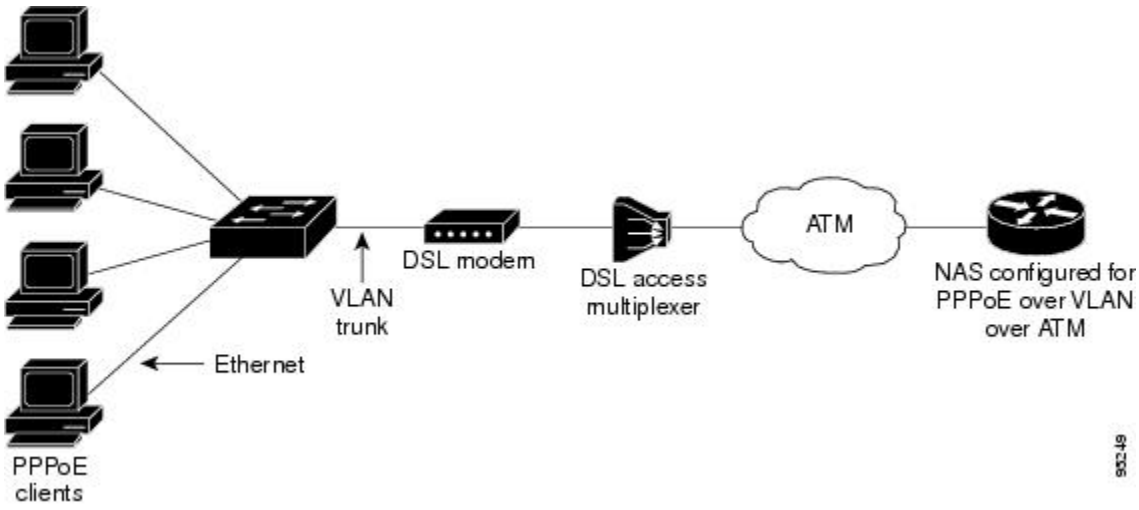
The PPPoE over VLAN Enhancements: Configuration Limit Removal and ATM Support feature enables ATM PVCs to process PPPoE over VLAN packets that use bridged RFC 1483 encapsulation. This capability allows PPPoE traffic from different IEEE 802.1Q VLANs to be multiplexed over the same ATM PVC.

The figure below shows a sample network topology that implements PPPoE over VLAN on ATM PVCs. In this topology, a service provider is using an Ethernet switch to provide Ethernet service to home users and a single PVC to provide the switch with WAN access. The home users use PPPoE to access services on the network access server (NAS). Each port on the switch is assigned a separate VLAN, and the VLANs are trunked over a Fast Ethernet or Gigabit Ethernet interface that is connected to a digital subscriber line (DSL) modem acting as a bridge.

The IEEE 802.1Q VLAN-encapsulated traffic coming in from the Ethernet switch trunk is encapsulated in RFC 1483 bridged encapsulation by the DSL modem and sent across the ATM WAN to the NAS. The NAS, which is configured to support PPPoE over VLANs over ATM PVCs, will extract the PPPoE packet from the PPPoE over IEEE 802.1Q VLAN over RFC 1483 bridged encapsulation and provide PPPoE services to the user.

In the downlink, the NAS sends packets in PPPoE over IEEE 802.1Q VLAN over RFC 1483 bridged encapsulation. The DSL modem strips off the RFC 1483 encapsulation and forwards the IEEE 802.1Q VLAN packets across the trunk to the switch. The switch then sends the Ethernet packets to the port associated with the IEEE 802.1 VLAN ID.

Figure 1: Sample Network Topology for PPPoE over IEEE 802.1Q VLANs over ATM



Benefits of PPPoE over VLAN Enhancements Configuration Limit Removal and ATM Support

The PPPoE over VLAN Enhancements: Configuration Limit Removal and ATM Support feature has the following benefits:

- Increases the number of VLANs that can be configured on a router to 4000 VLANs per interface by removing the requirement for each PPPoE VLAN to be configured on a subinterface.
- Provides support for PPPoE over VLANs over ATM interfaces using RFC 1483 bridged encapsulation

How to Configure PPPoE over VLAN Enhancements Configuration Limit Removal and ATM Support

Configuring PPPoE over IEEE 802.1Q VLAN Support on an Ethernet Interface

Perform this task to configure PPPoE over IEEE 802.1Q VLAN support on an Ethernet interface.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. Do one of the following:
   - **vlan-id dot1q** *vlan-id*
   -
   - **vlan-range dot1q** *start-vlan-id end-vlan-id*

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

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Router(config)# interface fastethernet 0/2`	Specifies the interface to be configured and enters interface configuration mode.

Step 4	Do one of the following:
	• **vlan-id dot1q** *vlan-id*
	•
	• **vlan-range dot1q** *start-vlan-id end-vlan-id*
	Example:
	`Router(config-if)# vlan-id dot1q 0`
	Example:
	Example:
	`Router(config-if)# vlan-range dot1q 0 60`
		Enables IEEE 802.1Q VLAN encapsulation for a specific VLAN on an Ethernet interface.
		or
		Enables IEEE 802.1Q VLAN encapsulation for a range of VLANs on an Ethernet interface.

Step 5	**pppoe enable** [**group** *group-name*] **Example:** `Router(config-if-vlan-range)# pppoe enable group pppoe1`	Enables PPPoE sessions over a specific VLAN or a range of VLANs.

Configuring an ATM PVC to Support PPPoE over IEEE 802.1Q VLAN Traffic

Perform this task to configure an ATM PVC to support RFC 1483 bridge encapsulated PPPoE over IEEE 802.1Q VLAN traffic.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface atm** *number* **.** *subinterface-number* {**multipoint | point-to-point}**
4. **pvc** [*name*] *vpi* / *vci*
5. **protocol pppovlan dot1q** {*vlan-id* | *start-vlan-id end-vlan-id*} [**group** *group-name*]

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface atm** *number* **.** *subinterface-number* {**multipoint	point-to-point}** **Example:** `Router(config)# interface atm 2/0.1 multipoint`	Configures an ATM multipoint subinterface and enters subinterface configuration mode.
Step 4	**pvc** [*name*] *vpi* / *vci* **Example:** `Router(config-subif)# pvc 0/60`	Configures a PVC and enters ATM VC configuration mode.
Step 5	**protocol pppovlan dot1q** {*vlan-id*	*start-vlan-id end-vlan-id*} [**group** *group-name*] **Example:** `Router(config-if-atm-vc)# protocol pppovlan dot1q 0 50 group pppoe1`	Enables PPPoE for a specific IEEE 802.1Q VLAN or a range of VLANs on an ATM PVC.

Configuring a VC Class for PPPoE over IEEE 802.1Q VLAN Support

Perform this task to configure support for PPPoE over IEEE 802.1Q VLANs in a VC class.

SUMMARY STEPS

1. **enable**

2. **configure terminal**
3. **vc-class atm** *name*
4. **protocol pppovlan dot1q** {*vlan-id* | *start-vlan-id end-vlan-id*} [**group** *group-name*]

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**vc-class atm** *name* **Example:** `Router(config)# vc-class atm class1`	Configures an ATM VC class and enters VC-class configuration mode.
Step 4	**protocol pppovlan dot1q** {*vlan-id* | *start-vlan-id end-vlan-id*} [**group** *group-name*] **Example:** `Router(config-vc-class)# protocol pppovlan dot1q 0 50 group pppoe1`	Enables support for PPPoE for a specific IEEE 802.1Q VLAN or a range of VLANs in a VC class. **Note** A VC class can be applied to an ATM interface, subinterface, PVC, or range of PVCs.

Monitoring and Maintaining PPPoE over IEEE 802.1Q VLAN

Perform this task to monitor and maintain PPPoE over VLAN connections.

SUMMARY STEPS

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

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**clear pppoe** {**interface** *type number* [**vc** {[*vpi/*]*vci* | *vc-name*}] [**vlan** *vlan-id*] | **rmac** *mac-address* [**sid** *session-id*] | **all**} **Example:** `Router# clear pppoe interface fastethernet 0/2 vlan 1`	Clears PPPoE sessions.
Step 3	**debug pppoe** {**data** | **errors** | **events** | **packets**} [**rmac** *remote-mac-address* | **interface** *type number*[**vc** {[*vpi /*]*vci* | *vc-name*}] [**vlan** *vlan-id*]] **Example:** `Router# debug pppoe events interface atm 0/0 vc 1/16 vlan 10`	Displays debugging information for PPPoE sessions.

Configuration Examples for PPPoE over VLAN Enhancements Configuration Limit Removal and ATM Support

Configuring PPPoE over IEEE 802.1Q VLAN Support on an Ethernet Interface Example

The following example shows how to configure PPPoE over a range of IEEE 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.

```
bba-group pppoe PPPOE
 virtual-template 1
 sessions per-mac limit 1
interface virtual-template 1
 ip address 10.10.10.10 255.255.255.0
 mtu 1492
interface fastethernet 0/0
 no ip address
 no ip mroute-cache
 duplex half
 vlan-range dot1q 20 30
```

```
 pppoe enable group PPPOE
 exit-vlan-config
```

Configuring PPPoE over IEEE 802.1Q VLAN Support on ATM PVCs Example

The following example shows how to configure an ATM PVC to support PPPoE over a range of IEEE 802.1Q VLANs:

```
bba-group pppoe PPPOEOA
 virtual-template 1
 sessions per-mac limit 1
interface virtual-template 1
 ip address 10.10.10.10 255.255.255.0
 mtu 1492
interface atm 4/0.10 multipoint
 pvc 10/100
  protocol pppovlan dot1q range 10 30 group PPPOEOA
```

Additional References

The following sections provide references related to the PPPoE Over VLAN Enhancements: Configuration Limit Removal and ATM Support feature.

Related Documents

Related Topic	Document Title
ATM PVC configuration	ATM chapter of the Cisco IOS Wide-Area Networking Configuration Guide
PPPoE and PPPoE over IEEE 802.1Q VLAN configuration	Broadband Access: PPP and Routed Bridge Encapsulation chapter of the Cisco IOS Wide-Area Networking Configuration Guide
VLAN range configuration (using subinterfaces)	VLAN Range feature module
ATM PVC and PPPoE configuration commands	Cisco IOS Wide-Area Networking Command Reference

Standards

Standard	Title
IEEE Standard 802.1Q, 1998	*Virtual Bridged Local Area Networks*

MIBs

MIB	MIBs Link
No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFC	Title
RFC 1483	*Multiprotocol Encapsulation over ATM Adaptation Layer 5*

Technical Assistance

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

Feature Information for PPPoE over VLAN Enhancements Configuration Limit Removal and ATM Support

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

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

Table 1: Feature Information for PPPoE over VLAN Enhancements: Configuration Limit Removal and ATM Support

Feature Name	Releases	Feature Information
PPPoE over VLAN Enhancements: Configuration Limit Removal and ATM Support	12.2 (31)SRC 12.3(2)T 12.2(33)SB Cisco IOS Release XE 3.9S	The PPPoE over VLAN Enhancements: Configuration Limit Removal and ATM Support feature provides two enhancements to PPP over Ethernet (PPPoE) over IEEE 802.1Q VLAN functionality: • It removes the requirement for each PPPoE VLAN to be created on a subinterface. Removal of this requirement increases the number of VLANs that can be configured on a router to 4000 VLANs per interface. • It adds ATM permanent virtual circuit (PVC) support for PPPoE over VLAN traffic that uses bridged RFC 1483 encapsulation. In Cisco IOS Release 12.2(31)SRC, this feature was introduced. In Cisco IOS Release 12.3(2)T, this feature was integrated into the T train. In Cisco IOS Release 12.2(33)SB, support was added for the Cisco IOS 10000 series routers. The following commands were introduced or modified: **clear pppoe** , **debug pppoe**, **pppoe enable**, **protocol pppovlan dot1q**, **vlan-id dot1q**, **vlan-range dot1q**.