IPSec ルータでのダイナミック LAN-to-LAN ピアと VPN Client の設定

目次

概要

この設定は、ハブスポーク環境にある 2 台のルータ間の LAN-to-LAN 設定を示しています。 Cisco VPN Client もこのハブに接続し、Extended Authentication（Xauth）を使用します。

このシナリオでは、スポーク ルータは DHCP 経由で IP アドレスを動的に取得します。 スポークが DSL またはケーブル モデム経由でインターネットに接続されている状況では、Dynamic Host Configuration Protocol（DHCP）を使用するのが一般的です。 これは、ISP がこれらの低コストの接続で動的に DHCP を使用して、IP アドレスをプロビジョニングすることが多いからです。

この状況で追加の設定なしに、ハブ ルータでワイルドカードの事前共有キーを使用することはできません。 これは、VPN Client 用の Xauth が必要となるためです。 Xauth を無効にすると、VPN Client の認証ができません。

Cisco IOS® Software Release 12.2(15)T での ISAKMP プロファイルの導入により、ピアの IP アドレスのみでなく、接続に関するその他のプロパティ（VPN Client グループ、ピア IP アドレス、Fully Qualified Domain Name（FQDN; 完全修飾ドメイン名）など）を照合できるため、この設定が可能になります。 ISAKMP プロファイルは、この設定の対象となります。

注: no-xauth キーワードを **crypto isakmp key** コマンドで使用して、LAN-to-LAN ピア用に Xauth をバイパスすることもできます。 詳細は、『スタティック IPSec ピアに対する XAUTH を無効にする機能』および『2 台のルータと Cisco VPN Client 4.x の間の IPsec の設定』を参照してください。

このドキュメントのスポーク ルータの設定は、同じハブに接続するすべてのスポーク ルータで複

製できます。 ただし、各スポーク間で、暗号化対象のトラフィックを参照するアクセス リストだけは異なります。

ルータを同一インターフェイス上の EzVPN クライアントおよびサーバとして設定する場合のシナリオの詳細は、『同一ルータ上での EzVPN クライアントおよびサーバの設定例』を参照してください。

DHCP を使用してパブリック インターフェイス上で IP アドレスを取得するリモート Cisco PIX ファイアウォールに対して動的に IPsec トンネルが作成できるように、Cisco VPN 3000 コンセントレータ シリーズを設定するには、『DHCP 用に設定された PIX ファイアウォールによる VPN 3000 コンセントレータ上の LAN-to-LAN トンネル』を参照してください。

パブリック インターフェイス上でダイナミック IP アドレスを取得するリモート VPN によって動的に IPsec トンネルが作成されるように、VPN 3000 コンセントレータ シリーズを設定するには、『DHCP 用に設定された Cisco IOS ルータによる VPN 3000 コンセントレータ上の IPsec LAN-to-LAN トンネルの設定例』を参照してください。

PIX/ASA セキュリティ アプライアンスで IOS® ルータからの動的な IPsec 接続を受け入れることができるようにするには、『スタティック IOS ルータと NAT 付きダイナミック PIX/ASA 7.x の間の IPsec の設定例』を参照してください。

前提条件

要件

このドキュメントに関する固有の要件はありません。

使用するコンポーネント

IPsec プロファイルは、Cisco IOS ソフトウェア リリース 12.2(15)T で導入されました。 Cisco バグ ID CSCea77140 (登録ユーザ専用) により、この設定を適切に動作させるには、Cisco IOS ソフトウェア リリース 12.3(3) 以降または Cisco IOS ソフトウェア リリース 12.3(2)T 以降を実行する必要があります。 これらの設定は、以下のソフトウェア バージョンでテストされています。

- ハブ ルータ上の Cisco IOS ソフトウェア リリース 12.3(6a)
- スポーク ルータ上の Cisco IOS ソフトウェア リリース 12.2(23a) (任意の暗号化バージョン)
- Windows 2000 上の Cisco VPN Client バージョン 4.0(4)

このドキュメントの情報は、特定のラボ環境にあるデバイスに基づいて作成されたものです。 このドキュメントで使用するすべてのデバイスは、クリアな (デフォルト) 設定で作業を開始しています。 ネットワークが稼働中の場合は、コマンドが及ぼす潜在的な影響を十分に理解しておく必要があります。

表記法

ドキュメント表記の詳細は、『シスコ テクニカル ティップスの表記法』を参照してください。

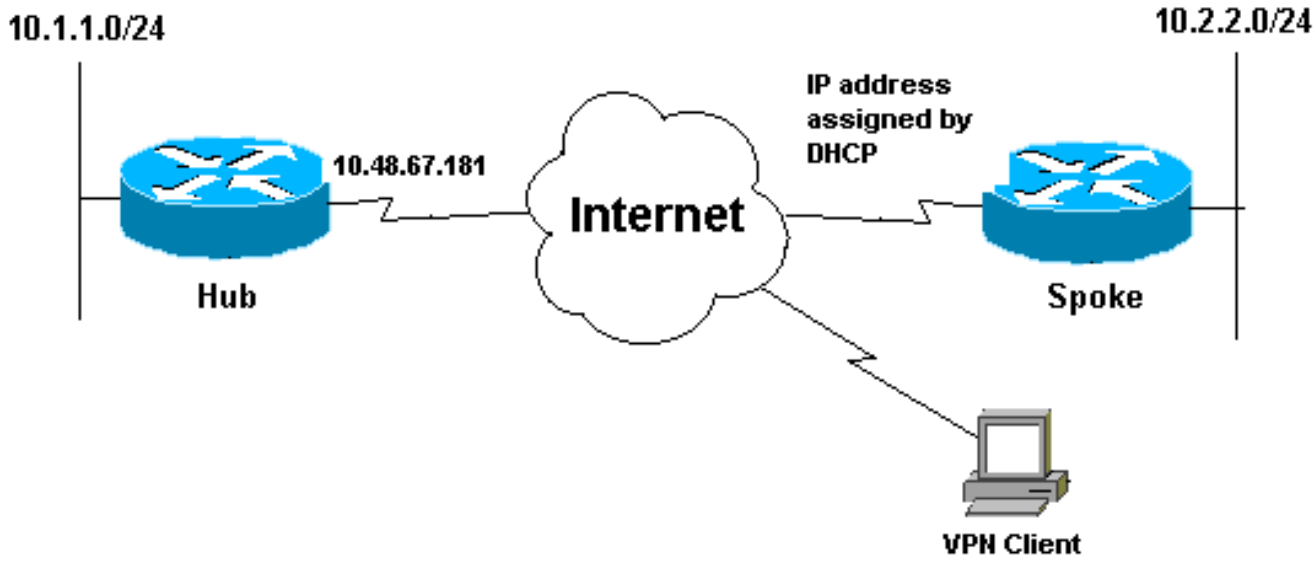
設定

この項では、このドキュメントで説明する機能の設定に必要な情報を提供します。

注: このドキュメントで使用されているコマンドの詳細を調べるには、Command Lookup Tool（登録ユーザ専用）を使用してください。

ネットワーク図

このドキュメントでは、次の図で示されるネットワーク構成を使用しています。



設定

このドキュメントでは、次のネットワーク構成を使用しています。

- ハブの設定
- スポーク設定

ハブの設定

```
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 !---
```

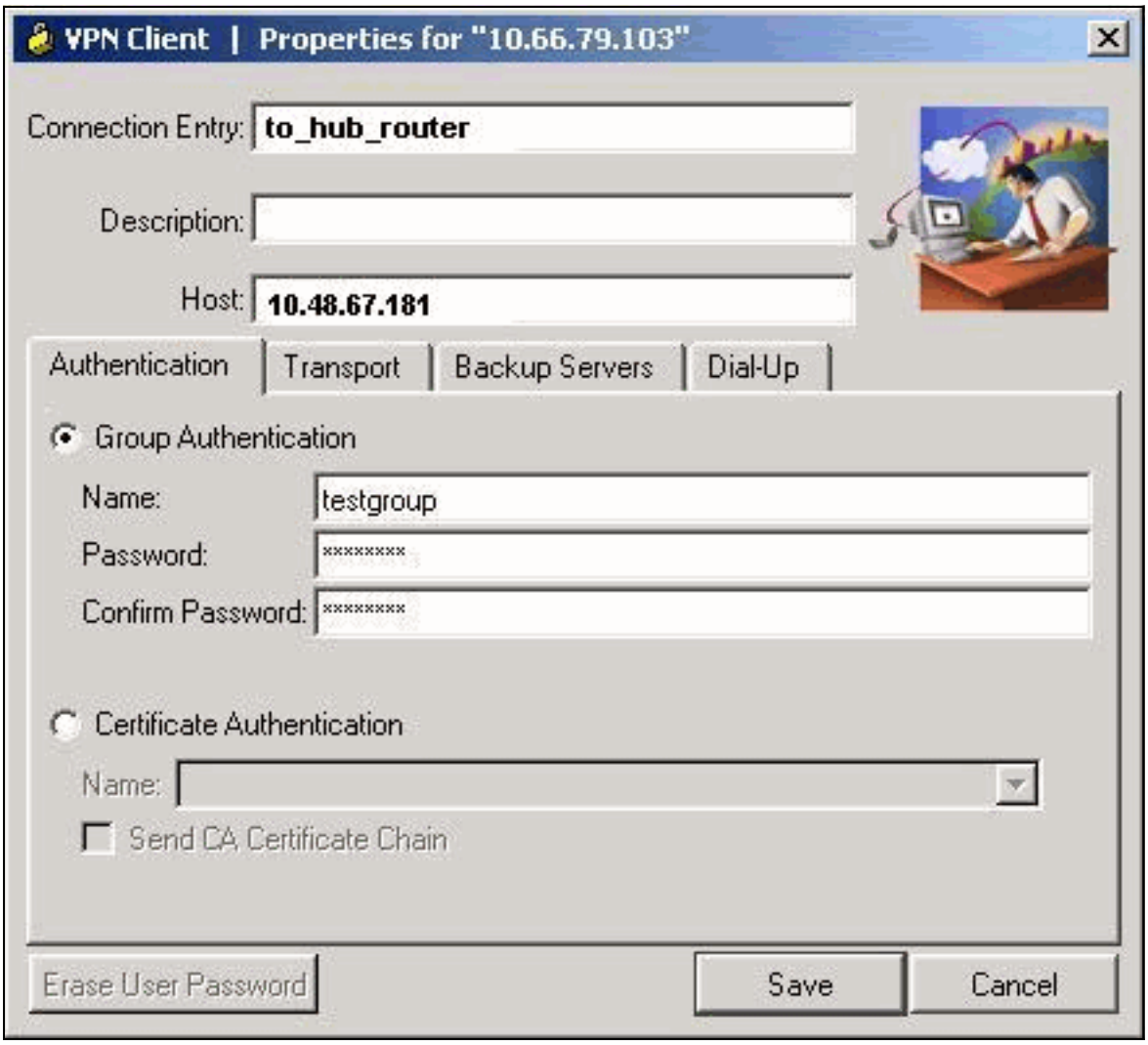
```
Cisco bug ID CSCea77140) and no Xauth. crypto isakmp
profile L2L description LAN-to-LAN for spoke router(s)
connection keyring spokes match identity address 0.0.0.0
!--- Profile for VPN Client connections, that matches !-
-- the "testgroup" group and defines the Xauth
properties. crypto isakmp profile 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
```

スポークの設定

```
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 クライアント

ハブ ルータの IP アドレスを参照する新しい接続エントリを作成します。 この例では、グループ名は「testgroup」、パスワードは「cisco321」です。 このことは、ハブ ルータの設定内容から確認できます。



確認

ここでは、設定が正常に動作していることを確認します。

ハブ ルータ上で debug コマンドを実行すると、スポークと VPN Client の接続に正しいパラメータが対応しているかどうかを確認できます。

Output Interpreter Tool（OIT）（登録ユーザ専用）では、特定の **show** コマンドがサポートされています。 OIT を使用して、**show** コマンド出力の解析を表示できます。

注: debug コマンドを使用する前に、『**debug コマンドの重要な情報**』を参照してください。

- **show ip interface**：スポーク ルータへの IP アドレスの割り当てを表示します。
- **show crypto isakmp sa detail**：IPSec のイニシエータ間で設定された IKE SA を表示します。たとえば、スポーク ルータおよび VPN Client と、ハブ ルータ間です。
- **show crypto ipsec sa**：IPSec のイニシエータ間で設定された IPsec SA を表示します。 たとえば、スポーク ルータおよび VPN Client と、ハブ ルータ間です。
- **debug crypto isakmp**：インターネット キー エクスチェンジ（IKE）イベントに関するメッセージを表示します。

- **debug crypto ipsec**：IPsec イベントを表示します。
- **debug crypto engine**：暗号化エンジン イベントを表示します。

以下は、**show ip interface f0/0** コマンドの出力です。

```
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
```

以下は、**show crypto isakmp sa detail** コマンドの出力です。

```
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
```

以下は、**show crypto ipsec sa** コマンドの出力です。

```
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:
```

以下のデバッグ出力は、スポーク ルータが IKE SA および IPSec SA を開始したときに、ハブ ルータで収集されたものです。

```
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

以下のデバッグ出力は、VPN Client が IKE SA および IPSec SA を開始したときに、ハブ ルータで収集されたものです。

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

クリプト マップのシーケンス番号の確認

スタティックおよびダイナミックなピアが同じクリプト マップで設定されている場合、クリプト マップのエントリの順序は非常に重要です。 ダイナミック暗証マップのエントリのシーケンス番号は、他のスタティック暗証マップのすべてのエントリよりも大きい**必要があります**。 スタティック エントリにダイナミック エントリよりも大きな番号付けがされている場合、これらのピアでの接続は失敗します。

スタティック エントリとダイナミック エントリが含まれるクリプト マップの、正しい番号付けの例を次に示します。 ダイナミック エントリのシーケンス番号が最も大きく、また、ある程度の余裕を持たせてスタティック エントリを追加できるようにしています。

```
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
```

トラブルシューティング

現在のところ、この設定に関する特定のトラブルシューティング情報はありません。

関連情報

- IPsec プロファイル設定
- Cisco IOS ソフトウェア リリース 12.2(15)T の新機能
- IPSec ネゴシエーション/IKE プロトコルに関するサポート ページ
- テクニカルサポートとドキュメント - Cisco Systems