

Enabling PPPoE Relay Discovery and Service Selection Functionality

The PPPoE Relay feature enables an L2TP access concentrator (LAC) to relay active discovery and service selection functionality for PPP over Ethernet (PPPoE), over a Layer 2 Tunneling Protocol (L2TP) control channel, to an L2TP network server (LNS) or tunnel switch (multihop node). The relay functionality of this feature allows the LNS or tunnel switch to advertise the services it offers to the client, thereby providing end-to-end control of services between the LNS and a PPPoE client.

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Prerequisites for Enabling PPPoE Relay Discovery and Service Selection Functionality

- You must understand the concepts described in the "Preparing for Broadband Access Aggregation" module.
- PPPoE sessions must be established using the procedures in the "Providing Protocol Support for Broadband Access Aggregation of PPPoE Sessions" module.
- This document assumes you understand how to configure a virtual private dialup network (VPDN) tunnel and a tunnel switch.

Information About Enabling PPPoE Relay Discovery and Service Selection Functionality

L2TP Active Discovery Relay for PPPoE

The PPPoE protocol described in RFC 2516 defines a method for active discovery and service selection of devices in the network by an LAC. A PPPoE client uses these methods to discover an access concentrator in the network, and the access concentrator uses these methods to advertise the services it offers.

The PPPoE Relay feature allows the active discovery and service selection functionality to be offered by the LNS, rather than just by the LAC. The PPPoE Relay feature implements the Network Working Group Internet-Draft titled *L2TP Active Discovery Relay for PPPoE* . The Internet-Draft describes how to relay PPPoE Active Discovery (PAD) and Service Relay Request (SRRQ) messages over an L2TP control channel (the tunnel).

The key benefit of the PPPoE Relay feature is end-to-end control of services between the LNS and a PPPoE client.

Note When the L2TP sessions are created, the traffic does not flow without the appxk9 and ipbasek9 licenses.

How to Enable PPPoE Relay Discovery and Service Selection Functionality

Configuring the LAC and Tunnel Switch for PPPoE Relay

Perform this task to configure the LAC and tunnel switch for PPPoE Relay, which configures a subscriber profile that directs PAD messages to be relayed on an L2TP tunnel. The subscriber profile also will contain an authorization key for the outgoing L2TP tunnel.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **subscriber profile** *profile-name*
4. **service relay pppoe vpdn group** *vpdn-group-name*
5. exit

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	**subscriber profile** *profile-name* **Example:** `Router(config)# subscriber profile profile-1`	Configures the subscriber profile name and enters subscriber profile configuration mode. • *profile-name* --Is referenced from a PPPoE profile configured by the **bba-group pppoe** global configuration command, so that all the PPPoE sessions using the PPPoE profile defined by the **bba-group pppoe**command will be treated according to the defined subscriber profile.
Step 4	**service relay pppoe vpdn group** *vpdn-group-name* **Example:** `Router(config-sss-profile)# service relay pppoe vpdn group Group-A`	Provides PPPoE relay service using a VPDN L2TP tunnel for the relay. The VPDN group name specified is used to obtain outgoing L2TP tunnel information. • See the What to Do Next, on page 3 section for the equivalent RADIUS profile entry.
Step 5	exit **Example:** `Router(config-sss-profile)# exit`	(Optional) Ends the configuration session and returns to privileged EXEC mode.

What to Do Next

Configure the LNS side of the configuration by performing the tasks described in the next section.

Configuring the LNS (or Multihop Node) to Respond to Relayed PAD Messages

On the router that responds to relayed PAD messages, perform this task to configure a PPPoE group and attach it to a VPDN group that accepts dial-in calls for L2TP. The relayed PAD messages will be passed from the VPDN L2TP tunnel and session to the PPPoE broadband group for receiving the PAD responses.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **vpdn-group** *vpdn-group-name*
4. **accept-dialin**
5. **protocol l2tp**
6. **virtual-template** *template-number*
7. **exit**
8. **terminate-from hostname** *host-name*
9. **relay pppoe bba-group** *pppoe-bba-group-name*
10. **exit**

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	**vpdn-group** *vpdn-group-name* **Example:** `Router(config)# vpdn-group Group-A`	Creates a VPDN group and enters VPDN group configuration mode.
Step 4	**accept-dialin** **Example:** `Router(config-vpdn)# accept-dialin`	Configures the LNS to accept tunneled PPP connections from an LAC and creates an accept-dialin VPDN subgroup.
Step 5	**protocol l2tp** **Example:** `Router(config-vpdn-req-in)# protocol l2tp`	Specifies the L2TP tunneling protocol.
Step 6	**virtual-template** *template-number* **Example:** `Router(config-vpdn-req-in)# virtual-template 2`	Specifies which virtual template will be used to clone virtual access interfaces.

	Command or Action	Purpose
Step 7	**exit** **Example:** `Router(config-vpdn-req-in)# exit`	Exits to VPDN group configuration mode.
Step 8	**terminate-from hostname** *host-name* **Example:** `Router(config-vpdn)# terminate-from hostname LAC-1`	Specifies the LAC hostname that will be required when the VPDN tunnel is accepted.
Step 9	**relay pppoe bba-group** *pppoe-bba-group-name* **Example:** `Router(config-vpdn)# relay pppoe bba-group group-2`	Specifies the PPPoE BBA group that will respond to the PAD messages. • The PPPoE BBA group name is defined with the **bba-group pppoe** *group-name* global configuration command.
Step 10	**exit** **Example:** `Router(config-vpdn)# exit`	Exits to global configuration mode.

Monitoring PPPoE Relay

Perform this task to monitor PPPoE Relay.

SUMMARY STEPS

1. **enable**
2. **show pppoe session**
3. **show pppoe relay context all**
4. **clear pppoe relay context**

DETAILED STEPS

Procedure

Step 1 **enable**

Enables privileged EXEC mode.

- Enter your password if prompted.

Example:

```
Router> enable
```

Step 2 **show pppoe session**

Displays information about currently active PPPoE sessions.

Example:

```
Router# show pppoe session
     1 session  in FORWARDED (FWDED) State
     1 session  total
Uniq ID  PPPoE  RemMAC          Port                    VT  VA         State
           SID  LocMAC                                      VA-st
     26     19  0001.96da.a2c0  Et0/0.1                  5  N/A RELFWD
                000c.8670.1006  VLAN:3434
```

Step 3 **show pppoe relay context all**

Displays the PPPoE relay context created for relaying PAD messages.

Example:

```
Router# show pppoe relay context all
Total PPPoE relay contexts 1
UID    ID     Subscriber-profile      State
25     18     cisco.com                 RELAYED
```

Example:

Step 4 **clear pppoe relay context**

This command clears the PPPoE relay context created for relaying PAD messages.

Example:

```
Router(config)# clear pppoe relay context
```

Troubleshooting Tips

Use the following commands in privileged EXEC mode to help you troubleshoot the PPPoE Relay feature:

- **debug ppp forwarding**
- **debug ppp negotiation**
- **debug pppoe events**
- **debug pppoe packets**
- **debug vpdn l2x-events**
- **debug vpdn l2x-packets**

Configuration Examples for Enabling PPPoE Relay Discovery and Service Selection Functionality

PPPoE Relay on LAC Configuration Example

The following is an example of a standard LAC configuration with the commands to enable PPPoE relay added:

```
hostname User2
!
username User1 password 0 field
username User2 password 0 field
username user-group password 0 field
username User5 password 0 field
username User2-lac-domain password 0 field
username User1-client-domain@cisco.net password 0 field
username User3-lns-domain password 0 field
!
ip domain-name cisco.com
!
vpdn enable
vpdn source-ip 10.0.195.151
!
vpdn-group User2-vpdn-group-domain
 request-dialin
  protocol l2tp
  domain cisco.net
 initiate-to ip 10.0.195.133
 local name User2-lac-domain
!
!
interface Loopback123
 ip address 10.22.2.2 255.255.255.0
!
interface Ethernet0/0
 ip address 10.0.195.151 255.255.255.0
 no keepalive
 half-duplex
 pppoe enable group group-1
 no cdp enable
!
interface Virtual-Template1
 mtu 1492
 ip unnumbered Loopback123
 ppp authentication chap
 ppp chap hostname User2-lac-domain
!
ip route 0.0.0.0 0.0.0.0 10.0.195.1
!
!
subscriber profile Profile1
 service relay pppoe vpdn group User2-vpdn-group-domain
!
bba-group pppoe group-1
 virtual-template 1
 service profile Profile1
!
```

Basic LNS Configured for PPPoE Relay Example

The following example shows the basic configuration for an LNS with commands added for PPPoE relay:

```
hostname User5
!
!
username User5 password 0 field
username user-group password 0 field
username User1 password 0 field
username User2 password 0 field
username User3 password 0 field
username User3-dialout password 0 cisco
username User2-dialout password 0 cisco
username abc password 0 cisco
username dial-7206a password 0 field
username mysgbpgroup password 0 cisco
username User3-lns-domain password 0 field
username User2-lac-domain password 0 field
username User1-client-domain@cisco.net password 0 field
username User5-mh password 0 field
username User1@domain.net password 0 field
ip subnet-zero
!
!
ip domain-name cisco.com
!
vpdn enable
vpdn multihop
vpdn source-ip 10.0.195.133
!
vpdn-group 1
 request-dialin
  protocol l2tp
!
vpdn-group 2
! Default L2TP VPDN group
 accept-dialin
  protocol l2tp
!
vpdn-group User5-mh
 request-dialin
  protocol l2tp
  domain cisco.net
 initiate-to ip 10.0.195.143
 local name User5-mh
!
vpdn-group User3-vpdn-group-domain
 accept-dialin
  protocol l2tp
  virtual-template 2
 terminate-from hostname User2-lac-domain
 local name User3-lns-domain
 relay pppoe group group-1
!
!
interface Loopback0
 no ip address
!
!
interface Loopback123
 ip address 10.23.3.2 255.255.255.0
!
```

```
!
interface FastEthernet0/0
 ip address 10.0.195.133 255.255.255.0
 duplex auto
 speed auto
 no cdp enable
!
!
interface Virtual-Template2
 mtu 1492
 ip unnumbered Loopback123
 ip access-group virtual-access3#234 in
 ppp mtu adaptive
 ppp authentication chap
 ppp chap hostname User3-lns-domain
!
!
ip default-gateway 10.0.195.1
ip classless
ip route 0.0.0.0 0.0.0.0 10.0.195.1
!
!
bba-group pppoe group-1
 virtual-template 2
!
```

Tunnel Switch (or Multihop Node) Configured to Respond to PAD Messages Example

The following is an example of a standard tunnel switch configuration with the commands to enable response to PPPoE relay messages added:

```
hostname User3
!
!
username User1 password 0 room1
username User2 password 0 room1
username User3 password 0 room1
username User1@domain.net password 0 room1
username User3-lns-dnis password 0 cisco
username User3-lns-domain password 0 room1
username User2-lac-dnis password 0 cisco
username User2-lac-domain password 0 room1
username User5 password 0 room1
username User5-mh password 0 room1
username user-group password 0 room1
username User3-dialout password 0 cisco
username User2-dialout password 0 cisco
username abc password 0 cisco
username dial-7206a password 0 room1
username mysgbpgroup password 0 cisco
username User1-client-domain@cisco.net password 0 room1
username User4-lns-domain password 0 room1
!
ip domain-name cisco.com
!
vpdn enable
!
vpdn-group User3-mh
 accept-dialin
  protocol l2tp
```

```
  virtual-template 1
 terminate-from hostname User5-mh
 relay pppoe bba-group group-1
!
interface Loopback0
 ip address 10.4.4.2 255.255.255.0
!
interface Loopback1
 ip address 10.3.2.2 255.255.255.0
!
interface Ethernet2/0
 ip address 10.0.195.143 255.255.0.0
 half-duplex
 no cdp enable
!
interface Virtual-Template1
 mtu 1492
 ip unnumbered Loopback0
 no keepalive
 ppp mtu adaptive
 ppp authentication chap
 ppp chap hostname User3-lns-domain
!
ip default-gateway 10.0.195.1
ip route 0.0.0.0 0.0.0.0 10.0.195.1
!
!
bba-group pppoe group-1
 virtual-template 1
!
```

Tunnel Switch Configured to Relay PAD Messages Example

The following partial example shows a configuration that allows the tunnel switch to relay PAD messages:

```
subscriber profile profile-1
! Configure profile for PPPoE Relay
 service relay pppoe vpdn group Example1.net
.
.
.
vpdn-group Example2.net
! Configure L2TP tunnel for PPPoE Relay
 accept-dialin
  protocol l2tp
.
.
.
 terminate-from host Host1
 relay pppoe bba-group group-1
.
.
.
vpdn-group Example1.net
! Configure L2TP tunnel for PPPoE Relay
 request-dialin
  protocol l2tp
.
.
.
 initiate-to ip 10.17.1.3
.
```

```
.
.
! PPPoE-group configured for relay
bba-group pppoe group-1
.
.
.
service profile profile-1
```

RADIUS Subscriber Profile Entry for the LAC Example

The following example shows how to enter Subscriber Service Switch subscriber service attributes in a AAA RADIUS server profile.

```
profile-1 = profile-name.
.
.
```

Cisco:Cisco-Avpair = "sss:sss-service=relay-pppoe"

The following is an example of a typical RADIUS subscriber profile entry for an LAC:

```
cisco.com Password = "password"
    Cisco:Cisco-Avpair = "sss:sss-service=relay-pppoe",
    Tunnel-Type = L2TP,
    Tunnel-Server-Endpoint = .....,
    Tunnel-Client-Auth-ID = "client-id",
    Tunnel-Server-Auth-ID = "server-id",
    Cisco:Cisco-Avpair = "vpdn:l2tp-tunnel-password=password",
    Cisco:Cisco-Avpair = "vpdn:l2tp-nosession-timeout=never",
    Tunnel-Assignment-Id = assignment-id
```

RADIUS VPDN Group User Profile Entry for the LNS Example

The following example shows how to enter the VPDN group attributes in a AAA RADIUS server profile.

```
profile-1 = profile-name.
.
.
   Cisco:Cisco-Avpair = "vpdn:relay-pppoe-bba-group=group-name
```

The following is an example of a typical RADIUS subscriber profile entry for an LNS:

```
cisco.com Password = "password"
    Tunnel-Type = L2TP,
    Tunnel-Server-Endpoint = .....,
    Tunnel-Client-Auth-ID = "client-id",
    Tunnel-Server-Auth-ID = "server-id",
    Cisco:Cisco-Avpair = "vpdn:l2tp-tunnel-password=password",
    Cisco:Cisco-Avpair = "vpdn:l2tp-nosession-timeout=never",
    Cisco:Cisco-Avpair = "vpdn:relay-pppoe-bba-group=group-name"
    Tunnel-Assignment-Id = assignment-id
```

Additional References

The following sections provide referenced related to the PPPoE Relay feature.

Related Documents

Related Topic	Document Title
VPDN tunnels	*Cisco IOS XE Dial Technologies Configuration Guide*
VPDN tunnel commands	*Cisco IOS XE Dial Technologies Configuration Guide*
Tunnel switching	L2TP Tunnel Switching feature module
PPPoE broadband groups	*Cisco IOS XE Broadband Access Aggregation and DSL Configuration Guide*
PPPoE broadband commands	*Cisco IOS XE Broadband Access Aggregation and DSL Command Reference*
Broadband access aggregation concepts	*Cisco IOS XE Broadband Access Aggregation and DSL Configuration Guide*
Tasks for preparing for broadband access aggregation	*Cisco IOS XE Broadband Access Aggregation and DSL Configuration Guide*

Standards

Standards	Title
None	--

MIBs

MIBs	MIBs Link
None	To locate and download MIBs for selected platforms, Cisco IOS XE software releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFCs	Title
RFC 2516	*Method for Transmitting PPP Over Ethernet (PPPoE)*
RFC 3817	• *L2TP Active Discovery Relay for PPPoE* • Network Working Group Internet-Draft, *L2TP Active Discovery Relay for PPPoE* , which can be seen at http://tools.ietf.org/html/draft-dasilva-l2tp-relaysvc-06

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 Enabling PPPoE Relay Discovery and Service Selection Functionality

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 Enabling PPPoE Relay Discovery and Service Selection Functionality

Feature Name	Releases	Feature Configuration Information
PPPoE Relay	Cisco IOS XE Release 2.1	The PPPoE Relay feature enables an L2TP access concentrator (LAC) to relay active discovery and service selection functionality for PPP over Ethernet (PPPoE), over a Layer 2 Tunneling Protocol (L2TP) control channel, to an L2TP network server (LNS) or tunnel switch (multihop node). This feature was integrated into Cisco IOS XE Release 2.1.
PPPoE Service Selection	Cisco IOS XE Release 2.4	This feature was integrated into Cisco IOS XE Release 2.4.