

在 Catalyst 4224 接入网关交换机与 Cisco IOS 路由器之间配置 IPSec

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简介

本文说明IPSec配置示例在Cisco Catalyst 4224接入网关交换机和运行Cisco IOS软件的Cisco路由器之间的。加密在接入网关的VLAN1(其中加密映射应用)和路由器的FastEthernet0/1接口之间完成。

先决条件

要求

本文档没有任何特定的前提条件。

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)14
- IOS c4224软件12.2(2)YC1

本文档中的信息都是基于特定实验室环境中的设备创建的。本文档中使用的所有设备最初均采用原始（默认）配置。如果您是在真实网络上操作，请确保您在使用任何命令前已经了解其潜在影响。

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）。

网络图

本文档使用以下网络设置：



配置

本文档使用以下配置：

- [Catalyst 4224访问网关交换机](#)
- [Cisco IOS 路由器](#)

Catalyst 4224访问网关交换机

```
triana#show version
Cisco Internetwork Operating System Software
IOS (tm) c4224 Software (c4224-IK903SX3-M), Version
12.2(2)YC1,
EARLY DEPLOYMENT RELEASE SOFTWARE (fc2)

26 FastEthernet/IEEE 802.3 interface(s)
2 Serial(sync/async) network interface(s)
2 Channelized E1/PRI port(s)
1 Virtual Private Network (VPN) Module(s)
!--- Access gateway has onboard encryption service
adapter. 8 Voice FXS interface(s) 256K bytes of non-
volatile configuration memory. 31744K bytes of processor
board System flash (Read/Write) Configuration register
is 0x2102 triana#show run
Building configuration...

Current configuration : 5111 bytes
!
! Last configuration change at 13:56:01 UTC Wed May 29
2002
! NVRAM config last updated at 13:56:03 UTC Wed May 29
2002
!
version 12.2
service timestamps debug datetime msec
service timestamps log datetime msec
```

```

no service password-encryption
!
hostname triana
!
no logging buffered
enable password ww
!
memory-size iomem 25
!--- Create the VLANS as required. vlan 1
  name default
vlan 3
  name VLAN0003
!--- Create the VLANS as required. vlan 2
  name data
vlan 999
  name VLAN0999
!
ip subnet-zero
no ip domain-lookup
!
ip audit notify log
ip audit po max-events 100
ip ssh time-out 120
ip ssh authentication-retries 3
isdn switch-type primary-net5
voicecard mode toll-by-pass
!
!
!
!
!
!
!
!
!
!
!
ccm-manager mgcp
!
!--- Define Phase 1 policy. crypto isakmp policy 10
  authentication pre-share
crypto isakmp key yoursecretkey address 209.165.201.6
!
!
!--- Define Phase 2 policy. crypto ipsec transform-set
basic esp-des esp-md5-hmac
crypto mib ipsec flowmib history tunnel size 200
crypto mib ipsec flowmib history failure size 200
!
!--- Define Phase 2 policy (continued). !--- Define the
encryption peer and crypto map parameters. crypto map
mymap 10 ipsec-isakmp
  set peer 209.165.201.6
  set transform-set basic
  match address cryptoacl
!
!
no spanning-tree optimize bpdu transmission
no spanning-tree vlan 1
no spanning-tree vlan 2
no spanning-tree vlan 3
!
controller E1 2/0
!
controller E1 2/1
!
translation-rule 1
  Rule 0 ^... 1

```

```
!  
translation-rule 2  
  Rule 0 ^10.. 0  
  Rule 1 ^11.. 1  
  Rule 2 ^12.. 2  
  Rule 3 ^13.. 3  
  Rule 4 ^14.. 4  
  Rule 5 ^15.. 5  
  Rule 6 ^16.. 6  
  Rule 7 ^17.. 7  
  Rule 8 ^18.. 8  
  Rule 9 ^19.. 9  
!  
translation-rule 6  
  Rule 0 ^112. 119  
!  
translation-rule 7  
  Rule 0 ^1212 1196  
!  
translation-rule 3  
  Rule 0 ^. 0  
!  
translation-rule 9  
  Rule 0 ^. 9  
!  
translation-rule 99  
  Rule 0 ^90.. 0  
  Rule 1 ^91.. 1  
  Rule 2 ^92.. 2  
  Rule 3 ^93.. 3  
  Rule 4 ^94.. 4  
  Rule 5 ^95.. 5  
  Rule 6 ^96.. 6  
  Rule 7 ^97.. 7  
  Rule 8 ^98.. 8  
  Rule 9 ^99.. 9  
!  
translation-rule 999  
  Rule 0 ^2186 1196  
!  
translation-rule 1122  
  Rule 0 ^1122 528001  
  Rule 1 ^1121 519352  
!  
translation-rule 20  
  Rule 0 ^000 500  
!  
!  
!  
interface Loopback0  
  no ip address  
!  
interface FastEthernet0/0  
  no ip address  
  duplex auto  
  speed auto  
!  
interface Serial1/0  
  no ip address  
  no fair-queue  
!  
interface Serial1/1  
  no ip address  
!  
!
```

```
interface FastEthernet5/0
  no ip address
  duplex auto
  speed auto
!
interface FastEthernet5/1
  no ip address
  shutdown
  duplex auto
  speed auto
  switchport voice vlan 3
  spanning-tree portfast
!
!--- For the lab setup, a host is connected on this
port. interface FastEthernet5/2
  no ip address
  duplex auto
  speed auto
!--- Place the port in VLAN 2. switchport access vlan 2
  spanning-tree portfast
!
interface FastEthernet5/3
  no ip address
  shutdown
  duplex auto
  speed auto
  switchport access vlan 999
  spanning-tree portfast
!
interface FastEthernet5/4
  no ip address
  duplex auto
  speed auto
  switchport access vlan 2
  switchport voice vlan 3
  spanning-tree portfast
!
interface FastEthernet5/5
  no ip address
  duplex auto
  speed auto
!
interface FastEthernet5/6
  no ip address
  duplex auto
  speed auto
!
interface FastEthernet5/7
  no ip address
  duplex auto
  speed auto
!
interface FastEthernet5/8
  no ip address
  duplex auto
  speed auto
!
interface FastEthernet5/9
  no ip address
  duplex auto
  speed auto
!
interface FastEthernet5/10
  no ip address
```

```
duplex auto
speed auto
switchport trunk allowed vlan 1-3
switchport mode trunk
!--- By default, the port belongs to VLAN 1. interface
FastEthernet5/11
no ip address
duplex auto
speed auto
!
interface FastEthernet5/12
no ip address
duplex auto
speed auto
!
interface FastEthernet5/13
no ip address
duplex auto
speed auto
!
interface FastEthernet5/14
no ip address
duplex auto
speed auto
!
interface FastEthernet5/15
no ip address
duplex auto
speed auto
!
interface FastEthernet5/16
no ip address
duplex auto
speed auto
!
interface FastEthernet5/17
no ip address
duplex auto
speed auto
!
interface FastEthernet5/18
no ip address
duplex auto
speed auto
!
interface FastEthernet5/19
no ip address
duplex auto
speed auto
!
interface FastEthernet5/20
no ip address
duplex auto
speed auto
!
interface FastEthernet5/21
no ip address
duplex auto
speed auto
!
interface FastEthernet5/22
no ip address
duplex auto
speed auto
```

```
!  
interface FastEthernet5/23  
  no ip address  
  duplex auto  
  speed auto  
!  
interface FastEthernet5/24  
  no ip address  
  duplex auto  
  speed auto  
!  
!--- Define an IP address and apply crypto map to enable  
!--- IPSec processing on this interface. interface Vlan  
1  
  ip address 209.165.201.5 255.255.255.224  
  crypto map mymap  
!  
!--- Define an IP address for VLAN 2. interface Vlan 2  
  ip address 192.168.10.1 255.255.255.0  
!  
ip classless  
ip route 10.48.66.0 255.255.254.0 209.165.201.6  
no ip http server  
!  
!  
ip access-list extended cryptoacl  
  remark This is crypto ACL  
  permit ip 192.168.10.0 0.0.0.255 10.48.66.0 0.0.1.255  
call rsvp-sync  
!  
voice-port 4/0  
  output attenuation 0  
!  
voice-port 4/1  
  output attenuation 0  
!  
voice-port 4/2  
  output attenuation 0  
!  
voice-port 4/3  
  output attenuation 0  
!  
voice-port 4/4  
  output attenuation 0  
!  
voice-port 4/5  
  output attenuation 0  
!  
voice-port 4/6  
  output attenuation 0  
!  
voice-port 4/7  
  output attenuation 0  
!  
mgcp  
no mgcp timer receive-rtcp  
!  
mgcp profile default  
!  
dial-peer cor custom  
!  
!  
!  
dial-peer voice 1 voip
```

```
!  
dial-peer voice 2 pots  
  shutdown  
!  
!  
line con 0  
  exec-timeout 0 0  
  length 0  
line vty 0 4  
  password ww  
  login  
!  
end  
  
 triana#
```

Cisco IOS 路由器

```
brussels#show run  
Building configuration...  
  
Current configuration : 1538 bytes  
!  
! Last configuration change at 17:16:19 UTC Wed May 29  
2002  
! NVRAM config last updated at 13:58:44 UTC Wed May 29  
2002  
!  
version 12.1  
no service single-slot-reload-enable  
service timestamps debug uptime  
service timestamps log uptime  
no service password-encryption  
!  
hostname brussels  
!  
enable secret 5 $1$/vuT$08lTvZgSFJ0xq5uTFc94u.  
!  
!  
!  
!  
!  
ip subnet-zero  
no ip domain-lookup  
!  
ip cef  
ip audit notify log  
ip audit po max-events 100  
!  
!  
!--- Define Phase 1 policy. crypto isakmp policy 10  
authentication pre-share  
crypto isakmp key yoursecretkey address 209.165.201.5  
!  
!  
!--- Define the encryption policy for this setup. crypto  
ipsec transform-set basic esp-des esp-md5-hmac  
!  
!--- Define a static crypto map entry for the remote PIX  
!--- with mode ipsec-isakmp. !--- This indicates that  
Internet Key Exchange (IKE) !--- is used to establish  
the IPSec !--- security associations for protecting the  
traffic !--- specified by this crypto map entry. crypto  
map vpnmap 10 ipsec-isakmp
```



```
set peer 209.165.201.5
set transform-set basic
match address cryptoacl
!
!
!
!
!
!
interface FastEthernet0/0
 ip address 10.48.66.34 255.255.254.0
 no ip mroute-cache
 duplex auto
 speed auto
!
interface Serial0/0
 no ip address
 shutdown
!
!--- Enable crypto processing on the interface !---
where traffic leaves the network. interface
FastEthernet0/1
 ip address 209.165.201.6 255.255.255.224
 no ip mroute-cache
 duplex auto
 speed auto
 crypto map vpnmap
!
interface Serial0/1
 no ip address
 shutdown
!
interface Group-Async1
 no ip address
 encapsulation ppp
 async mode dedicated
 ppp authentication pap
 group-range 33 40
!
ip classless
ip route 192.168.10.0 255.255.255.0 209.165.201.5
ip http server
!
!
!--- This access list defines interesting traffic for
IPSec. ip access-list extended cryptoacl
 permit ip 10.48.66.0 0.0.1.255 192.168.10.0 0.0.0.255
!
!
line con 0
 exec-timeout 0 0
 length 0
line 33 40
 modem InOut
line aux 0
line vty 0 4
 login local
!
end
```

验证

本部分所提供的信息可用于确认您的配置是否正常工作。IPSec操作的验证用调试指令完成。尝试扩展ping从路由器到接入网关背后的一台主机。.

[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 debug** —显示当前调试设置。
- [show crypto isakmp sa](#) - 显示对等体上的所有当前 IKE 安全关联 (SA)。
- **show crypto ipsec sa** - 显示当前 SA 使用的设置。

[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](#)

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 IPsec 事件。
- **debug crypto isakmp** — 显示关于 IKE 事件的消息。
- **debug crypto engine** - 显示来自加密引擎的信息。

[调试示例](#)

此部分为接入网关和路由器提供debug输出示例。

- [Catalyst 4224访问网关交换机](#)
- [Cisco IOS 路由器](#)

[Catalyst 4224访问网关交换机](#)

```
triana#debug crypto ipsec
Crypto IPSEC debugging is on
triana#debug crypto isakmp
Crypto ISAKMP debugging is on
triana#debug crypto engine
Crypto Engine debugging is on
triana#show debug
```

```
Cryptographic Subsystem:
```

```
  Crypto ISAKMP debugging is on
  Crypto Engine debugging is on
  Crypto IPSEC debugging is on
triana#
```

```
May 29 18:01:57.746: ISAKMP (0:0): received packet from 209.165.201.6 (N) NEW SA
May 29 18:01:57.746: ISAKMP: local port 500, remote port 500
May 29 18:01:57.746: ISAKMP (0:1): Input = IKE_MSG_FROM_PEER, IKE_MM_EXCH
Old State = IKE_READY New State = IKE_R_MM1
May 29 18:01:57.746: ISAKMP (0:1): processing SA payload. message ID = 0
May 29 18:01:57.746: ISAKMP (0:1): found peer pre-shared key
      matching 209.165.201.6
```

```
!--- 4224 access gateway checks the attributes for Internet Security !--- Association & Key
Management Protocol (ISAKMP) negotiation !--- against the policy it has in its local
```

configuration. May 29 18:01:57.746: ISAKMP (0:1): Checking ISAKMP transform 1 against priority 10 policy May 29 18:01:57.746: ISAKMP: encryption DES-CBC May 29 18:01:57.746: ISAKMP: hash SHA May 29 18:01:57.746: ISAKMP: default group 1 May 29 18:01:57.746: ISAKMP: auth pre-share !---
The received attributes are acceptable !--- against the configured set of attributes. May 29 18:01:57.746: ISAKMP (0:1): atts are acceptable. Next payload is 0 May 29 18:01:57.746: CryptoEngine0: generate alg parameter May 29 18:01:57.746: CryptoEngine0: CRYPTO_ISA_DH_CREATE(hw)(ipsec) May 29 18:01:57.898: CRYPTO_ENGINE: Dh phase 1 status: 0 May 29 18:01:57.898: ISAKMP (0:1): Input = IKE_MSG_INTERNAL, IKE_PROCESS_MAIN_MODE Old State = IKE_R_MM1 New State = IKE_R_MM1 May 29 18:01:57.898: ISAKMP (0:1): SA is doing pre-shared key authentication using id type ID_IPV4_ADDR May 29 18:01:57.898: ISAKMP (0:1): sending packet to 209.165.201.6 (R) MM_SA_SETUP May 29 18:01:57.898: ISAKMP (0:1): Input = IKE_MSG_INTERNAL, IKE_PROCESS_COMPLETE Old State = IKE_R_MM1 New State = IKE_R_MM2 May 29 18:01:58.094: ISAKMP (0:1): received packet from 209.165.201.6 (R) MM_SA_SETUP May 29 18:01:58.094: ISAKMP (0:1): Input = IKE_MSG_FROM_PEER, IKE_MM_EXCH Old State = IKE_R_MM2 New State = IKE_R_MM3 May 29 18:01:58.098: ISAKMP (0:1): processing KE payload. message ID = 0 May 29 18:01:58.098: CryptoEngine0: generate alg parameter May 29 18:01:58.098: CryptoEngine0: CRYPTO_ISA_DH_SHARE_SECRET(hw)(ipsec) May 29 18:01:58.246: ISAKMP (0:1): processing NONCE payload. message ID = 0 May 29 18:01:58.246: ISAKMP (0:1): found peer pre-shared key matching 209.165.201.6 May 29 18:01:58.250: CryptoEngine0: create ISAKMP SKEYID for conn id 1 May 29 18:01:58.250: CryptoEngine0: CRYPTO_ISA_SA_CREATE(hw)(ipsec) **May 29 18:01:58.250: ISAKMP (0:1): SKEYID state generated**
May 29 18:01:58.250: ISAKMP (0:1): processing vendor id payload
May 29 18:01:58.250: ISAKMP (0:1): speaking to another IOS box!
May 29 18:01:58.250: ISAKMP (0:1): Input = IKE_MSG_INTERNAL, IKE_PROCESS_MAIN_MODE Old State = IKE_R_MM3 New State = IKE_R_MM3
May 29 18:01:58.250: ISAKMP (0:1): sending packet to 209.165.201.6 (R) MM_KEY_EXCH
May 29 18:01:58.250: ISAKMP (0:1): Input = IKE_MSG_INTERNAL, IKE_PROCESS_COMPLETE Old State = IKE_R_MM3 New State = IKE_R_MM4
May 29 18:01:58.490: ISAKMP (0:1): received packet from 209.165.201.6 (R) MM_KEY_EXCH
May 29 18:01:58.490: CryptoEngine0: CRYPTO_ISA_IKE_DECRYPT(hw)(ipsec)
May 29 18:01:58.490: ISAKMP (0:1): Input = IKE_MSG_FROM_PEER, IKE_MM_EXCH Old State = IKE_R_MM4 New State = IKE_R_MM5
May 29 18:01:58.490: ISAKMP (0:1): processing ID payload. message ID = 0
May 29 18:01:58.490: ISAKMP (0:1): processing HASH payload. message ID = 0
May 29 18:01:58.490: CryptoEngine0: generate hmac context for conn id 1
May 29 18:01:58.490: CryptoEngine0: CRYPTO_ISA_IKE_HMAC(hw)(ipsec)
May 29 18:01:58.490: ISAKMP (0:1): SA has been authenticated with 209.165.201.6
!--- Phase 1 authentication is successful and the SA is authenticated. May 29 18:01:58.494: ISAKMP (0:1): Input = IKE_MSG_INTERNAL, IKE_PROCESS_MAIN_MODE Old State = IKE_R_MM5 New State = IKE_R_MM5 May 29 18:01:58.494: ISAKMP (1): ID payload next-payload : 8 type : 1 protocol : 17 port : 500 length : 8 May 29 18:01:58.494: ISAKMP (1): Total payload length: 12 May 29 18:01:58.494: CryptoEngine0: generate hmac context for conn id 1 May 29 18:01:58.494: CryptoEngine0: CRYPTO_ISA_IKE_HMAC(hw)(ipsec) May 29 18:01:58.494: CryptoEngine0: clear dh number for conn id 1 May 29 18:01:58.494: CryptoEngine0: CRYPTO_ISA_DH_DELETE(hw)(ipsec) May 29 18:01:58.494: CryptoEngine0: CRYPTO_ISA_IKE_ENCRYPT(hw)(ipsec) May 29 18:01:58.494: ISAKMP (0:1): sending packet to 209.165.201.6 (R) QM_IDLE May 29 18:01:58.498: ISAKMP (0:1): Input = IKE_MSG_INTERNAL, IKE_PROCESS_COMPLETE Old State = IKE_R_MM5 New State = IKE_P1_COMPLETE May 29 18:01:58.518: ISAKMP (0:1): received packet from 209.165.201.6 (R) QM_IDLE May 29 18:01:58.518: CryptoEngine0: CRYPTO_ISA_IKE_DECRYPT(hw)(ipsec) May 29 18:01:58.518: CryptoEngine0: generate hmac context for conn id 1 May 29 18:01:58.518: CryptoEngine0: CRYPTO_ISA_IKE_HMAC(hw)(ipsec) May 29 18:01:58.522: ISAKMP (0:1): processing HASH payload. message ID = -1809462101 May 29 18:01:58.522: ISAKMP (0:1): processing SA payload. message ID = -1809462101 May 29 18:01:58.522: ISAKMP (0:1): Checking IPsec proposal 1 May 29 18:01:58.522: ISAKMP: transform 1, ESP_DES May 29 18:01:58.522: ISAKMP: attributes in transform: May 29 18:01:58.522: ISAKMP: encaps is 1 May 29 18:01:58.522: ISAKMP: SA life type in seconds May 29 18:01:58.522: ISAKMP: SA life duration (basic) of 3600 May 29 18:01:58.522: ISAKMP: SA life type in kilobytes May 29 18:01:58.522: ISAKMP: SA life duration (VPI) of 0x0 0x46 0x50 0x0 May 29 18:01:58.522: ISAKMP: authenticator is HMAC-MD5 May 29 18:01:58.522: validate proposal 0 **May 29 18:01:58.522: ISAKMP (0:1): atts are acceptable.**
May 29 18:01:58.522: IPSEC(validate_proposal_request): proposal part #1,

```

!--- After the attributes are negotiated, !--- IKE asks IPsec to validate the proposal. (key
eng. msg.) dest= 209.165.201.5, src= 209.165.201.6, dest_proxy= 192.168.10.0/255.255.255.0/0/0
(type=4), src_proxy= 10.48.66.0/255.255.254.0/0/0 (type=4), protocol= ESP, transform= esp-des
esp-md5-hmac , lifedur= 0s and 0kb, spi= 0x0(0), conn_id= 0, keysize= 0, flags= 0x4 !--- spi is
still zero because SAs have not been set. May 29 18:01:58.522: validate proposal request 0 May
29 18:01:58.522: ISAKMP (0:1): processing NONCE payload. message ID = -1809462101 May 29
18:01:58.522: ISAKMP (0:1): processing ID payload. message ID = -1809462101 May 29 18:01:58.522:
ISAKMP (1): ID_IPV4_ADDR_SUBNET src 10.48.66.0/255.255.254.0 prot 0 port 0 May 29 18:01:58.522:
ISAKMP (0:1): processing ID payload. message ID = -1809462101 May 29 18:01:58.522: ISAKMP (1):
ID_IPV4_ADDR_SUBNET dst 192.168.10.0/255.255.255.0 prot 0 port 0 May 29 18:01:58.522: ISAKMP
(0:1): asking for 1 spis from ipsec May 29 18:01:58.522: ISAKMP (0:1): Node -1809462101, Input =
IKE_MSG_FROM_PEER, IKE_QM_EXCH Old State = IKE_QM_READY New State = IKE_QM_SPI_STARVE May 29
18:01:58.526: IPSEC(key_engine): got a queue event... May 29 18:01:58.526: IPSEC(spi_response):
getting spi 3384026087 for SA from 209.165.201.6 to 209.165.201.5 for prot 3 May 29
18:01:58.526: ISAKMP: received ke message (2/1) May 29 18:01:58.774: CryptoEngine0: generate
hmac context for conn id 1 May 29 18:01:58.774: CryptoEngine0: CRYPTO_ISA_IKE_HMAC(hw)(ipsec)
May 29 18:01:58.774: CryptoEngine0: CRYPTO_ISA_IKE_ENCRYPT(hw)(ipsec) May 29 18:01:58.774:
ISAKMP (0:1): sending packet to 209.165.201.6 (R) QM_IDLE May 29 18:01:58.774: ISAKMP (0:1):
Node -1809462101, Input = IKE_MSG_FROM_IPSEC, IKE_SPI_REPLY Old State = IKE_QM_SPI_STARVE New
State = IKE_QM_R_QM2 May 29 18:01:58.830: ISAKMP (0:1): received packet from 209.165.201.6 (R)
QM_IDLE May 29 18:01:58.830: CryptoEngine0: CRYPTO_ISA_IKE_DECRYPT(hw)(ipsec) May 29
18:01:58.834: CryptoEngine0: generate hmac context for conn id 1 May 29 18:01:58.834:
CryptoEngine0: CRYPTO_ISA_IKE_HMAC(hw)(ipsec) May 29 18:01:58.834: ipsec allocate flow 0 May 29
18:01:58.834: ipsec allocate flow 0 May 29 18:01:58.834: CryptoEngine0:
CRYPTO_ISA_IPSEC_KEY_CREATE(hw)(ipsec) May 29 18:01:58.834: CryptoEngine0:
CRYPTO_ISA_IPSEC_KEY_CREATE(hw)(ipsec) May 29 18:01:58.838: ISAKMP (0:1): Creating IPsec SAs
May 29 18:01:58.838: inbound SA from 209.165.201.6 to 209.165.201.5
(proxy 10.48.66.0 to 192.168.10.0)
May 29 18:01:58.838: has spi 0xC9B423E7 and conn_id 50 and flags 4
May 29 18:01:58.838: lifetime of 3600 seconds
May 29 18:01:58.838: lifetime of 4608000 kilobytes
May 29 18:01:58.838: outbound SA from 209.165.201.5 to 209.165.201.6
(proxy 192.168.10.0 to 10.48.66.0)
May 29 18:01:58.838: has spi 561973207 and conn_id 51 and flags 4
May 29 18:01:58.838: lifetime of 3600 seconds
May 29 18:01:58.838: lifetime of 4608000 kilobytes
May 29 18:01:58.838: ISAKMP (0:1): deleting node -1809462101 error FALSE reason
"quick mode done (await())"
May 29 18:01:58.838: ISAKMP (0:1): Node -1809462101, Input = IKE_MSG_FROM_PEER,
IKE_QM_EXCH
Old State = IKE_QM_R_QM2 New State = IKE_QM_PHASE2_COMPLETE

May 29 18:01:58.838: IPSEC(key_engine): got a queue event...
May 29 18:01:58.838: IPSEC(initialize_sas): ,
(key eng. msg.) dest= 209.165.201.5, src= 209.165.201.6,
dest_proxy= 192.168.10.0/255.255.255.0/0/0 (type=4),
src_proxy= 10.48.66.0/255.255.254.0/0/0 (type=4),
protocol= ESP, transform= esp-des esp-md5-hmac ,
lifedur= 3600s and 4608000kb,
spi= 0xC9B423E7(3384026087), conn_id= 50, keysize= 0, flags= 0x4
!--- IPsec SAs are now initialized and encrypted !--- communication can now take place. May 29
18:01:58.838: IPSEC(initialize_sas): , (key eng. msg.) src= 209.165.201.5, dest= 209.165.201.6,
src_proxy= 192.168.10.0/255.255.255.0/0/0 (type=4), dest_proxy= 10.48.66.0/255.255.254.0/0/0
(type=4), protocol= ESP, transform= esp-des esp-md5-hmac , lifedur= 3600s and 4608000kb, spi=
0x217F07D7(561973207), conn_id= 51, keysize= 0, flags= 0x4 !--- IPsec SAs are now initialized
and encrypted !--- communication can now take place. May 29 18:01:58.838: IPSEC(create_sa): sa
created, (sa) sa_dest= 209.165.201.5, sa_prot= 50, sa_spi= 0xC9B423E7(3384026087), sa_trans=
esp-des esp-md5-hmac , sa_conn_id= 50 May 29 18:01:58.838: IPSEC(create_sa): sa created, (sa)
sa_dest= 209.165.201.6, sa_prot= 50, sa_spi= 0x217F07D7(561973207), sa_trans= esp-des esp-md5-
hmac , sa_conn_id= 51 !--- Observe that two IPsec SAs are created. !--- Recollect that IPsec SAs
are bidirectional. triana# triana# triana# triana#show crypto isakmp sa
dst src state conn-id slot
209.165.201.5 209.165.201.6 QM_IDLE &n bsp; 1 0

```

triana#show crypto ipsec sa

interface: Vlan 1

Crypto map tag: mymap, local addr. 209.165.201.5

local ident (addr/mask/prot/port): (192.168.10.0/255.255.255.0/0/0)

remote ident (addr/mask/prot/port): (10.48.66.0/255.255.254.0/0/0)

current_peer: 209.165.201.6

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 0, #recv errors 0

local crypto endpt.: 209.165.201.5, remote crypto endpt.: 209.165.201.6

path mtu 1500, media mtu 1500

current outbound spi: 217F07D7

inbound esp sas:

spi: 0xC9B423E7(3384026087)

transform: esp-des esp-md5-hmac ,

in use settings = {Tunnel, }

slot: 0, conn id: 50, flow_id: 1, crypto map: mymap

sa timing: remaining key lifetime (k/sec): (4607998/3536)

IV size: 8 bytes

replay detection support: Y

inbound ah sas:

inbound pcp sas:

outbound esp sas:

spi: 0x217F07D7(561973207)

transform: esp-des esp-md5-hmac ,

in use settings = {Tunnel, }

slot: 0, conn id: 51, flow_id: 2, crypto map: mymap

sa timing: remaining key lifetime (k/sec): (4607999/3536)

IV size: 8 bytes

replay detection support: Y

outbound ah sas:

outbound pcp sas:

triana#

Cisco IOS 路由器

brussels#show debug

Cryptographic Subsystem:

Crypto ISAKMP debugging is on

Crypto Engine debugging is on

Crypto IPSEC debugging is on

brussels#p

Protocol [ip]:

Target IP address: 192.168.10.5

Repeat count [5]:

Datagram size [100]:

Timeout in seconds [2]:

Extended commands [n]: y

Source address or interface: fastethernet0/0

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 192.168.10.5, timeout is 2 seconds:

```
May 29 18:01:54.285: IPSEC(sa_request): ,
  (key eng. msg.) src= 209.165.201.6, dest= 209.165.201.5,
  src_proxy= 10.48.66.0/255.255.254.0/0/0 (type=4),
  dest_proxy= 192.168.10.0/255.255.255.0/0/0 (type=4),
  protocol= ESP, transform= esp-des esp-md5-hmac ,
  lifedur= 3600s and 4608000kb,
  spi= 0x217F07D7(561973207), conn_id= 0, keysize= 0, flags= 0x4004
May 29 18:01:54.285: ISAKMP: received ke message (1/1)
May 29 18:01:54.285: ISAKMP: local port 500, remote port 500
May 29 18:01:54.289: ISAKMP (0:1): beginning Main Mode exchange
May 29 18:01:54.289: ISAKMP (1): sending packet to 209.165.201.5 (I) MM_NO_STATE
May 29 18:01:54.461: ISAKMP (1): received packet from 209.165.201.5 (I) MM_NO_STATE
May 29 18:01:54.461: ISAKMP (0:1): processing SA payload. message ID = 0
May 29 18:01:54.461: ISAKMP (0:1): Checking ISAKMP transform 1
  against priority 10 policy
May 29 18:01:54.465: ISAKMP:      encryption DES-CBC
May 29 18:01:54.465: ISAKMP:      hash SHA
May 29 18:01:54.465: ISAKMP:      default group 1
May 29 18:01:54.465: ISAKMP:      auth pre-share
May 29 18:01:54.465: ISAKMP (0:1): atts are acceptable. Next payload is 0
May 29 18:01:54.465: CryptoEngine0: generate alg parameter
May 29 18:01:54.637: CRYPTO_ENGINE: Dh phase 1 status: 0
May 29 18:01:54.637: CRYPTO_ENGINE: Dh phase 1 status: 0
May 29 18:01:54.637: ISAKMP (0:1): SA is doing pre-shared key authentication
May 29 18:01:54.637: ISAKMP (1): SA is doing pre-shared key authentication using
  id type ID_IPV4_ADDR
May 29 18:01:54.641: ISAKMP (1): sending packet to 209.165.201.5 (I) MM_SA_SETUP
May 29 18:01:54.805: ISAKMP (1): received packet from 209.165.201.5 (I) MM_SA_SETUP
May 29 18:01:54.805: ISAKMP (0:1): processing KE payload. message ID = 0
May 29 18:01:54.805: CryptoEngine0: generate alg parameter
May 29 18:01:55.021: ISAKMP (0:1): processing NONCE payload. messa!!!!
Success rate is 80 percent (4/5), round-trip min/avg/max = 20/21/24 ms
brussels#ge ID = 0
May 29 18:01:55.021: CryptoEngine0: create ISAKMP SKEYID for conn id 1
May 29 18:01:55.025: ISAKMP (0:1): SKEYID state generated
May 29 18:01:55.029: ISAKMP (0:1): processing vendor id payload
May 29 18:01:55.029: ISAKMP (0:1): speaking to another IOS box!
May 29 18:01:55.029: ISAKMP (1): ID payload
  next-payload : 8
  type          : 1
  protocol      : 17
  port          : 500
  length        : 8
May 29 18:01:55.029: ISAKMP (1): Total payload length: 12
May 29 18:01:55.029: CryptoEngine0: generate hmac context for conn id 1
May 29 18:01:55.033: ISAKMP (1): sending packet to 209.165.201.5 (I) MM_KEY_EXCH
May 29 18:01:55.049: ISAKMP (1): received packet from 209.165.201.5 (I) MM_KEY_EXCH
May 29 18:01:55.053: ISAKMP (0:1): processing ID payload. message ID = 0
May 29 18:01:55.053: ISAKMP (0:1): processing HASH payload. message ID = 0
May 29 18:01:55.053: CryptoEngine0: generate hmac context for conn id 1
May 29 18:01:55.057: ISAKMP (0:1): SA has been authenticated with 209.165.201.5
!--- Phase 1 is completed and Phase 2 starts now. May 29 18:01:55.057: ISAKMP (0:1): beginning
Quick Mode exchange, M-ID of -1809462101 May 29 18:01:55.061: CryptoEngine0: generate hmac
context for conn id 1 May 29 18:01:55.065: ISAKMP (1): sending packet to 209.165.201.5 (I)
QM_IDLE May 29 18:01:55.065: CryptoEngine0: clear dh number for conn id 1 May 29 18:01:55.337:
ISAKMP (1): received packet from 209.165.201.5 (I) QM_IDLE May 29 18:01:55.341: CryptoEngine0:
```

```

generate hmac context for conn id 1 May 29 18:01:55.345: ISAKMP (0:1): processing SA payload.
message ID = -1809462101 May 29 18:01:55.345: ISAKMP (0:1): Checking IPsec proposal 1 May 29
18:01:55.345: ISAKMP: transform 1, ESP_DES May 29 18:01:55.345: ISAKMP: attributes in transform:
May 29 18:01:55.345: ISAKMP: encaps is 1 May 29 18:01:55.345: ISAKMP: SA life type in seconds
May 29 18:01:55.345: ISAKMP: SA life duration (basic) of 3600 May 29 18:01:55.345: ISAKMP: SA
life type in kilobytes May 29 18:01:55.345: ISAKMP: SA life duration (VPI) of 0x0 0x46 0x50 0x0
May 29 18:01:55.349: ISAKMP: authenticator is HMAC-MD5 May 29 18:01:55.349: validate proposal 0
May 29 18:01:55.349: ISAKMP (0:1): atts are acceptable.
May 29 18:01:55.349: IPSEC(validate_proposal_request): proposal part #1,
!--- After negotiating the attributes, IKE asks IPsec to !--- validate the proposal. (key eng.
msg.) dest= 209.165.201.5, src= 209.165.201.6, dest_proxy= 192.168.10.0/255.255.255.0/0/0
(type=4), src_proxy= 10.48.66.0/255.255.254.0/0/0 (type=4), protocol= ESP, transform= esp-des
esp-md5-hmac , lifedur= 0s and 0kb, spi= 0x0(0), conn_id= 0, keysize= 0, flags= 0x4 !--- spi is
still zero because SAs have not been set. May 29 18:01:55.353: validate proposal request 0 May
29 18:01:55.357: ISAKMP (0:1): processing NONCE payload. message ID = -1809462101 May 29
18:01:55.357: ISAKMP (0:1): processing ID payload. message ID = -1809462101 May 29 18:01:55.357:
ISAKMP (0:1): processing ID payload. message ID = -1809462101 May 29 18:01:55.357:
CryptoEngine0: generate hmac context for conn id 1 May 29 18:01:55.361: ipsec allocate flow 0
May 29 18:01:55.361: ipsec allocate flow 0 May 29 18:01:55.369: ISAKMP (0:1): Creating IPsec SAs
May 29 18:01:55.369: inbound SA from 209.165.201.5 to 209.165.201.6
(proxy 192.168.10.0 to 10.48.66.0)
May 29 18:01:55.369: has spi 561973207 and conn_id 2000 and flags 4
May 29 18:01:55.373: lifetime of 3600 seconds
May 29 18:01:55.373: lifetime of 4608000 kilobytes
May 29 18:01:55.373: outbound SA from 209.165.201.6 to 209.165.201.5
(proxy 10.48.66.0 to 192.168.10.0)
May 29 18:01:55.373: has spi -910941209 and conn_id 2001 and flags 4
May 29 18:01:55.373: lifetime of 3600 seconds
May 29 18:01:55.373: lifetime of 4608000 kilobytes
May 29 18:01:55.377: ISAKMP (1): sending packet to 209.165.201.5 (I) QM_IDLE
May 29 18:01:55.377: ISAKMP (0:1): deleting node -1809462101 error FALSE reason ""
May 29 18:01:55.381: IPSEC(key_engine): got a queue event...
May 29 18:01:55.381: IPSEC(initialize_sas): ,
(key eng. msg.) dest= 209.165.201.6, src= 209.165.201.5,
dest_proxy= 10.48.66.0/255.255.254.0/0/0 (type=4),
src_proxy= 192.168.10.0/255.255.255.0/0/0 (type=4),
protocol= ESP, transform= esp-des esp-md5-hmac ,
lifedur= 3600s and 4608000kb,
spi= 0x217F07D7(561973207), conn_id= 2000, keysize= 0, flags= 0x4
!--- IPsec SAs are now initialized and encrypted !--- communication can now take place. May 29
18:01:55.381: IPSEC(initialize_sas): , (key eng. msg.) src= 209.165.201.6, dest= 209.165.201.5,
src_proxy= 10.48.66.0/255.255.254.0/0/0 (type=4), dest_proxy= 192.168.10.0/255.255.255.0/0/0
(type=4), protocol= ESP, transform= esp-des esp-md5-hmac , lifedur= 3600s and 4608000kb, spi=
0xC9B423E7(3384026087), conn_id= 2001, keysize= 0, flags= 0x4 !--- IPsec SAs are now initialized
and encrypted !--- communication can now take place. May 29 18:01:55.385: IPSEC(create_sa): sa
created, (sa) sa_dest= 209.165.201.6, sa_prot= 50, sa_spi= 0x217F07D7(561973207), sa_trans= esp-
des esp-md5-hmac , sa_conn_id= 2000 May 29 18:01:55.385: IPSEC(create_sa): sa created, (sa)
sa_dest= 209.165.201.5, sa_prot= 50, sa_spi= 0xC9B423E7(3384026087), sa_trans= esp-des esp-md5-
hmac , sa_conn_id= 2001 !--- Observe that two IPsec SAs are created. !--- Recollect that IPsec
SAs are bidirectional. brussels# brussels#show crypto isakmp sa
dst src state conn-id slot
209.165.201.5 209.165.201.6 QM_IDLE 1 0

brussels#show crypto ipsec sa

interface: FastEthernet0/1
Crypto map tag: vpnmap, local addr. 209.165.201.6

local ident (addr/mask/prot/port): (10.48.66.0/255.255.254.0/0/0)
remote ident (addr/mask/prot/port): (192.168.10.0/255.255.255.0/0/0)
current_peer: 209.165.201.5
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.: 209.165.201.6, remote crypto endpt.: 209.165.201.5
path mtu 1500, media mtu 1500
current outbound spi: C9B423E7
```

```
inbound esp sas:
```

```
spi: 0x217F07D7(561973207)
transform: esp-des esp-md5-hmac ,
in use settings ={Tunnel, }
slot: 0, conn id: 2000, flow_id: 1, crypto map: vpnmap
sa timing: remaining key lifetime (k/sec): (4607998/3560)
IV size: 8 bytes
replay detection support: Y
```

```
inbound ah sas:
```

```
inbound pcp sas:
```

```
outbound esp sas:
```

```
spi: 0xC9B423E7(3384026087)
transform: esp-des esp-md5-hmac ,
in use settings ={Tunnel, }
slot: 0, conn id: 2001, flow_id: 2, crypto map: vpnmap
sa timing: remaining key lifetime (k/sec): (4607999/3560)
IV size: 8 bytes
replay detection support: Y
```

```
outbound ah sas:
```

```
outbound pcp sas:
```

```
brussels#
```

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