Exemplo de configuração de IKEv1/IKEv2 entre Cisco IOS e strongSwan

Contents

Introduction

Este documento fornece um exemplo de configuração para uma VPN LAN a LAN (L2L) entre o Cisco IOS® e strongSwan. As configurações do Internet Key Exchange versão 1 (IKEv1) e do Internet Key Exchange versão 2 (IKEv2) são apresentadas.

Prerequisites

Requirements

A Cisco recomenda que você tenha conhecimento destes tópicos:

- Conhecimento básico sobre as configurações do Linux
- Conhecimento sobre as configurações de VPN no Cisco IOS
- Conhecimento sobre estes protocolos: IKEv1IKEv2IPSec (Internet Protocol Security)

Componentes Utilizados

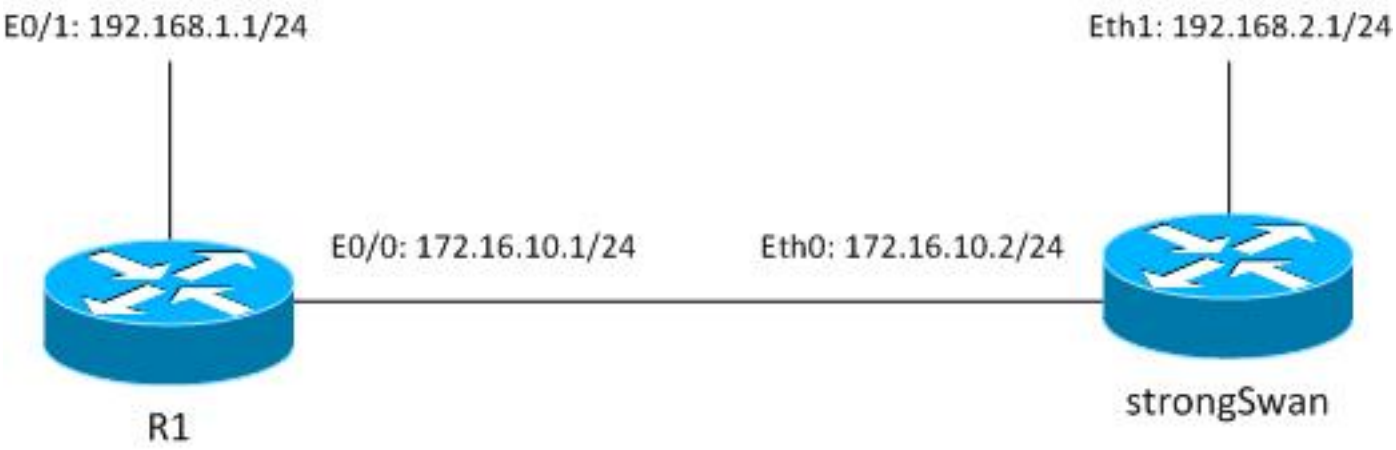
As informações neste documento são baseadas nestas versões de software:

- Cisco IOS versão 15.3T
- strongSwan 5.0.4
- kernel Linux 3.2.12

Configurar

Diagrama de Rede

A topologia é a mesma para ambos os exemplos, que é um túnel L2L entre o Cisco IOS e o strongSwan.



O tráfego é protegido entre 192.168.1.0/24<->192.168.2.0/24.

VPNs IPSec L2L de origem aberta

Há vários projetos de código aberto que utilizam protocolos de Internet Key Exchange (IKE) e IPSec para criar túneis L2L seguros:

- Rede de Longa Distância Livre e Segura (gratuito para S/WAN): histórico, não mantido ativamente
- ipsec-tools: racoon - não suporta IKEv2, kernels Linux mais antigos 2.6
- Openswan: suporte a IKEv2 muito básico, kernels Linux 2.6 mais antigos e API anterior, não mantidos ativamente
- Cisne forte: suporta extensões IKEv2 e EAP/mobility, novos kernels Linux 3.x e posteriores que usam API NETKEY (que é o nome para a implementação IPSec nativa no Kernel 2.6 e posterior), mantidos ativamente e bem documentados

Atualmente, a melhor escolha é geralmente strongSwan. Ela é semelhante em configuração a Openswan, mas há várias diferenças menores. Este guia concentra-se no strongSwan e na configuração do Cisco IOS.

IKEv1 entre o Cisco IOS e strongSwan

Configuração do Cisco IOS

```
crypto isakmp policy 10
 encr aes
 authentication pre-share
 group 5
crypto isakmp key cisco address 172.16.10.2

crypto ipsec transform-set TS esp-aes esp-sha-hmac
 mode tunnel

crypto map cmap 10 ipsec-isakmp
 set peer 172.16.10.2
 set transform-set TS
 match address cryptoacl

interface Ethernet0/1
 ip address 192.168.1.1 255.255.255.0

interface Ethernet0/0
 ip address 172.16.10.1 255.255.255.0
 crypto map cmap

ip access-list extended cryptoacl
 permit ip 192.168.1.0 0.0.0.255 192.168.2.0 0.0.0.255
```

strongConfiguração de Swan

O lado esquerdo está relacionado ao strongSwan e o lado direito é remoto (o Cisco IOS neste exemplo).

/etc/ipsec.conf

```
config setup
```

```
        # strictcrlpolicy=yes
        # uniqueids = no

conn %default
        ikelifetime=1440m
        keylife=60m
        rekeymargin=3m
        keyingtries=1
        keyexchange=ikev1
        authby=secret

conn ciscoios
        left=172.16.10.2 #strongswan outside address
        leftsubnet=192.168.2.0/24 #network behind strongswan
        leftid=172.16.10.2 #IKEID sent by strongswan
        leftfirewall=yes
        right=172.16.10.1 #IOS outside address
        rightsubnet=192.168.1.0/24 #network behind IOS
        rightid=172.16.10.1 #IKEID sent by IOS
        auto=add
        ike=aes128-md5-modp1536 #P1: modp1536 = DH group 5
        esp=aes128-sha1 #P2
```

Por padrão, o Cisco IOS usa o endereço como ID de IKE - é por isso que os endereços foram usados como "de direito" e "de esquerda". strongSwan, como o Cisco IOS, suporta criptografia de próxima geração (Suite B) - portanto, é possível usar as chaves 4096 Diffie-Hellman (DH) junto com AES256 e SHA512.

Para o parâmetro automático, o argumento "add" foi usado. Isso faz o túnel aparecer depois de receber tráfego interessante. Para iniciar imediatamente, o argumento "start" pode ser usado.

/etc/ipsec.secrets

```
172.16.10.2 172.16.10.1 : PSK cisco
```

Para IKEv1, ambas as chaves precisam ser iguais, neste exemplo "cisco".

IKEv2 entre Cisco IOS e strongSwan

Configuração do Cisco IOS

```
crypto ikev2 proposal ikev2proposal
 encryption aes-cbc-128
 integrity sha1
 group 5

crypto ikev2 policy ikev2policy
 match fvrf any
 proposal ikev2proposal

crypto ikev2 keyring keys
 peer strongswan
 address 172.16.10.2
 pre-shared-key local cisco
```

```
 pre-shared-key remote cisco

crypto ikev2 profile ikev2profile
 match identity remote address 172.16.10.2 255.255.255.255
 authentication remote pre-share
 authentication local pre-share
 keyring local keys

crypto ipsec transform-set TS esp-aes esp-sha-hmac
 mode tunnel

crypto map cmap 10 ipsec-isakmp
 set peer 172.16.10.2
 set transform-set TS
 set ikev2-profile ikev2profile
 match address cryptoacl

interface Ethernet0/1
 ip address 192.168.1.1 255.255.255.0

interface Ethernet0/0
 ip address 172.16.10.1 255.255.255.0
 crypto map cmap

ip access-list extended cryptoacl
 permit ip 192.168.1.0 0.0.0.255 192.168.2.0 0.0.0.255
```

strongConfiguração de Swan

Há apenas duas alterações em comparação ao IKEv1: teclas de troca e possivelmente teclas.

/etc/ipsec.conf

```
config setup
       # strictcrlpolicy=yes
       # uniqueids = no

conn %default
       ikelifetime=1440m
       keylife=60m
       rekeymargin=3m
       keyingtries=1
       keyexchange=ikev1
       authby=secret

conn ciscoios
       left=172.16.10.2
       leftsubnet=192.168.2.0/24
       leftid=172.16.10.2
       leftfirewall=yes
       right=172.16.10.1
       rightsubnet=192.168.1.0/24
       rightid=172.16.10.1
       auto=add
       ike=aes128-sha1-modp1536
       esp=aes128-sha1
        keyexchange=ikev2
```

/etc/ipsec.secrets

```
172.16.10.2 : PSK "cisco"
172.16.10.1 : PSK "cisco"
```

No IKEv2, as chaves de cada site podem ser diferentes.

Verificar

Consulte a seção Solução de problemas para obter os procedimentos de verificação.

Troubleshoot

Esta seção fornece informações que podem ser usadas para o troubleshooting da sua configuração.

IKEv1 entre o Cisco IOS e strongSwan

Cisco IOS

```
R1#ping 192.168.2.1 source e0/1 repeat 1
```

Estabelecimento de túnel acionado pelo Cisco IOS

```
*May 24 18:02:48.464: IPSEC(sa_request): ,
 (key eng. msg.) OUTBOUND local= 172.16.10.1:500, remote= 172.16.10.2:500,
   local_proxy= 192.168.1.0/255.255.255.0/256/0,
   remote_proxy= 192.168.2.0/255.255.255.0/256/0,
   protocol= ESP, transform= esp-aes esp-sha-hmac  (Tunnel),
   lifedur= 3600s and 4608000kb,
   spi= 0x0(0), conn_id= 0, keysize= 128, flags= 0x0
*May 24 18:02:48.465: ISAKMP:(0): SA request profile is (NULL)
*May 24 18:02:48.465: ISAKMP: Created a peer struct for 172.16.10.2, peer port 500
*May 24 18:02:48.465: ISAKMP: New peer created peer = 0xF334E7E0 peer_handle =
0x80000006
*May 24 18:02:48.465: ISAKMP: Locking peer struct 0xF334E7E0, refcount 1 for
isakmp_initiator
*May 24 18:02:48.465: ISAKMP: local port 500, remote port 500
*May 24 18:02:48.465: ISAKMP: set new node 0 to QM_IDLE
*May 24 18:02:48.465: ISAKMP: Find a dup sa in the avl tree during calling
isadb_insert sa = F49C9890
*May 24 18:02:48.465: ISAKMP:(0):Can not start Aggressive mode, trying Main mode.
*May 24 18:02:48.465: ISAKMP:(0):found peer pre-shared key matching 172.16.10.2
*May 24 18:02:48.465: ISAKMP:(0): constructed NAT-T vendor-rfc3947 ID
*May 24 18:02:48.465: ISAKMP:(0): constructed NAT-T vendor-07 ID
*May 24 18:02:48.465: ISAKMP:(0): constructed NAT-T vendor-03 ID
*May 24 18:02:48.465: ISAKMP:(0): constructed NAT-T vendor-02 ID
*May 24 18:02:48.465: ISAKMP:(0):Input = IKE_MESG_FROM_IPSEC, IKE_SA_REQ_MM
*May 24 18:02:48.465: ISAKMP:(0):Old State = IKE_READY  New State = IKE_I_MM1

*May 24 18:02:48.465: ISAKMP:(0): beginning Main Mode exchange
```

```
*May 24 18:02:48.465: ISAKMP:(0): sending packet to 172.16.10.2 my_port 500
peer_port 500 (I) MM_NO_STATE
*May 24 18:02:48.465: ISAKMP:(0):Sending an IKE IPv4 Packet.
*May 24 18:02:48.466: ISAKMP (0): received packet from 172.16.10.2 dport 500
sport 500 Global (I) MM_NO_STATE
*May 24 18:02:48.466: ISAKMP:(0):Input = IKE_MESG_FROM_PEER, IKE_MM_EXCH
*May 24 18:02:48.466: ISAKMP:(0):Old State = IKE_I_MM1  New State = IKE_I_MM2

*May 24 18:02:48.466: ISAKMP:(0): processing SA payload. message ID = 0
*May 24 18:02:48.466: ISAKMP:(0): processing vendor id payload
*May 24 18:02:48.466: ISAKMP:(0): vendor ID seems Unity/DPD but major 215 mismatch
*May 24 18:02:48.466: ISAKMP:(0): vendor ID is XAUTH
*May 24 18:02:48.466: ISAKMP:(0): processing vendor id payload
*May 24 18:02:48.466: ISAKMP:(0): vendor ID is DPD
*May 24 18:02:48.466: ISAKMP:(0): processing vendor id payload
*May 24 18:02:48.466: ISAKMP:(0): vendor ID seems Unity/DPD but major 69 mismatch
*May 24 18:02:48.466: ISAKMP (0): vendor ID is NAT-T RFC 3947
*May 24 18:02:48.466: ISAKMP:(0):found peer pre-shared key matching 172.16.10.2
*May 24 18:02:48.466: ISAKMP:(0): local preshared key found
*May 24 18:02:48.466: ISAKMP : Scanning profiles for xauth ...
*May 24 18:02:48.466: ISAKMP:(0):Checking ISAKMP transform 1 against priority
10 policy
*May 24 18:02:48.466: ISAKMP:      encryption AES-CBC
*May 24 18:02:48.466: ISAKMP:      keylength of 128
*May 24 18:02:48.466: ISAKMP:      hash SHA
*May 24 18:02:48.466: ISAKMP:      default group 5
*May 24 18:02:48.466: ISAKMP:      auth pre-share
*May 24 18:02:48.466: ISAKMP:      life type in seconds
*May 24 18:02:48.466: ISAKMP:      life duration (VPI) of  0x0 0x1 0x51 0x80
*May 24 18:02:48.466: ISAKMP:(0):atts are acceptable. Next payload is 0
*May 24 18:02:48.466: ISAKMP:(0):Acceptable atts:actual life: 0
*May 24 18:02:48.466: ISAKMP:(0):Acceptable atts:life: 0
*May 24 18:02:48.466: ISAKMP:(0):Fill atts in sa vpi_length:4
*May 24 18:02:48.466: ISAKMP:(0):Fill atts in sa life_in_seconds:86400
*May 24 18:02:48.466: ISAKMP:(0):Returning Actual lifetime: 86400
*May 24 18:02:48.466: ISAKMP:(0)::Started lifetime timer: 86400.

*May 24 18:02:48.466: ISAKMP:(0): processing vendor id payload
*May 24 18:02:48.466: ISAKMP:(0): vendor ID seems Unity/DPD but major 215 mismatch
*May 24 18:02:48.466: ISAKMP:(0): vendor ID is XAUTH
*May 24 18:02:48.466: ISAKMP:(0): processing vendor id payload
*May 24 18:02:48.466: ISAKMP:(0): vendor ID is DPD
*May 24 18:02:48.466: ISAKMP:(0): processing vendor id payload
*May 24 18:02:48.466: ISAKMP:(0): vendor ID seems Unity/DPD but major 69 mismatch
*May 24 18:02:48.466: ISAKMP (0): vendor ID is NAT-T RFC 3947
*May 24 18:02:48.466: ISAKMP:(0):Input = IKE_MESG_INTERNAL, IKE_PROCESS_MAIN_MODE
*May 24 18:02:48.466: ISAKMP:(0):Old State = IKE_I_MM2  New State = IKE_I_MM2

*May 24 18:02:48.466: ISAKMP:(0): sending packet to 172.16.10.2 my_port 500
peer_port 500 (I) MM_SA_SETUP
*May 24 18:02:48.466: ISAKMP:(0):Sending an IKE IPv4 Packet.
*May 24 18:02:48.466: ISAKMP:(0):Input = IKE_MESG_INTERNAL, IKE_PROCESS_COMPLETE
*May 24 18:02:48.466: ISAKMP:(0):Old State = IKE_I_MM2  New State = IKE_I_MM3

*May 24 18:02:48.474: ISAKMP (0): received packet from 172.16.10.2 dport 500 sport
500 Global (I) MM_SA_SETUP
*May 24 18:02:48.474: ISAKMP:(0):Input = IKE_MESG_FROM_PEER, IKE_MM_EXCH
*May 24 18:02:48.474: ISAKMP:(0):Old State = IKE_I_MM3  New State = IKE_I_MM4

*May 24 18:02:48.474: ISAKMP:(0): processing KE payload. message ID = 0
*May 24 18:02:48.482: ISAKMP:(0): processing NONCE payload. message ID = 0
*May 24 18:02:48.482: ISAKMP:(0):found peer pre-shared key matching 172.16.10.2
*May 24 18:02:48.482: ISAKMP:received payload type 20
*May 24 18:02:48.482: ISAKMP (1003): His hash no match - this node outside NAT
```

```
*May 24 18:02:48.482: ISAKMP:received payload type 20
*May 24 18:02:48.482: ISAKMP (1003): No NAT Found for self or peer
*May 24 18:02:48.482: ISAKMP:(1003):Input = IKE_MESG_INTERNAL, IKE_PROCESS_MAIN_MODE
*May 24 18:02:48.482: ISAKMP:(1003):Old State = IKE_I_MM4  New State = IKE_I_MM4

*May 24 18:02:48.482: ISAKMP:(1003):Send initial contact
*May 24 18:02:48.482: ISAKMP:(1003):SA is doing pre-shared key authentication using
id type ID_IPV4_ADDR
*May 24 18:02:48.482: ISAKMP (1003): ID payload
       next-payload : 8
       type         : 1
       address      : 172.16.10.1
       protocol     : 17
       port         : 500
       length       : 12
*May 24 18:02:48.482: ISAKMP:(1003):Total payload length: 12
*May 24 18:02:48.482: ISAKMP:(1003): sending packet to 172.16.10.2 my_port 500
peer_port 500 (I) MM_KEY_EXCH
*May 24 18:02:48.482: ISAKMP:(1003):Sending an IKE IPv4 Packet.
*May 24 18:02:48.482: ISAKMP:(1003):Input = IKE_MESG_INTERNAL, IKE_PROCESS_COMPLETE
*May 24 18:02:48.482: ISAKMP:(1003):Old State = IKE_I_MM4  New State = IKE_I_MM5

*May 24 18:02:48.483: ISAKMP (1003): received packet from 172.16.10.2 dport 500
sport 500 Global (I) MM_KEY_EXCH
*May 24 18:02:48.483: ISAKMP:(1003): processing ID payload. message ID = 0
*May 24 18:02:48.483: ISAKMP (1003): ID payload
       next-payload : 8
       type         : 1
       address      : 172.16.10.2
       protocol     : 0
       port         : 0
       length       : 12
*May 24 18:02:48.483: ISAKMP:(0):: peer matches *none* of the profiles
*May 24 18:02:48.483: ISAKMP:(1003): processing HASH payload. message ID = 0
*May 24 18:02:48.483: ISAKMP:(1003):SA authentication status:
       authenticated
*May 24 18:02:48.483: ISAKMP:(1003):SA has been authenticated with 172.16.10.2
*May 24 18:02:48.483: ISAKMP: Trying to insert a peer 172.16.10.1/172.16.10.2/500/,
 and inserted successfully F334E7E0.
*May 24 18:02:48.483: ISAKMP:(1003):Input = IKE_MESG_FROM_PEER, IKE_MM_EXCH
*May 24 18:02:48.483: ISAKMP:(1003):Old State = IKE_I_MM5  New State = IKE_I_MM6

*May 24 18:02:48.483: ISAKMP:(1003):Input = IKE_MESG_INTERNAL, IKE_PROCESS_MAIN_MODE
*May 24 18:02:48.483: ISAKMP:(1003):Old State = IKE_I_MM6  New State = IKE_I_MM6

*May 24 18:02:48.487: ISAKMP:(1003):Input = IKE_MESG_INTERNAL, IKE_PROCESS_COMPLETE
*May 24 18:02:48.487: ISAKMP:(1003):Old State = IKE_I_MM6  New State = IKE_P1_COMPLETE

*May 24 18:02:48.487: ISAKMP:(1003):beginning Quick Mode exchange, M-ID of 2605730229
*May 24 18:02:48.487: ISAKMP:(1003):QM Initiator gets spi
*May 24 18:02:48.487: ISAKMP:(1003): sending packet to 172.16.10.2 my_port 500
peer_port 500 (I) QM_IDLE
*May 24 18:02:48.487: ISAKMP:(1003):Sending an IKE IPv4 Packet.
*May 24 18:02:48.488: ISAKMP:(1003):Node 2605730229, Input = IKE_MESG_INTERNAL,
IKE_INIT_QM
*May 24 18:02:48.488: ISAKMP:(1003):Old State = IKE_QM_READY  New State = IKE_QM_I_QM1
*May 24 18:02:48.488: ISAKMP:(1003):Input = IKE_MESG_INTERNAL, IKE_PHASE1_COMPLETE
*May 24 18:02:48.488: ISAKMP:(1003):Old State = IKE_P1_COMPLETE  New State =
IKE_P1_COMPLETE

*May 24 18:02:48.488: ISAKMP (1003): received packet from 172.16.10.2 dport 500
sport 500 Global (I) QM_IDLE
*May 24 18:02:48.488: ISAKMP:(1003): processing HASH payload. message ID = 2605730229
*May 24 18:02:48.488: ISAKMP:(1003): processing SA payload. message ID = 2605730229
```

```
*May 24 18:02:48.488: ISAKMP:(1003):Checking IPSec proposal 1
*May 24 18:02:48.488: ISAKMP: transform 1, ESP_AES
*May 24 18:02:48.488: ISAKMP:   attributes in transform:
*May 24 18:02:48.488: ISAKMP:      key length is 128
*May 24 18:02:48.488: ISAKMP:      authenticator is HMAC-SHA
*May 24 18:02:48.488: ISAKMP:      encaps is 1 (Tunnel)
*May 24 18:02:48.488: ISAKMP:      SA life type in seconds
*May 24 18:02:48.488: ISAKMP:      SA life duration (basic) of 3600
*May 24 18:02:48.488: ISAKMP:      SA life type in kilobytes
*May 24 18:02:48.488: ISAKMP:      SA life duration (VPI) of  0x0 0x46 0x50 0x0
*May 24 18:02:48.488: ISAKMP:(1003):atts are acceptable.
*May 24 18:02:48.488: IPSEC(validate_proposal_request): proposal part #1
*May 24 18:02:48.488: IPSEC(validate_proposal_request): proposal part #1,
 (key eng. msg.) INBOUND local= 172.16.10.1:0, remote= 172.16.10.2:0,
    local_proxy= 192.168.1.0/255.255.255.0/256/0,
   remote_proxy= 192.168.2.0/255.255.255.0/256/0,
   protocol= ESP, transform= NONE  (Tunnel),
   lifedur= 0s and 0kb,
   spi= 0x0(0), conn_id= 0, keysize= 128, flags= 0x0
*May 24 18:02:48.488: Crypto mapdb : proxy_match
       src addr     : 192.168.1.0
       dst addr     : 192.168.2.0
       protocol     : 0
       src port     : 0
       dst port     : 0
*May 24 18:02:48.488: ISAKMP:(1003): processing NONCE payload. message ID = 2605730229
*May 24 18:02:48.488: ISAKMP:(1003): processing ID payload. message ID = 2605730229
*May 24 18:02:48.488: ISAKMP:(1003): processing ID payload. message ID = 2605730229
*May 24 18:02:48.488: ISAKMP:(1003):Node 2605730229, Input = IKE_MESG_FROM_PEER,
IKE_QM_EXCH
*May 24 18:02:48.488: ISAKMP:(1003):Old State = IKE_QM_I_QM1  New State =
IKE_QM_IPSEC_INSTALL_AWAIT
*May 24 18:02:48.488: IPSEC(key_engine): got a queue event with 1 KMI message(s)
*May 24 18:02:48.488: Crypto mapdb : proxy_match
       src addr     : 192.168.1.0
       dst addr     : 192.168.2.0
       protocol     : 256
       src port     : 0
       dst port     : 0
*May 24 18:02:48.488: IPSEC(crypto_ipsec_create_ipsec_sas): Map found cmap
*May 24 18:02:48.489: IPSEC(crypto_ipsec_sa_find_ident_head): reconnecting with the
same proxies and peer 172.16.10.2
*May 24 18:02:48.489: IPSEC(create_sa): sa created,
 (sa) sa_dest= 172.16.10.1, sa_proto= 50,
   sa_spi= 0x4C0D0EF0(1275924208),
   sa_trans= esp-aes esp-sha-hmac , sa_conn_id= 7
   sa_lifetime(k/sec)= (4608000/3600)
*May 24 18:02:48.489: IPSEC(create_sa): sa created,
 (sa) sa_dest= 172.16.10.2, sa_proto= 50,
   sa_spi= 0xC72072C6(3340792518),
   sa_trans= esp-aes esp-sha-hmac , sa_conn_id= 8
   sa_lifetime(k/sec)= (4608000/3600)
```

Em ambas as fases, a Internet Security Association e o Key Management Protocol (ISAKMP) e o IPSec estão ativados.

Cisco IOS: Verificar contadores de IPSec

```
R1#show crypto session detail
Crypto session current status
```

```
Code: C - IKE Configuration mode, D - Dead Peer Detection
K - Keepalives, N - NAT-traversal, T - cTCP encapsulation
X - IKE Extended Authentication, F - IKE Fragmentation

Interface: Ethernet0/0
Uptime: 00:00:05
Session status: UP-ACTIVE
Peer: 172.16.10.2 port 500 fvrf: (none) ivrf: (none)
     Phase1_id: 172.16.10.2
     Desc: (none)
 IKEv1 SA: local 172.16.10.1/500 remote 172.16.10.2/500 Active
         Capabilities:(none) connid:1003 lifetime:23:59:54
 IPSEC FLOW: permit ip 192.168.1.0/255.255.255.0 192.168.2.0/255.255.255.0
       Active SAs: 2, origin: crypto map
       Inbound:  #pkts dec'ed 0 drop 0 life (KB/Sec) 4164218/3594
       Outbound: #pkts enc'ed 0 drop 0 life (KB/Sec) 4164218/3594A
```

Após 100 pacotes serem enviados:

```
R1#ping 192.168.2.1 source e0/1 repeat 100
Type escape sequence to abort.
Sending 100, 100-byte ICMP Echos to 192.168.2.1, timeout is 2 seconds:
Packet sent with a source address of 192.168.1.1
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!
Success rate is 100 percent (100/100), round-trip min/avg/max = 4/4/5 ms
R1#

R1#show crypto session detail
Crypto session current status

Code: C - IKE Configuration mode, D - Dead Peer Detection
K - Keepalives, N - NAT-traversal, T - cTCP encapsulation
X - IKE Extended Authentication, F - IKE Fragmentation

Interface: Ethernet0/0
Uptime: 00:00:09
Session status: UP-ACTIVE
Peer: 172.16.10.2 port 500 fvrf: (none) ivrf: (none)
     Phase1_id: 172.16.10.2
     Desc: (none)
 IKEv1 SA: local 172.16.10.1/500 remote 172.16.10.2/500 Active
         Capabilities:(none) connid:1003 lifetime:23:59:50
 IPSEC FLOW: permit ip 192.168.1.0/255.255.255.0 192.168.2.0/255.255.255.0
       Active SAs: 2, origin: crypto map
       Inbound:  #pkts dec'ed 100 drop 0 life (KB/Sec) 4164202/3590
       Outbound: #pkts enc'ed 100 drop 0 life (KB/Sec) 4164202/3590
```

Cisco IOS: Verificar parâmetros de IKEv1 e IPSec

```
R1#show crypto isakmp sa detail
Codes: C - IKE configuration mode, D - Dead Peer Detection
      K - Keepalives, N - NAT-traversal
      T - cTCP encapsulation, X - IKE Extended Authentication
      psk - Preshared key, rsig - RSA signature
      renc - RSA encryption
IPv4 Crypto ISAKMP SA

C-id  Local           Remote          I-VRF  Status Encr Hash   Auth DH Lifetime Cap.
```

```
1003  172.16.10.1     172.16.10.2            ACTIVE aes  sha    psk  5  23:59:35
      Engine-id:Conn-id =  SW:3


R1#show crypto ipsec sa
interface: Ethernet0/0
   Crypto map tag: cmap, local addr 172.16.10.1

  protected vrf: (none)
  local  ident (addr/mask/prot/port): (192.168.1.0/255.255.255.0/0/0)
  remote ident (addr/mask/prot/port): (192.168.2.0/255.255.255.0/0/0)
  current_peer 172.16.10.2 port 500
    PERMIT, flags={origin_is_acl,}
   #pkts encaps: 100, #pkts encrypt: 100, #pkts digest: 100
   #pkts decaps: 100, #pkts decrypt: 100, #pkts verify: 100
   #pkts compressed: 0, #pkts decompressed: 0
   #pkts not compressed: 0, #pkts compr. failed: 0
   #pkts not decompressed: 0, #pkts decompress failed: 0
   #send errors 0, #recv errors 0

    local crypto endpt.: 172.16.10.1, remote crypto endpt.: 172.16.10.2
    plaintext mtu 1438, path mtu 1500, ip mtu 1500, ip mtu idb Ethernet0/0
    current outbound spi: 0xC72072C6(3340792518)
    PFS (Y/N): N, DH group: none

    inbound esp sas:
     spi: 0x4C0D0EF0(1275924208)
       transform: esp-aes esp-sha-hmac ,
       in use settings ={Tunnel, }
       conn id: 7, flow_id: SW:7, sibling_flags 80000040, crypto map: cmap
       sa timing: remaining key lifetime (k/sec): (4164202/3562)
       IV size: 16 bytes
       replay detection support: Y
       Status: ACTIVE(ACTIVE)

    inbound ah sas:

    inbound pcp sas:

    outbound esp sas:
     spi: 0xC72072C6(3340792518)
       transform: esp-aes esp-sha-hmac ,
       in use settings ={Tunnel, }
       conn id: 8, flow_id: SW:8, sibling_flags 80000040, crypto map: cmap
       sa timing: remaining key lifetime (k/sec): (4164202/3562)
       IV size: 16 bytes
       replay detection support: Y
       Status: ACTIVE(ACTIVE)

    outbound ah sas:

    outbound pcp sas:
```

As duas fases estão em alta. O índice de parâmetro de segurança (SPI) do IPSec é negociado. O contador aumentou para 100 após o envio de 100 pacotes.

Cisne forte: Estabelecimento de túnel

```
pluton# /etc/init.d/ipsec start
```

```
May 24 20:02:48 localhost charon: 10[NET] received packet: from 172.16.10.1[500]
to 172.16.10.2[500] (168 bytes)
May 24 20:02:48 localhost charon: 10[ENC] parsed ID_PROT request 0 [ SA V V V V ]
May 24 20:02:48 localhost charon: 10[IKE] received NAT-T (RFC 3947) vendor ID
May 24 20:02:48 localhost charon: 10[IKE] received draft-ietf-ipsec-nat-t-ike-07
vendor ID
May 24 20:02:48 localhost charon: 10[IKE] received draft-ietf-ipsec-nat-t-ike-03
vendor ID
May 24 20:02:48 localhost charon: 10[IKE] received draft-ietf-ipsec-nat-t-ike-02\n
vendor ID
May 24 20:02:48 localhost charon: 10[IKE] 172.16.10.1 is initiating a Main Mode IKE_SA
May 24 20:02:48 localhost charon: 10[IKE] 172.16.10.1 is initiating a Main Mode IKE_SA
May 24 20:02:48 localhost charon: 10[ENC] generating ID_PROT response 0 [ SA V V V ]
May 24 20:02:48 localhost charon: 10[NET] sending packet: from 172.16.10.2[500] to
172.16.10.1[500] (140 bytes)
May 24 20:02:48 localhost charon: 11[NET] received packet: from 172.16.10.1[500] to
172.16.10.2[500] (348 bytes)
May 24 20:02:48 localhost charon: 11[ENC] parsed ID_PROT request 0
[ KE No V V V NAT-D NAT-D ]
May 24 20:02:48 localhost charon: 11[ENC] generating ID_PROT response 0
[ KE No NAT-D NAT-D ]
May 24 20:02:48 localhost charon: 11[NET] sending packet: from 172.16.10.2[500]
to 172.16.10.1[500] (308 bytes)
May 24 20:02:48 localhost charon: 12[NET] received packet: from 172.16.10.1[500]
to 172.16.10.2[500] (108 bytes)
May 24 20:02:48 localhost charon: 12[ENC] parsed ID_PROT request 0
[ ID HASH N(INITIAL_CONTACT) ]
May 24 20:02:48 localhost charon: 12[CFG] looking for pre-shared key peer configs
matching 172.16.10.2...172.16.10.1[172.16.10.1]
May 24 20:02:48 localhost charon: 12[CFG] selected peer config "ciscoios"
May 24 20:02:48 localhost charon: 12[IKE] IKE_SA ciscoios[2] established between
172.16.10.2[172.16.10.2]...172.16.10.1[172.16.10.1]
May 24 20:02:48 localhost charon: 12[IKE] IKE_SA ciscoios[2] established between
172.16.10.2[172.16.10.2]...172.16.10.1[172.16.10.1]
May 24 20:02:48 localhost charon: 12[IKE] scheduling reauthentication in 3289s
May 24 20:02:48 localhost charon: 12[IKE] maximum IKE_SA lifetime 3469s
May 24 20:02:48 localhost charon: 12[ENC] generating ID_PROT response 0 [ ID HASH ]
May 24 20:02:48 localhost charon: 12[NET] sending packet: from 172.16.10.2[500] to
172.16.10.1[500] (76 bytes)
May 24 20:02:48 localhost charon: 14[NET] received packet: from 172.16.10.1[500] to
172.16.10.2[500] (188 bytes)
May 24 20:02:48 localhost charon: 14[ENC] parsed QUICK_MODE request 2605730229
[ HASH SA No ID ID ]
May 24 20:02:48 localhost charon: 14[IKE] received 3600s lifetime, configured 1200s
May 24 20:02:48 localhost charon: 14[IKE] received 4608000000 lifebytes, configured 0
May 24 20:02:48 localhost charon: 14[ENC] generating QUICK_MODE response 2605730229
[ HASH SA No ID ID ]
May 24 20:02:48 localhost charon: 14[NET] sending packet: from 172.16.10.2[500] to
172.16.10.1[500] (188 bytes)
May 24 20:02:48 localhost charon: 15[NET] received packet: from 172.16.10.1[500] to
172.16.10.2[500] (60 bytes)
May 24 20:02:48 localhost charon: 15[ENC] parsed QUICK_MODE request 2605730229 [ HASH ]
May 24 20:02:48 localhost charon: 15[IKE] CHILD_SA ciscoios{2} established with SPIs
c72072c6_i 4c0d0ef0_o and TS 192.168.2.0/24 === 192.168.1.0/24
May 24 20:02:48 localhost charon: 15[IKE] CHILD_SA ciscoios{2} established with SPIs
c72072c6_i 4c0d0ef0_o and TS 192.168.2.0/24 === 192.168.1.0/24
May 24 20:02:48 localhost vpn: + 172.16.10.1 192.168.1.0/24 == 172.16.10.1 --
172.16.10.2 == 192.168.2.0/24
```

As duas fases estão em alta. Os SPIs corretos que protegem o tráfego entre 192.168.2.0/24 e 192.168.1.0/24 são negociados.

Cisne forte: Verificar o status da conexão IPSec

```
pluton ~ # ipsec statusall
Status of IKE charon daemon (strongSwan 5.0.4, Linux 3.2.12-gentoo, x86_64):
 uptime: 4 minutes, since May 24 20:02:15 2013
 malloc: sbrk 393216, mmap 0, used 274064, free 119152
 worker threads: 8 of 16 idle, 7/1/0/0 working, job queue: 0/0/0/0, scheduled: 4
 loaded plugins: charon mysql sqlite aes des sha1 sha2 md5 random nonce x509
revocation constraints pubkey pkcs1 pkcs8 pgp dnskey pem openssl gcrypt fips-prf
gmp xcbc cmac hmac attr kernel-netlink resolve socket-default stroke updown
eap-identity eap-sim eap-aka eap-aka-3gpp2 eap-simaka-pseudonym eap-simaka-reauth
eap-md5 eap-gtc eap-mschapv2 eap-radius xauth-generic
Listening IP addresses:
 10.0.0.100
 192.168.10.1
 172.16.10.2
 192.168.2.1
Connections:
   ciscoios:  172.16.10.2...172.16.10.1  IKEv1
   ciscoios:   local:  [172.16.10.2] uses pre-shared key authentication
   ciscoios:   remote: [172.16.10.1] uses pre-shared key authentication
   ciscoios:   child:  192.168.2.0/24 === 192.168.1.0/24 TUNNEL
Security Associations (1 up, 0 connecting):
   ciscoios[2]: ESTABLISHED 4 minutes ago, 172.16.10.2[172.16.10.2]...
172.16.10.1[172.16.10.1]
   ciscoios[2]: IKEv1 SPIs: 278f22e3c3e5f606_i dbb5a27f3e0eccd1_r*,
pre-shared key reauthentication in 50 minutes
   ciscoios[2]: IKE proposal: AES_CBC_128/HMAC_SHA1_96/PRF_HMAC_SHA1/MODP_1536
   ciscoios{2}:  INSTALLED, TUNNEL, ESP SPIs: c72072c6_i 4c0d0ef0_o
   ciscoios{2}:  AES_CBC_128/HMAC_SHA1_96, 10000 bytes_i (100 pkts, 255s ago),
10000 bytes_o (100 pkts, 255s ago), rekeying in 11 minutes
   ciscoios{2}:   192.168.2.0/24 === 192.168.1.0/24
```

Os detalhes sobre os parâmetros negociados de ISAKMP e IPSec estão disponíveis.

Cisne forte: Verificar a política de IPSec

```
pluton ~ # ip -s xfrm policy
src 192.168.1.0/24 dst 192.168.2.0/24 uid 0
       dir fwd action allow index 258 priority 1859 share any flag  (0x00000000)
       lifetime config:
         limit: soft (INF)(bytes), hard (INF)(bytes)
         limit: soft (INF)(packets), hard (INF)(packets)
         expire add: soft 0(sec), hard 0(sec)
         expire use: soft 0(sec), hard 0(sec)
       lifetime current:
         0(bytes), 0(packets)
         add 2013-05-24 20:02:48 use -
       tmpl src 172.16.10.1 dst 172.16.10.2
               proto esp spi 0x00000000(0) reqid 2(0x00000002) mode tunnel
               level required share any
               enc-mask ffffffff auth-mask ffffffff comp-mask ffffffff
src 192.168.1.0/24 dst 192.168.2.0/24 uid 0
       dir in action allow index 248 priority 1859 share any flag  (0x00000000)
       lifetime config:
         limit: soft (INF)(bytes), hard (INF)(bytes)
         limit: soft (INF)(packets), hard (INF)(packets)
         expire add: soft 0(sec), hard 0(sec)
         expire use: soft 0(sec), hard 0(sec)
```

```
       lifetime current:
         0(bytes), 0(packets)
         add 2013-05-24 20:02:48 use 2013-05-24 20:02:56
       tmpl src 172.16.10.1 dst 172.16.10.2
              proto esp spi 0x00000000(0) reqid 2(0x00000002) mode tunnel
              level required share any
              enc-mask ffffffff auth-mask ffffffff comp-mask ffffffff
src 192.168.2.0/24 dst 192.168.1.0/24 uid 0
        dir out action allow index 241 priority 1859 share any flag  (0x00000000)
       lifetime config:
         limit: soft (INF)(bytes), hard (INF)(bytes)
         limit: soft (INF)(packets), hard (INF)(packets)
         expire add: soft 0(sec), hard 0(sec)
         expire use: soft 0(sec), hard 0(sec)
       lifetime current:
         0(bytes), 0(packets)
         add 2013-05-24 20:02:48 use 2013-05-24 20:02:56
       tmpl src 172.16.10.2 dst 172.16.10.1
              proto esp spi 0x00000000(0) reqid 2(0x00000002) mode tunnel
              level required share any
              enc-mask ffffffff auth-mask ffffffff comp-mask ffffffff
```

Os detalhes anteriores incluem tabelas de política interna.

IKEv2 entre Cisco IOS e strongSwan

Cisco IOS

```
R1#ping 192.168.2.1 source e0/1 repeat 1
```

Estabelecimento de túnel acionado pelo Cisco IOS

```
*May 24 19:14:10.485: IPSEC(sa_request): ,
 (key eng. msg.) OUTBOUND local= 172.16.10.1:500, remote= 172.16.10.2:500,
   local_proxy= 192.168.1.0/255.255.255.0/256/0,
   remote_proxy= 192.168.2.0/255.255.255.0/256/0,
   protocol= ESP, transform= esp-aes esp-sha-hmac  (Tunnel),
   lifedur= 3600s and 4608000kb,
   spi= 0x0(0), conn_id= 0, keysize= 128, flags= 0x0
*May 24 19:14:10.486: IKEv2:% Getting preshared key from profile keyring keys
*May 24 19:14:10.486: IKEv2:% Matched peer block 'strongswan'
*May 24 19:14:10.486: IKEv2:Searching Policy with fvrf 0, local address 172.16.10.1
*May 24 19:14:10.486: IKEv2:Found Policy 'ikev2policy'
*May 24 19:14:10.486: IKEv2:(SA ID = 1):[IKEv2 -> Crypto Engine] Computing DH public
key, DH Group 5
*May 24 19:14:10.486: IKEv2:(SA ID = 1):[Crypto Engine -> IKEv2] DH key Computation
PASSED
*May 24 19:14:10.486: IKEv2:(SA ID = 1):Request queued for computation of DH key
*May 24 19:14:10.486: IKEv2:IKEv2 initiator - no config data to send in IKE_SA_INIT exch
*May 24 19:14:10.486: IKEv2:(SA ID = 1):Generating IKE_SA_INIT message
*May 24 19:14:10.486: IKEv2:(SA ID = 1):IKE Proposal: 1, SPI size: 0
(initial negotiation),
Num. transforms: 4
  AES-CBC   SHA1   SHA96   DH_GROUP_1536_MODP/Group 5

*May 24 19:14:10.486: IKEv2:(SA ID = 1):Sending Packet [To 172.16.10.2:500/From
```

```
172.16.10.1:500/VRF i0:f0]
Initiator SPI : 9FFC38791FFEF212 - Responder SPI : 0000000000000000 Message id: 0
IKEv2 IKE_SA_INIT Exchange REQUEST
Payload contents:
 SA KE N VID VID NOTIFY(NAT_DETECTION_SOURCE_IP) NOTIFY(NAT_DETECTION_DESTINATION_IP)

*May 24 19:14:10.486: IKEv2:(SA ID = 1):Insert SA

*May 24 19:14:10.495: IKEv2:(SA ID = 1):Received Packet [From 172.16.10.2:500/To
172.16.10.1:500/VRF i0:f0]
Initiator SPI : 9FFC38791FFEF212 - Responder SPI : 6CDC17F5B0B10C1A Message id: 0
IKEv2 IKE_SA_INIT Exchange RESPONSE
Payload contents:
 SA KE N NOTIFY(NAT_DETECTION_SOURCE_IP) NOTIFY(NAT_DETECTION_DESTINATION_IP)
NOTIFY(Unknown - 16404)

*May 24 19:14:10.495: IKEv2:(SA ID = 1):Processing IKE_SA_INIT message
*May 24 19:14:10.495: IKEv2:(SA ID = 1):Verify SA init message
*May 24 19:14:10.495: IKEv2:(SA ID = 1):Processing IKE_SA_INIT message
*May 24 19:14:10.495: IKEv2:(SA ID = 1):Checking NAT discovery
*May 24 19:14:10.495: IKEv2:(SA ID = 1):NAT not found
*May 24 19:14:10.495: IKEv2:(SA ID = 1):[IKEv2 -> Crypto Engine] Computing DH
secret key, DH Group 5
*May 24 19:14:10.504: IKEv2:(SA ID = 1):[Crypto Engine -> IKEv2] DH key Computation
PASSED
*May 24 19:14:10.504: IKEv2:(SA ID = 1):Request queued for computation of DH secret
*May 24 19:14:10.504: IKEv2:(SA ID = 1):[IKEv2 -> Crypto Engine] Calculate SKEYSEED
and create rekeyed IKEv2 SA
*May 24 19:14:10.504: IKEv2:(SA ID = 1):[Crypto Engine -> IKEv2] SKEYSEED
calculation and creation of
rekeyed IKEv2 SA PASSED
*May 24 19:14:10.504: IKEv2:(SA ID = 1):Completed SA init exchange
*May 24 19:14:10.504: IKEv2:(SA ID = 1):Check for EAP exchange
*May 24 19:14:10.504: IKEv2:(SA ID = 1):Generate my authentication data
*May 24 19:14:10.504: IKEv2:(SA ID = 1):Use preshared key for id 172.16.10.1,
key len 5
*May 24 19:14:10.504: IKEv2:[IKEv2 -> Crypto Engine] Generate IKEv2 authentication
data
*May 24 19:14:10.504: IKEv2:[Crypto Engine -> IKEv2] IKEv2 authentication data
generation PASSED
*May 24 19:14:10.504: IKEv2:(SA ID = 1):Get my authentication method
*May 24 19:14:10.504: IKEv2:(SA ID = 1):My authentication method is 'PSK'
*May 24 19:14:10.504: IKEv2:(SA ID = 1):Check for EAP exchange
*May 24 19:14:10.504: IKEv2:(SA ID = 1):Generating IKE_AUTH message
*May 24 19:14:10.504: IKEv2:(SA ID = 1):Constructing IDi payload: '172.16.10.1'
of type 'IPv4 address'
*May 24 19:14:10.504: IKEv2:(SA ID = 1):ESP Proposal: 1, SPI size: 4
(IPSec negotiation),
Num. transforms: 3
   AES-CBC   SHA96   Don't use ESN
*May 24 19:14:10.504: IKEv2:(SA ID = 1):Building packet for encryption.
Payload contents:
 VID IDi AUTH SA TSi TSr NOTIFY(INITIAL_CONTACT) NOTIFY(SET_WINDOW_SIZE)
NOTIFY(ESP_TFC_NO_SUPPORT) NOTIFY(NON_FIRST_FRAGS)

*May 24 19:14:10.505: IKEv2:(SA ID = 1):Sending Packet
[To 172.16.10.2:500/From 172.16.10.1:500/VRF i0:f0]
Initiator SPI : 9FFC38791FFEF212 - Responder SPI : 6CDC17F5B0B10C1A Message id: 1
IKEv2 IKE_AUTH Exchange REQUEST
Payload contents:
 ENCR


*May 24 19:14:10.522: IKEv2:(SA ID = 1):Received Packet
```

```
[From 172.16.10.2:500/To 172.16.10.1:500/VRF i0:f0]
Initiator SPI : 9FFC38791FFEF212 - Responder SPI : 6CDC17F5B0B10C1A Message id: 1
IKEv2 IKE_AUTH Exchange RESPONSE
Payload contents:
 IDr AUTH SA TSi TSr NOTIFY(Unknown - 16403)

*May 24 19:14:10.522: IKEv2:(SA ID = 1):Process auth response notify
*May 24 19:14:10.522: IKEv2:(SA ID = 1):Searching policy based on peer's
identity '172.16.10.2' of type 'IPv4 address'
*May 24 19:14:10.522: IKEv2:Searching Policy with fvrf 0, local address 172.16.10.1
*May 24 19:14:10.522: IKEv2:Found Policy 'ikev2policy'
*May 24 19:14:10.522: IKEv2:(SA ID = 1):Verify peer's policy
*May 24 19:14:10.522: IKEv2:(SA ID = 1):Peer's policy verified
*May 24 19:14:10.522: IKEv2:(SA ID = 1):Get peer's authentication method
*May 24 19:14:10.522: IKEv2:(SA ID = 1):Peer's authentication method is 'PSK'
*May 24 19:14:10.522: IKEv2:(SA ID = 1):Get peer's preshared key for 172.16.10.2
*May 24 19:14:10.522: IKEv2:(SA ID = 1):Verify peer's authentication data
*May 24 19:14:10.522: IKEv2:(SA ID = 1):Use preshared key for id 172.16.10.2, key len 5
*May 24 19:14:10.522: IKEv2:[IKEv2 -> Crypto Engine] Generate IKEv2 authentication data
*May 24 19:14:10.522: IKEv2:[Crypto Engine -> IKEv2] IKEv2 authentication data
generation PASSED
*May 24 19:14:10.522: IKEv2:(SA ID = 1):Verification of peer's authenctication data
PASSED
*May 24 19:14:10.522: IKEv2:(SA ID = 1):Check for EAP exchange
*May 24 19:14:10.522: IKEv2:(SA ID = 1):Processing IKE_AUTH message
*May 24 19:14:10.522: IKEv2:KMI/verify policy/sending to IPSec:
        prot: 3 txfm: 12 hmac 2 flags 8177 keysize 128 IDB 0x0
*May 24 19:14:10.522: IPSEC(validate_proposal_request): proposal part #1
*May 24 19:14:10.522: IPSEC(validate_proposal_request): proposal part #1,
 (key eng. msg.) INBOUND local= 172.16.10.1:0, remote= 172.16.10.2:0,
    local_proxy= 192.168.1.0/255.255.255.0/256/0,
    remote_proxy= 192.168.2.0/255.255.255.0/256/0,
   protocol= ESP, transform= NONE  (Tunnel),
   lifedur= 0s and 0kb,
   spi= 0x0(0), conn_id= 0, keysize= 128, flags= 0x0
*May 24 19:14:10.522: Crypto mapdb : proxy_match
       src addr     : 192.168.1.0
       dst addr     : 192.168.2.0
       protocol     : 0
       src port     : 0
       dst port     : 0
*May 24 19:14:10.522: IKEv2:(SA ID = 1):IKEV2 SA created; inserting SA into database.
SA lifetime timer (86400 sec) started
*May 24 19:14:10.522: IKEv2:(SA ID = 1):Session with IKE ID PAIR
(172.16.10.2, 172.16.10.1) is UP
*May 24 19:14:10.522: IKEv2:IKEv2 MIB tunnel started, tunnel index 1
*May 24 19:14:10.522: IKEv2:(SA ID = 1):Load IPSEC key material
*May 24 19:14:10.522: IKEv2:(SA ID = 1):[IKEv2 -> IPsec] Create IPsec SA into
IPsec database
*May 24 19:14:10.522: IKEv2:(SA ID = 1):Asynchronous request queued

*May 24 19:14:10.522: IKEv2:(SA ID = 1):
*May 24 19:14:10.523: IPSEC(key_engine): got a queue event with 1 KMI message(s)
*May 24 19:14:10.523: Crypto mapdb : proxy_match
        src addr     : 192.168.1.0
       dst addr     : 192.168.2.0
       protocol     : 256
       src port     : 0
       dst port     : 0
*May 24 19:14:10.523: IPSEC(crypto_ipsec_create_ipsec_sas): Map found cmap
*May 24 19:14:10.523: IPSEC(crypto_ipsec_sa_find_ident_head): reconnecting with
the same proxies and peer 172.16.10.2
*May 24 19:14:10.523: IPSEC(create_sa): sa created,
 (sa) sa_dest= 172.16.10.1, sa_proto= 50,
```

```
   sa_spi= 0xDF405365(3745534821),
   sa_trans= esp-aes esp-sha-hmac , sa_conn_id= 6
   sa_lifetime(k/sec)= (4608000/3600)
*May 24 19:14:10.523: IPSEC(create_sa): sa created,
 (sa) sa_dest= 172.16.10.2, sa_proto= 50,
   sa_spi= 0xC0CC116C(3234599276),
   sa_trans= esp-aes esp-sha-hmac , sa_conn_id= 5
   sa_lifetime(k/sec)= (4608000/3600)
*May 24 19:14:10.523: IPSEC: Expand action denied, notify RP
*May 24 19:14:10.523: IKEv2:(SA ID = 1):[IPsec -> IKEv2] Creation of IPsec
SA into IPsec database PASSED
```

A sessão IKEv2 está ativa e o IPSec SA que protege o tráfego entre 192.168.1.0/24 e 192.168.2.0/24 foi criado.

Cisco IOS: Verificar contadores de IPSec

```
R1#show crypto session detail
Crypto session current status

Code: C - IKE Configuration mode, D - Dead Peer Detection
K - Keepalives, N - NAT-traversal, T - cTCP encapsulation
X - IKE Extended Authentication, F - IKE Fragmentation

Interface: Ethernet0/0
Uptime: 00:00:09
Session status: UP-ACTIVE
Peer: 172.16.10.2 port 500 fvrf: (none) ivrf: (none)
     Phase1_id: 172.16.10.2
     Desc: (none)
 IKEv2 SA: local 172.16.10.1/500 remote 172.16.10.2/500 Active
         Capabilities:(none) connid:1 lifetime:23:59:51
 IPSEC FLOW: permit ip 192.168.1.0/255.255.255.0 192.168.2.0/255.255.255.0
       Active SAs: 2, origin: crypto map
       Inbound:  #pkts dec'ed 0 drop 0 life (KB/Sec) 4375820/3590
       Outbound: #pkts enc'ed 0 drop 0 life (KB/Sec) 4375820/3590
```

Após 100 pacotes serem enviados:

```
R1#ping 192.168.2.1 source 192.168.1.1 repeat 100
Type escape sequence to abort.
Sending 100, 100-byte ICMP Echos to 192.168.2.1, timeout is 2 seconds:
Packet sent with a source address of 192.168.1.1
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!
Success rate is 100 percent (100/100), round-trip min/avg/max = 1/4/5 ms
R1#


R1#show crypto session detail
Crypto session current status

Code: C - IKE Configuration mode, D - Dead Peer Detection
K - Keepalives, N - NAT-traversal, T - cTCP encapsulation
X - IKE Extended Authentication, F - IKE Fragmentation

Interface: Ethernet0/0
Uptime: 00:00:15
Session status: UP-ACTIVE
```

```
Peer: 172.16.10.2 port 500 fvrf: (none) ivrf: (none)
     Phase1_id: 172.16.10.2
     Desc: (none)
 IKEv2 SA: local 172.16.10.1/500 remote 172.16.10.2/500 Active
         Capabilities:(none) connid:1 lifetime:23:59:45
 IPSEC FLOW: permit ip 192.168.1.0/255.255.255.0 192.168.2.0/255.255.255.0
       Active SAs: 2, origin: crypto map
       Inbound:  #pkts dec'ed 100 drop 0 life (KB/Sec) 4375803/3585
       Outbound: #pkts enc'ed 100 drop 0 life (KB/Sec) 4375803/3585
```

O contador aumentou 100 vezes.

Cisco IOS: Verificar parâmetros de IKEv2 e IPSec

O Cisco IOS tem estatísticas/detalhes muito bons para a sessão IKEv2:

```
R1#show crypto ikev2 sa detailed
 IPv4 Crypto IKEv2  SA

Tunnel-id Local                 Remote                fvrf/ivrf            Status
1         172.16.10.1/500       172.16.10.2/500       none/none            READY
     Encr: AES-CBC, keysize: 128, Hash: SHA96, DH Grp:5, Auth sign: PSK, Auth verify: PSK
     Life/Active Time: 86400/152 sec
     CE id: 1019, Session-id: 3
     Status Description: Negotiation done
     Local spi: 9FFC38791FFEF212       Remote spi: 6CDC17F5B0B10C1A
     Local id: 172.16.10.1
     Remote id: 172.16.10.2
     Local req msg id:  2              Remote req msg id:  0
     Local next msg id: 2              Remote next msg id: 0
     Local req queued:  2              Remote req queued:  0
     Local window:      5              Remote window:      1
     DPD configured for 0 seconds, retry 0
     Fragmentation not configured.
     Extended Authentication not configured.
     NAT-T is not detected
     Cisco Trust Security SGT is disabled
     Initiator of SA : Yes

 IPv6 Crypto IKEv2  SA


R1#show crypto ipsec sa

interface: Ethernet0/0
   Crypto map tag: cmap, local addr 172.16.10.1

  protected vrf: (none)
  local  ident (addr/mask/prot/port): (192.168.1.0/255.255.255.0/0/0)
  remote ident (addr/mask/prot/port): (192.168.2.0/255.255.255.0/0/0)
  current_peer 172.16.10.2 port 500
    PERMIT, flags={origin_is_acl,}
   #pkts encaps: 100, #pkts encrypt: 100, #pkts digest: 100
   #pkts decaps: 100, #pkts decrypt: 100, #pkts verify: 100
   #pkts compressed: 0, #pkts decompressed: 0
   #pkts not compressed: 0, #pkts compr. failed: 0
   #pkts not decompressed: 0, #pkts decompress failed: 0
   #send errors 0, #recv errors 0

    local crypto endpt.: 172.16.10.1, remote crypto endpt.: 172.16.10.2
```

```
    plaintext mtu 1438, path mtu 1500, ip mtu 1500, ip mtu idb Ethernet0/0
    current outbound spi: 0xC0CC116C(3234599276)
    PFS (Y/N): N, DH group: none

    inbound esp sas:
     spi: 0xDF405365(3745534821)
        transform: esp-aes esp-sha-hmac ,
       in use settings ={Tunnel, }
       conn id: 6, flow_id: SW:6, sibling_flags 80000040, crypto map: cmap
       sa timing: remaining key lifetime (k/sec): (4375803/3442)
       IV size: 16 bytes
       replay detection support: Y
       Status: ACTIVE(ACTIVE)

    inbound ah sas:

    inbound pcp sas:

    outbound esp sas:
     spi: 0xC0CC116C(3234599276)
        transform: esp-aes esp-sha-hmac ,
       in use settings ={Tunnel, }
       conn id: 5, flow_id: SW:5, sibling_flags 80000040, crypto map: cmap
       sa timing: remaining key lifetime (k/sec): (4375803/3442)
       IV size: 16 bytes
       replay detection support: Y
       Status: ACTIVE(ACTIVE)

    outbound ah sas:

    outbound pcp sas:
```

Cisne forte: Estabelecimento de túnel

```
May 24 21:14:10 localhost charon: 08[NET] received packet: from 172.16.10.1[500]
to 172.16.10.2[500] (400 bytes)
May 24 21:14:10 localhost charon: 08[ENC] parsed IKE_SA_INIT request 0
[ SA KE No V V N(NATD_S_IP) N(NATD_D_IP) ]
May 24 21:14:10 localhost charon: 08[ENC] received unknown vendor
ID: 43:49:53:43:4f:2d:44:45:4c:45:54:45:2d:52:45:41:53:4f:4e
May 24 21:14:10 localhost charon: 08[ENC] received unknown vendor ID:
46:4c:45:58:56:50:4e:2d:53:55:50:50:4f:52:54:45:44
May 24 21:14:10 localhost charon: 08[IKE] 172.16.10.1 is initiating an IKE_SA
May 24 21:14:10 localhost charon: 08[IKE] 172.16.10.1 is initiating an IKE_SA
May 24 21:14:10 localhost charon: 08[ENC] generating IKE_SA_INIT response 0
[ SA KE No N(NATD_S_IP) N(NATD_D_IP) N(MULT_AUTH) ]
May 24 21:14:10 localhost charon: 08[NET] sending packet: from 172.16.10.2[500]
to 172.16.10.1[500] (376 bytes)
May 24 21:14:10 localhost charon: 07[NET] received packet: from 172.16.10.1[500]
to 172.16.10.2[500] (284 bytes)
May 24 21:14:10 localhost charon: 07[ENC] parsed IKE_AUTH request 1 [ V IDi AUTH
SA TSi TSr N(INIT_CONTACT) N(SET_WINSIZE) N(ESP_TFC_PAD_N) N(NON_FIRST_FRAG) ]
May 24 21:14:10 localhost charon: 07[CFG] looking for peer configs matching
172.16.10.2[%any]...172.16.10.1[172.16.10.1]
May 24 21:14:10 localhost charon: 07[CFG] selected peer config 'ciscoios'
May 24 21:14:10 localhost charon: 07[IKE] authentication of '172.16.10.1' with
pre-shared key successful
May 24 21:14:10 localhost charon: 07[IKE] received ESP_TFC_PADDING_NOT_SUPPORTED,
not using ESPv3 TFC padding
May 24 21:14:10 localhost charon: 07[IKE] authentication of '172.16.10.2' (myself)
with pre-shared key
```

```
May 24 21:14:10 localhost charon: 07[IKE] IKE_SA ciscoios[2] established between
172.16.10.2[172.16.10.2]...172.16.10.1[172.16.10.1]
May 24 21:14:10 localhost charon: 07[IKE] IKE_SA ciscoios[2] established between
172.16.10.2[172.16.10.2]...172.16.10.1[172.16.10.1]
May 24 21:14:10 localhost charon: 07[IKE] scheduling reauthentication in 3247s
May 24 21:14:10 localhost charon: 07[IKE] maximum IKE_SA lifetime 3427s
May 24 21:14:10 localhost charon: 07[IKE] CHILD_SA ciscoios{2} established with
SPIs c0cc116c_i df405365_o and TS 192.168.2.0/24 === 192.168.1.0/24
May 24 21:14:10 localhost charon: 07[IKE] CHILD_SA ciscoios{2} established with
SPIs c0cc116c_i df405365_o and TS 192.168.2.0/24 === 192.168.1.0/24
May 24 21:14:10 localhost vpn: + 172.16.10.1 192.168.1.0/24 == 172.16.10.1 --
172.16.10.2 == 192.168.2.0/24
```

Os detalhes do estabelecimento do túnel se parecem um pouco com o IKEv1.

Cisne forte: Verificar o status da conexão IPSec

```
pluton ~ # ipsec statusall
Status of IKE charon daemon (strongSwan 5.0.4, Linux 3.2.12-gentoo, x86_64):
 uptime: 2 minutes, since May 24 21:13:27 2013
 malloc: sbrk 393216, mmap 0, used 274864, free 118352
 worker threads: 8 of 16 idle, 7/1/0/0 working, job queue: 0/0/0/0, scheduled: 4
 loaded plugins: charon mysql sqlite aes des sha1 sha2 md5 random nonce x509
revocation constraints pubkey pkcs1 pkcs8 pgp dnskey pem openssl gcrypt
fips-prf gmp xcbc cmac hmac attr kernel-netlink resolve socket-default
stroke updown eap-identity eap-sim eap-aka eap-aka-3gpp2 eap-simaka-pseudonym
eap-simaka-reauth eap-md5 eap-gtc eap-mschapv2 eap-radius xauth-generic
Listening IP addresses:
 10.0.0.100
 192.168.10.1
 192.168.2.1
 172.16.10.2
Connections:
   ciscoios:  172.16.10.2...172.16.10.1  IKEv2
   ciscoios:   local:  [172.16.10.2] uses pre-shared key authentication
   ciscoios:   remote: [172.16.10.1] uses pre-shared key authentication
   ciscoios:   child:  192.168.2.0/24 === 192.168.1.0/24 TUNNEL
Security Associations (1 up, 0 connecting):
   ciscoios[2]: ESTABLISHED 116 seconds ago, 172.16.10.2[172.16.10.2]...
172.16.10.1[172.16.10.1]
   ciscoios[2]: IKEv2 SPIs: 12f2fe1f7938fc9f_i 1a0cb1b0f517dc6c_r*,
pre-shared key reauthentication in 52 minutes
   ciscoios[2]: IKE proposal: AES_CBC_128/HMAC_SHA1_96/PRF_HMAC_SHA1/MODP_1536
   ciscoios{2}:  INSTALLED, TUNNEL, ESP SPIs: c0cc116c_i df405365_o
   ciscoios{2}:  AES_CBC_128/HMAC_SHA1_96, 10000 bytes_i (100 pkts, 102s ago),
10000 bytes_o (100 pkts, 102s ago), rekeying in 12 minutes
   ciscoios{2}:   192.168.2.0/24 === 192.168.1.0/24
```

Cisne forte: Verificar a política de IPSec

```
pluton ~ # ip -s xfrm policy
src 192.168.1.0/24 dst 192.168.2.0/24 uid 0
        dir fwd action allow index 1154 priority 1859 share any flag  (0x00000000)
       lifetime config:
         limit: soft (INF)(bytes), hard (INF)(bytes)
         limit: soft (INF)(packets), hard (INF)(packets)
         expire add: soft 0(sec), hard 0(sec)
         expire use: soft 0(sec), hard 0(sec)
```

```
        lifetime current:
          0(bytes), 0(packets)
          add 2013-05-24 21:14:10 use -
        tmpl src 172.16.10.1 dst 172.16.10.2
                proto esp spi 0x00000000(0) reqid 2(0x00000002) mode tunnel
                level required share any
                enc-mask ffffffff auth-mask ffffffff comp-mask ffffffff
src 192.168.1.0/24 dst 192.168.2.0/24 uid 0
        dir in action allow index 1144 priority 1859 share any flag  (0x00000000)
        lifetime config:
          limit: soft (INF)(bytes), hard (INF)(bytes)
          limit: soft (INF)(packets), hard (INF)(packets)
          expire add: soft 0(sec), hard 0(sec)
          expire use: soft 0(sec), hard 0(sec)
        lifetime current:
          0(bytes), 0(packets)
          add 2013-05-24 21:14:10 use 2013-05-24 21:14:23
        tmpl src 172.16.10.1 dst 172.16.10.2
                proto esp spi 0x00000000(0) reqid 2(0x00000002) mode tunnel
                level required share any
                enc-mask ffffffff auth-mask ffffffff comp-mask ffffffff
src 192.168.2.0/24 dst 192.168.1.0/24 uid 0
        dir out action allow index 1137 priority 1859 share any flag  (0x00000000)
        lifetime config:
          limit: soft (INF)(bytes), hard (INF)(bytes)
          limit: soft (INF)(packets), hard (INF)(packets)
          expire add: soft 0(sec), hard 0(sec)
          expire use: soft 0(sec), hard 0(sec)
        lifetime current:
          0(bytes), 0(packets)
          add 2013-05-24 21:14:10 use 2013-05-24 21:14:23
        tmpl src 172.16.10.2 dst 172.16.10.1
                proto esp spi 0x00000000(0) reqid 2(0x00000002) mode tunnel
                level required share any
                enc-mask ffffffff auth-mask ffffffff comp-mask ffffffff
```

Informações Relacionadas

- Openswan
- documentação do usuário strongSwan
- Guia de configuração do FlexVPN e Internet Key Exchange versão 2, Cisco IOS versão 15M&T
- Suporte Técnico e Documentação - Cisco Systems