IPSec 터널 엔드포인트 검색 구성

목차

소개

TED(Tunnel End-Point Discovery)는 라우터가 IPsec(IP Security) 엔드포인트를 자동으로 검색할 수 있도록 하는 Cisco IOS® Software 기능입니다. IKE(Internet Key Exchange)를 사용하여 IPsec을 구축하려면 보안 터널이 설정될 엔드포인트를 식별하는 모든 피어에 대해 암호화 맵을 구성해야 합니다. 터널이 설정될 피어가 많은 경우 이 접근 방식은 제대로 확장되지 않습니다. 동적 암호화 맵은 IPsec 피어를 자동으로 확인하여 이러한 시나리오를 간소화합니다. 이는 IKE 요청을 수신하는 라우터에서만 작동합니다. TED를 사용하면 IKE 요청을 시작 및 수신하는 라우터가 IPsec 터널 엔드포인트를 동적으로 검색할 수 있습니다.

TED는 시작 피어에서 원래 트래픽이 목적지로 지정된 목적지 네트워크 또는 호스트로 전송되는 특수 IKE 패킷인 검색 프로브를 사용합니다. TED 프로브는 보호된 엔티티의 주소를 사용하므로 주소는 전역적으로 라우팅 가능해야 합니다. NAT(Network Address Translation)가 포함된 경우 TED가 작동하지 않습니다.

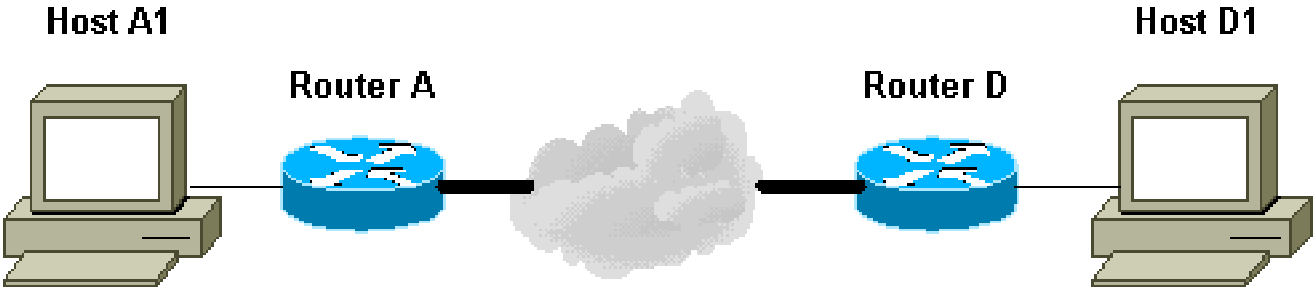
사전 요구 사항

요구 사항

이 구성을 시도하기 전에 다음 요구 사항을 충족해야 합니다.

- IPSec(IP Security) 암호화 소개에서 설명한 IPsec 지식 및 구성

이 예제 네트워크는 TED 프로세스의 작동 방식을 보여줍니다.



1. D1은 A1을 대상으로 하는 데이터 패킷을 전송합니다. SRC=D1 DST=A1
2. D는 IPsec SA(Security Association)가 설정되지 않은 것으로 확인되며(액세스 목록의 범위에 속함), 패킷을 삭제하고 A1을 대상으로 하는 TED 프로브 패킷(원격 피어가 누구인지 찾기 위해)을 페이로드에 포함된 D의 IP 주소로 보냅니다.SRC=D1DST=A1데이터=IP_of_D
3. TED 프로브 패킷이 A에 도착하며, TED 프로브 패킷으로 인식합니다. D1과 A1 사이의 모든 트래픽이 암호화되어야 하므로 패킷을 삭제합니다. 그런 다음 D를 대상으로 하는 TED 응답 패킷을 페이로드에서 IP 주소가 A인 상태로 전송합니다. 이는 D가 IPsec SA를 설정해야 하는 라우터를 알아야 하기 때문에 D가 처음에 TED 프로브 패킷을 보낸 이유입니다 .SRC=ADST=D데이터=IP_of_A
4. TED 응답 패킷은 D에 도착합니다. D는 이제 IKE 엔드포인트를 알고 있으므로 주 모드 또는 적극적인 모드에서 A에 대한 터널을 시작할 수 있습니다.

사용되는 구성 요소

이 문서의 정보는 이러한 소프트웨어 및 하드웨어 버전을 기반으로 합니다.

- Cisco IOS Software 릴리스 12.2(27)
- Cisco 2600 라우터

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

표기 규칙

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

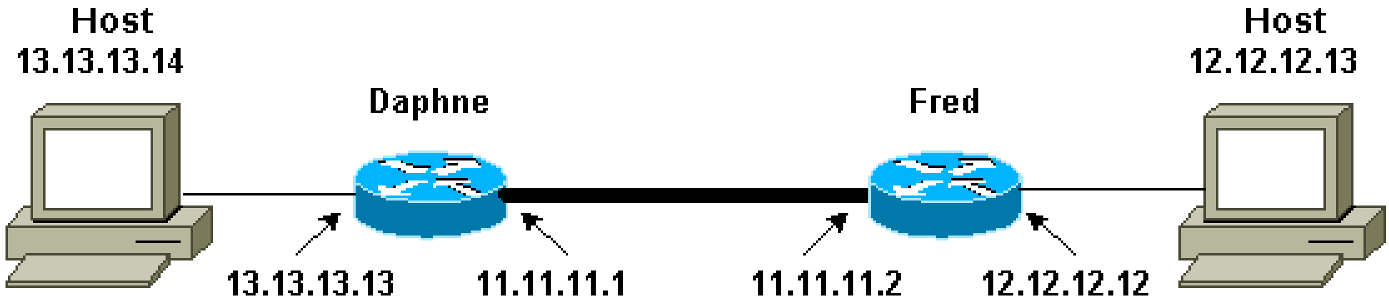
구성

이 섹션에는 이 문서에서 설명하는 기능을 구성하기 위한 정보가 표시됩니다.

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

네트워크 다이어그램

이 문서에서는 다음 네트워크 설정을 사용합니다.



참고: 라우터 Daphne와 Fred 간에 터널을 설정합니다.

구성

이 문서에서는 다음 구성을 사용합니다.

- 다프네
- 프레드

다프네 컨피그레이션

```
Daphne#show running-config
Building configuration...

Current configuration : 1426 bytes
!
version 12.2
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname Daphne
!
boot system flash  c2600-jk9s-mz.122-27.bin


enable password cisco
!

memory-size iomem 10
ip subnet-zero
!
!
no ip domain-lookup
!
!
!
!
!--- Defines the IKE policy. While using TED, the peer
!--- address associated with the pre-shared key should
be defined as wildcard !--- in the IKE policy, to
authenticate any discovered peer. crypto isakmp policy
10
 authentication pre-share
crypto isakmp key abc123 address 0.0.0.0 0.0.0.0
!
!
!--- Defines the transform to use for IPsec SAs. crypto
ipsec transform-set ted-transforms esp-des esp-md5-hmac
!
```

```
!--- Defines a dynamic crypto map to use for
establishing IPsec SAs. crypto dynamic-map ted-map 10
 set transform-set ted-transforms
 match address 101
!
!
!--- The 'discover' keyword used with the dynamic crypto
map !--- enables peer discovery. crypto map tedtag 10
ipsec-isakmp dynamic ted-map discover
!



!
interface FastEthernet0/0
 ip address 11.11.11.1 255.255.255.0
 duplex auto
 speed auto
 crypto map tedtag
!
interface FastEthernet0/1
 ip address 13.13.13.13 255.255.255.0
 duplex auto
 speed auto
!
ip classless
ip route 0.0.0.0 0.0.0.0 11.11.11.2
ip http server

!
!
!
!--- Defines the traffic to be encrypted using IPsec.
access-list 101 permit ip 13.13.13.0 0.0.0.255
12.12.12.0 0.0.0.255

!
!
!--- Output is suppressed. ! ! line con 0 line aux 0
line vty 0 4 login ! end
```

Fred 구성

```

fred#show running-config
Building configuration...

Current configuration : 1295 bytes
!
version 12.2
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname fred
!
boot system flash  c2600-jk9s-mz.122-27.bin



!
memory-size iomem 10
ip subnet-zero
!
!
!
```

```
!
!
!
!--- Defines the IKE policy. While using TED, the peer
!--- address associated with the pre-shared key should
be defined as wildcard !--- in the IKE policy, to
authenticate any discovered peer. crypto isakmp policy
10
 authentication pre-share
crypto isakmp key abc123 address 0.0.0.0 0.0.0.0
!
!
!--- Defines the transform to use for IPsec SAs. crypto
ipsec transform-set ted-transforms esp-des esp-md5-hmac
!
!--- Defines a dynamic crypto map used to establish
IPsec SAs. crypto dynamic-map ted-map 10
 set transform-set ted-transforms
 match address 101
!
!
!--- The 'discover' keyword used with the dynamic crypto
map !--- enables peer discovery. crypto map tedtag 10
ipsec-isakmp dynamic ted-map discover
!

!
!
interface FastEthernet0/0
 ip address 11.11.11.2 255.255.255.0
 duplex auto
 speed auto
 crypto map tedtag
!
interface FastEthernet0/1
 ip address 12.12.12.12 255.255.255.0
 duplex auto
 speed auto
!
ip classless
ip route 0.0.0.0 0.0.0.0 11.11.11.1
ip http server

!
!
!
!--- Defines the traffic encrypted using IPsec. access-
list 101 permit ip 12.12.12.0 0.0.0.255 13.13.13.0
0.0.0.255

!
!
!--- Output is suppressed. ! line con 0 line aux 0 line
vty 0 4 login ! end
```

다음을 확인합니다.

이 섹션을 사용하여 컨피그레이션이 제대로 작동하는지 확인합니다.

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

- **show crypto isakmp sa** - 라우터의 IKE SA를 표시하여 1단계 보안 연결을 표시합니다. 표시된 상태는 IKE SA가 작동 및 작동하는 것으로 간주될 경우 QM_IDLE입니다.
- **show crypto ipsec sa** - 라우터의 활성 IPsec SA의 자세한 목록을 표시하여 2단계 보안 연결을 표시합니다.
- **show crypto map**—암호화 액세스 목록, 변형 집합, 피어 등의 세부사항과 함께 라우터에 구성된 암호화 맵을 표시합니다.
- **show crypto engine connections active(암호화 엔진 연결 활성 표시)** - 연결된 인터페이스, 변환 및 카운터와 활성 SA 목록을 표시합니다.

샘플 출력 표시

이 섹션에서는 호스트 12.12.12.13으로 향하는 호스트에서 ping 명령이 실행될 때 라우터 Daphne의 **show** 명령 출력을 캡처합니다. 라우터 Fred의 출력도 유사합니다. 출력의 주요 매개변수는 굵게 표시됩니다. 명령 출력에 대한 자세한 내용은 IP 보안 문제 해결 - 디버그 명령 이해 및 사용을 참조하십시오.

```
Daphne#show crypto isakmp sa
dst             src             state           conn-id    slot
11.11.11.2      11.11.11.1      QM_IDLE               2       0


Daphne#show crypto ipsec sa

interface: FastEthernet0/0
    Crypto map tag: tedtag, local addr. 11.11.11.1

   protected vrf:
   local  ident (addr/mask/prot/port): (13.13.13.0/255.255.255.0/0/0)
   remote ident (addr/mask/prot/port): (12.12.12.0/255.255.255.0/0/0)
   current_peer: 11.11.11.2
     PERMIT, flags={}
    #pkts encaps: 9, #pkts encrypt: 9, #pkts digest 9
    #pkts decaps: 9, #pkts decrypt: 9, #pkts verify 9
    #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.: 11.11.11.1, remote crypto endpt.: 11.11.11.2
     path mtu 1500, media mtu 1500
     current outbound spi: B326CBE6

     inbound esp sas:
      spi: 0xD8870500(3632727296)
        transform: esp-des esp-md5-hmac ,
        in use settings ={Tunnel, }
        slot: 0, conn id: 2000, flow_id: 1, crypto map: tedtag
        sa timing: remaining key lifetime (k/sec): (4414715/2524)
        IV size: 8 bytes
        replay detection support: Y

     inbound ah sas:

     inbound pcp sas:

     outbound esp sas:
      spi: 0xB326CBE6(3005664230)
        transform: esp-des esp-md5-hmac ,
        in use settings ={Tunnel, }
        slot: 0, conn id: 2001, flow_id: 2, crypto map: tedtag
        sa timing: remaining key lifetime (k/sec): (4414715/2524)
        IV size: 8 bytes
        replay detection support: Y

     outbound ah sas:

     outbound pcp sas:


Daphne#show crypto map
Crypto Map "tedtag" 10 ipsec-isakmp
        Dynamic map template tag: ted-map
        Discover enabled

Crypto Map "tedtag" 11 ipsec-isakmp
        Peer = 11.11.11.2
        Extended IP access list
            access-list  permit ip 13.13.13.0 0.0.0.255 12.12.12.0 0.0.0.255
            dynamic (created from dynamic map ted-map/10)
        Current peer: 11.11.11.2
        Security association lifetime: 4608000 kilobytes/3600 seconds
        PFS (Y/N): N
        Transform sets={ ted-transforms, }
        Interfaces using crypto map tedtag:
                FastEthernet0/0


Daphne#show crypto engine connections active
  ID Interface            IP-Address      State  Algorithm           Encrypt  Decrypt
   2 <none>               <none>          set    HMAC_SHA+DES_56_CB        0        0
2000 FastEthernet0/0      11.11.11.1      set    HMAC_MD5+DES_56_CB        0        9
2001 FastEthernet0/0      11.11.11.1      set    HMAC_MD5+DES_56_CB        9        0
```

문제 해결

이 섹션에서는 컨피그레이션 문제를 해결할 수 있습니다.

문제 해결 명령

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

- debug crypto engine - 암호화 및 암호 해독 프로세스를 수행하는 암호화 엔진에 대한 정보를 표시합니다.
- debug crypto ipsec - 2단계의 IPsec 협상을 표시합니다.
- debug crypto isakmp - 1단계의 IKE 협상을 표시합니다.

디버그 출력 샘플

이 섹션에서는 IPsec으로 구성된 라우터의 **debug** 명령 출력을 캡처합니다. 이 경우 **ping** 명령이 호스트 12.12.12.13으로 향하는 호스트에서 실행됩니다.

- 다프네
- 프레드

다프네

```
Daphne#show debug
Cryptographic Subsystem:
  Crypto ISAKMP debugging is on
  Crypto Engine debugging is on
  Crypto IPSEC debugging is on
Daphne#
!--- TED process begins here. *Mar  1 02:07:18.850: IPSEC(tunnel discover request): ,
  (key eng. msg.) INBOUND local= 13.13.13.14, remote= 12.12.12.13,
    local_proxy= 13.13.13.0/255.255.255.0/0/0 (type=4),
    remote_proxy= 11.11.11.1/255.255.255.255/0/0 (type=1),
    protocol= ESP, transform= esp-des esp-md5-hmac ,
    lifedur= 3600s and 4608000kb,
    spi= 0x0(0), conn_id= 0, keysize= 0, flags= 0x4004 dest=FastEthernet0
    /0:11.11.11.2
*Mar  1 02:07:18.854: ISAKMP: received ke message (1/1)
*Mar  1 02:07:18.854: ISAKMP: GOT A PEER DISCOVERY MESSAGE FROM THE SA MANAGER!!!
*Mar  1 02:07:18.854: src = 13.13.13.14 to 12.12.12.13, protocol 3,
   transform 2, hmac 1
*Mar  1 02:07:18.854: proxy source is 13.13.13.0/255.255.255.0 and my
   address (not used now) is 11.11.11.1
!--- IKE uses UDP port 500. *Mar 1 02:07:18.854: ISAKMP: local port 500, remote port 500

*Mar  1 02:07:18.858: ISAKMP (0:1): no idb in request
*Mar  1 02:07:18.858: ISAKMP (1): ID payload
        next-payload : 5
        type         : 1
        protocol     : 17
        port         : 500
        length       : 8
*Mar  1 02:07:18.858: ISAKMP (1): Total payload length: 12
*Mar  1 02:07:18.858: 1st ID is 11.11.11.1
*Mar  1 02:07:18.862: 2nd ID is 13.13.13.0/255.255.255.0
*Mar  1 02:07:18.862: ISAKMP (0:1): beginning peer discovery exchange
!--- TED probe is sent to the original destination of the !--- IP packet that matches the crypto
access-list for encryption. *Mar  1 02:07:18.862: ISAKMP (0:1): sending packet to 12.12.12.13
(I)
PEER_DISCOVERY via FastEthernet0/0:11.11.11.2
!--- TED response is received and the peer discovered. *Mar  1 02:07:18.962: ISAKMP (0:1):
received packet from
11.11.11.2 (I) PEER_DISCOVERY
*Mar  1 02:07:18.966: ISAKMP (0:1): processing vendor id payload
*Mar  1 02:07:18.966: ISAKMP (0:1): speaking to another IOS box!
*Mar  1 02:07:18.966: ISAKMP (0:1): processing ID payload. message ID = 0
*Mar  1 02:07:18.966: ISAKMP:received payload type 16
*Mar  1 02:07:18.966: ISAKMP (0:1): received response to my peer discovery probe!
*Mar  1 02:07:18.966: ISAKMP (0:1): ted negotiated proxies:
 0 13.13.13.0/255.255.255.0:0, 12.12.12.0
/255.255.255.0:0
!--- Normal IKE process begins here to form a secure tunnel to the !--- peer discovered through
TED. *Mar  1 02:07:18.970: ISAKMP (0:1): initiating IKE to 11.11.11.2
 in response to probe.
*Mar  1 02:07:18.970: ISAKMP: local port 500, remote port 500
*Mar  1 02:07:18.970: ISAKMP (0:1): created new SA after peer-discovery
  with 11.11.11.2
*Mar  1 02:07:18.974: ISAKMP (0:2): sending packet to 11.11.11.2 (I) MM_NO_STATE
*Mar  1 02:07:18.974: ISAKMP (0:1): peer does not do paranoid keepalives.

*Mar  1 02:07:18.974: ISAKMP (0:1): deleting SA reason "delete_me flag/throw"
state (I) PEER_DISCOVE
RY (peer 12.12.12.13) input queue 0
*Mar  1 02:07:19.975: ISAKMP (0:1): purging SA., sa=82687F70, delme=82687F70
*Mar  1 02:07:19.975: CryptoEngine0: delete connection 1
```

```
*Mar  1 02:07:20.608: ISAKMP (0:2): received packet from 11.11.11.2 (I) MM_NO_STATE
*Mar  1 02:07:20.608: ISAKMP (0:2): processing SA payload. message ID = 0
*Mar  1 02:07:20.608: ISAKMP (0:2): found peer pre-shared key matching 11.11.11.2
 !--- IKE SAs are negotiated. *Mar  1 02:07:20.612: ISAKMP (0:2): Checking ISAKMP transform 1
 against priority 10 policy
*Mar  1 02:07:20.612: ISAKMP:      encryption DES-CBC
*Mar  1 02:07:20.612: ISAKMP:      hash SHA
*Mar  1 02:07:20.612: ISAKMP:      default group 1
*Mar  1 02:07:20.612: ISAKMP:      auth pre-share
*Mar  1 02:07:20.612: ISAKMP:      life type in seconds
*Mar  1 02:07:20.612: ISAKMP:      life duration (VPI) of  0x0 0x1 0x51 0x80
*Mar  1 02:07:20.612: ISAKMP (0:2): atts are acceptable. Next payload is 0
*Mar  1 02:07:20.616: CryptoEngine0: generate alg parameter
*Mar  1 02:07:20.781: CRYPTO_ENGINE: Dh phase 1 status: 0
*Mar  1 02:07:20.781: CRYPTO_ENGINE: Dh phase 1 status: 0
*Mar  1 02:07:20.781: ISAKMP (0:2): SA is doing pre-shared key authentication
      using id type ID_IPV4_ADDR
*Mar  1 02:07:20.797: ISAKMP (0:2): sending packet to 11.11.11.2 (I) MM_SA_SETUP
*Mar  1 02:07:22.972: ISAKMP (0:2): received packet from 11.11.11.2 (I) MM_SA_SETUP
*Mar  1 02:07:22.972: ISAKMP (0:2): processing KE payload. message ID = 0
*Mar  1 02:07:22.972: CryptoEngine0: generate alg parameter
*Mar  1 02:07:23.177: ISAKMP (0:2): processing NONCE payload. message ID = 0
*Mar  1 02:07:23.177: ISAKMP (0:2): found peer pre-shared key matching 11.11.11.2
*Mar  1 02:07:23.181: CryptoEngine0: create ISAKMP SKEYID for conn id 2
*Mar  1 02:07:23.181: ISAKMP (0:2): SKEYID state generated
*Mar  1 02:07:23.185: ISAKMP (0:2): processing vendor id payload
*Mar  1 02:07:23.185: ISAKMP (0:2): speaking to another IOS box!
*Mar  1 02:07:23.185: ISAKMP (2): ID payload
        next-payload : 8
        type         : 1
        protocol     : 17
        port         : 500
        length       : 8
*Mar  1 02:07:23.185: ISAKMP (2): Total payload length: 12
*Mar  1 02:07:23.185: CryptoEngine0: generate hmac context for conn id 2
*Mar  1 02:07:23.189: ISAKMP (0:2): sending packet to 11.11.11.2 (I) MM_KEY_EXCH
*Mar  1 02:07:23.277: ISAKMP (0:2): received packet from 11.11.11.2 (I) MM_KEY_EXCH
*Mar  1 02:07:23.281: ISAKMP (0:2): processing ID payload. message ID = 0
*Mar  1 02:07:23.281: ISAKMP (0:2): processing HASH payload. message ID = 0
*Mar  1 02:07:23.281: CryptoEngine0: generate hmac context for conn id 2
!--- Peer is authenticated. *Mar  1 02:07:23.285: ISAKMP (0:2): SA has been authenticated with
11.11.11.2
*Mar  1 02:07:23.285: ISAKMP (0:2): beginning Quick Mode exchange, M-ID of 409419560
*Mar  1 02:07:23.285: ISAKMP (0:2): asking for 1 spis from ipsec
*Mar  1 02:07:23.285: ISAKMP (0:2): had to get SPI's from ipsec.
*Mar  1 02:07:23.289: CryptoEngine0: clear dh number for conn id 1
*Mar  1 02:07:23.289: IPSEC(key_engine): got a queue event...
*Mar  1 02:07:23.289: IPSEC(spi_response): getting spi 4160804383 for SA
        from 11.11.11.1      to 11.11.11.2      for prot 3
*Mar  1 02:07:23.289: ISAKMP: received ke message (2/1)
*Mar  1 02:07:23.537: CryptoEngine0: generate hmac context for conn id 2
*Mar  1 02:07:23.541: ISAKMP (0:2): sending packet to 11.11.11.2 (I) QM_IDLE
*Mar  1 02:07:23.958: ISAKMP (0:2): received packet from 11.11.11.2 (I) QM_IDLE
*Mar  1 02:07:23.962: CryptoEngine0: generate hmac context for conn id 2
*Mar  1 02:07:23.962: ISAKMP (0:2): processing HASH payload. message ID = 409419560
*Mar  1 02:07:23.962: ISAKMP (0:2): processing SA payload. message ID = 409419560
!--- IPsec SAs are negotiated. *Mar  1 02:07:23.962: ISAKMP (0:2): Checking IPSec proposal 1
*Mar  1 02:07:23.962: ISAKMP: transform 1, ESP_DES
*Mar  1 02:07:23.966: ISAKMP:   attributes in transform:
*Mar  1 02:07:23.966: ISAKMP:      encaps is 1
*Mar  1 02:07:23.966: ISAKMP:      SA life type in seconds
*Mar  1 02:07:23.966: ISAKMP:      SA life duration (basic) of 3600
*Mar  1 02:07:23.966: ISAKMP:      SA life type in kilobytes
*Mar  1 02:07:23.966: ISAKMP:      SA life duration (VPI) of  0x0 0x46 0x50 0x0
```

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*Mar  1 02:07:23.966: ISAKMP:      authenticator is HMAC-MD5
*Mar  1 02:07:23.970: validate proposal 0
*Mar  1 02:07:23.970: ISAKMP (0:2): atts are acceptable.
*Mar  1 02:07:23.970: IPSEC(validate_proposal_request): proposal part #1,
  (key eng. msg.) INBOUND local= 11.11.11.1, remote= 11.11.11.2,
    local_proxy= 13.13.13.0/255.255.255.0/0/0 (type=4),
    remote_proxy= 12.12.12.0/255.255.255.0/0/0 (type=4),
    protocol= ESP, transform= esp-des esp-md5-hmac ,
    lifedur= 0s and 0kb,
    spi= 0x0(0), conn_id= 0, keysize= 0, flags= 0x4
*Mar  1 02:07:23.974: validate proposal request 0
*Mar  1 02:07:23.974: ISAKMP (0:2): processing NONCE payload. message ID = 409419560
*Mar  1 02:07:23.974: ISAKMP (0:2): processing ID payload. message ID = 409419560
*Mar  1 02:07:23.974: ISAKMP (0:2): processing ID payload. message ID = 409419560
*Mar  1 02:07:23.974: CryptoEngine0: generate hmac context for conn id 2
*Mar  1 02:07:23.978: ipsec allocate flow 0
*Mar  1 02:07:23.978: ipsec allocate flow 0
!--- IPsec SAs are generated for inbound and outbound traffic. *Mar  1 02:07:23.986: ISAKMP
(0:2): Creating IPSec SAs
*Mar  1 02:07:23.986:         inbound SA from 11.11.11.2 to 11.11.11.1
        (proxy 12.12.12.0 to 13.13.13.0)
*Mar  1 02:07:23.986:         has spi 0xF800D61F and conn_id 2000 and flags 4
*Mar  1 02:07:23.986:         lifetime of 3600 seconds
*Mar  1 02:07:23.986:         lifetime of 4608000 kilobytes
*Mar  1 02:07:23.990: outbound SA from 11.11.11.1 to 11.11.11.2
(proxy 13.13.13.0 to 12.12.12.0     )
*Mar  1 02:07:23.990: has spi -1535570016 and conn_id 2001 and flags C
*Mar  1 02:07:23.990:         lifetime of 3600 seconds
*Mar  1 02:07:23.990:         lifetime of 4608000 kilobytes
*Mar  1 02:07:23.990: ISAKMP (0:2): sending packet to 11.11.11.2 (I) QM_IDLE
*Mar  1 02:07:23.994: ISAKMP (0:2): deleting node 409419560 error FALSE reason ""
*Mar  1 02:07:23.994: IPSEC(key_engine): got a queue event...
*Mar  1 02:07:23.994: IPSEC(initialize_sas): ,
  (key eng. msg.) INBOUND local= 11.11.11.1, remote= 11.11.11.2,
    local_proxy= 13.13.13.0/255.255.255.0/0/0 (type=4),
    remote_proxy= 12.12.12.0/255.255.255.0/0/0 (type=4),
    protocol= ESP, transform= esp-des esp-md5-hmac ,
    lifedur= 3600s and 4608000kb,
    spi= 0xF800D61F(4160804383), conn_id= 2000, keysize= 0, flags= 0x4
*Mar  1 02:07:23.998: IPSEC(initialize_sas): ,
  (key eng. msg.) OUTBOUND local= 11.11.11.1, remote= 11.11.11.2,
    local_proxy= 13.13.13.0/255.255.255.0/0/0 (type=4),
    remote_proxy= 12.12.12.0/255.255.255.0/0/0 (type=4),
    protocol= ESP, transform= esp-des esp-md5-hmac ,
    lifedur= 3600s and 4608000kb,
    spi= 0xA4790FA0(2759397280), conn_id= 2001, keysize= 0, flags= 0xC
*Mar  1 02:07:24.002: IPSEC(create_sa): sa created,
  (sa) sa_dest= 11.11.11.1, sa_prot= 50,
    sa_spi= 0xF800D61F(4160804383),
    sa_trans= esp-des esp-md5-hmac , sa_conn_id= 2000
*Mar  1 02:07:24.002: IPSEC(create_sa): sa created,
  (sa) sa_dest= 11.11.11.2, sa_prot= 50,
    sa_spi= 0xA4790FA0(2759397280),
    sa_trans= esp-des esp-md5-hmac , sa_conn_id= 2001


Daphne#
```

프레드

```
fred#show debug

Cryptographic Subsystem:
  Crypto ISAKMP debugging is on
  Crypto Engine debugging is on
  Crypto IPSEC debugging is on
fred#
!--- Receives the TED probe. *Mar  1 02:07:45.763: ISAKMP (0:0): received packet from
 13.13.13.14 (N) NEW SA
*Mar  1 02:07:45.767: ISAKMP: local port 500, remote port 500
*Mar  1 02:07:45.779: ISAKMP (0:1): processing vendor id payload
*Mar  1 02:07:45.783: ISAKMP (0:1): speaking to another IOS box!
*Mar  1 02:07:45.783: ISAKMP (0:1): processing ID payload. message ID = 0
*Mar  1 02:07:45.787: ISAKMP (0:1): processing ID payload. message ID =
 -1992472852
*Mar  1 02:07:45.791: ISAKMP (1): ID_IPV4_ADDR_SUBNET src 13.13.13.0
 /255.255.255.0 prot 0 port 0
*Mar  1 02:07:45.791: ISAKMP (0:1): processing vendor id payload
!--- Sends a response to the other peer for the TED probe. *Mar  1 02:07:45.795: ISAKMP (0:1):
responding to peer discovery probe!
*Mar  1 02:07:45.799: peer's address is 11.11.11.1
*Mar  1 02:07:45.799: src (him) 4, 13.13.13.0/255.255.255.0 to dst
(me) 0, 0.0.0.0/0.0.0.0
*Mar  1 02:07:45.803: ISAKMP (0:1): peer can handle TED V3: changing source
to 11.11.11.1 and dest to 11.11.11.2
*Mar  1 02:07:45.811: ISAKMP (1): ID payload
        next-payload : 239
        type         : 1
        protocol     : 17
        port         : 500
        length       : 8
*Mar  1 02:07:45.815: ISAKMP (1): Total payload length: 12
*Mar  1 02:07:45.819: ISAKMP (0:1): sending packet to 11.11.11.1 (R)
 PEER_DISCOVERY
*Mar  1 02:07:45.823: ISAKMP (0:1): peer does not do paranoid keepalives.

*Mar  1 02:07:45.823: ISAKMP (0:1): deleting SA reason "delete_me flag/throw"
state (R) PEER_DISCOVE
RY (peer 11.11.11.1) input queue 0
*Mar  1 02:07:45.827: ISAKMP (0:1): deleting node 0 error TRUE reason
"delete_me flag/throw"
 !--- IKE processing begins here. *Mar  1 02:07:45.871: ISAKMP (0:0): received packet from
11.11.11.1
(N) NEW SA
*Mar  1 02:07:45.875: ISAKMP: local port 500, remote port 500
*Mar  1 02:07:45.883: ISAKMP (0:2): processing SA payload. message ID = 0
*Mar  1 02:07:45.887: ISAKMP (0:2): found peer pre-shared key matching 11.11.11.1
!--- IKE SAs are negotiated. *Mar  1 02:07:45.887: ISAKMP (0:2): Checking ISAKMP transform 1
against priority 10 policy
*Mar  1 02:07:45.891: ISAKMP:      encryption DES-CBC
*Mar  1 02:07:45.891: ISAKMP:      hash SHA
*Mar  1 02:07:45.895: ISAKMP:      default group 1
*Mar  1 02:07:45.895: ISAKMP:      auth pre-share
*Mar  1 02:07:45.899: ISAKMP:      life type in seconds
*Mar  1 02:07:45.899: ISAKMP:      life duration (VPI) of  0x0 0x1 0x51 0x80
*Mar  1 02:07:45.903: ISAKMP (0:2): atts are acceptable. Next payload is 0
*Mar  1 02:07:45.907: CryptoEngine0: generate alg parameter
*Mar  1 02:07:47.455: CRYPTO_ENGINE: Dh phase 1 status: 0
*Mar  1 02:07:47.455: CRYPTO_ENGINE: Dh phase 1 status: 0
*Mar  1 02:07:47.459: ISAKMP (0:2): SA is doing pre-shared key authentication
using id type ID_IPV4_
ADDR
*Mar  1 02:07:47.463: ISAKMP (0:2): sending packet to 11.11.11.1 (R) MM_SA_SETUP
*Mar  1 02:07:47.467: ISAKMP (0:1): purging SA., sa=2349E0, delme=2349E0
*Mar  1 02:07:47.471: ISAKMP (0:1): purging node 0
*Mar  1 02:07:47.475: CryptoEngine0: delete connection 1
*Mar  1 02:07:47.707: ISAKMP (0:2): received packet from 11.11.11.1 (R) MM_SA_SETUP
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*Mar  1 02:07:47.711: ISAKMP (0:2): processing KE payload. message ID = 0
*Mar  1 02:07:47.715: CryptoEngine0: generate alg parameter
*Mar  1 02:07:49.767: ISAKMP (0:2): processing NONCE payload. message ID = 0
*Mar  1 02:07:49.775: ISAKMP (0:2): found peer pre-shared key matching 11.11.11.1
*Mar  1 02:07:49.783: CryptoEngine0: create ISAKMP SKEYID for conn id 2
*Mar  1 02:07:49.799: ISAKMP (0:2): SKEYID state generated
*Mar  1 02:07:49.803: ISAKMP (0:2): processing vendor id payload
*Mar  1 02:07:49.807: ISAKMP (0:2): speaking to another IOS box!
*Mar  1 02:07:49.815: ISAKMP (0:2): sending packet to 11.11.11.1 (R) MM_KEY_EXCH
*Mar  1 02:07:50.087: ISAKMP (0:2): received packet from 11.11.11.1 (R) MM_KEY_EXCH
*Mar  1 02:07:50.095: ISAKMP (0:2): processing ID payload. message ID = 0
*Mar  1 02:07:50.099: ISAKMP (0:2): processing HASH payload. message ID = 0
*Mar  1 02:07:50.103: CryptoEngine0: generate hmac context for conn id 2
!--- Peer is authenticated. *Mar  1 02:07:50.111: ISAKMP (0:2): SA has been authenticated with
11.11.11.1
*Mar  1 02:07:50.115: ISAKMP (2): ID payload
        next-payload : 8
        type         : 1
        protocol     : 17
        port         : 500
        length       : 8
*Mar  1 02:07:50.115: ISAKMP (2): Total payload length: 12
*Mar  1 02:07:50.119: CryptoEngine0: generate hmac context for conn id 2
*Mar  1 02:07:50.131: CryptoEngine0: clear dh number for conn id 1
*Mar  1 02:07:50.135: ISAKMP (0:2): sending packet to 11.11.11.1 (R) QM_IDLE
*Mar  1 02:07:50.451: ISAKMP (0:2): received packet from 11.11.11.1 (R) QM_IDLE
*Mar  1 02:07:50.467: CryptoEngine0: generate hmac context for conn id 2
*Mar  1 02:07:50.475: ISAKMP (0:2): processing HASH payload. message ID = 409419560
*Mar  1 02:07:50.475: ISAKMP (0:2): processing SA payload. message ID = 409419560
!--- IPsec SAs are negotiated. *Mar  1 02:07:50.479: ISAKMP (0:2): Checking IPSec proposal 1
*Mar  1 02:07:50.479: ISAKMP: transform 1, ESP_DES
*Mar  1 02:07:50.483: ISAKMP:   attributes in transform:
*Mar  1 02:07:50.483: ISAKMP:      encaps is 1
*Mar  1 02:07:50.487: ISAKMP:      SA life type in seconds
*Mar  1 02:07:50.487: ISAKMP:      SA life duration (basic) of 3600
*Mar  1 02:07:50.487: ISAKMP:      SA life type in kilobytes
*Mar  1 02:07:50.491: ISAKMP:      SA life duration (VPI) of  0x0 0x46 0x50 0x0
*Mar  1 02:07:50.495: ISAKMP:      authenticator is HMAC-MD5
*Mar  1 02:07:50.495: validate proposal 0
*Mar  1 02:07:50.499: ISAKMP (0:2): atts are acceptable.
*Mar  1 02:07:50.503: IPSEC(validate_proposal_request): proposal part #1,
  (key eng. msg.) INBOUND local= 11.11.11.2, remote= 11.11.11.1,
    local_proxy= 12.12.12.0/255.255.255.0/0/0 (type=4),
    remote_proxy= 13.13.13.0/255.255.255.0/0/0 (type=4),
    protocol= ESP, transform= esp-des esp-md5-hmac ,
    lifedur= 0s and 0kb,
    spi= 0x0(0), conn_id= 0, keysize= 0, flags= 0x4
*Mar  1 02:07:50.515: validate proposal request 0
*Mar  1 02:07:50.519: ISAKMP (0:2): processing NONCE payload. message
ID = 409419560
*Mar  1 02:07:50.523: ISAKMP (0:2): processing ID payload. message ID = 409419560
*Mar  1 02:07:50.523: ISAKMP (0:2): processing ID payload. message ID = 409419560
*Mar  1 02:07:50.527: ISAKMP (0:2): asking for 1 spis from ipsec
*Mar  1 02:07:50.535: IPSEC(key_engine): got a queue event...
*Mar  1 02:07:50.543: IPSEC(spi_response): getting spi 2759397280 for SA
        from 11.11.11.2      to 11.11.11.1      for prot 3
*Mar  1 02:07:50.551: ISAKMP: received ke message (2/1)
*Mar  1 02:07:50.787: CryptoEngine0: generate hmac context for conn id 2
*Mar  1 02:07:50.803: ISAKMP (0:2): sending packet to 11.11.11.1 (R) QM_IDLE
*Mar  1 02:07:50.887: ISAKMP (0:2): received packet from 11.11.11.1 (R) QM_IDLE
*Mar  1 02:07:50.899: CryptoEngine0: generate hmac context for conn id 2
*Mar  1 02:07:50.907: ipsec allocate flow 0
*Mar  1 02:07:50.907: ipsec allocate flow 0
!--- IPsec SAs are generated for inbound and outbound traffic. *Mar  1 02:07:50.939: ISAKMP
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(0:2): Creating IPSec SAs
*Mar  1 02:07:50.939:         inbound SA from 11.11.11.1 to 11.11.11.2
        (proxy 13.13.13.0 to 12.12.12.0)
*Mar  1 02:07:50.947:         has spi 0xA4790FA0 and conn_id 2000 and
flags 4
*Mar  1 02:07:50.947:         lifetime of 3600 seconds
*Mar  1 02:07:50.951:         lifetime of 4608000 kilobytes
*Mar  1 02:07:50.951: outbound SA from 11.11.11.2 to 11.11.11.1
(proxy 12.12.12.0 to 13.13.13.0     )
*Mar  1 02:07:50.959:  has spi -134162913 and conn_id 2001 and flags C
*Mar  1 02:07:50.959:         lifetime of 3600 seconds
*Mar  1 02:07:50.963:         lifetime of 4608000 kilobytes
*Mar  1 02:07:50.963: ISAKMP (0:2): deleting node 409419560 error FALSE
 reason "quick mode done (awa
it()"
*Mar  1 02:07:50.971: IPSEC(key_engine): got a queue event...
*Mar  1 02:07:50.971: IPSEC(initialize_sas): ,
  (key eng. msg.) INBOUND local= 11.11.11.2, remote= 11.11.11.1,
    local_proxy= 12.12.12.0/255.255.255.0/0/0 (type=4),
    remote_proxy= 13.13.13.0/255.255.255.0/0/0 (type=4),
    protocol= ESP, transform= esp-des esp-md5-hmac ,
    lifedur= 3600s and 4608000kb,
    spi= 0xA4790FA0(2759397280), conn_id= 2000, keysize= 0, flags= 0x4
*Mar  1 02:07:50.983: IPSEC(initialize_sas): ,
  (key eng. msg.) OUTBOUND local= 11.11.11.2, remote= 11.11.11.1,
    local_proxy= 12.12.12.0/255.255.255.0/0/0 (type=4),
    remote_proxy= 13.13.13.0/255.255.255.0/0/0 (type=4),
    protocol= ESP, transform= esp-des esp-md5-hmac ,
    lifedur= 3600s and 4608000kb,
    spi= 0xF800D61F(4160804383), conn_id= 2001, keysize= 0, flags= 0xC
*Mar  1 02:07:51.003: IPSEC(create_sa): sa created,
  (sa) sa_dest= 11.11.11.2, sa_prot= 50,
    sa_spi= 0xA4790FA0(2759397280),
    sa_trans= esp-des esp-md5-hmac , sa_conn_id= 2000
*Mar  1 02:07:51.007: IPSEC(create_sa): sa created,
  (sa) sa_dest= 11.11.11.1, sa_prot= 50,
    sa_spi= 0xF800D61F(4160804383),
    sa_trans= esp-des esp-md5-hmac , sa_conn_id= 2001

fred#
```

관련 정보

- IPsec 구축
- 터널 엔드포인트 검색 향상
- 기술 지원 및 문서 – Cisco Systems