



# PPPoE over Ethernet and IEEE 802.1Q VLANs

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The Cisco 10000 series ESR supports the PPPoE over Ethernet (PPPoEoE) and PPPoE over IEEE 802.1Q VLANs feature in Cisco IOS Release 12.2(4)BZ1 or a later release. IEEE 802.1Q encapsulation is used to connect a VLAN-capable router with another VLAN-capable networking device.

This chapter discusses the PPPoE over Ethernet and IEEE 802.1Q VLANs features for the Cisco 10000 ESR. For more information, refer to the [“Configuring Broadband Access: PPP and Routed Bridge Encapsulation”](#) chapter in the *Cisco IOS Wide-Area Networking Configuration Guide*.

## PPPoE over Ethernet Feature

The Cisco 10000 ESR supports a PPPoE over Ethernet connection. PPPoE over Ethernet enables direct connection to an Ethernet interface. The Cisco 10000 ESR supports PPPoE over Ethernet sessions to enable multiple hosts on a shared Ethernet interface to open PPP sessions to the PPPoE server.

## Restrictions

The PPPoE over Ethernet feature has the following restriction:

- The Cisco 10000 ESR currently supports the PPPoE over Ethernet feature only on a Gigabit Ethernet interface.



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**Note** The Cisco 10000 ESR supports a Fast Ethernet interface for management traffic only.

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## Prerequisites

The Cisco 10000 ESR must be running Cisco IOS Release 12.2(4)BZ1 or a later release that includes the broadband aggregation features.



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## Configuration Tasks

To configure the PPPoE over Ethernet feature, perform the following configuration tasks:

- [Configuring a Virtual Template Interface, page 2](#)
- [Creating an Ethernet Interface and Enabling PPPoE, page 2](#)
- [Configuring PPPoE in a VPDN Group, page 2](#)

### Configuring a Virtual Template Interface

We recommend that you configure a virtual template before you configure the PPPoE or PPPoE over Ethernet feature. The virtual template interface is a logical entity that is applied dynamically as needed to an incoming PPP session request. To configure a virtual template interface, see the “[Configuring a Virtual Template Interface](#)” section on page 3-11.

### Creating an Ethernet Interface and Enabling PPPoE

To create an Ethernet interface and enable PPPoE on it, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# <b>interface</b> GigabitEthernet <i>number</i>	Creates an Ethernet interface and enters interface configuration mode.
Step 2	Router(config-if)# <b>pppoe enable</b>	Enables PPPoE and allows PPPoE sessions to be created through that interface.

### Configuring PPPoE in a VPDN Group

To configure a virtual private dial network (VPDN) group for PPPoE and to link it to the appropriate virtual template interface, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# <b>vpdn enable</b>	Enables VPDN configuration on the router.
Step 2	Router(config)# <b>vpdn group</b> <i>name</i>	Associates a VPDN group to a customer or VPDN profile.
Step 3	Router(config-vpdn)# <b>accept dialin</b>	Creates an accept dial-in VPDN group.
Step 4	Router(config-vpdn-acc-in)# <b>protocol pppoe</b>	Specifies the VPDN group to be used to establish PPPoE sessions.
Step 5	Router(config-vpdn-acc-in)# <b>virtual-template</b> <i>template-number</i>	Specifies the virtual template interface to use to clone virtual access interfaces (VAIs).
Step 6	Router(config-vpdn)# <b>pppoe limit per-mac</b> <i>number</i>	Specifies the maximum number of PPPoE sessions that can be sourced from a MAC address.
Step 7	Router(config-vpdn)# <b>pppoe limit max-sessions</b> <i>number</i>	Specifies the maximum number of PPPoE sessions that can be terminated on this router from all interfaces.

## Configuration Example

The following example shows a PPPoE over Ethernet configuration. In the example, the virtual-template 1 virtual template is linked to the VPDN group. The configuration also specifies the number of sessions allowed on the VPDN group.

```
!Creates a VPDN session group and links it to a virtual template.
vpdn-group 1
  accept-dialin
  protocol pppoe
  virtual-template 1
  pppoe limit per-mac 10
  pppoe limit max-sessions 32000

interface Loopback0
  ip address 172.16.0.1 255.255.255.255

!Enables PPPoE and allows PPPoE sessions to be created through this subinterface.
interface GigabitEthernet1/0/0
  no ip address
  negotiation auto
  pppoe enable

!Configures the virtual template interface.
interface Virtual-Template1
  ip unnumbered loop 0
  mtu 1492
  peer default ip address pool pool1
  ppp authentication chap

!Specifies the IP local pool to use for address assignment.
ip local pool pool1 192.168.0.1 192.168.0.100
```

## PPPoE over IEEE 802.1Q VLANs Feature

The PPPoE over IEEE 802.1Q VLANs feature, available in Cisco IOS Release 12.2(4)BZ1 or a later release, enables the Cisco 10000 ESR to support PPPoE over IEEE 802.1Q encapsulated VLANs using Gigabit Ethernet. IEEE 802.1Q encapsulation is used to interconnect a VLAN-capable router with another VLAN-capable networking device. The packets on the 802.1Q link contain a standard Ethernet frame and the VLAN information associated with that frame.

## Restrictions

The PPPoE over IEEE 802.1Q VLANs feature has the following restrictions:

- Supported on Gigabit Ethernet.
- Supported for PPPoE dial-in only. PPPoE dial-out (client) is not fully supported.
- PPPoE is disabled by default on a VLAN.

## Prerequisites

The Cisco 10000 ESR must be running Cisco IOS Release 12.2(4)BZ1 or a later release that has the broadband aggregation features.

## Configuration Tasks

To configure the PPPoE over IEEE 802.1Q VLANs feature, perform the following configuration tasks:

- [Configuring a Virtual Template Interface, page 4](#)
- [Creating an Ethernet 802.1Q Encapsulated Subinterface and Enabling PPPoE, page 4](#)
- [Configuring PPPoE in a VPDN Group, page 4](#)

The following sections describe how to perform these configuration tasks. For more information, refer to the “[Configuring Broadband Access: PPP and Routed Bridge Encapsulation](#)” chapter in the *Cisco IOS Wide-Area Networking Configuration Guide*.

### Configuring a Virtual Template Interface

We recommend that you configure a virtual template interface before you configure the PPPoE over IEEE 802.1Q VLANs feature. The virtual template interface is a logical entity that is applied dynamically as needed to a serial interface. To configure a virtual template interface, see the “[Configuring a Virtual Template Interface](#)” section on page 3-11.

### Creating an Ethernet 802.1Q Encapsulated Subinterface and Enabling PPPoE

To create an Ethernet 802.1Q encapsulated subinterface and enable PPPoE on it, use the following commands on the Cisco 10000 ESR beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# <b>interface GigabitEthernet slot/module/port.subinterface-number</b>	Creates a Gigabit Ethernet subinterface and enters subinterface configuration mode.
Step 2	Router(config-subif)# <b>encapsulation dot1q vlan-id</b>	Enables IEEE 802.1Q encapsulation on a specified subinterface in VLANs.
Step 3	Router(config-subif)# <b>pppoe enable</b>	Enables PPPoE and allows PPPoE sessions to be created through the specified subinterface.
Step 4	Router(config-subif)# <b>pppoe max-session number</b>	(Optional) Specifies the maximum number of PPPoE sessions under a VLAN.

### Configuring PPPoE in a VPDN Group

To configure a VPDN group for PPPoE and link it to the appropriate virtual template interface, use the following commands on the Cisco 10000 ESR beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# <b>vpdn enable</b>	Enables VPDN configuration on the router.
Step 2	Router(config)# <b>vpdn group name</b>	Associates a VPDN group to a customer or VPDN profile.
Step 3	Router(config-vpdn)# <b>accept dialin</b>	Creates an accept dial-in VPDN group.
Step 4	Router(config-vpdn-acc-in)# <b>protocol pppoe</b>	Specifies the VPDN group to be used to establish PPPoE sessions.
Step 5	Router(config-vpdn-acc-in)# <b>virtual-template template-number</b>	Specifies the virtual template interface to use to clone virtual access interfaces (VAIs).
Step 6	Router(config-vpdn)# <b>pppoe limit per-vlan number</b>	(Optional) Specifies the maximum number of PPPoE sessions under each VLAN.
Step 7	Router(config-vpdn)# <b>pppoe limit per-mac number</b>	(Optional) Specifies the maximum number of PPPoE sessions that can be sourced from a MAC address.
Step 8	Router(config-vpdn)# <b>pppoe limit max-sessions number</b>	Specifies the maximum number of PPPoE sessions that can be terminated on this router from all interfaces.

## Configuration Example

The following example shows a PPPoE over IEEE 802.1Q encapsulated VLAN configuration. In the example, the virtual-template 1 virtual template is linked to the VPDN group. The configuration also specifies the maximum number of sessions allowed on the VPDN group and the number of sessions allowed for each VLAN.

```
!Enables a virtual private dial-up network configuration on the router.
vpdn enable
!
!Creates a VPDN session group and links it to a virtual template.
vpdn-group 1
    accept-dialin
    protocol pppoe
    virtual-template 1
    pppoe limit per-mac 10
    pppoe limit per-vlan 100
    pppoe limit max-sessions 32000

interface Loopback0
    ip address 172.16.0.1 255.255.255.255

interface GigabitEthernet1/0/0
    no ip address
    negotiation auto

!Enables PPPoE and allows PPPoE sessions to be created through this subinterface.
interface GigabitEthernet1/0/0.10
    encapsulation dot1Q 20
    pppoe enable
    pppoe max-sessions 10

!Configures the virtual template interface.
interface Virtual-Template1
    ip unnumbered loop 0
    mtu 1492
    peer default ip address pool pool1
    ppp authentication chap
```

```
!Specifies the IP local pool to use for address assignment.
ip local pool pool1 192.168.0.1 192.168.0.100
```

## Verifying PPPoE over Ethernet and IEEE 802.1Q VLAN

To verify PPPoE over Ethernet and IEEE 802.1Q VLAN, use the following commands in privileged EXEC mode:

Command	Purpose
Router# <b>show vpdn</b>	Displays information about active Level 2 Forwarding (L2F) Protocol tunnel and message identifiers in a VPDN.
Router# <b>show vpdn session</b>	Displays information about active Layer 2 Tunnel Protocol (L2TP) or Layer 2 Forwarding (L2F) sessions in a VPDN.
Router# <b>show vpdn session packet</b>	Displays PPPoE session statistics.
Router# <b>show vpdn session all</b>	Displays PPPoE session information for each session ID.
Router# <b>show vpdn tunnel</b>	Displays PPPoE session count for the tunnel.
Router# <b>show pppoe session all</b>	Displays PPPoE session information for each session ID.
Router# <b>show pppoe session packets</b>	Displays PPPoE session statistics.

## Clearing PPPoE Sessions

To clear PPPoE sessions, use the following commands in privileged EXEC mode:

Command	Purpose
Router# <b>clear pppoe all</b>	Clears all PPPoE sessions.
Router# <b>clear pppoe interface</b>	Clears all PPPoE sessions on a physical interface or subinterface.
Router# <b>clear pppoe rmac</b>	Clears PPPoE sessions from a client host MAC address.

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