



# L2TP Dial-Out Load Balancing and Redundancy

The L2TP Dial-Out Load Balancing and Redundancy feature enables an L2TP network server (LNS) to dial out to multiple L2TP access concentrators (LACs). When the LAC with the highest priority goes down, it is possible for the LNS to failover to another lower priority LAC. The LNS can also load balance the sessions between multiple LACs that have the same priority settings.

## Feature Specifications for L2TP Dial-Out Load Balancing and Redundancy

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### Feature History

Release	Modification
12.2(15)T	This feature was introduced.

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### Supported Platforms

Cisco 7200, Cisco 7400

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## Finding Support Information for Platforms and Cisco IOS Software Images

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.

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# Restrictions for L2TP Dial-Out Load Balancing and Redundancy

Because multiple LACs are configured using the same virtual private dial-up network (VPDN) group, they must have the same tunnel configuration settings (the same L2TP tunnel password, for example).

## Information About L2TP Dial-Out Load Balancing and Redundancy

To configure the L2TP Dial-Out Load Balancing and Redundancy feature, you need to understand the following concepts:

- [Dial-Out and Multiple LACs on the LNS, page 2](#)
- [L2TP Load Balancing and Redundancy, page 2](#)

## Dial-Out and Multiple LACs on the LNS

In Cisco IOS software prior to Release 12.2(15)T, Layer 2 Tunneling Protocol (L2TP) large-scale dial-out using the Stacked Group Bidding Protocol (SGBP) provided a different form of load balancing and redundancy. The LNS was configured with the IP address of the primary LAC using the **initiate-to** VPDN group configuration command. The LNS would initially contact the primary LAC, so therefore the primary LAC had to be up and running for dial-out to take place. When the primary LAC was down, no dial-out could take place. When the primary LAC was up, the LAC would determine among itself and the secondary LACs which LAC had the least congestion, and then inform the LNS to use the selected LAC for dial-out.

Additionally, the **initiate-to** VPDN group configuration command used to specify the IP address for the tunnel did not support multiple statements on an LNS; only the IP address of the primary LAC could be configured. Therefore, the LNS could not contact any other LACs when the primary LAC went down, and failover was not supported for dial-out calls by the LNS.

The L2TP Dial-Out Load Balancing and Redundancy feature introduced in Cisco IOS Release 12.2(15)T enables an LNS to dial out to multiple LACs (multiple **initiate-to** VPDN group configuration commands, and therefore multiple IP addresses, are supported).

## L2TP Load Balancing and Redundancy

The L2TP Dial-Out Load Balancing and Redundancy feature supports load balancing between multiple LACs that have the same priority settings in the **initiate-to** VPDN group configuration commands. You can also set redundancy and failover by configuring differing priority values in the **initiate-to** VPDN group configuration commands. When the LAC with the highest priority goes down, the LNS will failover to another lower priority LAC.

# How to Configure L2TP Dial-Out Load Balancing and Redundancy

This section contains the following required procedure:

- [Configuring Multiple LACs on the LNS, page 3](#) (required)

## Configuring Multiple LACs on the LNS

To configure the L2TP Dial-Out Load Balancing and Redundancy feature, you configure multiple **initiate-to** command statements under a VPDN request dialout configuration. You will need to select the tunneling protocol and assign the VPDN subgroup to either a dial pool or rotary group. In most cases, defaults provided by the Cisco IOS software will configure the L2TP tunnel with the appropriate timers; however, you can use **l2tp tunnel** VPDN group configuration commands to change the default tunnel timer settings, if necessary.

## Prerequisites

The L2TP Dial-Out Load Balancing and Redundancy feature provides additional functionality for large-scale dial-out networks and Layer 2 tunneling. It is assumed that a network is already configured and operational, and that the task in this document will be performed on an operating network. See the [“Additional References”](#) section for information about large-scale dial-out networks and Layer 2 tunneling.

To configure an LNS with multiple LACs for the L2TP Dial-Out Load Balancing and Redundancy feature, use the following commands. (Note that the **l2tp tunnel** commands are optional and should only be used if it becomes necessary to change the default settings for these commands.)

## SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **vpdn-group** *name*
4. **request-dialout**
5. **protocol** {*l2f* | *l2tp* | *pppoe* | *any*}
6. **pool-member** *pool-number*  
or  
**rotary-group** *group-number*
7. **exit**
8. **initiate-to ip** *ip-address* [**limit** *limit-number*] [**priority** *priority-number*]
9. **l2tp tunnel retransmit initial retries** *number* (optional)
10. **l2tp tunnel retransmit initial timeout** {**min** | **max**} *seconds* (optional)
11. **l2tp tunnel busy timeout** *seconds* (optional)
12. **exit**

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>Enter your password if prompted.</li> </ul>
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<b>vpdn-group</b> <i>name</i>  <b>Example:</b> Router(config)# vpdn-group 1	Creates a VPDN group and starts VPDN group configuration mode.
Step 4	<b>request-dialout</b>  <b>Example:</b> Router(config-vpdn)# request-dialout	Enables an LNS to request VPDN dial-out calls by using L2TP, and starts VPDN request-dialout configuration mode. <ul style="list-style-type: none"> <li>For a VPDN group to request dial-out calls, you must select a tunneling protocol, and assign the VPDN subgroup using either the <b>pool-member</b> or <b>rotary-group</b> command.</li> </ul>
Step 5	<b>protocol l2tp</b>  <b>Example:</b> Router(config-vpdn-req-ou)# protocol l2tp	Specifies the tunneling protocol that the VPDN subgroup will use. Configure L2TP for the the L2TP Dial-Out Load Balancing and Redundancy feature.
Step 6	<b>pool-member</b> <i>pool-number</i>  <b>Example:</b> Router(config-vpdn-req-ou)# pool-member 1  or  <b>rotary-group</b> <i>group-number</i>  <b>Example:</b> Router(config-vpdn-req-ou)# rotary-group 1	Assigns a request-dialout VPDN subgroup to a dialer pool.  or  Assigns a request-dialout VPDN subgroup to a dialer rotary group.
Step 7	<b>exit</b>  <b>Example:</b> Router(config-vpdn-req-ou)# exit	Exits VPDN request-dialout configuration mode.

	Command or Action	Purpose
Step 8	<p><b>initiate-to ip</b> <i>ip-address</i> [<b>limit</b> <i>limit-number</i>] [<b>priority</b> <i>priority-number</i>]</p> <p><b>Example:</b> Router(config-vpdn)# initiate-to ip 10.0.58.201 priority 1</p>	<p>Specifies the IP address that will be used for Layer 2 tunneling, and includes the following options:</p> <ul style="list-style-type: none"> <li>– <b>limit</b>—Maximum number of connections that can be made to this IP address.</li> <li>– <b>priority</b>—Priority for this IP address (1 is the highest).</li> </ul> <ul style="list-style-type: none"> <li>• Multiple <b>initiate-to</b> commands can be entered to configure multiple LACs. The LACs can also be configured to provide load balancing and redundancy for failover; see the examples in the “<a href="#">Configuration Examples for L2TP Dial-Out Load Balancing and Redundancy</a>” section.</li> </ul>
Step 9	<p><b>l2tp tunnel retransmit initial retries</b> <i>number</i></p> <p><b>Example:</b> Router(config-vpdn)# l2tp tunnel retransmit initial retries 5</p>	<p>(Optional) Sets the number of times that the router will attempt to send out the initial control packet for tunnel establishment before considering a router busy, in a range from 1 to 1000.</p> <ul style="list-style-type: none"> <li>• Default is two tries.</li> </ul>
Step 10	<p><b>l2tp tunnel retransmit initial timeout</b> {<b>min</b>   <b>max</b>} <i>seconds</i></p> <p><b>Example:</b> Router(config-vpdn)# l2tp tunnel retransmit initial timeout min 4</p>	<p>(Optional) Sets the minimum or maximum amount of time that the router will wait before resending an initial packet out to establish a tunnel, in a range of from 1 to 8 seconds.</p> <ul style="list-style-type: none"> <li>• Minimum (<b>min</b>) default is 1 second; maximum (<b>max</b>) default is 8 seconds.</li> </ul>
Step 11	<p><b>l2tp tunnel busy timeout</b> <i>seconds</i></p> <p><b>Example:</b> Router(config-vpdn)# l2tp tunnel busy timeout 420</p>	<p>(Optional) Configures the amount of time that the router will wait before attempting to recontact a router that was previously busy, in a range from 60 to 6000 seconds.</p> <ul style="list-style-type: none"> <li>• Default is 300 seconds.</li> </ul>
Step 12	<p><b>exit</b></p> <p><b>Example:</b> Router(config-vpdn)# exit</p>	<p>Exits VPDN group configuration mode.</p>

## Troubleshooting Tips

Use the **show running-config EXEC** command to display the configuration and check that the VPDN group and subgroups are configured correctly.

# Configuration Examples for L2TP Dial-Out Load Balancing and Redundancy

This section provides the following configuration examples to show how the L2TP Dial-Out Load Balancing and Redundancy feature might be configured:

- [L2TP Dial-Out Load Balancing Example, page 6](#)
- [L2TP Dial-Out Failover Redundancy Example, page 6](#)
- [L2TP Dial-Out Failover Redundancy with Tunnel Timers Example, page 7](#)

## L2TP Dial-Out Load Balancing Example

The following partial example shows how to configure multiple LACs on a LNS, and load balance calls to the LACs by assigning the same priority value to each in the **initiate-to** commands:

```
!
vpdn enable
vpdn search-order domain
!
vpdn-group 1
:
:
request-dialout
protocol l2tp
pool-member 1
initiate-to ip 10.0.58.201 priority 10
initiate-to ip 10.0.58.205 priority 10
initiate-to ip 10.0.58.207 priority 10
initiate-to ip 10.0.58.209 priority 10
:
:
```

## L2TP Dial-Out Failover Redundancy Example

The following partial example shows how to set priorities in the **initiate-to** command to configure redundant LACs that will be accessed by the LNS in the event of call failure. When the LAC with the highest priority goes down, the LNS will failover to another, lower priority LAC. The highest priority value you can assign to a LAC is 1.

```
!
vpdn enable
vpdn search-order domain
!
vpdn-group 1
:
:
request-dialout
protocol l2tp
pool-member 1
initiate-to ip 10.0.58.201 priority 1
initiate-to ip 10.0.58.205 priority 100
:
:
```

## L2TP Dial-Out Failover Redundancy with Tunnel Timers Example

The following partial example shows how to set parameters to control how many times an LNS will retry connecting to a LAC, and the amount of time after which the LAC will declare itself down or busy so that the LNS will try connecting to the next LAC:

```
!
vpdn enable
vpdn search-order domain
!
vpdn-group 1
:
:
request-dialout
  protocol l2tp
  pool-member 1
  initiate-to ip 10.0.58.201 priority 1
  initiate-to ip 10.0.58.207 priority 50
  initiate-to ip 10.0.58.205 priority 100
  l2tp tunnel retransmit initial retries 5
  l2tp tunnel retransmit initial timeout min 4
  l2tp tunnel busy timeout 420
:
:
```

## Additional References

For additional information related to L2TP Dial-Out Load Balancing and Redundancy, see the following sections:

- [Related Documents, page 7](#)
- [Standards, page 8](#)
- [MIBs, page 8](#)
- [RFCs, page 8](#)
- [Technical Assistance, page 8](#)

## Related Documents

Related Topic	Document Title
Large-scale dial-out	<i>Cisco IOS Dial Technologies Configuration Guide</i> , Release 12.2; refer to the chapter “Configuring Large-Scale Dial-Out.”
Stack Group Bidding Protocol	<i>Cisco IOS Dial Technologies Configuration Guide</i> , Release 12.2; refer to the chapter “Configuring Multichassis Multilink PPP.”
VPDN groups	<i>Cisco IOS Dial Technologies Configuration Guide</i> , Release 12.2; refer to the chapter “Configuring Virtual Private Networks.”

## Standards

Standards	Title
None	—

## MIBs

MIBs	MIBs Link
None	To obtain lists of supported MIBs by platform and Cisco IOS release, and to download MIB modules, go to the Cisco MIB website on Cisco.com at the following URL:  <a href="http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml">http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml</a>

To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:

<http://tools.cisco.com/ITDIT/MIBS/servlet/index>

If Cisco MIB Locator does not support the MIB information that you need, you can also obtain a list of supported MIBs and download MIBs from the Cisco MIBs page at the following URL:

<http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>

To access Cisco MIB Locator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to [cco-locksmith@cisco.com](mailto:cco-locksmith@cisco.com). An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions found at this URL:

<http://www.cisco.com/register>

## RFCs

RFCs	Title
None	—

## Technical Assistance

Description	Link
Technical Assistance Center (TAC) home page, containing 30,000 pages of searchable technical content, including links to products, technologies, solutions, technical tips, tools, and lots more. Registered Cisco.com users can log in from this page to access even more content.	<a href="http://www.cisco.com/public/support/tac/home.shtml">http://www.cisco.com/public/support/tac/home.shtml</a>

# Command Reference

This section documents the modified **initiate-to** VPDN group configuration command. All other commands used with this feature are documented in the Cisco IOS Release 12.2 T command reference publications.

# initiate-to

To specify an IP address that will be used for Layer 2 tunneling, use the **initiate-to** command in VPDN group configuration mode. To remove an IP address from the VPDN group, use the **no** form of this command.

**initiate-to ip** *ip-address* [**limit** *limit-number*] [**priority** *priority-number*]

**no initiate-to** [**ip** *ip-address*]

## Syntax Description

<b>ip</b> <i>ip-address</i>	IP address of the router that will be tunneled to.
<b>limit</b> <i>limit-number</i>	(Optional) Maximum number of connections that can be made to this IP address in the range from 0 to 32767.
<b>priority</b> <i>priority-number</i>	(Optional) Priority for this IP address in the range from 1 to 32767. 1 is the highest priority.

## Defaults

This command is disabled.

## Command Modes

VPDN group configuration

## Command History

Release	Modification
12.0(5)T	This command was introduced.
12.2(15)T	This command was enhanced with the capability to configure multiple L2TP access concentrators (LACs) on an L2TP network server (LNS) within the same VPDN group.

## Usage Guidelines

Before you can use this command, you must enable one of the two request VPDN subgroups by using either the **request dialin** or **request dialout** command.

A LAC configured to request dial-in can be configured with multiple **initiate-to** commands to tunnel to more than one IP address.

An LNS configured to request dial-out can be configured with with multiple **initiate-to** commands to tunnel to more than one IP address.

## Examples

The following example configures VPDN group 1 to request an L2TP tunnel to the peer at IP address 10.3.2.1 for tunneling dial-out calls from dialer pool 1. This group can tunnel a maximum of five simultaneous users and it has the second highest priority for requesting dial-out calls.

```
vpdn-group 1
 request-dialout
  protocol l2tp
  pool-member 1
 initiate-to ip 10.3.2.1 limit 5 priority 2
```

The following example configures VPDN group 1 to request L2TP tunnels to the peers (LACs) at IP addresses 10.0.58.201 and 10.0.58.205. The two LACs configured by the **initiate-to** commands have differing priority values to provide failover redundancy.

```
vpdn-group 1
  accept-dialin
  protocol l2tp
  virtual-template 1
  request-dialout
  protocol l2tp
  pool-member 1
  initiate-to ip 10.0.58.201 priority 1
  initiate-to ip 10.0.58.205 priority 100
  source-ip 10.0.58.211
```

In the previous example, you would configure load balancing among the LACs by setting the **priority** values in the **initiate-to** commands to the same values.

The following partial example shows how to set parameters to control how many times an LNS will retry connecting to a LAC, and the amount of time after which the LAC will declare itself down or busy so that the LNS will try connecting to the next LAC. (Note that the **l2tp tunnel** commands are optional and should be used only if it becomes necessary to change the default settings for these commands.)

```
!
vpdn enable
vpdn search-order domain
!
vpdn-group 1
.
.
.
  request-dialout
  protocol l2tp
  pool-member 1
  initiate-to ip 10.0.58.201 priority 1
  initiate-to ip 10.0.58.207 priority 50
  initiate-to ip 10.0.58.205 priority 100
  l2tp tunnel retransmit initial retries 5
  l2tp tunnel retransmit initial timeout min 4
  l2tp tunnel busy timeout 420
.
.
.
```

#### Related Commands

Command	Description
<b>l2tp tunnel busy timeout</b>	Configures the amount of time that the router will wait before attempting to recontact a router that was previously busy.
<b>l2tp tunnel retransmit initial retries</b>	Sets the number of times that the router will attempt to send out the initial control packet for tunnel establishment before considering a router busy.
<b>l2tp tunnel retransmit initial timeout</b>	Sets the minimum or maximum amount of time that the router will wait before resending an initial packet out to establish a tunnel.

<b>Command</b>	<b>Description</b>
<b>request-dialin</b>	Configures a LAC to request L2F or L2TP tunnels to an LNS and create a request-dialin VPDN subgroup, and specifies a dial-in L2F or L2TP tunnel to a remote peer if a dial-in request is received for a specified domain or DNIS.
<b>request-dialout</b>	Enables an LNS to request VPDN dial-out calls by using L2TP.
<b>source-ip</b>	Specifies an alternate IP address for a VPDN tunnel that is different from the physical IP address used to open the tunnel.