Конфигурирование IPSec между коммутатором Catalyst 4224 Access Gateway Switch и маршрутизатором Cisco IOS

Содержание

[Введение](#)
[Предварительные условия](#)
[Требования](#)
[Используемые компоненты](#)
[Условные обозначения](#)
[Настройка](#)
[Схема сети](#)
[Конфигурации](#)
[Проверка](#)
[Устранение неполадок](#)
[Команды для устранения неполадок](#)
[Примеры отладочных команд](#)
[Дополнительные сведения](#)

Введение

Этот документ иллюстрирует образец конфигурации IPSec между коммутатором шлюза доступа Cisco Catalyst 4224 и маршрутизатором Cisco который управляется ПО IOS® Cisco. Шифрование произведено между VLAN1 шлюза доступа (где применена таблица шифрования) и интерфейсом FastEthernet0/1 маршрутизатора.

Предварительные условия

Требования

Для данного документа отсутствуют предварительные условия.

Используемые компоненты

Сведения, содержащиеся в данном документе, касаются следующих версий программного обеспечения и оборудования:

- Cisco IOS Software Release 12. (1) 14
- Программное обеспечение IOS c4224 12.2 (2) YC1

Сведения, содержащиеся в данном документе, были получены с устройств в специальной

лабораторной среде. Все устройства, описанные в данном документе, были запущены с конфигурацией по умолчанию. При работе с реальной сетью необходимо полностью осознавать возможные результаты использования всех команд.

Условные обозначения

Дополнительные сведения об условных обозначениях в документах см. Cisco Technical Tips Conventions.

Настройка

В этом разделе содержатся сведения о настройке функций, описанных в этом документе.

Примечание: Поиск дополнительной информации о командах в данном документе можно выполнить с помощью средства "Command Lookup" (Поиск команд) (только для зарегистрированных клиентов).

Схема сети

В настоящем документе используется следующая схема сети:

Конфигурации

Эти конфигурации используются в данном документе:

- Коммутатор шлюза доступа Catalyst 4224
- Маршрутизатор с ПО Cisco IOS

Коммутатор шлюза доступа Catalyst 4224

```
triana#show version
Cisco Internetwork Operating System Software
IOS (tm) c4224 Software (c4224-IK9O3SX3-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#
```

Маршрутизатор с ПО Cisco IOS

```
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
```

Проверка

В этом разделе содержатся сведения, которые помогают убедиться в надлежащей работе конфигурации. Проверка операций IPSec сделана с **командами отладки**. Команда extended ping предпринята от маршрутизатора до хоста позади шлюза доступа.

Некоторые команды show поддерживаются Средством интерпретации выходных данных(только зарегистрированные клиенты), которое позволяет просматривать аналитику выходных данных команды show.

- **show debug** текущие параметры настройки отладки.
- **show crypto isakmp sa – отображает все текущие сопоставления безопасности IKE (SA) на одноранговом узле.**
- **show crypto ipsec sa — отображает настройки, используемые текущими SA.**

Устранение неполадок

В этом разделе описывается процесс устранения неполадок конфигурации.

Команды для устранения неполадок

Примечание: Прежде чем применять команды отладки, ознакомьтесь с разделом "Важные сведения о командах отладки".

- **debug crypto ipsec– показывает события IPSec.**
- **debug crypto isakmp – отображает сообщения о событиях IKE.**
- **debug crypto engine– выводит информацию о криптографическом модуле.**

Примеры отладочных команд

Этот раздел предоставляет пример отладочных выходных данных для шлюза доступа и маршрутизатора.

- Коммутатор шлюза доступа Catalyst 4224
- Маршрутизатор с ПО Cisco IOS

Коммутатор шлюза доступа Catalyst 4224

```
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_MESG_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_MESG_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_MESG_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_MESG_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_MESG_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_MESG_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_MESG_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_MESG_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_MESG_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_MESG_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_MESG_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_MESG_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#
```

Маршрутизатор с ПО Cisco IOS

```
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#
```

Дополнительные сведения

- Страница поддержки IPSec
- Введение к IPSec
- Техническая поддержка - Cisco Systems