

# Configure ASA IKEv2 Remote Access with EAP-PEAP and Native Windows Client



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## Introduction

This document provides a configuration example for a Cisco Adaptive Security Appliance (ASA) Version 9.3.2 and later that allows remote VPN access to use Internet Key Exchange Protocol (IKEv2) with standard Extensible Authentication Protocol (EAP) authentication. This allows a native Microsoft Windows 7 client (and any other standard-based IKEv2) to connect to the ASA with IKEv2 and EAP authentication.

## Prerequisites

## Requirements

Cisco recommends that you have knowledge of these topics:

- Basic VPN and IKEv2 knowledge
- Basic Authentication, Authorization, and Accounting (AAA) and RADIUS knowledge
- Experience with ASA VPN configuration

- Experience with Identity Services Engine (ISE) configuration

## Components Used

The information in this document is based on these software and hardware versions:

- Microsoft Windows 7
- Cisco ASA software, Version 9.3.2 and later
- Cisco ISE, Release 1.2 and later

## Background Information

### AnyConnect Secure Mobility Client Considerations

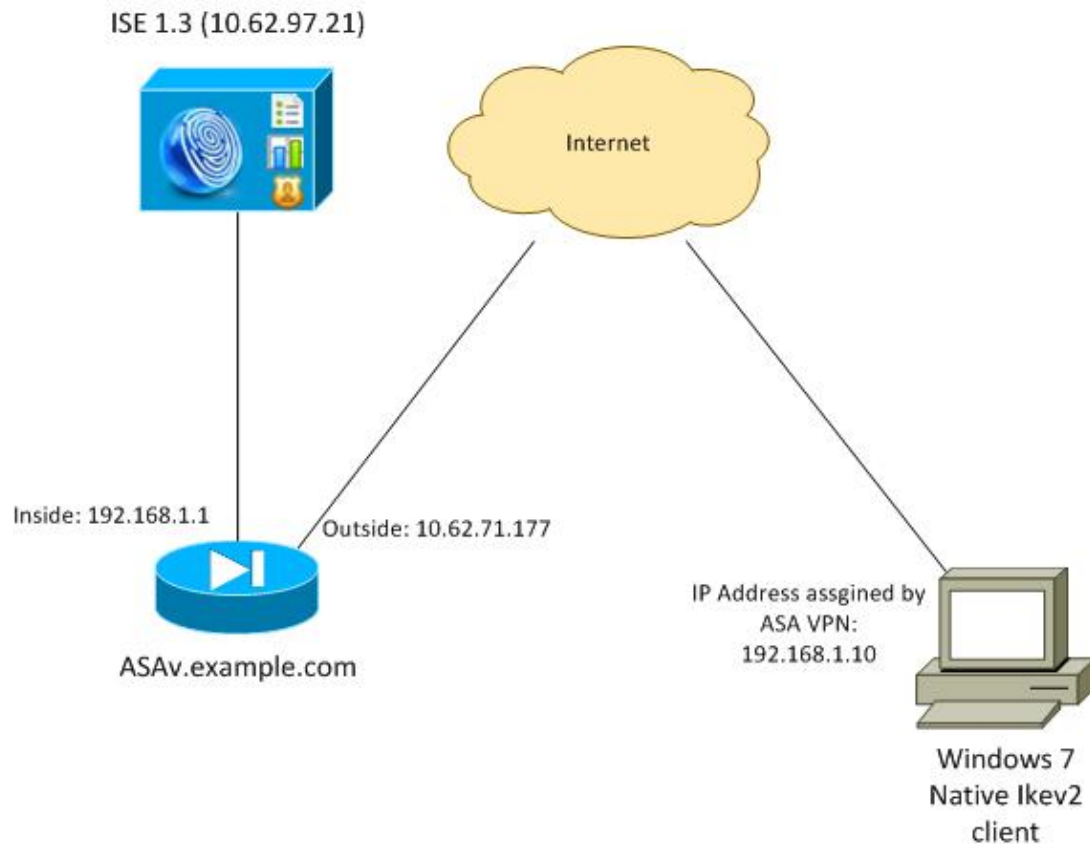
The native Windows IKEv2 client does not support split tunnel (there are no CONF REPLY attributes which could be accepted by the Windows 7 client), so the only possible policy with the Microsoft client is to tunnel all traffic (0/0 traffic selectors). If there is a need for a specific split tunnel policy, AnyConnect should be used.

AnyConnect does not support standardized EAP methods which are terminated on the AAA server (PEAP, Transport Layer Security). If there is a need to terminate EAP sessions on the AAA server then the Microsoft client can be used.

## Configure

*Note:* Use the Command Lookup Tool (registered customers only) in order to obtain more information on the commands used in this section.

## Network Diagram



The ASA is configured to authenticate with a certificate (the client needs to trust that certificate). The Windows 7 client is configured to authenticate with EAP (EAP-PEAP).

The ASA acts as VPN gateway terminating IKEv2 session from the client. The ISE acts as an AAA server terminating EAP session from the client. EAP packets are encapsulated in IKE\_AUTH packets for traffic between the client and the ASA (IKEv2) and then in RADIUS packets for authentication traffic between the ASA and the ISE.

## Certificates

Microsoft Certificate Authority (CA) has been used in order to generate the certificate for the ASA. The certificate requirements in order to be accepted by the Windows 7 native client are:

- The Extended Key Usage (EKU) extension should include Server Authentication (template "Web server" has been used in that example).
- The Subject-Name should include the Fully Qualified Domain Name (FQDN) which will be used by the client in order to connect (in this example ASAv.example.com).

For more details on the Microsoft client, see [Troubleshooting IKEv2 VPN Connections](#).

**Note:** Android 4.x is more restrictive and requires the correct Subject Alternative Name as per RFC 6125. For more information for Android, see [IKEv2 from Android strongSwan to Cisco IOS with EAP and RSA Authentication](#).

In order to generate a certificate signing request on the ASA, this configuration has been used:

```
hostname ASAv
domain-name example.com
```

```
crypto ca trustpoint TP
  enrollment terminal
```

```
crypto ca authenticate TP
crypto ca enroll TP
```

## ISE

### Step 1. Add the ASA to the network devices on the ISE.

Choose *Administration > Network Devices*. Set a preshared password which will be used by the ASA.

### Step 2. Create a username in the local store.

Choose *Administration > Identities > Users*. Create the username as required.

All other settings are enabled by default for the ISE to authenticate endpoints with EAP-PEAP (Protected Extensible Authentication Protocol).

## ASA

The configuration for remote access is similar for IKEv1 and IKEv2.

```
aaa-server ISE2 protocol radius
aaa-server ISE2 (inside) host 10.62.97.21
  key cisco

group-policy AllProtocols internal
group-policy AllProtocols attributes
  vpn-tunnel-protocol ikev1 ikev2 ssl-client ssl-clientless

ip local pool POOL 192.168.1.10-192.168.1.20 mask 255.255.255.0

crypto ipsec ikev2 ipsec-proposal ipsec-proposal
  protocol esp encryption aes-256 aes-192 aes
  protocol esp integrity sha-256 sha-1 md5

crypto dynamic-map DYNMAP 10 set ikev2 ipsec-proposal ipsec-proposal
crypto map MAP 10 ipsec-isakmp dynamic DYNMAP
crypto map MAP interface outside

crypto ikev2 policy 10
  encryption 3des
  integrity sha
  group 2
  prf sha
  lifetime seconds 86400
```

Since Windows 7 sends an IKE-ID type address in IKE\_AUTH packet, the *DefaultRAGroup* should be used in order to make sure that the connection lands on the correct tunnel-group. The ASA authenticates with a certificate (local-authentication) and expects the client to use EAP (remote-authentication). Also, the ASA needs to specifically send an EAP identity request for the client to respond with EAP identity response (query-identity).

```
tunnel-group DefaultRAGroup general-attributes
  address-pool POOL
  authentication-server-group ISE
  default-group-policy AllProtocols
tunnel-group DefaultRAGroup ipsec-attributes
  ikev2 remote-authentication eap query-identity
```

*ikev2 local-authentication certificate TP*

Finally, IKEv2 needs to be enabled and the correct certificate used.

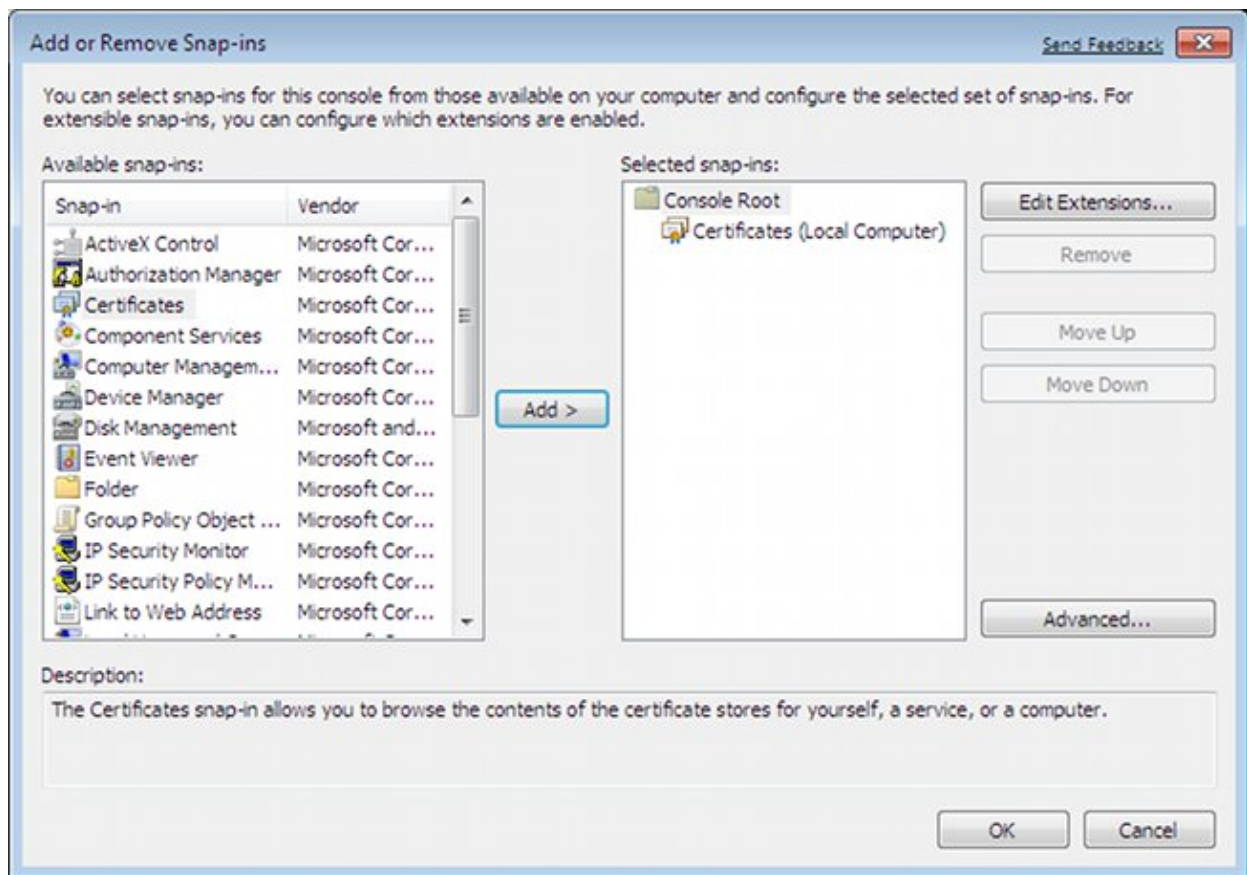
```
crypto ikev2 enable outside client-services port 443
crypto ikev2 remote-access trustpoint TP
```

## Windows 7

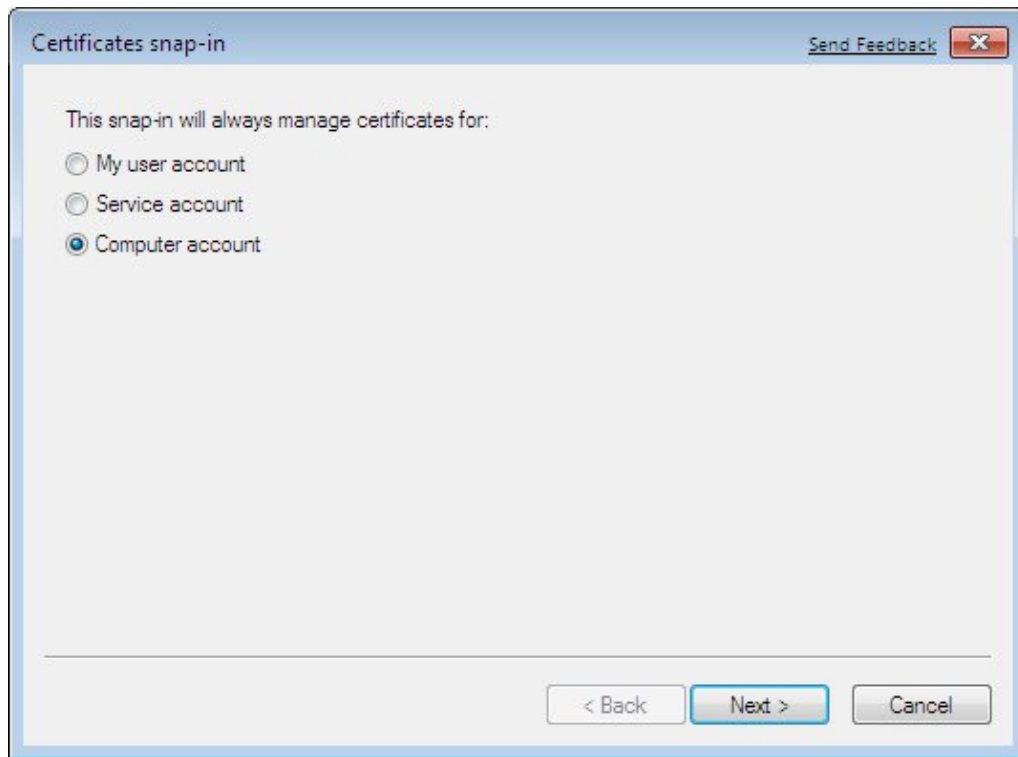
### Step 1. Install the CA certificate.

In order to trust the certificate presented by the ASA, the Windows client needs to trust its CA. That CA certificate should be added to the computer certificate store (not the user store). The Windows client uses the computer store in order to validate the IKEv2 certificate.

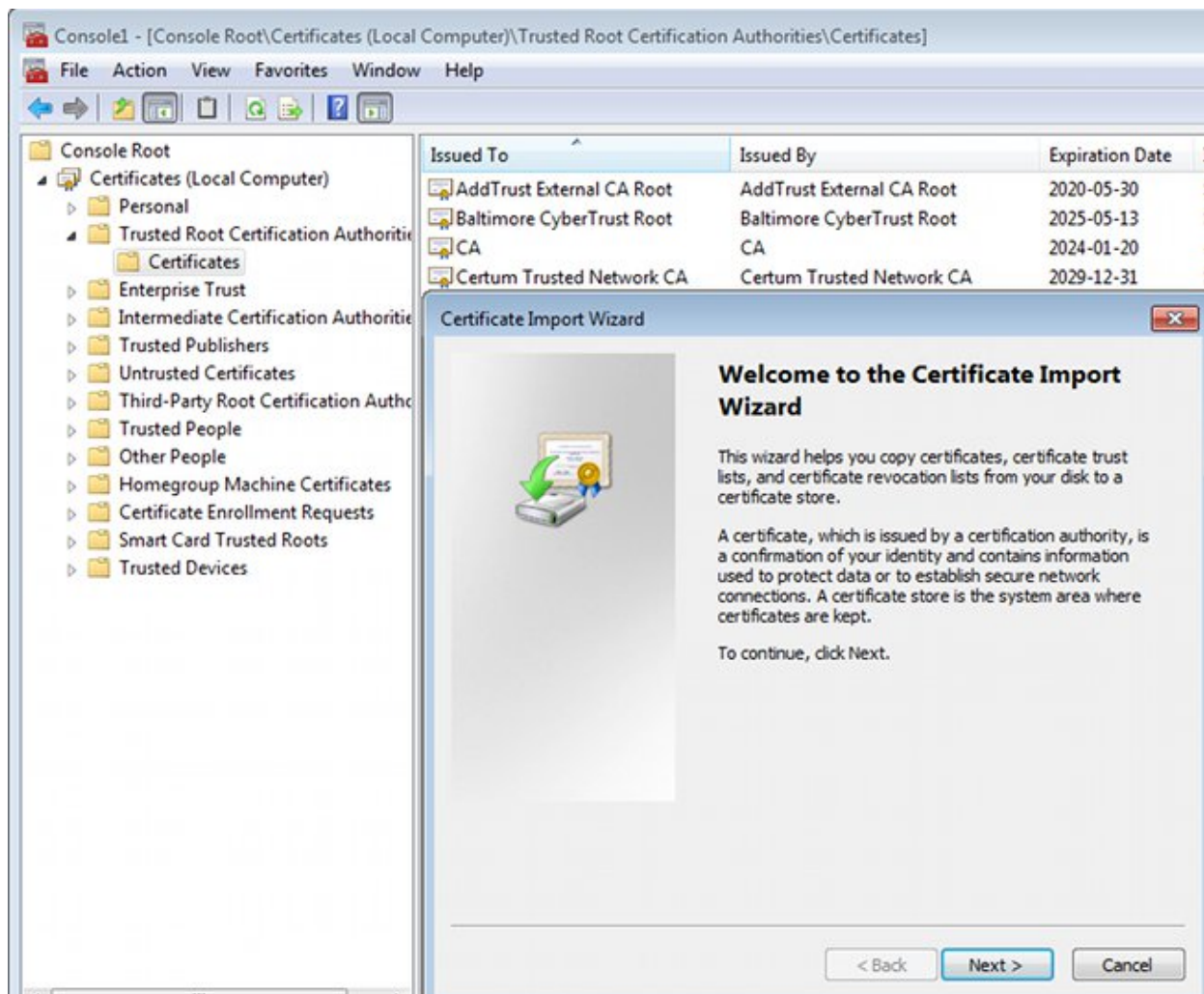
In order to add the CA, choose *MMC > Add or Remove Snap-ins > Certificates*.



Click the *Computer account* radio button.



Import the CA to the Trusted Root Certificate Authorities.



If the Windows client is not able to validate the certificate presented by the ASA, it reports:

13801: IKE authentication credentials are unacceptable

## Step 2. Configure the VPN connection.

In order to configure the VPN connection from the Network and Sharing Center, choose **Connect to a workplace** in order to create a VPN connection.

The image shows a Windows Control Panel window for Network and Sharing Center. The main area displays network information for 'ADMIN-KOMPUTER (This computer)', including 'Sieć 143' (Public network) and 'Internet'. Below this, there are links to 'View your active networks' and 'Change your networking settings'. A 'Set up a new connection or network' link is highlighted, with a sub-link 'Set up a wireless, broadband, dial-up, ad hoc, or VPN connection; or set up a router or access point.' Below this, a dialog box titled 'Set Up a Connection or Network' is open, showing four options: 'Connect to the Internet', 'Set up a new network', 'Connect to a workplace' (which is selected and highlighted), and 'Set up a dial-up connection'. The 'Next' button is visible at the bottom right of the dialog box.

Choose **Use my Internet connection (VPN)**.

How do you want to connect?

The image shows a dialog box titled 'How do you want to connect?'. It contains a single option: 'Use my Internet connection (VPN)' with a green arrow icon. Below the text, there is a description: 'Connect using a virtual private network (VPN) connection through the Internet.' At the bottom, there are three icons: a computer monitor, a globe, and a server rack, connected by lines.

Configure the address with an ASA FQDN. Make sure it is correctly resolved by the Domain Name Server (DNS).

### Type the Internet address to connect to

Your network administrator can give you this address.

Internet address:	<input type="text" value="ASAv.example.com"/>
Destination name:	<input type="text" value="IKEv2 connection to ASA"/>

Use a smart card

Allow other people to use this connection  
This option allows anyone with access to this computer to use this connection.

Don't connect now; just set it up so I can connect later

If required, adjust properties (such as certificate validation) on the Protected EAP Properties window.

**Protected EAP Properties**

When connecting:

- Validate server certificate
- Connect to these servers:

Trusted Root Certification Authorities:

- AddTrust External CA Root
- asa.mga.com
- ASAv
- Baltimore CyberTrust Root
- CA
- CA
- Certum Trusted Network CA

Do not prompt user to authorize new servers or trusted certification authorities.

Select Authentication Method:

Secured password (EAP-MSCHAP v2)

- Enable Fast Reconnect
- Enforce Network Access Protection
- Disconnect if server does not present cryptobinding TLV
- Enable Identity Privacy



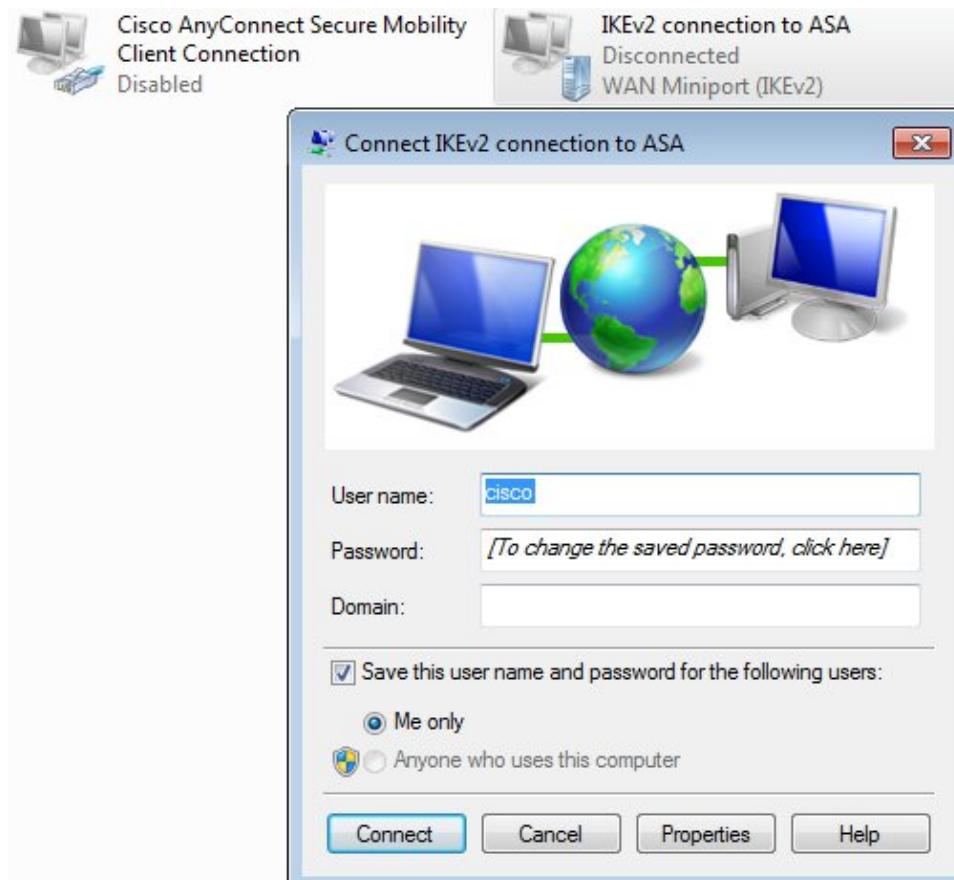
# Verify

Use this section to confirm that your configuration works properly.

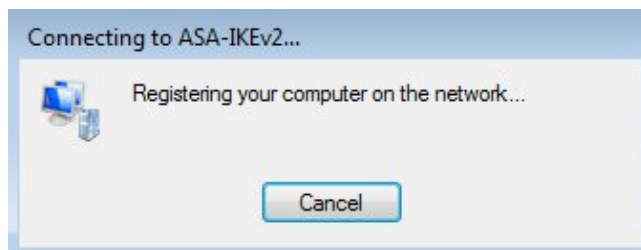
The Output Interpreter Tool (registered customers only) supports certain *show* commands. Use the Output Interpreter Tool in order to view an analysis of *show* command output.

## Windows Client

When you connect, enter your credentials.



After successful authentication the IKEv2 configuration is applied.



The session is UP.



The routing table has been updated with the default route with use of a new interface with the low metric.

```
C:\Users\admin>route print
=====
Interface List
 41.....IKEv2 connection to ASA
 11...08 00 27 d2 cb 54 .....Karta Intel(R) PRO/1000 MT Desktop Adapter
  1.....Software Loopback Interface 1
 15...00 00 00 00 00 00 00 e0 Karta Microsoft ISATAP
 12...00 00 00 00 00 00 00 e0 Teredo Tunneling Pseudo-Interface
 22...00 00 00 00 00 00 00 e0 Karta Microsoft ISATAP #4
=====

IPv4 Route Table
=====
Active Routes:
Network Destination        Netmask          Gateway          Interface        Metric
 0.0.0.0                   0.0.0.0          192.168.10.1     192.168.10.68    4491
 0.0.0.0                   0.0.0.0          On-link          192.168.1.10     11
 10.62.71.177             255.255.255.255  192.168.10.1     192.168.10.68    4236
 127.0.0.0                 255.0.0.0        On-link          127.0.0.1        4531
 127.0.0.1                 255.255.255.255  On-link          127.0.0.1        4531
 127.255.255.255          255.255.255.255  On-link          127.0.0.1        4531
 192.168.1.10             255.255.255.255  On-link          192.168.1.10     266
 192.168.10.0             255.255.255.0    On-link          192.168.10.68    4491
 192.168.10.68           255.255.255.255  On-link          192.168.10.68    4491
 192.168.10.255          255.255.255.255  On-link          192.168.10.68    4491
 224.0.0.0                 240.0.0.0        On-link          127.0.0.1        4531
 224.0.0.0                 240.0.0.0        On-link          192.168.10.68    4493
 224.0.0.0                 240.0.0.0        On-link          192.168.1.10     11
 255.255.255.255          255.255.255.255  On-link          127.0.0.1        4531
 255.255.255.255          255.255.255.255  On-link          192.168.10.68    4491
 255.255.255.255          255.255.255.255  On-link          192.168.1.10     266
=====
```

## Logs

After successful authentication the ASA reports:

```
ASAv(config)# show vpn-sessiondb detail ra-ikev2-ipsec

Session Type: Generic Remote-Access IKEv2 IPsec Detailed

Username       : cisco                               Index          : 13
Assigned IP    : 192.168.1.10                   Public IP      : 10.147.24.166
Protocol       : IKEv2 IPsecOverNatT
License        : AnyConnect Premium
Encryption     : IKEv2: (1)3DES  IPsecOverNatT: (1)AES256
Hashing        : IKEv2: (1)SHA1  IPsecOverNatT: (1)SHA1
Bytes Tx       : 0                               Bytes Rx       : 7775
Pkts Tx        : 0                               Pkts Rx       : 94
```

```

Pkts Tx Drop : 0                               Pkts Rx Drop : 0
Group Policy : AllProtocols                 Tunnel Group : DefaultRAGroup
Login Time   : 17:31:34 UTC Tue Nov 18 2014
Duration     : 0h:00m:50s
Inactivity   : 0h:00m:00s
VLAN Mapping : N/A                               VLAN           : none
Audt Sess ID : c0a801010000d000546b8276
Security Grp : none

```

```

IKEv2 Tunnels: 1
IPsecOverNatT Tunnels: 1

```

IKEv2:

```

Tunnel ID      : 13.1
UDP Src Port   : 4500                               UDP Dst Port   : 4500
Rem Auth Mode: EAP
Loc Auth Mode: rsaCertificate
Encryption    : 3DES                               Hashing        : SHA1
Rekey Int (T) : 86400 Seconds                       Rekey Left(T) : 86351 Seconds
PRF           : SHA1                               D/H Group     : 2
Filter Name   :

```

IPsecOverNatT:

```

Tunnel ID      : 13.2
Local Addr   : 0.0.0.0/0.0.0.0/0/0
Remote Addr : 192.168.1.10/255.255.255.255/0/0
Encryption     : AES256                               Hashing        : SHA1
Encapsulation  : Tunnel
Rekey Int (T)  : 28800 Seconds                       Rekey Left(T) : 28750 Seconds
Idle Time Out  : 30 Minutes                          Idle TO Left   : 29 Minutes
Bytes Tx       : 0                                   Bytes Rx      : 7834
Pkts Tx        : 0                                   Pkts Rx       : 95

```

ISE logs indicate successful authentication with default authentication and authorization rules.

The screenshot shows the Cisco Identity Services Engine (ISE) interface. At the top, there are navigation tabs for Home, Operations, Policy, Guest Access, and Administration. Below this, there are several status indicators: Misconfigured Supplicants (0), Misconfigured Network Devices (0), RADIUS Drops (6), and Client Stopped (0). The main part of the screenshot is a table of authentication logs. The table has columns for Time, Status, Det..., Repeat C..., Identity, Endpoint ID, Authorization Policy, Authorization Profiles, and Network Device. Two rows of logs are visible, both showing successful authentication for a 'cisco' identity from endpoint '10.147.24.166'.

Time	Status	Det...	Repeat C...	Identity	Endpoint ID	Authorization Policy	Authorization Profiles	Network Device
2014-11-18 18:31:34...			3	cisco	10.147.24.166			
2014-11-18 17:52:07...				cisco	10.147.24.166	Default >> Basic_Authenticated_Access	PermitAccess	ASAv

The details indicate the PEAP method.

## Authentication Details

Source Timestamp	2014-11-19 08:10:02.819
Received Timestamp	2014-11-19 08:10:02.821
Policy Server	ise13
Event	5200 Authentication succeeded
Failure Reason	
Resolution	
Root cause	
Username	cisco
User Type	User
Endpoint Id	10.147.24.166
Endpoint Profile	
IP Address	
Authentication Identity Store	Internal Users
Identity Group	
Audit Session Id	c0a8010100010000546c424a
Authentication Method	MSCHAPV2
Authentication Protocol	PEAP (EAP-MSCHAPv2)
Service Type	Login
Network Device	ASAv
Device Type	All Device Types
Location	All Locations
NAS IP Address	10.62.71.177
NAS Port Id	
NAS Port Type	Virtual
Authorization Profile	PermitAccess

## Debugs on the ASA

The most important debugs include:

```
ASAv# debug crypto ikev2 protocol 32  
<most debugs omitted for clarity....
```

IKE\_SA\_INIT packet received by the ASA (includes IKEv2 proposals and key exchange for Diffie–Hellman (DH)):

```
IKEv2-PROTO-2: Received Packet [From 10.147.24.166:500/To 10.62.71.177:500/VRF i0:f0]  
Initiator SPI : 7E5B69A028355701 - Responder SPI : 0000000000000000 Message id: 0  
IKEv2 IKE_SA_INIT Exchange REQUESTIKEv2-PROTO-3: Next payload: SA,  
  version: 2.0 Exchange type: IKE_SA_INIT, flags: INITIATOR Message id: 0, length: 528  
Payload contents:  
SA Next payload: KE, reserved: 0x0, length: 256  
  last proposal: 0x2, reserved: 0x0, length: 40  
  Proposal: 1, Protocol id: IKE, SPI size: 0, #trans: 4    last transform: 0x3,
```

```
reserved: 0x0: length: 8
.....
```

IKE\_SA\_INIT response to the initiator (includes IKEv2 proposals, key exchange for DH, and certificate request):

```
IKEv2-PROTO-2: (30): Generating IKE_SA_INIT message
IKEv2-PROTO-2: (30): IKE Proposal: 1, SPI size: 0 (initial negotiation),
Num. transforms: 4
(30):    3DES(30):    SHA1(30):    SHA96(30):    DH_GROUP_1024_MODP/Group
2IKEv2-PROTO-5:
Construct Vendor Specific Payload: DELETE-REASONIKEv2-PROTO-5: Construct Vendor
Specific Payload: (CUSTOM)IKEv2-PROTO-5: Construct Notify Payload:
NAT_DETECTION_SOURCE_IPIKEv2-PROTO-5: Construct Notify Payload:
NAT_DETECTION_DESTINATION_IPIKEv2-PROTO-5: Construct Vendor Specific Payload:
FRAGMENTATION(30):
IKEv2-PROTO-2: (30): Sending Packet [To 10.147.24.166:500/From
10.62.71.177:500/VRF i0:f0]
```

IKE\_AUTH for client with IKE-ID, certificate request, proposed transform sets, requested configuration, and traffic selectors:

```
IKEv2-PROTO-2: (30): Received Packet [From 10.147.24.166:4500/To 10.62.71.177:500/VRF
i0:f0]
(30): Initiator SPI : 7E5B69A028355701 - Responder SPI: 1B1A94C7A7739855 Message id: 1
(30): IKEv2 IKE_AUTH Exchange REQUESTIKEv2-PROTO-3: (30): Next payload: ENCR,
version: 2.0 (30): Exchange type: IKE_AUTH, flags: INITIATOR (30): Message id: 1,
length: 948(30):
```

IKE\_AUTH response from the ASA that includes an EAP identity request (first packet with EAP extensions). That packet also includes the certificate (if there is no correct certificate on the ASA there is a failure):

```
IKEv2-PROTO-2: (30): Generating EAP request
IKEv2-PROTO-2: (30): Sending Packet [To 10.147.24.166:4500/From 10.62.71.177:4500/VRF
i0:f0]
```

EAP response received by the ASA (length 5, payload: cisco):

```
(30): REAL Decrypted packet:(30): Data&colon; 14 bytes
(30): EAP(30): Next payload: NONE, reserved: 0x0, length: 14
(30): Code: response: id: 36, length: 10
(30): Type: identity
(30): EAP data&colon; 5 bytes
```

Then multiple packets are exchanged as a part of EAP-PEAP. Finally EAP success is received by the ASA and forwarded to the supplicant:

```
Payload contents:
(30): EAP(30): Next payload: NONE, reserved: 0x0, length: 8
(30): Code: success: id: 76, length: 4
```

Peer authentication is successful:

```
IKEv2-PROTO-2: (30): Verification of peer's authentication data PASSED
```

And the VPN session is finished correctly.

## Packet Level

The EAP identity request is encapsulated in "Extensible Authentication" of the IKE\_AUTH send by the ASA. Along with the identity request, IKE\_ID and certificates are sent.

No.	Source	Destination	Protocol	Length	Info
1	10.147.24.166	10.62.71.177	ISAKMP	570	IKE_SA_INIT
2	10.62.71.177	10.147.24.166	ISAKMP	501	IKE_SA_INIT
3	10.147.24.166	10.62.71.177	ISAKMP	990	IKE_AUTH
4	10.147.24.166	10.62.71.177	ISAKMP	959	IKE_AUTH
5	10.62.71.177	10.147.24.166	EAP	1482	Request, Identity
6	10.62.71.177	10.147.24.166	ISAKMP	1514	

Length: 1440

▸ Type Payload: Vendor ID (43) : Unknown Vendor ID

▸ Type Payload: Identification - Responder (36)

▾ Type Payload: Certificate (37)

Next payload: Authentication (39)

0... .... = Critical Bit: Not Critical

Payload length: 1203

Certificate Encoding: X.509 Certificate - Signature (4)

▸ Certificate Data (iso.2.840.113549.1.9.2=ASAv.example.com)

▸ Type Payload: Authentication (39)

▾ Type Payload: Extensible Authentication (48)

Next payload: NONE / No Next Payload (0)

0... .... = Critical Bit: Not Critical

Payload length: 10

▾ Extensible Authentication Protocol

Code: Request (1)

Id: 36

Length: 6

Type: Identity (1)

Identity:

All subsequent EAP packets are encapsulated in IKE\_AUTH. After the supplicant confirms the method (EAP-PEAP), it starts to build an Secure Sockets Layer (SSL) tunnel which protects the MSCHAPv2 session used for authentication.

5	10.62.71.177	10.147.24.166	EAP	1482	Request, Identity
6	10.62.71.177	10.147.24.166	ISAKMP	1514	
7	10.147.24.166	10.62.71.177	ISAKMP	110	IKE_AUTH
8	10.147.24.166	10.62.71.177	EAP	84	Response, Identity
9	10.62.71.177	10.147.24.166	EAP	80	Request, Protected EAP (EAP-PEAP)
10	10.62.71.177	10.147.24.166	ISAKMP	114	
11	10.147.24.166	10.62.71.177	ISAKMP	246	IKE_AUTH
12	10.147.24.166	10.62.71.177	SSL	220	Client Hello
13	10.62.71.177	10.147.24.166	TLSv1	1086	Server Hello

After multiple packets are exchanged the ISE confirms success.

43	10.147.24.166	10.62.71.177	ISAKMP	150 IKE_AUTH
44	10.147.24.166	10.62.71.177	TLSv1	117 Application Data
45	10.62.71.177	10.147.24.166	EAP	78 Success

▾ Type Payload: Extensible Authentication (48)

Next payload: NONE / No Next Payload (0)

0... .. = Critical Bit: Not Critical

Payload length: 8

▾ Extensible Authentication Protocol

Code: Success (3)

Id: 101

Length: 4

The IKEv2 session is completed by the ASA, final configuration (configuration reply with values such as an assigned IP address), transform sets, and traffic selectors are pushed to the VPN client.

45	10.62.71.177	10.147.24.166	EAP	78 Success
46	10.62.71.177	10.147.24.166	ISAKMP	114
47	10.147.24.166	10.62.71.177	ISAKMP	126 IKE_AUTH
48	10.147.24.166	10.62.71.177	ISAKMP	98 IKE_AUTH
49	10.62.71.177	10.147.24.166	ISAKMP	222 IKE_AUTH

▸ Type Payload: Configuration (47)

▸ Type Payload: Security Association (33)

▾ Type Payload: Traffic Selector - Initiator (44) # 1

Next payload: Traffic Selector - Responder (45)

0... .. = Critical Bit: Not Critical

Payload length: 24

Number of Traffic Selector: 1

Traffic Selector Type: TS\_IPV4\_ADDR\_RANGE (7)

Protocol ID: Unused

Selector Length: 16

Start Port: 0

End Port: 65535

Starting Addr: 192.168.1.10 (192.168.1.10)

Ending Addr: 192.168.1.10 (192.168.1.10)

▾ Type Payload: Traffic Selector - Responder (45) # 1

Next payload: Notify (41)

0... .. = Critical Bit: Not Critical

Payload length: 24

## Troubleshoot

There is currently no specific troubleshooting information available for this configuration.

## Related Information

- *Cisco ASA Series VPN CLI Configuration Guide, 9.3*
- *Cisco Identity Services Engine User Guide, Release 1.2*
- *Technical Support & Documentation – Cisco Systems*

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