IPsec 라우터 동적 LAN-to-LAN 피어 및 VPN 클라이언트 구성

목차

소개

이 컨피그레이션은 허브 스포크 환경에서 두 라우터 간의 LAN-to-LAN 컨피그레이션을 보여줍니다.Cisco VPN Client는 허브에 연결하고 Xauth(Extended Authentication)를 사용합니다.

이 시나리오의 스포크 라우터는 DHCP를 통해 동적으로 IP 주소를 가져옵니다.DHCP(Dynamic Host Configuration Protocol)는 스포크가 DSL이나 케이블 모뎀을 통해 인터넷에 연결되어 있는 경우에 일반적으로 사용됩니다.ISP는 이러한 저비용 연결에서 DHCP를 사용하여 IP 주소를 동적으로 프로비저닝하기 때문입니다.

추가 컨피그레이션이 없으면 허브 라우터에서 와일드카드 사전 공유 키를 사용할 수 없습니다.VPN 클라이언트 연결에 대한 Xauth가 LAN-to-LAN 연결을 끊기 때문입니다.그러나 Xauth를 비활성화하면 VPN 클라이언트 인증 기능이 줄어듭니다.

Cisco IOS® Software Release 12.2(15)T에서 ISAKMP 프로파일을 도입하면 피어 IP 주소뿐 아니라 연결의 다른 속성(VPN Client 그룹, 피어 IP 주소, FQDN[Fully Qualified Domain Name] 등)에서 일치시킬 수 있으므로 이 구성이 가능합니다.ISAKMP 프로파일은 이 컨피그레이션의 주체입니다.

참고: LAN-to-LAN 피어에 대해 Xauth를 우회하려면 crypto isakmp key 명령과 함께 no-**xauth** 키워드를 사용할 수도 있습니다.자세한 내용은 고정 IPsec 피어에 대해 Xauth를 비활성화하는 기능 및 두 라우터와 Cisco VPN 클라이언트 4.x 간에 IPsec 구성을 참조하십시오.

이 문서의 스포크 라우터 컨피그레이션은 동일한 허브에 연결된 다른 모든 스포크 라우터에 복제할 수 있습니다.스포크의 유일한 차이점은 암호화할 트래픽을 참조하는 액세스 목록입니다.

라우터를 EzVPN 클라이언트로 구성하고 동일한 인터페이스에서 서버를 구성할 수 있는 시나리오에 대한 자세한 내용은 동일한 라우터 컨피그레이션 예의 EzVPN 클라이언트 및 서버를 참조하십시오.

DHCP를 위해 구성된 PIX 방화벽이 있는 VPN 3000 Concentrator의 LAN-to-LAN 터널을 참조하여 DHCP를 사용하여 공용 인터페이스에서 IP 주소를 가져오는 원격 Cisco PIX 방화벽으로 동적으로 IPsec 터널을 생성합니다.

공용 인터페이스에서 동적 IP 주소를 수신하는 원격 VPN 디바이스로 IPsec 터널을 동적으로 생성하려면 VPN 3000 Concentrator with a Cisco IOS Router Configuration Example을 참조하여 VPN 3000 Concentrator Series를 구성합니다.

PIX/ASA 보안 어플라이언스가 IOS® 라우터에서 동적 IPsec 연결을 허용하도록 하려면 고정 IOS 라우터와 NAT가 있는 동적 PIX/ASA 7.x 간 IPsec을 참조하십시오.

사전 요구 사항

요구 사항

이 문서에 대한 특정 요건이 없습니다.

사용되는 구성 요소

IPsec 프로필은 Cisco IOS Software 릴리스 12.2(15)T에 도입되었습니다.Cisco 버그 ID CSCea77140(등록된 고객만 해당) 때문에 이 구성이 성공적으로 작동하려면 Cisco IOS Software 릴리스 12.3(3) 이상 또는 Cisco IOS Software 릴리스 12.3(2)T 이상을 실행해야 합니다.이러한 구성은 다음 소프트웨어 버전을 사용하여 테스트되었습니다.

- 허브 라우터의 Cisco IOS Software 릴리스 12.3(6a)
- 스포크 라우터의 Cisco IOS Software 릴리스 12.2(23a)(모든 암호화 버전일 수 있음)
- Windows 2000의 Cisco VPN Client Version 4.0(4)

이 문서의 정보는 특정 랩 환경의 디바이스를 토대로 작성되었습니다.이 문서에 사용된 모든 디바이스는 초기화된(기본) 컨피그레이션으로 시작되었습니다.현재 네트워크가 작동 중인 경우, 모든 명령어의 잠재적인 영향을 미리 숙지하시기 바랍니다.

표기 규칙

문서 규칙에 대한 자세한 내용은 Cisco 기술 팁 표기 규칙을 참고하십시오.

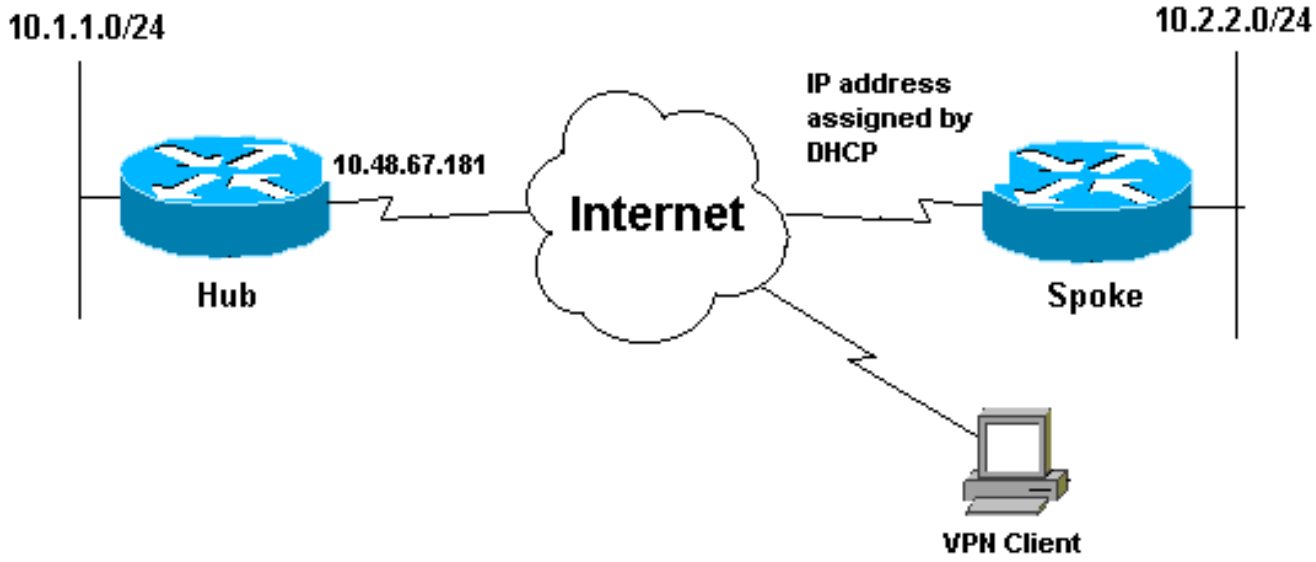
구성

이 섹션에는 이 문서에서 설명하는 기능을 구성하기 위한 정보가 표시됩니다.

참고: 명령 조회 도구(등록된 고객만 해당)를 사용하여 이 문서에 사용된 명령에 대한 자세한 내용을 확인하십시오.

네트워크 다이어그램

이 문서에서는 이 다이어그램에 표시된 네트워크 설정을 사용합니다.



구성

이 문서에서는 다음 네트워크 설정을 사용합니다.

- 허브 구성
- 스포크 구성

허브 구성

```
version 12.3
service timestamps debug datetime msec
service timestamps log datetime msec
service password-encryption
!
hostname Hub
!
no logging on
!
username gfullage password 7 0201024E070A0E2649
aaa new-model
!
!
aaa authentication login clientauth local
aaa authorization network groupauthor local
aaa session-id common
ip subnet-zero
!
!
no ip domain lookup
!
!  !--- Keyring that defines wildcard pre-shared key.
crypto keyring spokes
  pre-shared-key address 0.0.0.0 0.0.0.0 key cisco123
!
crypto isakmp policy 10
 encr 3des
 authentication pre-share
 group 2
!  !--- VPN Client configuration for group "testgroup"
!--- (this name is configured in the VPN Client). crypto
```

```
isakmp client configuration group testgroup
 key cisco321
 dns 1.1.1.1 2.2.2.2
 wins 3.3.3.3 4.4.4.4
 domain cisco.com
 pool ippool
!
!--- Profile for LAN-to-LAN connection, that references
!--- the wildcard pre-shared key and a wildcard !---
identity (this is what is broken in !--- Cisco bug ID
CSCea77140) and no Xauth. crypto isakmp profile L2L
   description LAN-to-LAN for spoke router(s) connection
   keyring spokes
   match identity address 0.0.0.0  !--- Profile for VPN
Client connections, that matches !--- the "testgroup"
group and defines the Xauth properties. crypto isakmp
profile VPNclient
   description VPN clients profile
   match identity group testgroup
   client authentication list clientauth
   isakmp authorization list groupauthor
   client configuration address respond
!
!
crypto ipsec transform-set myset esp-3des esp-sha-hmac
!
!--- Two instances of the dynamic crypto map !---
reference the two previous IPsec profiles. crypto
dynamic-map dynmap 5
 set transform-set myset
 set isakmp-profile VPNclient
crypto dynamic-map dynmap 10
 set transform-set myset
 set isakmp-profile L2L
!
!
!--- Crypto-map only references the two !--- instances
of the previous dynamic crypto map. crypto map mymap 10
ipsec-isakmp dynamic dynmap
!
!
!
interface FastEthernet0/0
 description Outside interface
 ip address 10.48.67.181 255.255.255.224
 no ip mroute-cache
 duplex auto
 speed auto
 crypto map mymap
!
interface FastEthernet0/1
 description Inside interface
 ip address 10.1.1.1 255.255.254.0

 duplex auto
 speed auto
 no keepalive
!
ip local pool ippool 10.5.5.1 10.5.5.254
no ip http server
no ip http secure-server
ip classless
ip route 0.0.0.0 0.0.0.0 10.48.66.181
```

```
!
!
call rsvp-sync
!
!
dial-peer cor custom
!
!
line con 0
 exec-timeout 0 0
 escape-character 27
line aux 0
line vty 0 4
 password 7 121A0C041104
!
!
end
```

스포크 구성

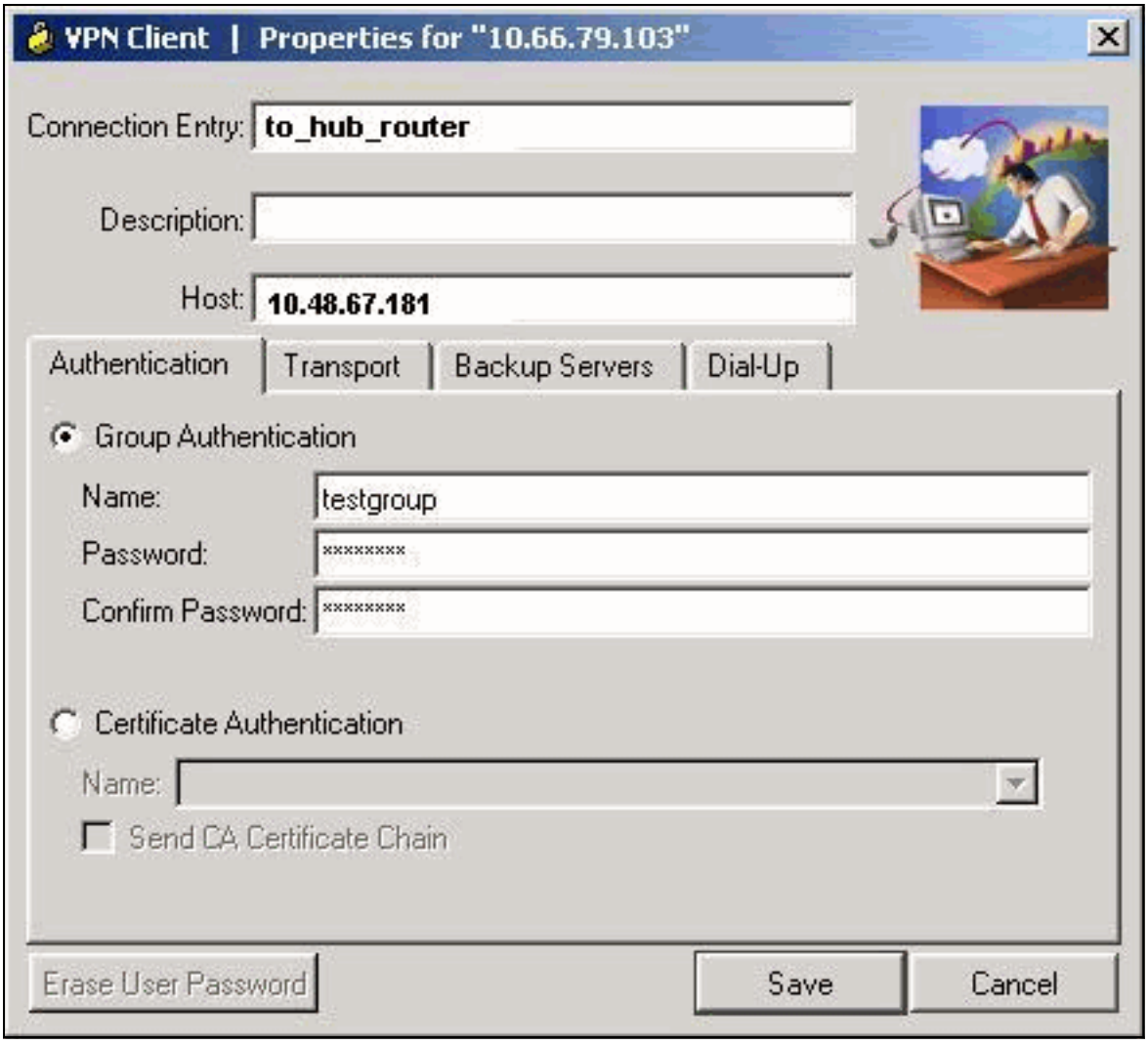
```
version 12.2
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Spoke
!
no logging on
!
ip subnet-zero
no ip domain lookup
!
ip cef
!
!
crypto isakmp policy 10
 encr 3des
 authentication pre-share
 group 2
crypto isakmp key cisco123 address 10.48.67.181
!
!
crypto ipsec transform-set myset esp-3des esp-sha-hmac
!
!--- Standard crypto map on the spoke router !--- that
references the known hub IP address. crypto map mymap 10
ipsec-isakmp
 set peer 10.48.67.181
 set transform-set myset
 match address 100
!
!
controller ISA 5/1
!
!
interface FastEthernet0/0
 description Outside interface

 ip address dhcp
 duplex auto
 speed auto
 crypto map mymap
!
```

```
interface FastEthernet0/1
 description Inside interface
 ip address 10.2.2.2 255.255.255.0
 duplex auto
 speed auto
 no keepalive
!
interface ATM1/0
 no ip address
 shutdown
 no atm ilmi-keepalive
!
ip classless
ip route 0.0.0.0 0.0.0.0 10.100.2.3
no ip http server
no ip http secure-server
!
!
!--- Standard access-list that references traffic to be
!--- encrypted. This is the only thing that needs !---
to be changed between different spoke routers. access-
list 100 permit ip 10.2.0.0 0.0.255.255 10.1.0.0
0.0.255.255
!
!
call rsvp-sync
!
!
mgcp profile default
!
!
line con 0
 exec-timeout 0 0
line aux 0
line vty 0 4
 password cisco
 login
!
!
end
```

VPN 클라이언트

허브 라우터의 IP 주소를 참조하는 새 연결 항목을 만듭니다.이 예에서 그룹 이름은 "testgroup"이고 비밀번호는 "cisco321"입니다. 허브 라우터 컨피그레이션에서 볼 수 있습니다.



다음을 확인합니다.

이 섹션을 사용하여 컨피그레이션이 제대로 작동하는지 확인합니다.

허브 라우터에서 실행되는 디버그 명령은 스포크 및 VPN 클라이언트 연결에 대해 올바른 매개변수가 일치하는지 확인할 수 있습니다.

Output Interpreter 도구(등록된 고객만 해당)(OIT)는 특정 **show** 명령을 지원합니다.OIT를 사용하여 **show** 명령 출력의 분석을 봅니다.

참고: debug **명령**을 사용하기 전에 디버그 명령에 대한 중요 정보를 참조하십시오.

- **show ip interface** - 스포크 라우터에 대한 IP 주소 할당을 표시합니다.
- **show crypto isakmp sa detail** - IPsec 개시자 간에 설정된 IKE SA를 표시합니다.예를 들어 스포크 라우터와 VPN 클라이언트, 허브 라우터를 예로 들 수 있습니다.
- **show crypto ipsec sa** - IPsec 개시자 간에 설정된 IPsec SA를 표시합니다.예를 들어 스포크 라우터와 VPN 클라이언트, 허브 라우터를 예로 들 수 있습니다.
- **debug crypto isakmp** - IKE(Internet Key Exchange) 이벤트에 대한 메시지를 표시합니다.
- **debug crypto ipsec** - IPsec 이벤트를 표시합니다.
- **debug crypto engine** — 암호화 엔진 이벤트를 표시합니다.

show ip interface f0/0 명령의 출력입니다.

```
spoke#show ip interface f0/0
FastEthernet0/1 is up, line protocol is up
Internet address is 10.100.2.102/24
Broadcast address is 255.255.255.255
Address determined by DHCP
```

show crypto isakmp sa detail 명령의 출력입니다.

```
hub#show crypto isakmp sa detail

Codes: C - IKE configuration mode, D - Dead Peer Detection

       K - Keepalives, N - NAT-traversal

       X - IKE Extended Authentication

       psk - Preshared key, rsig - RSA signature

       renc - RSA encryption



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

1     10.48.67.181    10.100.2.102             3des sha  psk  2   04:15:43

2     10.48.67.181    10.51.82.100             3des sha          2   05:31:58 CX
```

show crypto ipsec sa 명령의 출력입니다.

```
hub#show crypto ipsec sa

interface: FastEthernet0/0
Crypto map tag: mymap, local addr. 10.48.67.181

protected vrf:
local ident (addr/mask/prot/port): (0.0.0.0/0.0.0.0/0/0)
remote ident (addr/mask/prot/port): (10.5.5.1/255.255.255.255/0/0)
current_peer: 10.51.82.100:500
PERMIT, flags={}
#pkts encaps: 8, #pkts encrypt: 8, #pkts digest 8
#pkts decaps: 189, #pkts decrypt: 189, #pkts verify 189
#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.: 10.48.67.181, remote crypto endpt.: 10.51.82.100
path mtu 1500, ip mtu 1500
current outbound spi: B0C0F4AC

inbound esp sas:
spi: 0x7A1AB8F3(2048571635)
transform: esp-3des esp-sha-hmac ,
in use settings ={Tunnel, }
slot: 0, conn id: 2004, flow_id: 5, crypto map: mymap
sa timing: remaining key lifetime (k/sec): (4602415/3169)
IV size: 8 bytes
replay detection support: Y
```

```
inbound ah sas:

inbound pcp sas:

outbound esp sas:
spi: 0xB0C0F4AC(2965435564)
transform: esp-3des esp-sha-hmac ,
in use settings ={Tunnel, }
slot: 0, conn id: 2005, flow_id: 6, crypto map: mymap
sa timing: remaining key lifetime (k/sec): (4602445/3169)
IV size: 8 bytes
replay detection support: Y

outbound ah sas:

outbound pcp sas:

protected vrf:
local ident (addr/mask/prot/port): (10.1.0.0/255.255.0.0/0/0)
remote ident (addr/mask/prot/port): (10.2.0.0/255.255.0.0/0/0)
current_peer: 10.100.2.102:500
PERMIT, flags={}
#pkts encaps: 19, #pkts encrypt: 19, #pkts digest 19
#pkts decaps: 19, #pkts decrypt: 19, #pkts verify 19
#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.: 10.48.67.181, remote crypto endpt.: 10.100.2.102
path mtu 1500, ip mtu 1500
current outbound spi: 5FBE5408

inbound esp sas:
spi: 0x9CD7288C(2631346316)
transform: esp-3des esp-sha-hmac ,
in use settings ={Tunnel, }
slot: 0, conn id: 2002, flow_id: 3, crypto map: mymap
sa timing: remaining key lifetime (k/sec): (4569060/2071)
IV size: 8 bytes
replay detection support: Y

inbound ah sas:

inbound pcp sas:

outbound esp sas:
spi: 0x5FBE5408(1606308872)
transform: esp-3des esp-sha-hmac ,
in use settings ={Tunnel, }
slot: 0, conn id: 2003, flow_id: 4, crypto map: mymap
sa timing: remaining key lifetime (k/sec): (4569060/2070)
IV size: 8 bytes
replay detection support: Y

outbound ah sas:

outbound pcp sas:
```

이 디버그 출력은 스포크 라우터가 IKE 및 IPsec SA를 시작할 때 허브 라우터에서 수집되었습니다.

```
ISAKMP (0:0): received packet from 10.100.2.102 dport 500 sport 500
              Global (N) NEW SA
```

```
ISAKMP: local port 500, remote port 500
ISAKMP: insert sa successfully sa = 63D5BE0C
ISAKMP (0:1): Input = IKE_MESG_FROM_PEER, IKE_MM_EXCH
ISAKMP (0:1): Old State = IKE_READY New State = IKE_R_MM1

ISAKMP (0:1): processing SA payload. message ID = 0
ISAKMP: Looking for a matching key for 10.100.2.102 in default
ISAKMP: Looking for a matching key for 10.100.2.102 in spokes : success
ISAKMP (0:1): found peer pre-shared key matching 10.100.2.102
ISAKMP (0:1) local preshared key found
ISAKMP : Scanning profiles for xauth ... L2L VPNclient
ISAKMP (0:1) Authentication by xauth preshared
ISAKMP (0:1): Checking ISAKMP transform 1 against priority 10 policy
ISAKMP: encryption 3DES-CBC
ISAKMP: hash SHA
ISAKMP: default group 2
ISAKMP: auth pre-share
ISAKMP: life type in seconds
ISAKMP: life duration (VPI) of 0x0 0x1 0x51 0x80
ISAKMP (0:1): atts are acceptable. Next payload is 0
CryptoEngine0: generate alg parameter
CRYPTO_ENGINE: Dh phase 1 status: 0
CRYPTO_ENGINE: Dh phase 1 status: 0
ISAKMP (0:1): Input = IKE_MESG_INTERNAL, IKE_PROCESS_MAIN_MODE
ISAKMP (0:1): Old State = IKE_R_MM1 New State = IKE_R_MM1

ISAKMP (0:1): sending packet to 10.100.2.102 my_port 500 peer_port
              500 (R) MM_SA_SETUP
ISAKMP (0:1): Input = IKE_MESG_INTERNAL, IKE_PROCESS_COMPLETE
ISAKMP (0:1): Old State = IKE_R_MM1 New State = IKE_R_MM2

ISAKMP (0:1): received packet from 10.100.2.102 dport 500 sport 500
              Global (R) MM_SA_SETUP
ISAKMP (0:1): Input = IKE_MESG_FROM_PEER, IKE_MM_EXCH
ISAKMP (0:1): Old State = IKE_R_MM2 New State = IKE_R_MM3

ISAKMP (0:1): processing KE payload. message ID = 0
CryptoEngine0: generate alg parameter
ISAKMP (0:1): processing NONCE payload. message ID = 0
ISAKMP: Looking for a matching key for 10.100.2.102 in default
ISAKMP: Looking for a matching key for 10.100.2.102 in spokes : success
ISAKMP (0:1): found peer pre-shared key matching 10.100.2.102
CryptoEngine0: create ISAKMP SKEYID for conn id 1
ISAKMP (0:1): SKEYID state generated
ISAKMP (0:1): processing vendor id payload
ISAKMP (0:1): speaking to another IOS box!
ISAKMP (0:1): Input = IKE_MESG_INTERNAL, IKE_PROCESS_MAIN_MODE
ISAKMP (0:1): Old State = IKE_R_MM3 New State = IKE_R_MM3

ISAKMP (0:1): sending packet to 10.100.2.102 my_port 500 peer_port 500
              (R) MM_KEY_EXCH
ISAKMP (0:1): Input = IKE_MESG_INTERNAL, IKE_PROCESS_COMPLETE
ISAKMP (0:1): Old State = IKE_R_MM3 New State = IKE_R_MM4

ISAKMP (0:1): received packet from 10.100.2.102 dport 500 sport 500
              Global (R) MM_KEY_EXCH
ISAKMP (0:1): Input = IKE_MESG_FROM_PEER, IKE_MM_EXCH
ISAKMP (0:1): Old State = IKE_R_MM4 New State = IKE_R_MM5

ISAKMP (0:1): processing ID payload. message ID = 0
ISAKMP (0:1): ID payload
next-payload : 8
type : 1
address : 10.100.2.102
```

```
protocol : 17
port : 500
length : 12
ISAKMP (0:1): peer matches L2L profile
ISAKMP: Looking for a matching key for 10.100.2.102 in default
ISAKMP: Looking for a matching key for 10.100.2.102 in spokes : success
ISAKMP (0:1): Found ADDRESS key in keyring spokes
ISAKMP (0:1): processing HASH payload. message ID = 0
CryptoEngine0: generate hmac context for conn id 1
ISAKMP (0:1): SA authentication status: authenticated
ISAKMP (0:1): SA has been authenticated with 10.100.2.102
ISAKMP (0:1): Input = IKE_MESG_INTERNAL, IKE_PROCESS_MAIN_MODE
ISAKMP (0:1): Old State = IKE_R_MM5 New State = IKE_R_MM5

ISAKMP (0:1): SA is doing pre-shared key authentication using id type ID_IPV4_ADDR
ISAKMP (0:1): ID payload
next-payload : 8
type : 1
address : 10.48.67.181
protocol : 17
port : 500
length : 12
ISAKMP (1): Total payload length: 12
CryptoEngine0: generate hmac context for conn id 1
CryptoEngine0: clear dh number for conn id 1
ISAKMP (0:1): sending packet to 10.100.2.102 my_port 500 peer_port 500
              (R) MM_KEY_EXCH
ISAKMP (0:1): Input = IKE_MESG_INTERNAL, IKE_PROCESS_COMPLETE
ISAKMP (0:1): Old State = IKE_R_MM5 New State = IKE_P1_COMPLETE

ISAKMP (0:1): Input = IKE_MESG_INTERNAL, IKE_PHASE1_COMPLETE
ISAKMP (0:1): Old State = IKE_P1_COMPLETE New State = IKE_P1_COMPLETE
```

!--- IKE phase 1 is complete. ISAKMP (0:1): received packet from 10.100.2.102 dport 500 sport 500 Global (R) QM_IDLE ISAKMP: set new node 904613356 to QM_IDLE CryptoEngine0: generate hmac context for conn id 1 ISAKMP (0:1): processing HASH payload. message ID = 904613356 ISAKMP (0:1): processing SA payload. message ID = 904613356 ISAKMP (0:1): Checking IPSec proposal 1 ISAKMP: transform 1, ESP_3DES ISAKMP: attributes in transform: ISAKMP: encaps is 1 (Tunnel) ISAKMP: SA life type in seconds ISAKMP: SA life duration (basic) of 3600 ISAKMP: SA life type in kilobytes ISAKMP: SA life duration (VPI) of 0x0 0x46 0x50 0x0 ISAKMP: authenticator is HMAC-SHA CryptoEngine0: validate proposal **ISAKMP (0:1): atts are acceptable.**

```
IPSEC(validate_proposal_request): proposal part #1,
(key eng. msg.) INBOUND local= 10.48.67.181, remote= 10.100.2.102,
local_proxy= 10.1.0.0/255.255.0.0/0/0 (type=4),
remote_proxy= 10.2.0.0/255.255.0.0/0/0 (type=4),
protocol= ESP, transform= esp-3des esp-sha-hmac (Tunnel),
lifedur= 0s and 0kb,
spi= 0x0(0), conn_id= 0, keysize= 0, flags= 0x2
CryptoEngine0: validate proposal request
IPSEC(kei_proxy): head = mymap, map->ivrf = , kei->ivrf =
IPSEC(kei_proxy): head = mymap, map->ivrf = , kei->ivrf =
ISAKMP (0:1): processing NONCE payload. message ID = 904613356
ISAKMP (0:1): processing ID payload. message ID = 904613356
ISAKMP (0:1): processing ID payload. message ID = 904613356
ISAKMP (0:1): asking for 1 spis from ipsec
ISAKMP (0:1): Node 904613356, Input = IKE_MESG_FROM_PEER, IKE_QM_EXCH
ISAKMP (0:1): Old State = IKE_QM_READY New State = IKE_QM_SPI_STARVE
IPSEC(key_engine): got a queue event...
IPSEC(spi_response): getting spi 4172528328 for SA from 10.48.67.181 to
                    10.100.2.102 for prot 3
ISAKMP: received ke message (2/1)
CryptoEngine0: generate hmac context for conn id 1
ISAKMP (0:1): sending packet to 10.100.2.102 my_port 500 peer_port 500 (R) QM_IDLE
ISAKMP (0:1): Node 904613356, Input = IKE_MESG_FROM_IPSEC, IKE_SPI_REPLY
```

```
ISAKMP (0:1): Old State = IKE_QM_SPI_STARVE New State = IKE_QM_R_QM2
ISAKMP (0:1): received packet from 10.100.2.102 dport 500 sport 500 Global
              (R) QM_IDLE
CryptoEngine0: generate hmac context for conn id 1
CryptoEngine0: ipsec allocate flow
CryptoEngine0: ipsec allocate flow
ISAKMP (0:1): Creating IPSec SAs
inbound SA from 10.100.2.102 to 10.48.67.181 (f/i) 0/ 0
(proxy 10.2.0.0 to 10.1.0.0)
has spi 0xF8B3BAC8 and conn_id 2000 and flags 2
lifetime of 3600 seconds
lifetime of 4608000 kilobytes
has client flags 0x0
outbound SA from 10.48.67.181 to 10.100.2.102 (f/i) 0/ 0
(proxy 10.1.0.0 to 10.2.0.0 )
has spi 1757151497 and conn_id 2001 and flags A
lifetime of 3600 seconds
lifetime of 4608000 kilobytes
has client flags 0x0
ISAKMP (0:1): deleting node 904613356 error FALSE reason "quick mode done (await)"
ISAKMP (0:1): Node 904613356, Input = IKE_MESG_FROM_PEER, IKE_QM_EXCH
ISAKMP (0:1): Old State = IKE_QM_R_QM2 New State = IKE_QM_PHASE2_COMPLETE
IPSEC(key_engine): got a queue event...
IPSEC(initialize_sas): ,
(key eng. msg.) INBOUND local= 10.48.67.181, remote= 10.100.2.102,
local_proxy= 10.1.0.0/255.255.0.0/0/0 (type=4),
remote_proxy= 10.2.0.0/255.255.0.0/0/0 (type=4),
protocol= ESP, transform= esp-3des esp-sha-hmac (Tunnel),
lifedur= 3600s and 4608000kb,
spi= 0xF8B3BAC8(4172528328), conn_id= 2000, keysize= 0, flags= 0x2
IPSEC(initialize_sas): ,
(key eng. msg.) OUTBOUND local= 10.48.67.181, remote= 10.100.2.102,
local_proxy= 10.1.0.0/255.255.0.0/0/0 (type=4),
remote_proxy= 10.2.0.0/255.255.0.0/0/0 (type=4),
protocol= ESP, transform= esp-3des esp-sha-hmac (Tunnel),
lifedur= 3600s and 4608000kb,
spi= 0x68BC0109(1757151497), conn_id= 2001, keysize= 0, flags= 0xA
IPSEC(kei_proxy): head = mymap, map->ivrf = , kei->ivrf =
IPSEC(kei_proxy): head = mymap, map->ivrf = , kei->ivrf =
IPSEC(add mtree): src 10.1.0.0, dest 10.2.0.0, dest_port 0

IPSEC(create_sa): sa created,
(sa) sa_dest= 10.48.67.181, sa_prot= 50,
sa_spi= 0xF8B3BAC8(4172528328),
sa_trans= esp-3des esp-sha-hmac , sa_conn_id= 2000
IPSEC(create_sa): sa created,
(sa) sa_dest= 10.100.2.102, sa_prot= 50,
sa_spi= 0x68BC0109(1757151497),
sa_trans= esp-3des esp-sha-hmac , sa_conn_id= 2001
```

이 디버그 출력은 VPN 클라이언트가 IKE 및 IPsec SA를 시작할 때 허브 라우터에서 수집되었습니다.

```
ISAKMP (0:0): received packet from 10.51.82.100 dport 500 sport 500 Global
              (N) NEW SA
ISAKMP: local port 500, remote port 500
ISAKMP: insert sa successfully sa = 63D3D804
ISAKMP (0:2): processing SA payload. message ID = 0
ISAKMP (0:2): processing ID payload. message ID = 0
ISAKMP (0:2): ID payload
next-payload : 13
type : 11
group id : testgroup
```

```
protocol : 17
port : 500
length : 17
ISAKMP (0:2): peer matches VPNclient profile
ISAKMP: Looking for a matching key for 10.51.82.100 in default
ISAKMP: Looking for a matching key for 10.51.82.100 in spokes : success
ISAKMP: Created a peer struct for 10.51.82.100, peer port 500
ISAKMP: Locking peer struct 0x644AFC7C, IKE refcount 1 for
        crypto_ikmp_config_initialize_sa
ISAKMP (0:2): Setting client config settings 644AFCF8
ISAKMP (0:2): (Re)Setting client xauth list and state
ISAKMP (0:2): processing vendor id payload
ISAKMP (0:2): vendor ID seems Unity/DPD but major 215 mismatch
ISAKMP (0:2): vendor ID is Xauth
ISAKMP (0:2): processing vendor id payload
ISAKMP (0:2): vendor ID is DPD
ISAKMP (0:2): processing vendor id payload
ISAKMP (0:2): vendor ID seems Unity/DPD but major 123 mismatch
ISAKMP (0:2): vendor ID is NAT-T v2
ISAKMP (0:2): processing vendor id payload
ISAKMP (0:2): vendor ID seems Unity/DPD but major 194 mismatch
ISAKMP (0:2): processing vendor id payload
ISAKMP (0:2): vendor ID is Unity
ISAKMP (0:2) Authentication by xauth preshared

!--- Check of ISAKMP transforms against the configured ISAKMP policy. ISAKMP (0:2): Checking
ISAKMP transform 9 against priority 10 policy ISAKMP: encryption 3DES-CBC ISAKMP: hash SHA
ISAKMP: default group 2 ISAKMP: auth XAUTHInitPreShared ISAKMP: life type in seconds ISAKMP:
life duration (VPI) of 0x0 0x20 0xC4 0x9B ISAKMP (0:2): atts are acceptable. Next payload is 3
CryptoEngine0: generate alg parameter
CRYPTO_ENGINE: Dh phase 1 status: 0
CRYPTO_ENGINE: Dh phase 1 status: 0
ISAKMP (0:2): processing KE payload. message ID = 0
CryptoEngine0: generate alg parameter
ISAKMP (0:2): processing NONCE payload. message ID = 0
ISAKMP (0:2): vendor ID is NAT-T v2
ISAKMP (0:2): Input = IKE_MESG_FROM_PEER, IKE_AM_EXCH
ISAKMP (0:2): Old State = IKE_READY New State = IKE_R_AM_AAA_AWAIT

ISAKMP: got callback 1
CryptoEngine0: create ISAKMP SKEYID for conn id 2
ISAKMP (0:2): SKEYID state generated
ISAKMP (0:2): constructed NAT-T vendor-02 ID
ISAKMP (0:2): SA is doing pre-shared key authentication plus XAUTH
              using id type ID_IPV4_ADDR
ISAKMP (0:2): ID payload
next-payload : 10
type : 1
address : 10.48.67.181
protocol : 17
port : 0
length : 12
ISAKMP (2): Total payload length: 12
CryptoEngine0: generate hmac context for conn id 2
ISAKMP (0:2): sending packet to 10.51.82.100 my_port 500 peer_port 500
             (R) AG_INIT_EXCH
ISAKMP (0:2): Input = IKE_MESG_FROM_AAA, PRESHARED_KEY_REPLY
ISAKMP (0:2): Old State = IKE_R_AM_AAA_AWAIT New State = IKE_R_AM2

ISAKMP (0:2): received packet from 10.51.82.100 dport 500 sport 500 Global
             (R) AG_INIT_EXCH
ISAKMP (0:2): processing HASH payload. message ID = 0
CryptoEngine0: generate hmac context for conn id 2
ISAKMP (0:2): processing NOTIFY INITIAL_CONTACT protocol 1
```

```
spi 0, message ID = 0, sa = 63D3D804
ISAKMP (0:2): SA authentication status: authenticated
ISAKMP (0:2): Process initial contact,
bring down existing phase 1 and 2 SA's with local 10.48.67.181 remote
        10.51.82.100 remote port 500
ISAKMP (0:2): returning IP addr to the address pool
IPSEC(key_engine): got a queue event...
ISAKMP:received payload type 17
ISAKMP:received payload type 17
ISAKMP (0:2): SA authentication status: authenticated
ISAKMP (0:2): SA has been authenticated with 10.51.82.100
CryptoEngine0: clear dh number for conn id 1
ISAKMP: Trying to insert a peer 10.48.67.181/10.51.82.100/500/,
        and inserted successfully.
ISAKMP: set new node 1257790711 to CONF_XAUTH
CryptoEngine0: generate hmac context for conn id 2
ISAKMP (0:2): sending packet to 10.51.82.100 my_port 500 peer_port 500 (R) QM_IDLE
ISAKMP (0:2): purging node 1257790711
ISAKMP: Sending phase 1 responder lifetime 86400

ISAKMP (0:2): Input = IKE_MESG_FROM_PEER, IKE_AM_EXCH
ISAKMP (0:2): Old State = IKE_R_AM2 New State = IKE_P1_COMPLETE

ISAKMP (0:2): Need XAUTH
ISAKMP (0:2): Input = IKE_MESG_INTERNAL, IKE_PHASE1_COMPLETE
ISAKMP (0:2): Old State = IKE_P1_COMPLETE New State = IKE_XAUTH_AAA_START_LOGIN_AWAIT

ISAKMP: got callback 1
ISAKMP: set new node 955647754 to CONF_XAUTH

!--- Extended authentication begins. ISAKMP/xauth: request attribute XAUTH_USER_NAME_V2
ISAKMP/xauth: request attribute XAUTH_USER_PASSWORD_V2
CryptoEngine0: generate hmac context for conn id 2
ISAKMP (0:2): initiating peer config to 10.51.82.100. ID = 955647754
ISAKMP (0:2): sending packet to 10.51.82.100 my_port 500 peer_port 500
            (R) CONF_XAUTH
ISAKMP (0:2): Input = IKE_MESG_FROM_AAA, IKE_AAA_START_LOGIN
ISAKMP (0:2): Old State = IKE_XAUTH_AAA_START_LOGIN_AWAIT New State =
              IKE_XAUTH_REQ_SENT

ISAKMP (0:2): received packet from 10.51.82.100 dport 500 sport 500 Global
            (R) CONF_XAUTH
ISAKMP (0:2): processing transaction payload from 10.51.82.100. message
              ID = 955647754
CryptoEngine0: generate hmac context for conn id 2
ISAKMP: Config payload REPLY

!--- Username/password received from the VPN Client. ISAKMP/xauth: reply attribute
XAUTH_USER_NAME_V2
ISAKMP/xauth: reply attribute XAUTH_USER_PASSWORD_V2
ISAKMP (0:2): deleting node 955647754 error FALSE reason "done with
              xauth request/reply exchange"
ISAKMP (0:2): Input = IKE_MESG_FROM_PEER, IKE_CFG_REPLY
ISAKMP (0:2): Old State = IKE_XAUTH_REQ_SENT New State =
             IKE_XAUTH_AAA_CONT_LOGIN_AWAIT

ISAKMP: got callback 1
ISAKMP: set new node -1118110738 to CONF_XAUTH
CryptoEngine0: generate hmac context for conn id 2
ISAKMP (0:2): initiating peer config to 10.51.82.100. ID = -1118110738
ISAKMP (0:2): sending packet to 10.51.82.100 my_port 500 peer_port
              500 (R) CONF_XAUTH
ISAKMP (0:2): Input = IKE_MESG_FROM_AAA, IKE_AAA_CONT_LOGIN
ISAKMP (0:2): Old State = IKE_XAUTH_AAA_CONT_LOGIN_AWAIT New State =
```

```
              IKE_XAUTH_SET_SENT

ISAKMP (0:2): received packet from 10.51.82.100 dport 500 sport 500 Global
             (R) CONF_XAUTH
ISAKMP (0:2): processing transaction payload from 10.51.82.100. message
              ID = -1118110738
CryptoEngine0: generate hmac context for conn id 2

 !--- Success ISAKMP: Config payload ACK ISAKMP (0:2): XAUTH ACK Processed
ISAKMP (0:2): deleting node -1118110738 error FALSE reason "done with transaction"
ISAKMP (0:2): Input = IKE_MESG_FROM_PEER, IKE_CFG_ACK
ISAKMP (0:2): Old State = IKE_XAUTH_SET_SENT New State = IKE_P1_COMPLETE

ISAKMP (0:2): Input = IKE_MESG_INTERNAL, IKE_PHASE1_COMPLETE
ISAKMP (0:2): Old State = IKE_P1_COMPLETE New State = IKE_P1_COMPLETE

ISAKMP (0:2): received packet from 10.51.82.100 dport 500 sport 500
              Global (R) QM_IDLE
ISAKMP: set new node -798495444 to QM_IDLE
ISAKMP (0:2): processing transaction payload from 10.51.82.100. message
              ID = -798495444
CryptoEngine0: generate hmac context for conn id 2
ISAKMP: Config payload REQUEST
ISAKMP (0:2): checking request:
ISAKMP: IP4_ADDRESS
ISAKMP: IP4_NETMASK
ISAKMP: IP4_DNS
ISAKMP: IP4_NBNS
ISAKMP: ADDRESS_EXPIRY
ISAKMP: UNKNOWN Unknown Attr: 0x7000
ISAKMP: UNKNOWN Unknown Attr: 0x7001
ISAKMP: DEFAULT_DOMAIN
ISAKMP: SPLIT_INCLUDE
ISAKMP: UNKNOWN Unknown Attr: 0x7003
ISAKMP: UNKNOWN Unknown Attr: 0x7007
ISAKMP: UNKNOWN Unknown Attr: 0x7009
ISAKMP: APPLICATION_VERSION
ISAKMP: UNKNOWN Unknown Attr: 0x7008
ISAKMP: UNKNOWN Unknown Attr: 0x700A
ISAKMP: UNKNOWN Unknown Attr: 0x7005
ISAKMP (0:2): Input = IKE_MESG_FROM_PEER, IKE_CFG_REQUEST
ISAKMP (0:2): Old State = IKE_P1_COMPLETE New State = IKE_CONFIG_AUTHOR_AAA_AWAIT

ISAKMP: got callback 1
ISAKMP (0:2): attributes sent in message:
Address: 0.2.0.0
ISAKMP (0:2): allocating address 10.5.5.1
ISAKMP: Sending private address: 10.5.5.1
ISAKMP: Sending IP4_DNS server address: 1.1.1.1
ISAKMP: Sending IP4_DNS server address: 2.2.2.2
ISAKMP: Sending IP4_NBNS server address: 3.3.3.3
ISAKMP: Sending IP4_NBNS server address: 4.4.4.4
ISAKMP: Sending ADDRESS_EXPIRY seconds left to use the address: 86386
ISAKMP (0/2): Unknown Attr: UNKNOWN (0x7000)
ISAKMP (0/2): Unknown Attr: UNKNOWN (0x7001)
ISAKMP: Sending DEFAULT_DOMAIN default domain name: cisco.com
ISAKMP (0/2): Unknown Attr: UNKNOWN (0x7003)
ISAKMP (0/2): Unknown Attr: UNKNOWN (0x7007)
ISAKMP (0/2): Unknown Attr: UNKNOWN (0x7009)
ISAKMP: Sending APPLICATION_VERSION string: Cisco Internetwork Operating
       System Software
IOS (tm) 7200 Software (C7200-IK9S-M), Version 12.3(6a), RELEASE SOFTWARE (fc4)
Copyright (c) 1986-2004 by cisco Systems, Inc.
Compiled Fri 02-Apr-04 15:52 by kellythw
```

```
ISAKMP (0/2): Unknown Attr: UNKNOWN (0x7008)
ISAKMP (0/2): Unknown Attr: UNKNOWN (0x700A)
ISAKMP (0/2): Unknown Attr: UNKNOWN (0x7005)
CryptoEngine0: generate hmac context for conn id 2
ISAKMP (0:2): responding to peer config from 10.51.82.100. ID = -798495444
ISAKMP (0:2): sending packet to 10.51.82.100 my_port 500 peer_port 500 (R) CONF_ADDR
ISAKMP (0:2): deleting node -798495444 error FALSE reason ""
ISAKMP (0:2): Input = IKE_MESG_FROM_AAA, IKE_AAA_GROUP_ATTR
ISAKMP (0:2): Old State = IKE_CONFIG_AUTHOR_AAA_AWAIT New State = IKE_P1_COMPLETE

ISAKMP (0:2): Input = IKE_MESG_INTERNAL, IKE_PHASE1_COMPLETE
ISAKMP (0:2): Old State = IKE_P1_COMPLETE New State = IKE_P1_COMPLETE
```

!--- IKE phase 1 and Config Mode complete. !--- Check of IPsec proposals against configured transform set(s). ISAKMP (0:2): Checking IPSec proposal 12 ISAKMP: transform 1, ESP_3DES ISAKMP: attributes in transform: ISAKMP: authenticator is HMAC-SHA ISAKMP: encaps is 1 (Tunnel) ISAKMP: SA life type in seconds ISAKMP: SA life duration (VPI) of 0x0 0x20 0xC4 0x9B CryptoEngine0: validate proposal ISAKMP (0:2): atts are acceptable. IPSEC(validate_proposal_request): proposal part #1, (key eng. msg.) INBOUND local= 10.48.67.181, remote= 10.51.82.100, local_proxy= 0.0.0.0/0.0.0.0/0/0 (type=4), remote_proxy= 10.5.5.1/255.255.255.255/0/0 (type=1), protocol= ESP, transform= esp-3des esp-sha-hmac (Tunnel), lifedur= 0s and 0kb, spi= 0x0(0), conn_id= 0, keysize= 0, flags= 0x2 CryptoEngine0: validate proposal request IPSEC(kei_proxy): head = mymap, map->ivrf = , kei->ivrf = IPSEC(kei_proxy): head = mymap, map->ivrf = , kei->ivrf = ISAKMP (0:2): processing NONCE payload. message ID = 381726614 ISAKMP (0:2): processing ID payload. message ID = 381726614 ISAKMP (0:2): processing ID payload. message ID = 381726614 ISAKMP (0:2): asking for 1 spis from ipsec ISAKMP (0:2): Node 381726614, Input = IKE_MESG_FROM_PEER, IKE_QM_EXCH ISAKMP (0:2): Old State = IKE_QM_READY New State = IKE_QM_SPI_STARVE IPSEC(key_engine): got a queue event... IPSEC(spi_response): getting spi 2048571635 for SA from 10.48.67.181 to 10.51.82.100 for prot 3 ISAKMP: received ke message (2/1) CryptoEngine0: generate hmac context for conn id 2 ISAKMP (0:2): sending packet to 10.51.82.100 my_port 500 peer_port 500 (R) QM_IDLE ISAKMP (0:2): Node 381726614, Input = IKE_MESG_FROM_IPSEC, IKE_SPI_REPLY ISAKMP (0:2): Old State = IKE_QM_SPI_STARVE New State = IKE_QM_R_QM2 ISAKMP (0:2): received packet from 10.51.82.100 dport 500 sport 500 Global (R) QM_IDLE CryptoEngine0: generate hmac context for conn id 2 CryptoEngine0: ipsec allocate flow CryptoEngine0: ipsec allocate flow ISAKMP: Locking peer struct 0x644AFC7C, IPSEC refcount 1 for for stuff_ke ISAKMP (0:2): Creating IPSec SAs inbound SA from 10.51.82.100 to 10.48.67.181 (f/i) 0/ 0 (proxy 10.5.5.1 to 0.0.0.0) has spi 0x7A1AB8F3 and conn_id 2004 and flags 2 lifetime of 2147483 seconds has client flags 0x0 outbound SA from 10.48.67.181 to 10.51.82.100 (f/i) 0/ 0 (proxy 0.0.0.0 to 10.5.5.1) has spi -1329531732 and conn_id 2005 and flags A lifetime of 2147483 seconds has client flags 0x0 ISAKMP (0:2): deleting node 381726614 error FALSE reason "quick mode done (await)" ISAKMP (0:2): Node 381726614, Input = IKE_MESG_FROM_PEER, IKE_QM_EXCH ISAKMP (0:2): Old State = IKE_QM_R_QM2 New State = IKE_QM_PHASE2_COMPLETE IPSEC(key_engine): got a queue event... IPSEC(initialize_sas): , (key eng. msg.) **INBOUND** local= 10.48.67.181, remote= 10.51.82.100,
local_proxy= 0.0.0.0/0.0.0.0/0/0 (type=4),
remote_proxy= 10.5.5.1/0.0.0.0/0/0 (type=1),
protocol= ESP, transform= esp-3des esp-sha-hmac (Tunnel),
lifedur= 2147483s and 0kb,
spi= 0x7A1AB8F3(2048571635), conn_id= 2004, keysize= 0, flags= 0x2
IPSEC(initialize_sas): ,
(key eng. msg.) **OUTBOUND** local= 10.48.67.181, remote= 10.51.82.100,
local_proxy= 0.0.0.0/0.0.0.0/0/0 (type=4),
remote_proxy= 10.5.5.1/0.0.0.0/0/0 (type=1),
protocol= ESP, transform= esp-3des esp-sha-hmac (Tunnel),
lifedur= 2147483s and 0kb,
spi= 0xB0C0F4AC(2965435564), conn_id= 2005, keysize= 0, flags= 0xA
IPSEC(kei_proxy): head = mymap, map->ivrf = , kei->ivrf =
IPSEC(kei_proxy): head = mymap, map->ivrf = , kei->ivrf =
IPSEC(add mtree): src 0.0.0.0, dest 10.5.5.1, dest_port 0

IPSEC(create_sa): **sa created,**
(sa) sa_dest= 10.48.67.181, sa_prot= 50,
sa_spi= 0x7A1AB8F3(2048571635),
sa_trans= esp-3des esp-sha-hmac , sa_conn_id= 2004
IPSEC(create_sa): **sa created,**
```
```

```
(sa) sa_dest= 10.51.82.100, sa_prot= 50,
sa_spi= 0xB0C0F4AC(2965435564),
sa_trans= esp-3des esp-sha-hmac , sa_conn_id= 2005
```

암호화 맵 시퀀스 번호 확인

고정 피어와 동적 피어가 동일한 암호화 맵에서 구성된 경우 암호화 맵 엔트리의 순서가 매우 중요합니다.동적 암호화 맵 엔트리의 시퀀스 번호는 다른 모든 고정 암호화 맵 엔트리보다 커야 **합니다**.정적 엔트리의 번호가 동적 엔트리보다 높으면 해당 피어와의 연결이 실패합니다.

다음은 정적 엔트리와 동적 엔트리를 포함하는 올바른 번호의 암호화 맵의 예입니다.동적 엔트리는 가장 높은 시퀀스 번호를 가지며 고정 엔트리를 추가할 공간이 남아 있습니다.

```
crypto dynamic-map dynmap 20
set transform-set myset
crypto map mymap 10 ipsec-isakmp
match address 100
set peer 172.16.77.10
set transform-set myset
crypto map mymap 60000 ipsec-isakmp dynamic dynmap
```

문제 해결

현재 이 컨피그레이션에 사용할 수 있는 특정 문제 해결 정보가 없습니다.

관련 정보

- IPsec 프로파일 컨피그레이션
- Cisco IOS Software 릴리스 12.2(15)T 새로운 기능
- IPsec 협상/IKE 프로토콜 지원 페이지
- 기술 지원 및 문서 – Cisco Systems