Configuring NAS-Initiated Dial-In VPDN Tunneling

This module describes how to configure network access server (NAS)-initiated dial-in virtual private dialup networking (VPDN) tunneling. NAS-initiated dial-in tunneling provides secure tunneling of a PPP session from a NAS to a tunnel server without any special knowledge or interaction required from the client.

All of the tasks documented in this module require that tasks documented elsewhere in the have first been completed.

Module History

This module was first published on May 2, 2005, and last updated on October 31, 2008.

Finding Feature Information in This Module

Your Cisco IOS software release may not support all features. To find information about feature support and configuration, use the "Feature Information for NAS-Initiated Dial-In VPDN Tunneling" section on page 28.

Contents

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Prerequisites for Configuring NAS-Initiated Dial-In VPDN Tunneling

- Before performing the tasks documented in this module, you must perform the required tasks in the "Configuring AAA for VPDNs" module.
- The NAS should be configured to receive incoming calls from clients using ISDN, the Public Switched Telephone Network (PSTN), Digital Subscriber Line (DSL), or cable modem. For information on configuring a device to accept dial-in calls, refer to the appropriate sections of the *Cisco IOS Dial Technologies Configuration Guide*, Release 12.4 or the *Cisco IOS Broadband and DSL Configuration Guide*, Release 12.4.

Information About NAS-Initiated Dial-In VPDN Tunneling

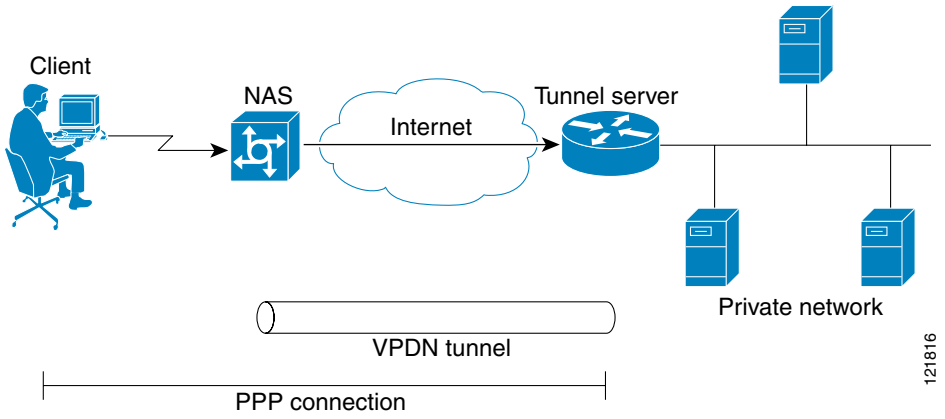
Before performing the tasks in this module, you should understand the following concepts:

NAS-Initiated Dial-in VPDN Tunneling

NAS-initiated dial-in VPDN tunneling is also known as compulsory tunneling. In NAS-initiated dial-in VPDN tunneling, the client dials in to the NAS through a medium that supports PPP. If the connection from the client to the Internet service provider (ISP) NAS is over a medium that is considered secure, such as DSL, ISDN, or the PSTN, the client may choose not to provide additional security. The PPP session is securely tunneled from the NAS to the tunnel server without any special knowledge or interaction required from the client. NAS-initiated dial-in VPDN tunnels can use either the Layer 2 Tunneling Protocol (L2TP) or the Layer 2 Forwarding (L2F) protocol.

A NAS-initiated dial-in tunneling scenario is shown in Figure 1.

Figure 1 NAS-Initiated Dial-In VPDN Scenario



L2TP Calling Station ID Suppression

In a NAS-initiated dial-in L2TP tunneling scenario, when the NAS connects to a tunnel server it transfers numerous attribute-value (AV) pairs as part of the session setup process. One of these AV pairs is L2TP AV pair 22, the Calling Number ID. The Calling Number ID AV pair includes the calling station ID of the originator of the session, which can be the phone number of the originator, the Logical Line ID (LLID) used to make the connection on the LAC, or the MAC address of the PC connecting to the network. This information can be considered sensitive in cases where the NAS and tunnel server are being managed by different entities. Depending on the security requirements of the NAS or end users, it may be desirable for the NAS to suppress part or all of the calling station ID.

Beginning in Cisco IOS Release 12.4(2)T, parts of the calling station ID can be masked, or the calling station ID can be removed completely. Calling station ID suppression can be configured globally on the NAS, for individual VPDN groups on the NAS, or on the remote RADIUS server if one is configured.

L2TP Failover

If a NAS fails to contact its peer during L2TP tunnel establishment, it can fail over to another configured tunnel server and attempt tunnel establishment with that device.

Failover can occur in the following scenarios:

- If the router sends a Start Control Connection Request (SCCRQ) a number of times and receives no response from the peer
- If the router receives a Stop Control Connection Notification (StopCCN) from its peer (Cisco IOS Release 12.2(13)T, Cisco IOS Release 12.2(28)SB, and later releases)
- If the router receives a Call Disconnect Notify (CDN) message from its peer (Cisco IOS Release 12.2(13)T, Cisco IOS Release 12.2(28)SB, and later releases)

In both the StopCCN control message and the CDN control message, a Result Code AV pair is included, which indicates the reason for tunnel or session termination, respectively. This AV pair may also include an optional Error Code, which further describes the nature of the termination. The various Result Code and Error Code values have been standardized in RFC 2661. Failover will occur if the combination of Result Code and Error Code values as defined in Table 1 is received from the peer.

Table 1 Defined Result and Error Codes from RFC 2661

Control Message	Result Code	Error Code
StopCCN, CDN	2: General error, see Error Code.	4: Insufficient resources to handle this operation now. 6: A generic vendor-specific error occurred.[1] 7: Try another. 9: Try another directed.
CDN	4: Temporary lack of resources.	—

1. For failover, this error code would be accompanied by a vendor-specific error AVP in the error message—in this case containing the Cisco vendor code (SMI_CISCO_ENTERPRISE_CODE) and a Cisco error code (L2TP_VENDOR_ERROR_SLIMIT).

When one of these three scenarios occurs, the router will mark the peer IP address as busy for 60 seconds by default. During that time no attempt will be made to establish a session or tunnel with the peer. The router will select an alternate peer to contact if one is configured. If a tunnel already exists to the alternate peer, new sessions will be brought up in the existing tunnel. Otherwise, the router will begin negotiations to establish a tunnel to the alternate peer.

How to Configure NAS-Initiated Dial-In VPDN Tunneling

In a NAS-initiated dial-in VPDN scenario, when a dial-in user requests contact with a remote network, the NAS must request the establishment of a VPDN tunnel to the tunnel server at the remote network. The tunnel server must be configured to accept the VPDN tunnels the NAS requests, and a virtual template interface must be established from which the tunnel server can clone a virtual access interface on demand.

Perform the following tasks to configure the NAS and the tunnel server for NAS-initiated dial-in VPDN tunneling:

- Configuring the NAS to Request Dial-In VPDN Tunnels, page 4 (required)
- Configuring the Tunnel Server to Accept Dial-In VPDN Tunnels, page 7 (required)
- Configuring the Virtual Template on the Tunnel Server, page 10 (required)
- Verifying a NAS-Initiated VPDN Configuration, page 12 (optional)
- Configuring L2TP Calling Station ID Suppression, page 16 (optional)

Configuring the NAS to Request Dial-In VPDN Tunnels

The NAS must be configured to request tunnel establishment with the remote tunnel server. Perform this task on the NAS to configure a VPDN request dial-in subgroup and the IP address of the tunnel server that will be the other endpoint of the VPDN tunnel.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **vpdn-group** *name*
4. **description** *string*
5. **request-dialin**
6. **protocol** {**any** | **l2f** | **l2tp**}
7. **domain** *domain-name*
   or
   dnis {*dnis-number* | *dnis-group-name*}
8. **exit**
9. **initiate-to ip** *ip-address* [**limit** *limit-number*] [**priority** *priority-number*]
10. **l2f ignore-mid-sequence**

DETAILED STEPS

	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** *name* **Example:** `Router(config)# vpdn-group 1`	Creates a VPDN group and enters VPDN group configuration mode.
Step 4	**description** *string* **Example:** `Router(config-vpdn)# description myvpdngroup`	(Optional) Adds a description to a VPDN group.
Step 5	**request-dialin** **Example:** `Router(config-vpdn)# request-dialin`	Configures a NAS to request the establishment of an L2F or L2TP tunnel to a tunnel server, creates a request-dialin VPDN subgroup, and enters VPDN request dial-in subgroup configuration mode.
Step 6	**protocol** {**any** | **l2f** | **l2tp**} **Example:** `Router(config-vpdn-req-in)# protocol l2tp`	Specifies the Layer 2 protocol that the VPDN group will use. • The **any** keyword can be used to specify that both L2TP and L2F tunnels can be established.

Step 7	**domain** *domain-name*
	
	or
	
	dnis {*dnis-number* | *dnis-group-name*}
	
	Example:
	`Router(config-vpdn-req-in)# domain example.com`
	
	or
	
	`Router(config-vpdn-req-in)# dnis 5687`
		Requests that PPP calls from a specific domain name be tunneled.
		
		or
		
		Requests that PPP calls from a specific Dialed Number Identification Service (DNIS) number or DNIS group be tunneled.

Step 8	**exit** **Example:** `Router(config-vpdn-req-in)# exit`	Exits to VPDN group configuration mode.

	Command or Action	Purpose
Step 9	**initiate-to ip** *ip-address* [**limit** *limit-number*] [**priority** *priority-number*] **Example:** `Router(config-vpdn)# initiate-to ip 10.1.1.1 limit 12`	Specifies an IP address that will be used for Layer 2 tunneling. • Beginning in Cisco IOS Release 12.2(15)T, the following options are available for this command: – **limit**—Maximum number of connections that can be made to this IP address. – **priority**—Priority for this IP address. **Note** The **priority** keyword is typically not configured on a NAS. Information used for load balancing and failover is configured on a remote authentication, authorization, and accounting (AAA) server instead. See the section "Configuring L2TP Tunnel Server Load Balancing and Failover on the NAS Remote RADIUS AAA Server" in the "Configuring AAA for VPDNs" module for more information about configuring load balancing and failover priorities using a remote AAA server. • Multiple tunnel servers can be configured on the NAS by configuring multiple initiate-to commands.
Step 10	**l2f ignore-mid-sequence** **Example:** `Router(config-vpdn)# l2f ignore-mid-sequence`	(Optional) Ignores multiplex ID (MID) sequence numbers for sessions in an L2F tunnel. • This command is available only if the **protocol l2f** or **protocol any** command has been configured in the VPDN subgroup. • This command is not required for Cisco-to-Cisco tunnel endpoints, and is required only if MID sequence numbering is not supported by a third-party hardware vendor.

What to Do Next

You must perform the task in the "Configuring the Tunnel Server to Accept Dial-In VPDN Tunnels" section.

Configuring the Tunnel Server to Accept Dial-In VPDN Tunnels

The tunnel server must be configured to accept tunnel requests from the remote NAS. Perform this task on the tunnel server to create a VPDN accept dial-in subgroup and to configure the tunnel server to accept tunnels from the NAS that will be the other endpoint of the VPDN tunnel. To configure the tunnel server to accept tunnels from multiple NASs, you must perform this task for each NAS.

SUMMARY STEPS

1. **enable**
2. **configure terminal**

3. **vpdn-group** *name*
4. **description** *string*
5. **accept-dialin**
6. **protocol** {**any** | **l2f** | **l2tp**}
7. **virtual-template** *number*
8. **exit**
9. **terminate-from hostname** *host-name*
10. **lcp renegotiation** {**always** | **on-mismatch**}
11. **force-local-chap**

DETAILED STEPS

	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** *name* **Example:** `Router(config)# vpdn-group 1`	Creates a VPDN group and enters VPDN group configuration mode.
Step 4	**description** *string* **Example:** `Router(config-vpdn)# description myvpdngroup`	(Optional) Adds a description to a VPDN group.
Step 5	**accept-dialin** **Example:** `Router(config-vpdn)# accept-dialin`	Configures a tunnel server to accept requests from a NAS to establish an L2F or L2TP tunnel, creates an accept-dialin VPDN subgroup, and enters VPDN accept dial-in subgroup configuration mode.
Step 6	**protocol** {**any** | **l2f** | **l2tp**} **Example:** `Router(config-vpdn-acc-in)# protocol l2tp`	Specifies the Layer 2 protocol that the VPDN group will use. • The **any** keyword can be used to specify that both L2TP and L2F tunnels can be established.
Step 7	**virtual-template** *number* **Example:** `Router(config-vpdn-acc-in)# virtual-template 1`	Specifies which virtual template will be used to clone virtual access interfaces.
Step 8	**exit** **Example:** `Router(config-vpdn-acc-in)# exit`	Exits to VPDN group configuration mode.
Step 9	**terminate-from hostname** *host-name* **Example:** `Router(config-vpdn)# terminate-from hostname NAS12`	Specifies the hostname of the remote NAS that will be required when accepting a VPDN tunnel.

	Command or Action	Purpose
Step 10	**lcp renegotiation** {**always** | **on-mismatch**} **Example:** `Router(config-vpdn)# lcp renegotiation always`	(Optional) Allows the tunnel server to renegotiate the PPP Link Control Protocol (LCP) on dial-in calls using L2TP or L2F. • This command is useful for a tunnel server that tunnels to a non-Cisco NAS, where the NAS may negotiate a different set of LCP options than what the tunnel server expects.
Step 11	**force-local-chap** **Example:** `Router(config-vpdn)# force-local-chap`	(Optional) Forces the tunnel server to reauthenticate the client. • Enabling this command forces the tunnel server to reauthenticate the client in addition to the proxy authentication that occurs at the NAS. **Note** This command will function only if Challenge Handshake Authentication Protocol (CHAP) authentication is enabled for PPP using the **ppp authentication chap** command in the virtual template configured on the tunnel server.

What to Do Next

You must perform the task in the "Configuring the Virtual Template on the Tunnel Server" section.

Configuring the Virtual Template on the Tunnel Server

When a request to establish a tunnel is received by the tunnel server, the tunnel server must create a virtual access interface. The virtual access interface is cloned from a virtual template interface, used, and then freed when no longer needed. The virtual template interface is a logical entity that is not tied to any physical interface.

Perform this task on the tunnel server to configure a basic virtual template. For more detailed information about all of the configuration options available for a virtual template, see the "Configuring Virtual Template Interfaces" section of the *Cisco IOS Dial Technologies Configuration Guide*, Release 12.4.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface virtual-template** *number*
4. **ip unnumbered** *type number*
5. **ppp authentication** *protocol1* [*protocol2...*] [**if-needed**] [*list-name* | **default**] [**callin**] [**one-time**] [**optional**]
6. **peer default ip address** {*ip-address* | **dhcp-pool** | **dhcp** | **pool** [*pool-name*]}
7. **encapsulation** *encapsulation-type*

DETAILED STEPS

	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 virtual-template** *number* **Example:** `Router(config)# interface virtual-template 1`	Enters interface configuration mode and creates a virtual template interface that can be configured and applied dynamically in creating virtual access interfaces.
Step 4	**ip unnumbered** *type number* **Example:** `Router(config-if)# ip unnumbered FastEthernet 0/0`	Enables IP processing on a serial interface without assigning an explicit IP address to the interface. **Note** Configuring the **ip address** command within a virtual template is not recommended. Configuring a specific IP address in a virtual template can result in the establishment of erroneous routes and the loss of IP packets.
Step 5	**ppp authentication** *protocol1* [*protocol2...*] [**if-needed**] [*list-name* | **default**] [**callin**] [**one-time**] [**optional**] **Example:** `Router(config-if)# ppp authentication chap`	Enables at least one PPP authentication protocol and specifies the order in which the protocols are selected on the interface.
Step 6	**peer default ip address** {*ip-address* | **dhcp-pool** | **dhcp** | **pool** [*pool-name*]} **Example:** `Router(config-if)# peer default ip address pool mypool`	Specifies an IP address, an address from a specific IP address pool, or an address from the Dynamic Host Configuration Protocol (DHCP) mechanism to be returned to a remote peer connecting to this interface.
Step 7	**encapsulation** *encapsulation-type* **Example:** `Router(config-if)# encapsulation ppp`	Sets the encapsulation method used by the interface.

What to Do Next

- You may perform the optional task in the "Verifying a NAS-Initiated VPDN Configuration" section.
- You may perform the optional task in the "Configuring L2TP Calling Station ID Suppression" section.

Verifying a NAS-Initiated VPDN Configuration

Perform the following tasks to verify or troubleshoot a NAS-initiated dial-in VPDN configuration:

- Verifying and Troubleshooting Tunnel Establishment Between the NAS and the Tunnel Server, page 12 (optional)
- Verifying the Connection Between the Client and the NAS, page 14 (optional)

Verifying and Troubleshooting Tunnel Establishment Between the NAS and the Tunnel Server

Perform this task to verify that a tunnel between the NAS and the tunnel server has been established, and to troubleshoot problems with tunnel establishment.

SUMMARY STEPS

1. **enable**
2. show vpdn tunnel all
3. **ping** *ip-address*
4. **debug vpdn event**
5. **debug vpdn errors**

DETAILED STEPS

Step 1 **enable**

Enter this command to enable privileged EXEC mode. Enter your password if prompted:

```
Router> enable
```

Step 2 **show vpdn tunnel all**

Enter this command to display details about all active VPDN tunnels. This example shows output from a tunnel server with a single active L2F tunnel:

```
Router# show vpdn tunnel all

% No active L2TP tunnels

L2F Tunnel
NAS name: ISP-NAS
NAS CLID: 36
NAS IP address 172.22.66.23
Gateway name: ENT-TS
Gateway CLID: 1
Gateway IP address 172.22.66.25
State: open
Packets out: 52
Bytes out: 1799
Packets in: 100
Bytes in: 7143
```

If no active tunnels have been established with the NAS, proceed with the following steps to troubleshoot the problem.

Step 3 **ping** *ip-address*

Enter this command to ping the NAS. The following output shows the result of a successful ping from the tunnel server to the NAS:

```
Router# ping 172.22.66.25

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.30.2.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 128/132/152 ms
```

If the tunnel server is unable to ping the NAS, there may be a problem with the routing path between the devices, or the NAS may not be functional.

Step 4 **debug vpdn event**

Enter the **debug vpdn event** command to display the VPDN events that occur during tunnel establishment. For complete field descriptions of these debug messages, refer to the **debug vpdn** command documentation in the *Cisco IOS Debug Command Reference*, Release 12.4T.

The following output from the tunnel server shows normal VPDN tunnel establishment for an L2F tunnel:

```
Router# debug vpdn event

L2F: Chap authentication succeeded for nas1.
Virtual-Access3 VPN Virtual interface created for user6@cisco.com
Virtual-Access3 VPN Set to Async interface
Virtual-Access3 VPN Clone from Vtemplate 1 block=1 filterPPP=0
%LINK-3-UPDOWN: Interface Virtual-Access3, changed state to up
Virtual-Access3 VPN Bind interface direction=2
Virtual-Access3 VPN PPP LCP accepted sent & rcv CONFACK
%LINEPROTO-5-UPDOWN: Line protocol on Interface Virtual-Access3, changed state to up
```

The following output from the tunnel server shows normal VPDN tunnel establishment for an L2TP tunnel:

```
Router# debug vpdn event

20:19:17: L2TP: I SCCRQ from ts1 tnl 8
20:19:17: L2X: Never heard of ts1
20:19:17: Tnl 7 L2TP: New tunnel created for remote ts1, address 172.21.9.4
20:19:17: Tnl 7 L2TP: Got a challenge in SCCRQ, ts1
20:19:17: Tnl 7 L2TP: Tunnel state change from idle to wait-ctl-reply
20:19:17: Tnl 7 L2TP: Got a Challenge Response in SCCCN from ts1
20:19:17: Tnl 7 L2TP: Tunnel Authentication success
20:19:17: Tnl 7 L2TP: Tunnel state change from wait-ctl-reply to established
20:19:17: Tnl 7 L2TP: SM State established
20:19:17: Tnl/Cl 7/1 L2TP: Session FS enabled
20:19:17: Tnl/Cl 7/1 L2TP: Session state change from idle to wait-for-tunnel
20:19:17: Tnl/Cl 7/1 L2TP: New session created
20:19:17: Tnl/Cl 7/1 L2TP: O ICRP to ts1 8/1
20:19:17: Tnl/Cl 7/1 L2TP: Session state change from wait-for-tunnel to wait-connect
20:19:17: Tnl/Cl 7/1 L2TP: Session state change from wait-connect to established
20:19:17: Vi1 VPDN: Virtual interface created for bum1@cisco.com
20:19:17: Vi1 VPDN: Set to Async interface
20:19:17: Vi1 VPDN: Clone from Vtemplate 1 filterPPP=0 blocking
20:19:18: %LINK-3-UPDOWN: Interface Virtual-Access1, changed state to up
20:19:18: Vi1 VPDN: Bind interface direction=2
20:19:18: Vi1 VPDN: PPP LCP accepting rcv CONFACK
20:19:19: %LINEPROTO-5-UPDOWN: Line protocol on Interface Virtual-Access1, changed state
to up
```

Step 5 **debug vpdn errors**

Enter this command to display error messages that are generated during tunnel establishment. The following output from the NAS shows an authentication failure during tunnel establishment. For complete field descriptions of these debug messages, refer to the **debug vpdn** command documentation in the *Cisco IOS Debug Command Reference*, Release 12.4T.

```
Router# debug vpdn errors

%LINEPROTO-5-UPDOWN: Line protocol on Interface Async1, changed state to down
%LINK-5-CHANGED: Interface Async1, changed state to reset
%LINK-3-UPDOWN: Interface Async1, changed state to down
%LINK-3-UPDOWN: Interface Async1, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Async1, changed state to up
VPDN tunnel management packet failed to authenticate
VPDN tunnel management packet failed to authenticate
```

If an authentication failure occurs, verify that both the NAS and the tunnel server are configured with the same secret password. You may also perform the tasks in the "Verifying L2TP Tunnel Establishment, PPP Negotiations, and Authentication with the Remote Client" section of the "Configuring AAA for VPDNs" module.

Verifying the Connection Between the Client and the NAS

Perform this task to verify the connection between the dial-in client and the NAS.

SUMMARY STEPS

1. Dial in to the NAS from a client PC.
2. **enable**
3. **show caller user** *user*
4. **show interfaces virtual-access** *number*
5. show vpdn session

DETAILED STEPS

Step 1 Dial in to the NAS from a client PC.

Ensure that the client PC is able to connect to the NAS by establishing a dial-in connection. As the call comes into the NAS, a LINK-3-UPDOWN message automatically appears on the NAS terminal screen. In the following example, the call comes into the NAS on asynchronous interface 14:

```
*Jan  1 21:22:18.410: %LINK-3-UPDOWN: Interface Async14, changed state to up
```

Note No **debug** commands are turned on to display this log message. This message should be displayed within 30 seconds after the client first sends the call.

If this message is not displayed by the NAS, there is a problem with the dial-in configuration. For more information about configuring and troubleshooting dial-in connections, see the *Cisco IOS Dial Technologies Configuration Guide*, Release 12.4.

Step 2 **enable**

Enter this command to enable privileged EXEC mode. Enter your password if prompted:

```
Router> enable
```

Step 3 **show caller user** *user*

Enter this command on the tunnel server to verify that the client received an IP address. The following example shows that user3 is using IP address 172.30.2.1.

```
Router# show caller user user3@cisco.com

  User: user3@cisco.com, line Vi1, service PPP L2F, active 00:01:35
  PPP: LCP Open, CHAP (<- AAA), IPCP
  IP: Local 172.22.66.25, remote 172.30.2.1
  VPDN: NAS ISP-NAS, MID 1, MID open
        HGW  ENT-TS, NAS CLID 36, HGW CLID 1, tunnel open
  Counts: 105 packets input, 8979 bytes, 0 no buffer
          0 input errors, 0 CRC, 0 frame, 0 overrun
          18 packets output, 295 bytes, 0 underruns
          0 output errors, 0 collisions, 0 interface resets
```

If an incorrect IP address or no IP address is displayed, there is a problem with IP addresses assignment. Verify the configuration of the **peer default ip address** command in the virtual template on the tunnel server.

Step 4 **show interfaces virtual-access** *number*

Enter this command to verify that the interface is up, that LCP is open, and that no errors are reported. The following output shows a functional interface:

```
Router# show interfaces virtual-access 1

Virtual-Access1 is up, line protocol is up
  Hardware is Virtual Access interface
  Interface is unnumbered. Using address of FastEthernet0/0 (172.22.66.25)
  MTU 1500 bytes, BW 115 Kbit, DLY 100000 usec,
     reliablility 255/255, txload 1/255, rxload 1/255
  Encapsulation PPP, loopback not set, keepalive set (10 sec)
  DTR is pulsed for 5 seconds on reset
  LCP Open
  Open: IPCP
  Last input 00:00:02, output never, output hang never
  Last clearing of "show interface" counters 3d00h
  Queueing strategy: fifo
  Output queue 1/40, 0 drops; input queue 0/75, 0 drops
  5 minute input rate 0 bits/sec, 0 packets/sec
  5 minute output rate 0 bits/sec, 0 packets/sec
     114 packets input, 9563 bytes, 0 no buffer
     Received 0 broadcasts, 0 runts, 0 giants, 0 throttles
     0 input errors, 0 CRC, 0 frame, 0 overrun, 0 ignored, 0 abort
     27 packets output, 864 bytes, 0 underruns
     0 output errors, 0 collisions, 0 interface resets
     0 output buffer failures, 0 output buffers swapped out
     0 carrier transitions
```

The virtual access interface is up and the line protocol is up, showing that virtual interface establishment was successful. For complete field descriptions of these messages or any error messages that appear, refer to the **show interfaces virtual-access** command documentation in the *Cisco IOS VPDN Command Reference*, Release 12.4T.

Step 5 **show vpdn session**

Enter this command on the tunnel server to verify that there are active VPDN sessions. This example shows output from a tunnel server with several active L2F and L2TP tunnels. For complete field descriptions of these messages or any error messages that appear, refer to the **show vpdn session** command documentation in the *Cisco IOS VPDN Command Reference*, Release 12.4T.

```
Router# show vpdn session

L2TP Session Information Total tunnels 1 sessions 4

LocID RemID TunID Intf          Username             State    Last Chg Uniq ID
4     691   13695 Se0/0         nobody2@cisco.com        est    00:06:00  4
5     692   13695 SSS Circuit   nobody1@cisco.com        est    00:01:43  8
6     693   13695 SSS Circuit   nobody1@cisco.com        est    00:01:43  9
3     690   13695 SSS Circuit   nobody3@cisco.com        est    2d21h     3

L2F Session Information Total tunnels 1 sessions 2

 CLID   MID    Username                  Intf          State   Uniq ID
 1      2      nobody@cisco.com             SSS Circuit   open    10
 1      3      nobody@cisco.com             SSS Circuit   open    11
```

If there is no session established for the client, you should perform the troubleshooting steps in the "Verifying and Troubleshooting Tunnel Establishment Between the NAS and the Tunnel Server" section.

Configuring L2TP Calling Station ID Suppression

In a NAS-initiated dial-in L2TP tunneling scenario, when a NAS connects to a tunnel server it transfers numerous AV pairs as part of the session setup process. One of these AV pairs is L2TP AV pair 22, the Calling Number ID. The Calling Number ID AV pair includes the calling station ID of the originator of the session, which can be the phone number of the originator, the LLID used to make the connection on the LAC, or the MAC address of the PC connecting to the network. This information can be considered sensitive in cases where the NAS and tunnel server are being managed by different entities. Depending on the security requirements of the NAS or end users, it may be desirable for the NAS to suppress part or all of the calling station ID.

Calling station ID suppression can be configured globally on the NAS, for individual VPDN groups on the NAS, or on the remote RADIUS server if one is configured.

The order of precedence for L2TP calling station ID suppression configurations is as follows:

- A RADIUS server configuration will take precedence over any configuration on the NAS.
- A VPDN group configuration will take precedence over a global configuration for calls associated with that VPDN group.
- A global configuration will be applied if no other method is configured.

Perform one or more of the following tasks to configure L2TP calling station ID suppression:

- Configuring Global L2TP Calling Station ID Suppression on the NAS, page 17 (optional)
- Configuring L2TP Calling Station ID Suppression for a VPDN Group on the NAS, page 18 (optional)
- Configuring L2TP Calling Station ID Suppression on the NAS Remote RADIUS Server, page 19 (optional)

Prerequisites for Configuring L2TP Calling Station ID Suppression

- You must first perform the required tasks in this module.

- You must configure the NAS and the tunnel server to use the L2TP protocol when performing the tasks in the "Configuring the NAS to Request Dial-In VPDN Tunnels" and "Configuring the Tunnel Server to Accept Dial-In VPDN Tunnels" sections.
- You must configure the NAS to tunnel calls based on the domain name when performing the task in the "Configuring the NAS to Request Dial-In VPDN Tunnels" section.
- You must configure the VPDN search order to use the domain name when performing the task in "Configuring the VPDN Tunnel Authorization Search Order" section of the "Configuring AAA for VPDNs" module.
- The NAS must be running Cisco IOS Release 12.4(2)T or a later release.

Configuring Global L2TP Calling Station ID Suppression on the NAS

The calling station ID information included in L2TP AV pair 22 can be removed or masked for every L2TP session established on the router if you configure L2TP calling station ID suppression globally. This configuration is compatible with either local or remote authorization.

Perform this task on the NAS to configure global L2TP calling station ID suppression.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **vpdn l2tp attribute clid mask-method** {**right** *mask-character characters* | **remove**} [**match** *match-string*]

DETAILED STEPS

	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 l2tp attribute clid mask-method** {**right** *mask-character characters* | **remove**} [**match** *match-string*] **Example:** `Router(config)# vpdn l2tp attribute clid mask-method right # 6 match %321`	Configures a NAS to suppress L2TP calling station IDs globally on the router. • **right** *mask-character characters*—Masks the calling station ID starting from the right end, using the specified *mask-character* to replace the defined number of *characters*. The *mask-character* must be a printable character. • **remove**—Removes the entire calling station ID. • **match** *match-string*—Removes or masks the calling station ID only when the username contains the specified *match-string*.

Configuring L2TP Calling Station ID Suppression for a VPDN Group on the NAS

The calling station ID information included in L2TP AV pair 22 can be removed or masked for calls associated with a specific VPDN group. This configuration is compatible with local authorization configurations.

Perform this task on the NAS to configure L2TP calling station ID suppression for calls associated with a particular VPDN group when using local authorization.

Prerequisites

You must configure the NAS and the tunnel server for local authorization when performing the task in the "Configuring AAA on the NAS and the Tunnel Server" section of the "Configuring AAA for VPDNs" module.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **vpdn-group** *name*
4. **l2tp attribute clid mask-method** {**right** *mask-character characters* | **remove**} [**match** *match-string*]

DETAILED STEPS

	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** *name* **Example:** `Router(config)# vpdn-group L2TP`	Creates a VPDN group and enters VPDN group configuration mode.
Step 4	**l2tp attribute clid mask-method** {**right** *mask-character characters* | **remove**} [**match** *match-string*] **Example:** `Router (config-vpdn)# l2tp attribute clid mask-method remove`	Configures a NAS to suppress L2TP calling station IDs for sessions associated with a VPDN group or VPDN template. • **right** *mask-character characters*—Masks the calling station ID starting from the right end, using the specified *mask-character* to replace the defined number of *characters*. The *mask-character* must be a printable character. • **remove**—Removes the entire calling station ID. • **match** *match-string*—Removes or masks the calling station ID only when the username contains the specified *match-string*.

Configuring L2TP Calling Station ID Suppression on the NAS Remote RADIUS Server

L2TP calling station ID suppression can be configured directly on the NAS, or in the RADIUS user profile. Configuring L2TP calling station ID suppression in the RADIUS user profile allows the configuration to be propagated to multiple NASs without having to configure each one.

Perform this task on the RADIUS server to configure a user profile that will allow the RADIUS server to instruct NASs to remove or mask the L2TP calling station ID.

Prerequisites

- The NAS must be configured for remote RADIUS AAA. Perform the tasks in the "Configuring AAA on the NAS and the Tunnel Server" and "Configuring Remote AAA for VPDNs" tasks in the "Configuring AAA for VPDNs" module to configure the NAS for remote RADIUS AAA.
- The RADIUS server must be configured for AAA. For information on configuring remote RADIUS servers, refer to the *Cisco IOS Security Configuration Guide*, Release 12.4.

SUMMARY STEPS

1. **Cisco-Avpair = vpdn:l2tp-tunnel-password=***secret*

2. **Cisco-Avpair = vpdn:tunnel-type=l2tp**
3. **Cisco-Avpair = vpdn:tunnel-id=***name*
4. **Cisco-Avpair = vpdn:ip-address=***address*
5. **Cisco-Avpair = vpdn:l2tp-clid-mask-method=**{**right:***character***:***characters* | **remove**}

DETAILED STEPS

	Command or Action	Purpose
Step 1	**Cisco-Avpair = vpdn:l2tp-tunnel-password=***secret* **Example:** `Cisco-Avpair = vpdn:l2tp-tunnel-password=cisco`	Specifies the L2TP tunnel password in the RADIUS user profile.
Step 2	**Cisco-Avpair = vpdn:tunnel-type=l2tp** **Example:** `Cisco-Avpair = vpdn:tunnel-type=l2tp`	Specifies L2TP as the tunneling protocol in the RADIUS user profile.
Step 3	**Cisco-Avpair = vpdn:tunnel-id=***name* **Example:** `Cisco-Avpair = vpdn:tunnel-id=test`	Specifies the tunnel ID in the RADIUS user profile.
Step 4	**Cisco-Avpair = vpdn:ip-address=***address* **Example:** `Cisco-Avpair = vpdn:ip-address=172.16.9.9`	Specifies the NAS IP address in the RADIUS user profile.
Step 5	**Cisco-Avpair = vpdn:l2tp-clid-mask-method=**{**right:***character***:***characters* | **remove**} **Example:** `Cisco-Avpair = vpdn:l2tp-clid-mask-method=right:#:5`	Specifies L2TP calling station ID suppression parameters in the RADIUS user profile. • **right**—Masks the calling station ID starting from the right side, using the specified *mask-character* to replace the defined number of *characters*. • **remove**—Removes the entire calling station ID.

Configuration Examples for NAS-Initiated Dial-In VPDN Tunneling

This section contains the following configuration examples:

Configuring the NAS for Dial-In VPDNs: Example

The following example configures a NAS named ISP-NAS to tunnel PPP calls to a tunnel server named ENT-TS using L2TP and local authentication and authorization:

```
! Enable AAA authentication and authorization with RADIUS as the default method
aaa new-model
aaa authentication ppp default radius
aaa authorization network default radius
!
! Configure the VPDN tunnel authentication password using the local name
username ISP-NAS password 7 tunnelme
username ENT-TS password 7 tunnelme
!
vpdn enable
!
! Configure VPN to first search on the client domain name and then on the DNIS
vpdn search-order domain dnis
!
! Allow a maximum of 10 simultaneous VPDN sessions
vpdn session-limit 10
!
! Configure the NAS to initiate VPDN dial-in sessions to the tunnel server
vpdn-group 1
 request-dialin
 protocol l2tp
 domain cisco.com
!
 initiate-to ip 172.22.66.25
 local name ISP-NAS
!
! Specifies the RADIUS server IP address, authorization port, and accounting port
radius-server host 172.22.66.16 auth-port 1645 acct-port 1646
!
! Specifies the authentication key to be used with the RADIUS server
radius-server key cisco
!
```

Configuring the Tunnel Server for Dial-in VPDNs: Example

The following example show a tunnel server named ENT-TS configured to accept L2TP tunnels from a NAS named ISP-NAS using local authentication and authorization:

```
! Configure AAA to first use the local database and then contact the RADIUS server for
! PPP authentication
aaa new-model
aaa authentication ppp default local radius
!
! Configure AAA network authorization and accounting by using the RADIUS server
aaa authorization network default radius
aaa accounting network default start-stop radius
!
! Configure the VPDN tunnel authentication password using the local name
username ISP-NAS password 7 tunnelme
username ENT-TS password 7 tunnelme
!
vpdn enable
!
! Configure the tunnel server to accept dial-in sessions from the NAS
vpdn-group 1
 accept-dialin
```

```
 protocol l2tp
 virtual-template 1
!
 terminate-from hostname ISP-NAS
 local name ENT-TS
 force-local-chap
!
! Configure the virtual template
interface Virtual-Template1
 ip unnumbered Ethernet0
 ppp authentication chap
 peer default ip address pool default
 encapsulation ppp
!
! Specifies the RADIUS server IP address, authorization port, and accounting port
radius-server host 172.22.66.13 auth-port 1645 acct-port 1646
!
! Specifies the authentication key to be used with the RADIUS server
radius-server key cisco
```

L2TP Calling Station ID Suppression with Local Authorization: Example

The following example configures a NAS for PPP over Ethernet over virtual LAN (PPPoEoVLAN). The NAS obtains a calling station ID from LLID NAS port preauthorization through RADIUS. The calling station ID will be removed from AV pair 22 for tunnels associated with the VPDN group named L2TP if the string #184 is included in the username.

```
hostname LAC
!
enable secret 5 $1$8qtb$MHcYeW2kn8VNYgz932eXl.
enable password lab
!
aaa new-model
!
aaa group server radius LLID-Radius
 server 192.168.1.5 auth-port 1645 acct-port 1646
!
aaa group server radius LAC-Radius
 server 192.168.1.6 auth-port 1645 acct-port 1646
!
aaa authentication ppp default local
aaa authorization network default local
aaa authorization network LLID group LLID-Radius
aaa accounting network default start-stop group LAC-Radius
aaa nas port extended
aaa session-id common
!
resource manager
!
ip subnet-zero
ip cef
no ip domain lookup
!
virtual-profile virtual-template 1
vpdn enable
vpdn search-order domain
!
vpdn-group L2TP
 request-dialin
 protocol l2tp
 domain cisco.com
```

```
 domain cisco.com#184
!
 initiate-to ip 192.168.1.4
 local name test
 l2tp tunnel password 0 cisco
 l2tp attribute clid mask-method remove match #184
!
vpdn-group UUT
 accept-dialin
 protocol pppoe
 virtual-template 1
!
subscriber access pppoe pre-authorize nas-port-id LLID send username
!
interface Loopback0
 no ip address
!
interface Loopback1
 ip address 10.1.1.1 255.255.255.0
!
interface Ethernet0/0
 ip address 192.168.1.3 255.255.255.0
 no cdp enable
!
interface Ethernet0/0.20
 encapsulation dot1Q 1024
 no snmp trap link-status
 pppoe enable
 pppoe max-sessions 200
 no cdp enable
!
interface Ethernet1/0
 ip address 10.1.1.10 255.255.255.0
 no cdp enable
!
interface Serial2/0
no ip address
 shutdown
 serial restart-delay 0
!
interface Serial3/0
 no ip address
 shutdown
 serial restart-delay 0
!
interface Virtual-Template1
 ip unnumbered Ethernet1/0
 ip mroute-cache
 no peer default ip address
 ppp authentication pap
!
ip classless
ip route 0.0.0.0 0.0.0.0 Ethernet0/0
ip route 10.0.0.0 255.0.0.0 Ethernet1/0
!
no ip http server
!
radius-server attribute 69 clear
radius-server host 192.168.1.5 auth-port 1645 acct-port 1646
radius-server host 192.168.1.6 auth-port 1645 acct-port 1646
radius-server domain-stripping delimiter #
radius-server key cisco
radius-server vsa send accounting
radius-server vsa send authentication
```

```
!
control-plane
!
line con 0
 exec-timeout 0 0
line aux 0
line vty 0 4
 password lab
```

L2TP Calling Station ID Suppression with RADIUS Authorization: Example

The following example configures a NAS for PPPoEoVLAN. The NAS obtains a calling station ID from LLID NAS port preauthorization through RADIUS. The RADIUS user profile specifies that the calling station ID should be masked by replacing the rightmost six characters with the character X.

NAS Configuration

```
hostname LAC
!
enable secret 5 $1$8qtb$MHcYeW2kn8VNYgz932eXl.
enable password lab
!
aaa new-model
!
aaa group server radius LLID-Radius
 server 192.168.1.5 auth-port 1645 acct-port 1646
!
aaa group server radius LAC-Radius
 server 192.168.1.6 auth-port 1645 acct-port 1646
!
aaa authentication ppp default local
aaa authorization network default group LAC-Radius
aaa authorization network LLID group LLID-Radius
aaa accounting network default start-stop group LAC-Radius
aaa nas port extended
aaa session-id common
!
resource manager
!
ip subnet-zero
ip cef
no ip domain lookup
!
virtual-profile virtual-template 1
vpdn enable
vpdn search-order domain
!
vpdn-group UUT
 accept-dialin
 protocol pppoe
 virtual-template 1
!
subscriber access pppoe pre-authorize nas-port-id LLID send username
!
interface Loopback0
 no ip address
!
interface Loopback1
 ip address 10.1.1.1 255.255.255.0
!
interface Ethernet0/0
```

```
 ip address 192.168.1.3 255.255.255.0
 no cdp enable
!
interface Ethernet0/0.20
 encapsulation dot1Q 1024
 no snmp trap link-status
 pppoe enable
 pppoe max-sessions 200
 no cdp enable
!
interface Ethernet1/0
 ip address 10.1.1.10 255.255.255.0
 no cdp enable
!
interface Serial2/0
no ip address
 shutdown
 serial restart-delay 0
!
interface Serial3/0
 no ip address
 shutdown
 serial restart-delay 0
!
interface Virtual-Template1
 ip unnumbered Ethernet1/0
 ip mroute-cache
 no peer default ip address
 ppp authentication pap
!
ip classless
ip route 0.0.0.0 0.0.0.0 Ethernet0/0
ip route 10.0.0.0 255.0.0.0 Ethernet1/0
!
no ip http server
!
radius-server attribute 69 clear
radius-server host 192.168.1.5 auth-port 1645 acct-port 1646
radius-server host 192.168.1.6 auth-port 1645 acct-port 1646
radius-server domain-stripping delimiter #
radius-server key cisco
radius-server vsa send accounting
radius-server vsa send authentication
!
control-plane
!
line con 0
 exec-timeout 0 0
line aux 0
line vty 0 4
 password lab
```

RADIUS User Profile Configuration

```
Cisco-Avpair = vpdn:l2tp-tunnel-password=cisco
Cisco-Avpair = vpdn:tunnel-type=l2tp
Cisco-Avpair = vpdn:tunnel-id=test
Cisco-Avpair = vpdn:ip-address=192.168.1.4
Cisco-Avpair = vpdn:l2tp-clid-mask-method=right:X:6
```

Where to Go Next

You may perform any of the relevant optional tasks in the "Configuring Additional VPDN Features" and "VPDN Tunnel Management" modules.

Additional References

The following sections provide references related to NAS-initiated VPDNs.

Related Documents

Related Topic	Document Title
VPDN technology overview	"VPDN Technology Overview"
VPDN commands: complete command syntax, command mode, defaults, usage guidelines, and examples	*Cisco IOS VPDN Command Reference*, Release 12.4T
Information about configuring the NAS to accept dialin connections from the client	*Cisco IOS Dial Technologies Configuration Guide*, Release 12.4
Information about configuring the NAS to accept broadband connections from the client	*Cisco IOS Broadband and DSL Configuration Guide*, Release 12.4
Information about virtual templates	"Configuring Virtual Template Interfaces" chapter of the *Cisco IOS Dial Technologies Configuration Guide*, Release 12.4
Dial Technologies commands: complete command syntax, command mode, defaults, usage guidelines, and examples	*Cisco IOS Dial Technologies Command Reference*, Release 12.4T
Technical support documentation for L2TP	*Layer 2 Tunnel Protocol (L2TP)*
Technical support documentation for VPDNs	*Virtual Private Dial-Up Network (VPDN)*

Standards

Standards	Title
None	—

MIBs

MIBs	MIBs Link
• CISCO-VPDN-MGMT-MIB • CISCO-VPDN-MGMT-EXT-MIB	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
RFC 2341	Cisco Layer Two Forwarding (Protocol) "L2F"
RFC 2661	*Layer Two Tunneling Protocol "L2TP"*

Technical Assistance

Description	Link
The Cisco Technical Support 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

Feature Information for NAS-Initiated Dial-In VPDN Tunneling

Table 2 lists the features in this module and provides links to specific configuration information. Only features that were introduced or modified in Cisco IOS Release 12.2(1) or a later release appear in the table.

Not all commands may be available in your Cisco IOS software release. For details on when support for a specific command was introduced, see the command reference documentation.

For information on a feature in this technology that is not documented here, see the "VPDN Features Roadmap."

Cisco IOS software images are specific to a Cisco IOS software release, a feature set, and a platform. Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at http://www.cisco.com/go/fn. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

Note Table 2 lists only the Cisco IOS software release that introduced support for a given feature in a given Cisco IOS software release train. Unless noted otherwise, subsequent releases of that Cisco IOS software release train also support that feature.

Table 2 Feature Information for NAS-Initiated Dial-In VPDN Tunneling

Feature Name	Software Releases	Feature Configuration Information
L2TP Calling Station ID Suppression	12.2(31)SB2	This feature allows the NAS to suppress part or all of the calling station ID from the NAS in the L2TP AV pair 22, the Calling Number ID. Calling station ID suppression can be configured globally on the router, for individual VPDN groups on the router, or on the remote RADIUS server if one is configured. The following sections provide information about this feature: • L2TP Calling Station ID Suppression, page 3 • Configuring L2TP Calling Station ID Suppression, page 16 The following commands were introduced by this feature: **l2tp attribute clid mask-method**, **vpdn l2tp attribute clid mask-method**.
L2TP Extended Failover	12.2(13)T 12.2(28)SB	This feature extends L2TP failover to occur if, during tunnel establishment, a router receives a StopCCN message from its peer, or during session establishment a router receives a CDN message from its peer. In either case, the router selects an alternate peer to contact. The following provides information about this feature: • L2TP Failover, page 3 No commands were introduced or modified by this feature.