

L2TP負載平衡和故障轉移

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簡介

本檔案將說明L2TP接入集中器(LAC)的功能，該集中器可對多個L2TP網路伺服器(LNS)執行負載平衡和故障切換功能。

必要條件

需求

本文件沒有特定需求。

採用元件

本文件所述內容不限於特定軟體和硬體版本。

慣例

如需文件慣例的詳細資訊，請參閱[思科技術提示慣例](#)。

LNS負載平衡

使用RADIUS將虛擬私人撥號網路(VPDN)通道資訊傳送到LAC時，可以將相同撥出號碼識別服務(DNIS)或網域的使用者轉送到多個LNS。當傳入隧道和會話需要在多個LNS之間共用以幫助負載分配並提供更高級別的冗餘時，需要滿足此要求。為了啟用負載平衡功能，作為通道端點的每個LNS的IP地址必須在思科供應商特定屬性(VSA)屬性/值對中提供。

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

「,」用作分隔符，以指示有多個終端可用於LAC（還可以使用空格作為分隔符來指示隧道終端的不同優先順序）。LAC基於隨機選擇傳送的第一非活動IP地址來選擇要使用的端點。如果忙（LAC無法連線到IP地址），則會選擇下一個IP地址。如果沒有可用的非活動IP地址，下一個選擇將基於處於「開放隧道狀態」的IP地址，最後是處於「掛起隧道狀態」的IP地址。

[LNS故障切換](#)

當使用多個LNS時，Cisco IOS®軟體最多允許六個優先順序級別。通過使用「/」作為分隔符，可以為下載到LAC的LNS分配不同的優先順序組。這允許某些LNS作為主LNS運行，而其他LNS作為備份運行。與以前一樣，隧道終端以思科VSA屬性/值對形式提供。

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

「/」分隔符表示10.51.6.82位於優先順序組1中，10.51.6.59位於優先順序組2中。

[LNS負載平衡和故障切換](#)

可以在同一配置檔案中同時使用負載平衡和故障切換。這可通過使用Cisco VSA屬性/值對"vpdn:ip-addresses"如下所示：

```
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"
```

這被解釋為：

- 通道端點1.1.1.1和2.2.2.2位於優先順序組1中
- 通道端點3.3.3.3和4.4.4.4位於優先順序組2中
- 通道端點5.5.5.5和6.6.6.6位於優先順序組3中

負載均衡功能在優先順序組1上執行 — 非活動/非忙、開啟、掛起。如果在這個優先順序別沒有可用的選項，請轉到下一個優先順序別，並繼續選擇邏輯。

[實驗室測試](#)

本節中的測試顯示了使用負載平衡和故障轉移功能的三種不同方案：

- 使用Cisco供應商特定的屬性/值對的LNS負載平衡
- 使用思科供應商特定的屬性/值對的LNS故障切換
- 使用Cisco供應商特定的屬性/值對進行LNS負載平衡和故障切換

[使用思科供應商特定的屬性/值對的LNS負載平衡](#)

[RADIUS設定檔](#)

Merit RADIUS伺服器3.6B上的RADIUS使用者和隧道配置檔案：

```
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 — 配置

```
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 — 配置

```
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.
```

從LAC進行的調試

```
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 00000000901177670
Jan 1 00:32:55.091: Attribute 26 26 00000000901147670
Jan 1 00:32:55.091: Attribute 26 47 00000000901297670
Jan 1 00:32:55.091: Attribute 26 39 00000000901217670
!--- 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**

