PSKでのサイト間VPNのためのASA IKEv2デバッグの使用

内容

概要

このドキュメントでは、Cisco適応型セキュリティアプライアンス(ASA)でのインターネットキーエクスチェンジバージョン2(IKEv2)のデバッグについて説明します。

前提条件

要件

このドキュメントに特有の要件はありません。

使用するコンポーネント

このドキュメントの内容は、特定のソフトウェアやハードウェアのバージョンに限定されるものではありません。

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ました。このドキュメントで使用するすべてのデバイスは、初期（デフォルト）設定の状態から起動しています

。本稼働中のネットワークでは、各コマンドによって起こる可能性がある影響を十分確認してください。

主な問題

IKEv2で使用されるパケット交換プロセスは、IKEv1で使用されるものとは根本的に異なります。IKEv1では、6つのパケットで構成されるフェーズ1交換と、3つのパケットで構成されるフェーズ2交換が明確に区別されています。IKEv2交換は可変です。

> **ヒント**：パケット交換プロセスの相違点と説明の詳細については、『IKEv2パケット交換およびプロトコルレベルデバッグ』を参照してください。

使用したデバッグ

次の2つのデバッグはIKEv2に使用されます。

```
debug crypto ikev2 protocol 127
debug crypto ikev2 platform 127
```

ASA の設定

このセクションでは、ASA1（発信側）とASA2（応答側）の設定例を示します。

ASA1

```
interface GigabitEthernet0/0
nameif outside
security-level 0
ip address 10.0.0.1 255.255.255.0

interface GigabitEthernet0/2
nameif inside
security-level 100
ip address 192.168.1.2 255.255.255.0

crypto ipsec ikev2 ipsec-proposal AES256
protocol esp encryption aes-256
protocol esp integrity sha-1 md5

access-list l2l_list extended permit ip host 192.168.1.1
  host  192.168.2.99
access-list l2l_list extended permit ip host 192.168.1.12
  host 192.168.2.99

crypto map outside_map 1 match address l2l_list
crypto map outside_map 1 set peer 10.0.0.2
crypto map outside_map 1 set ikev2 ipsec-proposal AES256
crypto map outside_map interface outside

crypto ikev2 policy 1
encryption aes-256
integrity sha
```

```
group 2
prf sha
lifetime seconds 86400

crypto ikev2 enable outside

tunnel-group 10.0.0.2 type ipsec-l2l
tunnel-group 10.0.0.2 ipsec-attributes
ikev2 remote-authentication pre-shared-key *****
ikev2 local-authentication pre-shared-key *****
```

ASA2

```
interface GigabitEthernet0/1
nameif outside
security-level 0
ip address 10.0.0.2 255.255.255.0

interface GigabitEthernet0/2
nameif inside
security-level 100
ip address 192.168.2.1 255.255.255.0

crypto ipsec ikev2 ipsec-proposal AES256
protocol esp encryption aes-256
protocol esp integrity sha-1 md5

access-list l2l_list extended permit ip host 192.168.2.99
  host 192.168.1.1
access-list l2l_list extended permit ip host 192.168.2.99
  host 192.168.1.12

crypto map outside_map 1 match address l2l_list
crypto map outside_map 1 set peer 10.0.0.1
crypto map outside_map 1 set ikev2 ipsec-proposal AES256
crypto map outside_map interface outside

crypto ikev2 policy 1
encryption aes-256
integrity sha
group 2
prf sha
lifetime seconds 86400

crypto ikev2 enable outside
tunnel-group 10.0.0.1 type ipsec-l2l
tunnel-group 10.0.0.1 ipsec-attributes
ikev2 remote-authentication pre-shared-key *****
ikev2 local-authentication pre-shared-key *****
```

デバッグ

このセクションでは、ASA1（発信側）とASA2（応答側）のトンネルネゴシエーションおよび子セキュリティアソシエーション(SA)のデバッグとメッセージの説明について説明します。

トンネル ネゴシエーション

ASA1は、ピアASA **10.0.0.2**の暗号化アクセスコントロールリスト(ACL)に一致するパケットを受信し、SAの作成を開始します。

```
IKEv2-PLAT-3: attempting to find tunnel
   group for IP: 10.0.0.2
IKEv2-PLAT-3: mapped to tunnel group 10.0.0.2
   using peer IP
IKEv2-PLAT-3: my_auth_method = 2
IKEv2-PLAT-3: supported_peers_auth_method = 2
IKEv2-PLAT-3: P1 ID = 0
IKEv2-PLAT-3: Translating IKE_ID_AUTO to = 255
IKEv2-PLAT-3: (16) tp_name set to:
IKEv2-PLAT-3: (16) tg_name set to: 10.0.0.2
IKEv2-PLAT-3: (16) tunn grp type set to: L2L
IKEv2-PLAT-5: New ikev2 sa request admitted
IKEv2-PLAT-5: Incrementing outgoing negotiating
  sa count by one
```

送信されるメッセージの最初のペアはIKE_SA_INIT交換のためのものです。これらのメッセージは、暗号化アルゴリズムをネゴシエートし、ナンスを交換し、Diffie-Hellman(DH)交換を実行します。

ASA1に関連する設定を次に示します。

```
crypto ikev2
   policy 1
encryption
aes-256
integrity sha
group 2
prf sha
lifetime seconds
  86400
crypto ikev2
  enable
  outside

Tunnel Group
matching the
identity name
s present:

tunnel-group
   10.0.0.2
   type ipsec-l2l
tunnel-group
   10.0.0.2
   ipsec-attributes
ikev2
   remote-
   authentication
   pre-shared-key
   *****
ikev2
   local-
   authentication
   pre-shared-key
  *****
```

この交換のデバッグ出力を次に示します。

```
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=0000000000000000 (I)
```

```
   MsgID = 00000000 CurState: IDLE Event: EV_INIT_SA
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=0000000000000000 (I)
   MsgID = 00000000 CurState: I_BLD_INIT
   Event: EV_GET_IKE_POLICY
IKEv2-PROTO-3: (16): Getting configured policies
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=0000000000000000
   (I) MsgID = 00000000 CurState: I_BLD_INIT
   Event: EV_SET_POLICY
IKEv2-PROTO-3: (16): Setting configured policies
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=0000000000000000 (I)
   MsgID = 00000000 CurState: I_BLD_INIT
   Event: EV_CHK_AUTH4PKI
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=0000000000000000 (I)
   MsgID = 00000000 CurState: I_BLD_INIT
   Event: EV_GEN_DH_KEY
IKEv2-PROTO-3: (16): Computing DH public key
IKEv2-PROTO-3: (16):
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=0000000000000000 (I)
   MsgID = 00000000 CurState: I_BLD_INIT
   Event: EV_NO_EVENT
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=0000000000000000 (I)
   MsgID = 00000000 CurState: I_BLD_INIT
   Event: EV_OK_RECD_DH_PUBKEY_RESP
IKEv2-PROTO-5: (16): Action: Action_Null
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=0000000000000000 (I)
   MsgID = 00000000 CurState: I_BLD_INIT
   Event: EV_GET_CONFIG_MODE
IKEv2-PROTO-5: (16): SM Trace-> SA: I_SPI=DFA3B583A4369958
```

次に、ASA1はIKE_INIT_SAパケットを構築します。このパケットには次のものが含まれます。

- ISAKMPヘッダー（SPI/バージョン/フラグ）
- SAi1(IKEイニシエータがサポートする暗号化アルゴリズム)
- KEi（発信側のDH公開キー値）
- N（イニシエータナンス）

```
R_SPI=0000000000000000 (I) MsgID = 00000000
   CurState: I_BLD_INIT Event: EV_BLD_MSG
IKEv2-PROTO-2: (16): Sending initial message
IKEv2-PROTO-3: Tx [L 10.0.0.1:500/R 10.0.0.2:500/VRF i0:f0]
   m_id: 0x0
IKEv2-PROTO-3: HDR[i:DFA3B583A4369958 -
   r: 0000000000000000]
IKEv2-PROTO-4: IKEV2 HDR ispi: DFA3B583A4369958 -
   rspi: 0000000000000000
IKEv2-PROTO-4: Next payload: SA, version: 2.0
IKEv2-PROTO-4: Exchange type: IKE_SA_INIT,
   flags: INITIATOR
IKEv2-PROTO-4: Message id: 0x0, length: 338
SA  Next payload: KE, reserved: 0x0,
   length: 48
```

```
IKEv2-PROTO-4: last proposal: 0x0, reserved: 0x0,
   length: 44  Proposal: 1, Protocol id: IKE,
   SPI size: 0, #trans: 4
IKEv2-PROTO-4:     last transform: 0x3, reserved: 0x0:
   length: 12 type: 1, reserved: 0x0, id: AES-CBC
IKEv2-PROTO-4:     last transform: 0x3, reserved: 0x0:
   length: 8 type: 2, reserved: 0x0, id: SHA1
IKEv2-PROTO-4:     last transform: 0x3, reserved: 0x0:
   length: 8 type: 3, reserved: 0x0, id: SHA96
IKEv2-PROTO-4:     last transform: 0x0, reserved: 0x0:
   length: 8 type: 4, reserved: 0x0,
   id: DH_GROUP_1024_MODP/Group 2
KE  Next payload: N, reserved: 0x0,
   length: 136
    DH group: 2, Reserved: 0x0
      19 65 43 45 d2 72 a7 11 b8 a4 93 3f 44 95 6c b8
     6d 5a f0 f8 1f f3 d4 b9 ff 41 7b 0d 13 90 82 cf
     34 2e 74 e3 03 6e 9e 00 88 80 5d 86 2c 4c 79 35
     ee e6 98 91 89 f3 48 83 75 09 02 f1 3c b1 7f f5
     be 05 f1 fa 7e 8a 4c 43 eb a9 2c 3a 47 c0 68 40
     f5 dd 02 9d a5 b5 a2 a6 90 64 95 fc 57 b5 69 e8
     b2 4f 8e f2 a5 05 e3 c7 17 f9 c0 e0 c8 3e 91 ed
     c1 09 23 3e e5 09 4f be 1a 6a d4 d9 fb 65 44 1d
N  Next payload: VID, reserved: 0x0,
   length: 24
     84 8b 80 c2 52 6c 4f c7 f8 08 b8 ed! 52 af a2 f4
     d5 dd d4 f4
VID  Next payload: VID, reserved: 0x0,
   length: 23

     43 49 53 43 4f 2d 44 45 4c 45 54 45 2d 52 45 41
     53 4f 4e
VID  Next payload: VID, reserved: 0x0, length: 59

     43 49 53 43 4f 28 43 4f 50 59 52 49 47 48 54 29
     26 43 6f 70 79 72 69 67 68 74 20 28 63 29 20 32
     30 30 39 20 43 69 73 63 6f 20 53 79 73 74 65 6d
     73 2c 20 49 6e 63 2e
VID  Next payload: NONE, reserved: 0x0, length: 20
    40 48 b7 6e bc e8 85 25 e7 de 7f 00 d6 c2 d3
```

次に、IKE_INIT_SAパケットがASA1によって送信されます。

```
IKEv2-PLAT-4: SENT PKT [IKE_SA_INIT]
   [10.0.0.1]:500->[10.0.0.2]:500
```

ASA2はIKEV_INIT_SAパケットを受信します。

```
IKEv2-PLAT-4: RECV PKT [IKE_SA_INIT]
   [10.0.0.1]:500->[10.0.0.2]:500
   InitSPI=0xdfa3b583a4369958 RespSPI=0x0000000000000000
   MID=00000000
```

ASA2は、そのピアのSA作成を開始します。

```
IKEv2-PROTO-3: Rx [L 10.0.0.2:500/R
   10.0.0.1:500/VRF i0:f0] m_id: 0x0
IKEv2-PROTO-3: HDR[i:DFA3B583A4369958 -
   r: 0000000000000000]
IKEv2-PROTO-4: IKEV2 HDR ispi: DFA3B583A4369958 -
   rspi: 0000000000000000
```

```
IKEv2-PROTO-4: Next payload: SA, version: 2.0
IKEv2-PROTO-4: Exchange type: IKE_SA_INIT,
   flags: INITIATOR
IKEv2-PROTO-4: Message id: 0x0, length: 338
IKEv2-PLAT-5: New ikev2 sa request admitted
IKEv2-PLAT-5: Incrementing incoming negotiating
   sa count by one
SA  Next payload: KE, reserved: 0x0, length: 48
IKEv2-PROTO-4:   last proposal: 0x0, reserved: 0x0,
   length: 44 Proposal: 1, Protocol id: IKE, SPI size: 0,
   #trans: 4
IKEv2-PROTO-4:     last transform: 0x3, reserved: 0x0:
   length: 12 type: 1, reserved: 0x0, id: AES-CBC
IKEv2-PROTO-4:     last transform: 0x3, reserved: 0x0:
   length: 8 type: 2, reserved: 0x0, id: SHA1
IKEv2-PROTO-4:     last transform: 0x3, reserved: 0x0:
   length: 8 type: 3, reserved: 0x0, id: SHA96
IKEv2-PROTO-4:     last transform: 0x0, reserved: 0x0:
   length: 8 type: 4, reserved: 0x0,
   id: DH_GROUP_1024_MODP/Group 2
KE  Next payload: N, reserved: 0x0, length: 136
    DH group: 2, Reserved: 0x0
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000000 CurState: IDLE
   Event: EV_RECV_INIT
IKEv2-PROTO-5: (16): SM Trace->
  SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
```

ASA2はIKE_INITメッセージを確認して処理します。

1. ASA1が提供する暗号スイートを選択します。

2. 独自のDH秘密キーを計算する

3. この IKE_SA 用のすべてキーの導出元となる SKEYID の値を計算します。次に送信されるすべてのメッセージのヘッダーを除くすべてのメッセージが暗号化され、認証されます。暗号化と整合性の保護に使用されるキーは、SKEYIDから導出され、次のように呼ばれます。

   SK_eは暗号化に使用されます。

   SK_aは、**認**証に使用されます。

   SK_d が計算され、さらに CHILD_SA のキーの材料の計算に使用されます。SK_e と SK_a は、方向ごとに別に計算されます。

ASA2に関連する設定を次に示します。

```
crypto ikev2
   policy 1
encryption
   aes-256
integrity sha
group 2
prf sha
lifetime seconds
   86400
crypto ikev2
   enable
```

```
   outside

Tunnel Group
matching the
identity name
is present:

tunnel-group
   10.0.0.1
   type ipsec-l2l
tunnel-group
   10.0.0.1
   ipsec-
   attributes
ikev2 remote-
   authentication
   pre-shared-key
   *****
ikev2 local-
   authentication
   pre-shared-key
  *****
```

デバッグ出力を次に示します。

```
MsgID = 00000000 CurState: R_INIT Event: EV_VERIFY_MSG
IKEv2-PROTO-3: (16): Verify SA init message
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000000 CurState: R_INIT Event: EV_INSERT_SA
IKEv2-PROTO-3: (16): Insert SA
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000000 CurState: R_INIT
   Event: EV_GET_IKE_POLICY
IKEv2-PROTO-3: (16): Getting configured policies
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000000 CurState: R_INIT Event:EV_PROC_MSG
IKEv2-PROTO-2: (16): Processing initial message
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000000 CurState: R_INIT
   Event: EV_DETECT_NAT
IKEv2-PROTO-3: (16): Process NAT discovery notify
IKEv2-PROTO-5: (16): No NAT found
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000000 CurState: R_INIT
   Event: EV_CHK_CONFIG_MODE
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000000 CurState: R_BLD_INIT
   Event: EV_SET_POLICY
IKEv2-PROTO-3: (16): Setting configured policies
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000000 CurState: R_BLD_INIT
   Event: EV_CHK_AUTH4PKI
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000000 CurState: R_BLD_INIT
   Event: EV_PKI_SESH_OPEN
```

```
IKEv2-PROTO-3: (16): Opening a PKI session
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000000 CurState: R_BLD_INIT
   Event: EV_GEN_DH_KEY
IKEv2-PROTO-3: (16): Computing DH public key
IKEv2-PROTO-3: (16):
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000000 CurState: R_BLD_INIT
   Event: EV_NO_EVENT
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000000 CurState: R_BLD_INIT
   Event: EV_OK_RECD_DH_PUBKEY_RESP
IKEv2-PROTO-5: (16): Action: Action_Null
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000000 CurState: R_BLD_INIT
   Event: EV_GEN_DH_SECRET
IKEv2-PROTO-3: (16): Computing DH secret key
IKEv2-PROTO-3: (16):
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000000 CurState: R_BLD_INIT
   Event: EV_NO_EVENT
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000000 CurState: R_BLD_INIT
   Event: EV_OK_RECD_DH_SECRET_RESP
IKEv2-PROTO-5: (16): Action: Action_Null
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958_SPI=27C943C13FD94665 (R)
   MsgID = 00000000 CurState: R_BLD_INIT
   Event: EV_GEN_SKEYID
IKEv2-PROTO-3: (16): Generate skeyid
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000000 CurState: R_BLD_INIT
   Event: EV_GET_CONFIG_MODE
IKEv2-PROTO-5: (16): SM Trace-> SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (R) MsgID = 00000000
  CurState: R_BLD_INIT Event: EV_BLD_MSG
```

ASA2は、ASA1が受信するIKE_SA_INIT交換の応答側メッセージを作成します。このパケットには次が含まれます。

- ISAKMP ヘッダー (SPI、バージョン、フラグ)
- SAr1(IKEレスポンダが選択する暗号化アルゴリズム)
- KEr (応答側の DH 公開キーの値)
- 応答側のナンス

デバッグ出力を次に示します。

```
IKEv2-PROTO-2: (16): Sending initial message
IKEv2-PROTO-3:   IKE Proposal: 1, SPI size: 0
   (initial negotiation),
Num. transforms: 4
```

```
AES-CBC SHA1 SHA96 DH_GROUP_1024_MODP/Group 2

IKEv2-PROTO-5: Construct Vendor Specific Payload:
   FRAGMENTATIONIKEv2-PROTO-3:
   Tx [L 10.0.0.2:500/R 10.0.0.1:500/VRF i0:f0] m_id: 0x0
IKEv2-PROTO-3: HDR[i:DFA3B583A4369958 - r: 27C943C13FD94665]
IKEv2-PROTO-4: IKEV2 HDR ispi: DFA3B583A4369958 -
   rspi: 27C943C13FD94665
IKEv2-PROTO-4: Next payload: SA, version: 2.0
IKEv2-PROTO-4: Exchange type: IKE_SA_INIT,
   flags: RESPONDER MSG-RESPONSE
IKEv2-PROTO-4: Message id: 0x0, length: 338
SA  Next payload: KE, reserved: 0x0, length: 48
IKEv2-PROTO-4:   last proposal: 0x0, reserved: 0x0,
   length: 44 Proposal: 1, Protocol id: IKE, SPI size: 0,
   #trans: 4
IKEv2-PROTO-4:     last transform: 0x3, reserved: 0x0:
   length: 12 type: 1, reserved: 0x0, id: AES-CBC
IKEv2-PROTO-4:     last transform: 0x3, reserved: 0x0:
   length: 8 type: 2, reserved: 0x0, id: SHA1
IKEv2-PROTO-4:     last transform: 0x3, reserved: 0x0:
   length: 8 type: 3, reserved: 0x0, id: SHA96
IKEv2-PROTO-4:     last transform: 0x0, reserved: 0x0:
   length: 8 type: 4, reserved: 0x0,
   id: DH_GROUP_1024_MODP/Group 2

KE  Next payload: N, reserved: 0x0, length: 136

DH group: 2, Reserved: 0x0
```

ASA2はASA1にレスポンダメッセージを送信します。

```
IKEv2-PLAT-4: SENT PKT [IKE_SA_INIT]
   [10.0.0.2]:500->[10.0.0.1]:500 InitSPI=0xdfa3b583a4369958
  RespSPI=0x27c943c13fd94665 MID=00000000
```

ASA1はASA2からIKE_SA_INIT応答パケットを受信します。

```
IKEv2-PLAT-4: RECV PKT
   [IKE_SA_INIT]
   [10.0.0.2]:500->
   [10.0.0.1]:500
   InitSPI=0xdfa3b583a4369958
   RespSPI=0x27c943c13fd94665
  MID=00000000
```

ASA2が認可プロセスのタイマーを開始します。

```
IKEv2-PROTO-5: (16):
   SM Trace->
   SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (R)
   MsgID = 00000000
   CurState: INIT_DONE
   Event: EV_DONE
IKEv2-PROTO-3: (16):
   Fragmentation is
   enabled
IKEv2-PROTO-3: (16): Cisco
   DeleteReason Notify
   is enabled
```

```
IKEv2-PROTO-3: (16): Complete
   SA init exchange
IKEv2-PROTO-5: (16):
   SM Trace->
   SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (R)
   MsgID = 00000000
   CurState: INIT_DONE
   Event: EV_CHK4_ROLE
IKEv2-PROTO-5: (16):
   SM Trace->
   SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (R)
   MsgID = 00000000

CurState: INIT_DONE Event:
   EV_START_TMR
IKEv2-PROTO-3: (16): Starting
   timer to wait for auth
   message (30 sec)
IKEv2-PROTO-5: (16):
   SM Trace->
   SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (R)
   MsgID = 00000000
   CurState: R_WAIT_AUTH
  Event: EV_NO_EVENT
```

ASA1 は応答を確認して次の処理を行います。

1. 発信側DH秘密キーが計算されます。

2. イニシエータSKEYIDが生成されます。

デバッグ出力を次に示します。

```
IKEv2-PROTO-3: Rx [L 10.0.0.1:500/R 10.0.0.2:500/VRF i0:f0]
   m_id: 0x0
IKEv2-PROTO-3: HDR[i:DFA3B583A4369958 - r: 27C943C13FD94665]
IKEv2-PROTO-4: IKEV2 HDR ispi: DFA3B583A4369958 -
   rspi: 27C943C13FD94665
IKEv2-PROTO-4: Next payload: SA, version: 2.0
IKEv2-PROTO-4: Exchange type: IKE_SA_INIT,
   flags: RESPONDER MSG-RESPONSE
IKEv2-PROTO-4: Message id: 0x0, length: 338

SA  Next payload: KE, reserved: 0x0, length: 48
IKEv2-PROTO-4:   last proposal: 0x0, reserved: 0x0,
   length: 44 Proposal: 1, Protocol id: IKE, SPI size: 0,
   #trans: 4
IKEv2-PROTO-4:     last transform: 0x3, reserved: 0x0:
   length: 12 type: 1, reserved: 0x0, id: AES-CBC
IKEv2-PROTO-4:     last transform: 0x3, reserved: 0x0:
   length: 8 type: 2, reserved: 0x0, id: SHA1
IKEv2-PROTO-4:     last transform: 0x3, reserved: 0x0:
   length: 8 type: 3, reserved: 0x0, id: SHA96
IKEv2-PROTO-4:     last transform: 0x0, reserved: 0x0:
   length: 8 type: 4, reserved: 0x0,
   id: DH_GROUP_1024_MODP/Group 2
KE  Next payload: N, reserved: 0x0, length: 136
    DH group: 2, Reserved: 0x0
```

```
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (I)
   MsgID = 00000000 CurState: I_WAIT_INIT
   Event: EV_RECV_INIT
IKEv2-PROTO-5: (16): Processing initial message
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (I)
   MsgID = 00000000 CurState: I_PROC_INIT
   Event: EV_CHK4_NOTIFY
IKEv2-PROTO-2: (16): Processing initial message
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (I)
   MsgID = 00000000 CurState: I_PROC_INIT
   Event: EV_VERIFY_MSG
IKEv2-PROTO-3: (16): Verify SA init message
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (I)
   MsgID = 00000000 CurState: I_PROC_INIT
   Event: EV_PROC_MSG
IKEv2-PROTO-2: (16): Processing initial message
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (I)
   MsgID = 00000000 CurState: I_PROC_INIT
   Event: EV_DETECT_NAT
IKEv2-PROTO-3: (16): Process NAT discovery notify
IKEv2-PROTO-3: (16): NAT-T is disabled
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (I)
   MsgID = 00000000 CurState: I_PROC_INIT
   Event: EV_CHK_NAT_T
IKEv2-PROTO-3: (16): Check NAT discovery
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (I)
   MsgID = 00000000 CurState: I_PROC_INIT
   Event: EV_CHK_CONFIG_MODE
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (I) MsgID = 00000000
   CurState: INIT_DONE Event: EV_GEN_DH_SECRET
IKEv2-PROTO-3: (16): Computing DH secret key
IKEv2-PROTO-3: (16):
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (I) MsgID = 00000000
   CurState: INIT_DONE Event: EV_NO_EVENT
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (I) MsgID = 00000000
   CurState: INIT_DONE Event: EV_OK_RECD_DH_SECRET_RESP
IKEv2-PROTO-5: (16): Action: Action_Null
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (I) MsgID = 00000000
   CurState: INIT_DONE Event: EV_GEN_SKEYID
IKEv2-PROTO-3: (16): Generate skeyid
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (I)
   MsgID = 00000000 CurState: INIT_DONE Event: EV_DONE
IKEv2-PROTO-3: (16): Fragmentation is enabled
IKEv2-PROTO-3: (16): Cisco DeleteReason Notify is enabled
```

ASA間のIKE_INIT_SA交換が完了しました。

```
IKEv2-PROTO-3: (16): Complete SA init exchange
```

ASA1はIKE_AUTH交換を開始し、認証ペイロードの生成を開始します。IKE_AUTH パケットには次が含まれます。

- ISAKMP ヘッダー (SPI、バージョン、フラグ)
- IDi(イニシエータID)
- AUTHペイロード
- SAi2 (IKEv1のフェーズ2トランスフォームセット交換と同様にSAを開始)
- TSiおよびTSr(イニシエータおよびレスポンダトラフィックセレクタ)

  注:TSiとTSrには、暗号化されたトラフィックを送受信するための発信側と応答側の送信元アドレスと宛先アドレスがそれぞれ含まれています。このアドレス範囲は、宛先および送信元がこの範囲内であるすべてのトラフィックをトンネルすることを指定します。提案が応答側で受け入れ可能な場合は、同一のTSペイロードが返されます。

また、トリガーパケットに一致するproxy_IDペアに対して最初のCHILD_SAが作成されます。

ASA1に関連する設定を次に示します。

```
crypto ipsec
   ikev2
   ipsec-proposal
   AES256
protocol esp
   encryption
   aes-256
protocol esp
   integrity
   sha-1 md5

access-list
   l2l_list
   extended
   permit ip
   host 10.0.0.2
  host 10.0.0.1
```

デバッグ出力を次に示します。

```
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (I)
   MsgID = 00000000 CurState: I_BLD_AUTH Event: EV_GEN_AUTH
IKEv2-PROTO-3: (16): Generate my authentication data
IKEv2-PROTO-3: (16): Use preshared key for id 10.0.0.1,
   key len 5
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (I)
   MsgID = 00000000 CurState: I_BLD_AUTH
   Event: EV_CHK_AUTH_TYPE
IKEv2-PROTO-3: (16): Get my authentication method
```

```
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (I)
   MsgID = 00000000 CurState: I_BLD_AUTH
   Event: EV_OK_AUTH_GEN
IKEv2-PROTO-3: (16): Check for EAP exchange
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (I)
   MsgID = 00000000 CurState: I_BLD_AUTH
   Event: EV_SEND_AUTH
IKEv2-PROTO-2: (16): Sending auth message
IKEv2-PROTO-5: Construct Vendor Specific Payload:
   CISCO-GRANITE
IKEv2-PROTO-3:   ESP Proposal: 1, SPI size: 4
   (IPSec negotiation),
Num. transforms: 4
   AES-CBC   SHA96   MD596
IKEv2-PROTO-5: Construct Notify Payload: INITIAL_CONTACT
IKEv2-PROTO-5: Construct Notify Payload: ESP_TFC_NO_SUPPORT
IKEv2-PROTO-5: Construct Notify Payload: NON_FIRST_FRAGS
IKEv2-PROTO-3: (16): Building packet for encryption;
   contents are:
VID  Next payload: IDi, reserved: 0x0, length: 20

     dd a3 b4 83 b7 01 6a 1f 3d b7 84 1a 75 e6 83 a6
IDi  Next payload: AUTH, reserved: 0x0, length: 12
    Id type: IPv4 address, Reserved: 0x0 0x0

     47 01 01 01
AUTH  Next payload: SA, reserved: 0x0, length: 28
    Auth method PSK, reserved: 0x0, reserved 0x0
Auth data&colon; 20 bytes
SA  Next payload: TSi, reserved: 0x0, length: 52
IKEv2-PROTO-4:   last proposal: 0x0, reserved: 0x0,
   length: 48 Proposal: 1, Protocol id: ESP, SPI size: 4,
   #trans: 4
IKEv2-PROTO-4:     last transform: 0x3, reserved: 0x0:
   length: 12 type: 1, reserved: 0x0, id: AES-CBC
IKEv2-PROTO-4:     last transform: 0x3, reserved: 0x0:
   length: 8 type: 3, reserved: 0x0, id: SHA96
IKEv2-PROTO-4:     last transform: 0x3, reserved: 0x0:
   length: 8 type: 3, reserved: 0x0, id: MD596
IKEv2-PROTO-4:     last transform: 0x0, reserved: 0x0:
   length: 8 type: 5, reserved: 0x0, id:

  TSi  Next payload: TSr, reserved: 0x0, length: 24
    Num of TSs: 1, reserved 0x0, reserved 0x0
    TS type: TS_IPV4_ADDR_RANGE, proto id: 0, length: 16
    start port: 0, end port: 65535
    start addr: 192.168.1.1, end addr: 192.168.1.1
TSr  Next payload: NOTIFY, reserved: 0x0, length: 24
    Num of TSs: 1, reserved 0x0, reserved 0x0
    TS type: TS_IPV4_ADDR_RANGE, proto id: 0, length: 16
    start port: 0, end port: 65535
    start addr: 192.168.2.99, end addr: 192.168.2.99
IKEv2-PROTO-3: Tx [L 10.0.0.1:500/R 10.0.0.2:500/VRF i0:f0]
   m_id: 0x1
IKEv2-PROTO-3: HDR[i:DFA3B583A4369958 - r: 27C943C13FD94665]
IKEv2-PROTO-4: IKEV2 HDR ispi: DFA3B583A4369958 -
   rspi: 27C943C13FD94665

IKEv2-PROTO-4: Next payload: ENCR, version: 2.0
IKEv2-PROTO-4: Exchange type: IKE_AUTH, flags: INITIATOR
IKEv2-PROTO-4: Message id: 0x1, length: 284
ENCR  Next payload: VID, reserved: 0x0, length: 256
```

```
Encrypted data&colon; 252 bytes
```

ASA1はIKE_AUTHパケットをASA2に送信します。

```
IKEv2-PLAT-4: SENT PKT [IKE_AUTH]
   [10.0.0.1]:500->[10.0.0.2]:500
   InitSPI=0xdfa3b583a4369958 RespSPI=0x27c943c13fd94665
  MID=00000001
```

ASA2はASA1から次のパケットを受信します。

```
IKEv2-PLAT-4: RECV PKT [IKE_AUTH]
   [10.0.0.1]:500->[10.0.0.2]:500
   InitSPI=0xdfa3b583a4369958 RespSPI=0x27c943c13fd94665
  MID=00000001
```

ASA2は許可タイマーを停止し、ASA1から受信した認証データを確認します。次に、ASA1とまったく同様に、独自の認証データを生成します。

ASA2に関連する設定を次に示します。

```
crypto ipsec
   ikev2
   ipsec-
   proposal
   AES256
protocol esp
   encryption
   aes-256
protocol esp
   integrity
  sha-1 md5
```

デバッグ出力を次に示します。

```
IKEv2-PROTO-3: Rx [L 10.0.0.2:500/R 10.0.0.1:500/VRF i0:f0]
   m_id: 0x1
IKEv2-PROTO-3: HDR[i:DFA3B583A4369958 - r: 27C943C13FD94665]
IKEv2-PROTO-4: IKEV2 HDR ispi: DFA3B583A4369958 -
   rspi: 27C943C13FD94665
IKEv2-PROTO-4: Next payload: ENCR, version: 2.0
IKEv2-PROTO-4: Exchange type: IKE_AUTH, flags: INITIATOR
IKEv2-PROTO-4: Message id: 0x1, length: 284
IKEv2-PROTO-5: (16): Request has mess_id 1;
   expected 1 through 1 REAL Decrypted packet:
   Data&colon; 216 bytes
IKEv2-PROTO-5: Parse Vendor Specific Payload: (CUSTOM) VID
   Next payload: IDi, reserved: 0x0, length: 20

     dd a3 b4 83 b7 01 6a 1f 3d b7 84 1a 75 e6 83 a6
IDi  Next payload: AUTH, reserved: 0x0, length: 12
    Id type: IPv4 address, Reserved: 0x0 0x0

     47 01 01 01
AUTH  Next payload: SA, reserved: 0x0, length: 28
    Auth method PSK, reserved: 0x0, reserved 0x0
Auth data&colon; 20 bytes
SA  Next payload: TSi, reserved: 0x0, length: 52
IKEv2-PROTO-4:   last proposal: 0x0, reserved: 0x0,
   length: 48 Proposal: 1, Protocol id: ESP, SPI size: 4,
```

```
   #trans: 4
IKEv2-PROTO-4:     last transform: 0x3, reserved: 0x0:
   length: 12 type: 1, reserved: 0x0, id: AES-CBC
IKEv2-PROTO-4:     last transform: 0x3, reserved: 0x0:
   length: 8 type: 3, reserved: 0x0, id: SHA96
IKEv2-PROTO-4:     last transform: 0x3, reserved: 0x0:
   length: 8 type: 3, reserved: 0x0, id: MD596
IKEv2-PROTO-4:     last transform: 0x0, reserved: 0x0:
   length: 8 type: 5, reserved: 0x0, id:
TSi  Next payload: TSr, reserved: 0x0, length: 24
    Num of TSs: 1, reserved 0x0, reserved 0x0
    TS type: TS_IPV4_ADDR_RANGE, proto id: 0, length: 16
    start port: 0, end port: 65535
    start addr: 192.168.1.1, end addr: 192.168.1.1
TSr  Next payload: NOTIFY, reserved: 0x0, length: 24
    Num of TSs: 1, reserved 0x0, reserved 0x0
    TS type: TS_IPV4_ADDR_RANGE, proto id: 0, length: 16
    start port: 0, end port: 65535
    start addr: 192.168.2.99, end addr: 192.168.2.99
IKEv2-PROTO-5: (16): SM Trace-> SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (R) MsgID = 00000001
   CurState: R_WAIT_AUTH Event: EV_RECV_AUTH
IKEv2-PROTO-3: (16): Stopping timer to wait for auth
   message
IKEv2-PROTO-5: (16): SM Trace-> SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (R) MsgID = 00000001
   CurState: R_WAIT_AUTH Event: EV_CHK_NAT_T
IKEv2-PROTO-3: (16): Check NAT discovery
IKEv2-PROTO-5: (16): SM Trace-> SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (R) MsgID = 00000001
   CurState: R_WAIT_AUTH Event: EV_PROC_ID
IKEv2-PROTO-2: (16): Recieved valid parameteres in
   process id
IKEv2-PLAT-3: (16) peer auth method set to: 2
IKEv2-PROTO-5: (16): SM Trace-> SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (R) MsgID = 00000001
   CurState: R_WAIT_AUTH
   Event: EV_CHK_IF_PEER_CERT_NEEDS_TO_BE_FETCHED_FOR_
   PROF_SEL
IKEv2-PROTO-5: (16): SM Trace-> SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (R) MsgID = 00000001
   CurState: R_WAIT_AUTH Event: EV_GET_POLICY_BY_PEERID
IKEv2-PROTO-3: (16): Getting configured policies
IKEv2-PLAT-3: attempting to find tunnel group for
   ID: 10.0.0.1
IKEv2-PLAT-3: mapped to tunnel group 10.0.0.1 using
   phase 1 ID
IKEv2-PLAT-3: (16) tg_name set to: 10.0.0.1
IKEv2-PLAT-3: (16) tunn grp type set to: L2L
IKEv2-PLAT-3: my_auth_method = 2
IKEv2-PLAT-3: supported_peers_auth_method = 2
IKEv2-PLAT-3: P1 ID = 0
IKEv2-PLAT-3: Translating IKE_ID_AUTO to = 255

IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000001 CurState: R_WAIT_AUTH
   Event: EV_SET_POLICY
IKEv2-PROTO-3: (16): Setting configured policies
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000001 CurState: R_WAIT_AUTH
   Event: EV_VERIFY_POLICY_BY_PEERID
IKEv2-PROTO-3: (16): Verify peer's policy
```

```
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000001
   CurState: R_WAIT_AUTH Event: EV_CHK_CONFIG_MODE
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000001 CurState: R_WAIT_AUTH
   Event: EV_CHK_AUTH4EAP
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000001 CurState: R_WAIT_AUTH
   Event: EV_CHK_POLREQEAP
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000001 CurState: R_VERIFY_AUTH
   Event: EV_CHK_AUTH_TYPE
IKEv2-PROTO-3: (16): Get peer authentication method
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000001 CurState: R_VERIFY_AUTH
   Event: EV_GET_PRESHR_KEY
IKEv2-PROTO-3: (16): Get peer's preshared key for 10.0.0.1
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000001 CurState: R_VERIFY_AUTH
   Event: EV_VERIFY_AUTH

IKEv2-PROTO-3: (16): Verify authentication data
IKEv2-PROTO-3: (16): Use preshared key for id 10.0.0.1,
   key len 5
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000001 CurState: R_VERIFY_AUTH
   Event: EV_GET_CONFIG_MODE
IKEv2-PLAT-2: Build config mode reply: no request stored
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000001 CurState: R_VERIFY_AUTH
   Event: EV_CHK4_IC
IKEv2-PROTO-3: (16): Processing initial contact
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000001 CurState: R_VERIFY_AUTH
   Event: EV_CHK_REDIRECT
IKEv2-PROTO-5: (16): Redirect check is not needed,
   skipping it
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000001 CurState: R_VERIFY_AUTH
   Event: EV_PROC_SA_TS
IKEv2-PROTO-2: (16): Processing auth message
IKEv2-PLAT-3: Selector received from peer is accepted
IKEv2-PLAT-3: PROXY MATCH on crypto map
   outside_map seq 1
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000001 CurState: R_VERIFY_AUTH
   Event: EV_NO_EVENT
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000001 CurState: R_VERIFY_AUTH
   Event: EV_OK_RECD_IPSEC_RESP
IKEv2-PROTO-2: (16): Processing auth message
```

ASA2はIKE_AUTHパケットを送信します。このパケットには次のものが含まれます。

- ISAKMP ヘッダー (SPI、バージョン、フラグ)
- IDr(応答側のアイデンティティ)
- AUTHペイロード
- SAr2 (IKEv1のフェーズ2トランスフォームセット交換と同様にSAを開始)
- TSiおよびTSr(イニシエータおよびレスポンダトラフィックセレクタ)

  注:TSiとTSrには、暗号化されたトラフィックを送受信するための発信側と応答側の送信元アドレスと宛先アドレスがそれぞれ含まれています。このアドレス範囲は、宛先および送信元がこの範囲内であるすべてのトラフィックをトンネルすることを指定します。これらのパラメータは、ASA1から受信したパラメータと同じです。

デバッグ出力を次に示します。

```
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000001 CurState: R_BLD_AUTH
   Event: EV_MY_AUTH_METHOD
IKEv2-PROTO-3: (16): Get my authentication method
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000001 CurState: R_BLD_AUTH
   Event: EV_GET_PRESHR_KEY
IKEv2-PROTO-3: (16): Get peer's preshared key for 10.0.0.1
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000001 CurState: R_BLD_AUTH
   Event: EV_GEN_AUTH
IKEv2-PROTO-3: (16): Generate my authentication data
IKEv2-PROTO-3: (16): Use preshared key for id 10.0.0.2,
   key len 5
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000001 CurState: R_BLD_AUTH
   Event: EV_CHK4_SIGN
IKEv2-PROTO-3: (16): Get my authentication method
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000001 CurState: R_BLD_AUTH
   Event: EV_OK_AUTH_GEN
IKEv2-PROTO-5: (16): SM Trace->
   SA: I_SPI=DFA3B583A4369958 R_SPI=27C943C13FD94665 (R)
   MsgID = 00000001 CurState: R_BLD_AUTH
   Event: EV_SEND_AUTH
IKEv2-PROTO-2: (16): Sending auth message
IKEv2-PROTO-5: Construct Vendor Specific Payload:
   CISCO-GRANITE
IKEv2-PROTO-3:   ESP Proposal: 1, SPI size: 4 (IPSec
   negotiation),
Num. transforms: 3
   AES-CBC   SHA96
IKEv2-PROTO-5: Construct Notify Payload:
```

```
   ESP_TFC_NO_SUPPORTIKEv2-PROTO-5:
   Construct Notify Payload: NON_FIRST_FRAGSIKEv2-PROTO-3:
     (16):
Building packet for encryption; contents are:
VID  Next payload: IDr, reserved: 0x0, length: 20
     25 c9 42 c1 2c ee b5 22 3d b7 84 1a 75 e6 83 a6
IDr  Next payload: AUTH, reserved: 0x0,
   length: 12 Id type: IPv4 address, Reserved: 0x0 0x0
     51 01 01 01
AUTH  Next payload: SA, reserved: 0x0,
   length: 28 Auth method PSK, reserved: 0x0, reserved 0x0
Auth data&colon; 20 bytes
SA  Next payload: TSi, reserved: 0x0,
   length: 44 IKEv2-PROTO-4:   last proposal: 0x0,
   reserved: 0x0, length: 40
  Proposal: 1, Protocol id: ESP, SPI size: 4, #trans: 3
IKEv2-PROTO-4:     last transform: 0x3, reserved: 0x0:
   length: 12 type: 1, reserved: 0x0, id: AES-CBC
IKEv2-PROTO-4:     last transform: 0x3, reserved: 0x0:
   length: 8 type: 3, reserved: 0x0, id: SHA96
IKEv2-PROTO-4:     last transform: 0x0, reserved: 0x0:
   length: 8 type: 5, reserved: 0x0, id:

TSi  Next payload: TSr, reserved: 0x0,
   length: 24 Num of TSs: 1, reserved 0x0, reserved 0x0
    TS type: TS_IPV4_ADDR_RANGE, proto id: 0, length: 16
    start port: 0, end port: 65535
    start addr: 192.168.1.1, end addr: 192.168.1.1
TSr  Next payload: NOTIFY, reserved: 0x0,
   length: 24 Num of TSs: 1, reserved 0x0, reserved 0x0
    TS type: TS_IPV4_ADDR_RANGE, proto id: 0, length: 16
    start port: 0, end port: 65535
    start addr: 192.168.2.99, end addr: 192.168.2.99
NOTIFY(ESP_TFC_NO_SUPPORT)  Next payload: NOTIFY,
   reserved: 0x0, length: 8 Security protocol id: IKE,
   spi size: 0, type: ESP_TFC_NO_SUPPORT
NOTIFY(NON_FIRST_FRAGS)  Next payload: NONE, reserved: 0x0,
   length: 8 Security protocol id: IKE, spi size: 0,
   type: NON_FIRST_FRAGS
IKEv2-PROTO-3: Tx [L 10.0.0.2:500/R 10.0.0.1:500/VRF i0:f0]
   m_id: 0x1
IKEv2-PROTO-3: HDR[i:DFA3B583A4369958 - r: 27C943C13FD94665]
IKEv2-PROTO-4: IKEV2 HDR ispi: DFA3B583A4369958 -
   rspi: 27C943C13FD94665
IKEv2-PROTO-4: Next payload: ENCR, version: 2.0
IKEv2-PROTO-4: Exchange type: IKE_AUTH, flags:
   RESPONDER MSG-RESPONSE
IKEv2-PROTO-4: Message id: 0x1, length: 236
ENCR  Next payload: VID, reserved: 0x0, length: 208
Encrypted data&colon; 204 bytes
```

ASA2がIKE_AUTHパケットの応答を送信します。

```
IKEv2-PLAT-4: SENT PKT [IKE_AUTH]
   [10.0.0.2]:500->[10.0.0.1]:500
   InitSPI=0xdfa3b583a4369958 RespSPI=0x27c943c13fd94665
  MID=00000001
```

ASA1はASA2から応答を受信します。

```
IKEv2-PLAT-4:
   RECV PKT [IKE_AUTH]
```

```
   [10.0.0.2]:500->
   [10.0.0.1]:500
   InitSPI=0xdfa3b583a4369958
   RespSPI=0x27c943c13fd94665
  MID=00000001
```

ASA2はSAデータベース(SAD)にエントリを挿入します。

```
IKEv2-PROTO-5: (16):
   SM Trace->
   SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (R)
   MsgID = 00000001
   CurState: AUTH_DONE
   Event: EV_OK
IKEv2-PROTO-5: (16): Action:
   Action_Null
IKEv2-PROTO-5: (16):
   SM Trace->
   SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (R)
   MsgID = 00000001
   CurState: AUTH_DONE
   Event: EV_PKI_SESH_CLOSE
IKEv2-PROTO-3: (16): Closing
   the PKI session
IKEv2-PROTO-5: (16):
   SM Trace->
   SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (R)
   MsgID = 00000001
   CurState: AUTH_DONE
   Event: EV_INSERT_IKE
IKEv2-PROTO-2: (16):
   SA created;
   inserting SA into database
```

ASA1はこのパケット内の認証データを確認して処理し、次にSAをSADに挿入します。

```
IKEv2-PROTO-3: Rx [L 10.0.0.1:500/R 10.0.0.2:500/VRF i0:f0]
   m_id: 0x1
IKEv2-PROTO-3: HDR[i:DFA3B583A4369958 - r: 27C943C13FD94665]
IKEv2-PROTO-4: IKEV2 HDR ispi: DFA3B583A4369958 -
   rspi: 27C943C13FD94665
IKEv2-PROTO-4: Next payload: ENCR, version: 2.0
IKEv2-PROTO-4: Exchange type: IKE_AUTH,
   flags: RESPONDER MSG-RESPONSE
IKEv2-PROTO-4: Message id: 0x1, length: 236
REAL Decrypted packet:Data&colon; 168 bytes
IKEv2-PROTO-5: Parse Vendor Specific Payload: (CUSTOM) VID
   Next payload: IDr, reserved: 0x0, length: 20

     25 c9 42 c1 2c ee b5 22 3d b7 84 1a 75 e6 83 a6
IDr  Next payload: AUTH, reserved: 0x0, length: 12
    Id type: IPv4 address, Reserved: 0x0 0x0

     51 01 01 01
AUTH  Next payload: SA, reserved: 0x0, length: 28
    Auth method PSK, reserved: 0x0, reserved 0x0
Auth data&colon; 20 bytes
SA  Next payload: TSi, reserved: 0x0, length: 44
IKEv2-PROTO-4:   last proposal: 0x0, reserved: 0x0,
```

```
   length: 40 Proposal: 1, Protocol id: ESP, SPI size: 4,
   #trans: 3
IKEv2-PROTO-4:     last transform: 0x3, reserved: 0x0:
   length: 12 type: 1, reserved: 0x0, id: AES-CBC
IKEv2-PROTO-4:     last transform: 0x3, reserved: 0x0:
   length: 8 type: 3, reserved: 0x0, id: SHA96
IKEv2-PROTO-4:     last transform: 0x0, reserved: 0x0:
   length: 8 type: 5, reserved: 0x0, id:

   TSi  Next payload: TSr, reserved: 0x0,
   length: 24 Num of TSs: 1, reserved 0x0, reserved 0x0
    TS type: TS_IPV4_ADDR_RANGE, proto id: 0, length: 16
    start port: 0, end port: 65535
    start addr: 192.168.1.1, end addr: 192.168.1.1
TSr  Next payload: NOTIFY, reserved: 0x0,
   length: 24 Num of TSs: 1, reserved 0x0, reserved 0x0
    TS type: TS_IPV4_ADDR_RANGE, proto id: 0, length: 16
    start port: 0, end port: 65535
    start addr: 192.168.2.99, end addr: 192.168.2.99
IKEv2-PROTO-5: Parse Notify Payload:
   ESP_TFC_NO_SUPPORT NOTIFY(ESP_TFC_NO_SUPPORT)
   Next payload: NOTIFY, reserved: 0x0, length: 8
    Security protocol id: IKE, spi size: 0,
   type: ESP_TFC_NO_SUPPORT
IKEv2-PROTO-5: Parse Notify Payload:
   NON_FIRST_FRAGS NOTIFY(NON_FIRST_FRAGS)  Next payload:
   NONE, reserved: 0x0, length: 8
    Security protocol id: IKE, spi size: 0,
   type: NON_FIRST_FRAGS
Decrypted packet:Data&colon; 236 bytes
IKEv2-PROTO-5: (16): SM Trace-> SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (I) MsgID = 00000001
   CurState: I_WAIT_AUTH Event: EV_RECV_AUTH
IKEv2-PROTO-5: (16): Action: Action_Null
IKEv2-PROTO-5: (16): SM Trace-> SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (I) MsgID = 00000001
   CurState: I_PROC_AUTH Event: EV_CHK4_NOTIFY
IKEv2-PROTO-2: (16): Process auth response notify
IKEv2-PROTO-5: (16): SM Trace-> SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (I) MsgID = 00000001
   CurState: I_PROC_AUTH Event: EV_PROC_MSG
IKEv2-PLAT-3: (16) peer auth method set to: 2
IKEv2-PROTO-5: (16): SM Trace-> SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (I) MsgID = 00000001
   CurState: I_PROC_AUTH
   Event: EV_CHK_IF_PEER_CERT_NEEDS_TO_BE_FETCHED_
   FOR_PROF_SEL
IKEv2-PROTO-5: (16): SM Trace-> SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (I) MsgID = 00000001
   CurState: I_PROC_AUTH Event: EV_GET_POLICY_BY_PEERID
IKEv2-PROTO-3: (16): Getting configured policies
IKEv2-PLAT-3: connection initiated with tunnel
   group 10.0.0.2
IKEv2-PLAT-3: (16) tg_name set to: 10.0.0.2
IKEv2-PLAT-3: (16) tunn grp type set to: L2L
IKEv2-PLAT-3: my_auth_method = 2
IKEv2-PLAT-3: supported_peers_auth_method = 2
IKEv2-PLAT-3: P1 ID = 0
IKEv2-PLAT-3: Translating IKE_ID_AUTO to = 255
IKEv2-PROTO-5: (16): SM Trace-> SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (I) MsgID = 00000001
   CurState: I_PROC_AUTH Event: EV_VERIFY_POLICY_BY_PEERID
IKEv2-PROTO-3: (16): Verify peer's policy
IKEv2-PROTO-5: (16): SM Trace-> SA: I_SPI=DFA3B583A4369958
```

```
   R_SPI=27C943C13FD94665 (I) MsgID = 00000001
   CurState: I_PROC_AUTH Event: EV_CHK_AUTH_TYPE
IKEv2-PROTO-3: (16): Get peer authentication method
IKEv2-PROTO-5: (16): SM Trace-> SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (I) MsgID = 00000001
   CurState: I_PROC_AUTH Event: EV_GET_PRESHR_KEY
IKEv2-PROTO-3: (16): Get peer's preshared key for 10.0.0.2
IKEv2-PROTO-5: (16): SM Trace-> SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (I) MsgID = 00000001
   CurState: I_PROC_AUTH Event: EV_VERIFY_AUTH
IKEv2-PROTO-3: (16): Verify authentication data
IKEv2-PROTO-3: (16): Use preshared key for id 10.0.0.2,
   key len 5
IKEv2-PROTO-5: (16): SM Trace-> SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (I) MsgID = 00000001
   CurState: I_PROC_AUTH Event: EV_CHK_EAP
IKEv2-PROTO-3: (16): Check for EAP exchange
IKEv2-PROTO-5: (16): SM Trace-> SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (I) MsgID = 00000001
   CurState: I_PROC_AUTH Event: EV_CHK_CONFIG_MODE
IKEv2-PROTO-5: (16): SM Trace-> SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (I) MsgID = 00000001
   CurState: I_PROC_AUTH Event: EV_CHK_IKE_ONLY
IKEv2-PROTO-5: (16): SM Trace-> SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (I) MsgID = 00000001
   CurState: I_PROC_AUTH Event: EV_PROC_SA_TS
IKEv2-PROTO-2: (16): Processing auth message
IKEv2-PROTO-5: (16): SM Trace-> SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (I) MsgID = 00000001
   CurState: AUTH_DONE Event: EV_OK
IKEv2-PROTO-5: (16): Action: Action_Null
IKEv2-PROTO-5: (16): SM Trace-> SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (I) MsgID = 00000001
   CurState: AUTH_DONE Event: EV_PKI_SESH_CLOSE
IKEv2-PROTO-3: (16): Closing the PKI session
IKEv2-PROTO-5: (16): SM Trace-> SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (I) MsgID = 00000001
   CurState: AUTH_DONE Event: EV_INSERT_IKE
IKEv2-PROTO-2: (16): SA created; inserting SA into
   database
```

これで、ASA1のトンネルがアクティブになります。

```
CONNECTION
    STATUS: UP...
   peer: 10.0.0.2:500,
   phase1_id: 10.0.0.2
IKEv2-PROTO-5: (16):
   SM Trace->
   SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (I)
   MsgID = 00000001
   CurState: AUTH_DONE
  Event: EV_REGISTER_SESSION
```

これで、ASA2のトンネルがアクティブになります。

```
CONNECTION
   STATUS: UP...
   peer: 10.0.0.1:500,
   phase1_id: 10.0.0.1
IKEv2-PROTO-5: (16):
```

```
   SM Trace->
   SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (R)
   MsgID = 00000001
   CurState: AUTH_DONE
  Event: EV_REGISTER_SESSION
```

注：通常、応答側トンネルは発信側トンネルよりも先にアクティブになります。

IKEv2登録プロセスはASA1で行われます。

```
IKEv2-PLAT-3: (16)
   connection
   auth hdl set to 15
IKEv2-PLAT-3: AAA conn
   attribute retrieval
   successfully queued
   for register session
   request.
IKEv2-PROTO-3: (16):
IKEv2-PROTO-5: (16):
   SM Trace->
   SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (I)
   MsgID = 00000001
   CurState: AUTH_DONE
   Event: EV_NO_EVENT
IKEv2-PLAT-3: (16) idle
   timeout set to: 30
IKEv2-PLAT-3: (16) session
   timeout set to: 0
IKEv2-PLAT-3: (16) group
   policy set to
   DfltGrpPolicy
IKEv2-PLAT-3: (16) class
   attr set
IKEv2-PLAT-3: (16) tunnel
   protocol set to: 0x5c
IKEv2-PLAT-3: IPv4 filter
   ID not configured
   for connection
IKEv2-PLAT-3: (16) group
   lock set to: none
IKEv2-PLAT-3: IPv6 filter ID
   not configured
   for connection
IKEv2-PLAT-3: (16)
   connection attribues
   set valid to TRUE
IKEv2-PLAT-3: Successfully
   retrieved conn attrs
IKEv2-PLAT-3: Session
   registration after conn
   attr retrieval
   PASSED, No error
IKEv2-PLAT-3:
CONNECTION STATUS:
   REGISTERED...
   peer: 10.0.0.2:500,
  phase1_id: 10.0.0.2
```

IKEv2登録プロセスはASA2で実行されます。

```
IKEv2-PLAT-3: (16)
   connection
   auth hdl set to 15
IKEv2-PLAT-3: AAA conn
   attribute retrieval
   successfully queued for
   register session request.
IKEv2-PROTO-3: (16):
IKEv2-PROTO-5: (16):
   SM Trace->
   SA: I_SPI=DFA3B583A4369958
   R_SPI=27C943C13FD94665 (R)
   MsgID = 00000001
   CurState: AUTH_DONE
   Event: EV_NO_EVENT
IKEv2-PLAT-3: (16) idle
   timeout
   set to: 30
IKEv2-PLAT-3: (16) session
   timeout
   set to: 0
IKEv2-PLAT-3: (16) group
   policy set to
   DfltGrpPolicy
IKEv2-PLAT-3: (16) class
   attr set
IKEv2-PLAT-3: (16) tunnel
   protocol set to: 0x5c
IKEv2-PLAT-3: IPv4 filter ID
   not configured
   for connection
IKEv2-PLAT-3: (16) group
   lock set to: none
IKEv2-PLAT-3: IPv6 filter ID
   not configured
   for connection
   attribues set
   valid to TRUE
IKEv2-PLAT-3: Successfully
   retrieved conn attrs
IKEv2-PLAT-3: Session
   registration after conn
   attr retrieval PASSED,
   No error
IKEv2-PLAT-3:
CONNECTION STATUS:
   REGISTERED...
   peer: 10.0.0.1:500,
  phase1_id: 10.0.0.1
```

子SAのデバッグ

> **注**：この交換は単一の要求と応答のペアで構成され、IKEv1ではフェーズ2の交換と呼ばれます。最初の交換が完了した後、IKE_SAのどちらの端からでも開始できます。

ASA2 が CHILD_SA 交換を開始します。これは CREATE_CHILD_SA 要求です。CHILD_SA パケットには一般的に次が含まれます。

- **SA HDR**:version.flagsと交換タイプが含まれます。

- **ナンスNi**（オプション）:CHILD_SAが初期交換の一部として作成される場合、2番目のキー交換(KE)ペイロードとナンスは送信できません。

- **SA ペイロード**

- **KEi**(Key-optional):CREATE_CHILD_SA要求には、CHILD_SAの転送秘密をより強固に保証するために、追加のDH交換のKEペイロードをオプションで含めることができます。SAが提供するDHグループが異なる場合、KEiは発信側が応答側が受け入れることを期待するグループの要素である必要があります。推測が誤っている場合、CREATE_CHILD_SA交換は失敗し、別のKEiで再試行する必要があります。

- **N**（Notifyペイロード、オプション）:Notifyペイロードは、エラー状態や状態遷移などの情報データをIKEピアに送信するために使用されます。Notify Payloadは、応答メッセージ（通常は要求が拒否された理由を示す）、情報の交換（IKE要求以外のエラーを報告する）、またはその他のメッセージに表示され、送信者の機能を示したり、要求の意味を変更したりできます。このCREATE_CHILD_SA交換がIKE_SA以外の現在のSAのキーを再生成する場合、タイプREKEY_SAのリードNペイロードは、キー再生成されるSAを識別する必要があります。このCREATE_CHILD_SA交換が現在のSAのキー再生成を行わない場合、Nペイロードを省略する必要があります。

- **TSiおよびTSr(オ**プション):SAが作成されるトラフィックセレクタを表示します。この例では、ホスト 192.168.1.12 とホスト 192.168.2.99 の間です。

CREATE_CHILD_SAデバッグ出力を次に示します。

```
IKEv2-PLAT-5: INVALID PSH HANDLE
IKEv2-PLAT-3: attempting to find tunnel group
   for IP: 10.0.0.1
IKEv2-PLAT-3: mapped to tunnel group 10.0.0.1
   using peer IP
IKEv2-PLAT-3: my_auth_method = 2
IKEv2-PLAT-3: supported_peers_auth_method = 2
IKEv2-PLAT-3: P1 ID = 0
IKEv2-PLAT-3: Translating IKE_ID_AUTO to = 255
IKEv2-PLAT-3: (226) tp_name set to:
IKEv2-PLAT-3: (226) tg_name set to: 10.0.0.1
IKEv2-PLAT-3: (226) tunn grp type set to: L2L
IKEv2-PLAT-3: PSH cleanup
IKEv2-PROTO-5: (225): SM Trace-> SA:
   I_SPI=FD366326E1FED6FE R_SPI=A75B9B2582AAECB7
   (I) MsgID = 00000001 CurState: READY
   Event: EV_INIT_CREATE_CHILD
IKEv2-PROTO-5: (225): Action: Action_Null
IKEv2-PROTO-5: (225): SM Trace-> SA:
   I_SPI=FD366326E1FED6FE R_SPI=A75B9B2582AAECB7
   (I) MsgID = 00000001 CurState: CHILD_I_INIT
   Event: EV_INIT_CREATE_CHILD
IKEv2-PROTO-5: (225): Action: Action_Null
IKEv2-PROTO-5: (225): SM Trace-> SA:
   I_SPI=FD366326E1FED6FE R_SPI=A75B9B2582AAECB7
   (I) MsgID = 00000001 CurState: CHILD_I_IPSEC
   Event: EV_INIT_CREATE_CHILD
IKEv2-PROTO-3: (225): Check for IPSEC rekey
IKEv2-PROTO-5: (225): SM Trace-> SA:
```

```
   I_SPI=FD366326E1FED6FE R_SPI=A75B9B2582AAECB7
   (I) MsgID = 00000001 CurState: CHILD_I_IPSEC
   Event: EV_SET_IPSEC_DH_GRP
IKEv2-PROTO-3: (225): Set IPSEC DH group
IKEv2-PROTO-5: (225): SM Trace-> SA:
   I_SPI=FD366326E1FED6FE R_SPI=A75B9B2582AAECB7
   (I) MsgID = 00000001
   CurState: CHILD_I_IPSEC Event: EV_CHK4_PFS
IKEv2-PROTO-3: (225): Checking for PFS configuration
IKEv2-PROTO-5: (225): SM Trace-> SA:
   I_SPI=FD366326E1FED6FE R_SPI=A75B9B2582AAECB7
   (I) MsgID = 00000001 CurState: CHILD_I_IPSEC
   Event: EV_BLD_MSG
IKEv2-PROTO-2: (225): Sending child SA exchange
IKEv2-PROTO-3: ESP Proposal: 1, SPI size: 4
   (IPSec negotiation), num. transforms: 4
   AES-CBC SHA96 MD596
IKEv2-PROTO-3: (225): Building packet for encryption;
   contents are:
   SA Next payload: N, reserved: 0x0, length: 52
IKEv2-PROTO-4: last proposal: 0x0, reserved: 0x0,
   length: 48 Proposal: 1, Protocol id: ESP,
   SPI size: 4, #trans: 4
IKEv2-PROTO-4: last transform: 0x3, reserved: 0x0:
   length: 12 type: 1, reserved: 0x0, id: AES-CBC
IKEv2-PROTO-4: last transform: 0x3, reserved: 0x0:
  length: 8 type: 3, reserved: 0x0, id: SHA96
IKEv2-PROTO-4: last transform: 0x3, reserved: 0x0:
   length: 8 type: 3, reserved: 0x0, id: MD596
IKEv2-PROTO-4: last transform: 0x0, reserved: 0x0:
   length: 8 type: 5, reserved: 0x0, id:

N Next payload: TSi, reserved: 0x0, length: 24

2d 3e ec 11 e0 c7 5d 67 d5 23 25 76 1d 50 0d 05
fa b7 f0 48
TSi Next payload: TSr, reserved: 0x0, length: 24
Num of TSs: 1, reserved 0x0, reserved 0x0
TS type: TS_IPV4_ADDR_RANGE, proto id: 0, length: 16
start port: 0, end port: 65535
start addr: 192.168.2.99, end addr: 192.168.2.99
TSr Next payload: NONE, reserved: 0x0, length: 24
Num of TSs: 1, reserved 0x0, reserved 0x0
TS type: TS_IPV4_ADDR_RANGE, proto id: 0, length: 16
start port: 0, end port: 65535
start addr: 192.168.1.12, end addr: 192.168.1.12

IKEv2-PROTO-3: (225): Checking if request will fit in
   peer window
IKEv2-PROTO-3: Tx [L 10.0.0.2:500/R 10.0.0.1:500/VRF i0:f0]
   m_id: 0x6
IKEv2-PROTO-3: HDR[i:FD366326E1FED6FE -
   r: A75B9B2582AAECB7]
IKEv2-PROTO-4: IKEV2 HDR ispi: FD366326E1FED6FE -
   rspi: A75B9B2582AAECB7
IKEv2-PROTO-4: Next payload: ENCR, version: 2.0
IKEv2-PROTO-4: Exchange type: CREATE_CHILD_SA,
   flags: INITIATOR
IKEv2-PROTO-4: Message id: 0x6, length: 180
ENCR Next payload: SA, reserved: 0x0, length: 152
Encrypted data&colon; 148 bytes
```

ASA2はこのパケットを送信し、応答を待ちます。

```
IKEv2-PLAT-4: SENT PKT
   [CREATE_CHILD_SA]
   [10.0.0.2]:500->
   [10.0.0.1]:500
   InitSPI=0xfd366326e1fed6fe
   RespSPI=0xa75b9b2582aaecb7
   MID=00000006

IKEv2-PROTO-5: (225):
   SM Trace->
   SA: I_SPI=FD366326E1FED6FE
   R_SPI=A75B9B2582AAECB7 (I)
   MsgID = 00000006
   CurState: CHILD_I_WAIT
  Event: EV_NO_EVENT
```

ASA1がパケットを受信します。

```
IKEv2-PLAT-4:
   RECV PKT [CREATE_CHILD_SA]
   [10.0.0.2]:500->
   [10.0.0.1]:500
   InitSPI=0xfd366326e1fed6fe
   RespSPI=0xa75b9b2582aaecb7
   MID=00000006

IKEv2-PROTO-3: Rx
   [L 10.0.0.1:500/R
   10.0.0.2:500/VRF i0:f0]
  m_id: 0x6
```

次に、ASA1はASA2から次の正確なパケットを受信し、それを確認します。

```
IKEv2-PROTO-3: HDR[i:FD366326E1FED6FE -
   r: A75B9B2582AAECB7]
IKEv2-PROTO-4: IKEV2 HDR ispi: FD366326E1FED6FE -
   rspi: A75B9B2582AAECB7
IKEv2-PROTO-4: Next payload: ENCR, version: 2.0
IKEv2-PROTO-4: Exchange type: CREATE_CHILD_SA,
   flags: INITIATOR
IKEv2-PROTO-4: Message id: 0x6, length: 180
IKEv2-PROTO-5: (225): Request has mess_id 6;
   expected 6 through 6
   REAL Decrypted packet:Data&colon; 124 bytes
   SA Next payload: N, reserved: 0x0, length: 52
IKEv2-PROTO-4: last proposal: 0x0, reserved: 0x0,
   length: 48 Proposal: 1, Protocol id: ESP,
   SPI size: 4, #trans: 4
IKEv2-PROTO-4: last transform: 0x3, reserved: 0x0:
   length: 12 ype: 1, reserved: 0x0, id: AES-CBC
IKEv2-PROTO-4: last transform: 0x3, reserved: 0x0:
   length: 8 type: 3, reserved: 0x0, id: SHA96
IKEv2-PROTO-4: last transform: 0x3, reserved: 0x0:
   length: 8 type: 3, reserved: 0x0, id: MD596
IKEv2-PROTO-4: last transform: 0x0, reserved: 0x0:
   length: 8 type: 5, reserved: 0x0, id:

N Next payload: TSi, reserved: 0x0, length: 24

2d 3e ec 11 e0 c7 5d 67 d5 23 25 76 1d 50 0d 05
fa b7 f0 48
```

```
TSi Next payload: TSr, reserved: 0x0, length: 24
Num of TSs: 1, reserved 0x0, reserved 0x0
TS type: TS_IPV4_ADDR_RANGE, proto id: 0, length: 16
start port: 0, end port: 65535
start addr: 192.168.2.99, end addr: 192.168.2.99
TSr Next payload: NONE, reserved: 0x0, length: 24
Num of TSs: 1, reserved 0x0, reserved 0x0
TS type: TS_IPV4_ADDR_RANGE, proto id: 0, length: 16
start port: 0, end port: 65535
start addr: 192.168.1.12, end addr: 192.168.1.12
Decrypted packet:Data&colon; 180 bytes
IKEv2-PROTO-5: (225): SM Trace->
   SA: I_SPI=FD366326E1FED6FE R_SPI=A75B9B2582AAECB7 (R)
   MsgID = 00000006 CurState: READY
   Event: EV_RECV_CREATE_CHILD
IKEv2-PROTO-5: (225): Action: Action_Null
IKEv2-PROTO-5: (225): SM Trace->
   SA: I_SPI=FD366326E1FED6FE R_SPI=A75B9B2582AAECB7 (R)
   MsgID = 00000006 CurState: CHILD_R_INIT
   Event: EV_RECV_CREATE_CHILD
IKEv2-PROTO-5: (225): Action: Action_Null
IKEv2-PROTO-5: (225): SM Trace->
   SA: I_SPI=FD366326E1FED6FE R_SPI=A75B9B2582AAECB7 (R)
   MsgID = 00000006 CurState: CHILD_R_INIT
   Event: EV_VERIFY_MSG
IKEv2-PROTO-3: (225): Validating create child message
IKEv2-PROTO-5: (225): SM Trace->
   SA: I_SPI=FD366326E1FED6FE R_SPI=A75B9B2582AAECB7 (R)
   MsgID = 00000006 urState: CHILD_R_INIT
  Event: EV_CHK_CC_TYPE
```

ASA1 は CHILD_SA 交換の返信を作成します。これは CREATE_CHILD_SA 応答です。CHILD_SA パケットには一般的に次が含まれます。

- SA HDR:version.flagsと交換タイプが含まれます。
- ナンスNi（オプション）:CHILD_SAが初期交換の一部として作成される場合、2番目のKEペイロードとナンスは送信できません。
- SA ペイロード
- KEi（キー、オプション）:CHILD_SAの転送秘密の強力な保証を有効にするために、CREATE_CHILD_SA要求には追加のDH交換のKEペイロードをオプションで含めることができます。SAが提供するDHグループが異なる場合、KEiは発信側が応答側が受け入れることを期待するグループの要素である必要があります。推測に失敗した場合、CREATE_CHILD_SA の交換は失敗し、別の KEi を使用して再試行を行う必要があります。
- N（Notifyペイロード、オプション）:Notifyペイロードは、エラー状態や状態遷移などの情報データをIKEピアに送信するために使用されます。Notify Payloadは、応答メッセージ（通常は要求が拒否された理由を示す）、情報の交換（IKE要求内にない エラーを報告するため）、またはその他のメッセージで、送信者機能を示すために、または要求の意味を変更するために表示されます。このCREATE_CHILD_SA交換がIKE_SA以外の現在のSAのキーを再生成する場合、タイプREKEY_SAのリードNペイロードは、キー再生成されるSAを識別する必要があります。このCREATE_CHILD_SA交換が現在のSAのキー再生成を行わない場合、Nペイロードを省略する必要があります。

- **TSiおよびTSr(オプション)**:SAが作成されるトラフィックセレクタを表示します。この例では、ホスト 192.168.1.12 とホスト 192.168.2.99 の間です。

デバッグ出力を次に示します。

```
IKEv2-PROTO-3: (225): Check for create child
   response message type
IKEv2-PROTO-5: (225): SM Trace->
   SA:I_SPI=FD366326E1FED6FE R_SPI=A75B9B2582AAECB7 (R)
   MsgID = 00000006 CurState: CHILD_R_IPSEC
   Event: EV_PROC_MSG
IKEv2-PROTO-2: (225): Processing child
   SA exchange
IKEv2-PLAT-3: Selector received from peer
   is accepted
IKEv2-PLAT-3: PROXY MATCH on crypto map
   outside_map seq 1
IKEv2-PROTO-5: (225): SM Trace->
   SA:I_SPI=FD366326E1FED6FE
   R_SPI=A75B9B2582AAECB7 (R) MsgID = 00000006
   CurState: CHILD_R_IPSEC Event: EV_NO_EVENT
IKEv2-PROTO-5: (225): SM Trace->
   SA:I_SPI=FD366326E1FED6FE
   R_SPI=A75B9B2582AAECB7 (R) MsgID = 00000005
   CurState: EXIT Event: EV_FREE_NEG
IKEv2-PROTO-5: (225): Deleting negotiation context
   for peer message ID: 0x5
IKEv2-PROTO-5: (225): SM Trace->
   SA:I_SPI=FD366326E1FED6FE
   R_SPI=A75B9B2582AAECB7 (R) MsgID = 00000006
   CurState: CHILD_R_IPSEC
   Event: EV_OK_RECD_IPSEC_RESP
IKEv2-PROTO-5: (225): Action: Action_Null
IKEv2-PROTO-5: (225): SM Trace->
   SA:I_SPI=FD366326E1FED6FE
   R_SPI=A75B9B2582AAECB7 (R) MsgID = 00000006
   CurState: CHILD_R_IPSEC Event: EV_PROC_MSG
IKEv2-PROTO-2: (225): Processing child SA exchange
IKEv2-PROTO-5: (225): SM Trace->
   SA:I_SPI=FD366326E1FED6FE R_SPI=A75B9B2582AAECB7 (R)
   MsgID = 00000006 CurState:
   CHILD_R_IPSEC Event: EV_SET_IPSEC_DH_GRP
IKEv2-PROTO-3: (225): Set IPSEC DH group
IKEv2-PROTO-5: (225): SM Trace->
   SA:I_SPI=FD366326E1FED6FE
   R_SPI=A75B9B2582AAECB7 (R) MsgID = 00000006
   CurState: CHILD_R_IPSEC Event: EV_OK
IKEv2-PROTO-3: (225): Requesting SPI from IPSec
IKEv2-PROTO-5: (225): SM Trace->
   SA:I_SPI=FD366326E1FED6FE
   R_SPI=A75B9B2582AAECB7 (R) MsgID = 00000006
   CurState: CHILD_R_WAIT_SPI Event: EV_OK_GOT_SPI
IKEv2-PROTO-5: (225): Action: Action_Null
IKEv2-PROTO-5: (225): SM Trace->
   SA:I_SPI=FD366326E1FED6FE
   R_SPI=A75B9B2582AAECB7 (R) MsgID = 00000006
   CurState: CHILD_R_BLD_MSG Event: EV_CHK4_PFS
IKEv2-PROTO-3: (225): Checking for PFS configuration
IKEv2-PROTO-5: (225): SM Trace->
   SA:I_SPI=FD366326E1FED6FE
   R_SPI=A75B9B2582AAECB7 (R) MsgID = 00000006
   CurState: CHILD_R_BLD_MSG Event: EV_BLD_MSG
```

```
IKEv2-PROTO-2: (225): Sending child SA exchange
IKEv2-PROTO-3: ESP Proposal: 1, SPI size: 4
  (IPSec negotiation),
Num. transforms: 3
AES-CBC SHA96
IKEv2-PROTO-3: (225): Building packet for encryption;
   contents are:
SA Next payload: N, reserved: 0x0, length: 44
IKEv2-PROTO-4: last proposal: 0x0, reserved: 0x0,
   length: 40
Proposal: 1, Protocol id: ESP, SPI size: 4,
   #trans: 3
IKEv2-PROTO-4: last transform: 0x3, reserved: 0x0:
   length: 12
type: 1, reserved: 0x0, id: AES-CBC
IKEv2-PROTO-4: last transform: 0x3, reserved: 0x0:
   length: 8
type: 3, reserved: 0x0, id: SHA96
IKEv2-PROTO-4: last transform: 0x0,
   reserved: 0x0: length: 8
type: 5, reserved: 0x0, id:

N Next payload: TSi, reserved: 0x0,
   length: 24

b7 6a c6 75 53 55 99 5a df ee 05
   18 1a 27 a6 cb
01 56 22 ad
TSi Next payload: TSr, reserved: 0x0,
   length: 24
Num of TSs: 1, reserved 0x0, reserved 0x0
TS type: TS_IPV4_ADDR_RANGE, proto id: 0,
   length: 16
start port: 0, end port: 65535
start addr: 192.168.2.99,
   end addr: 192.168.2.99
TSr Next payload: NONE, reserved: 0x0,
   length: 24
Num of TSs: 1, reserved 0x0, reserved 0x0
TS type: TS_IPV4_ADDR_RANGE, proto id: 0,
   length: 16
start port: 0, end port: 65535
start addr: 192.168.1.12, end addr: 192.168.1.12

IKEv2-PROTO-3: Tx
   [L 10.0.0.1:500/R 10.0.0.2:500/VRF i0:f0]
   m_id: 0x6
IKEv2-PROTO-3: HDR[i:FD366326E1FED6FE -
   r: A75B9B2582AAECB7]
IKEv2-PROTO-4: IKEV2 HDR ispi: FD366326E1FED6FE -
   rspi: A75B9B2582AAECB7
IKEv2-PROTO-4: Next payload: ENCR, version: 2.0
IKEv2-PROTO-4: Exchange type: CREATE_CHILD_SA,
   flags: RESPONDER MSG-RESPONSE
IKEv2-PROTO-4: Message id: 0x6, length: 172
ENCR Next payload: SA, reserved: 0x0,
   length: 144
Encrypted data&colon; 140 bytes
```

ASA1が応答を送信します。

```
IKEv2-PLAT-4: SENT PKT
   [CREATE_CHILD_SA]
```

```
   [10.0.0.1]:500->
   [10.0.0.2]:500
   InitSPI=0xfd366326e1fed6fe
   RespSPI=0xa75b9b2582aaecb7
  MID=00000006
```

ASA2がパケットを受信します。

```
IKEv2-PLAT-4:
   RECV PKT [CREATE_CHILD_SA]
   [10.0.0.1]:500->
   [10.0.0.2]:500
   InitSPI=0xfd366326e1fed6fe
   RespSPI=0xa75b9b2582aaecb7
   MID=00000006

IKEv2-PROTO-3: Rx
   [L 10.0.0.2:500/R
   10.0.0.1:500/VRF i0:f0]
  m_id: 0x6
```

ASA2は次のようにパケットを確認します。

```
IKEv2-PROTO-3: HDR[i:FD366326E1FED6FE -
   r: A75B9B2582AAECB7]
IKEv2-PROTO-4: IKEV2 HDR ispi: FD366326E1FED6FE -
   rspi: A75B9B2582AAECB7
IKEv2-PROTO-4: Next payload: ENCR, version: 2.0
IKEv2-PROTO-4: Exchange type: CREATE_CHILD_SA,
   flags: RESPONDER MSG-RESPONSE
IKEv2-PROTO-4: Message id: 0x6, length: 172

REAL Decrypted packet:Data&colon; 116 bytes
SA Next payload: N, reserved: 0x0, length: 44
IKEv2-PROTO-4: last proposal: 0x0, reserved: 0x0,
   length: 40 Proposal: 1, Protocol id: ESP, SPI size: 4,
   #trans: 3
IKEv2-PROTO-4: last transform: 0x3, reserved: 0x0:
   length: 12 type: 1, reserved: 0x0, id: AES-CBC
IKEv2-PROTO-4: last transform: 0x3, reserved: 0x0:
   length: 8 type: 3, reserved: 0x0, id: SHA96
IKEv2-PROTO-4: last transform: 0x0,
   reserved: 0x0: length: 8 type: 5, reserved: 0x0, id:

N Next payload: TSi, reserved: 0x0,
   length: 24

b7 6a c6 75 53 55 99 5a df ee 05 18
   1a 27 a6 cb
01 56 22 ad
TSi Next payload: TSr, reserved: 0x0,
   length: 24
Num of TSs: 1, reserved 0x0, reserved 0x0
TS type: TS_IPV4_ADDR_RANGE, proto id: 0,
   length: 16
start port: 0, end port: 65535
start addr: 192.168.2.99,
   end addr: 192.168.2.99
TSr Next payload: NONE, reserved: 0x0,
   length: 24
Num of TSs: 1, reserved 0x0, reserved 0x0
TS type: TS_IPV4_ADDR_RANGE, proto id: 0,
```

```
   length: 16
start port: 0, end port: 65535
start addr: 192.168.1.12,
   end addr: 192.168.1.12

Decrypted packet:Data&colon; 172 bytes
IKEv2-PROTO-5: (225): SM Trace->
   SA: I_SPI=FD366326E1FED6FE R_SPI=A75B9B2582AAECB7 (I)
   MsgID = 00000006 CurState:
   CHILD_I_WAIT Event: EV_RECV_CREATE_CHILD
IKEv2-PROTO-5: (225): Action: Action_Null
IKEv2-PROTO-5: (225): SM Trace-> SA: I_SPI=FD366326E1FED6FE
   R_SPI=A75B9B2582AAECB7 (I) MsgID = 00000006
   CurState: CHILD_I_PROC Event: EV_CHK4_NOTIFY
IKEv2-PROTO-2: (225): Processing any notify-messages
   in child SA exchange
IKEv2-PROTO-5: (225): SM Trace->
   SA: I_SPI=FD366326E1FED6FE R_SPI=A75B9B2582AAECB7 (I)
   MsgID = 00000006 CurState: CHILD_I_PROC
   Event: EV_VERIFY_MSG
IKEv2-PROTO-3: (225): Validating create child message
IKEv2-PROTO-5: (225): SM Trace->
   SA: I_SPI=FD366326E1FED6FE R_SPI=A75B9B2582AAECB7 (I)
   MsgID = 00000006 CurState: CHILD_I_PROC
   Event: EV_PROC_MSG
IKEv2-PROTO-2: (225): Processing child SA exchange
IKEv2-PROTO-5: (225): SM Trace->
   SA: I_SPI=FD366326E1FED6FE R_SPI=A75B9B2582AAECB7 (
   I) MsgID = 00000006 CurState: CHILD_I_PROC
   Event: EV_CHK4_PFS
IKEv2-PROTO-3: (225): Checking for PFS configuration
IKEv2-PROTO-5: (225): SM Trace-> SA:
   I_SPI=FD366326E1FED6FE R_SPI=A75B9B2582AAECB7 (I)
   MsgID = 00000006 CurState: CHILD_I_PROC
   Event: EV_CHK_IKE_REKEY
IKEv2-PROTO-3: (225): Checking if IKE SA rekey
IKEv2-PROTO-5: (225): SM Trace-> SA:
   I_SPI=FD366326E1FED6FE R_SPI=A75B9B2582AAECB7 (I)
   MsgID = 00000006 CurState: CHILD_I_PROC
   Event: EV_GEN_LOAD_IPSEC
IKEv2-PROTO-3: (225): Load IPSEC key material
IKEv2-PLAT-3: PROXY MATCH on crypto map outside_map seq 1
IKEv2-PLAT-3: (225) DPD Max Time will be: 10
IKEv2-PLAT-3: (225) DPD Max Time will be: 10
```

ASA1は、この子SAエントリをSADに挿入します。

```
IKEv2-PROTO-5: (225):
   SM Trace->
   SA: I_SPI=FD366326E1FED6FE
   R_SPI=A75B9B2582AAECB7 (R)
   MsgID = 00000006
   CurState: CHILD_R_DONE
   Event: EV_OK

IKEv2-PROTO-2: (225):
   SA created; inserting
   SA into database

IKEv2-PROTO-5: (225):
   SM Trace->
   SA: I_SPI=FD366326E1FED6FE
   R_SPI=A75B9B2582AAECB7 (R)
```

```
   MsgID = 00000006 CurState:
   CHILD_R_DONE
  Event: EV_START_DEL_NEG_TMR
```

ASA2は、この子SAエントリをSADに挿入します。

```
IKEv2-PROTO-5: (225):
   SM Trace->
   SA: I_SPI=FD366326E1FED6FE
   R_SPI=A75B9B2582AAECB7 (I)
   MsgID = 00000006
   CurState: CHILD_I_DONE
   Event: EV_OK

IKEv2-PROTO-2: (225):
   SA created;
  inserting SA into database
```

トンネルの確認

Internet Security Association and Key Management Protocol(ISAKMP)およびIPSecトンネルの設定を確認するには、このセクションで説明する情報を使用します。

ISAKMP

ISAKMPを確認するには、次のコマンドを入力します。

```
show crypto isakmp sa det
```

ASA1

ASA1の出力を次に示します。

```
ASA1(config)#show cry isa sa det
There are no IKEv1 SAs

IKEv2 SAs:Session-id:99220, Status:UP-ACTIVE, IKE count:1, CHILD count:2

Tunnel-id Local Remote Status Role
1889403559 10.0.0.1/500 10.0.0.2/500 READY RESPONDER

Encr: 3DES, Hash: MD596, DH Grp:2, Auth sign: PSK, Auth verify: PSK
Life/Active Time: 86400/195 sec
Session-id: 99220
Status Description: Negotiation done
Local spi: A75B9B2582AAECB7 Remote spi: FD366326E1FED6FE
Local id: 10.0.0.1
Remote id: 10.0.0.2
Local req mess id: 14 Remote req mess id: 16
Local next mess id: 14 Remote next mess id: 16
Local req queued: 14 Remote req queued: 16
Local window: 1 Remote window: 1
DPD configured for 10 seconds, retry 2
NAT-T is not detected
Child sa: local selector 192.168.1.12/0 - 192.168.1.12/65535
remote selector 192.168.2.99/0 - 192.168.2.99/65535
ESP spi in/out: 0x8564387d/0x8717a5a
```

```
AH spi in/out: 0x0/0x0
CPI in/out: 0x0/0x0
Encr: AES-CBC, keysize: 256, esp_hmac: SHA96
ah_hmac: None, comp: IPCOMP_NONE, mode tunnel
Child sa: local selector 192.168.1.1/0 - 192.168.1.1/65535
remote selector 192.168.2.99/0 - 192.168.2.99/65535
ESP spi in/out: 0x74756292/0xf0d97b2a
AH spi in/out: 0x0/0x0
CPI in/out: 0x0/0x0
Encr: AES-CBC, keysize: 256, esp_hmac: SHA96
ah_hmac: _NONE,, comp: IPCOMP_NONE, mode tunnel
```

ASA2

ASA2の出力を次に示します。

```
ASA2(config)#show cry isa sa det

There are no IKEv1 SAs

IKEv2 SAs:

Session-id:99220, Status:UP-ACTIVE, IKE count:1, CHILD count:2

Tunnel-id                Local                Remote    Status        Role
472237395         10.0.0.2/500         10.0.0.1/500     READY   INITIATOR
     Encr: 3DES, Hash: MD596, DH Grp:2, Auth sign: PSK, Auth verify: PSK
     Life/Active Time: 86400/190 sec
     Session-id: 99220
     Status Description: Negotiation done
     Local spi: FD366326E1FED6FE       Remote spi: A75B9B2582AAECB7
     Local id: 10.0.0.2
     Remote id: 10.0.0.1
     Local req mess id: 16             Remote req mess id: 13
     Local next mess id: 16            Remote next mess id: 13
     Local req queued: 16              Remote req queued: 13
     Local window: 1                   Remote window: 1
     DPD configured for 10 seconds, retry 2
     NAT-T is not detected
Child sa: local selector  192.168.2.99/0 - 192.168.2.99/65535
         remote selector 192.168.1.12/0 - 192.168.1.12/65535
         ESP spi in/out: 0x8717a5a/0x8564387d
         AH spi in/out: 0x0/0x0
         CPI in/out: 0x0/0x0
         Encr: AES-CBC, keysize: 256, esp_hmac: SHA96
         ah_hmac: None, comp: IPCOMP_NONE, mode tunnel
Child sa: local selector  192.168.2.99/0 - 192.168.2.99/65535
         remote selector 192.168.1.1/0 - 192.168.1.1/65535
         ESP spi in/out: 0xf0d97b2a/0x74756292
         AH spi in/out: 0x0/0x0
         CPI in/out: 0x0/0x0
         Encr: AES-CBC, keysize: 256, esp_hmac: SHA96
         ah_hmac: None, comp: IPCOMP_NONE, mode tunnel
```

IPSec

IPSecを確認するには、次のコマンドを入力します。

show crypto ipsec sa

ASA1

ASA1の出力を次に示します。

```
ASA1(config)#show cry ipsec sa
interface: outside
   Crypto map tag: outside_map, seq num: 1, local addr: 10.0.0.1

     access-list l2l_list extended permit ip host 192.168.1.1
       host 192.168.2.99
      local ident (addr/mask/prot/port):
         (192.168.1.1/255.255.255.255/0/0)
      remote ident (addr/mask/prot/port): (
         192.168.2.99/255.255.255.255/0/0)
      current_peer: 10.0.0.2

      #pkts encaps: 3, #pkts encrypt: 3, #pkts digest: 3
      #pkts decaps: 3, #pkts decrypt: 3, #pkts verify: 3
      #pkts compressed: 0, #pkts decompressed: 0
      #pkts not compressed: 3, #pkts comp failed: 0,
         #pkts decomp failed: 0
      #pre-frag successes: 0, #pre-frag failures: 0,
         #fragments created: 0
      #PMTUs sent: 0, #PMTUs rcvd: 0,
         #decapsulated frgs needing reassembly: 0
      #send errors: 0, #recv errors: 0

      local crypto endpt.: 10.0.0.1/500, remote crypto endpt.:
         10.0.0.2/500
      path mtu 1500, ipsec overhead 74, media mtu 1500
      current outbound spi: F0D97B2A
      current inbound spi : 74756292

    inbound esp sas:
      spi: 0x74756292 (1953850002)
         transform: esp-aes-256 esp-sha-hmac no compression
         in use settings ={L2L, Tunnel, }
         slot: 0, conn_id: 137990144, crypto-map: outside_map
         sa timing: remaining key lifetime (kB/sec): (4008959/28628)
         IV size: 16 bytes
         replay detection support: Y
         Anti replay bitmap:
          0x00000000 0x0000000F
   outbound esp sas:
     spi: 0xF0D97B2A (4040784682)
        transform: esp-aes-256 esp-sha-hmac no compression
        in use settings ={L2L, Tunnel, }
        slot: 0, conn_id: 137990144, crypto-map: outside_map
        sa timing: remaining key lifetime (kB/sec): (4147199/28628)
        IV size: 16 bytes
        replay detection support: Y
        Anti replay bitmap:
          0x00000000 0x00000001

   Crypto map tag: outside_map, seq num: 1, local addr: 10.0.0.1

     access-list l2l_list extended permit ip host 192.168.1.12
       host 192.168.2.99
     local ident (addr/mask/prot/port): (
       192.168.1.12/255.255.255.255/0/0)
     remote ident (addr/mask/prot/port):
       (192.168.2.99/255.255.255.255/0/0)
     current_peer: 10.0.0.2
     #pkts encaps: 3, #pkts encrypt: 3, #pkts digest: 3
```

```
      #pkts decaps: 3, #pkts decrypt: 3, #pkts verify: 3
      #pkts compressed: 0, #pkts decompressed: 0
      #pkts not compressed: 3, #pkts comp failed: 0,
        #pkts decomp failed: 0
      #pre-frag successes: 0, #pre-frag failures: 0,
        #fragments created: 0
      #PMTUs sent: 0, #PMTUs rcvd: 0, #decapsulated frgs needing
        reassembly: 0
      #send errors: 0, #recv errors: 0

      local crypto endpt.: 10.0.0.1/500, remote crypto
        endpt.: 10.0.0.2/500
      path mtu 1500, ipsec overhead 74, media mtu 1500
      current outbound spi: 08717A5A
      current inbound spi : 8564387D

   inbound esp sas:
     spi: 0x8564387D (2237937789)
        transform: esp-aes-256 esp-sha-hmac no compression
        in use settings ={L2L, Tunnel, }
        slot: 0, conn_id: 137990144, crypto-map: outside_map
        sa timing: remaining key lifetime (kB/sec): (4285439/28734)
        IV size: 16 bytes
        replay detection support: Y
        Anti replay bitmap:
         0x00000000 0x0000000F
   outbound esp sas:
     spi: 0x08717A5A (141654618)
        transform: esp-aes-256 esp-sha-hmac no compression
        in use settings ={L2L, Tunnel, }
        slot: 0, conn_id: 137990144, crypto-map: outside_map
        sa timing: remaining key lifetime (kB/sec): (4055039/28734)
        IV size: 16 bytes
        replay detection support: Y
Anti replay bitmap:
0x00000000 0x00000001
```

ASA2

ASA2の出力を次に示します。

```
ASA2(config)#show cry ipsec sa
interface: outside
   Crypto map tag: outside_map, seq num: 1, local addr: 10.0.0.2

     access-list l2l_list extended permit ip host 192.168.2.99 host
       192.168.1.12
     local ident (addr/mask/prot/port):
       (192.168.2.99/255.255.255.255/0/0)
     remote ident (addr/mask/prot/port):
       (192.168.1.12/255.255.255.255/0/0)
     current_peer: 10.0.0.1

     #pkts encaps: 3, #pkts encrypt: 3, #pkts digest: 3
     #pkts decaps: 3, #pkts decrypt: 3, #pkts verify: 3
     #pkts compressed: 0, #pkts decompressed: 0
     #pkts not compressed: 3, #pkts comp failed: 0,
       #pkts decomp failed: 0
     #pre-frag successes: 0, #pre-frag failures: 0,
       #fragments created: 0
     #PMTUs sent: 0, #PMTUs rcvd: 0, #decapsulated frgs needing
       reassembly: 0
```

```
    #send errors: 0, #recv errors: 0

    local crypto endpt.: 10.0.0.2/500, remote crypto
      endpt.: 10.0.0.1/500
    path mtu 1500, ipsec overhead 74, media mtu 1500
    current outbound spi: 8564387D
    current inbound spi : 08717A5A

  inbound esp sas:
    spi: 0x08717A5A (141654618)
       transform: esp-aes-256 esp-sha-hmac no compression
       in use settings ={L2L, Tunnel, }
       slot: 0, conn_id: 137973760, crypto-map: outside_map
       sa timing: remaining key lifetime (kB/sec): (4193279/28770)
       IV size: 16 bytes         replay detection support: Y
       Anti replay bitmap:
        0x00000000 0x0000000F
  outbound esp sas:
    spi: 0x8564387D (2237937789)
       transform: esp-aes-256 esp-sha-hmac no compression
       in use settings ={L2L, Tunnel, }
       slot: 0, conn_id: 137973760, crypto-map: outside_map
       sa timing: remaining key lifetime (kB/sec): (4055039/28770)
       IV size: 16 bytes         replay detection support: Y
       Anti replay bitmap:
        0x00000000 0x00000001

Crypto map tag: outside_map, seq num: 1, local addr: 10.0.0.2

   access-list l2l_list extended permit ip host 192.168.2.99
     host 192.168.1.1
   local ident (addr/mask/prot/port): (
     192.168.2.99/255.255.255.255/0/0)
   remote ident (addr/mask/prot/port):
     (192.168.1.1/255.255.255.255/0/0)
   current_peer: 10.0.0.1
   #pkts encaps: 3, #pkts encrypt: 3, #pkts digest: 3
   #pkts decaps: 3, #pkts decrypt: 3, #pkts verify: 3
   #pkts compressed: 0, #pkts decompressed: 0
   #pkts not compressed: 3, #pkts comp failed: 0,
     #pkts decomp failed: 0
   #pre-frag successes: 0, #pre-frag failures: 0,
     #fragments created: 0
   #PMTUs sent: 0, #PMTUs rcvd: 0, #decapsulated frgs needing
     reassembly: 0
   #send errors: 0, #recv errors: 0

   local crypto endpt.: 10.0.0.2/500, remote crypto
     endpt.: 10.0.0.1/500
   path mtu 1500, ipsec overhead 74, media mtu 1500
   current outbound spi: 74756292
   current inbound spi : F0D97B2A

inbound esp sas:
   spi: 0xF0D97B2A (4040784682)
      transform: esp-aes-256 esp-sha-hmac no compression
      in use settings ={L2L, Tunnel, }
      slot: 0, conn_id: 137973760, crypto-map: outside_map
      sa timing: remaining key lifetime (kB/sec): (4285439/28663)
      IV size: 16 bytes
      replay detection support: Y
      Anti replay bitmap:
       0x00000000 0x0000000F
outbound esp sas:
```

```
    spi: 0x74756292 (1953850002)
       transform: esp-aes-256 esp-sha-hmac no compression
       in use settings ={L2L, Tunnel, }
       slot: 0, conn_id: 137973760, crypto-map: outside_map
       sa timing: remaining key lifetime (kB/sec): (4331519/28663)
       IV size: 16 bytes
       replay detection support: Y
       Anti replay bitmap:
        0x00000000 0x00000001
```

show crypto ikev2 saコマンドの出力を確認することもできます。このコマンドは、**show crypto isakmp sa**コマンドの出力と同じ出力を提供します。

```
IKEv2 SAs:

Session-id:99220, Status:UP-ACTIVE, IKE count:1, CHILD count:2

Tunnel-id                Local                Remote    Status         Role
1889403559          10.0.0.1/500          10.0.0.2/500     READY    RESPONDER
     Encr: 3DES, Hash: MD596, DH Grp:2, Auth sign: PSK, Auth verify: PSK
     Life/Active Time: 86400/179 sec
Child sa: local selector  192.168.1.12/0 - 192.168.1.12/65535
         remote selector 192.168.2.99/0 - 192.168.2.99/65535
         ESP spi in/out: 0x8564387d/0x8717a5a
Child sa: local selector  192.168.1.1/0 - 192.168.1.1/65535
         remote selector 192.168.2.99/0 - 192.168.2.99/65535
         ESP spi in/out: 0x74756292/0xf0d97b2a
```

関連情報

- [シスコテクニカルサポートおよびダウンロード]

翻訳について
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