IKEv2从Android strongSwan到具有EAP和RSA身份验证的Cisco IOS

目录

简介

本文档介绍如何配置strongSwan的移动版本，以便通过互联网密钥交换版本2(IKEv2)协议访问Cisco IOS®软件VPN网关。

给出了三个示例：

- 具有strongSwan的Android电话，该StrongSwan通过可扩展身份验证协议 — 消息摘要5(EAP-MD5)身份验证连接到Cisco IOS软件VPN网关。
- 具有strongSwan的Android电话，通过证书身份验证(RSA)连接到Cisco IOS软件VPN网关。
- 具有strongSwan的Android电话，连接到网络地址转换(NAT)后的Cisco IOS软件VPN网关。 在

VPN网关证书中要求有两个x509扩展主题备用名称。
还包括Cisco IOS软件和strongSwan限制。

先决条件

要求

Cisco 建议您了解以下主题：

- OpenSSL配置的基本知识
- Cisco IOS软件命令行界面(CLI)配置的基本知识
- IKEv2的基本知识

使用的组件

本文档中的信息基于以下软件和硬件版本：

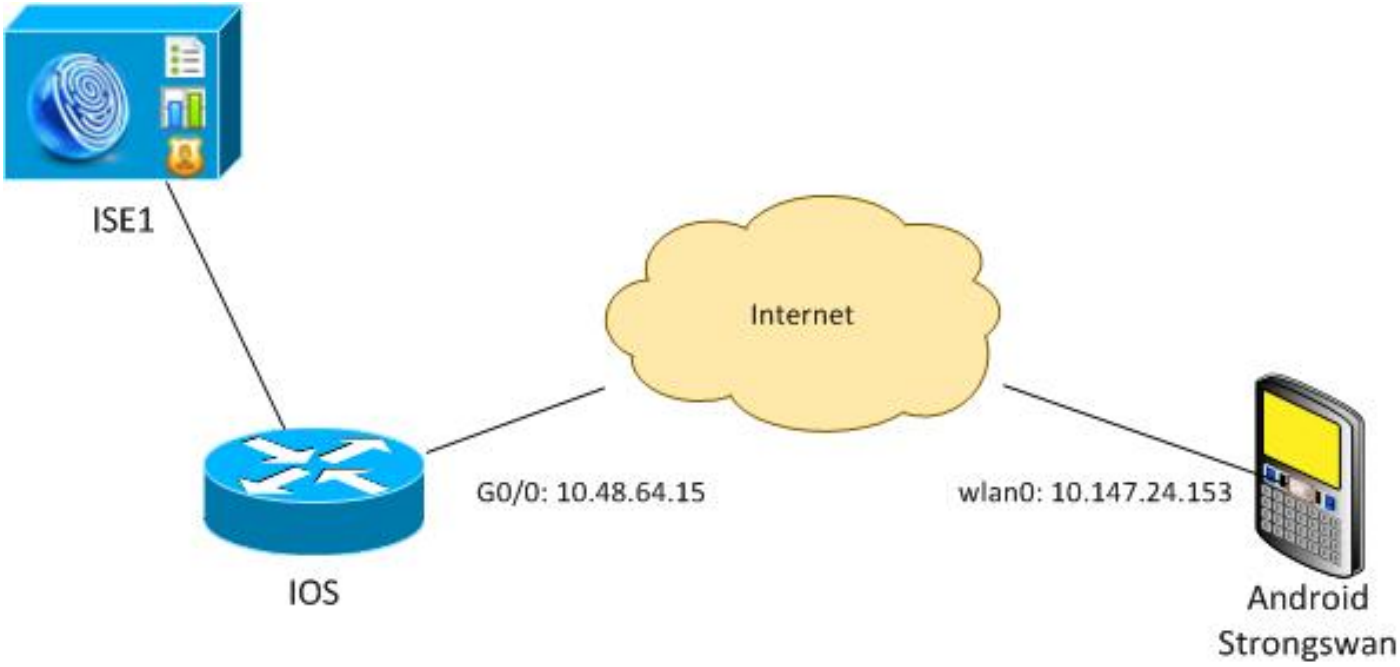
- Android 4.0或更高版本（使用strongSwan）
- Cisco IOS软件版本15.3T或更高版本
- 思科身份服务引擎(ISE)软件，版本1.1.4及更高版本

本文档中的信息都是基于特定实验室环境中的设备编写的。本文档中使用的所有设备最初均采用原始（默认）配置。如果您使用的是真实网络，请确保您已经了解所有命令的潜在影响。

配置

> **注意：**
>
> 命令输出解释程序工具（仅限注册用户）支持某些 **show 命令。**使用输出解释器工具来查看 show 命令输出的分析。
>
> 使用 **debug 命令之前，请参阅**有关 Debug 命令的重要信息。

网络图



Android strongSwan使用Cisco IOS软件网关建立IKEv2隧道，以安全访问内部网络。

证书注册

证书是基于EAP和基于RSA的身份验证的先决条件。

在EAP身份验证场景中，仅VPN网关需要证书。仅当软件提供由Android上受信任的证书颁发机构(CA)签名的证书时，客户端才连接到Cisco IOS软件。然后，EAP会话将启动，以便客户端向Cisco IOS软件进行身份验证。

对于基于RSA的身份验证，两个终端都必须具有正确的证书。

当IP地址用作对等ID时，对证书有其他要求。Android strongSwan验证VPN网关的IP地址是否包含在x509分机主题备用名称中。否则，Android会断开连接；这是一个良好的实践，也是RFC 6125的建议。

OpenSSL用作CA，因为Cisco IOS软件有以下限制：它无法生成扩展包含IP地址的证书。所有证书都由OpenSSL生成，并导入到Android和Cisco IOS软件。

在Cisco IOS软件中，**subject-alt-name**命令可用于创建包含IP地址的扩展，但该命令仅适用于自签名证书。Cisco Bug ID CSCui44783，“IOS ENH PKI cability to generate CSR with subject-alt-name extension”（IOS ENH PKI能力生成带有主题alt-name扩展的CSR）是允许Cisco IOS软件生成所有类型注册的扩展的增强请求。

以下是生成CA的命令示例：

```
#generate key
openssl genrsa -des3 -out ca.key 2048

#generate CSR
openssl req -new -key ca.key -out ca.csr

#remove protection
cp ca.key ca.key.org
```

```
openssl rsa -in ca.key.org -out ca.key

#self sign certificate
openssl x509 -req -days 365 -in ca.csr -signkey ca.key -out ca.crt
-extensions v3_req -extfile conf_global.crt
```

conf_global.crt是配置文件。CA分机应设置为TRUE:

```
[ req ]
default_bits              = 1024            # Size of keys
default_md                = md5                     # message digest algorithm
string_mask               = nombstr         # permitted characters
#string_mask              = pkix     # permitted characters
distinguished_name        = req_distinguished_name
req_extensions            = v3_req

[ v3_req ]
basicConstraints          = CA:TRUE
subjectKeyIdentifier      = hash
```

生成证书的命令与Cisco IOS软件和Android非常相似。本示例假设已有CA用于签署证书：

```
#generate key
openssl genrsa -des3 -out server.key 2048

#generate CSR
openssl req -new -key server.key -out server.csr

#remove protection
cp server.key server.key.org
openssl rsa -in server.key.org -out server.key

#sign the cert and add Alternate Subject Name extension from
conf_global_cert.crt file with configuration
openssl x509 -req -in server.csr -CA ca.crt -CAkey ca.key -CAcreateserial
-out server.crt -days 365 -extensions v3_req -extfile conf_global_cert.crt

#create pfx file containig CA cert and server cert
openssl pkcs12 -export -out server.pfx -inkey server.key -in server.crt
-certfile ca.crt
```

conf_global_cert.crt是配置文件。“备用主题名称”分机是键设置。在本例中，CA扩展设置为FALSE:

```
[ req ]
default_bits              = 1024            # Size of keys
default_md                = md5                     # message digest algorithm
string_mask               = nombstr         # permitted characters
#string_mask              = pkix     # permitted characters
distinguished_name        = req_distinguished_name
req_extensions            = v3_req

[ v3_req ]
basicConstraints          = CA:FALSE
subjectKeyIdentifier      = hash
subjectAltName            = @alt_names

[alt_names]
IP.1                      = 10.48.64.15
```

应为Cisco IOS软件和Android生成证书。

IP地址10.48.64.15属于Cisco IOS软件网关。为Cisco IOS软件生成证书时，请确保

subjectAltName设置为10.48.64.15。Android验证从Cisco IOS软件接收的证书并尝试在subjectAltName中查找其IP地址。

Cisco IOS 软件

Cisco IOS软件需要为基于RSA和基于EAP的身份验证安装正确的证书。

可以导入Cisco IOS软件的pfx文件（pkcs12容器）：

```
BSAN-2900-1(config)# crypto pki import TP pkcs12
http://10.10.10.1/server.pfx password 123456
% Importing pkcs12...
Source filename [server.pfx]?
CRYPTO_PKI: Imported PKCS12 file successfully.
```

使用**show crypto pki certificates verbose命令**验证导入是否成功：

```
BSAN-2900-1# show crypto pki certificates verbose
Certificate
 Status: Available
 Version: 3
 Certificate Serial Number (hex): 00A003C5DCDEFA146C
 Certificate Usage: General Purpose
 Issuer:
   cn=Cisco
   ou=Cisco TAC
   o=Cisco
   l=Krakow
   st=Malopolskie
   c=PL
  Subject:
    Name: IOS
    IP Address: 10.48.64.15
    cn=IOS
    ou=TAC
    o=Cisco
    l=Krakow
    st=Malopolska
    c=PL
 Validity Date:
   start date: 18:04:09 UTC Aug 1 2013
   end   date: 18:04:09 UTC Aug 1 2014
 Subject Key Info:
   Public Key Algorithm: rsaEncryption
   RSA Public Key: (2048 bit)
 Signature Algorithm: SHA1 with RSA Encryption
 Fingerprint MD5: 2C45BF10 0BACB98D 444F5804 1DC27ECF
 Fingerprint SHA1: 26B66A66 DF5E7D6F 498DD653 A2C164D7 4C7A7F8F
 X509v3 extensions:
   X509v3 Subject Key ID: AD598A9B 8AB6893B AB3CB8B9 28B2039C 78441E72
   X509v3 Basic Constraints:
       CA: FALSE
    X509v3 Subject Alternative Name:

        10.48.64.15
   Authority Info Access:
 Associated Trustpoints: TP
 Storage: nvram:Cisco#146C.cer
```

```
 Key Label: TP
 Key storage device: private config

CA Certificate
 Status: Available
 Version: 3
 Certificate Serial Number (hex): 00DC8EAD98723DF56A
 Certificate Usage: General Purpose
 Issuer:
   cn=Cisco
   ou=Cisco TAC
   o=Cisco
   l=Krakow
   st=Malopolskie
   c=PL
 Subject:
   cn=Cisco
   ou=Cisco TAC
   o=Cisco
   l=Krakow
   st=Malopolskie
   c=PL
 Validity Date:
   start date: 16:39:55 UTC Jul 23 2013
   end   date: 16:39:55 UTC Jul 23 2014
 Subject Key Info:
   Public Key Algorithm: rsaEncryption
   RSA Public Key: (2048 bit)
 Signature Algorithm: SHA1 with RSA Encryption
 Fingerprint MD5: 0A2432DC 33F0DC46 AAB23E26 ED474B7E
 Fingerprint SHA1: A50E3892 ED5C4542 FA7FF584 DE07B6E0 654A62D0
 X509v3 extensions:
   X509v3 Subject Key ID: 786F263C 0F5A1963 D6AD18F8 86DCE7C9 0185911E
   X509v3 Basic Constraints:
       CA: TRUE
   Authority Info Access:
 Associated Trustpoints: TP
 Storage: nvram:Cisco#F56ACA.cer

BSAN-2900-1#show ip int brief
Interface                  IP-Address      OK? Method Status          Protocol
GigabitEthernet0/0         10.48.64.15     YES NVRAM  up              up
```

Android

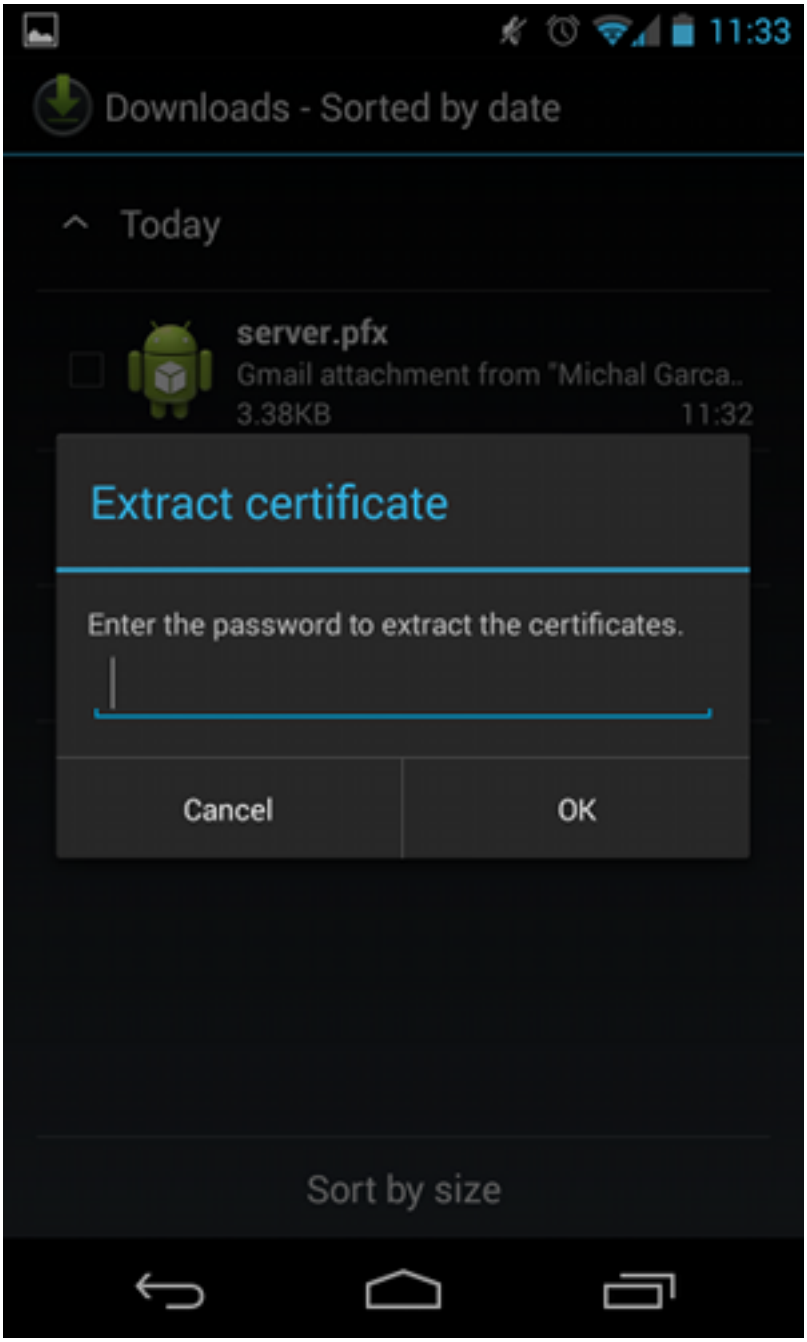
对于基于EAP的身份验证，Andorid只需安装正确的CA证书。

对于基于RSA的身份验证，Andorid需要同时安装CA证书和自己的证书。

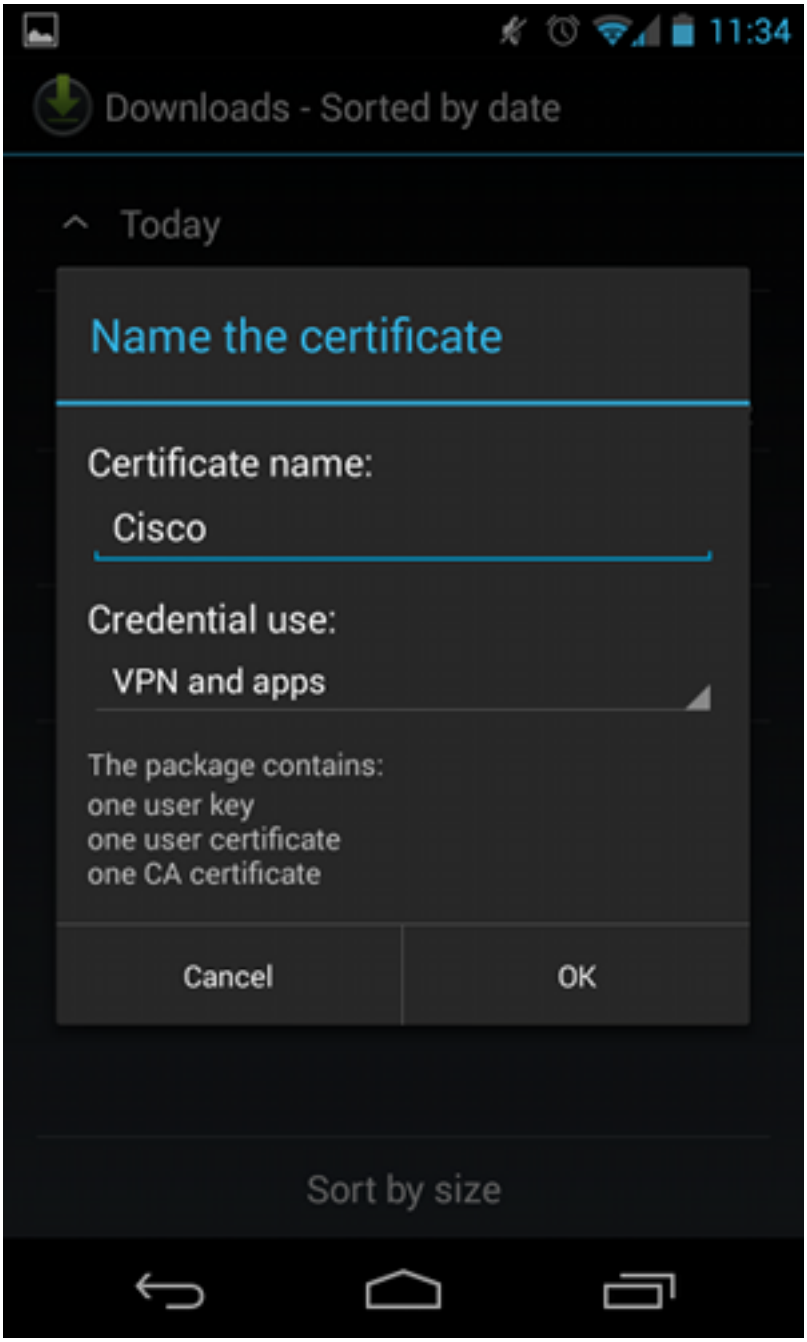
此过程介绍如何安装两个证书：

1. 通过电子邮件发送pfx文件，然后将其打开。

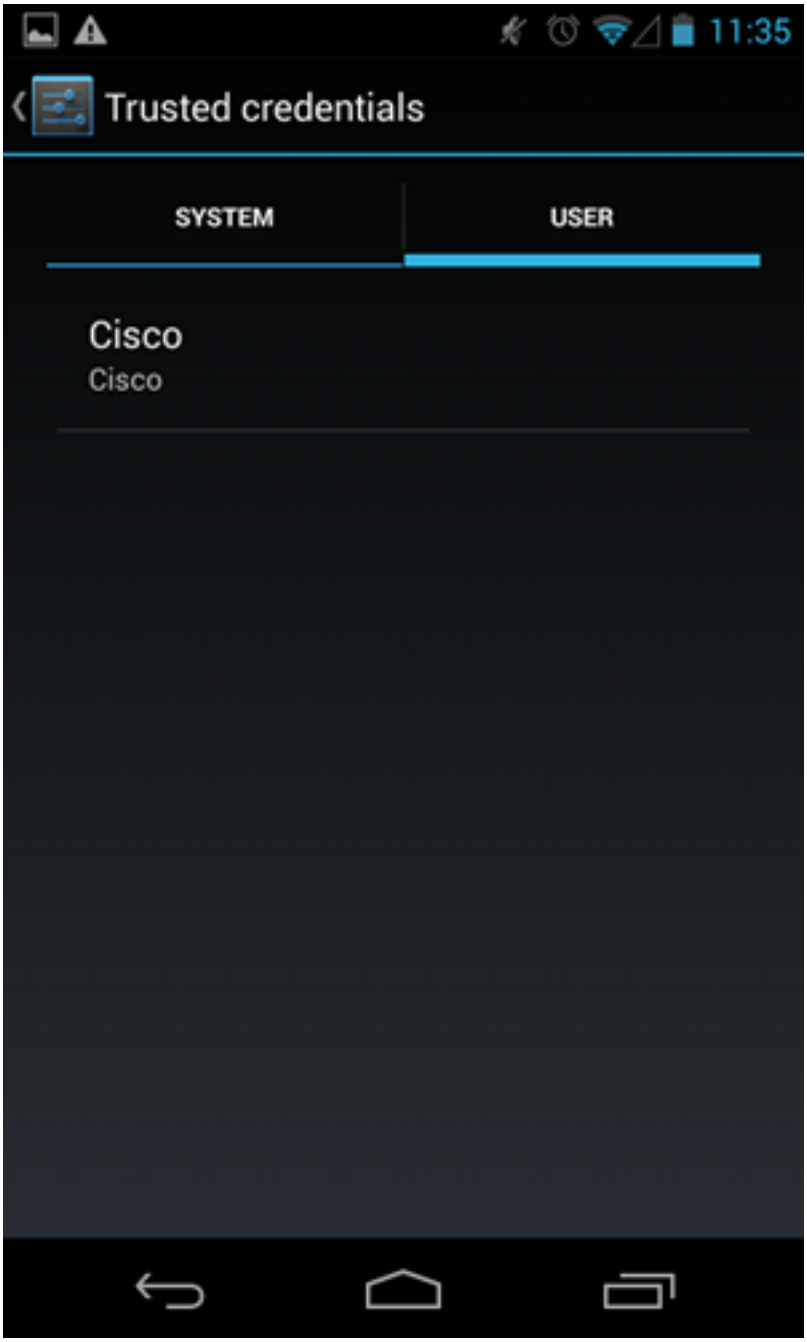
2. 提供生成pfx文件时使用的密码。



3. 提供导入的证书的名称。



4. 导航至**设置** > **安全** > **受信任凭据**以验证证书安装。新证书应显示在用户存储中：



此时，将安装用户证书和CA证书。pfx文件是包含用户证书和CA证书的pkcs12容器。

Android在导入证书时有精确要求。例如，要成功导入CA证书，Android要求将x509v3扩展基本约束CA设置为TRUE。因此，当您生成CA或使用自己的CA时，必须验证其是否具有正确的分机号：

```
pluton custom_ca # openssl x509 -in ca.crt -text
Certificate:
   Data&colon;
       Version: 3 (0x2)
       Serial Number:
           dc:8e:ad:98:72:3d:f5:6a
       Signature Algorithm: sha1WithRSAEncryption
       Issuer: C=PL, ST=Malopolskie, L=Krakow, O=Cisco, OU=Cisco TAC, CN=Cisco
<.....output omitted>

 X509v3 Basic Constraints:
                CA:TRUE

<.....output omitted>
```

EAP 身份验证

用于EAP身份验证的Cisco IOS软件配置

IKEv2允许使用EAP协议栈来执行用户身份验证。VPN网关自行提供证书。一旦客户端信任该证书，客户端就会从网关响应EAP请求身份。Cisco IOS软件使用该身份并向身份验证、授权和记帐(AAA)服务器发送Radius-Request消息，并在请求方(Android)和身份验证服务器（访问控制服务器[ACS]或ISE）之间建立EAP-MD5会话。

成功进行EAP-MD5身份验证后（如Radius-Accept消息所示），Cisco IOS软件使用配置模式将IP地址推送到客户端并继续进行流量选择器协商。

请注意，Android已发送IKEID=cisco（如配置）。 Cisco IOS软件上收到的此IKEID与“ikev2配置文件PROF”匹配。

```
aaa new-model
aaa authentication login eap-list-radius group radius
aaa authorization network IKE2_AUTHOR_LOCAL local

crypto pki trustpoint TP
 revocation-check none

crypto ikev2 authorization policy IKE2_AUTHOR_POLICY
 pool POOL
!
crypto ikev2 proposal ikev2-proposal
 encryption aes-cbc-128
 integrity sha1
 group 14
!
crypto ikev2 policy ikev2-policy
 proposal ikev2-proposal
!
!
crypto ikev2 profile PROF
 match identity remote key-id cisco
 authentication remote eap query-identity
 authentication local rsa-sig
 pki trustpoint TP
 aaa authentication eap eap-list-radius
 aaa authorization group eap list IKE2_AUTHOR_LOCAL IKE2_AUTHOR_POLICY
 aaa authorization user eap cached
 virtual-template 1

crypto ipsec transform-set 3DES-MD5 esp-aes esp-sha-hmac
 mode tunnel
!
crypto ipsec profile PROF
 set transform-set 3DES-MD5
 set ikev2-profile PROF

interface GigabitEthernet0/0
 ip address 10.48.64.15 255.255.255.128

interface Virtual-Template1 type tunnel
```

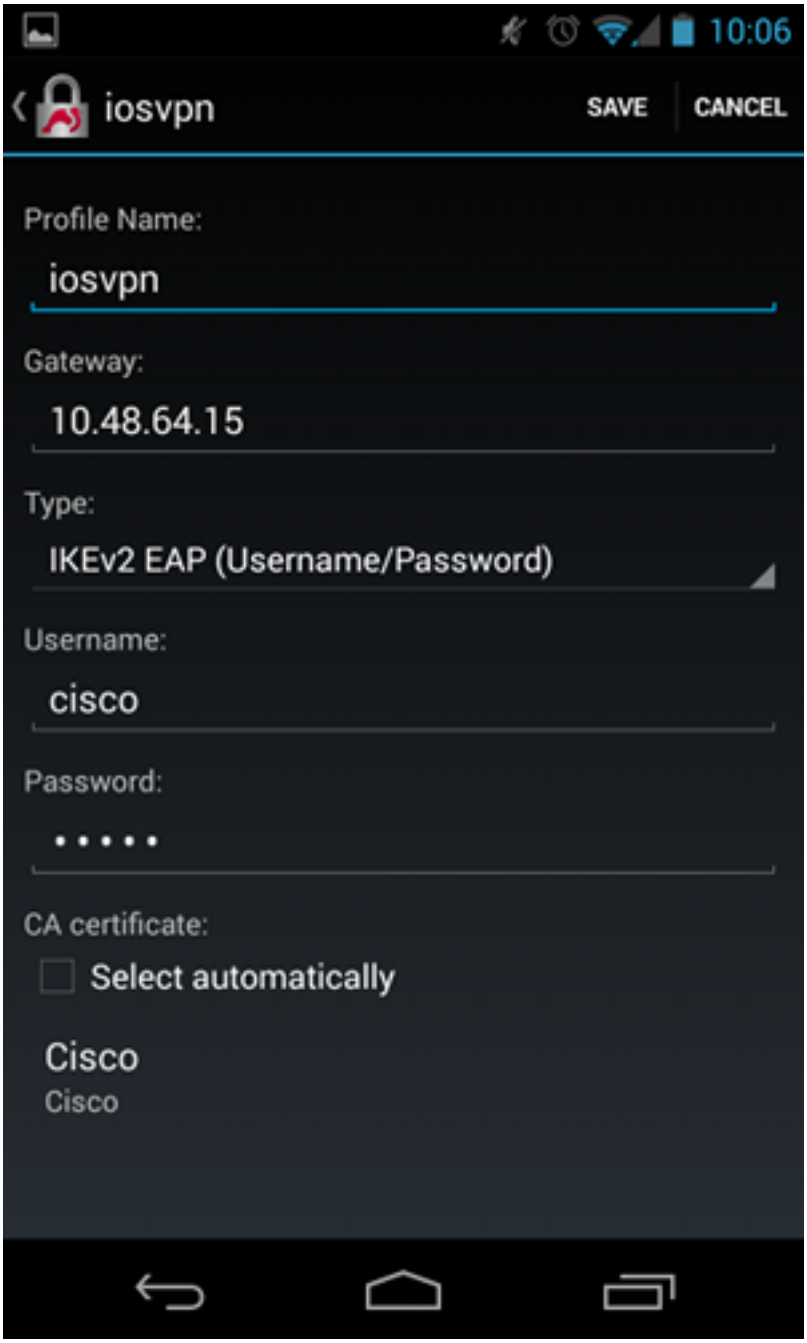
```
 ip unnumbered GigabitEthernet0/0
 tunnel mode ipsec ipv4
 tunnel protection ipsec profile PROF

ip local pool POOL 192.168.0.1 192.168.0.10

radius-server host 10.48.66.185 key cisco
```

EAP身份验证的Android配置

Android strongSwan必须配置EAP:

1. 禁用自动证书选择；否则，在第三个数据包中发送100个或更多CERT_REQ。

2. 选择在上一步中导入的特定证书(CA);用户名和密码应与AAA服务器上的相同。



EAP身份验证测试

在Cisco IOS软件中，这些是EAP身份验证的最重要调试。为了清楚起见，大多数输出已省略：

```
debug crypto ikev2 error
debug crypto ikev2 internal
debug radius authentication
debug radius verbose

IKEv2:New ikev2 sa request admitted
IKEv2:(SA ID = 1):Searching policy based on peer's identity 'cisco' of type
'FQDN'
IKEv2:(1): Choosing IKE profile PROF
IKEv2:Sending certificates as X509 certificates

RADIUS(00000025): Send Access-Request to 10.48.66.185:1645 id 1645/4,len 110
RADIUS: Received from id 1645/4 10.48.66.185:1645, Access-Challenge, len 79
RADIUS(00000025): Send Access-Request to 10.48.66.185:1645 id 1645/5,len 141
RADIUS: Received from id 1645/5 10.48.66.185:1645, Access-Challenge, len 100
RADIUS(00000025): Send Access-Request to 10.48.66.185:1645 id 1645/6,len 155
RADIUS: Received from id 1645/6 10.48.66.185:1645, Access-Accept, len 76

IKEv2:(SA ID = 1):SM Trace-> SA: I_SPI=AABAB198FACAAEDE R_SPI=D61F37C4DC875001
(R) MsgID = 00000004 CurState: R_PROC_EAP_RESP Event: EV_RECV_EAP_SUCCESS

IKEv2:IKEv2 local AAA author request for 'IKE2_AUTHOR_POLICY'
IKEv2:Received group author attributes: ipv4-pool: POOL, route-accept any tag:1
distance:1
IKEv2:Allocated addr 192.168.0.2 from local pool POOL
IKEv2:(SA ID = 1):SM Trace-> SA: I_SPI=AABAB198FACAAEDE R_SPI=D61F37C4DC875001
(R) MsgID = 00000005 CurState: R_VERIFY_AUTH Event:
   EV_OK_RECD_VERIFY_IPSEC_POLICY
%LINEPROTO-5-UPDOWN: Line protocol on Interface Virtual-Access1, changed state
to up
```

Android日志显示：

```
00[DMN] Starting IKE charon daemon (strongSwan 5.1.0dr2,
Linux 3.4.0-perf-gf43c3d9, armv7l)
00[KNL] kernel-netlink plugin might require CAP_NET_ADMIN capability
00[LIB] loaded plugins: androidbridge charon android-log openssl fips-prf
random nonce pubkey pkcs1 pkcs8 pem xcbc hmac socket-default kernel-netlink
00[LIB] unable to load 9 plugin features (9 due to unmet dependencies)
00[JOB] spawning 16 worker threads
13[IKE] initiating IKE_SA android[1] to 10.48.64.15
13[ENC] generating IKE_SA_INIT request 0 [ SA KE No N(NATD_S_IP) N(NATD_D_IP) ]
13[NET] sending packet: from 10.147.24.153[45581] to 10.48.64.15[500]
(648 bytes)
11[NET] received packet: from 10.48.64.15[500] to 10.147.24.153[45581]
(497 bytes)
11[ENC] parsed IKE_SA_INIT response 0 [ SA KE No V V N(NATD_S_IP) N(NATD_D_IP)
CERTREQ N(HTTP_CERT_LOOK) ]
11[ENC] received unknown vendor ID:
43:49:53:43:4f:2d:44:45:4c:45:54:45:2d:52:45:41:53:4f:4e
11[ENC] received unknown vendor ID:
46:4c:45:58:56:50:4e:2d:53:55:50:50:4f:52:54:45:44
11[IKE] faking NAT situation to enforce UDP encapsulation
11[IKE] cert payload ANY not supported - ignored
11[IKE] sending cert request for "C=PL, ST=Malopolskie, L=Krakow, O=Cisco,
OU=Cisco TAC, CN=Cisco"
11[IKE] establishing CHILD_SA android
11[ENC] generating IKE_AUTH request 1 [ IDi N(INIT_CONTACT) CERTREQ
CP(ADDR ADDR6 DNS DNS6) N(ESP_TFC_PAD_N) SA TSi TSr N(MOBIKE_SUP)
```

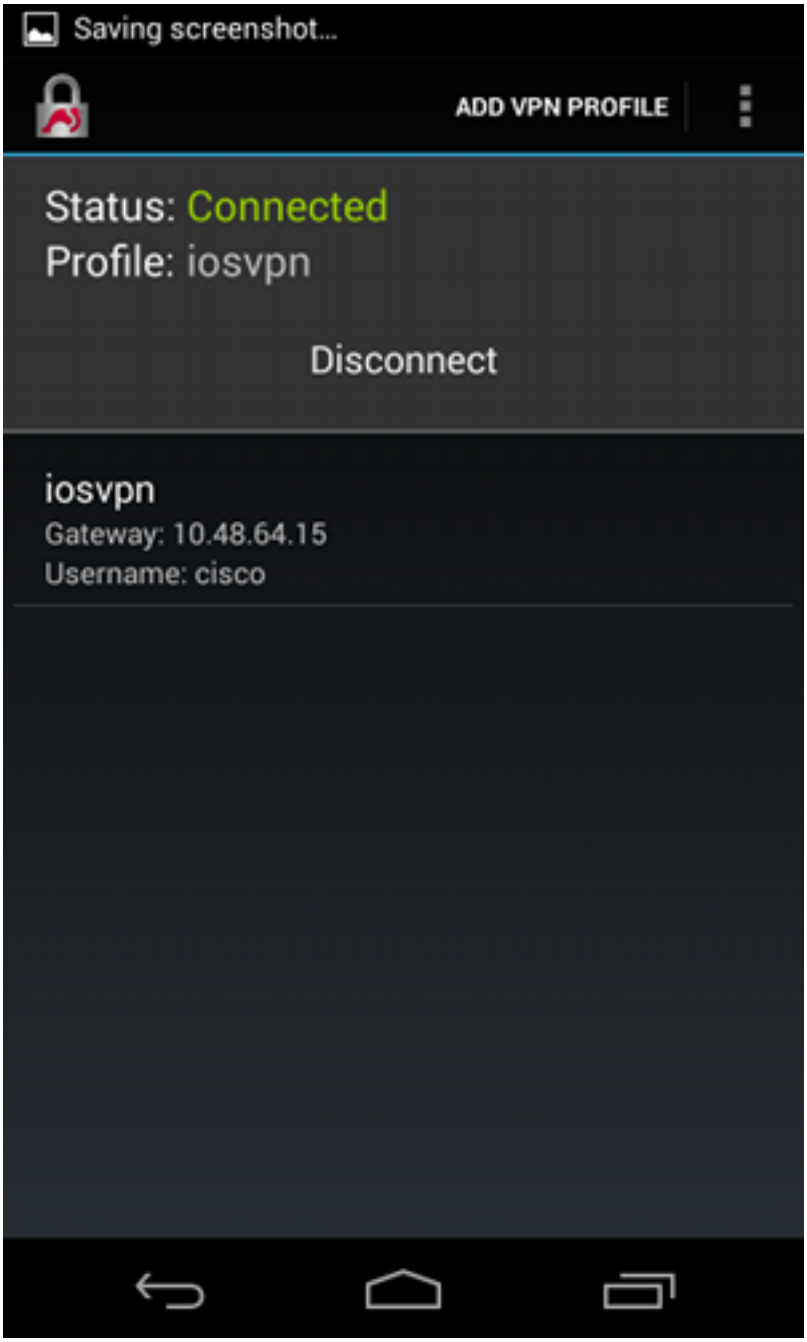
```
11[NET] sending packet: from 10.147.24.153[35564] to 10.48.64.15[4500]
(508 bytes)
10[NET] received packet: from 10.48.64.15[4500] to 10.147.24.153[35564]
(1292 bytes)
10[ENC] parsed IKE_AUTH response 1 [ V IDr CERT AUTH EAP/REQ/ID ]
10[IKE] received end entity cert "C=PL, ST=Malopolska, L=Krakow, O=Cisco,
OU=TAC, CN=IOS"
10[CFG] using certificate "C=PL, ST=Malopolska, L=Krakow, O=Cisco, OU=TAC,
CN=IOS"
10[CFG] using trusted ca certificate "C=PL, ST=Malopolskie, L=Krakow, O=Cisco,
OU=Cisco TAC, CN=Cisco"
10[CFG] reached self-signed root ca with a path length of 0
10[IKE] authentication of '10.48.64.15' with RSA signature successful
10[IKE] server requested EAP_IDENTITY (id 0x3B), sending 'cisco'
10[ENC] generating IKE_AUTH request 2 [ EAP/RES/ID ]
10[NET] sending packet: from 10.147.24.153[35564] to 10.48.64.15[4500]
(76 bytes)
09[NET] received packet: from 10.48.64.15[4500] to 10.147.24.153[35564]
(76 bytes)
09[ENC] parsed IKE_AUTH response 2 [ EAP/REQ/TLS ]
09[IKE] server requested EAP_TLS authentication (id 0x59)
09[IKE] EAP method not supported, sending EAP_NAK
09[ENC] generating IKE_AUTH request 3 [ EAP/RES/NAK ]
09[NET] sending packet: from 10.147.24.153[35564] to 10.48.64.15[4500]
(76 bytes)
08[NET] received packet: from 10.48.64.15[4500] to 10.147.24.153[35564]
(92 bytes)
08[ENC] parsed IKE_AUTH response 3 [ EAP/REQ/MD5 ]
08[IKE] server requested EAP_MD5 authentication (id 0x5A)
08[ENC] generating IKE_AUTH request 4 [ EAP/RES/MD5 ]
08[NET] sending packet: from 10.147.24.153[35564] to 10.48.64.15[4500]
(92 bytes)
07[NET] received packet: from 10.48.64.15[4500] to 10.147.24.153[35564]
(76 bytes)
07[ENC] parsed IKE_AUTH response 4 [ EAP/SUCC ]
07[IKE] EAP method EAP_MD5 succeeded, no MSK established
07[IKE] authentication of 'cisco' (myself) with EAP
07[ENC] generating IKE_AUTH request 5 [ AUTH ]
07[NET] sending packet: from 10.147.24.153[35564] to 10.48.64.15[4500]
(92 bytes)
06[NET] received packet: from 10.48.64.15[4500] to 10.147.24.153[35564]
(236 bytes)
06[ENC] parsed IKE_AUTH response 5 [ AUTH CP(ADDR) SA TSi TSr N(SET_WINSIZE)
N(ESP_TFC_PAD_N) N(NON_FIRST_FRAG) ]
06[IKE] authentication of '10.48.64.15' with EAP successful
06[IKE] IKE_SA android[1] established between
10.147.24.153[cisco]...10.48.64.15[10.48.64.15]
06[IKE] scheduling rekeying in 35421s
06[IKE] maximum IKE_SA lifetime 36021s
06[IKE] installing new virtual IP 192.168.0.1
06[IKE] received ESP_TFC_PADDING_NOT_SUPPORTED, not using ESPv3 TFC padding
06[IKE] CHILD_SA android{1} established with SPIs c776cb4f_i ea27f072_o and
TS 192.168.0.1/32 === 0.0.0.0/0
06[DMN] setting up TUN device for CHILD_SA android{1}
06[DMN] successfully created TUN device
```

此示例显示如何验证Cisco IOS软件的状态：

```
BSAN-2900-1#show crypto session detail
Crypto session current status

Code: C - IKE Configuration mode, D - Dead Peer Detection
K - Keepalives, N - NAT-traversal, T - cTCP encapsulation
```

```
X - IKE Extended Authentication, F - IKE Fragmentation

Interface: Virtual-Access1
Uptime: 00:02:12
Session status: UP-ACTIVE
Peer: 10.147.24.153 port 60511 fvrf: (none) ivrf: (none)
     Phase1_id: cisco
     Desc: (none)
 IKEv2 SA: local 10.48.64.15/4500 remote 10.147.24.153/60511 Active
         Capabilities:NX connid:1 lifetime:23:57:48
 IPSEC FLOW: permit ip 0.0.0.0/0.0.0.0 host 192.168.0.2
       Active SAs: 2, origin: crypto map
       Inbound:  #pkts dec'ed 40 drop 0 life (KB/Sec) 4351537/3468
       Outbound: #pkts enc'ed 5 drop 0 life (KB/Sec) 4351542/3468

BSAN-2900-1#show crypto ikev2 sa detailed
 IPv4 Crypto IKEv2  SA

Tunnel-id Local                 Remote                fvrf/ivrf         Status
1         10.48.64.15/4500      10.147.24.153/60511   none/none         READY
     Encr: AES-CBC, keysize: 128, Hash: SHA96, DH Grp:14, Auth sign: RSA,
Auth verify: EAP
     Life/Active Time: 86400/137 sec
     CE id: 1002, Session-id: 2
     Status Description: Negotiation done
     Local spi: D61F37C4DC875001       Remote spi: AABAB198FACAAEDE
     Local id: 10.48.64.15
     Remote id: cisco
     Remote EAP id: cisco
     Local req msg id:  0              Remote req msg id:  6
     Local next msg id: 0              Remote next msg id: 6
     Local req queued:  0              Remote req queued:  6
     Local window:      5              Remote window:      1
     DPD configured for 0 seconds, retry 0
     Fragmentation not configured.
     Extended Authentication configured.
     NAT-T is detected  outside
     Cisco Trust Security SGT is disabled
     Assigned host addr: 192.168.0.2
     Initiator of SA : No
```

下图显示了如何验证Android上的状态：


Saving screenshot...
ADD VPN PROFILE
Status: Connected
Profile: iosvpn
Disconnect
iosvpn
Gateway: 10.48.64.15
Username: cisco

RSA身份验证

用于RSA身份验证的Cisco IOS软件配置

在Rivest-Shamir-Adleman(RSA)身份验证中，Android发送证书以向Cisco IOS软件进行身份验证。因此，需要将该流量绑定到特定IKEv2配置文件的证书映射。用户EAP身份验证不是必需的。

以下是如何为远程对等体设置RSA身份验证的示例：

```
crypto pki certificate map CERT_MAP 10
 subject-name co android

crypto ikev2 profile PROF
 match certificate CERT_MAP
 authentication remote rsa-sig
```

```
 authentication local rsa-sig
 pki trustpoint TP
 aaa authorization group cert list IKE2_AUTHOR_LOCAL IKE2_AUTHOR_POLICY
 virtual-template 1
```

RSA身份验证的Android配置

用户凭证已被用户证书替换：

RSA身份验证测试

在Cisco IOS软件中，这些是RSA身份验证的最重要调试。为了清楚起见，大多数输出已省略：

```
debug crypto ikev2 error
debug crypto ikev2 internal
debug crypto pki transactions
```

```
debug crypto pki validation
debug crypto pki messages

IKEv2:New ikev2 sa request admitted
IKEv2:(SA ID = 1):Searching policy based on peer's identity 'cn=android,ou=TAC,
o=Cisco,l=Krakow,st=Malopolska,c=PL' of type 'DER ASN1 DN'
IKEv2:(1): Choosing IKE profile PROF
IKEv2:Sending certificates as X509 certificates
IKEv2:(SA ID = 1):Peer's authentication method is 'RSA'
IKEv2:Peer has sent X509 certificates
CRYPTO_PKI: Found a issuer match
CRYPTO_PKI: (9000B) Certificate is verified
CRYPTO_PKI: (9000B) Certificate validation succeeded
IKEv2:(SA ID = 1):[Crypto Engine -> IKEv2] Verification of signed
authentication data PASSED

IKEv2:IKEv2 local AAA author request for 'IKE2_AUTHOR_POLICY'
IKEv2:Received group author attributes: ipv4-pool: POOL, route-accept any tag:1
distance:1
IKEv2:Allocated addr 192.168.0.3 from local pool POOL
IKEv2:(SA ID = 1):SM Trace-> SA: I_SPI=E53A57E359A8437C R_SPI=A03D273FC75EEBD9
(R) MsgID = 00000001 CurState: R_VERIFY_AUTH Event:
EV_OK_RECD_VERIFY_IPSEC_POLICY
%LINEPROTO-5-UPDOWN: Line protocol on Interface Virtual-Access1, changed state
to up
```

Android日志显示：

```
00[DMN] Starting IKE charon daemon (strongSwan 5.1.0dr2,
Linux 3.4.0-perf-gf43c3d9, armv7l)
00[KNL] kernel-netlink plugin might require CAP_NET_ADMIN capability
00[LIB] loaded plugins: androidbridge charon android-log openssl fips-prf
random nonce pubkey pkcs1 pkcs8 pem xcbc hmac socket-default
00[LIB] unable to load 9 plugin features (9 due to unmet dependencies)
00[JOB] spawning 16 worker threads
05[CFG] loaded user certificate 'C=PL, ST=Malopolska, L=Krakow, O=Cisco,
OU=TAC, CN=android' and private key
05[CFG] loaded CA certificate 'C=PL, ST=Malopolskie, L=Krakow, O=Cisco,
OU=Cisco TAC, CN=Cisco'

05[IKE] initiating IKE_SA android[4] to 10.48.64.15
05[ENC] generating IKE_SA_INIT request 0 [ SA KE No N(NATD_S_IP) N(NATD_D_IP) ]
05[NET] sending packet: from 10.147.24.153[34697] to 10.48.64.15[500]
(648 bytes)
10[NET] received packet: from 10.48.64.15[500] to 10.147.24.153[34697]
(497 bytes)
10[ENC] parsed IKE_SA_INIT response 0 [ SA KE No V V N(NATD_S_IP) N(NATD_D_IP)
CERTREQ N(HTTP_CERT_LOOK) ]
10[ENC] received unknown vendor ID:
43:49:53:43:4f:2d:44:45:4c:45:54:45:2d:52:45:41:53:4f:4e
10[ENC] received unknown vendor ID:
46:4c:45:58:56:50:4e:2d:53:55:50:50:4f:52:54:45:44
10[IKE] faking NAT situation to enforce UDP encapsulation
10[IKE] cert payload ANY not supported - ignored
10[IKE] sending cert request for "C=PL, ST=Malopolskie, L=Krakow, O=Cisco,
OU=Cisco TAC, CN=Cisco"
10[IKE] authentication of 'C=PL, ST=Malopolska, L=Krakow, O=Cisco, OU=TAC,
CN=android' (myself) with RSA signature successful
10[IKE] sending end entity cert "C=PL, ST=Malopolska, L=Krakow, O=Cisco,
OU=TAC, CN=android"
10[IKE] establishing CHILD_SA android
10[ENC] generating IKE_AUTH request 1 [ IDi CERT N(INIT_CONTACT) CERTREQ
AUTH CP(ADDR ADDR6 DNS DNS6) N(ESP_TFC_PAD_N) SA
```

```
10[NET] sending packet: from 10.147.24.153[44527] to 10.48.64.15[4500]
(1788 bytes)
12[NET] received packet: from 10.48.64.15[4500] to 10.147.24.153[44527]
(1420 bytes)
12[ENC] parsed IKE_AUTH response 1 [ V IDr CERT AUTH CP(ADDR) SA TSi TSr
N(SET_WINSIZE) N(ESP_TFC_PAD_N) N(NON_FIRST_FRAG)
12[IKE] received end entity cert "C=PL, ST=Malopolska, L=Krakow, O=Cisco,
OU=TAC, CN=IOS"
12[CFG] using certificate "C=PL, ST=Malopolska, L=Krakow, O=Cisco, OU=TAC,
CN=IOS"
12[CFG] using trusted ca certificate "C=PL, ST=Malopolskie, L=Krakow, O=Cisco,
OU=Cisco TAC, CN=Cisco"
12[CFG] reached self-signed root ca with a path length of 0
12[IKE] authentication of '10.48.64.15' with RSA signature successful
12[IKE] IKE_SA android[4] established between 10.147.24.153[C=PL,
ST=Malopolska, L=Krakow, O=Cisco, OU=TAC,
CN=android]...10.48.64.15[10.48.64.15]
12[IKE] scheduling rekeying in 35413s
12[IKE] maximum IKE_SA lifetime 36013s
12[IKE] installing new virtual IP 192.168.0.3
12[IKE] received ESP_TFC_PADDING_NOT_SUPPORTED, not using ESPv3 TFC padding
12[IKE] CHILD_SA android{4} established with SPIs ecb3af87_i b2279175_o and
TS 192.168.0.3/32 === 0.0.0.0/0
12[DMN] setting up TUN device for CHILD_SA android{4}
12[DMN] successfully created TUN device
```

在Cisco IOS软件中，RSA用于签名和验证；在上一个场景中，EAP用于验证：

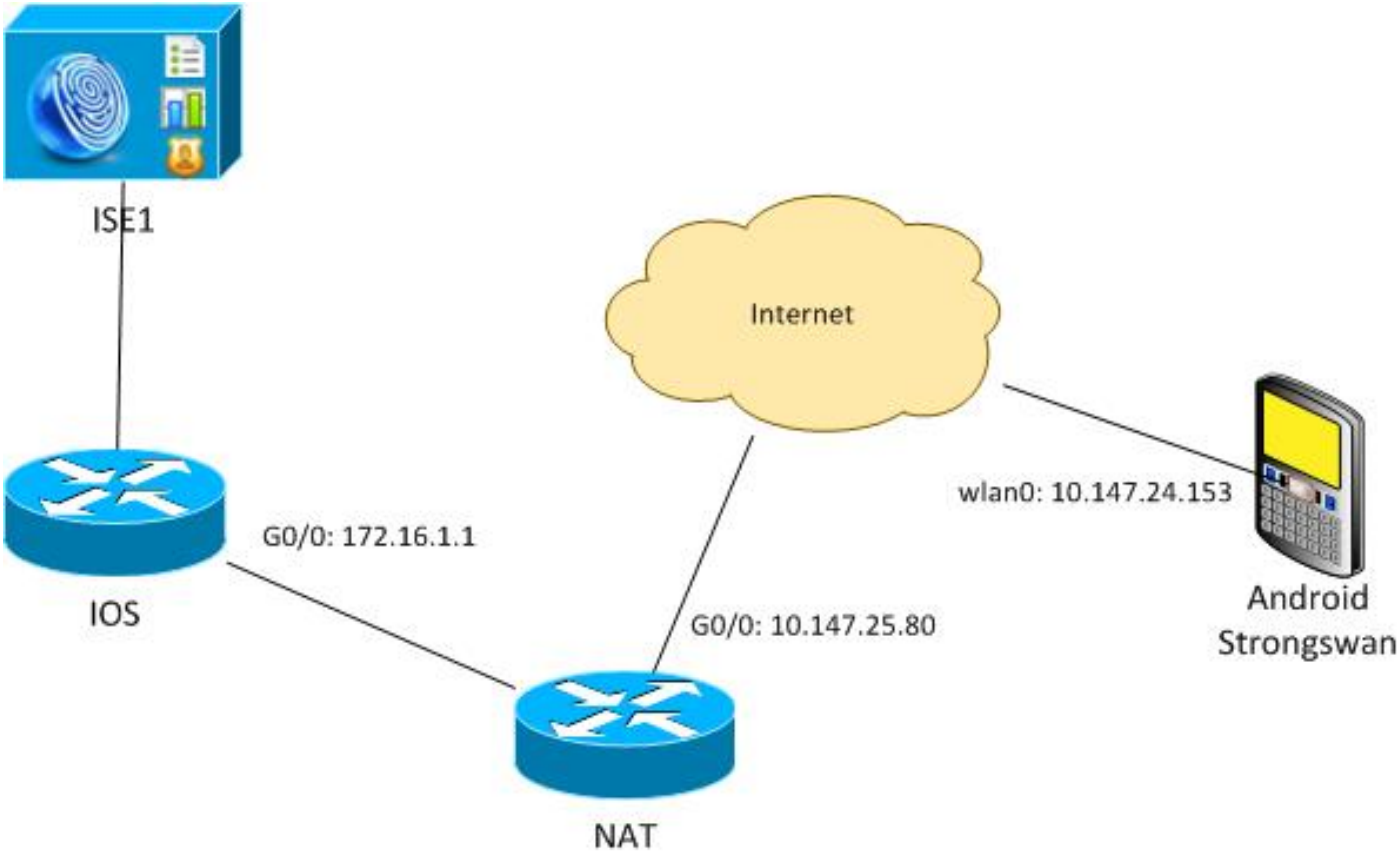
```
BSAN-2900-1#show crypto ikev2 sa detailed
 IPv4 Crypto IKEv2  SA

Tunnel-id Local                 Remote                fvrf/ivrf          Status
1         10.48.64.15/4500      10.147.24.153/44527   none/none          READY
     Encr: AES-CBC, keysize: 128, Hash: SHA96, DH Grp:14, Auth sign: RSA,
Auth verify: RSA
     Life/Active Time: 86400/16 sec
     CE id: 1010, Session-id: 3
     Status Description: Negotiation done
     Local spi: A03D273FC75EEBD9       Remote spi: E53A57E359A8437C
     Local id: 10.48.64.15
     Remote id: cn=android,ou=TAC,o=Cisco,l=Krakow,st=Malopolska,c=PL
     Local req msg id:  0              Remote req msg id:  2
     Local next msg id: 0              Remote next msg id: 2
     Local req queued:  0              Remote req queued:  2
     Local window:      5              Remote window:      1
     DPD configured for 0 seconds, retry 0
     Fragmentation not configured.
     Extended Authentication not configured.
     NAT-T is detected  outside
     Cisco Trust Security SGT is disabled
     Assigned host addr: 192.168.0.3
     Initiator of SA : No
```

Android上的状态验证与上一个场景中的状态验证类似。

NAT背后的VPN网关 — strongSwan和Cisco IOS软件限制

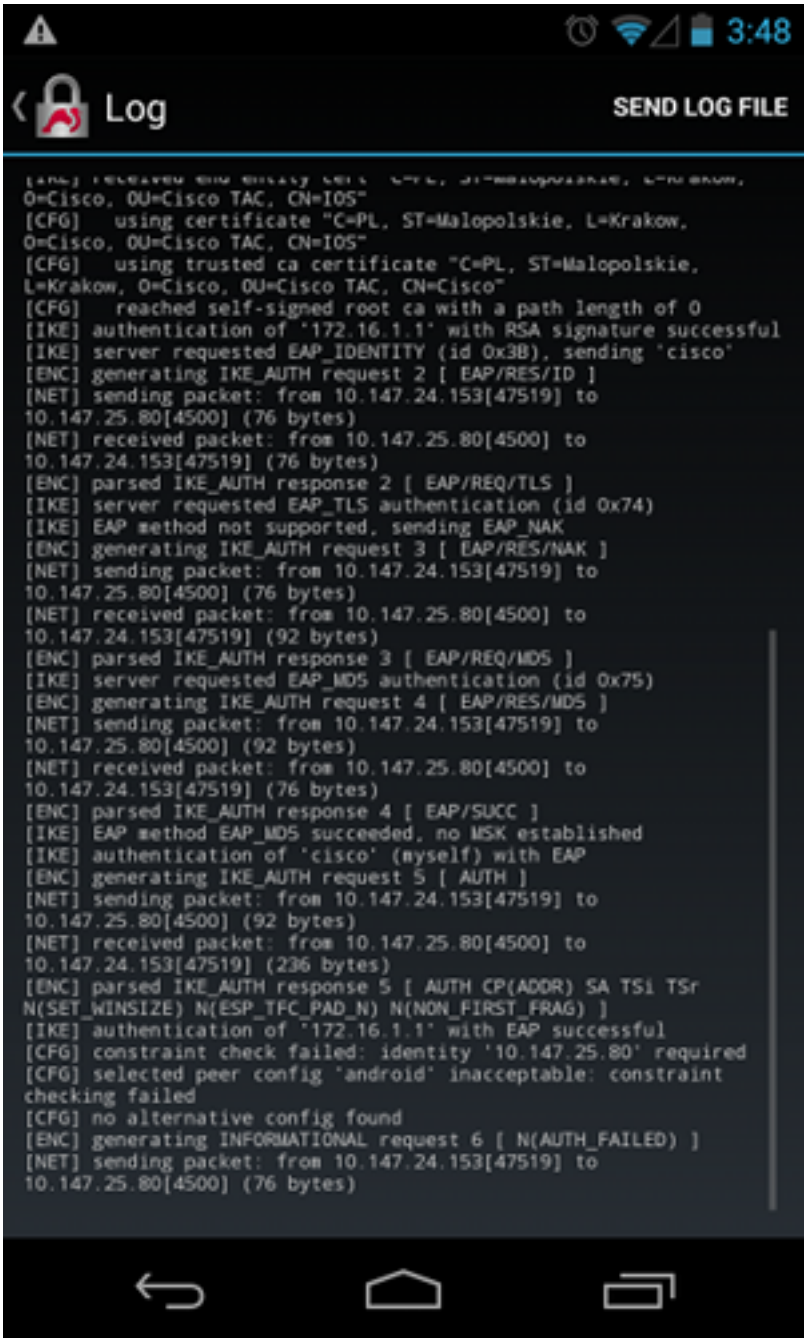
此示例解释了StrongSwan证书验证的限制。

假设Cisco IOS软件VPN网关IP地址从172.16.1.1静态转换为10.147.25.80。使用EAP身份验证。



另外，假设Cisco IOS软件证书具有172.16.1.1和10.147.25.80的使用者备用名称。

成功进行EAP身份验证后，Android将执行验证，并尝试在Subject Alternative Name扩展中查找Android配置(10.147.25.80)中使用的对等体的IP地址。验证失败：

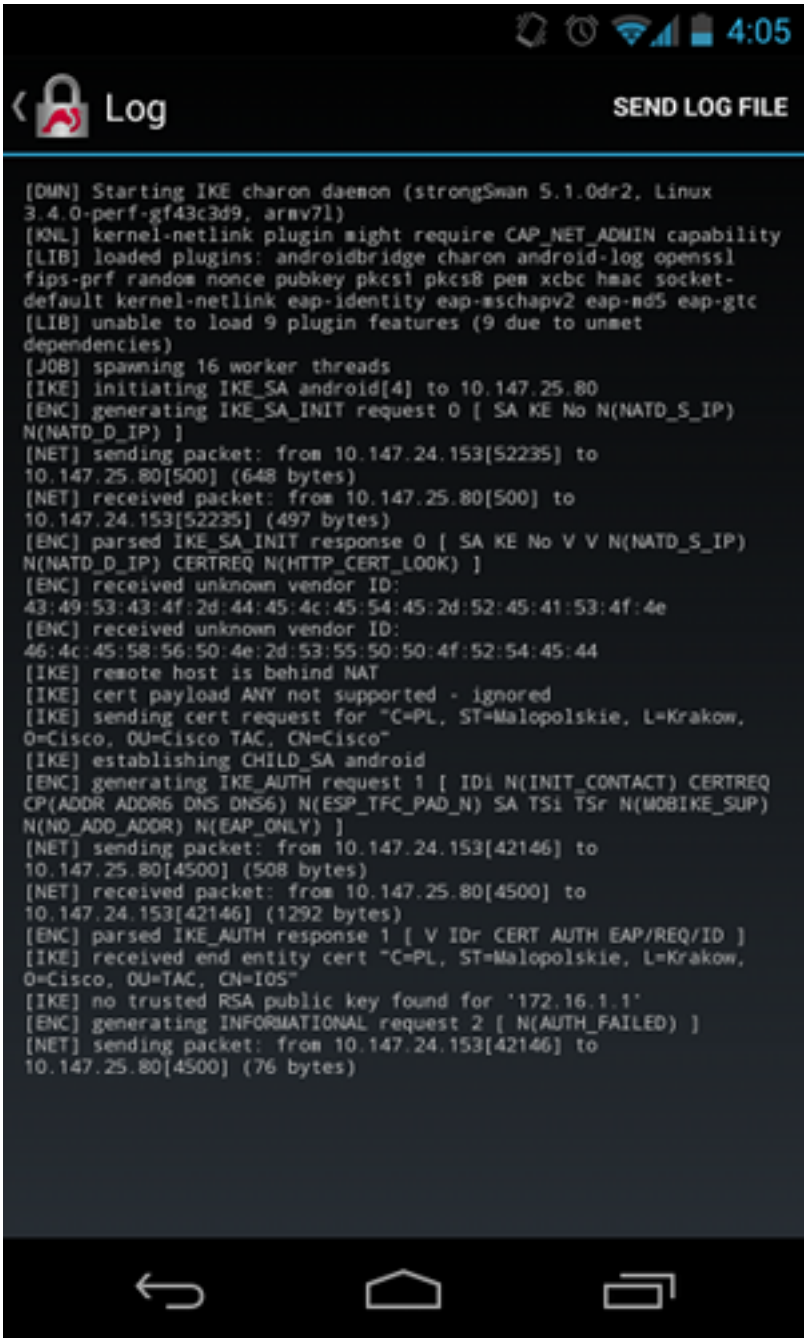


日志显示：

```
constraint check failed: identity '10.147.25.80' required
```

发生故障是因为Android只能读取第一个主题备用名称扩展(172.16.1.1)。

现在，假设Cisco IOS软件证书在主题备用名称中具有两个地址，但顺序相反：10.147.25.80和172.16.1.1。Android在收到第三个数据包中的IKEID(IKEID是VPN网关(172.16.1.1)的IP地址)时执行验证：



现在，日志显示：

```
no trusted RSA public key found for '172.16.1.1'
```

因此，当Android收到IKEID时，它需要在主题备用名称中查找IKEID，并且只能使用第一个IP地址。

> **注意：**在EAP身份验证中，Cisco IOS软件发送的IKEID是默认的IP地址。在RSA身份验证中，IKEID是默认的证书DN。使用ikev2配置文件下的**identity**命令手动更改这些值。

验证

配置示例中提供了验证和测试过程。

故障排除

本部分提供的信息可用于对配置进行故障排除。

strongSwan CA多CERT_REQ

当strongSwan上的证书设置为自动选择（默认）时，Android会发送CERT_REQ，用于第三个数据包中的本地存储中的所有受信任证书。Cisco IOS软件可能会丢弃该请求，因为它将大量证书请求识别为拒绝服务攻击：

```
*Jul 15 07:54:13: IKEv2:number of cert req exceeds the reasonable limit (100)
```

DVTI上的隧道源

虽然在虚拟隧道接口(VTI)上设置隧道源非常常见，但此处不必设置。假设**隧道**源命令在动态VTI(DVTI)下：

```
interface Virtual-Template1 type tunnel
 ip unnumbered GigabitEthernet0/0
 tunnel source GigabitEthernet0/0
 tunnel mode ipsec ipv4
 tunnel protection ipsec profile PROF
```

身份验证后，如果Cisco IOS软件尝试创建从虚拟模板克隆的虚拟访问接口，它会返回错误：

```
*Aug  1 13:34:22 IKEv2:Allocated addr 192.168.0.9 from local pool POOL
*Aug  1 13:34:22 IKEv2:(SA ID = 1):Set received config mode data
*Aug  1 13:34:22 IKEv2:% DVTI create request sent for profile PROF with PSH
index 1
*Aug  1 13:34:22 IKEv2:Failed to process KMI delete SA message with error 4
*Aug  1 13:34:24 IKEv2:Got a packet from dispatcher
*Aug  1 13:34:24 IKEv2:Processing an item off the pak queue
*Aug  1 13:34:24 IKEv2:Negotiation context locked currently in use
```

故障发生两秒后，Cisco IOS软件收到来自Android的重新传输的IKE_AUTH。该数据包被丢弃。

Cisco IOS软件错误和增强请求

- Cisco Bug ID CSCui46418，“IOS Ikev2 ip address sent as identity for RSA authentication”。此Bug不是问题，只要strongSwan在证书中查找IKEID以执行验证时能看到正确的主题备用名称（IP地址）。
- Cisco Bug ID CSCui44976，“IOS PKI错误地显示了X509v3扩展主题备用名称。”仅当主题备用名称中有多个IP地址时，才会发生此错误。仅显示最后一个IP地址，但这不会影响证书的使用。整个证书已发送并正确处理。
- Cisco Bug ID CSCui44783，“IOS ENH PKI cability to generate CSR with subject-alt-name extension”。
- Cisco Bug ID CSCui44335，“ASA ENH Certificate x509 extensions displayed”。

相关信息

- Cisco IOS 15.3 VPN配置指南
- Cisco IOS 15.3命令参考
- 思科IOS Flex VPN配置指南
- 技术支持和文档 - Cisco Systems