Konfigurieren von IPSec zwischen einem Catalyst 4224 Access Gateway-Switch und einem Cisco IOS-Router

Inhalt

Einführung

Dieses Dokument zeigt die Beispielkonfiguration von IPSec zwischen einem Cisco Catalyst 4224 Access Gateway-Switch und einem Cisco Router, auf dem die Cisco IOS® Software ausgeführt wird. Die Verschlüsselung erfolgt zwischen VLAN1 des Zugangs-Gateways (auf das die Crypto Map angewendet wird) und der FastEthernet0/1-Schnittstelle des Routers.

Voraussetzungen

Anforderungen

Für dieses Dokument bestehen keine besonderen Voraussetzungen.

Verwendete Komponenten

Die Informationen in diesem Dokument basieren auf den folgenden Software- und Hardwareversionen:

- Cisco IOS Softwareversion 12.(1)14
- IOS c4224 Software 12.2(2)YC1

Die in diesem Dokument enthaltenen Informationen wurden aus Geräten in einer bestimmten

Laborumgebung erstellt. Alle in diesem Dokument verwendeten Geräte haben mit einer leeren (Standard-)Konfiguration begonnen. Wenn Sie in einem Live-Netzwerk arbeiten, stellen Sie sicher, dass Sie die potenziellen Auswirkungen eines Befehls verstehen, bevor Sie es verwenden.

Konventionen

Weitere Informationen zu Dokumentkonventionen finden Sie unter Cisco Technical Tips Conventions.

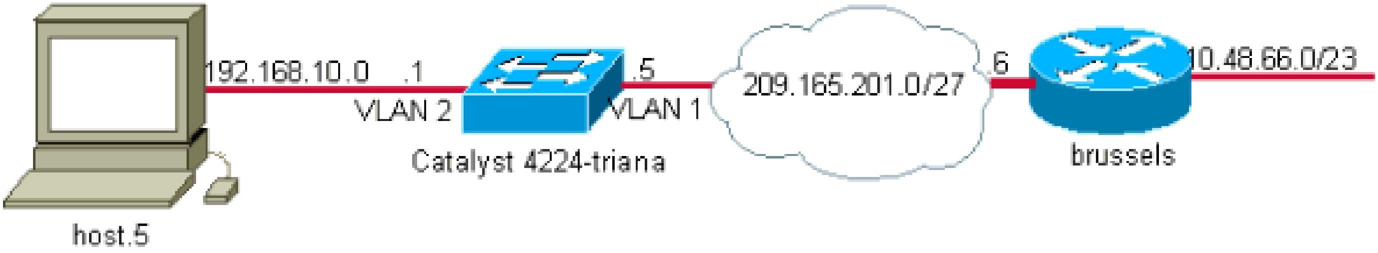
Konfigurieren

In diesem Abschnitt erhalten Sie Informationen zum Konfigurieren der in diesem Dokument beschriebenen Funktionen.

Hinweis: Um weitere Informationen zu den in diesem Dokument verwendeten Befehlen zu erhalten, verwenden Sie das Command Lookup Tool (nur registrierte Kunden).

Netzwerkdiagramm

In diesem Dokument wird die folgende Netzwerkeinrichtung verwendet:



Konfigurationen

In diesem Dokument werden folgende Konfigurationen verwendet:

- Catalyst 4224 Access Gateway-Switch
- Cisco IOS-Router

Catalyst 4224 Access Gateway-Switch

```
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#
```

Cisco IOS-Router

```
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
```

Überprüfen

Dieser Abschnitt enthält Informationen, mit denen Sie überprüfen können, ob Ihre Konfiguration ordnungsgemäß funktioniert. Die Überprüfung des IPSec-Vorgangs erfolgt mit **Debug-**Befehlen. Ein erweiterter Ping wird vom Router an einen Host hinter dem Access Gateway versucht.

Bestimmte **show**-Befehle werden vom Output Interpreter Tool unterstützt (nur registrierte Kunden), mit dem Sie eine Analyse der **show**-Befehlsausgabe anzeigen können.

- **show debug**: Zeigt die aktuellen Debugeinstellungen an.
- **show crypto isakmp sa**: Zeigt alle aktuellen IKE-Sicherheitszuordnungen (SAs) in einem Peer an.
- **show crypto ipsec sa**: Zeigt die von aktuellen SAs verwendeten Einstellungen an.

Fehlerbehebung

Dieser Abschnitt enthält Informationen zur Fehlerbehebung in Ihrer Konfiguration.

Befehle zur Fehlerbehebung

Hinweis: Bevor Sie **Debugbefehle** ausgeben, lesen Sie Wichtige Informationen über Debug-Befehle.

- **debug crypto ipsec**: Zeigt IPSec-Ereignisse an.
- **debug crypto isakmp**: Zeigt Meldungen über IKE-Ereignisse an.
- **debug crypto engine**: Zeigt Informationen vom Crypto Engine an.

Beispieldebugging

Dieser Abschnitt enthält Beispielausgaben für das Debuggen für das Access Gateway und den Router.

- Catalyst 4224 Access Gateway-Switch
- Cisco IOS-Router

Catalyst 4224 Access Gateway-Switch

```
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#
```

Cisco IOS-Router

```
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#
```

Zugehörige Informationen

- IPSec-Support-Seite
- Einführung in IPSec

- Technischer Support - Cisco Systems