# 使用IPX路由配置GRE和IPSec

## 目錄

## 簡介

本檔案將說明使用兩台路由器之間的通用路由封裝(GRE)通道的IP安全(IPSec)組態。IPSec可用於加密GRE通道，為非IP流量提供網路層安全，例如Novell Internetwork Packet Exchange(IPX)、AppleTalk等。在此範例中，GRE通道純粹用於傳輸非IP流量。因此，通道未設定任何IP位址。以下是一些組態注意事項：

- 使用IOS 12.2(13)T軟體及更高版本（編號更高的T系列軟體，12.3及更高版本）時，配置的IPSec加密對映只需應用於物理介面，不再需要應用於GRE隧道介面。在此版本之前的軟體版本中，需要將IPSec加密對映同時應用於隧道介面和物理介面。使用12.2.(13)T軟體及更高版本時，物理介面和隧道介面上仍有加密對映；但是，思科強烈建議您僅在物理介面上應用它。
- 應用密碼編譯對應之前，請確保GRE通道正常運作。
- 加密存取控制清單(ACL)中應將GRE作為允許通訊協定。例如，**access-list 101 permit gre** ***host #.#.#.# host #.#.#.#***（其中第一個主機號碼是GRE隧道的隧道源的IP地址，第二個主機號碼是隧道目標的IP地址）。
- 使用物理介面（或環回介面）IP地址標識Internet金鑰交換(IKE)對等體。
- 在某些Cisco IOS版本的早期版本中，因為錯誤，必須停用通道介面上的快速交換才能使其運作。關閉通道介面上的快速交換功能。有關此問題的錯誤詳細資訊，請參閱[CSCdm10376](#)(僅限[註冊](#)客戶)。

## 開始之前

### 必要條件

嘗試此配置之前，請確保滿足以下先決條件：

- IPX配置和路由知識
- 瞭解和配置GRE隧道
- ipsec的工作知識和配置

## 採用元件

本檔案中的資訊是根據以下軟體和硬體版本。

- Cisco IOS®軟體版本12.2(7)
- Cisco 3600系列路由器

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。如果您在即時網路中工作，請確保在使用任何命令之前瞭解其潛在影響。

## 慣例

如需文件慣例的詳細資訊，請參閱思科技術提示慣例。

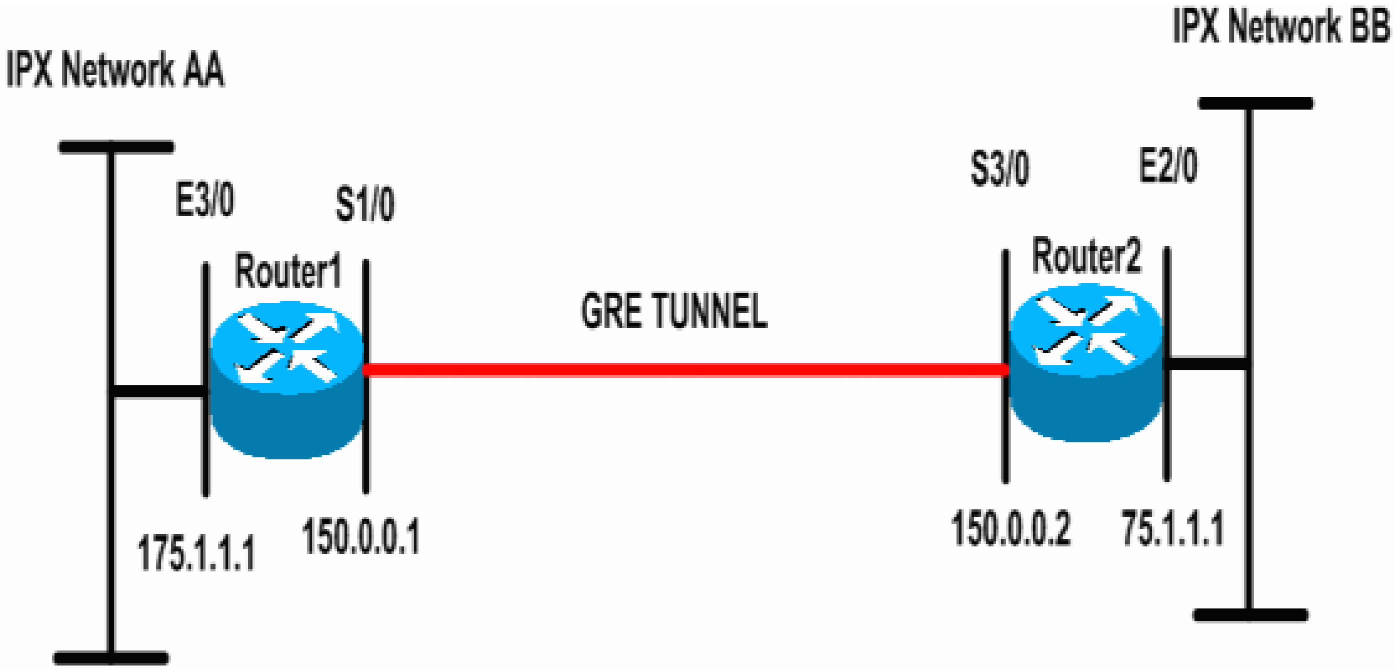
# 設定

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

本文檔使用下圖所示的網路設定。



## 組態

本文檔使用如下所示的配置。

**路由器1**

```
Current configuration: 1300 bytes
!
version 12.2
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Router1
!
ip subnet-zero
!
!--- Enables IPX routing. ipx routing 00e0.b064.258e
!
!--- Defines the IKE policy identifying the parameters
for building IKE SAs.
crypto isakmp policy 10
 authentication pre-share
 group 2
 lifetime 3600
!--- Defines the pre-shared key for the remote peer.
crypto isakmp key cisco address 200.1.1.1
!
!--- Defines the transform set to be used for IPSec SAs.
crypto ipsec transform-set tunnelset esp-des esp-md5-
hmac
!
!--- Configures the router to use the address of
Loopback0 interface !--- for IKE and IPSec traffic.
crypto map toBB local-address Loopback0
!--- Defines a crypto map to be used for establishing
IPSec SAs.
crypto map toBB 10 ipsec-isakmp
 set peer 200.1.1.1
 set transform-set tunnelset
 match address 101
!
interface Loopback0
 ip address 100.1.1.1 255.255.255.0
!
!--- Configures a GRE tunnel for transporting IPX
traffic. interface Tunnel0
 no ip address

ipx network CC
 tunnel source Serial1/0
 tunnel destination 150.0.0.2

!
interface Serial1/0
 ip address 150.0.0.1 255.255.255.0
!--- Applies the crypto map to the physical interface
used !--- for carrying GRE tunnel traffic. crypto map
toBB
!
interface Ethernet3/0
 ip address 175.1.1.1 255.255.255.0
ipx network AA
```

```
!--- Output suppressed. ip classless ip route 0.0.0.0
0.0.0.0 150.0.0.2 no ip http server ! !--- Configures
GRE tunnel traffic to be encrypted using IPSec. access-
list 101 permit gre host 150.0.0.1 host 150.0.0.2
!
line con 0
 transport input none
line aux 0
line vty 0 4
 login
!
end
```

## 路由器2

```


Current configuration:1525 bytes
!
version 12.2
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Router2
!
ip subnet-zero
!
!--- Enables IPX routing. ipx routing 0010.7b37.c8ae
!
!--- Defines the IKE policy identifying the parameters
for building IKE SAs.
crypto isakmp policy 10
 authentication pre-share
 group 2
 lifetime 3600
!--- Defines the pre-shared key for the remote peer.
crypto isakmp key cisco address 100.1.1.1
!
!--- Defines the transform set to be used for IPSec SAs.
crypto ipsec transform-set tunnelset esp-des esp-md5-
hmac
!
!--- Configures the router to use the address of
Loopback0 interface !--- for IKE and IPSec traffic.
crypto map toAA local-address Loopback0
!--- Defines a crypto map to be used for establishing
IPSec SAs.
crypto map toAA 10 ipsec-isakmp
 set peer 100.1.1.1
 set transform-set tunnelset
 match address 101
!
interface Loopback0
 ip address 200.1.1.1 255.255.255.0
!
!--- Configures a GRE tunnel for transporting IPX
traffic interface Tunnel0
 no ip address

 ipx network CC
 tunnel source Serial3/0
 tunnel destination 150.0.0.1
!
```

```
interface Ethernet2/0
 ip address 75.1.1.1 255.255.255.0
 ipx network BB
!
interface Serial3/0
 ip address 150.0.0.2 255.255.255.0
 clockrate 9600
!--- Applies the crypto map to the physical interface
used !--- for carrying GRE tunnel traffic. crypto map
toAA
!
!--- Output suppressed. ip classless ip route 0.0.0.0
0.0.0.0 150.0.0.1 no ip http server ! !--- Configures
GRE tunnel traffic to be encrypted using IPSec. access-
list 101 permit gre host 150.0.0.2 host 150.0.0.1
!
line con 0
 transport input none
line aux 0
line vty 0 4
 login
!
end
```

## 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 ipx interface** — 顯示裝置上配置的IPX介面的狀態和引數，例如IPX網路和節點地址。
- **show ipx route** — 顯示IPX路由表的內容。
- **show crypto isakmp sa** — 通過顯示路由器的IKE SA顯示第1階段的安全關聯。所顯示的狀態應為QM_IDLE，IKE SA才會被視為處於正常運行狀態。
- **show crypto ipsec sa** — 顯示路由器活動IPSec SA的詳細清單，顯示第2階段的安全關聯。
- **show crypto map** — 顯示路由器上配置的加密對映及其詳細資訊，如加密訪問清單、轉換集、對等體等。
- **show crypto engine connections active** — 顯示活動SA及其關聯介面、轉換和計數器的清單。

## 顯示輸出示例

本節擷取裝置Router1上若在目的地為Router2的Router1上執行IPX **ping**指令，則Router1上的**show**命令輸出。Router2上的輸出類似。輸出中的關鍵引數以**粗體顯示**。如需命令輸出的說明，請參閱IP安全性疑難排解 — 瞭解和使用debug命令檔案。

```
Router1#show ipx interface ethernet 3/0
Ethernet3/0 is up, line protocol is up
  IPX address is AA.00b0.64cb.eab1, NOVELL-ETHER [up]
  Delay of this IPX network, in ticks is 1 throughput 0 link delay 0
  IPXWAN processing not enabled on this interface.
!--- Output suppressed. Router2#show ipx interface ethernet 2/0
Ethernet2/0 is up, line protocol is up
  IPX address is BB.0002.16ae.c161, NOVELL-ETHER [up]
  Delay of this IPX network, in ticks is 1 throughput 0 link delay 0
  IPXWAN processing not enabled on this interface.
```

```
!--- Output suppressed. Router1#show ipx route
Codes: C - Connected primary network,    c - Connected secondary network
       S - Static, F - Floating static, L - Local (internal), W - IPXWAN
       R - RIP, E - EIGRP, N - NLSP, X - External, A - Aggregate
       s - seconds, u - uses, U - Per-user static/Unknown, H - Hold-down

3 Total IPX routes. Up to 1 parallel paths and 16 hops allowed.

No default route known.

C          AA (NOVELL-ETHER),  Et3/0
C          CC (TUNNEL),        Tu0
R          BB [151/01] via       CC.0010.7b37.c8ae,   56s, Tu0

Router2#show ipx route
Codes: C - Connected primary network,    c - Connected secondary network
       S - Static, F - Floating static, L - Local (internal), W - IPXWAN
       R - RIP, E - EIGRP, N - NLSP, X - External, A - Aggregate
       s - seconds, u - uses, U - Per-user static/Unknown, H - Hold-down

3 Total IPX routes. Up to 1 parallel paths and 16 hops allowed.

No default route known.

C          BB (NOVELL-ETHER),  Et2/0
C          CC (TUNNEL),        Tu0
R          AA [151/01] via       CC.00e0.b064.258e,    8s, Tu0

Router1#ping ipx BB.0010.7b37.c8ae

Type escape sequence to abort.
Sending 5, 100-byte IPX Novell Echoes to BB.0002.16ae.c161, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 52/53/56 ms

Router2#ping ipx  AA.00b0.64cb.eab1

Type escape sequence to abort.
Sending 5, 100-byte IPX Novell Echoes to AA.00b0.64cb.eab1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 52/53/56 ms


Router1#show crypto isakmp sa
dst             src             state           conn-id    slot
200.1.1.1       100.1.1.1       QM_IDLE               5       0


Router1#show crypto ipsec sa detail

interface: Serial1/0
    Crypto map tag: toBB, local addr. 100.1.1.1

   local  ident (addr/mask/prot/port): (150.0.0.1/255.255.255.255/47/0)
   remote ident (addr/mask/prot/port): (150.0.0.2/255.255.255.255/47/0)
   current_peer: 200.1.1.1
     PERMIT, flags={origin_is_acl,}
    #pkts encaps: 343, #pkts encrypt: 343, #pkts digest 343
    #pkts decaps: 343, #pkts decrypt: 343, #pkts verify 343
    #pkts compressed: 0, #pkts decompressed: 0
    #pkts not compressed: 0, #pkts compr. failed: 0, #pkts decompress failed: 0
    #pkts no sa (send) 1, #pkts invalid sa (rcv) 0
    #pkts encaps failed (send) 0, #pkts decaps failed (rcv) 0
    #pkts invalid prot (recv) 0, #pkts verify failed: 0
    #pkts invalid identity (recv) 0, #pkts invalid len (rcv) 0
    #pkts replay rollover (send): 0, #pkts replay rollover (rcv) 0
    ##pkts replay failed (rcv): 0
    #pkts internal err (send): 0, #pkts internal err (recv) 0

     local crypto endpt.: 100.1.1.1, remote crypto endpt.: 200.1.1.1
     path mtu 1500, ip mtu 1500, ip mtu interface Serial1/0
     current outbound spi: CB6F6DA6

     inbound esp sas:
      spi: 0xFD6F387(265745287)
        transform: esp-des esp-md5-hmac ,
        in use settings ={Tunnel, }
        slot: 0, conn id: 2010, flow_id: 11, crypto map: toBB
        sa timing: remaining key lifetime (k/sec): (4607994/1892)
        IV size: 8 bytes
        replay detection support: Y

     inbound ah sas:

     inbound pcp sas:

     outbound esp sas:
      spi: 0xCB6F6DA6(3413077414)
        transform: esp-des esp-md5-hmac ,
        in use settings ={Tunnel, }
        slot: 0, conn id: 2011, flow_id: 12, crypto map: toBB
        sa timing: remaining key lifetime (k/sec): (4607994/1892)
        IV size: 8 bytes
        replay detection support: Y

     outbound ah sas:

     outbound pcp sas:
```

```
Router1#show crypto map
Crypto Map: "toBB" idb: Loopback0 local address: 100.1.1.1

Crypto Map "toBB" 10 ipsec-isakmp
        Peer = 200.1.1.1
        Extended IP access list 101
            access-list 101 permit gre host 150.0.0.1 host 150.0.0.2
        Current peer: 200.1.1.1
        Security association lifetime: 4608000 kilobytes/3600 seconds
        PFS (Y/N): N
        Transform sets={ tunnelset, }
        Interfaces using crypto map toBB:
                Serial1/0
```

```
Router1#show crypto engine connections active

  ID Interface            IP-Address      State  Algorithm           Encrypt  Decrypt
   5 <none>               <none>          set    HMAC_SHA+DES_56_CB        0        0
2010 Serial1/0            150.0.0.1       set    HMAC_MD5+DES_56_CB        0       40
2011 Serial1/0            150.0.0.1       set    HMAC_MD5+DES_56_CB       45        0
```

# 疑難排解

本節提供的資訊可用於對組態進行疑難排解。

## 疑難排解指令

**注意：**發出debug指令之前，**請先參閱**有關Debug指令的重要資訊。

- **debug crypto engine** — 顯示有關執行加密和解密過程的加密引擎的資訊。
- **debug crypto ipsec** — 檢視第2階段的IPSec協商。
- **debug crypto isakmp** — 檢視階段1的IKE協商。

## 調試輸出示例

本節捕獲在配置了IPSec的路由器上輸出的debug命令。在發往router2的router1上執行IPX **ping**命令。

- Router1
- Router2

### Router1

```
Router1#show debug
Cryptographic Subsystem:
  Crypto ISAKMP debugging is on
  Crypto Engine debugging is on
  Crypto IPSEC debugging is on
Router1#
!--- GRE traffic matching crypto ACL triggers IPSec processing *Mar  2 00:41:17.593:
IPSEC(sa_request): ,
  (key eng. msg.) OUTBOUND local= 100.1.1.1, remote= 200.1.1.1,
    local_proxy= 150.0.0.1/255.255.255.255/47/0 (type=1),
    remote_proxy= 150.0.0.2/255.255.255.255/47/0 (type=1),
    protocol= ESP, transform= esp-des esp-md5-hmac ,
    lifedur= 3600s and 4608000kb,
    spi= 0x9AAD0079(2595029113), conn_id= 0, keysize= 0, flags= 0x400C
*Mar  2 00:41:17.597: ISAKMP: received ke message (1/1)
!--- IKE uses UDP port 500, begins main mode exchange. *Mar  2 00:41:17.597: ISAKMP: local port
500, remote port 500
*Mar  2 00:41:17.597: ISAKMP (0:1): beginning Main Mode exchange
*Mar  2 00:41:17.597: ISAKMP (0:1): sending packet to 200.1.1.1 (I) MM_NO_STATE
*Mar  2 00:41:17.773: ISAKMP (0:1): received packet from 200.1.1.1 (I) MM_NO_STATE
*Mar  2 00:41:17.773: ISAKMP (0:1): processing SA payload. message ID = 0
*Mar  2 00:41:17.773: ISAKMP (0:1): found peer pre-shared key matching 200.1.1.1
*Mar  2 00:41:17.773: ISAKMP (0:1): Checking ISAKMP transform 1 against priority 10 policy
!--- IKE SAs are negotiated. *Mar  2 00:41:17.773: ISAKMP:      encryption DES-CBC
*Mar  2 00:41:17.773: ISAKMP:      hash SHA
*Mar  2 00:41:17.773: ISAKMP:      default group 2
*Mar  2 00:41:17.773: ISAKMP:      auth pre-share
*Mar  2 00:41:17.773: ISAKMP:      life type in seconds
*Mar  2 00:41:17.773: ISAKMP:      life duration (basic) of 3600
*Mar  2 00:41:17.773: ISAKMP (0:1): atts are acceptable. Next payload is 0
*Mar  2 00:41:17.773: CryptoEngine0: generate alg parameter
*Mar  2 00:41:17.905: CRYPTO_ENGINE: Dh phase 1 status: 0
*Mar  2 00:41:17.905: CRYPTO_ENGINE: Dh phase 1 status: 0
```

```
*Mar  2 00:41:17.905: ISAKMP (0:1): SA is doing pre-shared key authentication using id type
ID_IPV4_
ADDR
*Mar  2 00:41:17.905: ISAKMP (0:1): sending packet to 200.1.1.1 (I) MM_SA_SETUP
*Mar  2 00:41:18.149: ISAKMP (0:1): received packet from 200.1.1.1 (I) MM_SA_SETUP
*Mar  2 00:41:18.153: ISAKMP (0:1): processing KE payload. message ID = 0
*Mar  2 00:41:18.153: CryptoEngine0: generate alg parameter
*Mar  2 00:41:18.317: ISAKMP (0:1): processing NONCE payload. message ID = 0
*Mar  2 00:41:18.317: ISAKMP (0:1): found peer pre-shared key matching 200.1.1.1
*Mar  2 00:41:18.317: CryptoEngine0: create ISAKMP SKEYID for conn id 1
*Mar  2 00:41:18.321: ISAKMP (0:1): SKEYID state generated
*Mar  2 00:41:18.321: ISAKMP (0:1): processing vendor id payload
*Mar  2 00:41:18.321: ISAKMP (0:1): speaking to another IOS box!
*Mar  2 00:41:18.321: ISAKMP (1): ID payload
        next-payload : 8
        type         : 1
        protocol     : 17
        port         : 500
        length       : 8
*Mar  2 00:41:18.321: ISAKMP (1): Total payload length: 12
*Mar  2 00:41:18.321: CryptoEngine0: generate hmac context for conn id 1
*Mar  2 00:41:18.321: ISAKMP (0:1): sending packet to 200.1.1.1 (I) MM_KEY_EXCH
*Mar  2 00:41:18.361: ISAKMP (0:1): received packet from 200.1.1.1 (I) MM_KEY_EXCH
*Mar  2 00:41:18.361: ISAKMP (0:1): processing ID payload. message ID = 0
*Mar  2 00:41:18.361: ISAKMP (0:1): processing HASH payload. message ID = 0
*Mar  2 00:41:18.361: CryptoEngine0: generate hmac context for conn id 1
!--- Peer is authenticated. *Mar  2 00:41:18.361: ISAKMP (0:1): SA has been authenticated with
200.1.1.1
!--- Begins quick mode exchange. *Mar  2 00:41:18.361: ISAKMP (0:1): beginning Quick Mode
exchange, M-ID of -2078851837
*Mar  2 00:41:18.365: CryptoEngine0: generate hmac context for conn id 1
*Mar  2 00:41:18.365: ISAKMP (0:1): sending packet to 200.1.1.1 (I) QM_IDLE
*Mar  2 00:41:18.365: CryptoEngine0: clear dh number for conn id 1
*Mar  2 00:41:18.681: ISAKMP (0:1): received packet from 200.1.1.1 (I) QM_IDLE
*Mar  2 00:41:18.681: CryptoEngine0: generate hmac context for conn id 1
*Mar  2 00:41:18.685: ISAKMP (0:1): processing HASH payload. message ID = -2078851837
*Mar  2 00:41:18.685: ISAKMP (0:1): processing SA payload. message ID = -2078851837
!--- Negotiates IPSec SA. *Mar  2 00:41:18.685: ISAKMP (0:1): Checking IPSec proposal 1
*Mar  2 00:41:18.685: ISAKMP: transform 1, ESP_DES
*Mar  2 00:41:18.685: ISAKMP:   attributes in transform:
*Mar  2 00:41:18.685: ISAKMP:      encaps is 1
*Mar  2 00:41:18.685: ISAKMP:      SA life type in seconds
*Mar  2 00:41:18.685: ISAKMP:      SA life duration (basic) of 3600
*Mar  2 00:41:18.685: ISAKMP:      SA life type in kilobytes
*Mar  2 00:41:18.685: ISAKMP:      SA life duration (VPI) of  0x0 0x46 0x50 0x0
*Mar  2 00:41:18.685: ISAKMP:      authenticator is HMAC-MD5
*Mar  2 00:41:18.685: validate proposal 0
*Mar  2 00:41:18.685: ISAKMP (0:1): atts are acceptable.
*Mar  2 00:41:18.685: IPSEC(validate_proposal_request): proposal part #1,
  (key eng. msg.) INBOUND local= 100.1.1.1, remote= 200.1.1.1,
    local_proxy= 150.0.0.1/255.255.255.255/47/0 (type=1),
    remote_proxy= 150.0.0.2/255.255.255.255/47/0 (type=1),
    protocol= ESP, transform= esp-des esp-md5-hmac ,
    lifedur= 0s and 0kb,
    spi= 0x0(0), conn_id= 0, keysize= 0, flags= 0x4
*Mar  2 00:41:18.689: validate proposal request 0
*Mar  2 00:41:18.689: ISAKMP (0:1): processing NONCE payload. message ID = -2078851837
*Mar  2 00:41:18.689: ISAKMP (0:1): processing ID payload. message ID = -2078851837
*Mar  2 00:41:18.689: ISAKMP (0:1): processing ID payload. message ID = -2078851837
*Mar  2 00:41:18.689: CryptoEngine0: generate hmac context for conn id 1
*Mar  2 00:41:18.689: ipsec allocate flow 0
*Mar  2 00:41:18.689: ipsec allocate flow 0
!--- IPSec SAs are generated for inbound and outbound traffic. *Mar  2 00:41:18.693: ISAKMP
(0:1): Creating IPSec SAs
```

```
*Mar  2 00:41:18.693:        inbound SA from 200.1.1.1 to 100.1.1.1
        (proxy 150.0.0.2 to 150.0.0.1)
*Mar  2 00:41:18.693:        has spi 0x9AAD0079 and conn_id 2000 and flags 4
*Mar  2 00:41:18.693:        lifetime of 3600 seconds
*Mar  2 00:41:18.693:        lifetime of 4608000 kilobytes
*Mar  2 00:41:18.693:        outbound SA from 100.1.1.1       to 200.1.1.1       (proxy
150.0.0.1
     to 150.0.0.2      )
*Mar  2 00:41:18.693:        has spi -1609905338 and conn_id 2001 and flags C
*Mar  2 00:41:18.693:        lifetime of 3600 seconds
*Mar  2 00:41:18.693:        lifetime of 4608000 kilobytes
*Mar  2 00:41:18.697: ISAKMP (0:1): sending packet to 200.1.1.1 (I) QM_IDLE
*Mar  2 00:41:18.697: ISAKMP (0:1): deleting node -2078851837 error FALSE reason ""
*Mar  2 00:41:18.697: IPSEC(key_engine): got a queue event...
*Mar  2 00:41:18.697: IPSEC(initialize_sas): ,
  (key eng. msg.) INBOUND local= 100.1.1.1, remote= 200.1.1.1,
    local_proxy= 150.0.0.1/0.0.0.0/47/0 (type=1),
    remote_proxy= 150.0.0.2/0.0.0.0/47/0 (type=1),
    protocol= ESP, transform= esp-des esp-md5-hmac ,
    lifedur= 3600s and 4608000kb,
    spi= 0x9AAD0079(2595029113), conn_id= 2000, keysize= 0, flags= 0x4
*Mar  2 00:41:18.697: IPSEC(initialize_sas): ,
  (key eng. msg.) OUTBOUND local= 100.1.1.1, remote= 200.1.1.1,
    local_proxy= 150.0.0.1/0.0.0.0/47/0 (type=1),
    remote_proxy= 150.0.0.2/0.0.0.0/47/0 (type=1),
    protocol= ESP, transform= esp-des esp-md5-hmac ,
    lifedur= 3600s and 4608000kb,
    spi= 0xA00ACB46(2685061958), conn_id= 2001, keysize= 0, flags= 0xC
*Mar  2 00:41:18.697: IPSEC(create_sa): sa created,
  (sa) sa_dest= 100.1.1.1, sa_prot= 50,
    sa_spi= 0x9AAD0079(2595029113),
    sa_trans= esp-des esp-md5-hmac , sa_conn_id= 2000
*Mar  2 00:41:18.701: IPSEC(create_sa): sa created,
  (sa) sa_dest= 200.1.1.1, sa_prot= 50,
    sa_spi= 0xA00ACB46(2685061958),
    sa_trans= esp-des esp-md5-hmac , sa_conn_id= 2001

Router1#
```

## Router2

```
Router2#show debug

Cryptographic Subsystem:
  Crypto ISAKMP debugging is on
  Crypto Engine debugging is on
  Crypto IPSEC debugging is on
Router2#
!--- IKE processing begins here. *Mar  2 00:30:26.093: ISAKMP (0:0): received packet from
100.1.1.1 (N) NEW SA
*Mar  2 00:30:26.093: ISAKMP: local port 500, remote port 500
*Mar  2 00:30:26.093: ISAKMP (0:1): processing SA payload. message ID = 0
*Mar  2 00:30:26.093: ISAKMP (0:1): found peer pre-shared key matching 100.1.1.1
!--- IKE SAs are negotiated. *Mar  2 00:30:26.093: ISAKMP (0:1): Checking ISAKMP transform 1
against priority 10 policy
*Mar  2 00:30:26.093: ISAKMP:      encryption DES-CBC
*Mar  2 00:30:26.093: ISAKMP:      hash SHA
*Mar  2 00:30:26.093: ISAKMP:      default group 2
*Mar  2 00:30:26.093: ISAKMP:      auth pre-share
*Mar  2 00:30:26.093: ISAKMP:      life type in seconds
*Mar  2 00:30:26.093: ISAKMP:      life duration (basic) of 3600
```

```
*Mar  2 00:30:26.093: ISAKMP (0:1): atts are acceptable. Next payload is 0
*Mar  2 00:30:26.097: CryptoEngine0: generate alg parameter
*Mar  2 00:30:26.229: CRYPTO_ENGINE: Dh phase 1 status: 0
*Mar  2 00:30:26.229: CRYPTO_ENGINE: Dh phase 1 status: 0
*Mar  2 00:30:26.229: ISAKMP (0:1): SA is doing pre-shared key authentication using id type
ID_IPV4_
ADDR
*Mar  2 00:30:26.229: ISAKMP (0:1): sending packet to 100.1.1.1 (R) MM_SA_SETUP
*Mar  2 00:30:26.417: ISAKMP (0:1): received packet from 100.1.1.1 (R) MM_SA_SETUP
*Mar  2 00:30:26.417: ISAKMP (0:1): processing KE payload. message ID = 0
*Mar  2 00:30:26.417: CryptoEngine0: generate alg parameter
*Mar  2 00:30:26.589: ISAKMP (0:1): processing NONCE payload. message ID = 0
*Mar  2 00:30:26.589: ISAKMP (0:1): found peer pre-shared key matching 100.1.1.1
*Mar  2 00:30:26.593: CryptoEngine0: create ISAKMP SKEYID for conn id 1
*Mar  2 00:30:26.593: ISAKMP (0:1):
SKEYID state generated
*Mar  2 00:30:26.593: ISAKMP (0:1): processing vendor id payload
*Mar  2 00:30:26.593: ISAKMP (0:1): speaking to another IOS box!
*Mar  2 00:30:26.593: ISAKMP (0:1): sending packet to 100.1.1.1 (R) MM_KEY_EXCH
*Mar  2 00:30:26.813: ISAKMP (0:1): received packet from 100.1.1.1 (R) MM_KEY_EXCH
*Mar  2 00:30:26.817: ISAKMP (0:1): processing ID payload. message ID = 0
*Mar  2 00:30:26.817: ISAKMP (0:1): processing HASH payload. message ID = 0
*Mar  2 00:30:26.817: CryptoEngine0: generate hmac context for conn id 1
!--- Peer is authenticated. *Mar  2 00:30:26.817: ISAKMP (0:1): SA has been authenticated with
100.1.1.1
*Mar  2 00:30:26.817: ISAKMP (1): ID payload
        next-payload : 8
        type         : 1
        protocol     : 17
        port         : 500
        length       : 8
*Mar  2 00:30:26.817: ISAKMP (1): Total payload length: 12
*Mar  2 00:30:26.817: CryptoEngine0: generate hmac context for conn id 1
*Mar  2 00:30:26.817: CryptoEngine0: clear dh number for conn id 1
*Mar  2 00:30:26.821: ISAKMP (0:1): sending packet to 100.1.1.1 (R) QM_IDLE
*Mar  2 00:30:26.869: ISAKMP (0:1): received packet from 100.1.1.1 (R) QM_IDLE
*Mar  2 00:30:26.869: CryptoEngine0: generate hmac context for conn id 1
*Mar  2 00:30:26.869: ISAKMP (0:1): processing HASH payload. message ID = -2078851837
*Mar  2 00:30:26.873: ISAKMP (0:1): processing SA payload. message ID = -2078851837
!--- IPSec SAs are negotiated. *Mar  2 00:30:26.873: ISAKMP (0:1): Checking IPSec proposal 1
*Mar  2 00:30:26.873: ISAKMP: transform 1, ESP_DES
*Mar  2 00:30:26.873: ISAKMP:   attributes in transform:
*Mar  2 00:30:26.873: ISAKMP:      encaps is 1
*Mar  2 00:30:26.873: ISAKMP:      SA life type in seconds
*Mar  2 00:30:26.873: ISAKMP:      SA life duration (basic) of 3600
*Mar  2 00:30:26.873: ISAKMP:      SA life type in kilobytes
*Mar  2 00:30:26.873: ISAKMP:      SA life duration (VPI) of  0x0 0x46 0x50 0x0
*Mar  2 00:30:26.873: ISAKMP:      authenticator is HMAC-MD5
*Mar  2 00:30:26.873: validate proposal 0
*Mar  2 00:30:26.873: ISAKMP (0:1): atts are acceptable.
*Mar  2 00:30:26.873: IPSEC(validate_proposal_request): proposal part #1,
  (key eng. msg.) INBOUND local= 200.1.1.1, remote= 100.1.1.1,
    local_proxy= 150.0.0.2/255.255.255.255/47/0 (type=1),
    remote_proxy= 150.0.0.1/255.255.255.255/47/0 (type=1),
    protocol= ESP, transform= esp-des esp-md5-hmac ,
    lifedur= 0s and 0kb,
    spi= 0x0(0), conn_id= 0, keysize= 0, flags= 0x4
*Mar  2 00:30:26.873: validate proposal request 0
*Mar  2 00:30:26.877: ISAKMP (0:1): processing NONCE payload. message ID = -2078851837
*Mar  2 00:30:26.877: ISAKMP (0:1): processing ID payload. message ID = -2078851837
*Mar  2 00:30:26.877: ISAKMP (0:1): processing ID payload. message ID = -2078851837
*Mar  2 00:30:26.877: ISAKMP (0:1): asking for 1 spis from ipsec
*Mar  2 00:30:26.877: IPSEC(key_engine): got a queue event...
*Mar  2 00:30:26.877: IPSEC(spi_response): getting spi 2685061958 for SA
```

```
        from 200.1.1.1       to 100.1.1.1       for prot 3
*Mar  2 00:30:26.877: ISAKMP: received ke message (2/1)
*Mar  2 00:30:27.129: CryptoEngine0: generate hmac context for conn id 1
*Mar  2 00:30:27.129: ISAKMP (0:1): sending packet to 100.1.1.1 (R) QM_IDLE
*Mar  2 00:30:27.185: ISAKMP (0:1): received packet from 100.1.1.1 (R) QM_IDLE
*Mar  2 00:30:27.189: CryptoEngine0: generate hmac context for conn id 1
*Mar  2 00:30:27.189: ipsec allocate flow 0
*Mar  2 00:30:27.189: ipsec allocate flow 0
!--- IPSec SAs are generated for inbound and outbound traffic. *Mar  2 00:30:27.193: ISAKMP
(0:1): Creating IPSec SAs
*Mar  2 00:30:27.193:         inbound SA from 100.1.1.1 to 200.1.1.1
        (proxy 150.0.0.1 to 150.0.0.2)
*Mar  2 00:30:27.193:         has spi 0xA00ACB46 and conn_id 2000 and flags 4
*Mar  2 00:30:27.193:         lifetime of 3600 seconds
*Mar  2 00:30:27.193:         lifetime of 4608000 kilobytes
*Mar  2 00:30:27.193:         outbound SA from 200.1.1.1       to 100.1.1.1       (proxy
150.0.0.2
     to 150.0.0.1       )
*Mar  2 00:30:27.193:         has spi -1699938183 and conn_id 2001 and flags C
*Mar  2 00:30:27.193:         lifetime of 3600 seconds
*Mar  2 00:30:27.193:         lifetime of 4608000 kilobytes
*Mar  2 00:30:27.193: ISAKMP (0:1): deleting node -2078851837 error FALSE reason "quick mode
done (a
wait()"
*Mar  2 00:30:27.193: IPSEC(key_engine): got a queue event...
*Mar  2 00:30:27.193: IPSEC(initialize_sas): ,
  (key eng. msg.) INBOUND local= 200.1.1.1, remote= 100.1.1.1,
    local_proxy= 150.0.0.2/0.0.0.0/47/0 (type=1),
    remote_proxy= 150.0.0.1/0.0.0.0/47/0 (type=1),
    protocol= ESP, transform= esp-des esp-md5-hmac ,
    lifedur= 3600s and 4608000kb,
    spi= 0xA00ACB46(2685061958), conn_id= 2000, keysize= 0, flags= 0x4
*Mar  2 00:30:27.197: IPSEC(initialize_sas): ,
  (key eng. msg.) OUTBOUND local= 200.1.1.1, remote= 100.1.1.1,
    local_proxy= 150.0.0.2/0.0.0.0/47/0 (type=1),
    remote_proxy= 150.0.0.1/0.0.0.0/47/0 (type=1),
    protocol= ESP, transform= esp-des esp-md5-hmac ,
    lifedur= 3600s and 4608000kb,
    spi= 0x9AAD0079(2595029113), conn_id= 2001, keysize= 0, flags= 0xC
*Mar  2 00:30:27.197: IPSEC(create_sa): sa created,
  (sa) sa_dest= 200.1.1.1, sa_prot= 50,
    sa_spi= 0xA00ACB46(2685061958),
    sa_trans= esp-des esp-md5-hmac , sa_conn_id= 2000
*Mar  2 00:30:27.197: IPSEC(create_sa): sa created,
  (sa) sa_dest= 100.1.1.1, sa_prot= 50,
    sa_spi= 0x9AAD0079(2595029113),
    sa_trans= esp-des esp-md5-hmac , sa_conn_id= 2001

Router2#
```

# 相關資訊

- GRE技術支援頁面
- IP安全(IPSec)技術支援頁面
- 技術支援 - Cisco Systems