

具有重疊專用網路的PIX防火牆和Cisco VPN 3000集中器之間的IPSec配置示例

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簡介

本文檔介紹如何在站點到站點IPSec VPN中配置Cisco Secure PIX防火牆，在VPN網關後面使用重疊的專用網路地址。在本示例中，PIX 6.2中引入的增強型網路地址轉換(NAT)功能用於將IPSec VPN隧道每一端的重疊網路轉換為非重疊地址空間。

必要條件

需求

本文件沒有特定需求。

採用元件

本文中的資訊係根據以下軟體和硬體版本：

- Cisco安全PIX防火牆506，軟體版本6.3(3)
- VPN 3030集中器及軟體版本4.1(5)

本文中的資訊是根據特定實驗室環境內的裝置所建立。文中使用到的所有裝置皆從已清除（預設）的組態來啟動。如果您的網路正在作用，請確保您已瞭解任何指令可能造成的影響。

慣例

如需文件慣例的詳細資訊，請參閱[思科技術提示慣例](#)。

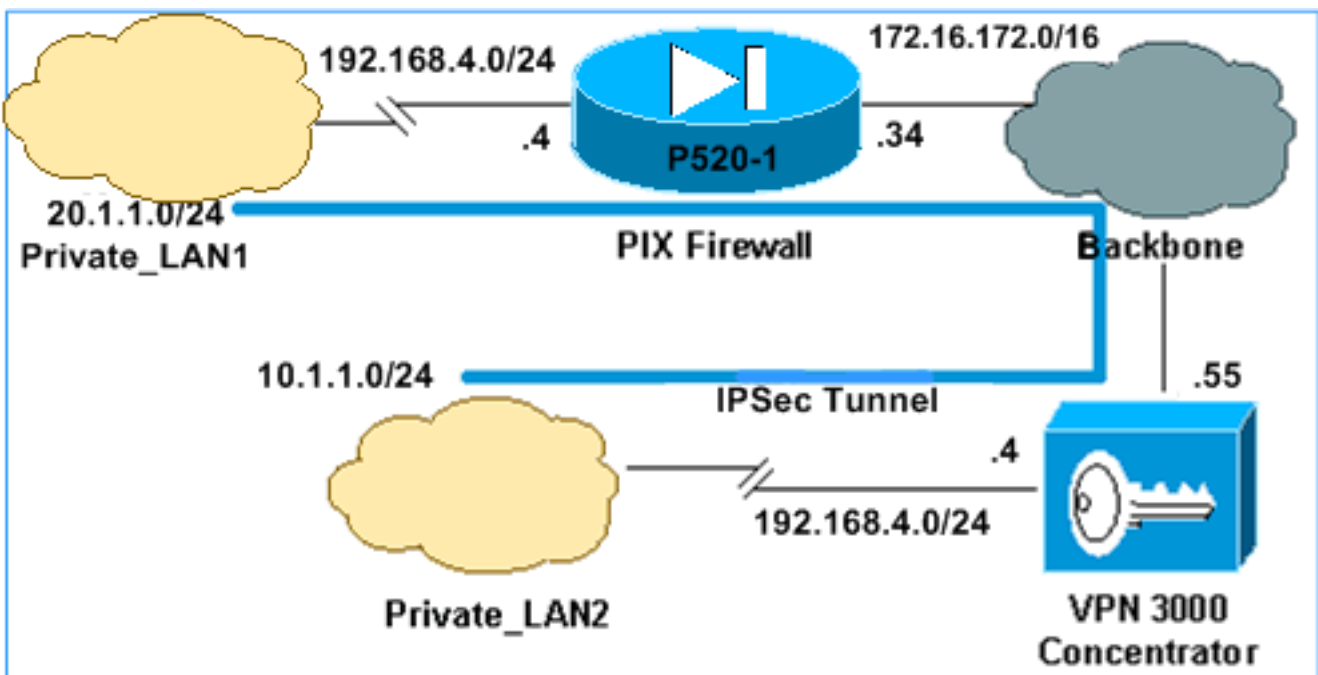
設定

本節提供用於設定本文件中所述功能的資訊。

注意：要查詢有關本文檔中使用的命令的其他資訊，請使用[命令查詢工具](#)([僅限註冊客戶](#))。

網路圖表

本檔案會使用下圖中所示的網路設定。



Private_LAN1和Private_LAN2的IP子網均為192.168.4.0/24。這將模擬IPSec通道兩端的重疊地址空間。此處將VPN 3000集中器用作不具備NAT over VPN流量功能的集中器的一個示例。

在本示例中，PIX執行雙向轉換，以便兩個專用LAN可以通過IPSec隧道通訊。此轉譯意味著Private_LAN1透過IPSec通道「看到」Private_LAN2為10.1.1.0/24，而Private_LAN2透過IPSec通道「看到」Private_LAN1為20.1.1.0/24。

組態

```
PIX
P520-1(config)#show run
: Saved
:
PIX Version 6.3(3)
interface ethernet0 auto
interface ethernet1 auto
nameif ethernet0 outside security0
nameif ethernet1 inside security100
```

```
enable password 8Ry2YjIyt7RRXU24 encrypted
passwd 2KFQnbNIdI.2KYOU encrypted
hostname P520-1
domain-name bru-ch.com
fixup protocol dns maximum-length 512
fixup protocol ftp 21
fixup protocol h323 h225 1720
fixup protocol h323 ras 1718-1719
fixup protocol http 80
fixup protocol rsh 514
fixup protocol rtsp 554
fixup protocol sip 5060
fixup protocol sip udp 5060
fixup protocol skinny 2000
fixup protocol smtp 25
fixup protocol sqlnet 1521
fixup protocol tftp 69
names
!--- Defines IPsec interesting traffic. !--- Note that
the host behind PIX communicates !--- to Private_LAN1
using 10.1.1.0/24. !--- When the packets arrive at the
PIX, they are first !--- translated to 192.168.4.0/24
and then encrypted by IPsec. access-list 101 permit ip
20.1.1.0 255.255.255.0 192.168.4.0 255.255.255.0
pager lines 24
mtu outside 1500
mtu inside 1500
ip address outside 172.16.172.34 255.255.255.0
ip address inside 192.168.4.4 255.255.255.0
ip audit info action alarm
ip audit attack action alarm
pdm history enable
arp timeout 14400
!--- Static translation defined to translate
Private_LAN2 !--- from 192.168.4.0/24 to 10.1.1.0/24.
static (outside,inside) 10.1.1.0 192.168.4.0 netmask
255.255.255.0 0 0
!--- Static translation defined to translate
Private_LAN1 !--- from 192.168.4.0/24 to 20.1.1.0/24. !-
-- Note that this translation is used for both !--- VPN
and Internet traffic from Private_LAN1. !--- A routable
global IP address range, or an extra NAT !--- at the ISP
router (in front of PIX), is !--- required if
Private_LAN1 also needs internal access. static
(inside,outside) 20.1.1.0 192.168.4.0 netmask
255.255.255.0 0 0
route outside 0.0.0.0 0.0.0.0 172.16.172.55 1
timeout xlate 3:00:00
timeout conn 1:00:00 half-closed 0:10:00 udp 0:02:00 rpc
0:10:00 h225 1:00:00
timeout h323 0:05:00 mgcp 0:05:00 sip 0:30:00 sip_media
0:02:00
timeout uauth 0:05:00 absolute
aaa-server TACACS+ protocol tacacs+
aaa-server RADIUS protocol radius
aaa-server LOCAL protocol local
no snmp-server location
no snmp-server contact
snmp-server community public
no snmp-server enable traps
floodguard enable
sysopt connection permit-ipsec
!--- Defines IPsec encryption and authentication
algorithms. crypto ipsec transform-set myset esp-des
```

```

esp-md5-hmac
!--- Defines crypto map. crypto map vpn 10 ipsec-isakmp
crypto map vpn 10 match address 101
crypto map vpn 10 set peer 172.16.172.55
crypto map vpn 10 set transform-set myset
!--- Apply crypto map on the outside interface. crypto
map vpn interface outside
isakmp enable outside
!--- Defines pre-shared secret (cisco123) used for IKE
authentication. isakmp key ***** address
172.16.172.55 netmask 255.255.255.255
isakmp identity address
!--- Defines ISAKMP policy. isakmp policy 1
authentication pre-share
isakmp policy 1 encryption des
isakmp policy 1 hash md5
isakmp policy 1 group 1
isakmp policy 1 lifetime 86400
telnet timeout 5
ssh timeout 5
console timeout 0
terminal width 80
Cryptochecksum:6cc25fc2fea20958dfe74c1fca45ada2
: end

```

VPN 3000集中器LAN到LAN隧道配置

對於目標地址20.1.1.0 /24(Private_LAN1)，您需要在VPN 3000上擁有靜態路由。為此，請選擇 **Configuration > System > IP Routing > Static Routes**，然後選擇Add。填寫完欄位後，按一下Add。

Configuration | System | IP Routing | Static Routes | Add

Configure and add a static route.

Network Address	<input type="text" value="20.1.1.0"/>	Enter the network address.
Subnet Mask	<input type="text" value="255.255.255.0"/>	Enter the subnet mask.
Metric	<input type="text" value="1"/>	Enter the numeric metric for this route (1 through 16).
Destination		
Router Address <input checked="" type="radio"/>	<input type="text" value="172.16.172.34"/>	Enter the router/gateway IP address.
Interface <input type="radio"/>	<input type="text" value="Ethernet 2 (Public) (172.16.172.55)"/> ▼	Select the interface to route to.

使用這些映像中的設定來配置VPN 3000集中器。

Add a new IPSec LAN-to-LAN connection.

Enable

Check to enable this LAN-to-LAN connection.

Name

Enter the name for this LAN-to-LAN connection.

Interface

Select the interface for this LAN-to-LAN connection.

Connection Type

Choose the type of LAN-to-LAN connection. An *Originate-Only* connection may have multiple peers specified below.

Peers

Enter the remote peer IP addresses for this LAN-to-LAN connection. *Originate-Only* connection may specify up to ten peer IP addresses. Enter one IP address per line.

Digital Certificate

Select the digital certificate to use.

Certificate Transmission Entire certificate chain
 Identity certificate only

Choose how to send the digital certificate to the IKE peer.

Preshared Key

Enter the preshared key for this LAN-to-LAN connection.

Authentication

Specify the packet authentication mechanism to use.

Encryption

Specify the encryption mechanism to use.

IKE Proposal

Select the IKE Proposal to use for this LAN-to-LAN connection.

Filter

Choose the filter to apply to the traffic that is tunneled through this LAN-to-LAN connection.

IPSec NAT-T

Check to let NAT-T compatible IPSec peers establish this LAN-to-LAN connection through a NAT device. You must also enable IPSec over NAT-T under NAT Transparency.

Bandwidth Policy

Choose the bandwidth policy to apply to this LAN-to-LAN connection.

Routing

Choose the routing mechanism to use. **Parameters below are ignored if Network Autodiscovery is chosen.**

Local Network: If a LAN-to-LAN NAT rule is used, this is the Translated Network address.

Network List

Specify the local network address list or the IP address and wildcard mask for this LAN-to-LAN connection.

IP Address

Note: Enter a *wildcard* mask, which is the reverse of a subnet mask. A wildcard mask has 1s in bit positions to ignore, 0s in bit positions to match. For example, 10.10.1.0/0.0.0.255 = all 10.10.1.nnn addresses.

Wildcard Mask

Remote Network: If a LAN-to-LAN NAT rule is used, this is the Remote Network address.

Network List

Specify the remote network address list or the IP address and wildcard mask for this LAN-to-LAN connection.

IP Address

Note: Enter a *wildcard* mask, which is the reverse of a subnet mask. A wildcard mask has 1s in bit positions to ignore, 0s in bit positions to match. For example, 10.10.1.0/0.0.0.255 = all 10.10.1.nnn addresses.

Wildcard Mask

Add

Cancel

驗證

本節提供的資訊可用於確認您的組態是否正常運作。

[輸出直譯器工具](#) (僅供註冊客戶使用) 支援某些 `show` 命令，此工具可讓您檢視 `show` 命令輸出的分析。

- `show crypto isakmp sa` — 顯示對等體上的所有當前網際網路金鑰交換 (IKE) 安全關聯 (SA)。
- `show crypto isakmp sa detail` — 顯示對等體上所有當前 IKE SA 的詳細資訊。
- `show crypto ipsec sa` — 顯示當前 SA 使用的設定。
- `show xlate detail` — 顯示轉換插槽資訊。

PIX

```
P520-1(config)#  
P520-1(config)#show crypto isakmp sa  
Total      : 1  
Embryonic  : 0
```

dst	src	state	pending	created
172.16.172.55	172.16.172.34	QM_IDLE	0	1

```
P520-1(config)#show crypto isakmp sa detail
```

```
Total      : 1  
Embryonic  : 0
```

Local	Remote	Encr	Hash	Auth	State	Lifetime
172.16.172.34:500	172.16.172.55:500	des	md5	psk	QM_IDLE	86211

```
P520-1(config)#
```

```
P520-1(config)#show crypto ipsec sa
```

```

interface: outside
  Crypto map tag: vpn, local addr. 172.16.172.34

local ident (addr/mask/prot/port): (20.1.1.0/255.255.255.0/0/0)
remote ident (addr/mask/prot/port): (192.168.4.0/255.255.255.0/0/0)
current_peer: 172.16.172.55:500
  PERMIT, flags={origin_is_acl,}
#pkts encaps: 4, #pkts encrypt: 4, #pkts digest 4
#pkts decaps: 4, #pkts decrypt: 4, #pkts verify 4
#pkts compressed: 0, #pkts decompressed: 0
#pkts not compressed: 0, #pkts compr. failed: 0, #pkts decompress failed: 0
#send errors 1, #recv errors 0

local crypto endpt.: 172.16.172.34, remote crypto endpt.: 172.16.172.55
path mtu 1500, ipsec overhead 56, media mtu 1500
current outbound spi: 734575cb

inbound esp sas:
spi: 0xe028850d(3760751885)
  transform: esp-des esp-md5-hmac ,
  in use settings ={Tunnel, }
  slot: 0, conn id: 1, crypto map: vpn
  sa timing: remaining key lifetime (k/sec): (4607999/28751)
  IV size: 8 bytes
  replay detection support: Y

inbound ah sas:

inbound pcp sas:

outbound esp sas:
spi: 0x734575cb(1933931979)
  transform: esp-des esp-md5-hmac ,
  in use settings ={Tunnel, }
  slot: 0, conn id: 2, crypto map: vpn
  sa timing: remaining key lifetime (k/sec): (4607999/28751)
  IV size: 8 bytes
  replay detection support: Y

outbound ah sas:

```

```

P520-1(config)#show xlate detail
2 in use, 2 most used
Flags: D - DNS, d - dump, I - identity, i - inside, n - no random,
      o - outside, r - portmap, s - static
NAT from inside:192.168.4.1 to outside:20.1.1.1 flags s
NAT from outside:192.168.4.1 to inside:10.1.1.1 flags s

```

使用ping流量驗證通道。在PIX上收集的debug icmp trace輸出說明了如何通過NAT轉換資料包。

```



P520-1(config)# debug icmp trace
ICMP trace on
Warning: this may cause problems on busy networks
P520-1(config)#
1: ICMP echo-request from inside:192.168.4.1 to 10.1.1.1 ID=3060 seq=4391 length=80
2: ICMP echo-request: translating inside:192.168.4.1 to outside:20.1.1.1
3: ICMP echo-request: untranslating inside:10.1.1.1 to outside:192.168.4.1

```

4: ICMP echo-reply from outside:192.168.4.1 to 20.1.1.1 ID=3060 seq=4391 length=80
5: ICMP echo-reply: translating outside:192.168.4.1 to inside:10.1.1.1
6: ICMP echo-reply: untranslating outside:20.1.1.1 to inside:192.168.4.1
7: ICMP echo-request from inside:192.168.4.1 to 10.1.1.1 ID=3061 seq=4391 length=80
8: ICMP echo-request: translating inside:192.168.4.1 to outside:20.1.1.1
9: ICMP echo-request: untranslating inside:10.1.1.1 to outside:192.168.4.1
10: ICMP echo-reply from outside:192.168.4.1 to 20.1.1.1 ID=3061 seq=4391 length=80
11: ICMP echo-reply: translating outside:192.168.4.1 to inside:10.1.1.1
12: ICMP echo-reply: untranslating outside:20.1.1.1 to inside:192.168.4.1
13: ICMP echo-request from inside:192.168.4.1 to 10.1.1.1 ID=3062 seq=4391 length=80
14: ICMP echo-request: translating inside:192.168.4.1 to outside:20.1.1.1
15: ICMP echo-request: untranslating inside:10.1.1.1 to outside:192.168.4.1
16: ICMP echo-reply from outside:192.168.4.1 to 20.1.1.1 ID=3062 seq=4391 length=80
17: ICMP echo-reply: translating outside:192.168.4.1 to inside:10.1.1.1
18: ICMP echo-reply: untranslating outside:20.1.1.1 to inside:192.168.4.1
19: ICMP echo-request from inside:192.168.4.1 to 10.1.1.1 ID=3063 seq=4391 length=80
20: ICMP echo-request: translating inside:192.168.4.1 to outside:20.1.1.1
21: ICMP echo-request: untranslating inside:10.1.1.1 to outside:192.168.4.1
22: ICMP echo-reply from outside:192.168.4.1 to 20.1.1.1 ID=3063 seq=4391 length=80
23: ICMP echo-reply: translating outside:192.168.4.1 to inside:10.1.1.1
24: ICMP echo-reply: untranslating outside:20.1.1.1 to inside:192.168.4.1
25: ICMP echo-request from inside:192.168.4.1 to 10.1.1.1 ID=3064 seq=4391 length=80
26: ICMP echo-request: translating inside:192.168.4.1 to outside:20.1.1.1
27: ICMP echo-request: untranslating inside:10.1.1.1 to outside:192.168.4.1
28: ICMP echo-reply from outside:192.168.4.1 to 20.1.1.1 ID=3064 seq=4391 length=80
29: ICMP echo-reply: translating outside:192.168.4.1 to inside:10.1.1.1
30: ICMP echo-reply: untranslating outside:20.1.1.1 to inside:192.168.4.1
P520-1(config)#

[VPN集中器](#)

選擇Monitoring > Sessions > Detail以驗證VPN 3000 Concentrator配置。

Monitoring Sessions Detail		Wednesday, 07 July 2004 18:17:33					
		Reset  Refresh 					
Back to Sessions							
Connection Name	IP Address	Protocol	Encryption	Login Time	Duration	Bytes Tx	Bytes Rx
ToPIX	172.16.172.34	IPSec/LAN-to-LAN	DES-56	Jul 07 18:09:20	0:08:13	416	416

IKE Sessions: 1
IPSec Sessions: 1

IKE Session			
Session ID	1	Encryption Algorithm	DES-56
Hashing Algorithm	MD5	Diffie-Hellman Group	Group 1 (768-bit)
Authentication Mode	Pre-Shared Keys	IKE Negotiation Mode	Main
Rekey Time Interval	86400 seconds		
IPSec Session			
Session ID	2	Remote Address	20.1.1.0/0.0.0.255
Local Address	192.168.4.0/0.0.0.255	Encryption Algorithm	DES-56
Hashing Algorithm	MD5	SEP	1
Encapsulation Mode	Tunnel	Rekey Time Interval	28800 seconds
Rekey Data Interval	4608000 KBytes		
Bytes Received	416	Bytes Transmitted	416

疑難排解

本節提供的資訊可用於對組態進行疑難排解。有關故障排除的其他資訊，請參閱以下文檔：

- [排除VPN 3000集中器上的連線問題](#)
- [IP安全性疑難排解 — 瞭解和使用debug命令](#)
- [排除PIX在已建立的IPSec隧道上傳遞資料流量的故障](#)

疑難排解指令

[輸出直譯器工具](#)(僅供註冊客戶使用)支援某些show命令，此工具可讓您檢視show命令輸出的分析。

注意：發出debug指令之前，請先參閱[有關Debug指令的重要資訊](#)。

此輸出演示了IKE協商的工作調試。此處顯示的是debug crypto isakmp和debug crypto ipsec命令的輸出。

```
P520-1(config)#show debug
debug crypto ipsec 1
debug crypto isakmp 1
P520-1(config)#
ISAKMP (0): beginning Main Mode exchange

crypto_isakmp_process_block:src:172.16.172.55, dest:172.16.172.34 spt:500 dpt:500
OAK_MM exchange
ISAKMP (0): processing SA payload. message ID = 0

ISAKMP (0): Checking ISAKMP transform 1 against priority 1 policy
ISAKMP:      encryption DES-CBC
ISAKMP:      hash MD5
ISAKMP:      default group 1
ISAKMP:      auth pre-share
ISAKMP:      life type in seconds
ISAKMP:      life duration (VPI) of 0x0 0x1 0x51 0x80
ISAKMP (0): atts are acceptable. Next payload is 0
ISAKMP (0): processing vendor id payload
```

```
ISAKMP (0): SA is doing pre-shared key authentication using id type ID_IPV4_ADDR
return status is IKMP_NO_ERROR
crypto_isakmp_process_block:src:172.16.172.55, dest:172.16.172.34 spt:500 dpt:500
OAK_MM exchange
ISAKMP (0): processing KE payload. message ID = 0
ISAKMP (0): processing NONCE payload. message ID = 0
ISAKMP (0): processing vendor id payload
ISAKMP (0): processing vendor id payload
ISAKMP (0): received xauth v6 vendor id
ISAKMP (0): processing vendor id payload
ISAKMP (0): speaking to another IOS box!
ISAKMP (0): processing vendor id payload
ISAKMP (0): speaking to a VPN3000 concentrator
ISAKMP (0): ID payload
    next-payload : 8
    type          : 1
    protocol      : 17
    port          : 500
    length        : 8
ISAKMP (0): Total payload length: 12
return status is IKMP_NO_ERROR
crypto_isakmp_process_block:src:172.16.172.55, dest:172.16.172.34 spt:500 dpt:500
OAK_MM exchange
ISAKMP (0): processing ID payload. message ID = 0
ISAKMP (0): processing HASH payload. message ID = 0
ISAKMP (0): processing vendor id payload
ISAKMP (0): remote peer supports dead peer detection
ISAKMP (0): SA has been authenticated

ISAKMP (0): beginning Quick Mode exchange, M-ID of -995061605:c4b0909bIPSEC
(key_engine): got a queue event...
IPSEC(spi_response): getting spi 0xe028850d(3760751885) for SA
    from 172.16.172.55 to 172.16.172.34 for prot 3

return status is IKMP_NO_ERROR
ISAKMP (0): sending INITIAL_CONTACT notify
ISAKMP (0): sending NOTIFY message 24578 protocol 1
VPN Peer: ISAKMP: Added new peer: ip:172.16.172.55/500 Total VPN Peers:1
VPN Peer: ISAKMP: Peer ip:172.16.172.55/500 Ref cnt incremented to:1 Total
VPN Peers:1
crypto_isakmp_process_block:src:172.16.172.55, dest:172.16.172.34 spt:500 dpt:500
OAK_QM exchange
oakley_process_quick_mode:
OAK_QM_IDLE
ISAKMP (0): processing SA payload. message ID = 3299905691
ISAKMP : Checking IPsec proposal 1
ISAKMP: transform 1, ESP_DES
ISAKMP:  attributes in transform:
ISAKMP:      SA life type in seconds
ISAKMP:      SA life duration (basic) of 28800
ISAKMP:      SA life type in kilobytes
ISAKMP:      SA life duration (VPI) of 0x0 0x46 0x50 0x0
ISAKMP:      encaps is 1
ISAKMP:      authenticator is HMAC-MD5
ISAKMP (0): atts are acceptable.IPSEC(validate_proposal_request): proposal part #1,
(key eng. msg.) dest= 172.16.172.55, src= 172.16.172.34,
    dest_proxy= 192.168.4.0/255.255.255.0/0/0 (type=4),
    src_proxy= 20.1.1.0/255.255.255.0/0/0 (type=4),
    protocol= ESP, transform= esp-des esp-md5-hmac ,
    lifedur= 0s and 0kb,
    spi= 0x0(0), conn_id= 0, keysize= 0, flags= 0x4

ISAKMP (0): processing NONCE payload. message ID = 3299905691
```

```
ISAKMP (0): processing ID payload. message ID = 3299905691
ISAKMP (0): processing ID payload. message ID = 3299905691
ISAKMP (0): Creating IPsec SAs
  inbound SA from 172.16.172.55 to 172.16.172.34
  (proxy 192.168.4.0 to 20.1.1.0)
  has spi 3760751885 and conn_id 1 and flags 4
  lifetime of 28800 seconds
  lifetime of 4608000 kilobytes
  outbound SA from 172.16.172.34 to 172.16.172.55
  (proxy 20.1.1.0 to 192.168.4.0)
  has spi 1933931979 and conn_id 2 and flags 4
  lifetime of 28800 seconds
  lifetime of 4608000 kilobytes
IPSEC(key_engine): got a queue event...
IPSEC(initialize_sas): ,
(key eng. msg.) dest= 172.16.172.34, src= 172.16.172.55,
dest_proxy= 20.1.1.0/255.255.255.0/0/0 (type=4),
src_proxy= 192.168.4.0/255.255.255.0/0/0 (type=4),
protocol= ESP, transform= esp-des esp-md5-hmac ,
lifedur= 28800s and 4608000kb,
spi= 0xe028850d(3760751885), conn_id= 1, keysize= 0, flags= 0x4
IPSEC(initialize_sas): ,
(key eng. msg.) src= 172.16.172.34, dest= 172.16.172.55,
src_proxy= 20.1.1.0/255.255.255.0/0/0 (type=4),
dest_proxy= 192.168.4.0/255.255.255.0/0/0 (type=4),
protocol= ESP, transform= esp-des esp-md5-hmac ,
lifedur= 28800s and 4608000kb,
spi= 0x734575cb(1933931979), conn_id= 2, keysize= 0, flags= 0x4

VPN Peer: IPSEC: Peer ip:172.16.172.55/500 Ref cnt incremented to:2 Total VPN Peers:1
VPN Peer: IPSEC: Peer ip:172.16.172.55/500 Ref cnt incremented to:3 Total VPN Peers:1
return status is IKMP_NO_ERROR
P520-1(config)#
P520-1(config)#
crypto_isakmp_process_block:src:172.16.172.55, dest:172.16.172.34 spt:500 dpt:500
ISAKMP (0): processing NOTIFY payload 36136 protocol 1
spi 0, message ID = 1690390088
ISAKMP (0): received DPD_R_U_THERE from peer 172.16.172.55
ISAKMP (0): sending NOTIFY message 36137 protocol 1
return status is IKMP_NO_ERR_NO_TRANS
P520-1(config)#
```

相關資訊

- [安全和VPN產品支援頁面](#)
- [安全和VPN技術支援頁面](#)
- [IPSec支援頁面](#)
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