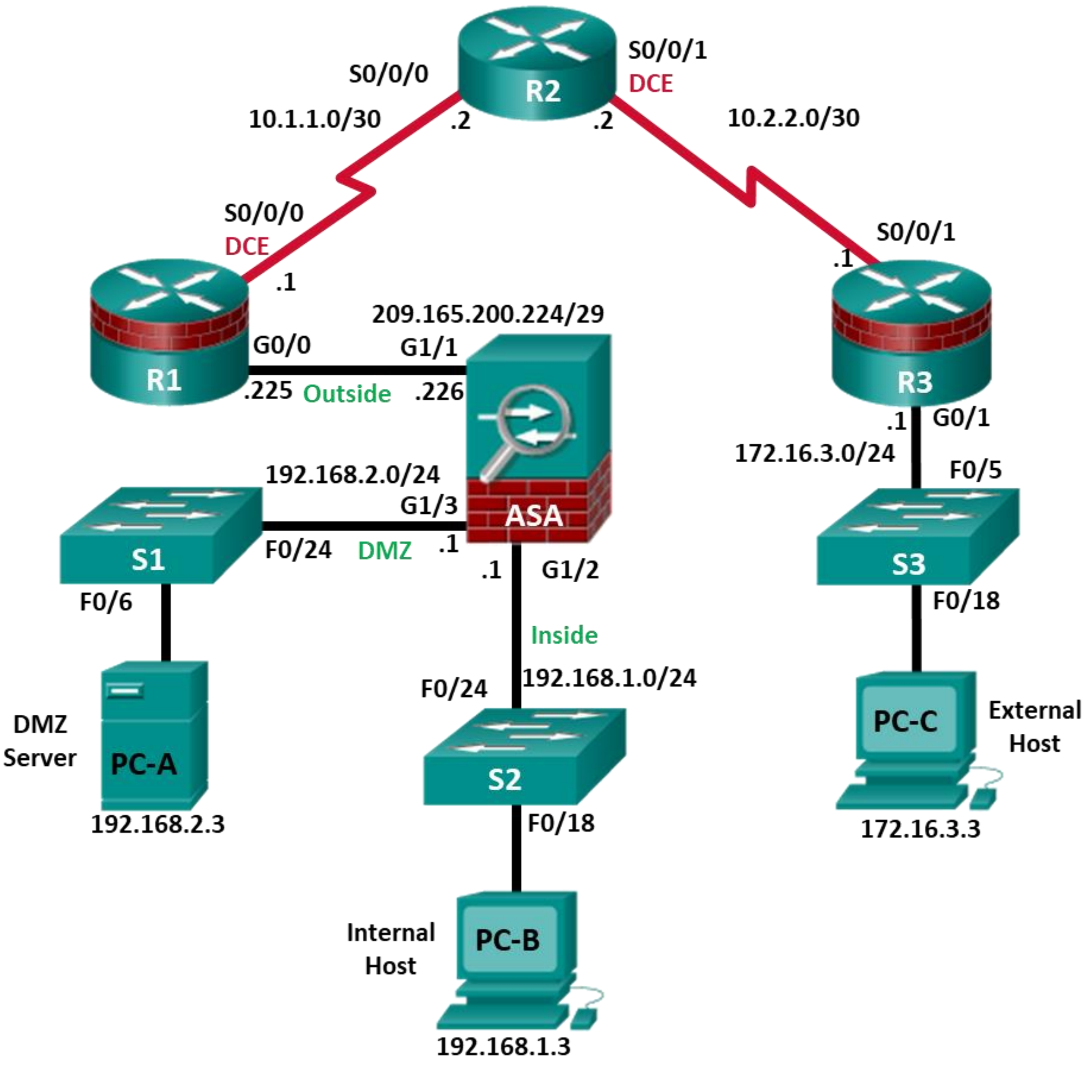
CCNA Security

Lab - Configure AnyConnect Remote Access SSL VPN Using ASA 5506-X ASDM (Instructor Version)

Instructor Note: Red font color or gray highlights indicate text that appears in the instructor copy only.

Topology



Note: ISR G1 devices use FastEthernet interfaces instead of GigabitEthernet interfaces.

IP Addressing Table

Device	Interface	IP Address	Subnet Mask	Default Gateway	Switch Port
R1	G0/0	209.165.200.225	255.255.255.248	N/A	ASA G1/1
R1	S0/0/0 (DCE)	10.1.1.1	255.255.255.252	N/A	N/A
R2	S0/0/0	10.1.1.2	255.255.255.252	N/A	N/A
R2	S0/0/1 (DCE)	10.2.2.2	255.255.255.252	N/A	N/A
R3	G0/1	172.16.3.1	255.255.255.0	N/A	S3 F0/5
R3	S0/0/1	10.2.2.1	255.255.255.252	N/A	N/A
ASA	G1/1 (outside)	209.165.200.226	255.255.255.248	NA	R1 G0/0
ASA	G1/2 (inside)	192.168.1.1	255.255.255.0	NA	S2 F0/24
ASA	G1/3 (dmz)	192.168.2.1	255.255.255.0	NA	S1 F0/24
PC-A	NIC	192.168.2.3	255.255.255.0	192.168.2.1	S1 F0/6
PC-B	NIC	192.168.1.3	255.255.255.0	192.168.1.1	S2 F0/18
PC-C	NIC	172.16.3.3	255.255.255.0	172.16.3.1	S3 F0/18

Objectives

Part 1: Configure Basic Device Settings

- Cable the network and clear previous device settings, as shown in the topology.
- Configure basic settings for routers.
- Configure PC host IP settings.
- Verify connectivity.
- Save the basic running configuration for each router and switch.

Part 2: Access the ASA Console and ASDM

- Access the ASA console.
- Clear the previous ASA configuration settings.
- Bypass Setup mode.
- Configure the ASA by using the CLI script.
- Access ASDM.

Part 3: Configure AnyConnect Client SSL VPN Remote Access Using ASDM

- Start the VPN wizard.
- Specify the VPN encryption protocol.
- Specify the client image to upload to AnyConnect users.
- Configure AAA local authentication.
- Configure the client address assignment.
- Configure the network name resolution.

- Exempt address translation for VPN traffic.
- Review the AnyConnect client deployment details.
- Review the Summary screen and apply the configuration to the ASA.

Part 4: Connect to an AnyConnect SSL VPN

- Verify the AnyConnect client profile.
- Log in from the remote host.
- Perform platform detection (if required).
- Perform an automatic installation of the AnyConnect VPN Client (if required).
- Manually install the AnyConnect VPN Client (if required).
- Confirm VPN connectivity.

Background/Scenario

In addition to stateful firewall and other security features, the ASA can provide both site-to-site and remote access VPN functionality. The ASA provides two main deployment modes that are found in Cisco SSL remote access VPN solutions:

- **Clientless SSL VPN -** A clientless, browser-based VPN that lets users establish a secure, remote-access VPN tunnel to the ASA and use a web browser and built-in SSL to protect VPN traffic. After authentication, users are presented with a portal page and can access specific, predefined internal resources from the portal.
- **Client-Based SSL VPN -** A client-based VPN that provides full-tunnel SSL VPN connection, but requires a VPN client application to be installed on the remote host. After authentication, users can access any internal resource as if they were physically on the local network. The ASA supports both SSL and IPsec client-based VPNs.

In Part 1 of this lab, you will configure the topology and non-ASA devices. In Part 2, you will prepare the ASA for ASDM access. In Part 3, you will use the ASDM VPN wizard to configure an AnyConnect client-based SSL remote access VPN. In Part 4 you will establish a connection and verify connectivity.

Your company has two locations connected to an ISP. R1 represents a CPE device managed by the ISP. R2 represents an intermediate Internet router. R3 connects users at the remote branch office to the ISP. The ASA is an edge security device that connects the internal corporate network and DMZ to the ISP while providing NAT services to inside hosts.

Management has asked you to provide VPN access to teleworkers using the ASA as a VPN concentrator. They want you to test the client-based model using SSL and the Cisco AnyConnect client.

Note: The router commands and output in this lab are from a Cisco 1941 router with Cisco IOS Release 15.4(3)M2 (with a Security Technology Package license). Other routers and Cisco IOS versions can be used. See the Router Interface Summary Table at the end of the lab to determine which interface identifiers to use based on the equipment in the lab. Depending on the router model and Cisco IOS version, the commands available and the output produced might vary from what is shown in this lab.

The ASA used with this lab is a Cisco model 5506-X with an 8-port integrated switch, running OS version 9.10(1), Adaptive Security Device Manager (ASDM) version 7.10(1), and comes with a Base license that allows a maximum of five VLANs.

Instructor Note: AnyConnect Secure Mobility Client release 4.1 or later is recommended. Instructions for installing AnyConnect Client packages to ASA flash are provided in the Chapter 0.0.0.0 lab.

Note: Before beginning, ensure that the ASA, routers and switches have been erased and have no startup configurations.

Instructor Note: Instructions for erasing ASA, switches and routers are provided in the Chapter 0.0.0.0 lab.

Required Resources

- 3 Routers (Cisco 1941 with Cisco IOS Release 15.4(3)M2 image with a Security Technology Package license)
- 3 Switches (Cisco 2960 with cryptography IOS image for SSH support – Release 15.0(2)SE7 or comparable) (not required)
- 1 ASA 5506-X (OS version 9.10(1) and ASDM version 7.10(1) and Base license or comparable)
- 3 PCs (Windows, SSH Client and Java version compatible with installed ASDM version)
- Serial and Ethernet cables, as shown in the topology
- Console cables to configure Cisco networking devices

Part 1: Configure Basic Device Settings

In Part 1, you will set up the network topology and configure basic settings on the routers such as interface IP addresses and static routing.

Note: Do not configure any ASA settings at this time.

Step 1: Cable the network and clear previous device settings.

Attach the devices shown in the topology diagram and cable as necessary. Ensure that the routers and switches have been erased and have no startup configurations.

Step 2: Configure R1 using the CLI script.

In this step, you will use the following CLI script to configure basic settings on R1. Copy and paste the basic configuration script commands listed below. Observe the messages as the commands are applied to ensure that there are no warnings or errors.

Note: Depending on the router model, interfaces might be numbered differently than those listed. You might need to alter the designations accordingly.

Note: Passwords in this task are set to a minimum of 10 characters and are relatively simple for the purposes of performing the lab. More complex passwords are recommended in a production network.

```
hostname R1
security passwords min-length 10
enable algorithm-type scrypt secret cisco12345
username admin01 algorithm-type scrypt secret admin01pass
ip domain name ccnasecurity.com
line con 0
 login local
 exec-timeout 5 0
 logging synchronous
exit
line vty 0 4
 login local
 transport input ssh
 exec-timeout 5 0
 logging synchronous
```

```
exit
interface gigabitethernet 0/0
 ip address 209.165.200.225 255.255.255.248
 no shut
exit
int serial 0/0/0
 ip address 10.1.1.1 255.255.255.252
 clock rate 2000000
 no shut
exit
ip route 0.0.0.0 0.0.0.0 Serial0/0/0
crypto key generate rsa general-keys modulus 1024
```

Step 3: Configure R2 using the CLI script.

In this step, you will use the following CLI script to configure basic settings on R2. Copy and paste the basic configuration script commands listed below. Observe the messages as the commands are applied to ensure that there are no warnings or errors.

```
hostname R2
security passwords min-length 10
enable algorithm-type scrypt secret cisco12345
username admin01 algorithm-type scrypt secret admin01pass
ip domain name ccnasecurity.com
line con 0
 login local
 exec-timeout 5 0
 logging synchronous
exit
line vty 0 4
 login local
 transport input ssh
 exec-timeout 5 0
 logging synchronous
exit
interface serial 0/0/0
 ip address 10.1.1.2 255.255.255.252
 no shut
exit
interface serial 0/0/1
 ip address 10.2.2.2 255.255.255.252
 clock rate 2000000
 no shut
exit
ip route 209.165.200.224 255.255.255.248 Serial0/0/0
ip route 172.16.3.0 255.255.255.0 Serial0/0/1
crypto key generate rsa general-keys modulus 1024
```

Step 4: Configure R3 using the CLI script.

In this step, you will use the following CLI script to configure basic settings on R3. Copy and paste the basic configuration script commands listed below. Observe the messages as the commands are applied to ensure that there are no warnings or errors.

```
hostname R3
security passwords min-length 10
enable algorithm-type scrypt secret cisco12345
username admin01 algorithm-type scrypt secret admin01pass
ip domain name ccnasecurity.com
line con 0
 login local
 exec-timeout 5 0
 logging synchronous
exit
line vty 0 4
 login local
 transport input ssh
 exec-timeout 5 0
 logging synchronous
exit
interface gigabitethernet 0/1
 ip address 172.16.3.1 255.255.255.0
 no shut
exit
int serial 0/0/1
 ip address 10.2.2.1 255.255.255.252
 no shut
exit
ip route 0.0.0.0 0.0.0.0 Serial0/0/1
crypto key generate rsa general-keys modulus 1024
```

Step 5: Configure PC host IP settings.

Configure a static IP address, subnet mask, and default gateway for PC-A, PC-B, and PC-C as shown in the IP Addressing table.

Step 6: Verify connectivity.

The ASA is the focal point for the network zones, and it has not yet been configured. Therefore, there will be no connectivity between devices that are connected to it. However, PC-C should be able to ping the R1 interface G0/0. From PC-C, ping the R1 G0/0 IP address (**209.165.200.225**). If these pings are unsuccessful, troubleshoot the basic device configurations before continuing.

Note: If you can ping from PC-C to R1 G0/0 and S0/0/0, you have demonstrated that static routing is configured and functioning correctly.

Step 7: Save the basic running configuration for each router and switch.

Part 2: Access the ASA Console and ASDM

Step 1: Clear the previous ASA configuration settings.

a. Use the **write erase** command to remove the **startup-config** file from flash memory.

Note: The **erase startup-config** IOS command is not supported on the ASA.

b. Use the **reload** command to restart the ASA. This causes the ASA to display in CLI Setup mode. If you see the **System config has been modified. Save? [Y]es/[N]o:** message, type **n**, and press **Enter**.

Step 2: Bypass Setup mode.

When the ASA completes the reload process, it should detect that the startup configuration file is missing and go into Setup mode. If it does not go into Setup mode, repeat Step 2.

a. When prompted to preconfigure the firewall through interactive prompts (Setup mode), respond with **no**.

b. Enter privileged EXEC mode with the **enable** command. The password should be kept blank (no password).

Step 3: Configure the ASA by using the CLI script.

In this step, you will use a CLI script to configure basic settings, the firewall, and the DMZ.

a. Use the **show run** command to confirm that there is no previous configuration in the ASA other than the defaults that the ASA automatically inserts.

b. Enter global configuration mode. When prompted to enable anonymous call-home reporting, respond **no**.

c. Copy and paste the Pre-VPN Configuration Script commands listed below at the ASA global configuration mode prompt to start configuring the SSL VPNs.

Observe the messages as the commands are applied to ensure that there are no warnings or errors. If prompted to replace the RSA key pair, respond **yes**.

```
hostname CCNAS-ASA
domain-name ccnasecurity.com
enable password cisco12345
interface G1/2
 nameif inside
 security-level 100
 ip address 192.168.1.1 255.255.255.0
 no shutdown
interface G1/1
 nameif outside
 security-level 0
 ip address 209.165.200.226 255.255.255.248
 no shutdown
interface G1/3
 nameif dmz
 security-level 70
 ip address 192.168.2.1 255.255.255.0
 no shutdown
object network inside-net
 subnet 192.168.1.0 255.255.255.0
```

```
object network dmz-server
 host 192.168.2.3
access-list OUTSIDE-DMZ extended permit ip any host 192.168.2.3
object network inside-net
 nat (inside,outside) dynamic interface
object network dmz-server
 nat (dmz,outside) static 209.165.200.227
access-group OUTSIDE-DMZ in interface outside
route outside 0.0.0.0 0.0.0.0 209.165.200.225 1
username admin01 password admin01pass
aaa authentication telnet console LOCAL
aaa authentication ssh console LOCAL
aaa authentication http console LOCAL
http server enable
http 192.168.1.0 255.255.255.0 inside
ssh 192.168.1.0 255.255.255.0 inside
telnet 192.168.1.0 255.255.255.0 inside
telnet timeout 10
ssh timeout 10
class-map inspection_default
 match default-inspection-traffic
policy-map global_policy
 class inspection_default
   inspect icmp
crypto key generate rsa modulus 1024
```

d. At the privileged EXEC mode prompt, issue the **write mem** (or **copy run start**) command to save the running configuration to the startup configuration and the RSA keys to non-volatile memory.

Step 4: Access ASDM.

a. On PC-B, start ASDM using the ASDM application or by using a browser and connecting to **https://192.168.1.1** and then choosing **Run ASDM**.

Please refer to the previous lab for more detailed instructions.

Note: If one of the choices is **Install Java Web Start**, you will need to input https://192.168.1.1/admin/public/startup.jnlp in a browser if you do not want to install the Launcher.

b. After the ASDM Launcher starts, log in as user **admin01** with password **admin01pass**.

Part 3: Configure AnyConnect SSL VPN Remote Access Using ASDM

Step 1: Start the VPN wizard.

a. On the ASDM main menu, click **Wizards** > **VPN Wizards** > **AnyConnect VPN Wizard**. Review the on-screen text and topology diagram.

b. Click **Next** to continue and open the Connection Profile Identification window.

Step 2: Configure the SSL VPN interface connection profile.

a. On the Connection Profile Identification screen, enter **AnyConnect-SSL-VPN** as the Connection Profile Name and specify the **outside** interface as the VPN Access Interface.

b. Click **Next** to continue and open the VPN Protocols window.

Step 3: Specify the VPN encryption protocol.

a. In this lab, we are not creating an IPsec VPN. Therefore, uncheck the **IPsec** check box and leave the **SSL** check box checked. Do not specify a device certificate.

b. Click **Next** to continue to open the Client Images window.

Step 4: Specify the client image to upload to AnyConnect users.

a. We need to make the Windows version of AnyConnect downloadable to connecting users. Click **Add** to open the Add AnyConnect Client Image window to specify the AnyConnect client image filename.

b. Click **Browse Flash** and select the AnyConnect package file for Windows. The image file name begins with **anyconnect-win-xxx.pkg**. In our example, the image filename is **anyconnect-win-4.6.04054-webdeploy-k9.pkg**.

c. Click **OK** to return to the AnyConnect Client Image window.

d. Click **OK** again to return to the Client Image window.

e. The selected image is now displayed in the Client Images window.

f. Click **Next** to continue to open the Authentication Methods window.

Step 5: Configure AAA local authentication.

a. The corporate policy for remote administrative access is to authenticate administrative users against the local user database. Therefore, ensure that the AAA Server Group is specified as **LOCAL**.

b. Enter a new user named **REMOTE-USER** with the password **cisco12345**.

c. Click **Add**.

d. Click **Next** to continue and open the SAML Configuration window. Security Assertion Markup Language (SAML) is an XML based open standard data format for exchanging authentication and authorization data. We are not enabling SAML in this lab, therefore leave settings to their default.

e. Click **Next** to open the Client Address Assignment window.

Step 6: Configure the client address assignment.

AnyConnect clients connecting remotely must be assigned an IP address from an IP address pool. There are no address pools by default. Therefore, a pool must first be created.

a. Click **New** to open the Add IPv4 Pool window to create an IPv4 address pool.

b. Assign the pool the name **Remote-Pool** with a starting IP address of **192.168.1.100**, an ending IP address of **192.168.1.125**, and a subnet mask of **255.255.255.0**.

c. Click **OK** to return to the Client Address Assignment window, which now displays the newly created remote user IP address pool.

d. Click **Next** to continue and open the Network Name Resolution Servers window.

Step 7: Configure the network name resolution.

a. Enter the IP address of a DNS server (**192.168.2.3**). Leave the current domain name as **ccnasecurity.com**.

b. Click **Next** to continue to open the NAT Exempt window.

Step 8: Exempt address translation for VPN traffic.

a. Remote user traffic should not use NAT. Therefore, click the **Exempt VPN traffic from network address translation** check box. Do not change the default entries for the Inside Interface (**inside**) and the Local Network (**any4**).

b. Click **Next** to continue to open the AnyConnect Client Deployment window.

Step 9: Review the AnyConnect client deployment details.

a. This informational screen describes two AnyConnect connection options. Click **Next** to continue and open the Summary window.

Step 10: Review the Summary screen and apply the configuration to the ASA.

a. On the Summary screen, review the configuration description. Use the Back button to make any changes.

b. Click **Finish** to commit the configuration to the ASA. After the configuration is delivered to the ASA, ASDM displays the AnyConnect Connection Profiles window.

Part 4: Connect to an AnyConnect SSL VPN

Step 1: Log in from the remote host.

a. Initially, you will establish a clientless SSL VPN connection to the ASA to download the AnyConnect client software. Open a web browser on PC-C. In the address field of the browser, enter **https://209.165.200.226** for the SSL VPN. SSL is required to connect to the ASA, therefore, use secure HTTP (HTTPS).

b. Enter the previously created username **REMOTE-USER** with the password **cisco12345**.

c. Click **Login** to continue and open the AnyConnect Secure Mobility Client Download window.

Note: The ASA may request confirmation that this is a trusted site. If requested, click **Yes** to proceed.

Note: If you were unable to log in, use the CLI to verify that the user REMOTE-USER is configured. If it is still not working, enter the command **username REMOTE-USER password cisco12345** in the CLI.

Step 2: Install the AnyConnect VPN Client.

a. The AnyConnect Secure Mobility Client will detect your platform and if Java is installed. Next it stops at the Download option for you to select the image client. Click **AnyConnect VPN** to continue.

b. Download the AnyConnect Secure Mobility Client by following the on-screen instructions.

c. Install the AnyConnect client by following the on-screen instructions.

d. When the AnyConnect VPN client has been installed, start the **Cisco AnyConnect VPN Client**.

e. When prompted to enter the secure gateway address, enter **209.165.200.226** in the Connect to field, and click **Connect**.

   If the message **Untrusted Server Blocked!** is displayed, click **Change Setting...**. Unselect the **Block connections to untrusted server** checkbox and close the window to continue and attempt to connect again. Click **Connect Anyway** to use the untrusted server certificate.

f. When prompted, enter **REMOTE-USER** for the username and **cisco12345** as the password.

Step 3: Confirm VPN connectivity.

When the full tunnel SSL VPN connection is established, an icon will appear in the system tray that signifies that the client has successfully connected to the SSL VPN network.

a. Display connection statistics and information by double-clicking the **AnyConnect** icon in the system tray. You will be able to disconnect the SSN VPN session from here. **Do Not** click **Disconnect** at this time. Click the **gear icon** at the bottom left corner of the Cisco AnyConnect Secure Mobility client window.

b. Use the scroll bar on the right side of the Virtual Private Network (VPN) – Statistics tab for additional connection information.

Note: The inside IP address that is assigned to the client from the VPN pool is 192.168.1.100-125.

c. From a command prompt on the remote host PC-C, verify the IP addressing by using the **ipconfig** command. Notice that there are two IP addresses listed. One is for the PC-C remote host local IP address (172.16.3.3) and the other is the IP address assigned to the SSL VPN tunnel (192.168.1.100).

d. From remote host PC-C, ping PC-B (**192.168.1.3**) to verify connectivity.

Step 4: Use the ASDM Monitor to view the AnyConnect remote user session.

Note: Future SSL VPN sessions can be launched through the web portal or through the installed Cisco AnyConnect SSL VPN client. While the remote user at PC-C is still logged in using the AnyConnect client, you can view the session statistics by using the ASDM monitor.

a. On the ASDM menu bar, click **Monitoring** and then select **VPN** > **VPN Statistics** > **Sessions**.

b. Click the **Filter By** pull-down list and select **AnyConnect Client**. You should see the **VPN-User** session logged in from PC-C, which has been assigned an inside network IP address of 192.168.1.100 by the ASA.

Note: You may need to click **Refresh** to display the remote user session.

Reflection

1. Describe at least two benefits of client–based vs. clientless VPNs?

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Users have access to the same internal network resources as if they were on the LAN. Client-based VPN solutions, such as AnyConnect, can be configured to automatically download the proper client software based on the client platform characteristics.

2. Describe at least one difference between using SSL compared to IPsec for remote access tunnel encryption?

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Client-based VPNs can offer a more secure tunnel, if using IPsec, but are somewhat more complex to configure.

Router Interface Summary Table

Router Interface Summary				
Router Model	**Ethernet Interface #1**	**Ethernet Interface #2**	**Serial Interface #1**	**Serial Interface #2**
1800	Fast Ethernet 0/0 (F0/0)	Fast Ethernet 0/1 (Fa0/1)	Serial 0/0/0 (S0/0/0)	Serial 0/0/1 (S0/0/1)
1900	Gigabit Ethernet 0/0 (G0/0)	Gigabit Ethernet 0/1 (G0/1)	Serial 0/0/0 (S0/0/0)	Serial 0/0/1 (S0/0/1)
2801	Fast Ethernet 0/0 (F0/0)	Fast Ethernet 0/1 (F0/1)	Serial 0/1/0 (S0/1/0)	Serial 0/1/1 (S0/1/1)
2811	Fast Ethernet 0/0 (F0/0)	Fast Ethernet 0/1 (F0/1)	Serial 0/0/0 (S0/0/0)	Serial 0/0/1 (S0/0/1)
2900	Gigabit Ethernet 0/0 (G0/0)	Gigabit Ethernet 0/1 (G0/1)	Serial 0/0/0 (S0/0/0)	Serial 0/0/1 (S0/0/1)
Note: To find out how the router is configured, look at the interfaces to identify the type of router and how many interfaces the router has. There is no way to effectively list all the combinations of configurations for each router class. This table includes identifiers for the possible combinations of Ethernet and Serial interfaces in the device. The table does not include any other type of interface, even though a specific router may contain one. An example of this might be an ISDN BRI interface. The string in parenthesis is the legal abbreviation that can be used in Cisco IOS commands to represent the interface.				

Device Configs

ASA 5506-X Config – After Part 4

```
CCNAS-ASA# show running-config
: Saved

:
: Hardware:   ASA5506, 4096 MB RAM, CPU Atom C2000 series 1250 MHz, 1 CPU (4 cores)
:
ASA Version 9.10(1)
!
hostname CCNAS-ASA
domain-name ccnasecurity.com
enable password ***** pbkdf2
names
no mac-address auto
ip local pool Remote-Pool 192.168.1.100-192.168.1.125 mask 255.255.255.0

!
interface GigabitEthernet1/1
 nameif outside
 security-level 0
 ip address 209.165.200.226 255.255.255.248
!
interface GigabitEthernet1/2
```

```
 nameif inside
 security-level 100
 ip address 192.168.1.1 255.255.255.0
!
interface GigabitEthernet1/3
 nameif dmz
 security-level 70
 ip address 192.168.2.1 255.255.255.0
!
interface GigabitEthernet1/4
 shutdown
 no nameif
 no security-level
 no ip address
!
interface GigabitEthernet1/5
 shutdown
 no nameif
 no security-level
 no ip address
!
interface GigabitEthernet1/6
 shutdown
 no nameif
 no security-level
 no ip address
!
interface GigabitEthernet1/7
 shutdown
 no nameif
 no security-level
 no ip address
!
interface GigabitEthernet1/8
 shutdown
 no nameif
 no security-level
 no ip address
!
interface Management1/1
 management-only
 shutdown
 no nameif
 no security-level
 no ip address
!
ftp mode passive
dns server-group DefaultDNS
 domain-name ccnasecurity.com
```

```
object network inside-net
 subnet 192.168.1.0 255.255.255.0
object network dmz-server
 host 192.168.2.3
object network NETWORK_OBJ_192.168.1.96_27
 subnet 192.168.1.96 255.255.255.224
access-list OUTSIDE-DMZ extended permit ip any host 192.168.2.3
pager lines 24
mtu inside 1500
mtu outside 1500
mtu dmz 1500
icmp unreachable rate-limit 1 burst-size 1
no asdm history enable
arp timeout 14400
no arp permit-nonconnected
arp rate-limit 16384
nat (inside,outside) source static any any destination static
NETWORK_OBJ_192.168.1.96_27 NETWORK_OBJ_192.168.1.96_27 no-proxy-arp route-lookup
!
object network inside-net
 nat (inside,outside) dynamic interface
object network dmz-server
 nat (dmz,outside) static 209.165.200.227
access-group OUTSIDE-DMZ in interface outside
route outside 0.0.0.0 0.0.0.0 209.165.200.225 1
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 sctp 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
timeout conn-holddown 0:00:15
timeout igp stale-route 0:01:10
user-identity default-domain LOCAL
aaa authentication telnet console LOCAL
aaa authentication ssh console LOCAL
aaa authentication http console LOCAL
aaa authentication login-history
http server enable
http 192.168.1.0 255.255.255.0 inside
no snmp-server location
no snmp-server contact
service sw-reset-button
crypto ipsec security-association pmtu-aging infinite
crypto ca trustpool policy
telnet 192.168.1.0 255.255.255.0 inside
telnet timeout 10
```

```
ssh stricthostkeycheck
ssh 192.168.1.0 255.255.255.0 inside
ssh timeout 10
ssh version 2
ssh key-exchange group dh-group1-sha1
console timeout 0

threat-detection basic-threat
threat-detection statistics access-list
no threat-detection statistics tcp-intercept
webvpn
 enable outside
 anyconnect image disk0:/anyconnect-win-4.6.04054-webdeploy-k9.pkg 1
 anyconnect enable
 tunnel-group-list enable
 cache
  disable
 error-recovery disable
group-policy GroupPolicy_AnyConnect-SSL-VPN internal
group-policy GroupPolicy_AnyConnect-SSL-VPN attributes
 wins-server none
 dns-server value 192.168.2.3
 vpn-tunnel-protocol ssl-client
 default-domain value ccnasecurity.com
dynamic-access-policy-record DfltAccessPolicy
username admin01 password ***** pbkdf2
username REMOTE-USER password ***** pbkdf2
tunnel-group AnyConnect-SSL-VPN type remote-access
tunnel-group AnyConnect-SSL-VPN general-attributes
 address-pool Remote-Pool
 default-group-policy GroupPolicy_AnyConnect-SSL-VPN
tunnel-group AnyConnect-SSL-VPN webvpn-attributes
 group-alias AnyConnect-SSL-VPN enable
!
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
  no tcp-inspection
policy-map global_policy
 class inspection_default
  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
  inspect dns preset_dns_map
  inspect icmp
policy-map type inspect dns migrated_dns_map_2
 parameters
  message-length maximum client auto
  message-length maximum 512
  no tcp-inspection
policy-map type inspect dns migrated_dns_map_1
 parameters
  message-length maximum client auto
  message-length maximum 512
  no tcp-inspection
!
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:4312df6ad00e44f7cc834b59b2e239fe
: end
```

Router R1

```
R1# show run
Building configuration...

Current configuration : 1694 bytes
!
version 15.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname R1
!
boot-start-marker
boot-end-marker
!
security passwords min-length 10
enable secret 9 $9$4OVlVQCgcg5HRU$9JbJ5WpsOTBRm8H1cyIPLqGmTG3t3AFS9bx1I51tsnE
!
no aaa new-model
memory-size iomem 15
!
!
ip cef
no ipv6 cef
!
multilink bundle-name authenticated
!
cts logging verbose
!
username admin01 secret 9
$9$5GtoxBiNFw5p9k$upl/WwRQGzsvRp6m4PWRoti1TWCR5G97MxBKnugrW6M
!
redundancy
!
interface Embedded-Service-Engine0/0
no ip address
 shutdown
!
interface GigabitEthernet0/0
 ip address 209.165.200.225 255.255.255.248
 duplex auto
 speed auto
!
interface GigabitEthernet0/1
 no ip address
 shutdown
 duplex auto
 speed auto
!
interface Serial0/0/0
 ip address 10.1.1.1 255.255.255.252
 clock rate 2000000
!
interface Serial0/0/1
 no ip address
 shutdown
```

```
!
ip forward-protocol nd
!
no ip http server
no ip http secure-server
!
ip route 0.0.0.0 0.0.0.0 Serial0/0/0
!
control-plane
!
line con 0
 exec-timeout 5 0
 logging synchronous
 login local
line aux 0
line 2
 no activation-character
 no exec
 transport preferred none
 transport output pad telnet rlogin lapb-ta mop udptn v120 ssh
 stopbits 1
line vty 0 4
 exec-timeout 5 0
 logging synchronous
 login local
 transport input telnet
!
scheduler allocate 20000 1000
!
end
```

Router R2

```
R2# show run
Building configuration...

Current configuration : 1678 bytes
!
version 15.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname R2
!
boot-start-marker
boot-end-marker
!
security passwords min-length 10
enable secret 9 $9$Nb4BPAMsmT24y.$4bn2kyZCwulndKiaU1453lzF4n3ge95hfoFIKrucvpI
```

```
!
no aaa new-model
memory-size iomem 15
!
ip cef
no ipv6 cef
!
multilink bundle-name authenticated
!
cts logging verbose
!
username admin01 secret 9
$9$6PSI5.sujsrgN.$LFz4TeeqS/1FtxvK23Le8jxUAY9sjeedVmyF/PA9sPo
!
redundancy
!
interface Embedded-Service-Engine0/0
 no ip address
interface Embedded-Service-Engine0/0
 no ip address
 shutdown
!
interface GigabitEthernet0/0
 no ip address
 shutdown
 duplex auto
 speed auto
!
interface GigabitEthernet0/1
 no ip address
 shutdown
 duplex auto
 speed auto
!
interface Serial0/0/0
 ip address 10.1.1.2 255.255.255.252
!
interface Serial0/0/1
 ip address 10.2.2.2 255.255.255.252
 clock rate 2000000
!
ip forward-protocol nd
!
no ip http server
no ip http secure-server
!
ip route 172.16.3.0 255.255.255.0 Serial0/0/1
ip route 209.165.200.224 255.255.255.248 Serial0/0/0
!
```

```
control-plane
!
line con 0
 exec-timeout 5 0
 logging synchronous
 login local
line aux 0
line 2
 no activation-character
 no exec
 transport preferred none
 transport output pad telnet rlogin lapb-ta mop udptn v120 ssh
 stopbits 1
line vty 0 4
 exec-timeout 5 0
 logging synchronous
 login local
 transport input telnet
!
scheduler allocate 20000 1000
!
end
```

Router R3

```
R3# show run
Building configuration...

Current configuration : 1655 bytes
!
version 15.4
service timestamps debug datetime msec
service timestamps log datetime msec
no service password-encryption
!
hostname R3
!
boot-start-marker
boot-end-marker
!
security passwords min-length 10
enable secret 9 $9$5Mho73ipFPMgWE$yJiMb2sLFmK1P2mWClFwuB3gtdlQWqyjhAZNruqHyrk
!
no aaa new-model
memory-size iomem 15
!
ip cef
no ipv6 cef
!
```

```
multilink bundle-name authenticated
!
cts logging verbose
!
vtp domain TSHOOT
vtp mode transparent
username admin01 secret 9
$9$JXN7EcHDQcdh2k$9qnRjzJxhSGJK3KGF9FOpiZU6HpDCGdWFRUdfg6QIVY
!
redundancy
!
interface Embedded-Service-Engine0/0
 no ip address
 shutdown
!
interface GigabitEthernet0/0
 no ip address
 shutdown
 duplex auto
 speed auto
!
interface GigabitEthernet0/1
 ip address 172.16.3.1 255.255.255.0
 duplex auto
 speed auto
!
interface Serial0/0/0
 no ip address
 shutdown
 clock rate 2000000
!
interface Serial0/0/1
 ip address 10.2.2.1 255.255.255.252
!
ip forward-protocol nd
!
no ip http server
no ip http secure-server
!
ip route 0.0.0.0 0.0.0.0 Serial0/0/1
!
control-plane
!
line con 0
 exec-timeout 5 0
 logging synchronous
 login local
line aux 0
line 2
```

```
 no activation-character
 no exec
 transport preferred none
 transport output pad telnet rlogin lapb-ta mop udptn v120 ssh
 stopbits 1
line vty 0 4
 exec-timeout 5 0
 logging synchronous
 login local
 transport input telnet
!
scheduler allocate 20000 1000
!
end
```

Switches S1, S2 and S3 – Use default configs, except for host name