VPN Using Cisco ASA 5505

Technology Design Guide

August 2014 Series

CISCO VALIDATED DESIGN

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Preface

Cisco Validated Designs (CVDs) present systems that are based on common use cases or engineering priorities. CVDs incorporate a broad set of technologies, features, and applications that address customer needs. Cisco engineers have comprehensively tested and documented each design in order to ensure faster, more reliable, and fully predictable deployment.

CVDs include two guide types that provide tested design details:

- **Technology design guides** provide deployment details, information about validated products and software, and best practices for specific types of technology.
- **Solution design guides** integrate existing CVDs but also include product features and functionality across Cisco products and sometimes include information about third-party integration.

Both CVD types provide a tested starting point for Cisco partners or customers to begin designing and deploying systems.

CVD Foundation Series

This CVD Foundation guide is a part of the *August 2014 Series*. As Cisco develops a CVD Foundation series, the guides themselves are tested together, in the same network lab. This approach assures that the guides in a series are fully compatible with one another. Each series describes a lab-validated, complete system.

The CVD Foundation series incorporates wired and wireless LAN, WAN, data center, security, and network management technologies. Using the CVD Foundation simplifies system integration, allowing you to select solutions that solve an organization's problems—without worrying about the technical complexity.

To ensure the compatibility of designs in the CVD Foundation, you should use guides that belong to the same release. For the most recent CVD Foundation guides, please visit the CVD Foundation web site.

Comments and Questions

If you would like to comment on a guide or ask questions, please use the feedback form.

CVD Navigator

The CVD Navigator helps you determine the applicability of this guide by summarizing its key elements: the use cases, the scope or breadth of the technology covered, the proficiency or experience recommended, and CVDs related to this guide. This section is a quick reference only. For more details, see the Introduction.

Use Cases

This guide addresses the following technology use cases:

- **Teleworker with Wired Ethernet Devices**—Teleworkers who need always-on, secure access to networked business services from the remote home office often require telework resources connected with wired Ethernet.

For more information, see the "Use Cases" section in this guide.

Scope

This guide covers the following areas of technology and products:

- Remote-site teleworking using the Cisco Adaptive Security Appliance
- Internet edge firewall and VPN termination on Cisco Adaptive Security Appliances

For more information, see the "Design Overview" section in this guide.

Proficiency

This guide is for people with the following technical proficiencies—or equivalent experience:

- **CCNA Security**—1 to 3 years installing, monitoring, and troubleshooting network devices to maintain integrity, confidentiality, and availability of data and devices

Related CVD Guides

Remote Access VPN Technology Design Guide

To view the related CVD guides, click the titles or visit the CVD Foundation web site.

Technology Use Case

Many organizations face increasing need to offer a telecommuter solution to their employees. Employees perceive that commuting and water-cooler chatter are time they spend at work, and renting or buying office space and fixtures, and even deploying network infrastructure to host the work force, adds up to a substantial sum of capital and operating expense.

Providing an office-like work environment at the teleworker's home requires:

- A phone that is accessible as an extension on the organization's phone system.
- An unobtrusive, quiet, low-power solution to provide multiple Ethernet connections for one or more IP-phones or other desktop collaboration resources.
- One or more Ethernet connections for computers that access the organization's network, as well as Ethernet connectivity for other network-connected devices, such as printers and IP video surveillance equipment.

Employees don't need wireless connectivity at the telework site because all of the telework resources connect with wired Ethernet.

Use Case: Teleworker with Wired Ethernet Devices

Teleworkers require always-on secure access to networked business services from the remote home office. Sometimes employees don't need wireless connectivity at the telework site because all of the telework resources connect with wired Ethernet.

This design guide enables the following network capabilities:

- Authentication for employees before they can communicate with internal resources and encryption for all information sent and received to the organization's main location
- Co-residence with the organization's Internet edge firewall or remote-access VPN setup
- Power over Ethernet (PoE) for voice endpoints at the teleworker location

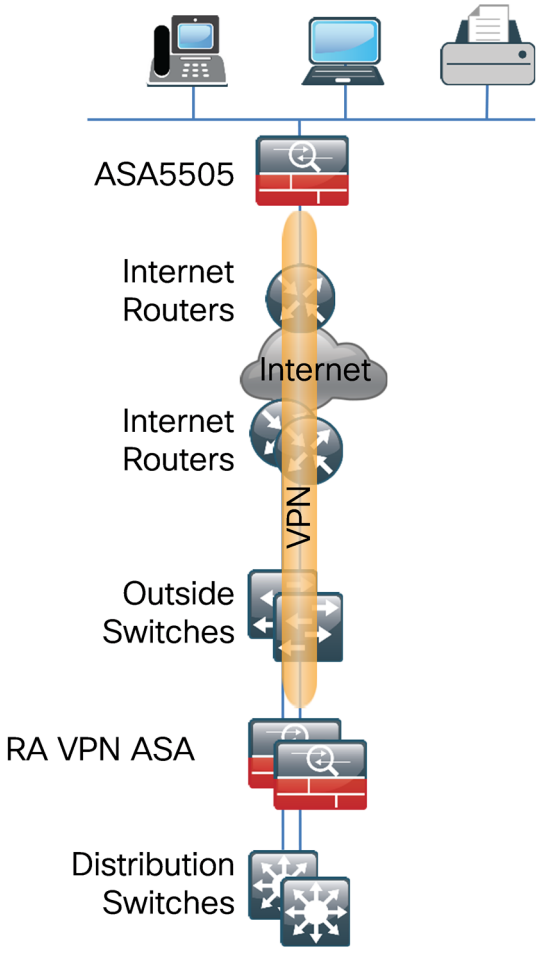
Design Overview

Cisco Adaptive Security Appliance (ASA) 5505 offers a low-cost option to provide teleworker connectivity to the organization. Cisco ASA 5505 provides secure connectivity for data and collaboration endpoints in a compact, fanless form factor, minimizing noise and space requirements.

The Cisco ASA 5505 teleworker solution integrates at the organization's Internet edge. The teleworker's connection terminates at resilient Cisco ASA firewalls at the organization's Internet edge. This solution is configured on the same ASA firewalls as the remote-access virtual private network (RAVPN) solution. This configuration applies to dedicated and shared-mode RAVPN deployments. Some of the configuration re-uses portions of the RAVPN configuration, although it may be configured to be completely independent of the RAVPN resources. The addition of the head-end's support for Cisco ASA 5505 teleworker termination does not affect RAVPN connectivity, and the configuration can be applied without the imposition of a service outage.

The Cisco ASA 5505 teleworker solution provides access for endpoint devices, such as laptop and desktop computers, IP phones, printers, and other devices that connect to the network via wired Ethernet connections. Two of the Cisco ASA 5505's ports provide Power over Ethernet (PoE) to support IP phones, IP video surveillance, and other endpoints without cluttering the teleworker's office with additional cables and wall-wart power supplies.

Figure 1 - Cisco ASA 5505 teleworker topology



The Cisco ASA 5505 teleworker solution offers:

- **Low cost**–With this solution, you get a Cisco ASA 5505, a Cisco IP phone, and the necessary license on the organization's Internet edge Cisco ASAs.
- **Flexible connectivity**–The Cisco ASA 5505's integrated Ethernet switch can accommodate multiple endpoint devices, including two interfaces that can provide PoE.
- **Simple deployment**–The Cisco ASA 5505 can be configured quickly with a brief text-file configuration.
- **Security**–Deactivation of the teleworker site's credentials on the Internet-edge appliance can terminate the teleworker's connectivity.

  Ideally, the Cisco ASA 5505 teleworker device is preconfigured and sent home with the teleworker user. A newly-provisioned or existing desktop IP-phone can be taken home, as well, and registers to the Cisco Call Manager server over the VPN.

Deployment Details

How to Read Commands

This guide uses the following conventions for commands that you enter at the command-line interface (CLI).

Commands to enter at a CLI prompt:

```
configure terminal
```

Commands that specify a value for a variable:

```
ntp server 10.10.48.17
```

Commands with variables that you must define:

```
class-map [highest class name]
```

Commands at a CLI or script prompt:

```
Router# enable
```

Long commands that line wrap are underlined. Enter them as one command:

```
police rate 10000 pps burst 10000
packets conform-action
```

Noteworthy parts of system output (or of device configuration files) are highlighted:

```
interface Vlan64
  ip address 10.5.204.5 255.255.255.0
```

Configuration of remote-access connectivity consists of three phases. In the first phase, you configure Cisco Secure ACS to authenticate and authorize teleworker users. In the second phase, you configure your resilient Internet-edge appliance pair to receive VPN connections from teleworkers' Cisco ASA 5505 appliances. In the third phase, you deploy configuration on the teleworkers' Cisco ASA 5505 hardware clients.

PROCESS

Configuring Cisco Secure ACS for Teleworker VPN

1. Create authorization profile
2. Create an authorization rule

This design uses Cisco Secure ACS in conjunction with Microsoft Active Directory for authentication of teleworkers who remotely connect to the enterprise via the Cisco ASA 5505 appliance.

When the Cisco ASA firewall queries the Cisco Secure ACS server (which then proxies the request to the Active Directory database) to determine whether a user's name and password is valid, Cisco Secure ACS also retrieves other Active Directory attributes, such as group membership. Based on this group membership, Cisco Secure ACS sends back a group policy name to the ASA appliance, along with the success or failure of the login. Cisco ASA uses the group policy name in order to assign the user to the appropriate VPN group policy.

In this process, Active Directory is the primary directory container for user credentials and group membership. Before you begin this process, your Active Directory must have a vpn-teleworker group defined.

User name	Active Directory Group
VPN-teleworker-1	cisco.local/Users/vpn-teleworker
VPN-teleworker-2	cisco.local/Users/vpn-teleworker

Procedure 1 Create authorization profile

Create an authorization profile in order to identify teleworker users that belong to the vpn-teleworker group in Active Directory.

Step 1: In **Policy Elements > Authorization and Permissions > Network Access > Authorization Profiles**, click **Create**.

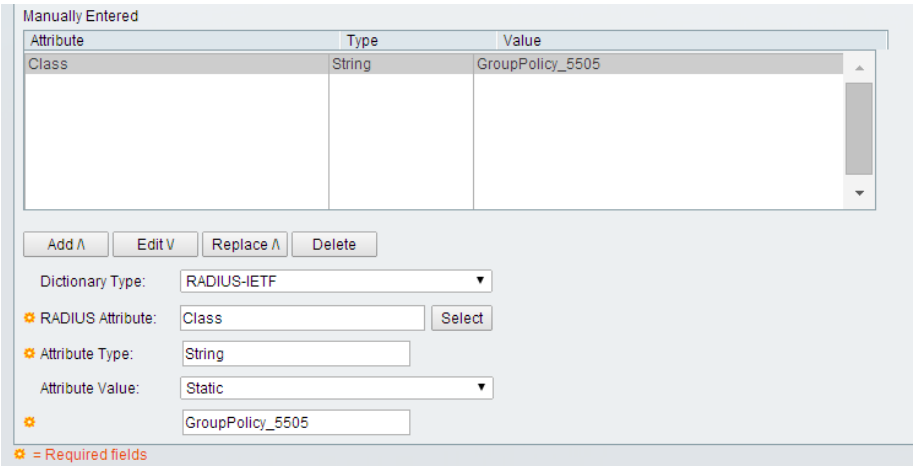
Step 2: In the **Name** box, enter a name for the authorization profile. (Example: VPN-Teleworker)

Step 3: Click the **RADIUS Attributes** tab, and then in the **RADIUS Attribute** row, click **Select**.

Step 4: In the RADIUS Dictionary dialog box, pane, select **Class**, and then click **OK**.

Next, you must configure the attribute value to match the group policy that you will configure on the Cisco ASA appliance.

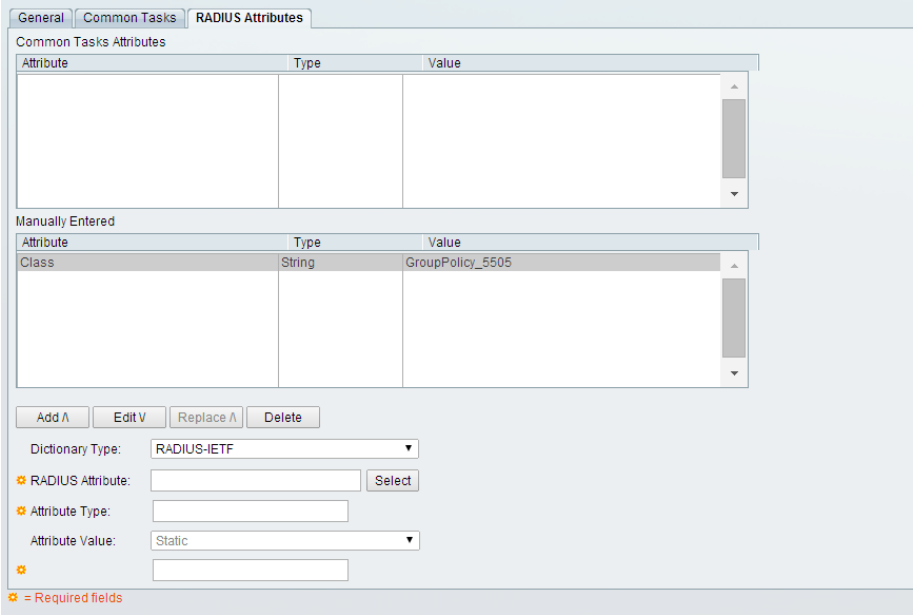
Step 5: In the **Attribute Value** box, enter the group policy name, and then click **Add ^**. (Example: GroupPolicy_5505)



Tech Tip

The group policy name must exactly match the group policy name of the Teleworker5505 connection profile on the ASA appliance, configured later in this document.

Step 6: Click **Submit**.



Procedure 2 Create an authorization rule

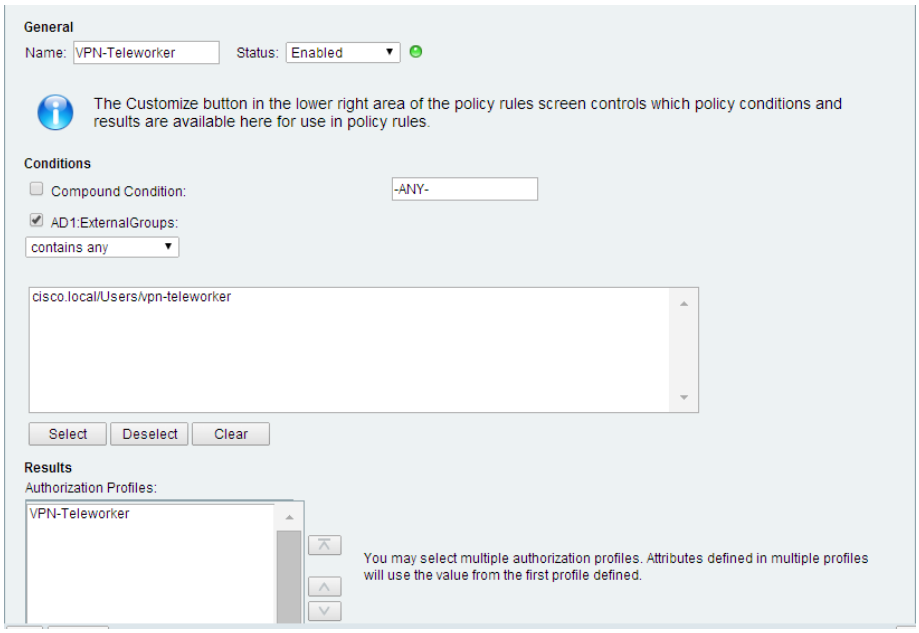
Step 1: In **Access Policies > Access Services > Remote Access VPN > Authorization**, click **Create**.

Step 2: In the **Name** box, enter a rule name. (Example: VPN-Teleworker)

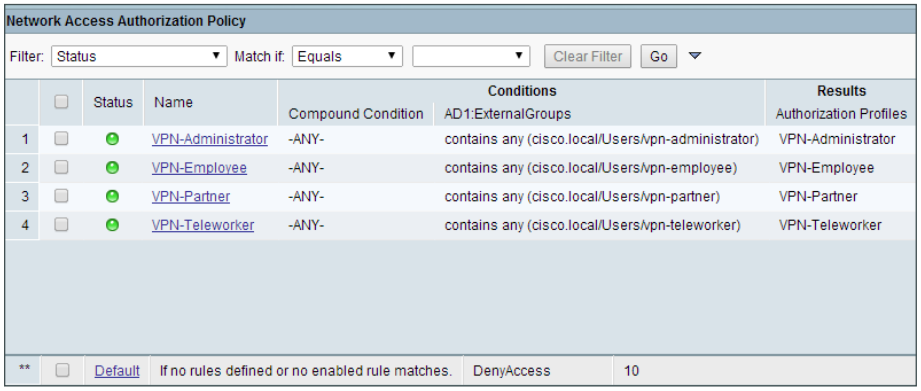
Step 3: Under Conditions, select **AD1:ExternalGroups**.

Step 4: In the condition definition box, select the **Active Directory** group. (Example: cisco.local/Users/vpn-teleworker)

Step 5: Under Results, select the authorization profile, and then click **Select**. (Example: VPN-Teleworker)



Step 6: Click **OK**.



PROCESS

Configuring RAVPN Cisco ASA for Teleworker VPN

1. Configure IPsec(IKEv1) connection profile
2. Configure NAT exemption
3. Configure route advertisement

As a rule, the Cisco ASA configuration for Cisco ASA 5505 teleworker VPN is self-contained. A few aspects rely on configuration from the Internet-edge foundation, so you need to have followed the configuration steps for Cisco ASA-based Remote Access VPN in the Remote Access VPN Design Guide.

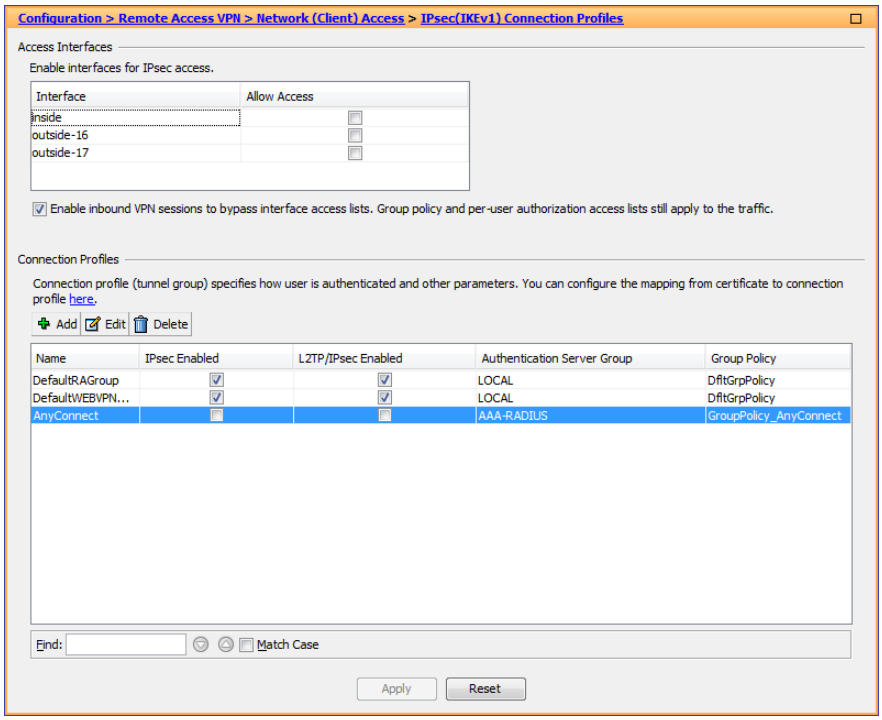
Procedure 1 Configure IPsec(IKEv1) connection profile

The IPsec connection profile carries the bulk of the configuration that sets the behavior for VPN client connections, so you must apply a number of steps in this procedure to complete the central configuration.

Step 1: Launch the Cisco ASA Security Device Manager.

Step 2: Navigate to the **Configuration > Remote Access VPN > Network (Client) Access > IPsec(IKEv1) Connection Profiles**.

Step 3: In the right pane under **Connection Profiles**, click **Add**.



Step 4: On the Add IPsec Remote Access Connection Profile dialog box, enter the following details. This configuration affects the behavior of the Cisco ASA 5505 teleworker device, as described.

- Name—**Teleworker5505**

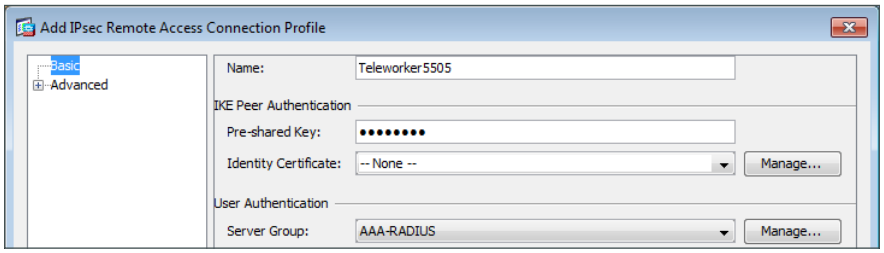
  This entry is the name of the VPN group that is reflected in the Cisco ASA 5505 Easy VPN Client configuration.

- IKE Peer Authentication Pre-Shared Key—**c1sco123**

  This entry is the group key that must be duplicated in the Cisco ASA 5505 Easy VPN Client configuration.

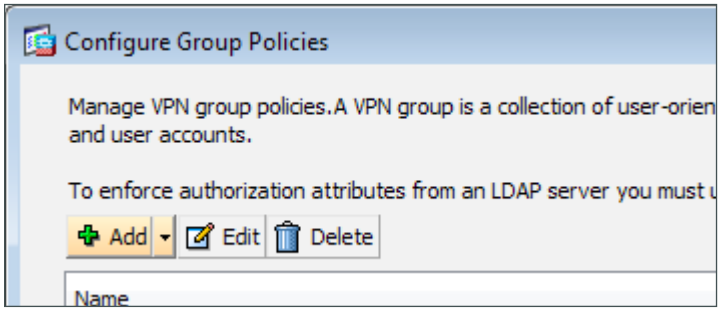
- Server Group—Select **AAA-RADIUS** or **AD**, depending on whether you are using Access Control Service (ACS) or Microsoft Active Directory for user authentication.

  This entry selects the server that authenticates user names and passwords that are presented to open the Easy VPN Client tunnel.

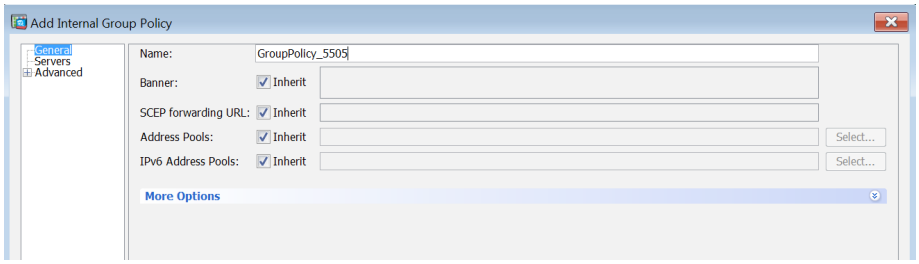


Step 5: On the right side of the **Group Policy** list, click **Manage**.

Step 6: On the Configure Group Policies dialog box, click **Add**.



Step 7: On the Add Internal Group Policy dialog box, select **General**, and then in the **Name** box, enter **GroupPolicy_5505**.

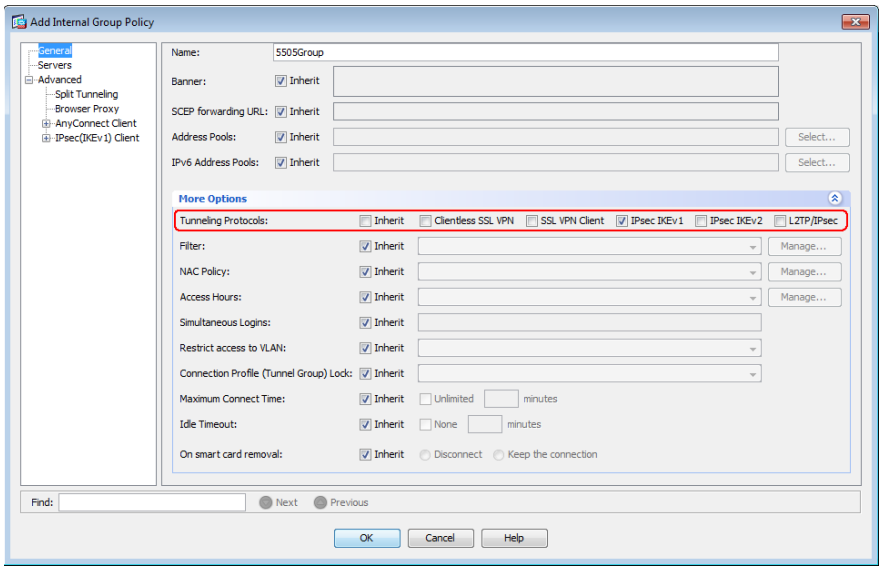


Tech Tip

The **Name** must exactly match the group policy name of the VPN-Teleworker authorization profile provisioned on the ACS earlier in this document.

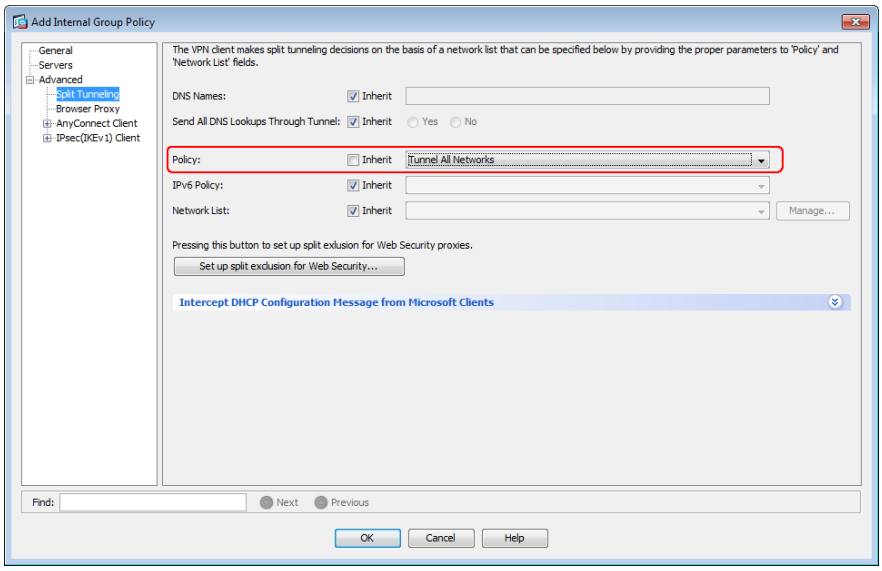
Step 8: Expand the options panel by clicking **More Options**.

Step 9: Next to **Tunneling Protocols**, clear **Inherit**, and then select **IPsec IKEv1**.



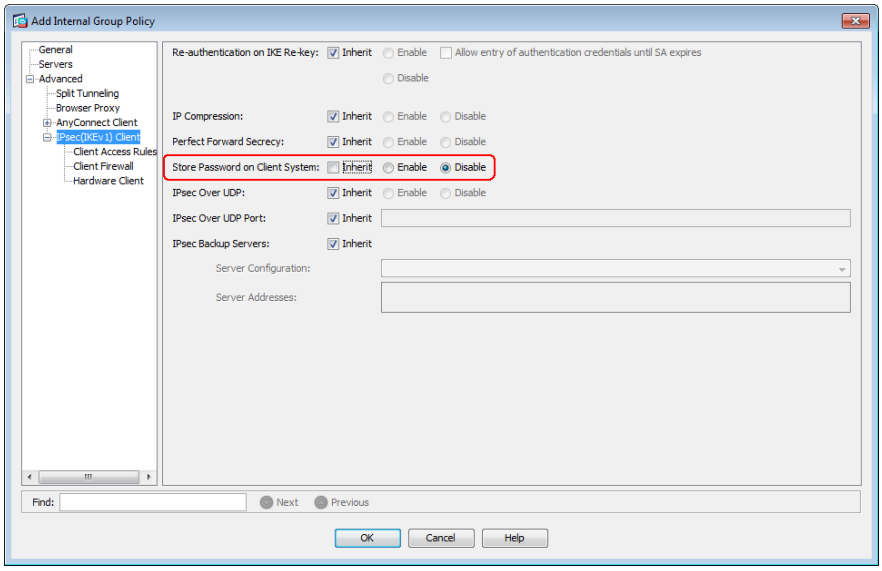
Step 10: Navigate to **Advanced > Split Tunneling**, and in the right panel, next to **Policy**, clear **Inherit.**

Step 11: Next to **Policy**, in the drop-down list, ensure that **Tunnel All Networks** is selected.



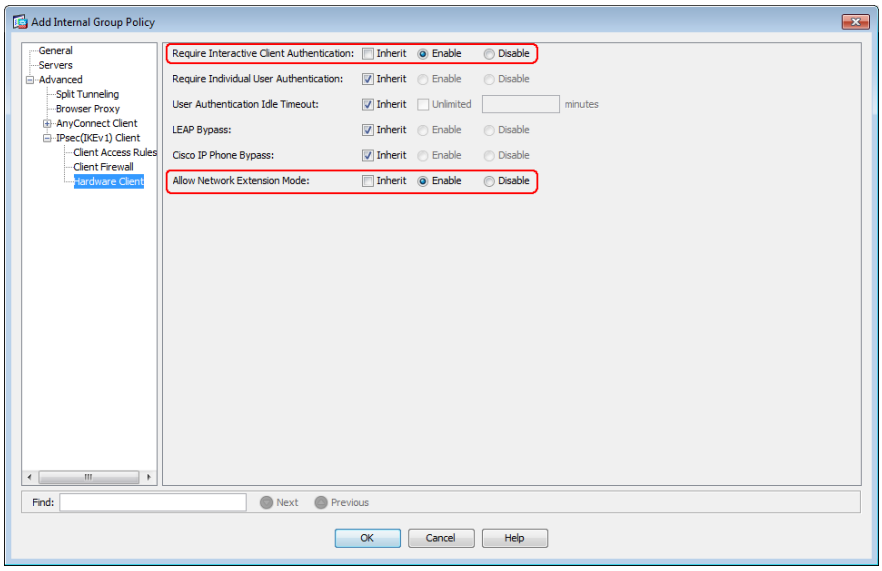
Step 12: Navigate to **Advanced > IPsec(IKEv1) Client**.

Step 13: Next to **Store Password on Client System**, clear **Inherit** and ensure that **Disable** is selected.



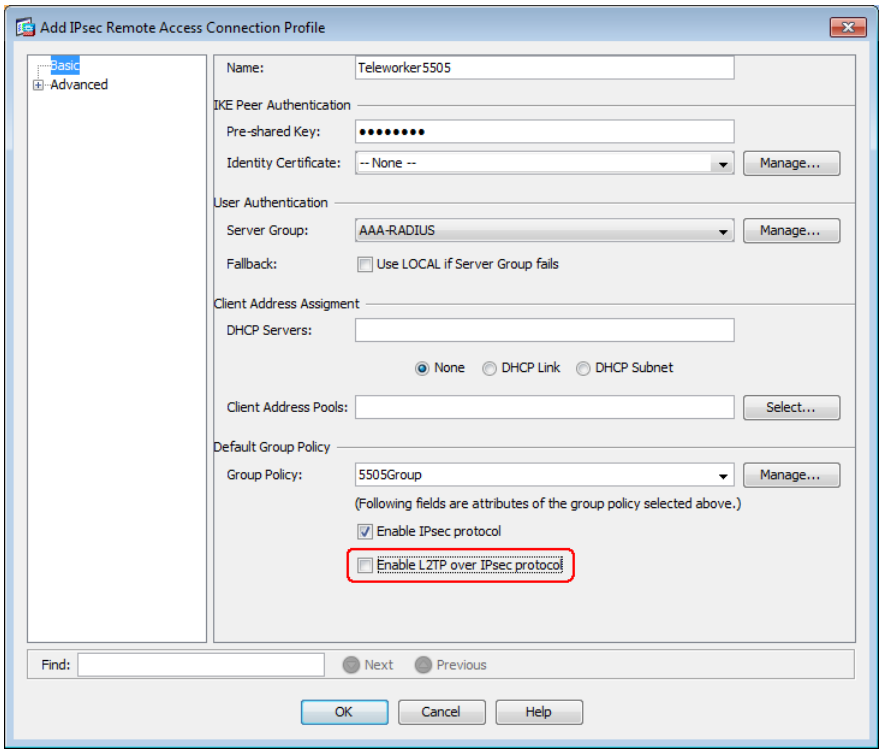
Step 14: Navigate to **Advanced > IPsec(IKEv1) Client > Hardware Client,** and do the following:

- Next to **Require Interactive Client Authentication**, clear **Inherit** and ensure that **Enable** is selected.
- Next to **Allow Network Extension Mode**, clear **Inherit** and ensure that **Enable** is selected.
- Click **OK**.



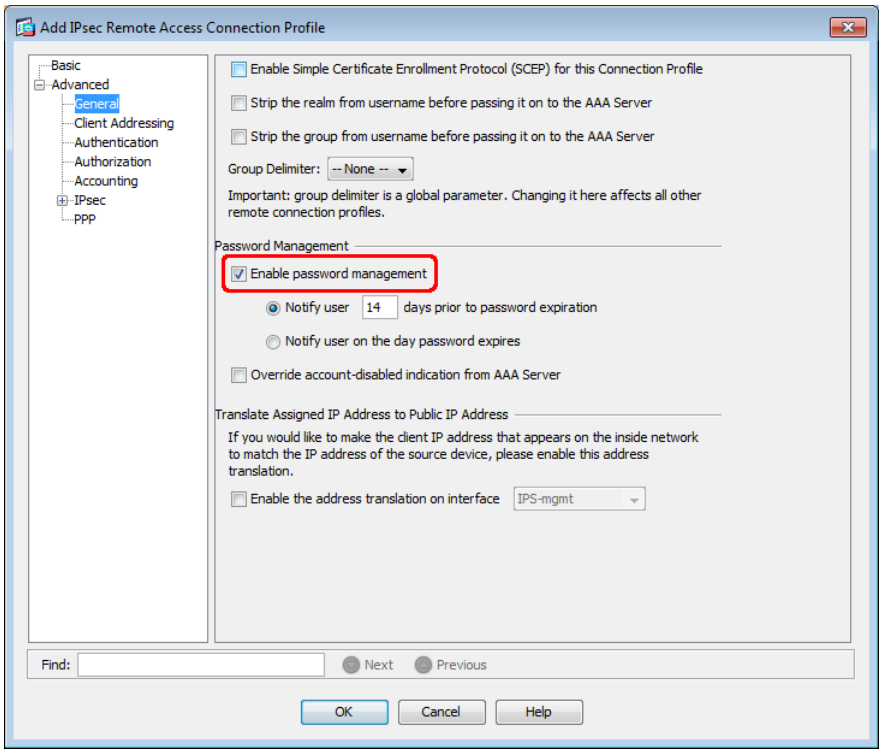
Step 15: On the Configure Group Policies dialog box, click **OK**.

Step 16: On the Add IPsec Remote Access Connection Profile dialog box, and then clear **Enable L2TP over IPsec protocol**.



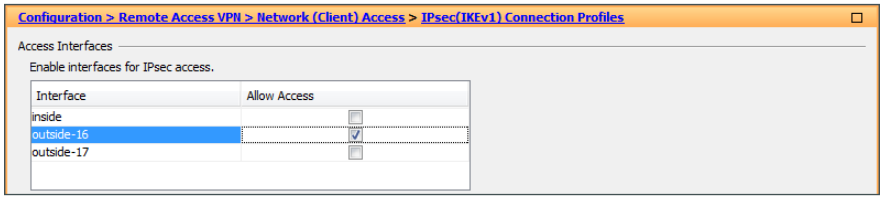
Step 17: Navigate to **Advanced > General**.

Step 18: Under **Password Management**, select **Enable password management**, and then click **OK**.



Step 19: Back on **Configuration > Remote Access VPN > Network (Client) Access > IPsec(IKEv1) Connection Profiles**.

Step 20: Under **Access Interfaces**, next to the appliance's primary outside interface, select **Allow Access**.



Step 21: Under **Connection Profiles**, verify that the new Teleworker5505 profile appears, and then click **Apply**.

Procedure 2 Configure NAT exemption

The Internet-edge appliances must not apply network address translation (NAT) on traffic between the organization's private network and the IP-subnet that encompasses teleworkers' remote addresses. You must configure a policy that prevents the Internet-edge appliance from applying NAT.

Configure a network object for the summary address of the internal network. The network object will be used during the security policy configuration.

Step 1: Navigate to **Configuration > Firewall > Objects > Network Objects/Groups**.

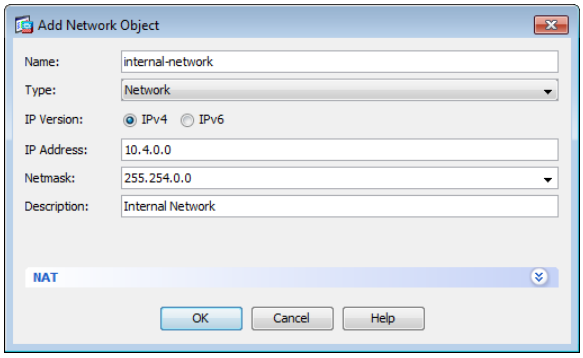
Step 2: Click **Add > Network Object**.

Step 3: On the Add Network Object dialog box, in the **Name box**, enter a description for the network summary (Example: internal-network).

Step 4: In the **Type** list, choose **Network**.

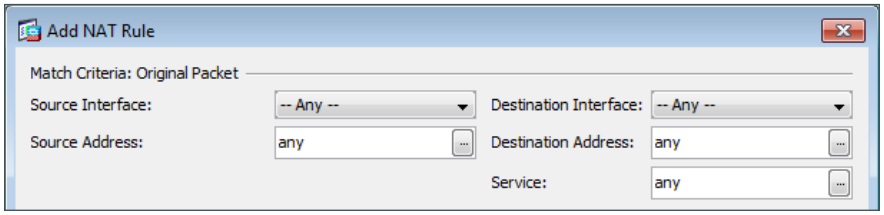
Step 5: In the **IP Address** box, enter the address that summarizes all internal networks (Example: 10.4.0.0).

Step 6: In the **Netmask** box, enter the internal network summary netmask, and then click **OK** (Example: 255.254.0.0).

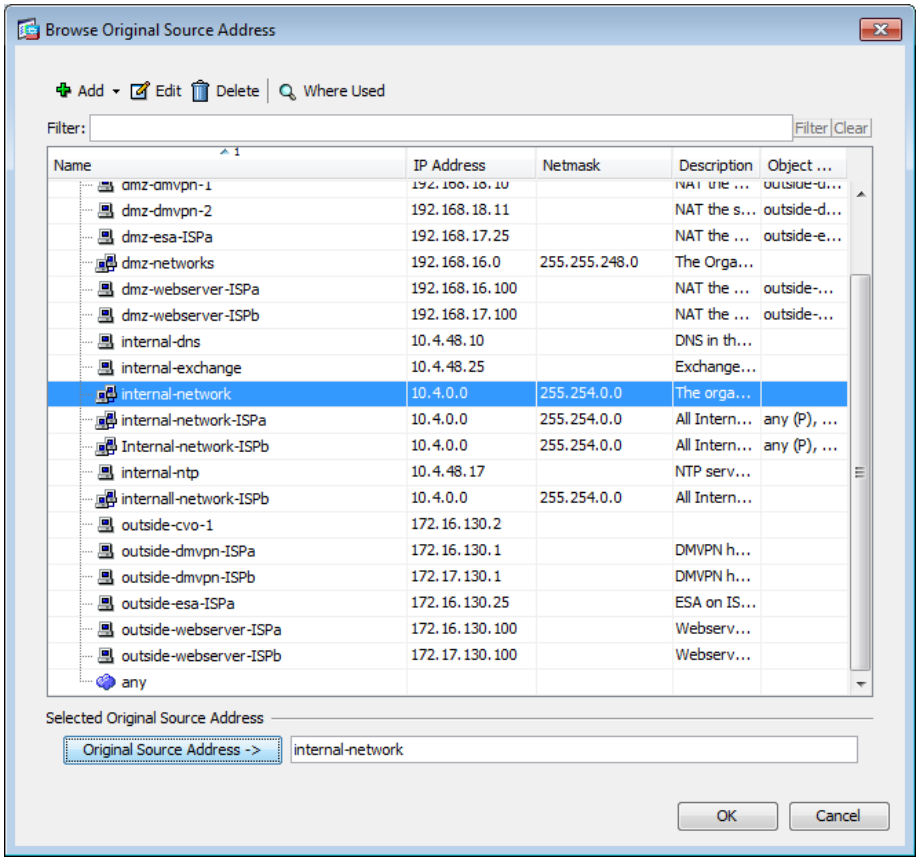


Step 7: Navigate to **Configuration > Firewall > NAT Rules**, and then click **Add**.

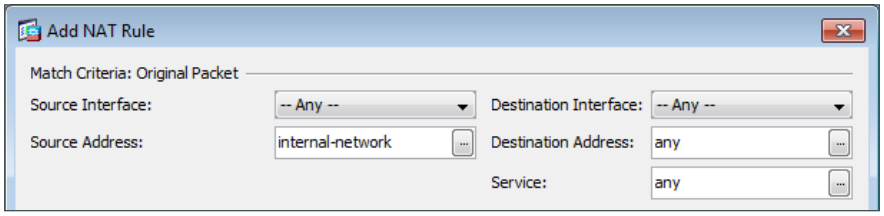
Step 8: On the Add NAT Rule dialog box, under **Match Criteria: Original Packet**, in the **Source Address** box, click the ellipsis (…).



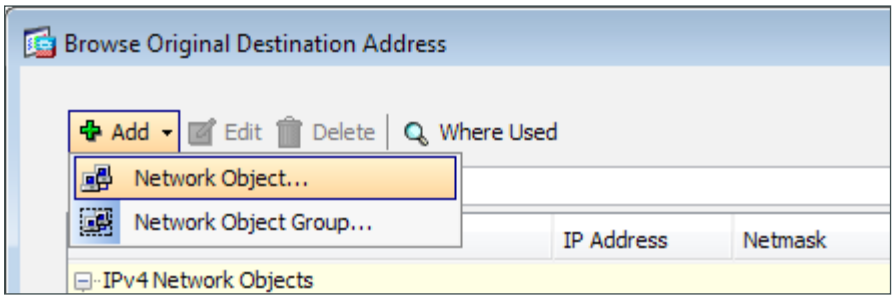
Step 9: On the Browse Original Source Address dialog box, expand the **IPv4 Network Objects** list, double-click **internal-network**, and then click **OK**.



Step 10: On the Add NAT Rule dialog box, under **Match Criteria: Original Packet**, in the **Destination Address** box, click the ellipsis (…).

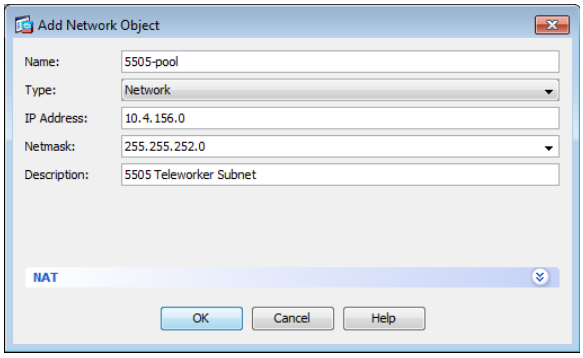


Step 11: On the Browse Original Destination Address dialog box, click **Add,** and then click **Network Object**.

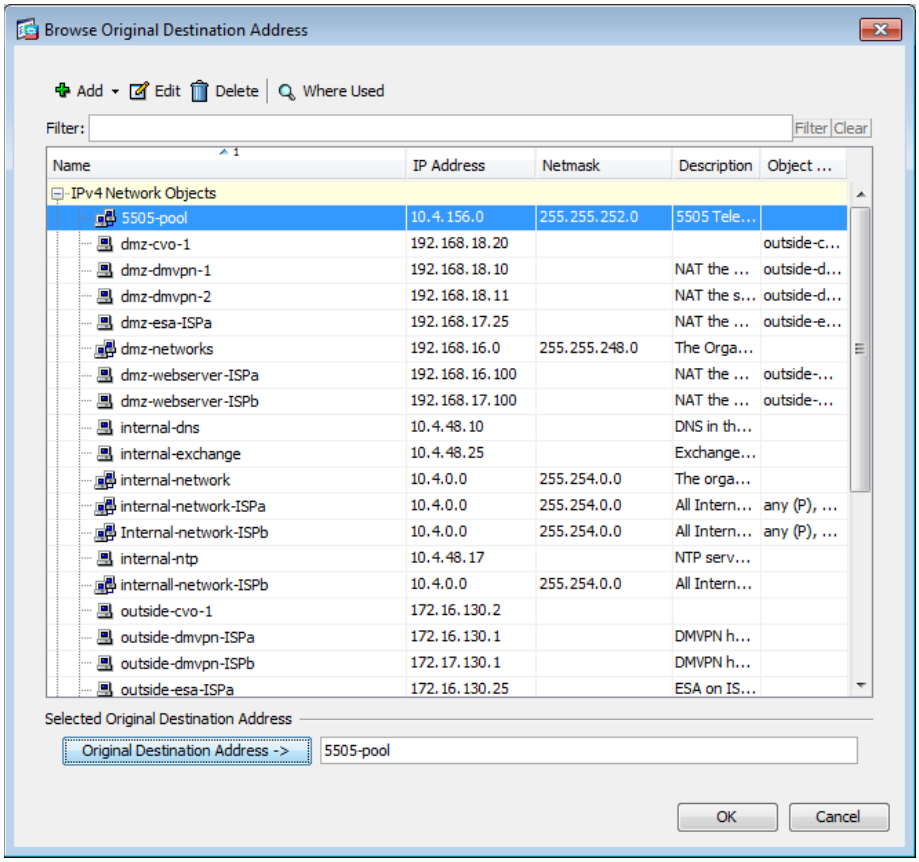


Step 12: On the Add Network Object dialog box, enter the following values, and then click **OK**.

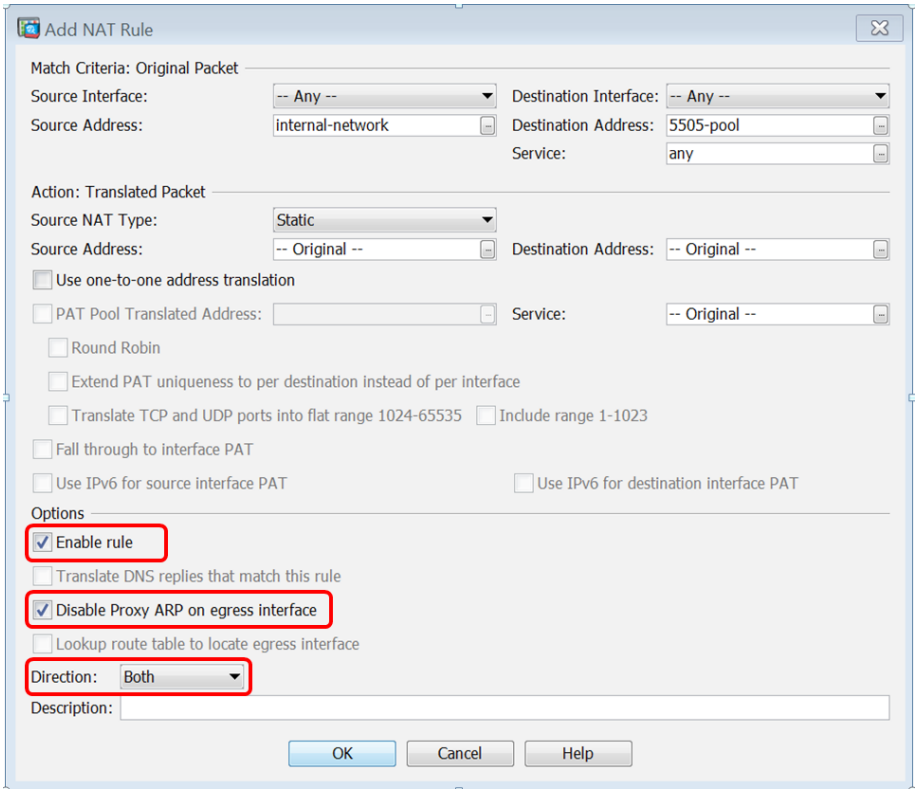
- Name—**5505-pool**
- Type—**Network**
- IP Address—**10.4.156.0**
- Netmask—**255.255.252.0**
- Description—**5505 Teleworker Subnet**



Step 13: On the Browse Original Destination Address dialog box, expand the **IPv4 Network Objects** list, double-click **5505-pool**, and then click **OK**.



Step 14: Under **Options**, ensure that **Enable Rule** and **Disable Proxy ARP on egress interface** are selected and that the indicated direction is **Both**, and then click **OK**.



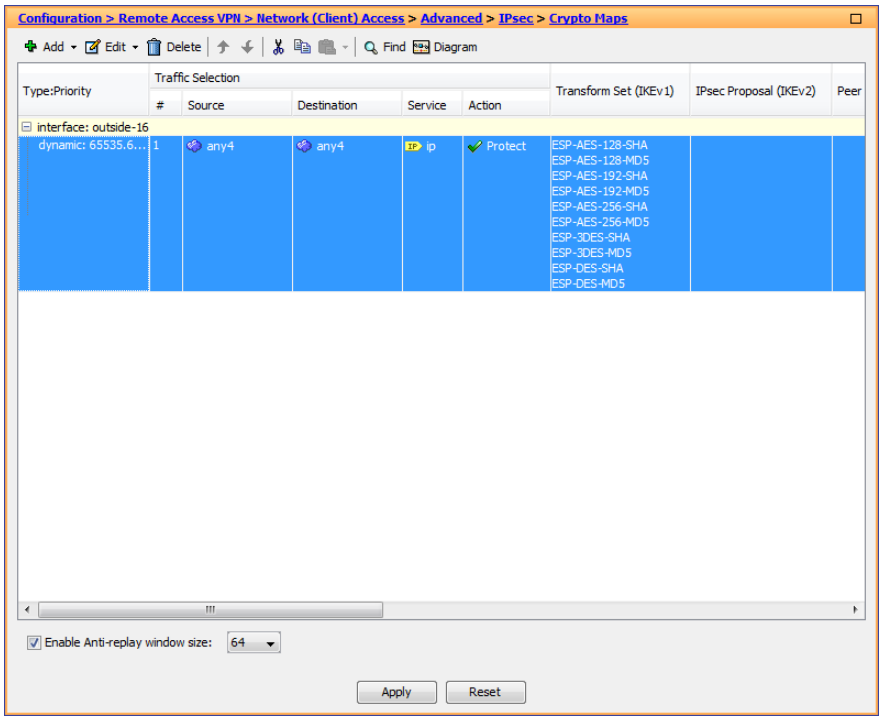
Step 15: Review the configuration, and then click **Apply**.

Procedure 3 Configure route advertisement

The Internet-edge appliances must advertise the teleworker sites' networks to the internal network. RAVPN address pools are advertised as host routes by reverse route injection (RRI) and summarized by the Internet-edge appliance. Teleworker subnets are advertised by RRI, as well, but without summarization; the teleworker subnets remain intact as eight-number (/29) subnets advertised to the rest of the network.

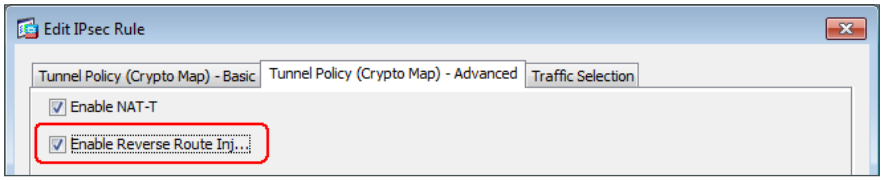
Step 1: Navigate to **Configuration > Remote Access VPN > Network (Client) Access > Advanced > IPsec > Crypto Maps**.

Step 2: Select the crypto map listed under the primary outside interface, and then click **Edit**.



Step 3: Click the **Tunnel Policy (Crypto Map) - Advanced** tab.

Step 4: Select **Enable Reverse Route Injection**, and then click **OK**.



Step 5: On the Crypto Maps pane, click **Apply**.

PROCESS

Configuring Teleworker Cisco ASA 5505 Endpoints

1. Configure inside VLAN and switch ports
2. Define global device configuration
3. Configure outside VLAN and switch port
4. Configure Cisco ASA 5505 DHCP server
5. Configure Cisco ASA 5505 Easy VPN client
6. Initiate VPN connection
7. Verify VPN connection

Each teleworker's Cisco ASA 5505 endpoint must be configured to connect to your resilient Internet-edge appliance. Because this configuration is likely to be deployed on multiple devices, the configuration is shown only in the command-line interface to streamline deployment. All Cisco ASA 5505 teleworker sites connect using Network Extension Mode, which allows teleworker-site endpoints to connect freely to the organization's LAN. Connecting in Network Extension Mode is particularly critical for endpoints, such as IP phones and video surveillance cameras, which might be susceptible to NAT's modification of data traffic.

Each site must use a unique inside-IP subnet. Otherwise, all configuration is identical between sites. To avoid conflicting address assignments, Cisco recommends that you maintain a spreadsheet of subnet assignments for the various users that will be issued Cisco ASA 5505 telecommuter equipment.

User name	Subnet	ASA 5505 LAN address	Hostname
VPN-teleworker-1	10.4.156.0/29	10.4.156.1	TS01-ASA5505
VPN-teleworker-2	10.4.156.8/29	10.4.156.9	TS02-ASA5505

Procedure 1 Configure inside VLAN and switch ports

Each Cisco ASA 5505 teleworker site needs a unique inside subnet, which you should track in a spreadsheet, as recommended in the introduction of this section.

Step 1: Configure the VLAN 1 interface for the teleworker site's LAN.

```
interface Vlan1
 nameif inside
 security-level 100
 ip address 10.4.156.1 255.255.255.248
```

Step 2: Associate the Cisco ASA 5505's Ethernet 0/1 through Ethernet 0/7 interfaces with VLAN 1, and instruct the teleworker to connect PoE-enabled devices to the Ethernet 0/6 and 0/7 ports.

```
interface Ethernet0/1
 switchport access vlan 1
 no shutdown
…
interface Ethernet0/7
 switchport access vlan 1
 no shutdown
```

Procedure 2 Define global device configuration

Step 1: Configure the Cisco ASA 5055's hostname and domain name.

```
hostname TS01-ASA5505
domain-name cisco.local
```

Step 2: Define a local administrative username.

```
username admin password c1sco123 privilege 15
```

Step 3: Set the enable password.

```
enable password c1sco123
```

Step 4: Define the management configuration.

```
http server enable
http 10.0.0.0 255.0.0.0 inside
ssh 10.0.0.0 255.0.0.0 inside
management-access inside
```

Step 5: If you are using centralized AAA, define authentication servers for management access.

```
aaa-server AAA-SERVERS protocol tacacs+
aaa-server AAA-SERVERS (inside) host 10.4.48.15
 key SecretKey
aaa authentication http console AAA-SERVERS LOCAL
aaa authentication ssh console AAA-SERVERS LOCAL
```

Procedure 3 Configure outside VLAN and switch port

Step 1: Configure a VLAN interface to receive an IP address via DHCP from the teleworker's Internet gateway device.

```
interface Vlan2
 nameif outside
 security-level 0
 ip address dhcp setroute
```

Step 2: Associate the Cisco ASA 5505's Ethernet 0/0 interface with VLAN 2, and instruct the teleworker to connect Ethernet 0/0 to their Internet gateway device.

```
interface Ethernet0/0
 switchport access vlan 2
 no shutdown
```

Procedure 4 Configure Cisco ASA 5505 DHCP server

The Cisco ASA 5505 must be configured to provide IP-addresses for the teleworker endpoints, such as computers, phones, printers, and video surveillance devices. Each site must use a unique subnet, which should be tracked in a spreadsheet, as recommended in the introduction of this section.

Step 1: Define the DHCP scope address range. The DHCP scope must be in the same subnet as the inside (VLAN 1) interface.

```
dhcpd address 10.4.156.2-10.4.156.6 inside
```

Step 2: Configure the DNS and domain-name values that will be distributed to clients.

```
dhcpd dns 10.4.48.10 interface inside
dhcpd domain cisco.local interface inside
```

Step 3: Define DHCP option 150 to provide the Cisco Unified Call Manager Server address for Cisco IP phones.

```
dhcpd option 150 ip 10.4.48.120
```

Step 4: Enable the DHCP scope.

```
dhcpd enable inside
```

Procedure 5 Configure Cisco ASA 5505 Easy VPN client

Cisco ASA 5505 uses Easy VPN network-extension mode to negotiate the VPN connectivity to the Internet-edge Cisco ASA Remote Access server.

Step 1: Apply the Easy VPN client configuration for the remote Cisco ASA 5505: The vpngroup and password values must match the IPsec Remote Access Connection Profile that you configured on the Internet-edge appliance.

```
vpnclient server 172.16.130.122
```

Step 2: Set network-extension mode:

```
vpnclient mode network-extension-mode
```

Step 3: Define the Easy VPN client connection attributes. The vpngroup and password values must match the IPsec Remote Access Connection Profile that you configured on the Internet-edge appliance.

```
vpnclient vpngroup Teleworker5505 password c1sco123
```

Step 4: Enable the Cisco ASA 5505's Easy VPN client:

```
vpnclient enable
```

Procedure 6 Initiate VPN connection

The teleworker must manually initiate their VPN connection; when the user employs a web browser to access web content on your internal network, Cisco ASA 5505 intercepts the connection and provides an interactive login prompt.

Tech Tip

Until the Easy VPN tunnel is established, DNS queries from clients behind the appliance will time-out. With the tunnel down, the clients cannot reach the DNS server. To avoid this time delay, you can directly access the Easy VPN connection status web page using an IP address: https://**10.4.156.1:1443**/netaccess/connstatus.html.

It is convenient to set the web browser home page to the Easy VPN connection status web page.

Step 1: Using a web browser navigate to the Easy VPN connection status web page. You can also navigate to any internal web site. (Example: 10.4.48.10)

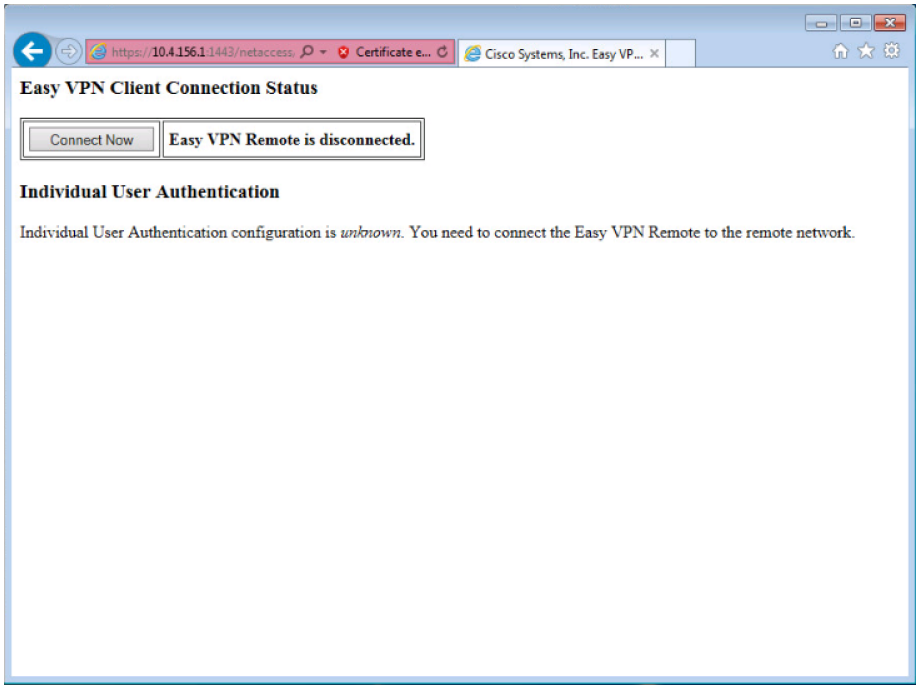
```
https://[ASA 5505 LAN Address]:443/netaccess/connstatus.html
```

Example

```
https://10.4.156.1:443/netaccess/connstatus.html
```

Step 2: You will be redirected to an Easy VPN Connection Status web page.

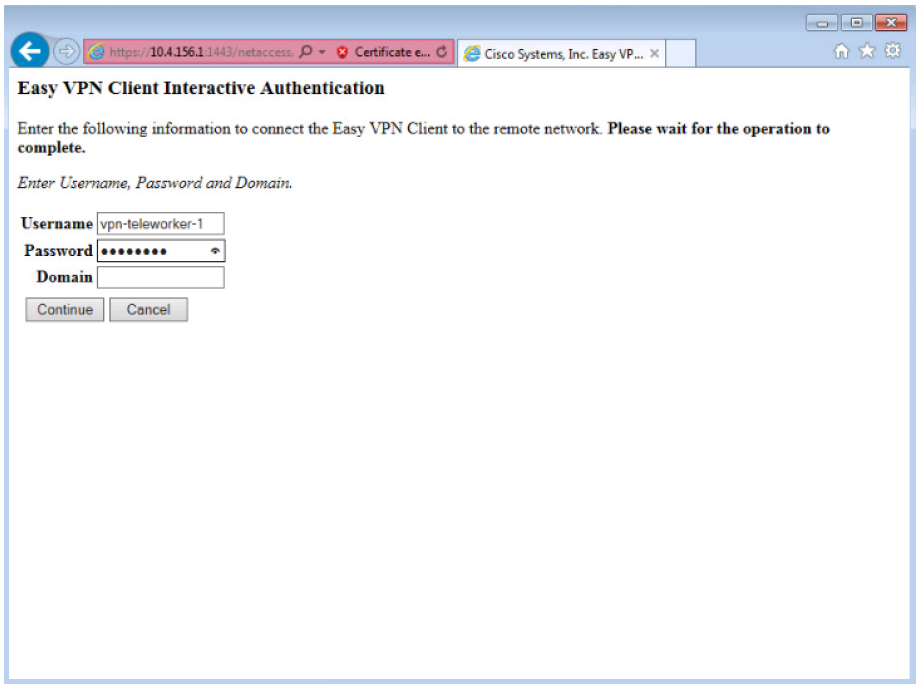
Step 3: Click **Connect Now**.



Step 4: Enter the **Username**. (Example: vpn-teleworker-1)

Step 5: Enter the **Password**. (Example: c1sco123)

Step 6: Enter the **Domain**. (Example: *leave blank*)



The VPN connection is negotiated with the provided username and password, and the requested web page is rendered.

Tech Tip

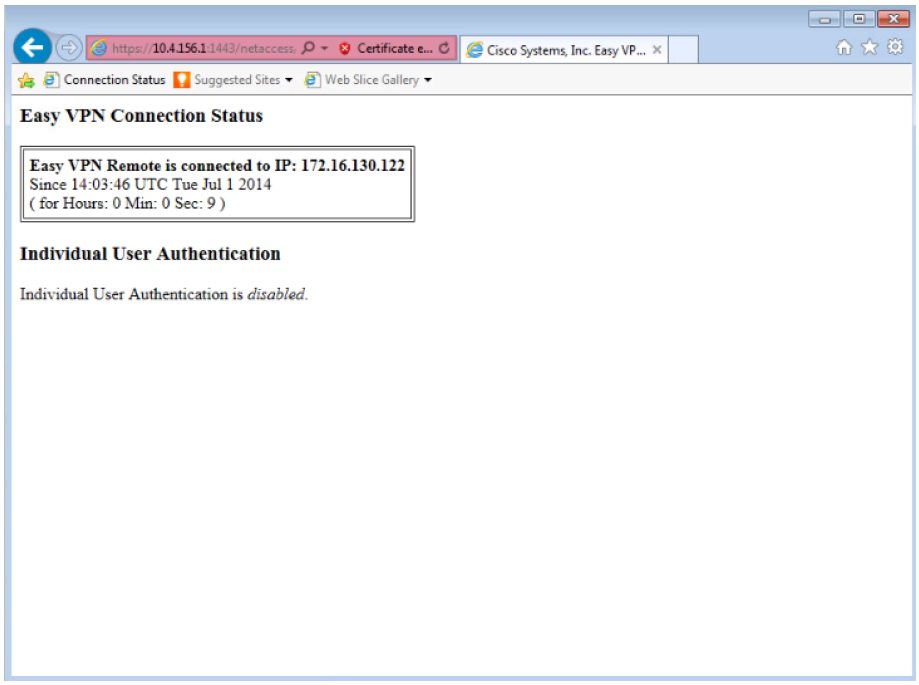
The IP Phone connected to Cisco ASA 5505 can't place or receive calls if the user's VPN connection is not active.

In the event that a teleworker's VPN access must be revoked, the authentication server should deny the teleworker's access.

Procedure 7 Verify VPN connection

You can check the status of the Easy VPN connection from Cisco ASA 5505.

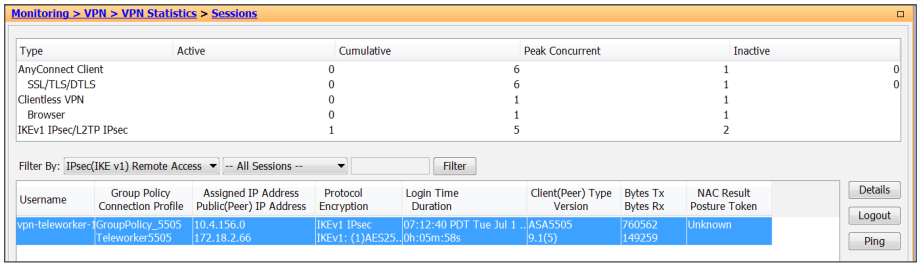
Step 1: Using a web browser, navigate to the ASA 5505 appliance's Easy VPN connection status web page. (Example: https://10.4.156.1:1443/netaccess/connstatus.html)



The Easy VPN connection may also be monitored from the RA VPN ASA appliance.

Step 2: Navigate to **Monitoring > VPN > VPN Statistics > Sessions**.

Step 3: From the **Filter By**: pull down menus, select **IPsec(IKE v1) Remote Access** and select **-- All Sessions --**.



Appendix A: Product List

Remote-Site

Functional Area	Product Description	Part Numbers	Software
Remote Site Appliance	Cisco ASA 5505 Firewall Edition Bundle security appliance	ASA5505-BUN-K9	ASA 9.1(5)

Internet Edge

Functional Area	Product Description	Part Numbers	Software
Firewall	Cisco ASA 5545-X IPS Edition - security appliance	ASA5545-IPS-K9	ASA 9.1(5) IPS 7.1(8p2)E4 feature set
	Cisco ASA 5525-X IPS Edition - security appliance	ASA5525-IPS-K9	
	Cisco ASA 5515-X IPS Edition - security appliance	ASA5515-IPS-K9	
	Cisco ASA 5512-X IPS Edition - security appliance	ASA5512-IPS-K9	
	Cisco ASA 5512-X Security Plus license	ASA5512-SEC-PL	
	Firewall Management	ASDM	7.1(6)
RA VPN Firewall	Cisco ASA 5545-X Firewall Edition - security appliance	ASA5545-K9	ASA 9.1(5)
	Cisco ASA 5525-X Firewall Edition - security appliance	ASA5525-K9	
	Cisco ASA 5515-X Firewall Edition - security appliance	ASA5515-K9	
	Cisco ASA 5512-X Firewall Edition - security appliance	ASA5512-K9	
	Cisco ASA 5512-X Security Plus license	ASA5512-SEC-PL	
	Firewall Management	ASDM	7.1(6)

Access Control

Functional Area	Product Description	Part Numbers	Software
Authentication Services	ACS 5.5 VMware Software And Base License	CSACS-5.5-VM-K9	5.5 with Cumulative Patch 5.5.0.46.2 feature set

Appendix B: Tested Topology

Figure 2 - Cisco ASA 5505 physical topology

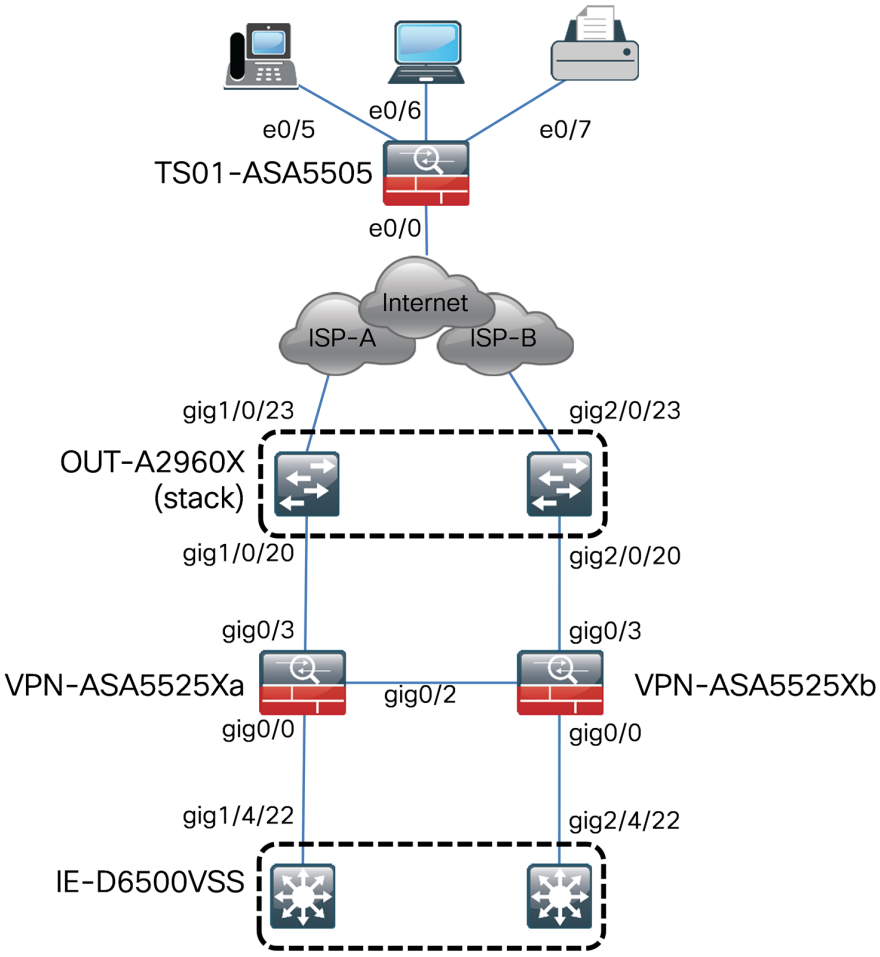
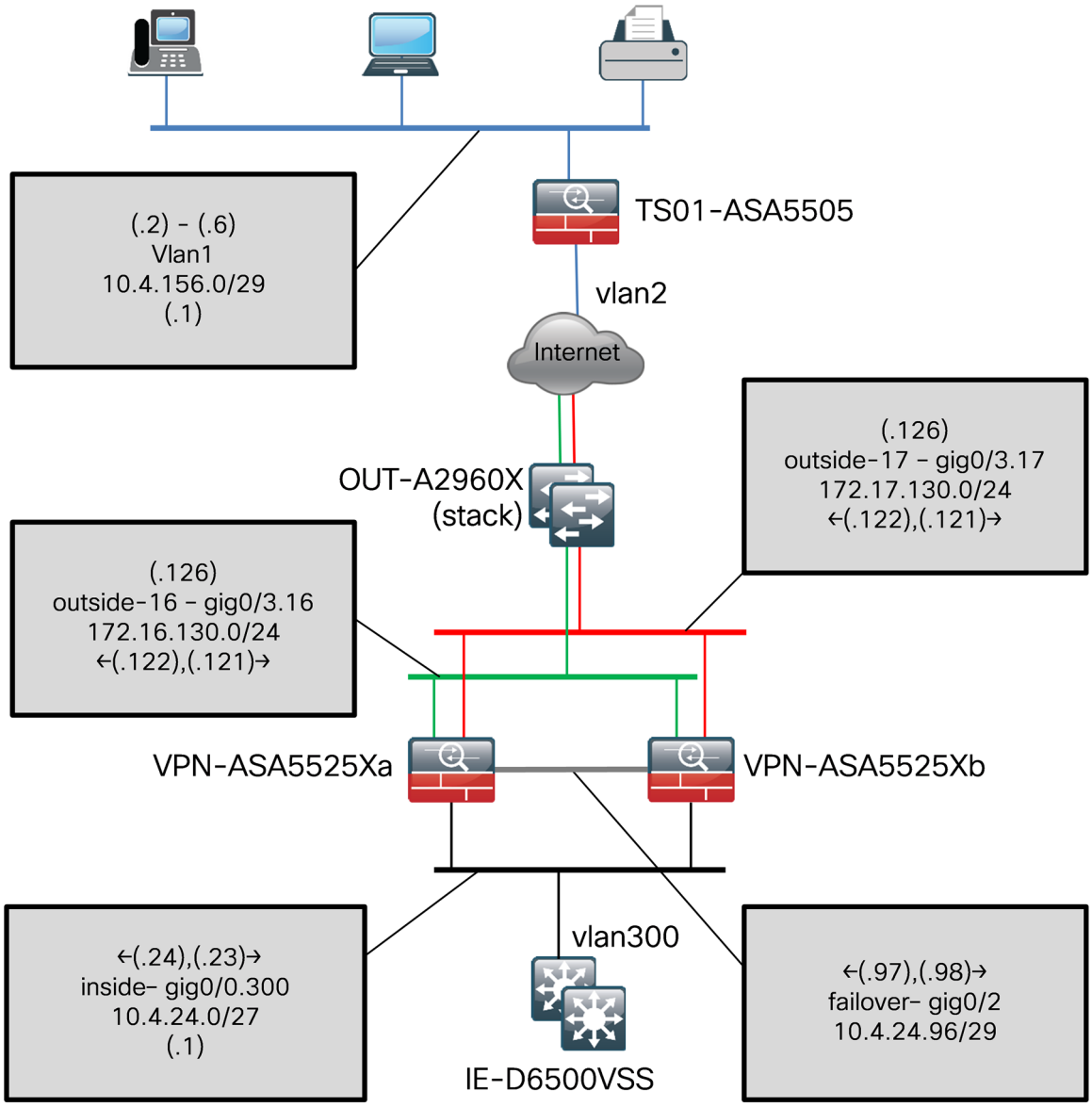


Figure 3 - Cisco ASA 5505 logical topology



Appendix C: Configuration Files

VPN-ASA5525X

```
ASA Version 9.1(5)
!
hostname VPN-ASA5525X
domain-name cisco.local
enable password 8Ry2YjIyt7RRXU24 encrypted
xlate per-session deny tcp any4 any4
xlate per-session deny tcp any4 any6
xlate per-session deny tcp any6 any4
xlate per-session deny tcp any6 any6
xlate per-session deny udp any4 any4 eq domain
xlate per-session deny udp any4 any6 eq domain
xlate per-session deny udp any6 any4 eq domain
xlate per-session deny udp any6 any6 eq domain
names
ip local pool RA-pool 10.4.28.1-10.4.31.254 mask 255.255.252.0
!
interface GigabitEthernet0/0
 nameif inside
 security-level 100
 ip address 10.4.24.24 255.255.255.224 standby 10.4.24.23
 ospf message-digest-key 1 md5 *****
 ospf authentication message-digest
 authentication key eigrp 100 ***** key-id 1
 authentication mode eigrp 100 md5
 summary-address eigrp 100 10.4.28.0 255.255.252.0 5
!
interface GigabitEthernet0/1
 shutdown
 no nameif
 no security-level
 no ip address
!
interface GigabitEthernet0/2
 description LAN/STATE Failover Interface
!
interface GigabitEthernet0/3
 no nameif
 no security-level
 no ip address
!
```

```
interface GigabitEthernet0/3.16
 vlan 16
 nameif outside-16
 security-level 0
 ip address 172.16.130.122 255.255.255.0 standby 172.16.130.121
!
interface GigabitEthernet0/3.17
 vlan 17
 nameif outside-17
 security-level 0
 ip address 172.17.130.122 255.255.255.0 standby 172.17.130.121
!
interface GigabitEthernet0/4
 shutdown
 no nameif
 no security-level
 no ip address
!
interface GigabitEthernet0/5
 shutdown
 no nameif
 no security-level
 no ip address
!
interface GigabitEthernet0/6
 shutdown
 no nameif
 no security-level
 no ip address
!
interface GigabitEthernet0/7
 shutdown
 no nameif
 no security-level
 no ip address
!
interface Management0/0
 management-only
 shutdown
 no nameif
 no security-level
 no ip address
!
ftp mode passive
clock timezone PST -8
clock summer-time PDT recurring
dns domain-lookup inside
```

```
dns server-group DefaultDNS
 domain-name cisco.local
same-security-traffic permit intra-interface
object network Gateway
 host 10.4.24.1
object network NETWORK_OBJ_10.4.28.0_22
 subnet 10.4.28.0 255.255.255.0
object network internal-network
 subnet 10.4.0.0 255.255.0.0
object network 5505-Pool
 subnet 10.4.156.0 255.255.252.0
 description 5505 Teleworker Subnet
access-list ALL_BUT_DEFAULT standard deny host 0.0.0.0
access-list ALL_BUT_DEFAULT standard permit any4
access-list RA_PartnerACL remark Partners can access this internal host only!
access-list RA_PartnerACL standard permit host 10.4.48.35
access-list RA_SplitTunnelACL remark Internal Networks
access-list RA_SplitTunnelACL standard permit 10.4.0.0 255.254.0.0
access-list RA_SplitTunnelACL remark DMZ Networks
access-list RA_SplitTunnelACL standard permit 192.168.16.0 255.255.248.0
pager lines 24
logging enable
logging timestamp
logging buffered informational
mtu inside 1500
mtu outside-16 1500
mtu outside-17 1500
failover
failover lan unit secondary
failover lan interface failover GigabitEthernet0/2
failover polltime unit msec 200 holdtime msec 800
failover polltime interface msec 500 holdtime 5
failover key *****
failover replication http
failover link failover GigabitEthernet0/2
failover interface ip failover 10.4.24.97 255.255.255.248 standby 10.4.24.98
monitor-interface outside-16
monitor-interface outside-17
icmp unreachable rate-limit 1 burst-size 1
asdm image disk0:/asdm-716.bin
no asdm history enable
arp timeout 14400
no arp permit-nonconnected
nat (any,any) source static internal-network internal-network destination static 5505-
Pool 5505-Pool no-proxy-arp
!
router eigrp 100
```

```
 no auto-summary
 distribute-list ALL_BUT_DEFAULT out
 network 10.4.0.0 255.254.0.0
 passive-interface default
 no passive-interface inside
 redistribute static
!
route outside-16 0.0.0.0 0.0.0.0 172.16.130.126 1 track 1
route outside-17 0.0.0.0 0.0.0.0 172.17.130.126 50
route outside-16 172.18.1.1 255.255.255.255 172.16.130.126 1
route inside 0.0.0.0 0.0.0.0 10.4.24.1 tunneled
timeout xlate 3:00:00
timeout pat-xlate 0:00:30
timeout conn 1:00:00 half-closed 0:10:00 udp 0:02:00 icmp 0:00:02
timeout sunrpc 0:10:00 h323 0:05:00 h225 1:00:00 mgcp 0:05:00 mgcp-pat 0:05:00
timeout sip 0:30:00 sip_media 0:02:00 sip-invite 0:03:00 sip-disconnect 0:02:00
timeout sip-provisional-media 0:02:00 uauth 0:05:00 absolute
timeout tcp-proxy-reassembly 0:01:00
timeout floating-conn 0:00:00
dynamic-access-policy-record DfltAccessPolicy
aaa-server AAA-SERVER protocol tacacs+
aaa-server AAA-SERVER (inside) host 10.4.48.15
 key *****
aaa-server AD protocol nt
aaa-server AD (inside) host 10.4.48.10
 timeout 5
 nt-auth-domain-controller AD-1
user-identity default-domain LOCAL
aaa authentication enable console AAA-SERVER LOCAL
aaa authentication ssh console AAA-SERVER LOCAL
aaa authentication serial console AAA-SERVER LOCAL
aaa authentication http console AAA-SERVER LOCAL
aaa authorization exec authentication-server
http server enable
http 10.4.48.0 255.255.255.0 inside
snmp-server host inside 10.4.48.35 community *****
no snmp-server location
no snmp-server contact
snmp-server community *****
snmp-server enable traps snmp authentication linkup linkdown coldstart warmstart
sysopt noproxyarp inside
sla monitor 16
 type echo protocol ipIcmpEcho 172.18.1.1 interface outside-16
sla monitor schedule 16 life forever start-time now
crypto ipsec ikev1 transform-set ESP-AES-256-MD5 esp-aes-256 esp-md5-hmac
crypto ipsec ikev1 transform-set ESP-DES-SHA esp-des esp-sha-hmac
crypto ipsec ikev1 transform-set ESP-3DES-SHA esp-3des esp-sha-hmac
```

```
crypto ipsec ikev1 transform-set ESP-DES-MD5 esp-des esp-md5-hmac
crypto ipsec ikev1 transform-set ESP-AES-192-MD5 esp-aes-192 esp-md5-hmac
crypto ipsec ikev1 transform-set ESP-3DES-MD5 esp-3des esp-md5-hmac
crypto ipsec ikev1 transform-set ESP-AES-256-SHA esp-aes-256 esp-sha-hmac
crypto ipsec ikev1 transform-set ESP-AES-128-SHA esp-aes esp-sha-hmac
crypto ipsec ikev1 transform-set ESP-AES-192-SHA esp-aes-192 esp-sha-hmac
crypto ipsec ikev1 transform-set ESP-AES-128-MD5 esp-aes esp-md5-hmac
crypto ipsec security-association pmtu-aging infinite
crypto dynamic-map SYSTEM_DEFAULT_CRYPTO_MAP 65535 set ikev1 transform-set ESP-AES-128-
SHA ESP-AES-128-MD5 ESP-AES-192-SHA ESP-AES-192-MD5 ESP-AES-256-SHA ESP-AES-256-MD5
ESP-3DES-SHA ESP-3DES-MD5 ESP-DES-SHA ESP-DES-MD5
crypto dynamic-map SYSTEM_DEFAULT_CRYPTO_MAP 65535 set reverse-route
crypto map outside-16_map 65535 ipsec-isakmp dynamic SYSTEM_DEFAULT_CRYPTO_MAP
crypto map outside-16_map interface outside-16
crypto ca trustpoint CVD-ROOT-CA
 enrollment terminal
 crl configure
crypto ca trustpoint CVD-Issuing-CA
 enrollment terminal
 crl configure
crypto ca trustpoint VPN-ASA5525X-Cert
 enrollment terminal
 fqdn VPN-ASA5525X.cisco.local
 email admin@cisco.local
 subject-name CN=VPN-ASA5525X.cisco.local
 ip-address 172.16.130.122
 keypair VPN-ASA5525X-Keypair
 no validation-usage
 crl configure
crypto ca trustpoint VPN-ASA5525X-FO-Cert
 enrollment terminal
 fqdn VPN-ASA5525X-FO.cisco.local
 email admin@cisco.local
 subject-name CN=VPN-ASA5525X-FO.cisco.local
 ip-address 172.17.130.122
 keypair VPN-ASA5525X-Keypair
 no validation-usage
 crl configure
crypto ca trustpool policy
crypto ca certificate chain CVD-ROOT-CA
 certificate ca 4e880aa7904ed6b044ea8b63e9b514b2
    30820343 3082022b a0030201 0202104e 880aa790 4ed6b044 ea8b63e9 b514b230
    0d06092a 864886f7 0d010105 05003034 310c300a 06035504 0b130363 7664310e
    300c0603 55040a13 05636973 636f3114 30120603 55040313 0b435644 2d524f4f
    542d4341 301e170d 31343035 31353134 31313333 5a170d32 34303531 35313432
    3133335a 3034310c 300a0603 55040b13 03637664 310e300c 06035504 0a130563
    6973636f 31143012 06035504 03130b43 56442d52 4f4f542d 43413082 0122300d
```

```
    06092a86 4886f70d 01010105 00038201 0f003082 010a0282 010100a0 990544d6
    fc717fd4 d331c159 28863052 6c03cc41 e284ab1a f77867d0 0cc8a6c0 6a33d886
    1e02cacf db19d210 3004ff6f bb6e62ba 8a4f651a e7207932 ba3addf8 5af1aeb4
    7353bf06 63cc10d8 e3765f27 af66dfa5 4389c1ea 7222900b 74144501 5acac43a
    7498e06a 173cb13c c27a6fb5 21d87d3e ca54174a 7a693fae 127d64c1 9d5bee72
    decace95 71473605 7e2fc656 0dd067b6 017f91a2 ab9a3370 9a3b1923 8f0629c6
    b3b96ffd 5954e409 81e97096 233cd3ae 2aca6bbd ffbd8de8 35cf2172 1b26127e
    27a6865d bc8a4031 1fbebd46 307c9cf5 feab318d 8d845b49 ae456ead 3a1ef234
    3de6697a 40ef34ca f3f58b3e e87907ed 4abb14ba 02833e25 bd08a302 03010001
    a351304f 300b0603 551d0f04 04030201 86300f06 03551d13 0101ff04 05300301
    01ff301d 0603551d 0e041604 14cd7e65 0f3b6ced b6ed9dfc 5527abf9 2ebb5219
    82301006 092b0601 04018237 15010403 02010030 0d06092a 864886f7 0d010105
    05000382 01010040 8f78ce66 58337414 c2384a97 b2aedd01 b1068a18 835eecd6
    660f2024 114037f9 cb0969d2 dfc19744 c46f4a49 4e30554f 64abdc81 92bb30c9
    5e17396a 1deac46e fbfb7695 c1302d14 f5ff4f8e 9cd478c5 13050d55 64b80e91
    cc77fe6f 53be3cb5 10955ab2 beb31c25 7af6a988 0256262e 331a21bd 6c8a5afd
    997528e0 118b72f1 1e3669be 642fff55 f8077585 7dabc65a 12b4e916 156ea66a
    f6b5780d ed0f4333 e8202a63 d370d695 d97b8b35 50f4e58a 612df664 2cc6f307
    b317f833 ab8bf9f6 7343363c eb8a884e b8bb6ab7 b1b440ad 4d400b4d c96a03b2
    87e52b62 61e7a6fb d6dd9dde c889ee28 dcfcf0d3 4f06665e 809b1f5c d54b7ba9
    eeab0dce 3c0318
  quit
crypto ca certificate chain CVD-Issuing-CA
 certificate ca 77000000135662b8af34a01af0000000000013
    30820422 3082030a a0030201 02021377 00000013 5662b8af 34a01af0 00000000
    0013300d 06092a86 4886f70d 01010505 00303431 0c300a06 0355040b 13036376
    64310e30 0c060355 040a1305 63697363 6f311430 12060355 0403130b 4356442d
    524f4f54 2d434130 1e170d31 34303830 38323031 3730375a 170d3139 30383038
    32303237 30375a30 47311530 13060a09 92268993 f22c6401 1916056c 6f63616c
    31153013 060a0992 268993f2 2c640119 16056369 73636f31 17301506 03550403
    130e4356 442d4973 7375696e 672d4341 30820122 300d0609 2a864886 f70d0101
    01050003 82010f00 3082010a 02820101 00a7b7f2 18465440 6e7747ca 2ab433a0
    05f1def4 e308fff0 27c6f859 7b33b6e0 ced1f635 0558272a 19ed588c a78b8070
    79ac0349 80c95bdd 29e3eef3 fa05fb47 973b1def c683b967 b06536c9 fd285d9f
    71cd6160 59f18c08 778f4bf4 92705e01 3cd72a8b 08ebf802 0d8a4ad9 67749859
    77d4c9b1 9b64978e a75e0389 96d5f074 e92ba9a8 3d1e6007 600e3fbc e63062b0
    eac7e907 a1278741 a70ae435 0b88aae3 a2890e6d 5d931c4b 4bbb1c14 58955fac
    38cd9d18 18b97ad5 924c146a e36eddbd b0e91100 11e2a5f4 1b7cc388 67e8038d
    cbcf3b52 0b7f6dc5 b2f9dc72 f7d01586 10c0de74 b6ddf2c3 70cd7c0d 6cb2218d
    9d3a3447 2f1980be aea5dd5b f55ce0a2 07020301 0001a382 01183082 01143010
    06092b06 01040182 37150104 03020100 301d0603 551d0e04 1604147d 6241fcae
    8c0c5bc3 3f6c1e77 1c0adcb7 c5fe7d30 43060355 1d20043c 303a3038 06082a03
    048b2f43 5905302c 302a0608 2b060105 05070201 161e6874 74703a2f 2f706b69
    2e636973 636f2e6c 6f63616c 2f637073 2e747874 30190609 2b060104 01823714
    02040c1e 0a005300 75006200 43004130 0b060355 1d0f0404 03020186 300f0603
    551d1301 01ff0405 30030101 ff301f06 03551d23 04183016 8014cd7e 650f3b6c
    edb6ed9d fc5527ab f92ebb52 19823042 0603551d 1f043b30 393037a0 35a03386
```

```
    31687474 703a2f2f 706b692e 63697363 6f2e6c6f 63616c2f 43657274 456e726f
    6c6c2f43 56442d52 4f4f542d 43412e63 726c300d 06092a86 4886f70d 01010505
    00038201 01003efd 1cc701f0 3f616935 73ebd6dc d92ffba0 8897eafe af0a0bb5
    87173150 a5109e09 098f572d c9c5f557 f3e64e9e d340d6de 7957ce14 1b553ca2
    49baabaf dc24533a 17f88a33 73fed58b 25738798 bfa3f6c1 bf02b3aa 44495901
    0f15e716 e779d14d fe179f0f 24e9399d cbf07908 59fb882b 3393725b 835df324
    9df5c2dc d3fd9607 6c419fac c1936170 e8440e42 8666e49c 0a72d8ea 12fc4fc2
    9b8065bd a382baa3 72a95cfc 67f66c2e 2ac85997 920ce639 1be5d102 175418d2
    59a7bade 5c5fab92 59eacdda cf3cdd61 b3d608df 77f008e0 473c5f5a a46281e3
    bee2cc01 4eaea839 3dc83751 4f69ed27 33406bc8 c52c6557 2fb78106 911f3699
    92bdffdb 5151
  quit
crypto ca certificate chain VPN-ASA5525X-Cert
 certificate 610c1592000000000013
    3082053b 30820423 a0030201 02020a61 0c159200 00000000 13300d06 092a8648
    86f70d01 01050500 30473115 3013060a 09922689 93f22c64 01191605 6c6f6361
    6c311530 13060a09 92268993 f22c6401 19160563 6973636f 31173015 06035504
    03130e43 56442d49 73737569 6e672d43 41301e17 0d313430 38323131 34333332
    355a170d 31363038 32303134 33333235 5a306b31 1d301b06 092a8648 86f70d01
    0908130e 3137322e 31362e31 33302e31 32323127 30250609 2a864886 f70d0109
    02131856 504e2d41 53413535 3235582e 63697363 6f2e6c6f 63616c31 21301f06
    03550403 13185650 4e2d4153 41353532 35582e63 6973636f 2e6c6f63 616c3081
    9f300d06 092a8648 86f70d01 01010500 03818d00 30818902 818100b9 a5d30006
    43b5230e 09e52622 7a9d7af4 d1cba501 0e609301 1d7c807d 29e46800 235c1da3
    60cfa84b f8d1a44a d3e65c30 dcc6aca8 cd662d7e 572fc06d 8df5c474 7d8075a6
    eae2283d 696ceff7 8570186f ca8e3415 0e01b60c d74a4287 1809a8f6 f2dfb0b8
    d82061ea 957201cb 8b6bb964 30a96302 ebb7a1ba ada3141f ca24f102 03010001
    a3820287 30820283 300b0603 551d0f04 04030205 e0303606 03551d11 042f302d
    81116164 6d696e40 63697363 6f2e6c6f 63616c82 1856504e 2d415341 35353235
    582e6369 73636f2e 6c6f6361 6c301d06 03551d0e 04160414 336fa966 ceb1aab7
    ba16fb9c c65478d7 25f54a92 301f0603 551d2304 18301680 147d6241 fcae8c0c
    5bc33f6c 1e771c0a dcb7c5fe 7d304506 03551d1f 043e303c 303aa038 a0368634
    68747470 3a2f2f70 6b692e63 6973636f 2e6c6f63 616c2f43 65727445 6e726f6c
    6c2f4356 442d4973 7375696e 672d4341 2e63726c 305f0608 2b060105 05070101
    04533051 304f0608 2b060105 05073002 86436874 74703a2f 2f706b69 2e636973
    636f2e6c 6f63616c 2f436572 74456e72 6f6c6c2f 43412e63 6973636f 2e6c6f63
    616c5f43 56442d49 73737569 6e672d43 412e6372 74303e06 092b0601 04018237
    15070431 302f0627 2b060104 01823715 0881f9ac 0d87f6ea 7e81e19d 33828097
    0184afe9 22811a87 90ed3f81 f1c30e02 01640201 02305b06 03551d25 04543052
    06082b06 01050507 03010608 2b060105 05070304 06082b06 01050507 03070608
    2b060105 05070306 06082b06 01050508 02020608 2b060105 05070305 060a2b06
    01040182 370a0304 06082b06 01050507 03023071 06092b06 01040182 37150a04
    64306230 0a06082b 06010505 07030130 0a06082b 06010505 07030430 0a06082b
    06010505 07030730 0a06082b 06010505 07030630 0a06082b 06010505 08020230
    0a06082b 06010505 07030530 0c060a2b 06010401 82370a03 04300a06 082b0601
    05050703 02304406 092a8648 86f70d01 090f0437 3035300e 06082a86 4886f70d
    03020202 0080300e 06082a86 4886f70d 03040202 00803007 06052b0e 03020730
```

```
    0a06082a 864886f7 0d030730 0d06092a 864886f7 0d010105 05000382 0101008a
    b221719c 16dffbd9 9f4841d8 663e55e2 b2020406 a75f21aa 9c4b06eb 69b91b88
    286412ff 9ba2c524 b7194ce3 0b4163e5 881123e1 2cd360d0 bff51db2 47d58b13
    af5516d3 eaf13203 01edab4c b1c77c33 2ec0ef37 b6237115 ea3aa905 238b9b3c
    2f2ed1b7 3c83d769 4060e601 d66bbfd0 ca7eeb54 5c249a3f a31c7cfa b9a9d947
    c8c7542b ab5fae56 98a632ff cf62d191 52bc5e51 9e85b89e bfe5c908 da21a5ca
    9d9501cd 8974d903 ce5f7c94 d2837bff 7cc01c6e a9795a8a 1bae18e1 4e6f7573
    0ed2f6c0 ecf3993b 1e9d3cc8 e0d4fc07 20ed2f1c a94b6ac7 65208e03 f271dedf
    77260c78 24b84e32 974e0548 a84001ce 1d5edb3b aa733b8a 7e0ca22c dba537
  quit
 certificate ca 77000000135662b8af34a01af0000000000013
    30820422 3082030a a0030201 02021377 00000013 5662b8af 34a01af0 00000000
    0013300d 06092a86 4886f70d 01010505 00303431 0c300a06 0355040b 13036376
    64310e30 0c060355 040a1305 63697363 6f311430 12060355 0403130b 4356442d
    524f4f54 2d434130 1e170d31 34303830 38323031 3730375a 170d3139 30383038
    32303237 30375a30 47311530 13060a09 92268993 f22c6401 1916056c 6f63616c
    31153013 060a0992 268993f2 2c640119 16056369 73636f31 17301506 03550403
    130e4356 442d4973 7375696e 672d4341 30820122 300d0609 2a864886 f70d0101
    01050003 82010f00 3082010a 02820101 00a7b7f2 18465440 6e7747ca 2ab433a0
    05f1def4 e308fff0 27c6f859 7b33b6e0 ced1f635 0558272a 19ed588c a78b8070
    79ac0349 80c95bdd 29e3eef3 fa05fb47 973b1def c683b967 b06536c9 fd285d9f
    71cd6160 59f18c08 778f4bf4 92705e01 3cd72a8b 08ebf802 0d8a4ad9 67749859
    77d4c9b1 9b64978e a75e0389 96d5f074 e92ba9a8 3d1e6007 600e3fbc e63062b0
    eac7e907 a1278741 a70ae435 0b88aae3 a2890e6d 5d931c4b 4bbb1c14 58955fac
    38cd9d18 18b97ad5 924c146a e36eddbd b0e91100 11e2a5f4 1b7cc388 67e8038d
    cbcf3b52 0b7f6dc5 b2f9dc72 f7d01586 10c0de74 b6ddf2c3 70cd7c0d 6cb2218d
    9d3a3447 2f1980be aea5dd5b f55ce0a2 07020301 0001a382 01183082 01143010
    06092b06 01040182 37150104 03020100 301d0603 551d0e04 1604147d 6241fcae
    8c0c5bc3 3f6c1e77 1c0adcb7 c5fe7d30 43060355 1d20043c 303a3038 06082a03
    048b2f43 5905302c 302a0608 2b060105 05070201 161e6874 74703a2f 2f706b69
    2e636973 636f2e6c 6f63616c 2f637073 2e747874 30190609 2b060104 01823714
    02040c1e 0a005300 75006200 43004130 0b060355 1d0f0404 03020186 300f0603
    551d1301 01ff0405 30030101 ff301f06 03551d23 04183016 8014cd7e 650f3b6c
    edb6ed9d fc5527ab f92ebb52 19823042 0603551d 1f043b30 393037a0 35a03386
    31687474 703a2f2f 706b692e 63697363 6f2e6c6f 63616c2f 43657274 456e726f
    6c6c2f43 56442d52 4f4f542d 43412e63 726c300d 06092a86 4886f70d 01010505
    00038201 01003efd 1cc701f0 3f616935 73ebd6dc d92ffba0 8897eafe af0a0bb5
    87173150 a5109e09 098f572d c9c5f557 f3e64e9e d340d6de 7957ce14 1b553ca2
    49baabaf dc24533a 17f88a33 73fed58b 25738798 bfa3f6c1 bf02b3aa 44495901
    0f15e716 e779d14d fe179f0f 24e9399d cbf07908 59fb882b 3393725b 835df324
    9df5c2dc d3fd9607 6c419fac c1936170 e8440e42 8666e49c 0a72d8ea 12fc4fc2
    9b8065bd a382baa3 72a95cfc 67f66c2e 2ac85997 920ce639 1be5d102 175418d2
    59a7bade 5c5fab92 59eacdda cf3cdd61 b3d608df 77f008e0 473c5f5a a46281e3
    bee2cc01 4eaea839 3dc83751 4f69ed27 33406bc8 c52c6557 2fb78106 911f3699
    92bdffdb 5151
  quit
crypto ca certificate chain VPN-ASA5525X-FO-Cert
```

```
certificate 61e9962b000000000014
   30820544 3082042c a0030201 02020a61 e9962b00 00000000 14300d06 092a8648
   86f70d01 01050500 30473115 3013060a 09922689 93f22c64 01191605 6c6f6361
   6c311530 13060a09 92268993 f22c6401 19160563 6973636f 31173015 06035504
   03130e43 56442d49 73737569 6e672d43 41301e17 0d313430 38323131 38333533
   305a170d 31363038 32303138 33353330 5a307131 1d301b06 092a8648 86f70d01
   0908130e 3137322e 31372e31 33302e31 3232312a 30280609 2a864886 f70d0109
   02131b56 504e2d41 53413535 3235582d 464f2e63 6973636f 2e6c6f63 616c3124
   30220603 55040313 1b56504e 2d415341 35353235 582d464f 2e636973 636f2e6c
   6f63616c 30819f30 0d06092a 864886f7 0d010101 05000381 8d003081 89028181
   00b9a5d3 000643b5 230e09e5 26227a9d 7af4d1cb a5010e60 93011d7c 807d29e4
   6800235c 1da360cf a84bf8d1 a44ad3e6 5c30dcc6 aca8cd66 2d7e572f c06d8df5
   c4747d80 75a6eae2 283d696c eff78570 186fca8e 34150e01 b60cd74a 42871809
   a8f6f2df b0b8d820 61ea9572 01cb8b6b b96430a9 6302ebb7 a1baada3 141fca24
   f1020301 0001a382 028a3082 0286300b 0603551d 0f040403 0205e030 39060355
   1d110432 30308111 61646d69 6e406369 73636f2e 6c6f6361 6c821b56 504e2d41
   53413535 3235582d 464f2e63 6973636f 2e6c6f63 616c301d 0603551d 0e041604
   14336fa9 66ceb1aa b7ba16fb 9cc65478 d725f54a 92301f06 03551d23 04183016
   80147d62 41fcae8c 0c5bc33f 6c1e771c 0adcb7c5 fe7d3045 0603551d 1f043e30
   3c303aa0 38a03686 34687474 703a2f2f 706b692e 63697363 6f2e6c6f 63616c2f
   43657274 456e726f 6c6c2f43 56442d49 73737569 6e672d43 412e6372 6c305f06
   082b0601 05050701 01045330 51304f06 082b0601 05050730 02864368 7474703a
   2f2f706b 692e6369 73636f2e 6c6f6361 6c2f4365 7274456e 726f6c6c 2f43412e
   63697363 6f2e6c6f 63616c5f 4356442d 49737375 696e672d 43412e63 7274303e
   06092b06 01040182 37150704 31302f06 272b0601 04018237 150881f9 ac0d87f6
   ea7e81e1 9d338280 970184af e922811a 8790ed3f 81f1c30e 02016402 0102305b
   0603551d 25045430 5206082b 06010505 07030106 082b0601 05050703 0406082b
   06010505 07030706 082b0601 05050703 0606082b 06010505 08020206 082b0601
   05050703 05060a2b 06010401 82370a03 0406082b 06010505 07030230 7106092b
   06010401 8237150a 04643062 300a0608 2b060105 05070301 300a0608 2b060105
   05070304 300a0608 2b060105 05070307 300a0608 2b060105 05070306 300a0608
   2b060105 05080202 300a0608 2b060105 05070305 300c060a 2b060104 0182370a
   0304300a 06082b06 01050507 03023044 06092a86 4886f70d 01090f04 37303530
   0e06082a 864886f7 0d030202 02008030 0e06082a 864886f7 0d030402 02008030
   0706052b 0e030207 300a0608 2a864886 f70d0307 300d0609 2a864886 f70d0101
   05050003 82010100 9e23cf4c 9b5ab813 3da1167d 03ee400f 6b26ca5e 7b2405b9
   ec0423b1 e7b8535e d6cbabbb 1b783d2b 6a6fbf0d d62e053d 545bb478 f6593192
   c8b60021 bbf439f6 b4bb0de1 518b627f e309fbab 4528b616 816db3eb b18ace20
   e4010ff1 5911f3b6 93918c4e 3f657656 fdc5963d d8da9c37 f98ca5e4 5f32ac57
   0a65716c e06ad2aa 70b95b33 2230c87a a6c403bd 615e125c 0e64f6e2 9b5d86b1
   edf9b2ae 9ddb2489 a577f32a 66ed1f7d 1d316c78 06ddef66 66315aeb 1e27951d
   05f1431b 16ae1b73 d2363e4d bd8fc96a 98b4b305 17445e35 0246a63e a1a51ab6
   086ebf06 ad6cbec5 b4620fc8 1cbfeb8e 4eefeb04 c7a16b61 c17c5a85 2759c16a
   4e0dbbd6 fc24597b
 quit
certificate ca 77000000135662b8af34a01af0000000000013
   30820422 3082030a a0030201 02021377 00000013 5662b8af 34a01af0 00000000
```

```
    0013300d 06092a86 4886f70d 01010505 00303431 0c300a06 0355040b 13036376
    64310e30 0c060355 040a1305 63697363 6f311430 12060355 0403130b 4356442d
    524f4f54 2d434130 1e170d31 34303830 38323031 3730375a 170d3139 30383038
    32303237 30375a30 47311530 13060a09 92268993 f22c6401 1916056c 6f63616c
    31153013 060a0992 268993f2 2c640119 16056369 73636f31 17301506 03550403
    130e4356 442d4973 7375696e 672d4341 30820122 300d0609 2a864886 f70d0101
    01050003 82010f00 3082010a 02820101 00a7b7f2 18465440 6e7747ca 2ab433a0
    05f1def4 e308fff0 27c6f859 7b33b6e0 ced1f635 0558272a 19ed588c a78b8070
    79ac0349 80c95bdd 29e3eef3 fa05fb47 973b1def c683b967 b06536c9 fd285d9f
    71cd6160 59f18c08 778f4bf4 92705e01 3cd72a8b 08ebf802 0d8a4ad9 67749859
    77d4c9b1 9b64978e a75e0389 96d5f074 e92ba9a8 3d1e6007 600e3fbc e63062b0
    eac7e907 a1278741 a70ae435 0b88aae3 a2890e6d 5d931c4b 4bbb1c14 58955fac
    38cd9d18 18b97ad5 924c146a e36eddbd b0e91100 11e2a5f4 1b7cc388 67e8038d
    cbcf3b52 0b7f6dc5 b2f9dc72 f7d01586 10c0de74 b6ddf2c3 70cd7c0d 6cb2218d
    9d3a3447 2f1980be aea5dd5b f55ce0a2 07020301 0001a382 01183082 01143010
    06092b06 01040182 37150104 03020100 301d0603 551d0e04 1604147d 6241fcae
    8c0c5bc3 3f6c1e77 1c0adcb7 c5fe7d30 43060355 1d20043c 303a3038 06082a03
    048b2f43 5905302c 302a0608 2b060105 05070201 161e6874 74703a2f 2f706b69
    2e636973 636f2e6c 6f63616c 2f637073 2e747874 30190609 2b060104 01823714
    02040c1e 0a005300 75006200 43004130 0b060355 1d0f0404 03020186 300f0603
    551d1301 01ff0405 30030101 ff301f06 03551d23 04183016 8014cd7e 650f3b6c
    edb6ed9d fc5527ab f92ebb52 19823042 0603551d 1f043b30 393037a0 35a03386
    31687474 703a2f2f 706b692e 63697363 6f2e6c6f 63616c2f 43657274 456e726f
    6c6c2f43 56442d52 4f4f542d 43412e63 726c300d 06092a86 4886f70d 01010505
    00038201 01003efd 1cc701f0 3f616935 73ebd6dc d92ffba0 8897eafe af0a0bb5
    87173150 a5109e09 098f572d c9c5f557 f3e64e9e d340d6de 7957ce14 1b553ca2
    49baabaf dc24533a 17f88a33 73fed58b 25738798 bfa3f6c1 bf02b3aa 44495901
    0f15e716 e779d14d fe179f0f 24e9399d cbf07908 59fb882b 3393725b 835df324
    9df5c2dc d3fd9607 6c419fac c1936170 e8440e42 8666e49c 0a72d8ea 12fc4fc2
    9b8065bd a382baa3 72a95cfc 67f66c2e 2ac85997 920ce639 1be5d102 175418d2
    59a7bade 5c5fab92 59eacdda cf3cdd61 b3d608df 77f008e0 473c5f5a a46281e3
    bee2cc01 4eaea839 3dc83751 4f69ed27 33406bc8 c52c6557 2fb78106 911f3699
    92bdffdb 5151
  quit
crypto ikev1 enable outside-16
crypto ikev1 policy 10
 authentication crack
 encryption aes-256
 hash sha
 group 2
 lifetime 86400
crypto ikev1 policy 20
 authentication rsa-sig
 encryption aes-256
 hash sha
 group 2
 lifetime 86400
```

```
crypto ikev1 policy 30
 authentication pre-share
 encryption aes-256
 hash sha
 group 2
 lifetime 86400
crypto ikev1 policy 40
 authentication crack
 encryption aes-192
 hash sha
 group 2
 lifetime 86400
crypto ikev1 policy 50
 authentication rsa-sig
 encryption aes-192
 hash sha
 group 2
 lifetime 86400
crypto ikev1 policy 60
 authentication pre-share
 encryption aes-192
 hash sha
 group 2
 lifetime 86400
crypto ikev1 policy 70
 authentication crack
 encryption aes
 hash sha
 group 2
 lifetime 86400
crypto ikev1 policy 80
 authentication rsa-sig
 encryption aes
 hash sha
 group 2
 lifetime 86400
crypto ikev1 policy 90
 authentication pre-share
 encryption aes
 hash sha
 group 2
 lifetime 86400
crypto ikev1 policy 100
 authentication crack
 encryption 3des
 hash sha
 group 2
```

```
 lifetime 86400
crypto ikev1 policy 110
 authentication rsa-sig
 encryption 3des
 hash sha
 group 2
 lifetime 86400
crypto ikev1 policy 120
 authentication pre-share
 encryption 3des
 hash sha
 group 2
 lifetime 86400
crypto ikev1 policy 130
 authentication crack
 encryption des
 hash sha
 group 2
 lifetime 86400
crypto ikev1 policy 140
 authentication rsa-sig
 encryption des
 hash sha
 group 2
 lifetime 86400
crypto ikev1 policy 150
 authentication pre-share
 encryption des
 hash sha
 group 2
 lifetime 86400
!
track 1 rtr 16 reachability
telnet timeout 5
ssh stricthostkeycheck
ssh 10.4.48.0 255.255.255.0 inside
ssh timeout 5
ssh version 2
ssh key-exchange group dh-group1-sha1
console timeout 0
threat-detection statistics access-list
no threat-detection statistics tcp-intercept
ntp server 10.4.48.17
ssl encryption aes256-sha1 aes128-sha1 3des-sha1
ssl trust-point VPN-ASA5525X-Cert outside-16
ssl trust-point VPN-ASA5525X-Cert outside-17
webvpn
```

```
 enable outside-16
 enable outside-17
 anyconnect-essentials
 anyconnect image disk0:/anyconnect-win-3.1.05160-k9.pkg 1
 anyconnect image disk0:/anyconnect-macosx-i386-3.1.05160-k9.pkg 2
 anyconnect profiles RA-Profile disk0:/ra-profile.xml
 anyconnect enable
 tunnel-group-list enable
group-policy GroupPolicy_Employee internal
group-policy GroupPolicy_Employee attributes
 banner value Group "vpn-employee" allows for unrestricted access with a tunnel all
policy.
group-policy GroupPolicy_5505 internal
group-policy GroupPolicy_5505 attributes
 vpn-tunnel-protocol ikev1
 password-storage disable
 split-tunnel-policy tunnelall
 secure-unit-authentication enable
 nem enable
group-policy GroupPolicy_AnyConnect internal
group-policy GroupPolicy_AnyConnect attributes
 wins-server none
 dns-server value 10.4.48.10
 vpn-tunnel-protocol ssl-client
 default-domain value cisco.local
group-policy GroupPolicy_Partner internal
group-policy GroupPolicy_Partner attributes
 banner value Group "vpn-partner" allows for access control list (ACL) restricted access
with a tunnel all policy.
 vpn-filter value RA_PartnerACL
group-policy GroupPolicy_Administrator internal
group-policy GroupPolicy_Administrator attributes
 banner value Group "vpn-administrator" allows for unrestricted access with a split
tunnel policy.
 split-tunnel-policy tunnelspecified
 split-tunnel-network-list value RA_SplitTunnelACL
username admin password w2Y.6Op4j7clVDk2 encrypted privilege 15
tunnel-group AnyConnect type remote-access
tunnel-group AnyConnect general-attributes
 address-pool RA-pool
 authentication-server-group AD
 default-group-policy GroupPolicy_AnyConnect
 password-management
tunnel-group AnyConnect webvpn-attributes
 group-alias AnyConnect enable
 group-url https://172.16.130.122/AnyConnect enable
 group-url https://172.17.130.122/AnyConnect enable
```

```
tunnel-group Teleworker5505 type remote-access
tunnel-group Teleworker5505 general-attributes
 authentication-server-group AAA-SERVER
 default-group-policy GroupPolicy_5505
 password-management
tunnel-group Teleworker5505 ipsec-attributes
 ikev1 pre-shared-key *****
!
class-map inspection_default
 match default-inspection-traffic
!
!
policy-map type inspect dns preset_dns_map
 parameters
  message-length maximum client auto
  message-length maximum 512
policy-map global_policy
 class inspection_default
  inspect dns preset_dns_map
  inspect ftp
  inspect h323 h225
  inspect h323 ras
  inspect ip-options
  inspect netbios
  inspect rsh
  inspect rtsp
  inspect skinny
  inspect esmtp
  inspect sqlnet
  inspect sunrpc
  inspect tftp
  inspect sip
  inspect xdmcp
!
service-policy global_policy global
prompt hostname context
no call-home reporting anonymous
call-home
 profile CiscoTAC-1
  no active
  destination address http https://tools.cisco.com/its/service/oddce/services/
DDCEService
  destination address email callhome@cisco.com
  destination transport-method http
  subscribe-to-alert-group diagnostic
  subscribe-to-alert-group environment
  subscribe-to-alert-group inventory periodic monthly 1
```

```
  subscribe-to-alert-group configuration periodic monthly 1
  subscribe-to-alert-group telemetry periodic daily
Cryptochecksum:fc2f5629d41067885d8bf72400322745
: end
```

ASA-5505

```
ASA Version 9.1(5)
!
hostname TS01-ASA5505
domain-name cisco.local
enable password 2y4FIGBVVyBLau0Q encrypted
xlate per-session deny tcp any4 any4
xlate per-session deny tcp any4 any6
xlate per-session deny tcp any6 any4
xlate per-session deny tcp any6 any6
xlate per-session deny udp any4 any4 eq domain
xlate per-session deny udp any4 any6 eq domain
xlate per-session deny udp any6 any4 eq domain
xlate per-session deny udp any6 any6 eq domain
names
!
interface Ethernet0/0
 switchport access vlan 2
!
interface Ethernet0/1
!
interface Ethernet0/2
!
interface Ethernet0/3
!
interface Ethernet0/4
!
interface Ethernet0/5
!
interface Ethernet0/6
!
interface Ethernet0/7
!
interface Vlan1
 nameif inside
 security-level 100
 ip address 10.4.156.1 255.255.255.248
!
interface Vlan2
 nameif outside
 security-level 0
```

```
 ip address dhcp setroute
!
ftp mode passive
dns server-group DefaultDNS
 domain-name cisco.local
pager lines 24
mtu inside 1500
mtu outside 1500
icmp unreachable rate-limit 1 burst-size 1
no asdm history enable
arp timeout 14400
no arp permit-nonconnected
timeout xlate 3:00:00
timeout pat-xlate 0:00:30
timeout conn 1:00:00 half-closed 0:10:00 udp 0:02:00 icmp 0:00:02
timeout sunrpc 0:10:00 h323 0:05:00 h225 1:00:00 mgcp 0:05:00 mgcp-pat 0:05:00
timeout sip 0:30:00 sip_media 0:02:00 sip-invite 0:03:00 sip-disconnect 0:02:00
timeout sip-provisional-media 0:02:00 uauth 0:05:00 absolute
timeout tcp-proxy-reassembly 0:01:00
timeout floating-conn 0:00:00
dynamic-access-policy-record DfltAccessPolicy
aaa-server AAA-SERVERS protocol tacacs+
aaa-server AAA-SERVERS (inside) host 10.4.48.15
 key *****
user-identity default-domain LOCAL
aaa authentication http console AAA-SERVERS LOCAL
aaa authentication ssh console AAA-SERVERS LOCAL
http server enable
http 10.0.0.0 255.0.0.0 inside
no snmp-server location
no snmp-server contact
snmp-server enable traps snmp authentication linkup linkdown coldstart warmstart
crypto ipsec security-association pmtu-aging infinite
crypto ca trustpool policy
crypto ikev1 policy 65535
 authentication pre-share
 encryption 3des
 hash sha
 group 2
 lifetime 86400
telnet timeout 5
ssh stricthostkeycheck
ssh 10.0.0.0 255.0.0.0 inside
ssh timeout 5
ssh key-exchange group dh-group1-sha1
console timeout 0
management-access inside
```

```
vpnclient server 172.16.130.122
vpnclient mode network-extension-mode
vpnclient vpngroup Teleworker5505 password *****
vpnclient enable
dhcpd option 150 ip 10.4.48.120
!
dhcpd address 10.4.156.2-10.4.156.6 inside
dhcpd dns 10.4.48.10 interface inside
dhcpd domain cisco.local interface inside
dhcpd enable inside
!
threat-detection statistics access-list
no threat-detection statistics tcp-intercept
username admin password w2Y.6Op4j7clVDk2 encrypted privilege 15
!
class-map inspection_default
 match default-inspection-traffic
!
!
policy-map type inspect dns preset_dns_map
 parameters
  message-length maximum client auto
  message-length maximum 512
policy-map global_policy
 class inspection_default
  inspect dns preset_dns_map
  inspect ftp
  inspect h323 h225
  inspect h323 ras
  inspect ip-options
  inspect netbios
  inspect rsh
  inspect rtsp
  inspect skinny
  inspect esmtp
  inspect sqlnet
  inspect sunrpc
  inspect tftp
  inspect sip
  inspect xdmcp
!
service-policy global_policy global
prompt hostname context
no call-home reporting anonymous
call-home
 profile CiscoTAC-1
  no active
```

```
  destination address http https://tools.cisco.com/its/service/oddce/services/
DDCEService
  destination address email callhome@cisco.com
  destination transport-method http
  subscribe-to-alert-group diagnostic
  subscribe-to-alert-group environment
  subscribe-to-alert-group inventory periodic monthly
  subscribe-to-alert-group configuration periodic monthly
  subscribe-to-alert-group telemetry periodic daily
Cryptochecksum:614cfe033289e55a52925aa88c77cfa4
: end
```

Appendix D: Changes

This appendix summarizes the changes Cisco made to this guide since its last edition.

- We updated the Cisco ASA 5505 software to 9.1(5).
- We updated the RA VPN ASA configuration to explicitly disable proxy ARP for Identity NAT rules.
- We added detailed steps for creating an authorization profile and associated rules for VPN teleworker group on the Cisco ACS.
- We added topology diagrams.
- We created detailed steps for establishing the VPN tunnel.

Feedback

Please use the feedback form to send comments and suggestions about this guide.

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