



PPPoE on Ethernet

This feature module describes the PPP over Ethernet (PPPoE) on Ethernet feature and includes the following sections:

- Feature Overview, page 1
- Supported Platforms, page 2
- Supported Standards, MIBs, and RFCs, page 2
- Prerequisites, page 3
- Configuration Tasks, page 3
- Configuration Examples, page 5
- Command Reference, page 6

Feature Overview

The PPPoE on Ethernet feature adds support to PPPoE by adding direct connection to actual Ethernet interfaces. PPPoE provides service-provider digital subscriber line (DSL) support. This Ethernet specification can be used by multiple hosts on a shared Ethernet interface to open PPP sessions to multiple destination with one or more bridging modems.

Benefits

Broadband Remote Access

For a bridged-Ethernet topology, this feature allows access providers to maintain session abstraction associated with PPP networks.

PPPoE

PPPoE provides the ability to connect a network of hosts over a simple bridging access device to a remote access concentrator where each host utilizes its own PPP stack. And the user gets a familiar interface.

PPPoE provides service-provider DSL support. In service-provider DSL deployments, PPPoE facilitates consumer end adoption by leveraging Ethernet scale curves and by using an embedded base.

Restrictions

The following restrictions apply when the PPPoE on Ethernet feature is used:

- PPPoE will not be supported on Frame Relay.
- PPPoE will not be supported on any other LAN interfaces such as FDDI and Token Ring.
- Fast switching is supported. PPP over Ethernet over RFC 1483 fibswitching will be supported for IP. All other protocols will be switched over process switching.

Related Documents

The following are related feature modules on PPPoE:

- *PPPoE on ATM*
- *PPPoE on Cable Interfaces*
- *PPPoE on IEEE 802.1Q Encapsulation*

Supported Platforms

This feature is supported on the following platforms:

- Cisco 3600 series
- Cisco 4500 series
- Cisco 4700 series
- Cisco 6400 series
- Cisco 7500 series
- Cisco MC3810 series
- Cisco UBR 7200 series

Supported Standards, MIBs, and RFCs

Standards

None

MIBs

No new MIBs are supported by this feature.

To obtain lists of MIBs supported by platform and Cisco IOS release and to download MIB modules, go to the Cisco MIB web site on Cisco Connection Online (CCO) at <http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>.

RFCs

- RFC 2516, *A Method for Transmitting PPPoE*

Prerequisites

Before you can configure PPPoE on Ethernet, you need to configure a virtual private dialup network (VPDN) group using the **accept dialin** command, enable PPPoE, and specify a virtual template for PPPoE sessions.

Configuration Tasks

See the following sections for configuration tasks for the PPPoE on Ethernet feature. Each task in the list indicates if the task is optional or required.

- Enabling PPPoE on Ethernet in a VPDN Group (Required)
- Limiting PPPoE Sessions from a MAC Address (Optional)
- Creating and Configuring a Virtual Template (Optional)
- Specifying an Ethernet Interface (Optional)
- Enabling PPPoE on an Ethernet Interface (Required)

Enabling PPPoE on Ethernet in a VPDN Group

To configure the physical interface that will carry the PPPoE session and link it to the appropriate virtual template interface, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	<code>Router(config)# vpdn enable</code>	Enables virtual private dial-up networking.
Step 2	<code>Router(config-if)# vpdn group name</code>	Associates a VPDN group to a customer or VPDN profile.
Step 3	<code>Router(config-if)# accept dialin</code>	Creates an accept dial-in VPDN group.
Step 4	<code>Router(config-if)# protocol pppoe</code>	Specifies the VPDN group to be used to establish PPPoE sessions.
Step 5	<code>Router(config-if)# virtual-template template-number</code>	Specifies which virtual template will be used to clone virtual access interfaces.

Limiting PPPoE Sessions from a MAC Address

To set the limit of sessions to be sourced from a MAC address, use the following command in VPDN configuration mode:

Command	Purpose
Router(config-if)# pppoe session-limit per-mac <i>number</i>	Sets the limit of sessions to be sourced from a MAC address.

Creating and Configuring a Virtual Template

To create and configure a virtual template, use the following commands beginning in global configuration mode:

	Command	Purpose
Step 1	Router(config)# interface virtual-template <i>number</i>	Creates a virtual template, and enters interface configuration mode.
Step 2	Router(config-if)# ip unnumbered ethernet <i>number</i>	Optionally, enables IP without assigning a specific IP address on the LAN.
Step 3	Router(config-if)# mtu <i>bytes</i>	Optionally, sets the maximum transmission unit (MTU) size for the interface.

Other optional configuration commands can be added to the virtual template configuration. For example, you can enable the PPP authentication on the virtual template using the **ppp authentication chap** command. Refer to the “Virtual Interface Template Service” chapter in the Release 12.1 *Cisco IOS Dial Solutions Configuration Guide* for additional information about configuring the virtual template.

Although Cisco Express Forwarding (CEF) switching is supported, flow, and optimum switching are not; these configurations are ignored on the PPP-over-Ethernet virtual access interface. CEF is enabled by default for IP. All other protocol traffic will be processed switched.



Note

The PPP reliable link that uses Link Access Procedure, Balanced (LAPB) is not supported.

Specifying an Ethernet Interface

After you create a virtual template for PPPoE on Ethernet, specify a multipoint or point-to-point interface. To specify an Ethernet multipoint interface, use one of the following commands in global configuration mode:

Command	Purpose
Router# interface ethernet <i>interface-number</i>	Specifies the Ethernet interface using the appropriate format of the interface ethernet command.

Enabling PPPoE on an Ethernet Interface

To enable PPPoE on Ethernet interfaces, use the following command in global configuration mode:

Command	Purpose
Router# pppoe enable	Specifies the VPDN group to be used for establishing PPPoE sessions.

Monitoring and Maintaining VPDN Groups

To monitor and maintain VPDN groups, use the following command in EXEC mode.

Command	Purpose
Router# show vpdn	Displays information about active Level 2 Forwarding (L2F) Protocol tunnel and message identifiers in a VPDN.
Router# show vpdn session packet	Displays PPPoE session statistics.
Router# show vpdn session all	Displays PPPoE session information for each session ID.
Router# show vpdn tunnel	Displays PPPoE session count for the tunnel.

Configuration Examples

This section provides the following configuration examples:

- PPPoE on Ethernet Example
- Enabling PPPoE on an Ethernet Interface Example

PPPoE on Ethernet Example

The following example configures PPPoE on Ethernet to accept dial-in PPPoE sessions. The virtual access interface for the PPP session is cloned from virtual template interface 1. Bridged Ethernet protocol data units (PDUs) with destination MAC addresses set to the Ethernet interface MAC address and Ethernet type set to 0x8863 are enqueued to the PPPoE discovery process. All bridged Ethernet PDUs with destination MAC addresses set to the Ethernet interface MAC address and Ethernet type set to 0x8864 coming in are forwarded to the virtual access interface associated with the PPP session.

```
vpdn enable

vpdn-group 1
 accept dialin
 protocol pppoe
 virtual template 1
 pppoe limit per-mac <number>

int virtual-template 1
 ip address 100.100.100.100 255.255.255.0
 mtu 1492
```

For PPPoE virtual template interfaces, the **mtu** command must be configured because Ethernet has a maximum payload size of 1500 bytes, the PPPoE header is 6 bytes, and PPP Protocol ID is 2 bytes.



Note

Dial-out mode will not be supported.

Enabling PPPoE on an Ethernet Interface Example

The following example enables PPPoE on an Ethernet interface:

```
interface ethernet1/0
 pppoe enable
```

Command Reference

This section documents new and modified commands. All other commands used with this feature are documented in the Cisco IOS Release 12.1 command reference publications.

New Command

- **pppoe enable**

Modified Command

- **show vpdn**

pppoe enable

To enable PPP over Ethernet encapsulation (PPPoE) sessions on an Ethernet interface, use the **pppoe enable** global configuration command.

pppoe enable

Syntax Description

This command contains no arguments or keywords.

Defaults

No default behavior or values.

Command Modes

Global configuration

Command History

Release	Modification
12.1(2)T	This command was introduced.

Usage Guidelines

PPPoE by default is disabled on all Ethernet interfaces.

Examples

The following example enables PPPoE sessions on Ethernet interface 1/0:

```
interface ethernet1/0
pppoe enable
```

Related Commands

Command	Description
debug vpdn pppoe-data	Displays data packets of PPPoE sessions.
debug vpdn pppoe-error	Displays PPPoE protocol errors that prevent a session from being established or errors that cause an established session to be closed.
debug vpdn pppoe-events	Displays PPPoE protocol messages about events that are part of normal session establishment or shutdown.
debug vpdn pppoe-packet	Displays each PPPoE protocol packet exchanged.
pppoe session-limit per-mac	Sets the limit of sessions to be sourced from a MAC address.

show vpdn

To display information about active Level 2 Forwarding (L2F) Protocol tunnel and message identifiers in a virtual private dialup network (VPDN), use the **show vpdn** EXEC command.

show vpdn [session][packets][tunnel][all]

Syntax Description

session	(Optional) Displays a summary of the status of all active tunnels.
packets	(Optional) Displays a summary of packets coming in and going out of a session.
tunnel	(Optional) Displays information about all active L2F and L2TP tunnels in summary-style format.
all	(Optional) Displays summary information about all active L2F and L2TP tunnels.

Defaults

No default behavior or values.

Command Modes

EXEC

Command History

Release	Modification
11.2	This command was introduced.
12.1(1)T	This command was modified to display Point-to-Point Protocol over Ethernet (PPPoE) session information. The following keywords were added: <ul style="list-style-type: none"> • all • packets • session
12.1(2)T	This command was modified to display PPPoE session information on actual Ethernet interfaces.

Usage Guidelines

If the **session**, **packet**, or **all** keyword is specified, the output of this command displays PPPoE session information.

PPPoE will be supported on ATM permanent virtual connections (PVCs) compliant with RFC 1483 only. Currently, PPPoE is not supported on Frame Relay and any other LAN interfaces such as FDDI and Token Ring.

Examples

The following is example output from the **show vpdn** command for L2F and L2TP sessions:

```
Router# show vpdn

Active L2F tunnels
NAS Name   Gateway Name   NAS CLID   Gateway CLID   State
nas        gateway        4          2              open

L2F MIDs
Name       NAS Name      Interface   MID            State
phil@cisco.com  nas          As7        1              open
sam@cisco.com  nas          As8        2              open
```

Table 1 describes the fields shown in the **show vpdn** command display.

Table 1 show vpdn Field Descriptions

Field	Description
Active L2F tunnels	
NAS Name	Host name of the network access server, which is the remote termination point of the tunnel.
Gateway Name	Host name of the home gateway, which is the local termination point of the tunnel.
NAS CLID	A number uniquely identifying the VPDN tunnel on the network access server.
Gateway CLID	A number uniquely identifying the VPDN tunnel on the gateway.
State	Indicates whether the tunnel is open, opening, closing, or closed.
L2F MIDs	
Name	Username of the person from whom a protocol message was forwarded over the tunnel.
NAS Name	Host name of the network access server.
Interface	Interface from which the protocol message was sent.
MID	A number uniquely identifying this user in this tunnel.
State	Indicates status for the individual user in the tunnel. The states are: opening, open, closed, closing, and waiting_for_tunnel. The waiting_for_tunnel state means that the user connection is waiting until the main tunnel can be brought up before it moves to the opening state.

The following is example output from the **show vpdn** command for a PPPoE session:

```
Router# show vpdn

%No active L2TP tunnels
%No active L2F tunnels

PPPoE Tunnel and Session Information Total tunnels 1 sessions 1
PPPoE Tunnel Information
Session count:1
PPPoE Session Information
SID      RemMAC      LocMAC      Intf      VASt      OIntf      VC
1        0010.7b01.2cd9  0090.ab13.bca8  Vi4      UP        AT6/0      0/104
```

The following is example output from the **show vpdn** command for a PPPoE session on an actual Ethernet interface:

```
Router# show vpdn

%No active L2TP tunnels
%No active L2F tunnels

PPPoE Tunnel and Session Information Total tunnels 1 sessions 1
PPPoE Tunnel Information
Session count:1
PPPoE Session Information
SID          RemMAC          LocMAC          Intf          VASt          OIntf
1            0090.bf06.c870 00e0.1459.2521  Vi1          UP           Eth1
```

The following is example output from the **show vpdn session** command for a PPPoE session:

```
Router# show vpdn session

%No active L2TP tunnels
%No active L2F tunnels

PPPoE Session Information Total tunnels 1 sessions 1
PPPoE Session Information
SID          RemMAC          LocMAC          Intf          VASt          OIntf          VC
1            0010.7b01.2cd9 0090.ab13.bca8  Vi4          UP           AT6/0         0/104
```

Table 2 describes the fields shown in both the **show vpdn** and **show vpdn session** command displays.

Table 2 *show vpdn and show vpdn session Field Descriptions*

Field	Description
Session count	Number of sessions in the PPPoE tunnel.
SID	Session ID for the PPPoE session.
RemMAC	Remote MAC address of the host.
LocMAC	Local MAC address of the router. It is the default MAC address of the router.
Intf	Virtual access interface associated with the PPP session.
VASt	Line Protocol state of the virtual access interface.
OIntf	Outgoing interface.
VC	VC on which the PPPoE session is established.

The following is example output from the **show vpdn session packets** command for a PPPoE session:

```
Router# show vpdn session packets

%No active L2TP tunnels
%No active L2F tunnels

PPPoE Session Information Total tunnels 1 sessions 1
PPPoE Session Information
SID          Pkts-In          Pkts-Out          Bytes-In          Bytes-Out
1            202333           202337            2832652           2832716
```

Table 3 describes the fields shown in the **show vpdn session packets** command display.

Table 3 show vpdn session packets Field Descriptions

Field	Description
SID	Session ID for the PPPOE session.
Pkts-In	Number of packets coming into the session.
Pkts-Out	Number of packets going out of this session.
Bytes-In	Number of bytes coming into the session.
Bytes-Out	Number of bytes going out of this session.

The following is example output from the **show vpdn tunnel** command for L2F and L2TP sessions:

```
Router# show vpdn tunnel

L2TP Tunnel Information (Total tunnels=1 sessions=1)
LocID RemID Remote Name State Remote Address Port Sessions
2 10 wander est 172.21.9.13 1701 1
L2F Tunnel
NAS CLID HGW CLID NAS Name HGW Name State
9 1 stella acadia open
172.21.9.4 172.21.9.232
```

Table 4 describes the fields shown in the **show vpdn tunnel** command display.

Table 4 show vpdn tunnel Field Descriptions

Field	Description
Remote Name	Host name of the home gateway, which is the local termination point of the tunnel.
State	A number uniquely identifying the VPDN tunnel on the network access server.
NAS CLID	A number uniquely identifying the VPDN tunnel on the network access server.
HGW CLID	A number uniquely identifying the VPDN tunnel on the gateway.
NAS Name	Host name of the network access server.
HGW Name	Host name of the network.
State	Indicates status for the individual user in the tunnel. The states are: opening, open, closed, closing, and waiting_for_tunnel. The waiting_for_tunnel state means that the user connection is waiting until the main tunnel can be brought up before it moves to the opening state.

The following is example output from the **show vpdn session all** command for a PPPoE session:

```
Router# show vpdn session all

%No active L2TP tunnels
%No active L2F tunnels

PPPoE Session Information Total tunnels 1 sessions 1
session id:1
local MAC address:0090.ab13.bca8, remote MAC address:0010.7b01.2cd9
virtual access interface:Vi4, outgoing interface:AT6/0, vc:0/104
202343 packets sent, 202339 received, 2832800 bytes sent, 2832736 received
```

This example output displays all accessible information about a PPPoE session. Table 5 describes the fields shown in the **show vpdn session all** command display.

Table 5 *show vpdn session all Field Descriptions*

Field	Description
session id	Session ID for the PPPoE session.
local MAC address	Local MAC address of the router. It is the default MAC address of the router.
remote MAC address	Remote MAC address of the host.
virtual access interface	Virtual access interface associated with the PPP session.
outgoing interface	Outgoing interface.
vc	VC on which the PPPoE session is established.

Related Commands

Command	Description
vpdn enable	Enables virtual private dialup networking on the router and informs the router to look for tunnel definitions in a local database and on a remote authorization server (home gateway), if one is present.
vpdn group	Associates a VPDN group to a customer or VPDN profile.
vpdn logging history failure	Enables the logging of failure events to the failure history table.