Bilanciamento del carico e failover L2TP

Sommario

Introduzione

Questo documento spiega le funzionalità di un L2TP access concentrator (LAC) che esegue funzioni di bilanciamento del carico e failover su più server di rete L2TP (LNS).

Prerequisiti

Requisiti

Nessun requisito specifico previsto per questo documento.

Componenti usati

Il documento può essere consultato per tutte le versioni software o hardware.

Convenzioni

Per ulteriori informazioni sulle convenzioni usate, consultare il documento [Cisco sulle convenzioni nei suggerimenti tecnici.](#)

Load balancing LNS

Quando si utilizza RADIUS per inviare le informazioni del tunnel VPDN (Virtual Private Dial-up Network) a un LAC, è possibile inoltrare gli utenti dello stesso DNIS (Dial-Number Identification Service) o dominio a più LAN. Questo è un requisito quando i tunnel e le sessioni in entrata devono essere condivisi su più LAN per facilitare la distribuzione del carico e offrire livelli più elevati di ridondanza. Per abilitare la funzione di bilanciamento del carico, gli indirizzi IP di ciascuna rete LAN disponibile come endpoint del tunnel devono essere recapitati nella coppia attributo/valore Cisco specifico del fornitore (VSA).

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

Il carattere ',' viene utilizzato come delimitatore per indicare che esistono più endpoint disponibili per il LAC. È inoltre possibile utilizzare uno spazio come delimitatore per indicare la stessa priorità degli endpoint del tunnel. Il LAC seleziona l'endpoint da utilizzare in base alla selezione casuale del primo indirizzo IP non attivo consegnato. Se è occupato (il LAC non può connettersi all'indirizzo IP), viene selezionato l'indirizzo IP successivo. Se non sono disponibili indirizzi IP non attivi, la selezione successiva si basa su un indirizzo IP in 'stato tunnel aperto' e infine su un indirizzo IP in 'stato tunnel in sospeso'.

Failover LNS

Il software Cisco IOS® consente un massimo di sei livelli di priorità quando si utilizzano più LAN. Utilizzando il delimitatore '/', è possibile assegnare diversi gruppi di priorità alle linee LNS scaricate nel LAC. In questo modo, alcuni LNS possono funzionare come LNS primari e altri come backup. Come in precedenza, gli endpoint del tunnel vengono forniti nella coppia attributo/valore Cisco VSA.

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

Il delimitatore '/' indica che 10.51.6.82 è nel gruppo di priorità 1 e 10.51.6.59 nel gruppo di priorità 2.

Bilanciamento del carico e failover LNS

Èpossibile utilizzare sia il bilanciamento del carico che il failover nello stesso profilo. A tal fine, è possibile usare la coppia attributo/valore `"vpdn:ip-address"` di Cisco VSA, come mostrato di seguito:

```
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"
```

Tale espressione è interpretata come segue:

- gli endpoint del tunnel 1.1.1.1 e 2.2.2.2 si trovano nel gruppo di priorità 1
- gli endpoint del tunnel 3.3.3.3 e 4.4.4.4 si trovano nel gruppo di priorità 2
- gli endpoint del tunnel 5.5.5.5 e 6.6.6.6 si trovano nel gruppo di priorità 3

La funzione di bilanciamento del carico viene eseguita sul gruppo di priorità 1 - non attivo/non occupato, aperto, in sospeso. Se a questo livello di priorità non sono disponibili risorse, passare al livello di priorità successivo e continuare la logica di selezione.

Test di laboratorio

Il test di questa sezione mostra tre diversi scenari per l'utilizzo delle funzionalità di bilanciamento del carico e failover:

- Bilanciamento del carico LNS con coppie attributo/valore specifiche del fornitore Cisco
- Failover LNS con coppie attributo/valore specifiche del fornitore Cisco
- Bilanciamento del carico e failover LNS utilizzando coppie attributo/valore specifiche del fornitore Cisco

Load balancing LNS con coppie di attributi/valori specifiche del fornitore Cisco

Profilo RADIUS

Profili utente e tunnel RADIUS su server RADIUS Merit 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 - Configurazione

```
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 - Configurazione

```
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.*

Debug eseguiti da 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 00000009020B5365
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 SCCRP 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
```