

在具有 VPN 服务模块的 Catalyst 6500 和 PIX 防火墙之间配置 IPSec LAN 到 LAN 隧道的配置示例

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简介

本文档介绍如何在含有 IPSec VPN 服务模块 (W) 的 Cisco Catalyst 6500 系列交换机与 Cisco PIX 防火墙之间创建 IPSec LAN 到 LAN 隧道。

先决条件

要求

本文档没有任何特定的要求。

使用的组件

本文档中的信息基于以下软件和硬件版本：

- 适用于含 IPSec VPN 服务模块的 Catalyst 6000 系列 Supervisor 引擎的 Cisco IOS® 软件 12.2(14)SY2 版
- Cisco PIX 防火墙软件 6.3(3) 版

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

有关文件规则的更多信息请参见“Cisco技术提示规则”。

背景信息

Catalyst 6500 VPN 服务模块有两个千兆以太网 (GE) 端口，无外部可见的接头。这些端口只在配置时是可寻址的。端口 1 始终为内部端口。此端口处理从和到网络内部的所有业务量。第二个端口(端口2)处理所有业务量从和对广域网或外部网络。这两个端口在802.1q中继模式下总是配置。VPN服务模块对数据包流使用称线内冲突(BITW)的技术。

数据包由一对 VLAN 处理：一个第 3 层内部 VLAN 和一个第 2 层外部 VLAN。从内部传到外部的包，通过一种称为对内部VLAN的编码地址识别逻辑(EARL)的方法进行寻址。该方法将数据包加密之后，VPN 服务模块将使用相应的外部 VLAN。在解密过程中，使用外部 VLAN 将从外部到内部的数据包桥接到 VPN 服务模块。VPN 服务模块将数据包解密并将 VLAN 映射到相应的内部 VLAN 之后，EARL 将数据包路由到适当的 LAN 端口。第 3 层内部 VLAN 和第 2 层外部 VLAN 通过 **crypto connect vlan** 命令连接在一起。在Catalyst 6500系列交换机中有三种类型的端口：

- **路由端口** - 默认情况下，在 Cisco IOS 中所有以太网端口都是路由端口。这些端口有一个与它联系的隐藏VLAN。
- **接入端口** - 这些端口有一个外部 VLAN 或 VLAN 中继协议 (VTP) VLAN 与其关联。您能关联超过一个端口到默认的VLAN。
- **中继端口** - 这些端口承载许多外部 VLAN 或 VTP VLAN，上面所有数据包都以 802.1Q 报头进行封装。

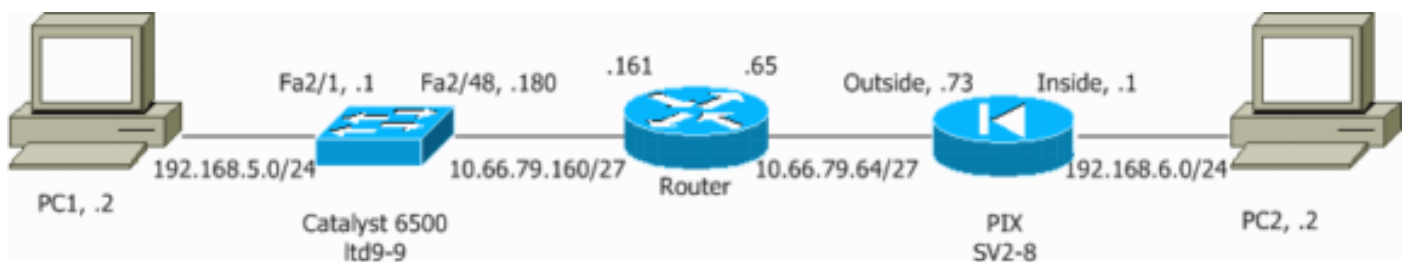
配置

本部分提供有关如何配置本文档所述功能的信息。

注意：使用[命令查找工具](#)(仅限注册客户)可查找有关本文档中使用的命令的详细信息。

网络图

本文档使用以下网络设置：



使用第 2 层接入或中继端口配置 IPsec

执行以下这些步骤，在外部物理接口作为第 2 层接入或中继端口的情况下配置 IPsec。

1. 将内部 VLAN 添加到 VPN 服务模块的内部端口。假设VPN服务模块在插槽4上。使用VLAN 100作为内部VLAN，使用VLAN 209作为外部VLAN。按如下所示配置 VPN 服务模块的 GE 端口：

```
interface GigabitEthernet4/1
  no ip address
  flowcontrol receive on
  flowcontrol send off
  switchport
  switchport trunk encapsulation dot1q
  switchport trunk allowed vlan 1,100,1002-1005
  switchport mode trunk
  cdp enable
```

```
interface GigabitEthernet4/2
  no ip address
  flowcontrol receive on
  flowcontrol send off
  switchport
  switchport trunk encapsulation dot1q
  switchport trunk allowed vlan 1,209,1002-1005
  switchport mode trunk
  cdp enable
  spanning-tree portfast trunk
```

2. 添加 VLAN 100 接口和隧道终止处的接口（本例中为 interface Vlan 209，如下所示）。

```
interface Vlan100
  ip address 10.66.79.180 255.255.255.224
```

```
interface Vlan209
  no ip address
  crypto connect vlan 100
```

3. 配置外部物理端口作为接入或中继端口（本例中为 FastEthernet 2/48，如下所示）。

```
!--- This is the configuration that uses an access port. interface FastEthernet2/48
no ip address
switchport
switchport access vlan 209
switchport mode access
```

```
!--- This is the configuration that uses a trunk port. interface FastEthernet2/48
no ip address switchport
switchport trunk encapsulation dot1q
switchport mode trunk
```

4. 创建旁路 NAT。将以下条目添加到 no nat 语句以免除在这些网络之间的 NAT：

```
access-list inside_nat0_outbound permit ip 192.168.5.0 0.0.0.255
192.168.6.0 0.0.0.255
global (outside) 1 interface
nat (inside) 0 access-list inside_nat0_outbound
nat (inside) 1 192.168.5.0 255.255.255.0
```

5. 创建您的加密配置以及定义将被加密的流量的访问控制列表 (ACL)。按如下所示，创建用于定义从内部网络 192.168.5.0/24 到远程网络 192.168.6.0/24 的流量的加密 ACL（本例中为 ACL 100 - 关注流量）：

```
access-list 100 permit ip 192.168.5.0 0.0.0.255 192.168.6.0 0.0.0.255
```

按如下所示定义您的 Internet 安全连接和密钥管理协议 (ISAKMP) 策略方案：

```
crypto isakmp policy 1
hash md5
authentication pre-share
group 2
```

发出下面这个命令 (在本例中) 以使用和定义预共享密钥 :

```
crypto isakmp key cisco address 10.66.79.73
```

按如下所示定义您的 IPsec 方案 :

```
crypto ipsec transform-set cisco esp-des esp-md5-hmac
```

按如下所示创建您的加密映射语句 :

```
crypto map cisco 10 ipsec-isakmp
set peer 10.66.79.73
set transform-set cisco
match address 100
```

6. 按如下所示将加密映射应用于 VLAN 100 接口 :

```
interface vlan100
crypto map cisco
```

使用以下这些配置 :

- [Catalyst 6500](#)
- [PIX 防火墙](#)

Catalyst 6500

```
!--- Define the Phase 1 policy. crypto isakmp policy 1
hash md5
authentication pre-share
group 2
crypto isakmp key cisco address 10.66.79.73
!
!
!--- Define the encryption policy for this setup. crypto
ipsec transform-set cisco esp-des esp-md5-hmac
!
!--- Define a static crypto map entry for the peer !---
with mode ipsec-isakmp. !--- This indicates that
Internet Key Exchange (IKE) !--- is used to establish
the IPsec !--- security associations (SAs) to protect
the traffic !--- specified by this crypto map entry.
crypto map cisco 10 ipsec-isakmp
set peer 10.66.79.73
set transform-set cisco
match address 100
!
!
no spanning-tree vlan 100
!
!
```

```

!
interface FastEthernet2/1
 ip address 192.168.5.1 255.255.255.0
!
!--- This is the outside Layer 2 port that allows !---
VLAN 209 traffic to enter. interface FastEthernet2/48 no
ip address switchport switchport trunk encapsulation
dot1q switchport mode trunk ! interface
GigabitEthernet4/1 no ip address flowcontrol receive on
flowcontrol send off switchport switchport trunk
encapsulation dot1q !--- VLAN 100 is defined as the
Interface VLAN (IVLAN). switchport trunk allowed vlan
1,100,1002-1005
 switchport mode trunk
 cdp enable
!
interface GigabitEthernet4/2
 no ip address
 flowcontrol receive on
 flowcontrol send off
 switchport
 switchport trunk encapsulation dot1q
!--- The Port VLAN (PVLAN) configuration is handled
transparently by !--- the VPN service module without
user configuration !--- or involvement. It also is not
shown in the configuration. !--- Note: For every IVLAN,
a corresponding PVLAN exists.

switchport trunk allowed vlan 1,209,1002-1005
 switchport mode trunk
 cdp enable
 spanning-tree portfast trunk
!
interface Vlan1
 no ip address
 shutdown
!
!--- This is the IVLAN that is configured to intercept
the traffic !--- destined to the secure port on which
the inside port !--- of the VPN service module is the
only port present. interface Vlan100 ip address
10.66.79.180 255.255.255.224 crypto map cisco
!--- This is the secure port that is a virtual Layer 3
interface. !--- This interface purposely does not have a
Layer 3 IP address !--- configured. This is normal for
the BITW process. !--- The IP address is moved from this
interface to the VLAN 100 to !--- accomplish BITW. This
brings the VPN service module into !--- the packet path.
interface Vlan209 no ip address crypto connect vlan 100
!
ip classless

global (outside) 1 interface
!--- NAT 0 prevents NAT for networks specified in the
ACL inside_nat0_outbound. nat (inside) 0 access-list
inside_nat0_outbound nat (inside) 1 192.168.5.0
255.255.255.0 !--- Configure the routing so that the
device !--- is directed to reach its destination
network. ip route 0.0.0.0 0.0.0.0 10.66.79.161
!--- This access list (inside_nat0_outbound) is used
with the nat zero command. !--- This prevents traffic
which matches the access list from undergoing !---
network address translation (NAT). The traffic specified
by this ACL is !--- traffic that is to be encrypted and

```

```
!--- sent across the VPN tunnel. This ACL is intentionally !--- the same as (100). !--- Two separate access lists should always be used in this configuration. access-list inside_nat0_outbound permit ip 192.168.5.0 0.0.0.255 192.168.6.0 0.0.0.255
```

```
!--- This is the crypto ACL. access-list 100 permit ip 192.168.5.0 0.0.0.255 192.168.6.0 0.0.0.255
```

PIX 防火墙

```
SV2-8(config)# show run
: Saved
:
PIX Version 6.3(3)
interface ethernet0 auto
interface ethernet1 auto
interface ethernet2 auto shutdown
interface ethernet3 auto shutdown
interface ethernet4 auto shutdown
interface ethernet5 auto shutdown
interface ethernet6 auto shutdown
nameif ethernet0 outside security0
nameif ethernet1 inside security100
nameif ethernet2 intf2 security10
nameif ethernet3 intf3 security15
nameif ethernet4 intf4 security20
nameif ethernet5 intf5 security25
nameif ethernet6 intf6 security30
enable password 8Ry2YjIyt7RRXU24 encrypted
passwd 2KFQnbNIdI.2KYOU encrypted
hostname SV2-8
domain-name cisco.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 ils 389
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
!--- This is the traffic to the router. access-list 100 permit ip 192.168.6.0 255.255.255.0 192.168.5.0 255.255.255.0
access-list nonat permit ip 192.168.6.0 255.255.255.0 192.168.5.0 255.255.255.0
pager lines 24
mtu outside 1500
mtu inside 1500
mtu intf2 1500
mtu intf3 1500
mtu intf4 1500
mtu intf5 1500
mtu intf6 1500
ip address outside 10.66.79.73 255.255.255.224
ip address inside 192.168.6.1 255.255.255.0
```

```
ip address intf2 127.0.0.1 255.255.255.255
no ip address intf3
no ip address intf4
no ip address intf5
no ip address intf6
ip audit info action alarm
ip audit attack action alarm
no failover
failover timeout 0:00:00
failover poll 15
no failover ip address outside
no failover ip address inside
no failover ip address intf2
no failover ip address intf3
no failover ip address intf4
no failover ip address intf5
no failover ip address intf6
pdm history enable
arp timeout 14400
global (outside) 1 interface
nat (inside) 0 access-list nonat
nat (inside) 1 192.168.6.0 255.255.255.0 0 0
route outside 0.0.0.0 0.0.0.0 10.66.79.65 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
!--- These are IPsec policies. sysopt connection permit-
ipsec
crypto ipsec transform-set cisco esp-des esp-md5-hmac
crypto map cisco 10 ipsec-isakmp
crypto map cisco 10 match address 100
crypto map cisco 10 set peer 10.66.79.180
crypto map cisco 10 set transform-set cisco
crypto map cisco interface outside
!--- These are IKE policies. isakmp enable outside
isakmp key ***** address 10.66.79.180 netmask
255.255.255.255
isakmp policy 1 authentication pre-share
isakmp policy 1 encryption des
isakmp policy 1 hash md5
isakmp policy 1 group 2
isakmp policy 1 lifetime 86400
telnet timeout 5
ssh timeout 5
console timeout 0
terminal width 80
Cryptochecksum:244c86c9beab00bda8f790502ca74db9
: end
```

[使用路由端口配置 IPsec](#)

执行以下这些步骤，在外部物理接口作为第 3 层路由端口的情况下配置 IPsec。

1. 将内部 VLAN 添加到 VPN 服务模块的内部端口。假设 VPN 服务模块在插槽 4 上。使用 VLAN 100 作为内部 VLAN，使用 VLAN 209 作为外部 VLAN。按如下所示配置 VPN 服务模块的 GE 端口：

```
interface GigabitEthernet4/1
no ip address
flowcontrol receive on
flowcontrol send off
switchport
switchport trunk encapsulation dot1q
switchport trunk allowed vlan 1,100,1002-1005
switchport mode trunk
cdp enable
```

```
interface GigabitEthernet4/2
no ip address
flowcontrol receive on
flowcontrol send off
switchport
switchport trunk encapsulation dot1q
switchport trunk allowed vlan 1,209,1002-1005
switchport mode trunk
cdp enable
spanning-tree portfast trunk
```

2. 添加 VLAN 100 接口和隧道终止处的接口（本例中为 FastEthernet2/48，如下所示）。

```
interface Vlan100
ip address 10.66.79.180 255.255.255.224

interface FastEthernet2/48
no ip address
crypto connect vlan 100
```

3. 创建旁路 NAT。将以下条目添加到 no nat 语句以免除在这些网络之间的 NAT：

```
access-list inside_nat0_outbound permit ip 192.168.5.0 0.0.0.255
192.168.6.0 0.0.0.255
global (outside) 1 interface
nat (inside) 0 access-list inside_nat0_outbound
nat (inside) 1 192.168.5.0 255.255.255.0
```

4. 创建您的加密配置以及用于定义被加密的流量的 ACL。按如下所示，创建用于定义从内部网络 192.168.5.0/24 到远程网络 192.168.6.0/24 的流量的 ACL（本例中为 ACL 100）：

```
access-list 100 permit ip 192.168.5.0 0.0.0.255 192.168.6.0 0.0.0.255
```

按如下所示定义您的 ISAKMP 策略方案：

```
crypto isakmp policy 1
hash md5
authentication pre-share
group 2
```

发出下面这个命令（在本例中）以使用和定义预共享密钥：

```
crypto isakmp key cisco address 10.66.79.73
```

按如下所示定义您的 IPsec 方案：


```
crypto ipsec transform-set cisco esp-des esp-md5-hmac
```

按如下所示创建您的加密映射语句：

```
crypto map cisco 10 ipsec-isakmp
  set peer 10.66.79.73
  set transform-set cisco
  match address 100
```

5. 按如下所示将加密映射应用于 VLAN 100 接口：

```
interface vlan100
  crypto map cisco
```

使用以下这些配置：

- [Catalyst 6500](#)
- [PIX 防火墙](#)

Catalyst 6500

```
!--- Define the Phase 1 policy. crypto isakmp policy 1
  hash md5
  authentication pre-share
  group 2
crypto isakmp key cisco address 10.66.79.73
!
!
!--- Define the encryption policy for this setup. crypto
ipsec transform-set cisco esp-des esp-md5-hmac
!
!--- Define a static crypto map entry for the peer !---
with mode ipsec-isakmp. !--- This indicates that IKE is
used to establish the !--- IPsec SAs to protect the
traffic !--- specified by this crypto map entry. crypto
map cisco 10 ipsec-isakmp
  set peer 10.66.79.73
  set transform-set cisco
  match address 100
!
!
no spanning-tree vlan 100
!
!
!
interface FastEthernet2/1
  ip address 192.168.5.1 255.255.255.0
!
!--- This is the secure port that is configured in
routed port mode. !--- This routed port mode does not
have a Layer 3 IP address !--- configured. This is
normal for the BITW process. !--- The IP address is
moved from this interface to the VLAN 100 to !---
accomplish BITW. This brings the VPN service module into
!--- the packet path. This is the Layer 2 port VLAN on
which the !--- outside port of the VPN service module
also belongs. ! interface FastEthernet2/48 no ip address
crypto connect vlan 100
!
```

```

interface GigabitEthernet4/1
  no ip address
  flowcontrol receive on
  flowcontrol send off
  switchport
  switchport trunk encapsulation dot1q
  !--- VLAN 100 is defined as the IVLAN.  switchport trunk
allowed vlan 1,100,1002-1005
  switchport mode trunk
  cdp enable
!
interface GigabitEthernet4/2
  no ip address
  flowcontrol receive on
  flowcontrol send off
  switchport
  switchport trunk encapsulation dot1q
  !--- The PVLAN configuration is handled transparently by
  the !--- VPN service module without user configuration
  !--- or involvement. It also is not shown in the
  configuration. !--- Note: For every IVLAN, a
  corresponding PVLAN exists.

  switchport trunk allowed vlan 1,209,1002-1005
  switchport mode trunk
  cdp enable
  spanning-tree portfast trunk
!
interface Vlan1
  no ip address
  shutdown
!
  !--- This is the IVLAN that is configured to intercept
  the traffic !--- destined to the secure port on which
  the inside port of the !--- VPN service module is the
  only port present. interface Vlan100 ip address
  10.66.79.180 255.255.255.224  crypto map cisco
  !--- This is the secure port that is a virtual Layer 3
  interface. !--- This interface purposely does not have a
  Layer 3 IP address !--- configured. This is normal for
  the BITW process. !--- The IP address is moved from this
  interface to the VLAN 100 to !--- accomplish BITW. This
  brings the VPN service module into !--- the packet path.
  ! ip classless global (outside) 1 interface !--- NAT 0
  prevents NAT for networks specified in the ACL
  inside_nat0_outbound. nat (inside) 0 access-list
  inside_nat0_outbound nat (inside) 1 192.168.6.0
  255.255.255.0 !--- Configure the routing so that the
  device !--- is directed to reach its destination
  network. ip route 0.0.0.0 0.0.0.0 10.66.79.161
!
  !--- This access list (inside_nat0_outbound) is used
  with the nat zero command. !--- This prevents traffic
  which matches the access list from undergoing !---
  network address translation (NAT). The traffic specified
  by this ACL is !--- traffic that is to be encrypted and
  !--- sent across the VPN tunnel. This ACL is
  intentionally !--- the same as (100). !--- Two separate
  access lists should always be used in this
  configuration.

access-list inside_nat0_outbound permit ip 192.168.5.0

```

```
0.0.0.255 192.168.6.0 0.0.0.255
```

```
!--- This is the crypto ACL. access-list 100 permit ip  
192.168.5.0 0.0.0.255 192.168.6.0 0.0.0.255
```

PIX 防火墙

```
SV2-8(config)# show run  
: Saved  
:  
PIX Version 6.3(3)  
interface ethernet0 auto  
interface ethernet1 auto  
interface ethernet2 auto shutdown  
interface ethernet3 auto shutdown  
interface ethernet4 auto shutdown  
interface ethernet5 auto shutdown  
interface ethernet6 auto shutdown  
nameif ethernet0 outside security0  
nameif ethernet1 inside security100  
nameif ethernet2 intf2 security10  
nameif ethernet3 intf3 security15  
nameif ethernet4 intf4 security20  
nameif ethernet5 intf5 security25  
nameif ethernet6 intf6 security30  
enable password 8Ry2YjIyt7RRXU24 encrypted  
passwd 2KFQnbNIdI.2KYOU encrypted  
hostname SV2-8  
domain-name cisco.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 ils 389  
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  
!--- This is the traffic to the router. access-list 100  
permit ip 192.168.6.0 255.255.255.0 192.168.5.0  
255.255.255.0  
access-list nonat permit ip 192.168.6.0 255.255.255.0  
192.168.5.0 255.255.255.0  
pager lines 24  
mtu outside 1500  
mtu inside 1500  
mtu intf2 1500  
mtu intf3 1500  
mtu intf4 1500  
mtu intf5 1500  
mtu intf6 1500  
ip address outside 10.66.79.73 255.255.255.224  
ip address inside 192.168.6.1 255.255.255.0  
ip address intf2 127.0.0.1 255.255.255.255  
no ip address intf3  
no ip address intf4  
no ip address intf5
```

```

no ip address intf6
ip audit info action alarm
ip audit attack action alarm
no failover
failover timeout 0:00:00
failover poll 15
no failover ip address outside
no failover ip address inside
no failover ip address intf2
no failover ip address intf3
no failover ip address intf4
no failover ip address intf5
no failover ip address intf6
pdm history enable
arp timeout 14400
global (outside) 1 interface
nat (inside) 0 access-list nonat
nat (inside) 1 192.168.6.0 255.255.255.0 0 0
route outside 0.0.0.0 0.0.0.0 10.66.79.65 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
!--- These are IPsec policies. sysopt connection permit-
ipsec
crypto ipsec transform-set cisco esp-des esp-md5-hmac
crypto map cisco 10 ipsec-isakmp
crypto map cisco 10 match address 100
crypto map cisco 10 set peer 10.66.79.180
crypto map cisco 10 set transform-set cisco
crypto map cisco interface outside
!--- These are IKE policies. isakmp enable outside
isakmp key ***** address 10.66.79.180 netmask
255.255.255.255
isakmp policy 1 authentication pre-share
isakmp policy 1 encryption des
isakmp policy 1 hash md5
isakmp policy 1 group 2
isakmp policy 1 lifetime 86400
telnet timeout 5
ssh timeout 5
console timeout 0
terminal width 80
Cryptochecksum:244c86c9beab00bda8f790502ca74db9
: end

```

验证

本部分提供的信息有助于确认配置是否正常运行。

[命令输出解释程序 \(仅限注册用户 \) \(OIT\) 支持某些 show 命令。](#) 使用 OIT 可查看对 show 命令输

出的分析。

- show crypto ipsec sa - 显示当前的 IPsec SA 所采用的设置。
- show crypto isakmp sa - 显示对等体上的所有当前 IKE SA。
- show crypto vlan - 显示与加密配置关联的 VLAN。
- show crypto eli - 显示 VPN 服务模块的统计信息。

有关验证和排除 IPsec 故障的其他信息，请参阅 [IP 安全故障排除 - 了解和使用 debug 命令](#)。

[故障排除](#)

此部分提供信息故障排除您的配置。

[故障排除命令](#)

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 ipsec - 显示第 2 阶段的 IPsec 协商。
- debug crypto isakmp - 显示第 1 阶段的 ISAKMP 协商。
- debug crypto engine - 显示已加密的数据流。
- clear crypto isakmp - 清除与第 1 阶段相关的 SA。
- clear crypto sa - 清除与第 2 阶段相关的 SA。

有关验证和排除 IPsec 故障的其他信息，请参阅 [IP 安全故障排除 - 了解和使用 debug 命令](#)。

[相关信息](#)

- [IPsec 支持页面](#)
- [配置 IPsec 网络安全](#)
- [配置 Internet 密钥交换安全协议](#)
- [技术支持 - Cisco Systems](#)