

L2TP Load Balancing and Failover

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Introduction

This document explains the capabilities of a L2TP access concentrator (LAC) that performs load balancing and failover functions to multiple L2TP network servers (LNS).

Prerequisites

Requirements

There are no specific requirements for this document.

Components Used

This document is not restricted to specific software and hardware versions.

Conventions

Refer to Cisco Technical Tips Conventions for more information on document conventions.

LNS Load Balancing

When using RADIUS to deliver virtual private dial–up network (VPDN) tunnel information to a LAC, it is possible to forward users of the same dialed number identification service (DNIS) or domain to multiple LNS. This is a requirement when the incoming tunnels and sessions need to be shared across multiple LNSs to aid in load distribution and offer higher levels of redundancy. In order to enable the load balancing feature, the IP addresses for each LNS that is available as a tunnel endpoint must be delivered in the Cisco vendor–specific attribute (VSA) attribute/value pair.

```
Cisco:Avpair = "vpdn:ip-addresses=10.51.6.82,10.51.6.59"
```

The ',' is used as a delimiter to indicate that there are multiple endpoints available to the LAC (you can also use a space as the delimiter to indicate equal priority of tunnel endpoints). The LAC selects which endpoint to use based on the random selection of the first non-active IP address delivered. If this is busy (the LAC cannot connect to the IP address) the next IP address is selected. If there are no non-active IP addresses available, the next selection is based on an IP address that is in 'open tunnel state', and finally an IP address that is 'pending tunnel state'.

LNS Failover

Cisco IOS® software allows a maximum of six priority levels when utilizing multiple LNSs. By using the '/' as the delimiter, you can assign different priority groups to the LNS that are downloaded to the LAC. This allows certain LNSs to operate as the primary LNS and others as a backup. As before, the tunnel endpoints are delivered in the Cisco VSA attribute/value pair.

```
Cisco:Avpair = "vpdn:ip-addresses=10.51.6.82/10.51.6.59"
```

The '/' delimiter indicates that 10.51.6.82 is in Priority Group 1 and 10.51.6.59 is in Priority Group 2.

LNS Load Balancing and Failover

It is possible to use both load balancing and failover in the same profile. This is achieved by using the Cisco VSA attribute/value pair "vpdn:ip-addresses", as shown here:

```
Cisco:Avpair = "vpdn:ip-addresses=  
1.1.1.1,2.2.2.2/3.3.3.3,4.4.4.4/5.5.5.5,6.6.6.6"
```

This is interpreted as:

- tunnel endpoints 1.1.1.1 and 2.2.2.2 are in Priority Group 1
- tunnel endpoints 3.3.3.3 and 4.4.4.4 are in Priority Group 2
- tunnel endpoints 5.5.5.5 and 6.6.6.6 are in Priority Group 3

The load balancing function is performed on Priority Group 1 – non-active/non-busy, open, pending. If none are available at this priority level, go to the next priority level, and continue the selection logic.

Lab Testing

The testing in this section shows three different scenarios for using the load balancing and failover features:

- LNS load balancing using Cisco vendor-specific attribute/value pairs
- LNS Failover using Cisco vendor-specific attribute/value pairs
- LNS load balancing and failover using Cisco vendor-specific attribute/value pairs

LNS Load Balancing using Cisco Vendor-Specific Attribute/Value Pairs

RADIUS Profile

RADIUS user and tunnel profiles on Merit RADIUS Server 3.6B:

```
2500-1 Password = "cisco"
```

Cisco – L2TP Load Balancing and Failover

```

Service-Type = Framed,
Framed-Protocol = PPP,
Framed-IP-Address = 255.255.255.255

dnis:614629 Password = "cisco"
Service-Type = Outbound,
Cisco:Avpair = "vpdn:tunnel-type=l2tp",
Cisco:Avpair = "vpdn:tunnel-id=hgw",
Cisco:Avpair = "vpdn:ip-addresses=10.51.6.82,10.51.6.59",
Cisco:Avpair = "vpdn:l2tp-tunnel-password=hello"

```

LAC – Configuration

```

aaa new-model

!--- Enables Authentication, Authorization and Accounting functionality.

aaa group server radius NSA_LAB
server 10.51.6.3 auth-port 1645 acct-port 0 non-standard
!
aaa authentication login default local
aaa authentication ppp default local group NSA_LAB
aaa authentication ppp DIAL group NSA_LAB local
aaa authorization network default group NSA_LAB local
aaa authorization network DIAL group NSA_LAB local

!--- Authentication and Authorization will be implemented
!--- in sequence by the methods configured.

vpdn enable

!--- Enables the VPDN feature.

no vpdn logging
vpdn search-order dnis

!--- Once LCP state is open, the dialed number is checked
!--- to see if the remote is a VPDN user.

interface Serial0:15
no ip address
encapsulation ppp
no logging event link-status
dialer rotary-group 1
dialer-group 1
autodetect encapsulation ppp v120
no snmp trap link-status
isdn switch-type primary-net5
isdn incoming-voice modem
compress stac
!
interface Dialer1
ip unnumbered Loopback0
encapsulation ppp
no ip mroute-cache
dialer-group 1
autodetect encapsulation ppp v120

!--- Allows the encapsulation type to be dynamically set if the call
!--- type is not identified in the ISDN Q.931 Lower Layer Compatibility.

peer default ip address pool default
compress stac

```

```

ppp authentication chap pap DIAL
ppp authorization DIAL

!--- The list-name DIAL is configured, that PPP Authentication and
!--- Authorization will use.

ppp chap hostname 5300-1

!--- The name 5300-1 is used for all CHAP challenge and response on
!--- this interface.

ppp multilink
!
radius-server host 10.51.6.3 auth-port 1645 acct-port 1646 non-standard

!--- 'non-standard' indicates that the RADIUS Server will use
!--- non standard RADIUS attributes.

```

LNS – Configuration

```

aaa new-model

!--- Enables Authentication, Authorization and Accounting functionality.

aaa authentication login default local
aaa authentication enable default group radius enable
aaa authentication ppp default local
aaa authentication ppp vpdn group radius none
aaa authorization network default local none
aaa authorization network vpdn group radius local

!--- Authentication and Authorization will be implemented
!--- in sequence by the methods configured.

vpdn enable

!--- Enables the VPDN feature.

vpdn-group 1
accept-dialin
protocol l2tp
virtual-template 1
local name l2tp-gw
l2tp tunnel password 7 1211001B1E04

!--- The LNS will accept connections from the LAC using L2TP
!--- using All Virtual-Access Interfaces that are created will be cloned from
!--- Virtual-Template 1. The name 'l2tp-gw' is used to identify the password,
!--- that will authenticate the tunnel, is encrypted.

interface Ethernet5/0
ip address 10.51.6.59 255.255.252.0
!
interface Virtual-Template1
ip unnumbered Ethernet5/0
no ip route-cache cef
peer default ip address pool default
ppp authentication chap vpdn
ppp authorization vpdn
!
radius-server host 10.51.6.3 auth-port 1645 acct-port 1646 non-standard

```

*!--- 'non-standard' identifies the RADIUS Server will be
!--- using nonstandard RADIUS attributes.*

Debugs Taken from LAC

```
Jan 1 00:32:54.847: %LINK-3-UPDOWN: Interface Serial0:0, changed state to up
Jan 1 00:32:55.027: Se0:0 PPP: Treating connection as a callin
Jan 1 00:32:55.027: Se0:0 PPP: Phase is ESTABLISHING, Passive Open
Jan 1 00:32:55.027: Se0:0 CHAP: Using alternate hostname 5300-1
Jan 1 00:32:55.027: Se0:0 LCP: State is Listen
Jan 1 00:32:55.027: Se0:0 LCP: I CONFREQ [Listen] id 112 len 10
- snip -
Jan 1 00:32:55.063: Se0:0 LCP: State is Open
Jan 1 00:32:55.063: Se0:0 PPP: Phase is AUTHENTICATING, by this end
Jan 1 00:32:55.063: Se0:0 CHAP: Using alternate hostname 5300-1
Jan 1 00:32:55.063: Se0:0 CHAP: O CHALLENGE id 14 len 27 from "5300-1"
Jan 1 00:32:55.083: Se0:0 CHAP: I RESPONSE id 14 len 27 from "2500-1"
Jan 1 00:32:55.083: Se0:0 PPP: Phase is FORWARDING
Jan 1 00:32:55.083: Se0:0 VPDN: Got DNIS string 614629
Jan 1 00:32:55.083: Se0:0 VPDN: Looking for tunnel -- dnis:614629 --
Jan 1 00:32:55.083: Serial0:0 AAA/AUTHOR/VPDN (480033158):
Port='Serial0:0' list='default' service=NET
Jan 1 00:32:55.083: AAA/AUTHOR/VPDN: Serial0:0 (480033158) user='dnis:614629'
Jan 1 00:32:55.087: Serial0:0 AAA/AUTHOR/VPDN (480033158): send AV service=ppp
Jan 1 00:32:55.087: Serial0:0 AAA/AUTHOR/VPDN (480033158): send AV protocol=vpdn
Jan 1 00:32:55.087: Serial0:0 AAA/AUTHOR/VPDN (480033158): found list "default"
Jan 1 00:32:55.087: Serial0:0 AAA/AUTHOR/VPDN (480033158): Method=NSA_LAB (radius)
Jan 1 00:32:55.087: RADIUS: Initial Transmit Serial0:0 id 50 10.51.6.3:1645,
Access-Request, len 100
Jan 1 00:32:55.087: Attribute 4 6 0A330644
Jan 1 00:32:55.087: Attribute 5 6 00000000
Jan 1 00:32:55.087: Attribute 26 17 000000009020B5365
Jan 1 00:32:55.087: Attribute 61 6 00000002
Jan 1 00:32:55.087: Attribute 1 13 646E6973
Jan 1 00:32:55.087: Attribute 30 8 36313436
Jan 1 00:32:55.087: Attribute 2 18 F0AF3BC4
Jan 1 00:32:55.087: Attribute 6 6 00000005
Jan 1 00:32:55.091: RADIUS: Received from id 50 10.51.6.3:1645,
Access-Accept, len 167
Jan 1 00:32:55.091: Attribute 6 6 00000005
Jan 1 00:32:55.091: Attribute 26 29 0000000901177670
Jan 1 00:32:55.091: Attribute 26 26 0000000901147670
Jan 1 00:32:55.091: Attribute 26 47 0000000901297670
Jan 1 00:32:55.091: Attribute 26 39 0000000901217670

!--- LAC receives a call, negotiates PPP, LCP is declared Open,  
!--- the dialed number is queried to ascertain if this is a VPDN customer.  
!--- VPDN attempts to find an existing tunnel for the user, queries RADIUS for  
!--- the tunnel information.

Jan 1 00:32:55.091: RADIUS: saved authorization data for user 61F40024 at
61F9813C
Jan 1 00:32:55.091: RADIUS: cisco AVPair "vpdn:tunnel-type=l2tp"
Jan 1 00:32:55.091: RADIUS: cisco AVPair "vpdn:tunnel-id=hgw"
Jan 1 00:32:55.091: RADIUS: cisco AVPair "vpdn:ip-addresses=10.51.6.82,10.51.6.59"
Jan 1 00:32:55.095: RADIUS: cisco AVPair "vpdn:l2tp-tunnel-password=hello"
Jan 1 00:32:55.095: AAA/AUTHOR (480033158): Post authorization status = PASS_ADD
Jan 1 00:32:55.095: AAA/AUTHOR/VPDN: Processing AV service=ppp
Jan 1 00:32:55.095: AAA/AUTHOR/VPDN: Processing AV protocol=vpdn
Jan 1 00:32:55.095: AAA/AUTHOR/VPDN: Processing AV tunnel-type=l2tp
Jan 1 00:32:55.095: AAA/AUTHOR/VPDN: Processing AV tunnel-id=hgw
Jan 1 00:32:55.095: AAA/AUTHOR/VPDN: Processing AV ip-addresses=
```

10.51.6.82,10.51.6.59

```
Jan 1 00:32:55.095: AAA/AUTHOR/VPDN: Processing AV l2tp-tunnel-password=hello
Jan 1 00:32:55.095: Se0:0 VPDN/RPMS/: Got tunnel info for dnis:614629
Jan 1 00:32:55.095: Se0:0 VPDN/RPMS/: LAC hgw
Jan 1 00:32:55.095: Se0:0 VPDN/RPMS/: l2tp-busy-disconnect yes
Jan 1 00:32:55.095: Se0:0 VPDN/RPMS/: l2tp-tunnel-password xxxxxx
Jan 1 00:32:55.095: Se0:0 VPDN/RPMS/: 2 IP addresses
Jan 1 00:32:55.095: Se0:0 VPDN/RPMS/: IP 10.51.6.82 Priority 1
Jan 1 00:32:55.095: Se0:0 VPDN/RPMS/: IP 10.51.6.59 Priority 1
Jan 1 00:32:55.095: Se0:0 VPDN/: curlvl 1 Address 0: 10.51.6.82, priority 1
Jan 1 00:32:55.095: Se0:0 VPDN/: Select non-active address 10.51.6.82, priority 1
```

```
!--- The tunnel information is downloaded, using Cisco VSA. Two LNS IP
!--- Addresses are used with a ',' as the delimiter, indicating that both
!--- have equal priority. In this case 10.51.6.82 is selected as the tunnel
!--- endpoint.
```

```
Jan 1 00:32:55.095: Se0:0 VPDN: Find LNS process created
Jan 1 00:32:55.095: Tnl 49467 L2TP: SM State idle
Jan 1 00:32:55.095: Tnl 49467 L2TP: O SCCRQ
Jan 1 00:32:55.099: Tnl 49467 L2TP: Tunnel state change from idle to
wait-ctl-reply
Jan 1 00:32:55.099: Tnl 49467 L2TP: SM State wait-ctl-reply
Jan 1 00:32:55.099: Se0:0 VPDN: Forward to address 10.51.6.82
Jan 1 00:32:55.099: Se0:0 VPDN: Pending
Jan 1 00:32:55.099: Se0:0 VPDN: Process created
Jan 1 00:32:55.191: Tnl 49467 L2TP: I SCCRP from l2tp-gw
Jan 1 00:32:55.191: Tnl 49467 L2TP: Got a challenge from remote peer, l2tp-gw
Jan 1 00:32:55.191: Tnl 49467 L2TP: Got a response from remote peer, l2tp-gw
Jan 1 00:32:55.191: Tnl 49467 L2TP: Tunnel Authentication success
Jan 1 00:32:55.191: Tnl 49467 L2TP: Tunnel state change from
wait-ctl-reply to established
Jan 1 00:32:55.191: Tnl 49467 L2TP: O SCCCN to l2tp-gw tnlid 62193
Jan 1 00:32:55.195: Tnl 49467 L2TP: SM State established
Jan 1 00:32:55.195: Tnl/Cl 49467/16 L2TP: Session FS enabled
Jan 1 00:32:55.195: Tnl/Cl 49467/16 L2TP: Session state change
from idle to wait-for-tunnel
Jan 1 00:32:55.195: Se0:0 Tnl/Cl 49467/16 L2TP: Create session
Jan 1 00:32:55.195: Tnl 49467 L2TP: SM State established
Jan 1 00:32:55.195: Se0:0 Tnl/Cl 49467/16 L2TP: O ICRQ to l2tp-gw 62193/0
Jan 1 00:32:55.195: Se0:0 Tnl/Cl 49467/16 L2TP: Session state change
from wait-for-tunnel to wait-reply
Jan 1 00:32:55.195: Se0:0 VPDN: 2500-1 is forwarded
Jan 1 00:32:55.327: Se0:0 Tnl/Cl 49467/16 L2TP: O ICCN to l2tp-gw 62193/17
Jan 1 00:32:55.327: Se0:0 Tnl/Cl 49467/16 L2TP: Session state change
from wait-reply to established
Jan 1 00:32:56.195: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0:0,
changed state to up
Jan 1 00:33:00.851: %ISDN-6-CONNECT:Interface Serial0:0 is now connected to 2500-1
Jan 1 00:33:06.111: %ISDN-6-CONNECT:
Interface Serial0:1 is now connected to N/A N/A
```

```
!--- Second call is received by the LAC,
!--- the dialed number is a VPDN customer.
```

```
Jan 1 00:33:35.027: As1 LCP: I CONFREQ [Closed] id 1 len 23
- snip -
Jan 1 00:33:39.275: As1 LCP: State is Open
Jan 1 00:33:39.275: As1 PPP: Phase is AUTHENTICATING, by this end
Jan 1 00:33:39.275: As1 CHAP: Using alternate hostname 5300-1
Jan 1 00:33:39.275: As1 CHAP: O CHALLENGE id 2 len 27 from "5300-1"
Jan 1 00:33:39.383: As1 CHAP: I RESPONSE id 2 len 25 from "paul"
Jan 1 00:33:39.383: As1 PPP: Phase is FORWARDING
Jan 1 00:33:39.383: As1 VPDN: Got DNIS string 614629
```

```

Jan 1 00:33:39.383: As1 VPDN: Looking for tunnel -- dnis:614629 --
Jan 1 00:33:39.387: Async1 AAA/AUTHOR/VPDN (3019717950):
Port='Async1' list='default' service=NET
Jan 1 00:33:39.387: AAA/AUTHOR/VPDN: Async1 (3019717950) user='dnis:614629'
Jan 1 00:33:39.387: Async1 AAA/AUTHOR/VPDN (3019717950): send AV service=ppp
Jan 1 00:33:39.387: Async1 AAA/AUTHOR/VPDN (3019717950): send AV protocol=vpdn
Jan 1 00:33:39.387: Async1 AAA/AUTHOR/VPDN (3019717950): found list "default"
Jan 1 00:33:39.387: Async1 AAA/AUTHOR/VPDN (3019717950): Method=NSA_LAB (radius)
Jan 1 00:33:39.387: RADIUS: Initial Transmit Async1 id 52 10.51.6.3:1645,
Access-Request, len 97
Jan 1 00:33:39.387: Attribute 4 6 0A330644
Jan 1 00:33:39.387: Attribute 5 6 00000001
Jan 1 00:33:39.387: Attribute 26 14 0000000902084173
Jan 1 00:33:39.387: Attribute 61 6 00000000
Jan 1 00:33:39.387: Attribute 1 13 646E6973
Jan 1 00:33:39.387: Attribute 30 8 36313436
Jan 1 00:33:39.387: Attribute 2 18 E9164E4C
Jan 1 00:33:39.387: Attribute 6 6 00000005
Jan 1 00:33:39.391: RADIUS: Received from id 52 10.51.6.3:1645,
Access-Accept, len 167
Jan 1 00:33:39.391: Attribute 6 6 00000005
Jan 1 00:33:39.391: Attribute 26 29 0000000901177670
Jan 1 00:33:39.391: Attribute 26 26 0000000901147670
Jan 1 00:33:39.391: Attribute 26 47 0000000901297670
Jan 1 00:33:39.391: Attribute 26 39 0000000901217670
Jan 1 00:33:39.391: RADIUS: saved authorization data for user
621904CC at 61FAB9EC
Jan 1 00:33:39.391: RADIUS: cisco AVPair "vpdn:tunnel-type=l2tp"
Jan 1 00:33:39.391: RADIUS: cisco AVPair "vpdn:tunnel-id=hgw"
Jan 1 00:33:39.391: RADIUS: cisco AVPair "vpdn:ip-addresses=10.51.6.82,10.51.6.59"
Jan 1 00:33:39.391: RADIUS: cisco AVPair "vpdn:l2tp-tunnel-password=hello"
Jan 1 00:33:39.395: AAA/AUTHOR (3019717950): Post authorization status = PASS_ADD
Jan 1 00:33:39.395: AAA/AUTHOR/VPDN: Processing AV service=ppp
Jan 1 00:33:39.395: AAA/AUTHOR/VPDN: Processing AV protocol=vpdn
Jan 1 00:33:39.395: AAA/AUTHOR/VPDN: Processing AV tunnel-type=l2tp
Jan 1 00:33:39.395: AAA/AUTHOR/VPDN: Processing AV tunnel-id=hgw
Jan 1 00:33:39.395: AAA/AUTHOR/VPDN:
Processing AV ip-addresses=10.51.6.82,10.51.6.59
Jan 1 00:33:39.395: AAA/AUTHOR/VPDN:
Processing AV l2tp-tunnel-password=hello
Jan 1 00:33:39.395: As1 VPDN/RPMS/: Got tunnel info for dnis:614629
Jan 1 00:33:39.395: As1 VPDN/RPMS/: LAC hgw
Jan 1 00:33:39.395: As1 VPDN/RPMS/: l2tp-busy-disconnect yes
Jan 1 00:33:39.395: As1 VPDN/RPMS/: l2tp-tunnel-password xxxxxx
Jan 1 00:33:39.395: As1 VPDN/RPMS/: 2 IP addresses
Jan 1 00:33:39.395: As1 VPDN/RPMS/: IP 10.51.6.82 Priority 1
Jan 1 00:33:39.395: As1 VPDN/RPMS/: IP 10.51.6.59 Priority 1
Jan 1 00:33:39.395: As1 VPDN/: curlvl 1 Address 1: 10.51.6.59, priority 1
Jan 1 00:33:39.395: As1 VPDN/: Select non-active address 10.51.6.59, priority 1

!--- The second non-active endpoint is selected 10.51.6.59
!--- and the control connection is established.

Jan 1 00:33:39.395: As1 VPDN: Find LNS process created
Jan 1 00:33:39.395: Tnl 20770 L2TP: SM State idle
Jan 1 00:33:39.395: Tnl 20770 L2TP: O SCCRQ
Jan 1 00:33:39.399: Tnl 20770 L2TP: Tunnel state change from idle to
wait-ctl-reply
Jan 1 00:33:39.399: Tnl 20770 L2TP: SM State wait-ctl-reply
Jan 1 00:33:39.399: As1 VPDN: Forward to address 10.51.6.59
Jan 1 00:33:39.399: As1 VPDN: Pending
Jan 1 00:33:39.399: As1 VPDN: Process created
Jan 1 00:33:39.399: Tnl 20770 L2TP: I SCCRQ from l2tp-gw
Jan 1 00:33:39.399: Tnl 20770 L2TP: Got a challenge from remote peer, l2tp-gw

```

```
Jan 1 00:33:39.399: Tnl 20770 L2TP: Got a response from remote peer, l2tp-gw
Jan 1 00:33:39.399: Tnl 20770 L2TP: Tunnel Authentication success
Jan 1 00:33:39.399: Tnl 20770 L2TP: Tunnel state change from
wait-ctl-reply to established
Jan 1 00:33:39.403: Tnl 20770 L2TP: O SCCCN to l2tp-gw tnlid 42921
Jan 1 00:33:39.403: Tnl 20770 L2TP: SM State established
Jan 1 00:33:39.403: As1 VPDN: Forwarding...
Jan 1 00:33:39.403: Tnl/Cl 20770/17 L2TP: Session FS enabled
Jan 1 00:33:39.403: Tnl/Cl 20770/17 L2TP: Session state change from
idle to wait-for-tunnel
Jan 1 00:33:39.403: As1 Tnl/Cl 20770/17 L2TP: Create session
Jan 1 00:33:39.403: Tnl 20770 L2TP: SM State established
Jan 1 00:33:39.403: As1 Tnl/Cl 20770/17 L2TP: O ICRQ to l2tp-gw 42921/0
Jan 1 00:33:39.403: As1 Tnl/Cl 20770/17 L2TP: Session state change from
wait-for-tunnel to wait-reply
Jan 1 00:33:39.403: As1 VPDN: paul is forwarded
Jan 1 00:33:39.407: As1 Tnl/Cl 20770/17 L2TP: O ICCN to l2tp-gw 42921/16
Jan 1 00:33:39.407: As1 Tnl/Cl 20770/17 L2TP: Session state change from
wait-reply to established
```


Shows from LAC

```
5300-1#show users
Line   User   Host(s)      Idle   Location
1 ty 1   paul        Async interface -   "Async Incoming Call"

Interface User   Mode      Idle Peer Address
Se0/0/0 2500-1 Sync PPP   -

5300-1#show vpdn

L2TP Tunnel and Session Information Total tunnels 2 sessions 2

LocID  RemID  Remote Name  State Remote Address Port Sessions
49467  62193  l2tp-gw      est  10.51.6.82  1701 1

LocID  RemID  TunID  Intf  Username  State Last Chg Fastswitch
16     17     49467  Se0/0/0 2500-1    est  00:01:36 enabled

LocID  RemID  Remote Name  State Remote Address Port Sessions
20770  42921  l2tp-gw      est  10.51.6.59  1701 1

LocID  RemID  TunID  Intf  Username  State Last Chg Fastswitch
17     16     20770  As1   paul      est  00:00:52 enabled

% No active L2F tunnels
```

```
5300-1#show vpdn tunnel

L2TP Tunnel Information Total tunnels 2 sessions 2

LocID  RemID  Remote Name  State Remote Address Port Sessions
49467  62193  l2tp-gw      est  10.51.6.82  1701 1
20770  42921  l2tp-gw      est  10.51.6.59  1701 1
```

Shows from LNS - 10.51.6.82

```
1600-3#show users
Line   User   Host(s)      Idle   Location
V11    2500-1 Virtual PPP (L2TP) 00:00:07

1600-3#show vpdn

L2TP Tunnel and Session Information Total tunnels 1 sessions 1

LocID  RemID  Remote Name  State Remote Address Port Sessions
62193  49467  hgw          est  10.51.6.68  1701 1

LocID  RemID  TunID  Intf  Username  State Last Chg Fastswitch
17     16     62193  V11   2500-1    est  00:02:07 enabled

% No active L2F tunnels
```

Shows from LNS - 10.51.6.59

```
Nsa-7200-3#show users
Line   User   Host(s)      Idle   Location
V11    paul   Virtual PPP (L2TP) 00:00:00

Nsa-7200-3#show vpdn

L2TP Tunnel and Session Information Total tunnels 1 sessions 1

LocID  RemID  Remote Name  State Remote Address Port Sessions
42921  20770  hgw          est  10.51.6.68  1701 1

LocID  RemID  TunID  Intf  Username  State Last Chg Fastswitch
16     17     42921  V11   paul      est  00:01:14 enabled

% No active L2F tunnels
```

LNS Failover Using Cisco Vendor-Specific Attribute/Value Pairs

RADIUS Profile

RADIUS user and tunnel profiles on Merit RADIUS Server 3.6B:

```
2500-1 Password = "cisco"  
Service-Type = Framed,  
Framed-Protocol = PPP,  
Framed-IP-Address = 255.255.255.255  
  
dnis:614629 Password = "cisco"  
Service-Type = Outbound,  
Cisco:Avpair = "vpdn:tunnel-type=l2tp",  
Cisco:Avpair = "vpdn:tunnel-id=hgw",  
Cisco:Avpair = "vpdn:ip-addresses=10.51.6.82/10.51.6.59",  
Cisco:Avpair = "vpdn:l2tp-tunnel-password=hello"
```

LAC and LNS Configuration

Same as previous.

Debugs Taken from LAC

```
Jan 1 02:00:35.767: As2 LCP: State is Open  
Jan 1 02:00:35.767: As2 PPP: Phase is AUTHENTICATING, by this end  
[0 sess, 0 load]  
Jan 1 02:00:35.767: As2 CHAP: Using alternate hostname 5300-1  
Jan 1 02:00:35.767: As2 CHAP: O CHALLENGE id 1 len 27 from "5300-1"  
Jan 1 02:00:35.959: As2 CHAP: I RESPONSE id 1 len 25 from "paul"  
Jan 1 02:00:35.959: As2 PPP: Phase is FORWARDING [0 sess, 0 load]  
Jan 1 02:00:35.959: As2 VPDN: Got DNIS string 614629  
Jan 1 02:00:35.959: As2 VPDN: Looking for tunnel -- dnis:614629 --  
Jan 1 02:00:35.959: AAA/AUTHOR/VPDN: Async2 (3581154520) user='dnis:614629'  
Jan 1 02:00:35.963: Async2 AAA/AUTHOR/VPDN (3581154520): send AV service=ppp  
Jan 1 02:00:35.963: Async2 AAA/AUTHOR/VPDN (3581154520): send AV protocol=vpdn  
Jan 1 02:00:35.963: Async2 AAA/AUTHOR/VPDN (3581154520): found list "default"  
Jan 1 02:00:35.963: Async2 AAA/AUTHOR/VPDN (3581154520): Method=NSA_LAB (radius)  
Jan 1 02:00:35.963: RADIUS: Initial Transmit Async2 id 56 10.51.6.3:1645,  
Access-Request, len 109  
Jan 1 02:00:35.963: Attribute 4 6 0A330644  
Jan 1 02:00:35.963: Attribute 5 6 00000000  
Jan 1 02:00:35.963: Attribute 26 14 0000000902084173  
Jan 1 02:00:35.963: Attribute 61 6 00000000  
Jan 1 02:00:35.963: Attribute 1 13 646E6973  
Jan 1 02:00:35.963: Attribute 30 8 36313436  
Jan 1 02:00:35.963: Attribute 31 12 31363139  
Jan 1 02:00:35.963: Attribute 2 18 2A5AF04C  
Jan 1 02:00:35.963: Attribute 6 6 00000005  
Jan 1 02:00:35.967: RADIUS: Received from id 56 10.51.6.3:1645,  
Access-Accept, len 167  
Jan 1 02:00:35.967: Attribute 6 6 00000005  
Jan 1 02:00:35.967: Attribute 26 29 0000000901177670  
Jan 1 02:00:35.967: Attribute 26 26 0000000901147670  
Jan 1 02:00:35.967: Attribute 26 47 0000000901297670  
Jan 1 02:00:35.967: Attribute 26 39 0000000901217670  
Jan 1 02:00:35.967: RADIUS: cisco AVPair "vpdn:tunnel-type=l2tp"  
Jan 1 02:00:35.967: RADIUS: cisco AVPair "vpdn:tunnel-id=hgw"  
Jan 1 02:00:35.967: RADIUS: cisco AVPair "vpdn:ip-addresses=10.51.6.82/10.51.6.59"  
Jan 1 02:00:35.967: RADIUS: cisco AVPair "vpdn:l2tp-tunnel-password=hello"  
Jan 1 02:00:35.967: AAA/AUTHOR (3581154520): Post authorization status = PASS_ADD
```

```

Jan 1 02:00:35.967: AAA/AUTHOR/VPDN: Processing AV service=ppp
Jan 1 02:00:35.967: AAA/AUTHOR/VPDN: Processing AV protocol=vpdn
Jan 1 02:00:35.967: AAA/AUTHOR/VPDN: Processing AV tunnel-type=l2tp
Jan 1 02:00:35.967: AAA/AUTHOR/VPDN: Processing AV tunnel-id=hgw
Jan 1 02:00:35.967: AAA/AUTHOR/VPDN: Processing AV ip-addresses=
10.51.6.82/10.51.6.59
Jan 1 02:00:35.967: AAA/AUTHOR/VPDN: Processing AV l2tp-tunnel-password=hello

!--- LAC receives a call, negotiates PPP, LCP is declared Open,
!--- the dialed number is queried to ascertain if this is a VPDN customer.
!--- VPDN attempts to find an existing tunnel for the user, queries RADIUS for
!--- the tunnel information.

Jan 1 02:00:35.967: As2 VPDN/RPMS/: Got tunnel info for dnis:614629
Jan 1 02:00:35.971: As2 VPDN/RPMS/: LAC hgw
Jan 1 02:00:35.971: As2 VPDN/RPMS/: l2tp-busy-disconnect yes
Jan 1 02:00:35.971: As2 VPDN/RPMS/: l2tp-tunnel-password xxxxxx
Jan 1 02:00:35.971: As2 VPDN/RPMS/: 2 IP addresses
Jan 1 02:00:35.971: As2 VPDN/RPMS/: IP 10.51.6.82 Priority 1
Jan 1 02:00:35.971: As2 VPDN/RPMS/: IP 10.51.6.59 Priority 2
Jan 1 02:00:35.971: As2 VPDN/: curlvl 1 Address 0: 10.51.6.82, priority 1
Jan 1 02:00:35.971: As2 VPDN/: Select non-active address 10.51.6.82, priority 1

!--- The tunnel information is downloaded, using Cisco VSA.
!--- Two RADIUS server IP Address's are used with a '/' as the delimiter,
!--- indicating that there are two priority groups. In this case 10.51.6.82,
!--- as Priority level 1, is selected as the tunnel endpoint.

Jan 1 02:00:35.971: Tnl 17044 L2TP: SM State idle
Jan 1 02:00:35.971: Tnl 17044 L2TP: O SCCRQ
Jan 1 02:00:35.971: Tnl 17044 L2TP: Tunnel state change from idle to
wait-ctl-reply
Jan 1 02:00:35.971: Tnl 17044 L2TP: SM State wait-ctl-reply
Jan 1 02:00:35.971: As2 VPDN: Find LNS process created
Jan 1 02:00:35.971: As2 VPDN: Forward to address 10.51.6.82
Jan 1 02:00:35.971: As2 VPDN: Pending
Jan 1 02:00:35.971: As2 VPDN: Process created
Jan 1 02:00:35.983: Tnl 17044 L2TP: I SCCRP from l2tp-gw
Jan 1 02:00:35.983: Tnl 17044 L2TP: Got a challenge from remote peer, l2tp-gw
Jan 1 02:00:35.983: Tnl 17044 L2TP: Got a response from remote peer, l2tp-gw
Jan 1 02:00:35.983: Tnl 17044 L2TP: Tunnel Authentication success
Jan 1 02:00:35.983: Tnl 17044 L2TP:
Tunnel state change from wait-ctl-reply to established
Jan 1 02:00:35.983: Tnl 17044 L2TP: O SCCN to l2tp-gw tnlid 9017
Jan 1 02:00:35.983: Tnl 17044 L2TP: SM State established
Jan 1 02:00:35.983: As2 VPDN: Forwarding...
Jan 1 02:00:35.987: Tnl/Cl 17044/2 L2TP: Session FS enabled
Jan 1 02:00:35.987: Tnl/Cl 17044/2 L2TP:
Session state change from idle to wait-for-tunnel
Jan 1 02:00:35.987: As2 Tnl/Cl 17044/2 L2TP: Create session
Jan 1 02:00:35.987: Tnl 17044 L2TP: SM State established
Jan 1 02:00:35.987: As2 Tnl/Cl 17044/2 L2TP: O ICRQ to l2tp-gw 9017/0
Jan 1 02:00:35.987: As2 Tnl/Cl 17044/2 L2TP:
Session state change from wait-for-tunnel to wait-reply
Jan 1 02:00:35.987: As2 VPDN: paul is forwarded
Jan 1 02:00:35.995: As2 Tnl/Cl 17044/2 L2TP: O ICCN to l2tp-gw 9017/2
Jan 1 02:00:35.995: As2 Tnl/Cl 17044/2 L2TP: Session state change
from wait-reply to established

!--- The Tunnel and Session are now established.
!--- A second call is received by the LAC.

Jan 1 02:03:21.775: Se0:1 LCP: State is Open
Jan 1 02:03:21.775: Se0:1 PPP: Phase is AUTHENTICATING, by this end

```

```

[0 sess, 0 load]
Jan 1 02:03:21.775: Se0:1 CHAP: Using alternate hostname 5300-1
Jan 1 02:03:21.775: Se0:1 CHAP: O CHALLENGE id 1 len 27 from "5300-1"
Jan 1 02:03:21.799: Se0:1 CHAP: I RESPONSE id 1 len 27 from "2500-1"
Jan 1 02:03:21.799: Se0:1 PPP: Phase is FORWARDING [0 sess, 0 load]
Jan 1 02:03:21.799: Se0:1 VPDN: Got DNIS string 614629
Jan 1 02:03:21.799: Se0:1 VPDN: Looking for tunnel -- dnis:614629 --
Jan 1 02:03:21.799: Serial0:1 AAA/AUTHOR/VPDN (2106866192): Port='Serial0:1'
list='default' service=NET
Jan 1 02:03:21.799: AAA/AUTHOR/VPDN: Serial0:1 (2106866192) user='dnis:614629'
Jan 1 02:03:21.799: Serial0:1 AAA/AUTHOR/VPDN (2106866192): send AV service=ppp
Jan 1 02:03:21.799: Serial0:1 AAA/AUTHOR/VPDN (2106866192): send AV protocol=vpdn
Jan 1 02:03:21.799: Serial0:1 AAA/AUTHOR/VPDN (2106866192): found list "default"
Jan 1 02:03:21.799: Serial0:1 AAA/AUTHOR/VPDN (2106866192): Method=NSA_LAB (radius)
Jan 1 02:03:21.803: RADIUS: Initial Transmit Serial0:1 id 60 10.51.6.3:1645,
Access-Request, len 112
Jan 1 02:03:21.803: Attribute 4 6 0A330644
Jan 1 02:03:21.803: Attribute 5 6 00000001
Jan 1 02:03:21.803: Attribute 26 17 00000009020B5365
Jan 1 02:03:21.803: Attribute 61 6 00000002
Jan 1 02:03:21.803: Attribute 1 13 646E6973
Jan 1 02:03:21.803: Attribute 30 8 36313436
Jan 1 02:03:21.803: Attribute 31 12 32303835
Jan 1 02:03:21.803: Attribute 2 18 1A511187
Jan 1 02:03:21.803: Attribute 6 6 00000005
Jan 1 02:03:21.803: RADIUS: Received from id 60 10.51.6.3:1645,
Access-Accept, len 167
Jan 1 02:03:21.803: Attribute 6 6 00000005
Jan 1 02:03:21.803: Attribute 26 29 0000000901177670
Jan 1 02:03:21.803: Attribute 26 26 0000000901147670
Jan 1 02:03:21.803: Attribute 26 47 0000000901297670
Jan 1 02:03:21.803: Attribute 26 39 0000000901217670
Jan 1 02:03:21.807: RADIUS: cisco AVPair "vpdn:tunnel-type=l2tp"
Jan 1 02:03:21.807: RADIUS: cisco AVPair "vpdn:tunnel-id=hgw"
Jan 1 02:03:21.807: RADIUS: cisco AVPair "vpdn:ip-addresses=10.51.6.82/10.51.6.59"
Jan 1 02:03:21.807: RADIUS: cisco AVPair "vpdn:l2tp-tunnel-password=hello"
Jan 1 02:03:21.807: AAA/AUTHOR (2106866192): Post authorization status = PASS_ADD
Jan 1 02:03:21.807: AAA/AUTHOR/VPDN: Processing AV service=ppp
Jan 1 02:03:21.807: AAA/AUTHOR/VPDN: Processing AV protocol=vpdn
Jan 1 02:03:21.807: AAA/AUTHOR/VPDN: Processing AV tunnel-type=l2tp
Jan 1 02:03:21.807: AAA/AUTHOR/VPDN: Processing AV tunnel-id=hgw
Jan 1 02:03:21.807: AAA/AUTHOR/VPDN: Processing AV ip-addresses=
10.51.6.82/10.51.6.59
Jan 1 02:03:21.807: AAA/AUTHOR/VPDN: Processing AV l2tp-tunnel-password=hello
Jan 1 02:03:21.807: Se0:1 VPDN/RPMS/: Got tunnel info for dnis:614629
Jan 1 02:03:21.807: Se0:1 VPDN/RPMS/: LAC hgw
Jan 1 02:03:21.807: Se0:1 VPDN/RPMS/: l2tp-busy-disconnect yes
Jan 1 02:03:21.807: Se0:1 VPDN/RPMS/: l2tp-tunnel-password xxxxxx
Jan 1 02:03:21.807: Se0:1 VPDN/RPMS/: 2 IP addresses
Jan 1 02:03:21.807: Se0:1 VPDN/RPMS/: IP 10.51.6.82 Priority 1
Jan 1 02:03:21.807: Se0:1 VPDN/RPMS/: IP 10.51.6.59 Priority 2
Jan 1 02:03:21.807: Se0:1 VPDN/: curlvl 1 Address 0: 10.51.6.82, priority 1
Jan 1 02:03:21.811: Se0:1 VPDN/: Select open address 10.51.6.82, priority 1
Jan 1 02:03:21.811: Se0:1 VPDN: Forward to address 10.51.6.82

!--- The tunnel information is downloaded, LNS - 10.51.6.82 is
!--- selected again as the tunnel endpoint as this is in Priority level 1.

Jan 1 02:03:21.811: Se0:1 VPDN: Forwarding...
Jan 1 02:03:21.811: Tnl/Cl 17044/3 L2TP: Session state change from
idle to wait-for-tunnel
Jan 1 02:03:21.811: Se0:1 Tnl/Cl 17044/3 L2TP: Create session
Jan 1 02:03:21.811: Tnl 17044 L2TP: SM State established
Jan 1 02:03:21.811: Se0:1 Tnl/Cl 17044/3 L2TP: O ICRQ to l2tp-gw 9017/0

```

```

Jan 1 02:03:21.811: Se0:1 Tnl/Cl 17044/3 L2TP: Session state change
from wait-for-tunnel to wait-reply
Jan 1 02:03:21.811: Se0:1 VPDN: 2500-1 is forwarded
Jan 1 02:03:21.819: Se0:1 Tnl/Cl 17044/3 L2TP: O ICCN to l2tp-gw 9017/3
Jan 1 02:03:21.819: Se0:1 Tnl/Cl 17044/3 L2TP: Session state change
from wait-reply to established

```

Shows from LNS - 10.51.6.82

```

1600-3#show users

```

Interface	User	Mode	Idle	Peer Address
V1	paul	Virtual PPP (L2TP)	00:00:03	
V2	2500-1	Virtual PPP (L2TP)	00:00:04	

```

1600-3#show vpdn

```

L2TP Tunnel and Session Information Total tunnels 1 sessions 2

LocID	RemID	Remote Name	State	Remote Address	Port	Sessions
9017	17044	hgw	est	10.51.6.68	1701	2

LocID	RemID	TunID	Intf	Username	State	Last Chg	Fastswitch
3	3	9017	V2	2500-1	est	00:00:27	enabled
2	2	9017	V1	paul	est	00:00:14	enabled

% No active L2F tunnel

LNS Load Balancing and Failover using Cisco Vendor-Specific Attribute/Value Pairs

RADIUS Profile

RADIUS user and tunnel profile on Merit RADIUS Server 3.6B:

```

2500-1 Password = "cisco"
Service-Type = Framed,
Framed-Protocol = PPP,
Framed-IP-Address = 255.255.255.255
dnis:614629 Password = "cisco"
Service-Type = Outbound,
Cisco:Avpair = "vpdn:tunnel-type=l2tp",
Cisco:Avpair = "vpdn:tunnel-id=hgw",
Cisco:Avpair = "vpdn:ip-addresses=
10.51.6.80,10.51.6.59/10.51.6.2,10.51.6.3/10.51.6.82,10.51.6.5",
Cisco:Avpair = "vpdn:l2tp-tunnel-password=hello"

```

LAC and LNS Configuration

Same as previous.

Debugs taken from LAC

```

Jan 1 00:43:11.539: %LINK-3-UPDOWN: Interface Serial0:0, changed state to up

Jan 1 00:43:11.755: Se0:0 LCP: State is Open
Jan 1 00:43:11.755: Se0:0 PPP: Phase is AUTHENTICATING, by this end
Jan 1 00:43:11.755: Se0:0 CHAP: Using alternate hostname 5300-1
Jan 1 00:43:11.755: Se0:0 CHAP: O CHALLENGE id 18 len 27 from "5300-1"

```

Cisco – L2TP Load Balancing and Failover

```

Jan 1 00:43:11.775: Se0:0 CHAP: I RESPONSE id 18 len 27 from "2500-1"
Jan 1 00:43:11.775: Se0:0 PPP: Phase is FORWARDING
Jan 1 00:43:11.775: Se0:0 VPDN: Got DNIS string 614629
Jan 1 00:43:11.775: Se0:0 VPDN: Looking for tunnel -- dnis:614629 --
Jan 1 00:43:11.775: Serial0:0 AAA/AUTHOR/VPDN (2215378044): Port='Serial0:0'
list='default' service=NET
Jan 1 00:43:11.775: AAA/AUTHOR/VPDN: Serial0:0 (2215378044) user='dnis:614629'
Jan 1 00:43:11.775: Serial0:0 AAA/AUTHOR/VPDN (2215378044): send AV service=ppp
Jan 1 00:43:11.775: Serial0:0 AAA/AUTHOR/VPDN (2215378044): send AV protocol=vpdn
Jan 1 00:43:11.775: Serial0:0 AAA/AUTHOR/VPDN (2215378044): found list "default"
Jan 1 00:43:11.775: Serial0:0 AAA/AUTHOR/VPDN (2215378044): Method=NSA_LAB (radius)
Jan 1 00:43:11.779: RADIUS: Initial Transmit Serial0:0 id 57 10.51.6.3:1645,
Access-Request, len 112
Jan 1 00:43:11.779: Attribute 4 6 0A330644
Jan 1 00:43:11.779: Attribute 5 6 00000000
Jan 1 00:43:11.779: Attribute 26 17 00000009020B5365
Jan 1 00:43:11.779: Attribute 61 6 00000002
Jan 1 00:43:11.779: Attribute 1 13 646E6973
Jan 1 00:43:11.779: Attribute 30 8 36313436
Jan 1 00:43:11.779: Attribute 31 12 32303835
Jan 1 00:43:11.779: Attribute 2 18 BA50FCD1
Jan 1 00:43:11.779: Attribute 6 6 00000005
Jan 1 00:43:11.783: RADIUS: Received from id 57 10.51.6.3:1645,
Access-Accept, len 208
Jan 1 00:43:11.783: Attribute 6 6 00000005
Jan 1 00:43:11.783: Attribute 26 29 0000000901177670
Jan 1 00:43:11.783: Attribute 26 26 0000000901147670
Jan 1 00:43:11.783: Attribute 26 88 0000000901527670
Jan 1 00:43:11.783: Attribute 26 39 0000000901217670
Jan 1 00:43:11.783: RADIUS: cisco AVPair "vpdn:tunnel-type=l2tp"
Jan 1 00:43:11.783: RADIUS: cisco AVPair "vpdn:tunnel-id=hgw"
Jan 1 00:43:11.783: RADIUS: cisco AVPair "vpdn:ip-addresses=
10.51.6.80,10.51.6.59/10.51.6.2,10.51.6.3/10.51.6.82,10.51.6.5"
Jan 1 00:43:11.783: RADIUS: cisco AVPair "vpdn:l2tp-tunnel-password=hello"
Jan 1 00:43:11.783: AAA/AUTHOR (2215378044): Post authorization status = PASS_ADD
Jan 1 00:43:11.783: AAA/AUTHOR/VPDN: Processing AV service=ppp
Jan 1 00:43:11.783: AAA/AUTHOR/VPDN: Processing AV protocol=vpdn
Jan 1 00:43:11.783: AAA/AUTHOR/VPDN: Processing AV tunnel-type=l2tp
Jan 1 00:43:11.783: AAA/AUTHOR/VPDN: Processing AV tunnel-id=hgw
Jan 1 00:43:11.783: AAA/AUTHOR/VPDN: Processing AV ip-addresses=
10.51.6.80,10.51.6.59/10.51.6.2,10.51.6.3/10.51.6.82,10.51.6.5
Jan 1 00:43:11.783: AAA/AUTHOR/VPDN:
Processing AV l2tp-tunnel-password=hello
Jan 1 00:43:11.783: Se0:0 VPDN/RPMS/: Got tunnel info for dnis:614629
Jan 1 00:43:11.783: Se0:0 VPDN/RPMS/: LAC hgw
Jan 1 00:43:11.787: Se0:0 VPDN/RPMS/: l2tp-busy-disconnect yes
Jan 1 00:43:11.787: Se0:0 VPDN/RPMS/: l2tp-tunnel-password xxxxxx
Jan 1 00:43:11.787: Se0:0 VPDN/RPMS/: 6 IP addresses
Jan 1 00:43:11.787: Se0:0 VPDN/RPMS/: IP 10.51.6.80 Priority 1
Jan 1 00:43:11.787: Se0:0 VPDN/RPMS/: IP 10.51.6.59 Priority 1
Jan 1 00:43:11.787: Se0:0 VPDN/RPMS/: IP 10.51.6.2 Priority 2
Jan 1 00:43:11.787: Se0:0 VPDN/RPMS/: IP 10.51.6.3 Priority 2
Jan 1 00:43:11.787: Se0:0 VPDN/RPMS/: IP 10.51.6.82 Priority 3
Jan 1 00:43:11.787: Se0:0 VPDN/RPMS/: IP 10.51.6.5 Priority 3

!--- The tunnel information is downloaded, using Cisco VSA. Two RADIUS
!--- server IP Addresses are used with a '/' as the delimiter for each
!--- of the three priority groups. In this case, 10.51.6.82 in Priority
!--- Group 3, is the tunnel endpoint that is valid.

Jan 1 00:43:11.787: Se0:0 VPDN/: curlvl 1 Address 1: 10.51.6.59, priority 1
Jan 1 00:43:11.787: VPDN: Free busy address 10.51.6.59
Jan 1 00:43:11.787: Se0:0 VPDN/: Select non-active address 10.51.6.59, priority 1
Jan 1 00:43:11.787: Se0:0 VPDN: Find LNS process created

```

```

Jan 1 00:43:11.787: Tnl 8262 L2TP: SM State idle
Jan 1 00:43:11.787: Tnl 8262 L2TP: O SCCRQ
Jan 1 00:43:11.787: Tnl 8262 L2TP: Tunnel state change from idle to wait-ctl-reply
Jan 1 00:43:11.787: Tnl 8262 L2TP: SM State wait-ctl-reply
Jan 1 00:43:11.787: Se0:0 VPDN: Forward to address 10.51.6.59
Jan 1 00:43:11.791: Se0:0 VPDN: Pending
Jan 1 00:43:11.791: Se0:0 VPDN: Process created
Jan 1 00:43:12.787: Tnl 8262 L2TP: O Resend SCCRQ, flg TLS, ver 2, len 128, tnl 0, cl 0, ns 0, nr 0
Jan 1 00:43:12.787: Tnl 8262 L2TP: Control channel retransmit delay set to 1 seconds
Jan 1 00:43:13.787: Tnl 8262 L2TP: O Resend SCCRQ, flg TLS, ver 2, len 128, tnl 0, cl 0, ns 0, nr 0
Jan 1 00:43:13.787: Tnl 8262 L2TP: Control channel retransmit delay set to 2 seconds
Jan 1 00:43:15.787: Tnl 8262 L2TP: Timeout opening tunnel to 10.51.6.59
Jan 1 00:43:15.787: Tnl 63291 L2TP: Control channel retransmit delay set to 4 seconds
Jan 1 00:43:15.787: Se0:0 VPDN/: curlvl 1 Address 1: 10.51.6.59, priority 1 busy

!--- 10.51.6.59 is selected as the first non-active IP Address in Priority
!--- Group 1. As we cannot establish the Control Connection after the
!--- 4 second SCCRQ timeout, we select the next non-active IP
!--- Address in the same Priority Group.

Jan 1 00:43:15.787: Se0:0 VPDN/: curlvl 1 Address 0: 10.51.6.80, priority 1
Jan 1 00:43:15.787: VPDN: Free busy address 10.51.6.80
Jan 1 00:43:15.787: Se0:0 VPDN/: Select non-active address 10.51.6.80, priority 1
Jan 1 00:43:15.787: Tnl 63291 L2TP: Tunnel state change from wait-ctl-reply to idle
Jan 1 00:43:15.787: Tnl 63291 L2TP: SM State idle
Jan 1 00:43:15.787: Tnl 63291 L2TP: O SCCRQ
Jan 1 00:43:15.787: Tnl 63291 L2TP: Tunnel state change from idle to wait-ctl-reply
Jan 1 00:43:15.787: Tnl 63291 L2TP: SM State wait-ctl-reply
Jan 1 00:43:16.787: Tnl 63291 L2TP: O Resend SCCRQ, flg TLS, ver 2, len 128, tnl 0, cl 0, ns 0, nr 0
Jan 1 00:43:16.787: Tnl 63291 L2TP: Control channel retransmit delay set to 1 seconds
Jan 1 00:43:17.543: %ISDN-6-CONNECT: Interface Serial0:0 is now connected to 2085730592
Jan 1 00:43:17.787: Tnl 63291 L2TP: O Resend SCCRQ, flg TLS, ver 2, len 128, tnl 0, cl 0, ns 0, nr 0
Jan 1 00:43:17.787: Tnl 63291 L2TP: Control channel retransmit delay set to 2 seconds
Jan 1 00:43:19.787: Tnl 63291 L2TP: Timeout opening tunnel to 10.51.6.80
Jan 1 00:43:19.787: Tnl 52784 L2TP: Control channel retransmit delay set to 4 seconds
Jan 1 00:43:19.787: Se0:0 VPDN/: curlvl 1 Address 0: 10.51.6.80, priority 1 busy
Jan 1 00:43:19.787: Se0:0 VPDN/: curlvl 1 Address 1: 10.51.6.59, priority 1 busy
Jan 1 00:43:19.787: Se0:0 VPDN/: curlvl 2 Address 2: 10.51.6.2, priority 2
Jan 1 00:43:19.787: VPDN: Free busy address 10.51.6.2
Jan 1 00:43:19.787: Se0:0 VPDN/: Select non-active address 10.51.6.2, priority 2
Jan 1 00:43:19.787: Tnl 52784 L2TP: Tunnel state change from wait-ctl-reply to idle
Jan 1 00:43:19.787: Tnl 52784 L2TP: SM State idle
Jan 1 00:43:19.787: Tnl 52784 L2TP: O SCCRQ
Jan 1 00:43:19.787: Tnl 52784 L2TP: Tunnel state change from idle to wait-ctl-reply
Jan 1 00:43:19.787: Tnl 52784 L2TP: SM State wait-ctl-reply
Jan 1 00:43:20.787: Tnl 52784 L2TP: O Resend SCCRQ, flg TLS, ver 2, len 128, tnl 0, cl 0, ns 0, nr 0
Jan 1 00:43:20.787: Tnl 52784 L2TP: Control channel retransmit delay set to 1 seconds

```

```

Jan 1 00:43:21.671: Se0:0 CHAP: I RESPONSE id 18 len 27 from "2500-1"
Jan 1 00:43:21.671: Se0:0 VPDN: LCP state already FORWARDING/FORWARDED,
silent discard
Jan 1 00:43:21.787: Tnl 52784 L2TP: O Resend SCCRQ, flg TLS, ver 2, len 128,
tnl 0, cl 0, ns 0, nr 0
Jan 1 00:43:21.787: Tnl 52784 L2TP: Control channel retransmit
delay set to 2 seconds
Jan 1 00:43:23.787: Tnl 52784 L2TP: Timeout opening tunnel to 10.51.6.2
Jan 1 00:43:23.787: Tnl 42277 L2TP: Control channel retransmit
delay set to 4 seconds
Jan 1 00:43:23.787: Se0:0 VPDN/: curlvl 2 Address 2: 10.51.6.2, priority 2 busy
Jan 1 00:43:23.787: Se0:0 VPDN/: curlvl 2 Address 3: 10.51.6.3, priority 2
Jan 1 00:43:23.787: VPDN: Free busy address 10.51.6.3
Jan 1 00:43:23.787: Se0:0 VPDN/: Select non-active address 10.51.6.3, priority 2
Jan 1 00:43:23.787: Tnl 42277 L2TP: Tunnel state change from
wait-ctl-reply to idle
Jan 1 00:43:23.787: Tnl 42277 L2TP: SM State idle
Jan 1 00:43:23.787: Tnl 42277 L2TP: O SCCRQ
Jan 1 00:43:23.787: Tnl 42277 L2TP: Tunnel state change from
idle to wait-ctl-reply
Jan 1 00:43:23.787: Tnl 42277 L2TP: SM State wait-ctl-reply
Jan 1 00:43:24.787: Tnl 42277 L2TP: O Resend SCCRQ, flg TLS, ver 2,
len 128, tnl 0, cl 0, ns 0, nr 0
Jan 1 00:43:24.787: Tnl 42277 L2TP: Control channel retransmit delay
set to 1 seconds
Jan 1 00:43:25.787: Tnl 42277 L2TP: O Resend SCCRQ, flg TLS, ver 2,
len 128, tnl 0, cl 0, ns 0, nr 0
Jan 1 00:43:25.787: Tnl 42277 L2TP: Control channel retransmit
delay set to 2 seconds
Jan 1 00:43:27.787: Tnl 42277 L2TP: Timeout opening tunnel to 10.51.6.3
Jan 1 00:43:27.787: Tnl 31770 L2TP: Control channel retransmit
delay set to 4 seconds
Jan 1 00:43:27.787: Se0:0 VPDN/: curlvl 2 Address 3: 10.51.6.3, priority 2 busy
Jan 1 00:43:27.787: Se0:0 VPDN/: curlvl 2 Address 2: 10.51.6.2, priority 2 busy
Jan 1 00:43:27.787: Se0:0 VPDN/: curlvl 3 Address 4: 10.51.6.82, priority 3
Jan 1 00:43:27.787: Se0:0 VPDN/: Select non-active address 10.51.6.82, priority 3

!--- Eventually arrive at the IP Address 10.51.6.82 in Priority Group 3.
!--- As this is valid, the Control Connection and session are established.

Jan 1 00:43:27.787: Tnl 31770 L2TP: Tunnel state change from
wait-ctl-reply to idle
Jan 1 00:43:27.787: Tnl 31770 L2TP: SM State idle
Jan 1 00:43:27.787: Tnl 31770 L2TP: O SCCRQ
Jan 1 00:43:27.787: Tnl 31770 L2TP: Tunnel state change from
idle to wait-ctl-reply
Jan 1 00:43:27.787: Tnl 31770 L2TP: SM State wait-ctl-reply
Jan 1 00:43:27.799: Tnl 31770 L2TP: I SCCRP from l2tp-gw
Jan 1 00:43:27.799: Tnl 31770 L2TP: Got a challenge from remote peer, l2tp-gw
Jan 1 00:43:27.799: Tnl 31770 L2TP: Got a response from remote peer, l2tp-gw
Jan 1 00:43:27.799: Tnl 31770 L2TP: Tunnel Authentication success
Jan 1 00:43:27.799: Tnl 31770 L2TP: Tunnel state change from
wait-ctl-reply to established
Jan 1 00:43:27.799: Tnl 31770 L2TP: O SCCCN to l2tp-gw tnlid 3843
Jan 1 00:43:27.799: Tnl 31770 L2TP: SM State established
Jan 1 00:43:27.799: Se0:0 VPDN: Forwarding...
Jan 1 00:43:27.799: Tnl/Cl 31770/7 L2TP: Session FS enabled
Jan 1 00:43:27.799: Tnl/Cl 31770/7 L2TP: Session state change from
idle to wait-for-tunnel
Jan 1 00:43:27.803: Se0:0 Tnl/Cl 31770/7 L2TP: Create session
Jan 1 00:43:27.803: Tnl 31770 L2TP: SM State established
Jan 1 00:43:27.803: Se0:0 Tnl/Cl 31770/7 L2TP: O ICRQ to l2tp-gw 3843/0
Jan 1 00:43:27.803: Se0:0 Tnl/Cl 31770/7 L2TP: Session state change from
wait-for-tunnel to wait-reply

```



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Jan 1 00:43:27.803: Se0:0 VPDN: 2500-1 is forwarded
Jan 1 00:43:27.811: Se0:0 Tnl/Cl 31770/7 L2TP: O ICCN to l2tp-gw 3843/9
Jan 1 00:43:27.811: Se0:0 Tnl/Cl 31770/7 L2TP: Session state change from
wait-reply to established
Jan 1 00:43:28.803: %LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0:0,
changed state to up
```

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