使用 GRE 通道配置带有 EIGRP 和 IPX 的 IPSec

目录

[简介](#)
[先决条件](#)
[要求](#)
[使用的组件](#)
[规则](#)
[配置](#)
[网络图](#)
[配置](#)
[验证](#)
[隧道开启时的 show 命令输出](#)
[故障排除](#)
[故障排除命令](#)
[相关信息](#)

简介

普通的 IPSec 配置不能传输路由协议，例如 Enhanced Interior Gateway Routing Protocol (EIGRP) 和 Open Shortest Path First (OSPF)，也不能传输非 IP 数据流，例如互联网分组交换 (IPX)、AppleTalk 等。本文说明了如何使用路由协议和IPSec，在不同网络之间路由非IP数据流。此技术使用通用路由封装 (GRE) 作为实现此功能的方法。

先决条件

要求

尝试进行此配置之前，请确保满足以下要求：

- 在应用加密映射之前，请确保隧道正常工作。
- 加密访问列表需要将 GRE 作为允许的协议：access-list 101 permit gre host x.x.x.x host y.y.y.y x.x.x.x = <tunnel_source> y.y.y.y = <tunnel_destination>
- 使用回环IP地址识别互联网密钥交换(IKE)对等体及隧道源和隧道目的地，以改进其可用性。
- 有关可能的最大传输单元 (MTU) 问题的讨论，请参阅在 Windows 和 Sun 系统上调整 IP MTU、TCP MSS 和 PMTUD。

使用的组件

本文档中的信息基于以下软件和硬件版本：

- Cisco IOS® 软件版本 12.1.8 和 12.2.1

本文档中的信息都是基于特定实验室环境中的设备编写的。本文档中使用的所有设备最初均采用原始（默认）配置。如果您使用的是真实网络，请确保您已经了解所有命令的潜在影响。

规则

有关文档规则的详细信息，请参阅 Cisco 技术提示规则。

配置

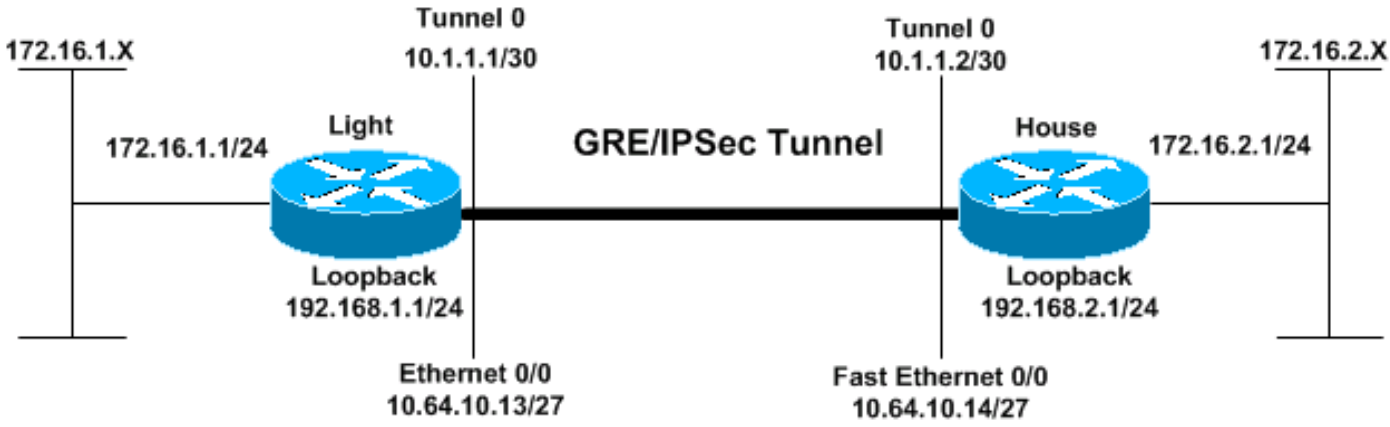
本部分提供有关如何配置本文档所述功能的信息。

注意： 要查找本文档所用命令的其他信息，请使用命令查找工具（仅限注册用户）。

IOS 配置说明：使用 Cisco IOS 软件版本 12.2(13)T 及更高版本代码（编号更高的 T 训练代码、Cisco IOS 软件版本 12.3 及更高版本代码），只需将配置的 IPSEC“加密映射”应用到物理接口，而不再需要将其应用到 GRE 隧道接口。使用 Cisco IOS 软件版本 12.2.(13)T 及更高版本的代码仍能正常工作时，请在物理和隧道接口上应用“加密映射”。不过，强烈建议仅在物理接口上应用它。

网络图

本文档使用此图所示的网络设置。



配置

- 灯
- 议院

灯

```
Current configuration:
!
version 12.2
no service single-slot-reload-enable
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname Light
!
```

```
logging rate-limit console 10 except errors
!
ip subnet-zero
!
!
no ip finger
!
no ip dhcp-client network-discovery
ipx routing 00e0.b06a.40fc ! !--- IKE policies. crypto
isakmp policy 25 hash md5 authentication pre-share
crypto isakmp key cisco123 address 192.168.2.1 ! !---
IPSec policies. crypto ipsec transform-set WWW esp-des
esp-md5-hmac mode transport ! crypto map GRE local-
address Loopback0 crypto map GRE 50 ipsec-isakmp set
peer 192.168.2.1 set transform-set WWW !--- What to
encrypt? match address 101 ! call rsvp-sync ! fax
interface-type modem mta receive maximum-recipients 0 !
interface Loopback0 ip address 192.168.1.1 255.255.255.0
! interface Tunnel0 ip address 10.1.1.1 255.255.255.252
ip mtu 1440 ipx network CC tunnel source Loopback0
tunnel destination 192.168.2.1 crypto map GRE !
interface FastEthernet0/0 ip address 10.64.10.13
255.255.255.224 no ip route-cache no ip mroute-cache
duplex auto speed auto crypto map GRE ! interface
FastEthernet0/1 ip address 172.16.1.1 255.255.255.0
duplex auto speed auto ipx network AA ! router eigrp 10
network 10.1.1.0 0.0.0.3 network 172.16.1.0 0.0.0.255
network 192.168.1.0 no auto-summary no eigrp log-
neighbor-changes ! ip kerberos source-interface any ip
classless ip route 192.168.2.0 255.255.255.0 10.64.10.14
ip http server ! !--- What to encrypt? access-list 101
permit gre host 192.168.1.1 host 192.168.2.1 ! dial-peer
cor custom ! line con 0 transport input none line aux 0
line vty 0 4 login ! end Light#!
```

议院

```
Current configuration:
version 12.1
service timestamps debug uptime
service timestamps log uptime
no service password-encryption
!
hostname House
!
ip subnet-zero
!
ipx routing 00e0.b06a.4114 ! !--- IKE policies. crypto
isakmp policy 25 hash md5 authentication pre-share
crypto isakmp key cisco123 address 192.168.1.1 ! !---
IPSec policies. crypto ipsec transform-set WWW esp-des
esp-md5-hmac mode transport ! crypto map GRE local-
address Loopback0 crypto map GRE 50 ipsec-isakmp set
peer 192.168.1.1 set transform-set WWW !--- What to
encrypt? match address 101 ! ! interface Loopback0 ip
address 192.168.2.1 255.255.255.0 ! interface Tunnel0 ip
address 10.1.1.2 255.255.255.252 ip mtu 1440 ipx network
CC tunnel source Loopback0 tunnel destination
192.168.1.1 crypto map GRE ! interface FastEthernet0/0
ip address 10.64.10.14 255.255.255.224 no ip route-cache
no ip mroute-cache duplex auto speed auto crypto map GRE
! interface FastEthernet0/1 ip address 172.16.2.1
255.255.255.0 duplex auto speed auto ipx network BB !
interface FastEthernet4/0 no ip address shutdown duplex
auto speed auto ! router eigrp 10 network 10.1.1.0
```

```
0.0.0.3 network 172.16.2.0 0.0.0.255 network 192.168.2.0
no auto-summary no eigrp log-neighbor-changes ! ip
classless ip route 192.168.1.0 255.255.255.0 10.64.10.13
ip http server !--- What to encrypt? access-list 101
permit gre host 192.168.2.1 host 192.168.1.1 ! line con
0 line aux 0 line vty 0 4 login ! end House#
```

验证

本部分提供的信息可帮助您确认您的配置是否可正常运行。

命令输出解释程序工具（仅限注册用户）支持某些 **show** 命令，使用此工具可以查看对 show 命令输出的分析。

- **show crypto engine connections active** - 显示 IPSec 对等体之间的加密和解密数据包。
- **show crypto isakmp sa** — 显示第 1 阶段的安全关联。
- **show crypto ipsec sa** - 显示第 2 阶段的安全连接。
- **show ipx route [network] [default] [detailed]** - 显示 IPX 路由表的内容。

隧道开启时的 show 命令输出

```
Light#show ip route Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP D -
EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area N1 - OSPF NSSA external type 1, N2 -
OSPF NSSA external type 2 E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP i - IS-
IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area * - candidate default, U -
per-user static route, o - ODR P - periodic downloaded static route Gateway of last resort is
not set 172.16.0.0/24 is subnetted, 2 subnets C 172.16.1.0 is directly connected,
FastEthernet0/1 D 172.16.2.0 [90/297246976] via 10.1.1.2, 00:00:31, Tunnel0 10.0.0.0/8 is
variably subnetted, 2 subnets, 2 masks C 10.1.1.0/30 is directly connected, Tunnel0 C
10.64.10.0/27 is directly connected, FastEthernet0/0 C 192.168.1.0/24 is directly connected,
Loopback0 S 192.168.2.0/24 [1/0] via 10.64.10.14 Light#ping Protocol [ip]: Target IP address:
172.16.2.1 Repeat count [5]: Datagram size [100]: Timeout in seconds [2]: Extended commands [n]:
y Source address or interface: 172.16.1.1 Type of service [0]: Set DF bit in IP header? [no]:
Validate reply data? [no]: Data pattern [0xABCD]: Loose, Strict, Record, Timestamp,
Verbose[none]: Sweep range of sizes [n]: Type escape sequence to abort. Sending 5, 100-byte ICMP
Echos to 172.16.2.1, timeout is 2 seconds: !!!!! Success rate is 100 percent (5/5), round-trip
min/avg/max = 1/2/4 ms Light# House#show ip route Codes: C - connected, S - static, I - IGRP, R
- RIP, M - mobile, B - BGP D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area N1 -
OSPF NSSA external type 1, N2 - OSPF NSSA external type 2 E1 - OSPF external type 1, E2 - OSPF
external type 2, E - EGP i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter
area * - candidate default, U - per-user static route, o - ODR P - periodic downloaded static
route Gateway of last resort is not set 172.16.0.0/24 is subnetted, 2 subnets D 172.16.1.0
[90/297246976] via 10.1.1.1, 00:00:36, Tunnel0 C 172.16.2.0 is directly connected,
FastEthernet0/1 10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks C 10.1.1.0/30 is directly
connected, Tunnel0 C 10.64.10.0/27 is directly connected, FastEthernet0/0 S 192.168.1.0/24 [1/0]
via 10.64.10.13 C 192.168.2.0/24 is directly connected, Loopback0 House#ping Protocol [ip]:
Target IP address: 172.16.1.1 Repeat count [5]: Datagram size [100]: Timeout in seconds [2]:
Extended commands [n]: y Source address or interface: 172.16.2.1 Type of service [0]: Set DF bit
in IP header? [no]: Validate reply data? [no]: Data pattern [0xABCD]: Loose, Strict, Record,
Timestamp, Verbose[none]: Sweep range of sizes [n]: Type escape sequence to abort. Sending 5,
100-byte ICMP Echos to 172.16.1.1, timeout is 2 seconds: !!!!! Success rate is 100 percent
(5/5), round-trip min/avg/max = 1/2/4 ms Light#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 3 Total IPX routes. Up to 1 parallel paths and 16 hops allowed. No default route
known. C AA (NOVELL-ETHER), Fa0/1 C CC (TUNNEL), Tu0 R BB [151/01] via CC.00e0.b06a.4114, 17s,
Tu0 House#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 3 Total IPX routes. Up to 1 parallel paths and 16 hops allowed. No default route known. C BB (NOVELL-ETHER), Fa0/1 C CC (TUNNEL), Tu0 R AA [151/01] via CC.00e0.b06a.40fc, 59s, Tu0 Light#**ping ipx BB.0004.9af2.8261** Type escape sequence to abort. Sending 5, 100-byte IPX Novell Echoes to BB.0004.9af2.8261, timeout is 2 second: !!!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms House#**ping ipx AA.0004.9af2.8181** Type escape sequence to abort. Sending 5, 100-byte IPX Novell Echoes to AA.0004.9af2.8181, timeout is 2 second: !!!!! Success rate is 100 percent (5/5), round-trip min/avg/max = 1/2/4 ms Light#**show crypto isa sa** dst src state conn-id slot 192.168.2.1 192.168.1.1 QM_IDLE 1 0 192.168.1.1 192.168.2.1 QM_IDLE 2 0 House#**show crypto isa sa** dst src state conn-id slot 192.168.1.1 192.168.2.1 QM_IDLE 1 0 192.168.2.1 192.168.1.1 QM_IDLE 2 0 Light#**show crypto engine connections active** ID Interface IP-Address State Algorithm Encrypt Decrypt 1 <none> <none> set HMAC_MD5+DES_56_CB 0 0 2 <none> <none> set HMAC_MD5+DES_56_CB 0 0 2000 FastEthernet0/0 10.64.10.13 set HMAC_MD5+DES_56_CB 0 161 2001 FastEthernet0/0 10.64.10.13 set HMAC_MD5+DES_56_CB 161 0 2002 FastEthernet0/0 10.64.10.13 set HMAC_MD5+DES_56_CB 0 0 2003 FastEthernet0/0 10.64.10.13 set HMAC_MD5+DES_56_CB 0 0 2004 FastEthernet0/0 10.64.10.13 set HMAC_MD5+DES_56_CB 0 0 2005 FastEthernet0/0 10.64.10.13 set HMAC_MD5+DES_56_CB 0 0 House#**show crypto engine connections active** ID Interface IP-Address State Algorithm Encrypt Decrypt 1 <none> <none> set HMAC_MD5+DES_56_CB 0 0 2 <none> <none> set HMAC_MD5+DES_56_CB 0 0 2000 FastEthernet0/0 10.64.10.14 set HMAC_MD5+DES_56_CB 0 159 2001 FastEthernet0/0 10.64.10.14 set HMAC_MD5+DES_56_CB 159 0 2002 FastEthernet0/0 10.64.10.14 set HMAC_MD5+DES_56_CB 0 0 2003 FastEthernet0/0 10.64.10.14 set HMAC_MD5+DES_56_CB 0 0 2004 FastEthernet0/0 10.64.10.14 set HMAC_MD5+DES_56_CB 0 0 2005 FastEthernet0/0 10.64.10.14 set HMAC_MD5+DES_56_CB 0 0 House#**show crypto ipsec sa detail** interface: Tunnel0 Crypto map tag: GRE, local addr. 192.168.2.1 local ident (addr/mask/prot/port): (192.168.2.1/255.255.255.255/47/0) remote ident (addr/mask/prot/port): (192.168.1.1/255.255.255.255/47/0) current_peer: 192.168.1.1 PERMIT, flags={origin_is_acl,transport_parent,} #pkts encaps: 192, #pkts encrypt: 192, #pkts digest 192 #pkts decaps: 190, #pkts decrypt: 190, #pkts verify 190 #pkts compressed: 0, #pkts decompressed: 0 #pkts not compressed: 0, #pkts compr. failed: 0, #pkts decompress failed: 0 #pkts no sa (send) 12, #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.: 192.168.2.1, remote crypto endpt.: 192.168.1.1 path mtu 1514, media mtu 1514 current outbound spi: 1FA721CA inbound esp sas: spi: 0xEE52531(249898289) transform: esp-des esp-md5-hmac , in use settings ={Transport, } slot: 0, conn id: 2000, flow_id: 1, crypto map: GRE sa timing: remaining key lifetime (k/sec): (4607961/2797) IV size: 8 bytes replay detection support: Y spi: 0xFEE24F3(267265267) transform: esp-des esp-md5-hmac , in use settings ={Transport, } slot: 0, conn id: 2002, flow_id: 3, crypto map: GRE sa timing: remaining key lifetime (k/sec): (4608000/2826) IV size: 8 bytes replay detection support: Y spi: 0x19240817(421791767) transform: esp-des esp-md5-hmac , in use settings ={Transport, } slot: 0, conn id: 2004, flow_id: 5, crypto map: GRE sa timing: remaining key lifetime (k/sec): (4608000/2759) IV size: 8 bytes replay detection support: Y inbound ah sas: inbound pcp sas: outbound esp sas: spi: 0x1FA721CA(531046858) transform: esp-des esp-md5-hmac , in use settings ={Transport, } slot: 0, conn id: 2001, flow_id: 2, crypto map: GRE sa timing: remaining key lifetime (k/sec): (4607972/2797) IV size: 8 bytes replay detection support: Y spi: 0x12B10EB0(313593520) transform: esp-des esp-md5-hmac , in use settings ={Transport, } slot: 0, conn id: 2003, flow_id: 4, crypto map: GRE sa timing: remaining key lifetime (k/sec): (4608000/2826) IV size: 8 bytes replay detection support: Y spi: 0x1A700242(443548226) transform: esp-des esp-md5-hmac , in use settings ={Transport, } slot: 0, conn id: 2005, flow_id: 6, crypto map: GRE sa timing: remaining key lifetime (k/sec): (4608000/2759) IV size: 8 bytes replay detection support: Y outbound ah sas: outbound pcp sas: local ident (addr/mask/prot/port): (192.168.2.1/255.255.255.255/0/0) remote ident (addr/mask/prot/port): (192.168.1.1/255.255.255.255/0/0) current_peer: 192.168.1.1 PERMIT, flags={transport_parent,} #pkts encaps: 0, #pkts encrypt: 0, #pkts digest 0 #pkts decaps: 0, #pkts decrypt: 0, #pkts verify 0 #pkts compressed: 0, #pkts decompressed: 0 #pkts not compressed: 0, #pkts compr. failed: 0, #pkts decompress failed: 0 #pkts no sa (send) 0, #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.: 192.168.2.1, remote crypto endpt.: 192.168.1.1 path mtu 1514, media mtu 1514 current outbound spi: 0 inbound esp sas: inbound ah sas: inbound pcp sas: outbound esp sas: outbound ah sas: outbound pcp sas: interface: FastEthernet0/0 Crypto map tag: GRE, local addr. 192.168.2.1 local ident (addr/mask/prot/port): (192.168.2.1/255.255.255.255/47/0) remote ident (addr/mask/prot/port):

```
(192.168.1.1/255.255.255.255/47/0) current_peer: 192.168.1.1 PERMIT,
flags={origin_is_acl,transport_parent,} #pkts encaps: 193, #pkts encrypt: 193, #pkts digest 193
#pkts decaps: 192, #pkts decrypt: 192, #pkts verify 192 #pkts compressed: 0, #pkts decompressed:
0 #pkts not compressed: 0, #pkts compr. failed: 0, #pkts decompress failed: 0 #pkts no sa (send)
12, #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.:
192.168.2.1, remote crypto endpt.: 192.168.1.1 path mtu 1514, media mtu 1514 current outbound
spi: 1FA721CA inbound esp sas: spi: 0xEE52531(249898289) transform: esp-des esp-md5-hmac , in
use settings ={Transport, } slot: 0, conn id: 2000, flow_id: 1, crypto map: GRE sa timing:
remaining key lifetime (k/sec): (4607961/2789) IV size: 8 bytes replay detection support: Y spi:
0xFEE24F3(267265267) transform: esp-des esp-md5-hmac , in use settings ={Transport, } slot: 0,
conn id: 2002, flow_id: 3, crypto map: GRE sa timing: remaining key lifetime (k/sec):
(4608000/2817) IV size: 8 bytes replay detection support: Y spi: 0x19240817(421791767)
transform: esp-des esp-md5-hmac , in use settings ={Transport, } slot: 0, conn id: 2004,
flow_id: 5, crypto map: GRE sa timing: remaining key lifetime (k/sec): (4608000/2750) IV size: 8
bytes replay detection support: Y inbound ah sas: inbound pcp sas: outbound esp sas: spi:
0x1FA721CA(531046858) transform: esp-des esp-md5-hmac , in use settings ={Transport, } slot: 0,
conn id: 2001, flow_id: 2, crypto map: GRE sa timing: remaining key lifetime (k/sec):
(4607972/2789) IV size: 8 bytes replay detection support: Y spi: 0x12B10EB0(313593520)
transform: esp-des esp-md5-hmac , in use settings ={Transport, } slot: 0, conn id: 2003,
flow_id: 4, crypto map: GRE sa timing: remaining key lifetime (k/sec): (4608000/2817) IV size: 8
bytes replay detection support: Y spi: 0x1A700242(443548226) transform: esp-des esp-md5-hmac ,
in use settings ={Transport, } slot: 0, conn id: 2005, flow_id: 6, crypto map: GRE sa timing:
remaining key lifetime (k/sec): (4608000/2750) IV size: 8 bytes replay detection support: Y
outbound ah sas: outbound pcp sas: local ident (addr/mask/prot/port):
(192.168.2.1/255.255.255.255/0/0) remote ident (addr/mask/prot/port):
(192.168.1.1/255.255.255.255/0/0) current_peer: 192.168.1.1 PERMIT, flags={transport_parent,}
#pkts encaps: 0, #pkts encrypt: 0, #pkts digest 0 #pkts decaps: 0, #pkts decrypt: 0, #pkts
verify 0 #pkts compressed: 0, #pkts decompressed: 0 #pkts not compressed: 0, #pkts compr.
failed: 0, #pkts decompress failed: 0 #pkts no sa (send) 0, #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.: 192.168.2.1, remote crypto endpt.:
192.168.1.1 path mtu 1514, media mtu 1514 current outbound spi: 0 inbound esp sas: inbound ah
sas: inbound pcp sas: outbound esp sas: outbound ah sas: outbound pcp sas:
```

故障排除

本部分提供的信息可用于对配置进行故障排除。

故障排除命令

命令输出解释程序工具（仅限注册用户）支持某些 **show** 命令，使用此工具可以查看对 show 命令输出的分析。

注意： 在发出 **debug** 命令之前，请参阅有关 debug 命令的重要信息。

- **debug crypto isakmp** -显示在阶段1期间的错误。
- **debug crypto ipsec** -显示在阶段2期间的错误。
- **debug crypto engine** - 显示来自加密引擎的信息。
- **debug ip your routing protocol** - 显示与路由协议的路由事务相关的信息。
- **clear crypto connection connection-id [slot/*rsm*/VIP]** - 终止当前正在进行的加密会话。当会话超时时，加密会话通常会终止。使用 **show crypto cisco connections** 命令可获得连接 ID 值。
- **clear crypto isakmp** - 清除第 1 阶段的安全连接。
- **clear crypto sa** - 清除第 2 阶段的安全连接。

相关信息

- IPSec 支持页面
- IP 安全 (IPsec) 加密简介
- 配置 IPSec 网络安全
- 配置 Internet 密钥交换安全协议
- 命令查找工具 (仅限注册用户)
- 技术支持 - Cisco Systems