

Cisco IOS와 strongSwan 컨피그레이션 간의 IKEv1/IKEv2 예

목차

[소개](#)

[사전 요구 사항](#)

[요구 사항](#)

[사용되는 구성 요소](#)

[구성](#)

[네트워크 다이어그램](#)

[오픈 소스 L2L IPSec VPN](#)

[Cisco IOS와 strongSwan 간의 IKEv1](#)

[Cisco IOS 컨피그레이션](#)

[strongSwan 컨피그레이션](#)

[Cisco IOS와 strongSwan 간의 IKEv2](#)

[Cisco IOS 컨피그레이션](#)

[strongSwan 컨피그레이션](#)

[다음을 확인합니다.](#)

[문제 해결](#)

[Cisco IOS와 strongSwan 간의 IKEv1](#)

[Cisco IOS](#)

[Cisco IOS에 의해 트리거된 터널 설정](#)

[Cisco IOS:IPSec 카운터 확인](#)

[Cisco IOS:IKEv1 및 IPSec 매개변수 확인](#)

[strongSwan:터널 설정](#)

[strongSwan:IPSec 연결 상태 확인](#)

[strongSwan:IPSec 정책 확인](#)

[Cisco IOS와 strongSwan 간의 IKEv2](#)

[Cisco IOS](#)

[Cisco IOS에 의해 트리거된 터널 설정](#)

[Cisco IOS:IPSec 카운터 확인](#)

[Cisco IOS:IKEv2 및 IPSec 매개변수 확인](#)

[strongSwan:터널 설정](#)

[strongSwan:IPSec 연결 상태 확인](#)

[strongSwan:IPSec 정책 확인](#)

[관련 정보](#)

소개

이 문서에서는 Cisco IOS®와 strongSwan 간의 LAN-to-LAN(L2L) VPN에 대한 컨피그레이션 예제를 제공합니다. IKEv1(Internet Key Exchange version 1) 및 IKEv2(Internet Key Exchange version 2) 컨피그레이션이 모두 표시됩니다.

사전 요구 사항

요구 사항

다음 주제에 대한 지식을 보유하고 있으면 유용합니다.

- Linux 구성에 대한 기본 지식
- Cisco IOS의 VPN 컨피그레이션에 대한 지식
- 다음 프로토콜에 대한 지식: IKEv1, IKEv2, IPSec(Internet Protocol Security)

사용되는 구성 요소

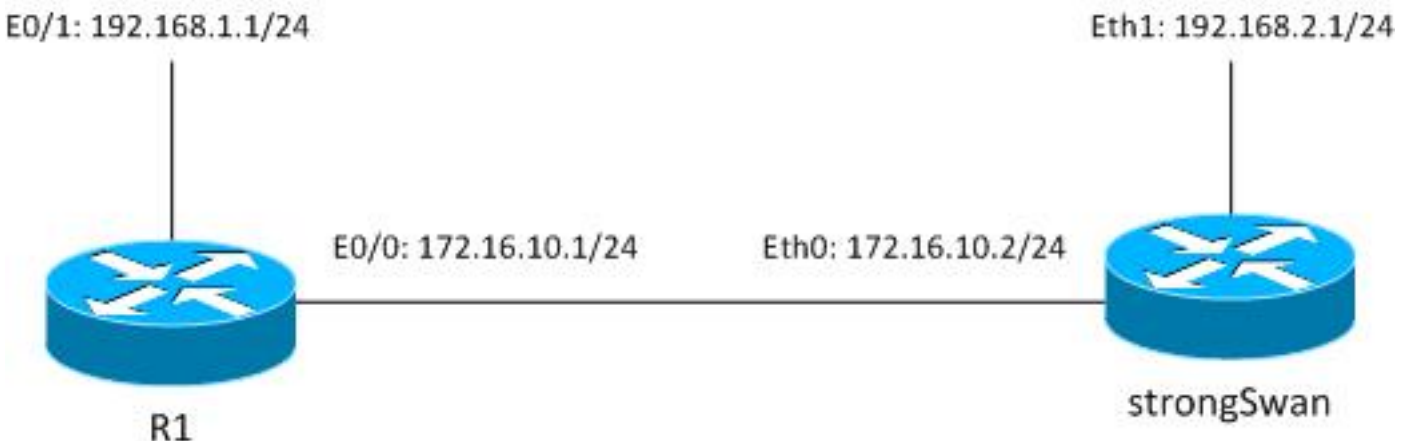
이 문서의 정보는 다음 소프트웨어 버전을 기반으로 합니다.

- Cisco IOS 릴리스 15.3T
- 스트림스완 5.0.4
- Linux 커널 3.2.12

구성

네트워크 다이어그램

토폴로지는 Cisco IOS와 strongSwan 간의 L2L 터널인 두 가지 예에 모두 동일합니다.



트래픽은 192.168.1.0/24 <-> 192.168.2.0/24 사이에서 보호됩니다.

오픈 소스 L2L IPSec VPN

IKE(Internet Key Exchange) 및 IPSec 프로토콜을 사용하여 보안 L2L 터널을 구축하는 몇 가지 오픈 소스 프로젝트가 있습니다.

- 무료 보안 광역 네트워킹(무료 S/WAN): 능동적으로 유지되지 않은 역사
 - ipsec 도구: racon - IKEv2, 이전 Linux 커널 2.6을 지원하지 않습니다.
 - Openswan: 매우 기본적인 IKEv2 지원, 이전 Linux 커널 2.6 및 이전 API, 능동적으로 유지되지 않음
 - strongSwan: NETKEY API(커널 2.6 이상에서 네이티브 IPSec 구현을 위한 이름)를 사용하는 새로운 Linux 커널 3.x 이상, IKEv2 및 EAP/모빌리티 확장 지원, 능동적으로 유지, 문서화
- 현재, 가장 좋은 선택은 보통 강한 스완입니다. Openswan의 구성과 비슷하지만 몇 가지 사소한 차이점이 있습니다. 이 가이드는 strongSwan 및 Cisco IOS 컨피그레이션에 중점을 둡니다.

Cisco IOS와 strongSwan 간의 IKEv1

Cisco IOS 컨피그레이션

```
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
```

strongSwan 컨피그레이션

왼쪽은 strongSwan과 관련이 있고 오른쪽은 remote(이 예에서는 Cisco IOS)입니다.

/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
```

기본적으로 Cisco IOS는 주소를 IKE ID로 사용합니다. 따라서 주소가 'rightTid' 및 "leftid"로 사용되었습니다. Cisco IOS와 같은 strongSwan은 Next-Generation Cryptography(Suite B)를 지원하므로 AES256 및 SHA512와 함께 4096 DH(Diffie-Hellman) 키를 사용할 수 있습니다.

auto 매개 변수의 경우 "add" 인수가 사용되었습니다. 그러면 흥미로운 트래픽이 발생하면 터널이 나타납니다. 즉시 시작하려면 "start" 인수를 사용할 수 있습니다.

/etc/ipsec.secrets

```
172.16.10.2 172.16.10.1 : PSK cisco
```

IKEv1의 경우 두 키가 동일해야 합니다(이 예에서는 "cisco").

Cisco IOS와 strongSwan 간의 IKEv2

Cisco IOS 컨피그레이션

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

```
crypto ikev2 policy ikev2policy
match fvrfr 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

```

strongSwan 컨피그레이션

IKEv1에 비해 2가지 변경 사항만 있습니다. 키 교환 및 가능한 키.

/etc/ipsec.conf

```

config setup
    # strictcrpolicy=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"

```

IKEv2에서는 각 사이트의 키가 다를 수 있습니다.

다음을 확인합니다.

확인 절차는 문제 해결 섹션을 참조하십시오.

문제 해결

이 섹션에서는 컨피그레이션 문제를 해결하는 데 사용할 수 있는 정보를 제공합니다.

Cisco IOS와 strongSwan 간의 IKEv1

Cisco IOS

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

Cisco IOS에 의해 트리거된 터널 설정

```
*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_MSG_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_MSG_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_MSG_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_MSG_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_MSG_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_MSG_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)

```

두 단계 모두에서 ISAKMP(Internet Security Association and Key Management Protocol)와 IPsec이 작동합니다.

Cisco IOS:IPSec 카운터 확인

```

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
```

100개의 패킷이 전송된 후:

```
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:IKEv1 및 IPsec 매개변수 확인

```
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:

두 단계 모두 정상입니다.IPSec SPI(Security Parameter Index)가 협상됩니다.패킷이 100개 전송되면 카운터가 100개로 증가했습니다.

strongSwan:터널 설정

```
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

```

두 단계 모두 정상입니다. 192.168.2.0/24에서 192.168.1.0/24 사이의 트래픽을 보호하는 올바른 SPI가 협상됩니다.

strongSwan:IPSec 연결 상태 확인

```

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 ppp 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**

협상된 ISAKMP 및 IPsec 매개변수에 대한 세부 정보를 사용할 수 있습니다.

strongSwan:IPsec 정책 확인

```
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

```

이전 세부 정보에는 내부 정책 테이블이 포함됩니다.

Cisco IOS와 strongSwan 간의 IKEv2

Cisco IOS

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

Cisco IOS에 의해 트리거된 터널 설정

```

*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 authentication 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
```

IKEv2 세션이 작동되고 192.168.1.0/24에서 192.168.2.0/24 사이의 트래픽을 보호하는 IPsec SA가 생성되었습니다.

Cisco IOS:IPSec 카운터 확인

```
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
```

100개의 패킷이 전송된 후:

```
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
카운터가 100개 증가했다.

Cisco IOS:IKEv2 및 IPSec 매개변수 확인

Cisco IOS는 IKEv2 세션에 대한 통계/세부 정보를 매우 잘 제공합니다.

```
R1#show crypto ikev2 sa detailed
```

```
IPv4 Crypto IKEv2 SA
```

```
Tunnel-id Local Remote fvr/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:

strongSwan:터널 설정

```
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
```

터널 설정 세부 정보는 IKEv1과 약간 유사합니다.

strongSwan:IPSec 연결 상태 확인

```
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
```

strongSwan:IPSec 정책 확인

```
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
tmp1 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
tmp1 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

```

관련 정보

- [Openswan](#)
- [strongSwan 사용자 설명서](#)
- [FlexVPN 및 Internet Key Exchange 버전 2 컨피그레이션 가이드, Cisco IOS 릴리스 15M&T](#)
- [기술 지원 및 문서 - Cisco Systems](#)