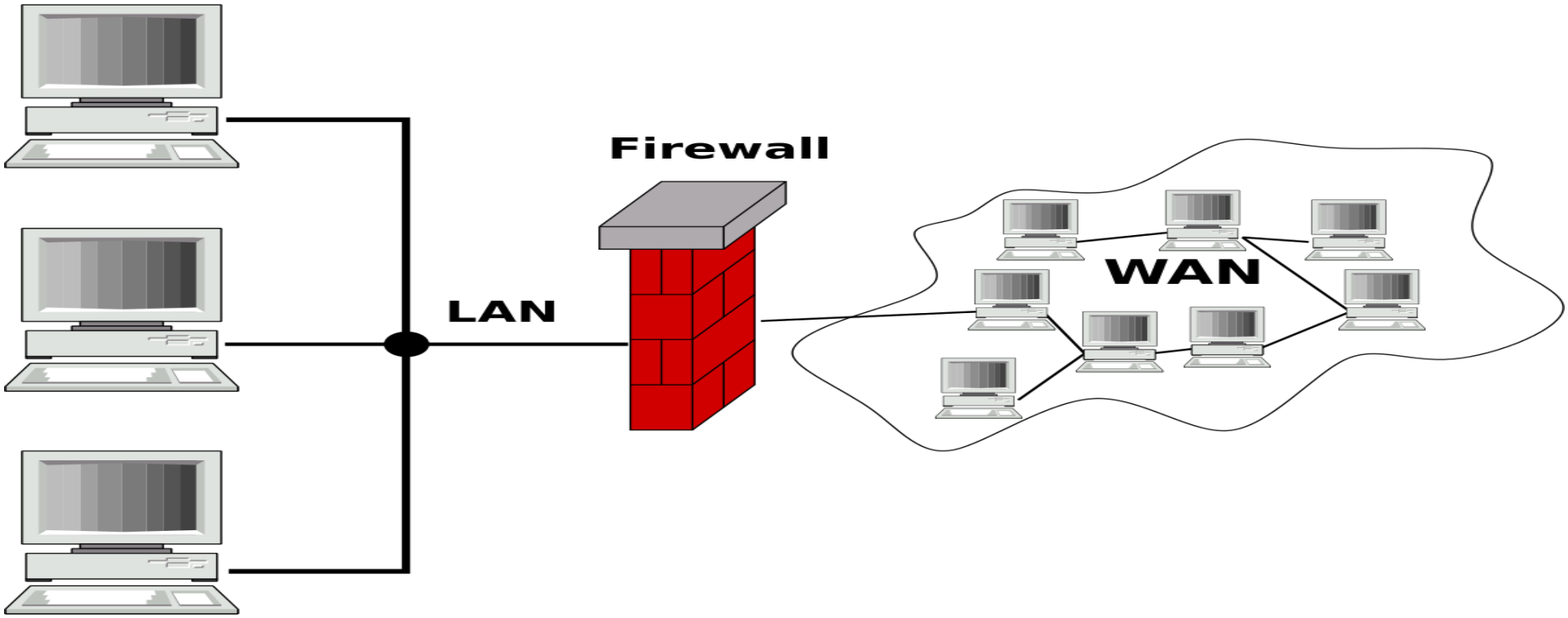
Network Professional Training center

Providing Job Role Training in one of Fastest Growing IT Jobs Sector



NPTC Cisco ASA & FTD TrainingVideo Guide

Table of Content

Computer Network Revision

Routing

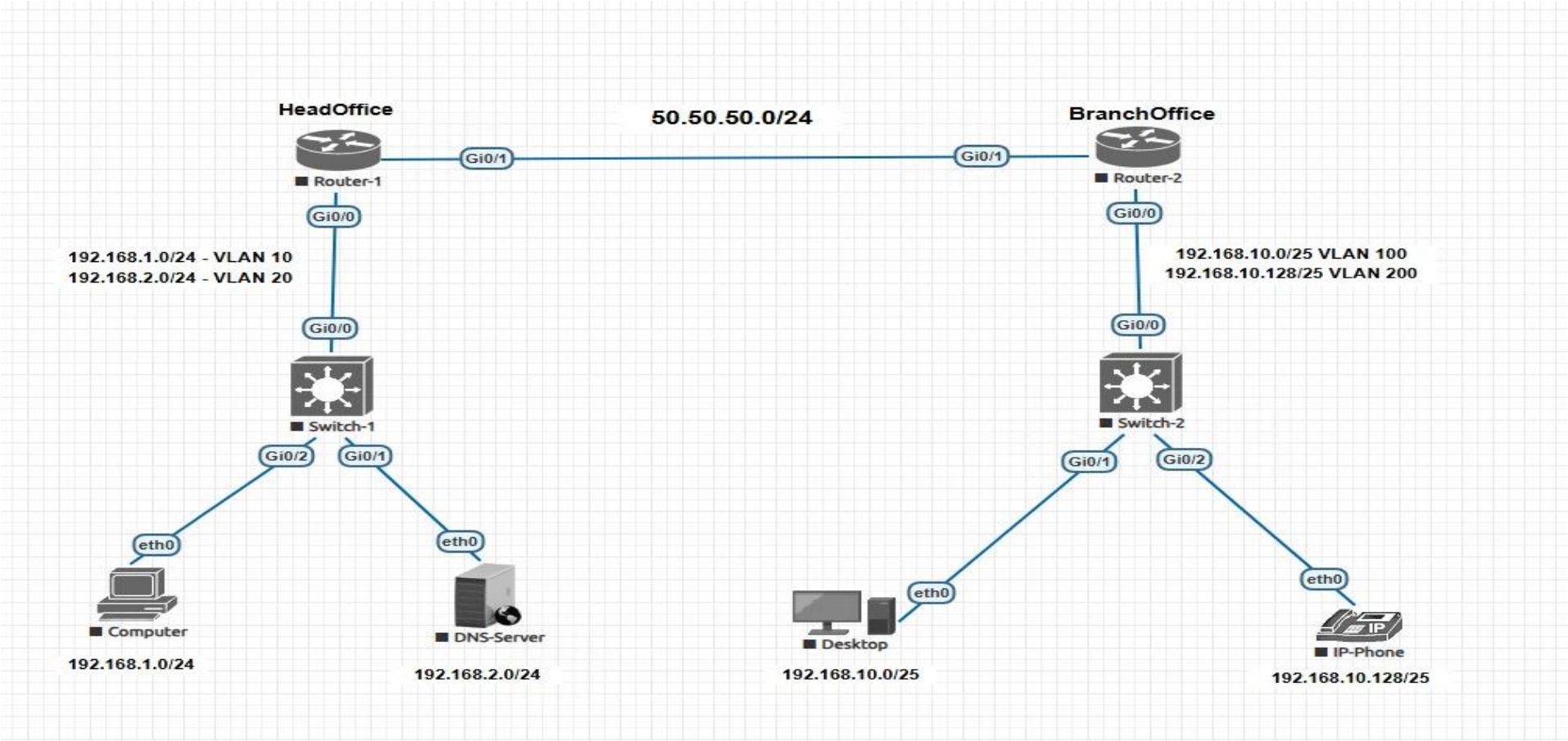
Routing protocols are used to determine how data is transmitted between networks. They can be categorized as link state, distance vector, or exterior gateway protocols.

In simple terms, routing protocols determine how routers communicate with each other to share information about network topology. They allow routers to dynamically adapt to changes, such as link failures or network congestion, ensuring reliable and efficient data delivery. Understanding these protocols is crucial for network engineers and administrators tasked with maintaining seamless connectivity.

Routing Protocols

These are protocols which help Routing Protocols to carry their information from one router to another example: **Static routing** and **dynamic routing** such as OSPF, EIGRP, RIP, IS-IS and BGP to figure out what paths traffic should take

Network Routing Recap Project



Global Configuration

1. Configure the hostname base on the Network Diagram

2. Disable the dns lookup feature.
3. Assign IKE as the Secret password.
4. Direct the Cisco IOS to encrypt any passwords stored in clear-text.

Console Port

5. Configure the console port on all devices to log input synchronously
6. Set password to NPTC
7. Configure the idling timeout to 30 mins

VTY Ports

8. Allow 5 concurrent sessions of remote access
9. Configure the vty ports to log input synchronously
10. Set password to V
11. Configure idling timeout to 30 mins and 10 seconds
12. Save config

Verify the above steps using the proper Show command

13. **Assigning IP Addresses and port description**
14.
15. **Configure the Branch Office to act as DHCP Server and exclude 10 IP addresses from the Vlan 200 Scope**

Vlan and Trunk

16. **Configure Vlan 10 and 20 on Switch 1 and name it as Desktop and Servers respectively**
17. **Configure Vlan 100 and 200 on Switch 2 and name them as Desktop and VOIP repectively**
18. **Configure the switch virtual interface (SVI) using respective vlan on the Switch**
19. **Configure a Switch Default Gateway**
20. **Configure Trunk Port base on the topology**
21. **Configure Access port base on the topology**
22. **Disable all port on the switches which are not connected.**

First Hop Redundancy Protocol" (FHRP)

A "First Hop Redundancy Protocol" (FHRP) is a networking protocol designed to provide redundancy for the default gateway on a network, ensuring seamless connectivity even if the primary router fails by allowing multiple routers to share a virtual IP address and act as a backup for one another, with only one active at a time; essentially, it protects against single points of failure at the first hop of a network connection

Key points about FHRP:

Purpose:

To maintain network connectivity by automatically switching to a backup router if the primary gateway becomes unavailable.

Virtual IP Address:

All routers in an FHRP group share a single "virtual IP address" which is used as the default gateway by devices on the network.

Active and Standby Routers:

Within an FHRP group, only one router is designated as "active" and handles traffic, while the others remain in "standby" mode, ready to take over if needed.

Failover Mechanism:

When the active router fails, the FHRP protocol detects the issue and automatically elects a new active router from the standby group, ensuring minimal disruption to network traffic.

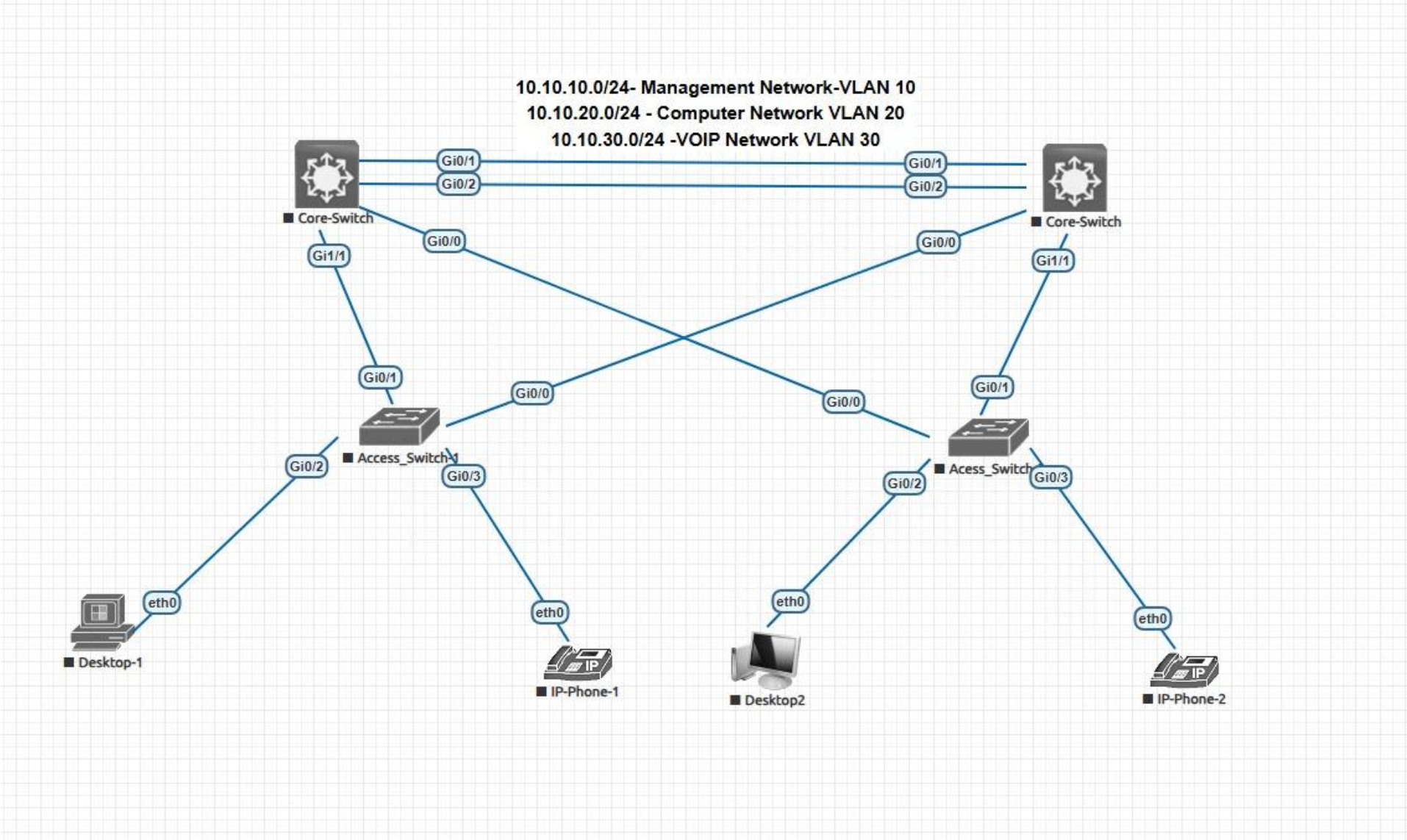
TYPES ofFHRP

Hot Standby Router Protocol (HSRP): A Cisco proprietary protocol considered the most widely used FHRP.

Virtual Router Redundancy Protocol (VRRP): An industry standard FHRP with similar functionality to HSRP.

Gateway Load Balancing Protocol (GLBP): Allows for load balancing across multiple active routers, not just failover.

Redundancy Protocol Project


10.10.10.0/24- Management Network-VLAN 10
10.10.20.0/24 - Computer Network VLAN 20
10.10.30.0/24 -VOIP Network VLAN 30
Core-Switch
Gi0/1
Gi0/2
Gi0/1
Gi0/2
Core-Switch
Gi0/0
Gi0/0
Gi1/1
Gi1/1
Gi0/1
Gi0/0
Gi0/0
Gi0/1
Access_Switch-1
Acess_Switch
Gi0/2
Gi0/3
Gi0/2
Gi0/3
eth0
eth0
eth0
eth0
Desktop-1
IP-Phone-1
Desktop2
IP-Phone-2

Global Configuration

1. Configure the hostname base on the topology
2. Disable the dns lookup feature.
3. Assign Cisc0 as the Secret password.

Console Port

4. Configure the console port on all devices to log input synchronously
5. Set password to Cisc0
6. Configure the idling timeout to 30 mins

VTY Ports

7. Allow 5 concurrent sessions of remote access
8. Configure the vty ports to log input synchronously
9. Set password to Cisc0
10. Configure idling timeout to 60 mins

VLAN Configuration

11. Configure below vlan as follow and allow them to propagate to the access switch

Vlan 10 - Management Vlan - **10.10.10.0/24**
Vlan 20 - Computer Vlan – **10.10.20.0/24 and create as Multicast**
Vlan 30 - VOIP Vlan **– 10.10.30.0/24**

Trunk Configuration

12. Configure the trunk port base on the topology

VlanTrunking Protocol (VTP) Configuration

13. Configure the vtp mode of the access switch as Client
14. Configure the vtp domain name and password on both Core switch as follow

Domain Name – NPTC

Password- secret

Etherchannels

15. Configure etherchannel using PAgP with ON mode on Core_SW1 and ON mode on Core_SW2.

Redundancy Configuration

16. Configure your network using HSRP the above ether channel topology

IP Routing

17. Enable ip routing on the two Core switches

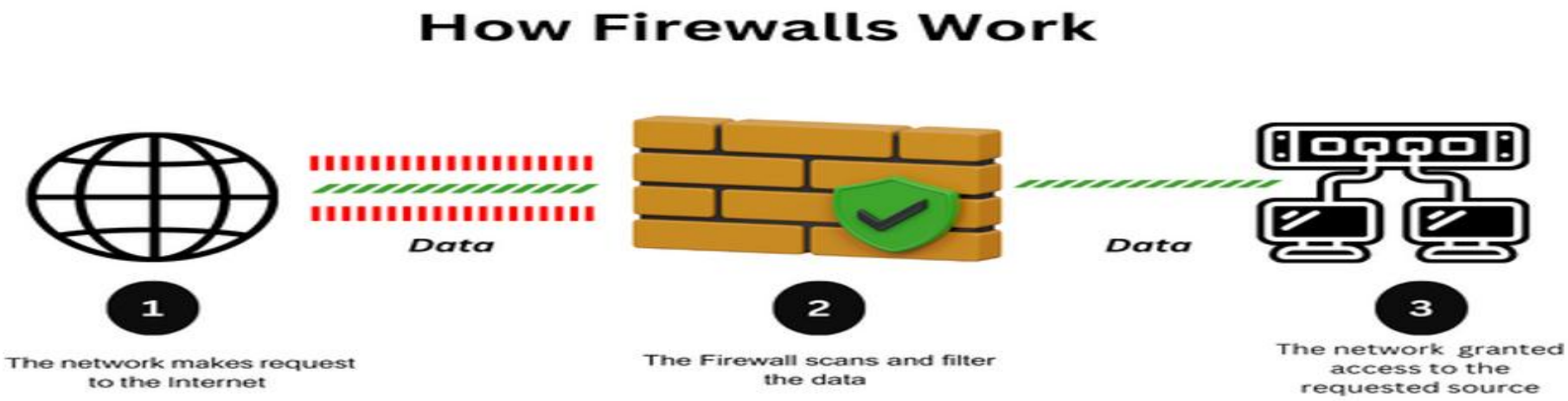
Access Port

18. Configure all access port for auto settings

Introduction of Firewall in Computer Network

In networking, a firewall is a security device that monitors and controls network traffic, acting as a barrier between a trusted internal network and untrusted external networks, based on predefined security rules. The main purpose of a firewall is to separate a secured area (Higher security Zone / Inside Network) from a less secure area (Low security Zone / Outside Network etc.) and to control communication between the two. Firewall also controls inbound and outbound communications across devices.

They work by examining incoming and outgoing data packets and comparing them against a set of rules. Based on these rules, the firewall can either allow or block the traffic.



In large corporate network environments, you can also place a network firewall within your internal LAN in order to provide segmentation of private LAN IP subnets (e.g you can isolate servers LAN from users LAN for example).

Throughout the years firewalls started to include IDS and IPS functions including Anti-X and Web content filtering services.

Firewall Products

- Cisco
- SonicWALL
- Palo Alto Networks
- Juniper
- Watchguard
- Checkpoint
- Fortinet

Competitors to Cisco ASA

Cisco ASA with Firepower services is a premium security product for Enterprise Networks and according to gartner.com and spiceworks.com there are only three direct competitors to these Cisco products. They are Palo Alto, Fortinet and Checkpoint.

Palo Alto

Palo Alto next generation firewalls provide similar features to Cisco ASA firewalls through their PAN-OS operating system. The Palo Alto firewalls, and firewall clusters can be managed by their Firewall management system known as Panorama.

Fortinet

Fortinet has a very large range of firewall models aimed at every size network from entry level to cloud data centers. These firewalls run the Fortigate operating system. Fortinet is one of the fast-growing security firms worldwide and they manufacture all kinds of security products, such as firewalls, antivirus, email security, SIEM, Wi-Fi etc.

Checkpoint

Checkpoint has taken a unified approach to network security through a suite of products that include Next Generation Firewalls known as the Infinity architecture.

This architecture is made up of five sections which are Quantum, Cloud guard, Harmony and Infinity Vision which surrounds their Security Intelligence center known as Infinity Threat Cloud. Checkpoint has a large offering of 15 different Firewall models.

Advantages of using Firewall

1. **Protection from unauthorized access:** Firewalls can be set up to restrict incoming traffic from particular IP addresses or networks, preventing hackers or other malicious actors from easily accessing a network or system. Protection from unwanted access.

2. **Prevention of malware and other threats:** Malware and other threat prevention: Firewalls can be set up to block traffic linked to known malware or other security concerns, assisting in the defense against these kinds of attacks.

3. **Control of network access:** By limiting access to specified individuals or groups for particular servers or applications, firewalls can be used to restrict access to particular network resources or services.

4. **Monitoring of network activity:** Firewalls can be set up to record and keep track of all network activity. This information is essential for identifying and looking into security problems and other kinds of shady behavior.

5. **Regulation compliance:** Many industries are bound by rules that demand the usage of firewalls or other security measures. Organizations can comply with these rules and prevent any fines or penalties by using a firewall.

6. **Network segmentation:** By using firewalls to split up a bigger network into smaller subnets, the attack surface is reduced and the security level is raised.

Types of Firewall Base How to Deploy

1. **Dedicated hardware appliances** are generally used in data centers.

2. **Software on a machine** as used by home users. e.g., Windows Firewall

3. **Managed firewall services** have many options, including a premises-, network-, or **cloud-based service (Firewall as a Service)**. In this case, the firewall manufacturer or service provider takes care of the network and is responsible for firewall administration, log monitoring, etc.

Types of Firewall Based on Method of Operation

1. **Packet Filtering/Stateless:** As the name suggests, the user can either allow or drop packets based on source and destination IP, IP protocol ID, etc., from entering the internal network. This type of filtering works at the network transport layer.

2. **Proxy:** It offers more security than other types of filtering. In proxy filtering, the client connects with a proxy instead of a target system and initiates a new connection. This makes it harder for an attacker to discover the network, as they are not getting the response from the target system.

3. **Stateful Inspection:** In this type of inspection, systems maintain a state table (maintains active connections), analyze incoming and outgoing packets, and drop accordingly.

4. **Application Layer Firewalls –**
   These firewalls can examine application layer (of OSI model) information like an HTTP request. If finds some suspicious application that can be responsible for harming our network or that is not safe for our network then it gets blocked right away.

5. **Next-generation Firewalls –**
   These firewalls are called intelligent firewalls. These firewalls can perform all the tasks that are performed by the other types of firewalls that we learned previously but on top of that, it includes additional features like application awareness and control, integrated intrusion prevention, and cloud-delivered threat intelligence.

Firewall Modes

Cisco ASA can be used in 2 modes which are Routed Mode and Transparent Mode

Routed Firewall Mode

In routed mode (default mode), the ASA is considered to be a router in the network. Routed mode supports many interfaces. Each interface is on a different subnet. The ASA acts as a router between connected networks, and each interface requires an IP address on different subnet.

Transparent Firewall Mode.

ASA in Transparent firewall mode, works a layer 2 switch/bridge while still providing firewall benefits (intrusion prevention, packet inspection etc).

Only management interface can received an IP address when ASA is working in Transparent Mode. The ASA connects the same network between it interfaces. Because the firewall is not a routed hop, you can easily introduce a transparent firewall into an existing network without having to making any change in network

Initial Configuration

Asa(config)# firewall transparent

Characteristics of Transparent Mode

- Transparent firewall mode supports only two interfaces (inside and outside)
- The firewall bridges packets from one VLAN to the other instead of routing them.
- MAC lookups are performed instead of routing table lookups.
- Can run in single firewall context or in multiple firewall contexts.
- A management IP address is required on the ASA.
- The management IP address must be in the same subnet as the connected network.
- Each interface of the ASA must be a different VLAN interface.
- Even though the appliance acts as a Layer 2 bridge, Layer 3 traffic cannot pass through the security appliance from a lower security level to a higher security level interface.
- The firewall can allow any traffic through by using normal extended Access Control Lists (ACL).

Benefits of using firewall in transparent mode –

- No change required on existing IP addressing
- Protocols such as HSRP, VRRP, and GLBP can pass.
- Multicast streams can traverse
- Non-IP traffic can be allowed (IPX, MPLS, BPDUs etc.)
- Routing protocols can establish adjacencies through the firewall

Cisco Firewall Models

Cisco PIX 500 Series (legacy)

Models: 501 (user based), 506, 510, 525, 535

Security LicensingServices: Statefull Firewall, IPsec VPN (Client, Site), Application Inspection (Using Fixups)

Cisco ASA 5500 Series

Models: 5505 (user based), 5510, 5520/5530/5540/5550, 558X series

Security Licensing Services :(Verification command = Show license features)

Stateful Firewall • IPSec VPN (Client, Site) • SSL VPN (Client) • Application Inspection (using MQC- same as QOS in IOS) • Virtualization (using Contexts) • Modes: Transparent, Routed • Content Security (Anti-Spam, Anti-Phishing , Anti-Virus , Anti-Spyware , File Blocking ,URL Filtering)• IPS

Cisco ASA Components

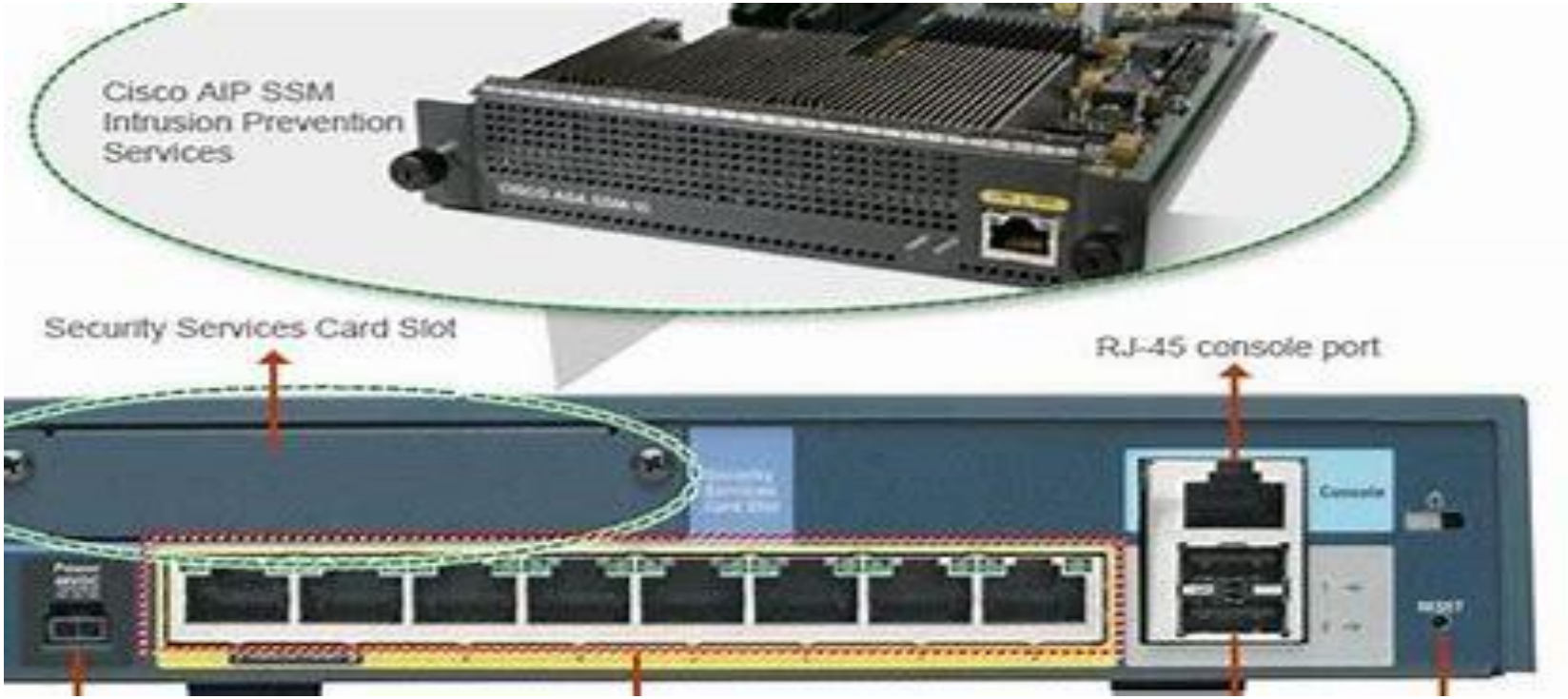
Ethernet ports

Management port

Console port

Flash Memory

Security Expansion



ASA Security Models (for mid-range ASA Firewall)

- SSC (Security Services Card)
  - ASA 5505
  - Services: IPS

- SSM (Security Services Module)
  - ASA 5510, 5520, 5540
  - Services: IPS, Content Security

ASA Security Models (for High-end ASA Firewall)

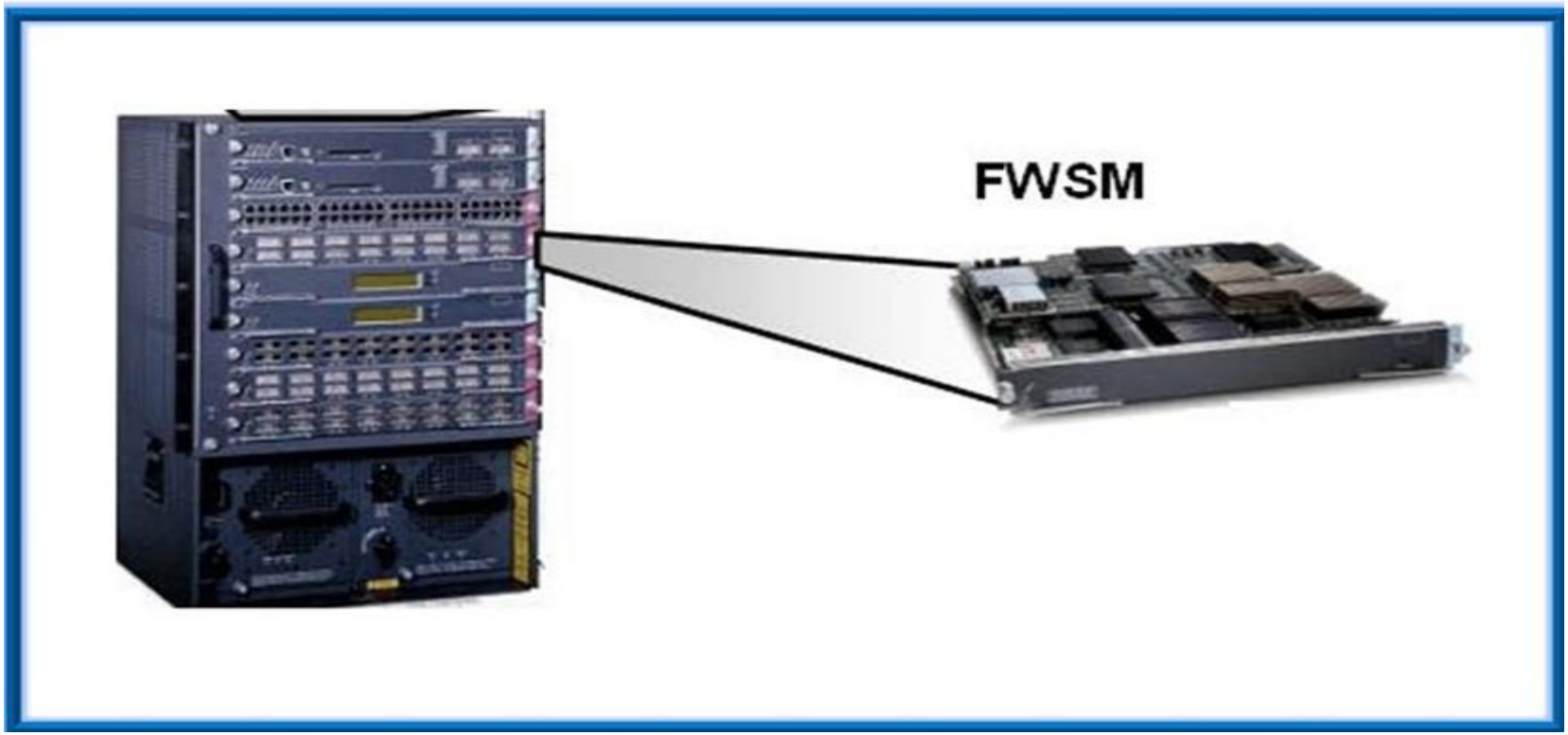
- SSP (Security Services Processors)
  - ASA 5580, 5585
  - IPS services

Service Modules (Cisco Catalyst 6500)

FWSM-Firewall service models- This models normally don't have vpn features, The **WEB VPN services module** support up to 32,000 SSL VPN users and up to 4 modules can be used in single chassis

ACE- Application Control Engine Module for Cisco 6500 Series and 7600 Series routers (ACE supports translation and load balancing)

CSM-Content Switching Module



Perfnormance Metric Consideration

- Firewall and VPN Services
  - Using one or the other not both!

High-end Network Security Appliances | Mid-range Network Security Appliances

Cisco ASA 5500 Series Model/License	Cisco ASA 5505 Base / **Security Plus**	Cisco ASA 5510 Base / **Security Plus**	Cisco ASA 5520	Cisco ASA 5540	Cisco ASA 5550
Product Image (click to enlarge)					
Network Location	Small Business, Branch Office, Enterprise Teleworker	Internet Edge	Internet Edge	Internet Edge	Internet Edge, Campus
Performance Summary					
Maximum Firewall throughput (Mbps)	150 Mbps	300 Mbps	450 Mbps	650 Mbps	1 Gbps (real-world HTTP), 1.2 Gbps
Maximum Firewall Connections	10,000 / 25,000	50,000 / 130,000	280,000	400,000	650,000
Maximum Firewall Connections/Second	4000	9000	12,000	25,000	36,000
Packets Per Second (64 byte)	85,000	190,000	320,000	500,000	600,000
Maximum 3DES/AES VPN Throughput	100 Mbps	170 Mbps	225 Mbps	325 Mbps	425 Mbps

Cisco ASA Firewall Security Levels

The Cisco ASA Firewall uses so-called “security levels” that indicate how trusted an interface is compared to another interface. The higher the security level, the more trusted the interface is. Each interface on the ASA is a security zone so by using these security levels we have different trust levels for our security zones.

An interface with a high-security level can access an interface with a low-security level, but the other way around is not possible unless we configure an access-list that permits this traffic.

Here are a couple of examples of security levels:

- **Security level 0**: This is the lowest security level there is on the ASA, and by default, it is assigned to the “outside” interface. Since there is no lower security level, this means that traffic from the outside is unable to reach any of our interfaces unless we permit it within an access-list.
- **Security level 100:** This is the highest security level on our ASA, and by default, this is assigned to the “inside” interface. We usually use this for our “LAN”. Since this is the highest security level, by default, it can reach all the other interfaces.
- **Security level 1 – 99**: We can create any other security levels that we want, for example, we can use security level 50 for our DMZ. This means that traffic is allowed from our inside network to the DMZ (security level 100 -> 50) and also from the DMZ to the outside (security level 50 -> 0). Traffic from the DMZ, however, can’t go to the inside (without an access-list) because traffic from security level 50 is not allowed to reach security level 100. You can create as many security levels as you want…

Rules

In short, this is how the security levels work:

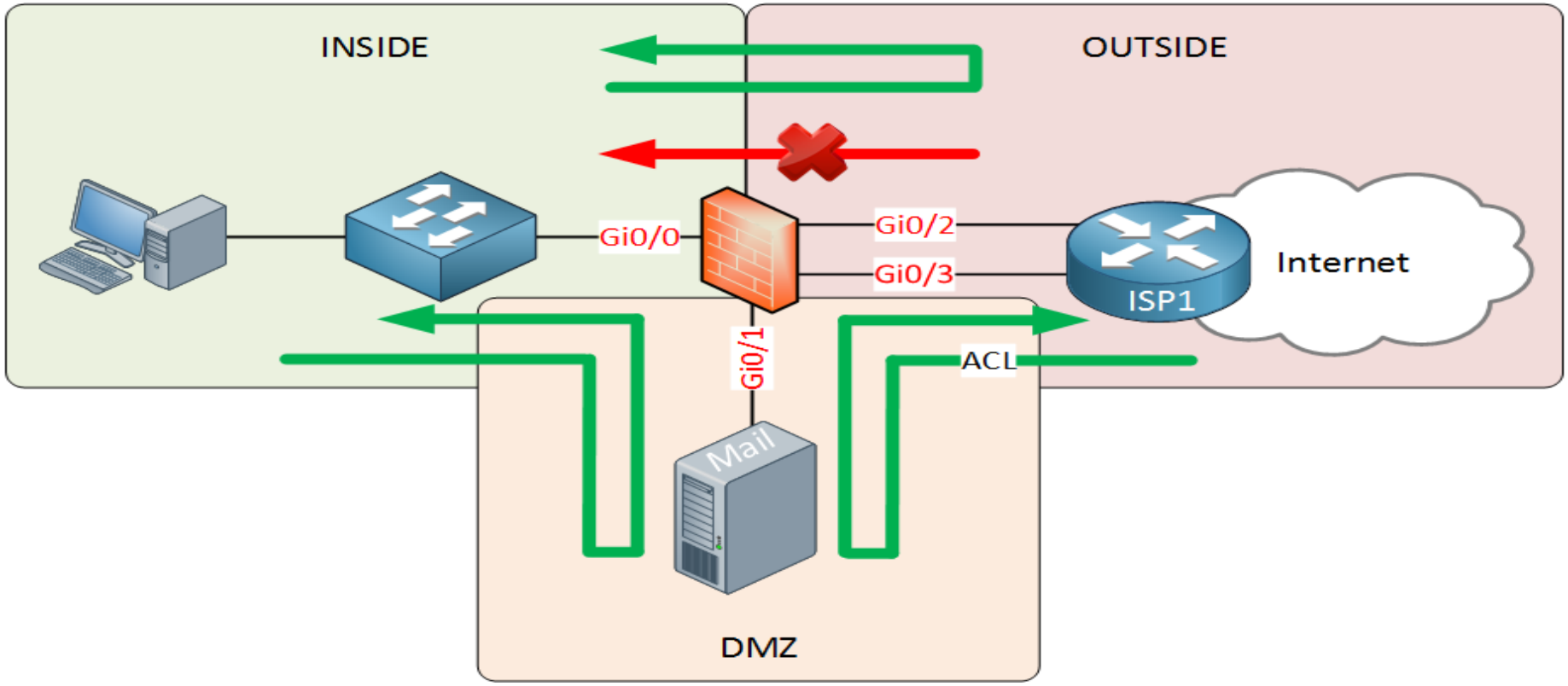
- Traffic from a **higher security level to a lower security level is allowed**. For example, traffic from the inside is allowed to reach the outside. Of course, it's possible to restrict this with access-lists.

- Traffic from a **lower security level to a higher security level is not allowed**. This could be traffic from the outside headed towards the inside. You can also change this with an access-list. This might be useful if you have servers in the DMZ that you want to reach from the outside.

- Traffic between interfaces with the **same security level is not allowed**. For example, if you have an interface called "DMZ1" with security level 50 and another one called "DMZ2" with the same security level, then traffic between the two will be dropped. You can change this behavior with the global **same-security-traffic permit inter-interface** command.

- Our LAN is our trusted network, which would have a high security level. The WAN is untrusted so it will have a low security level. This means that traffic from our LAN > WAN will be permitted. Traffic from the WAN to our LAN will be denied. Since the firewall is stateful, it keeps track of outgoing connections and will permit the return traffic from our LAN.
- If you want to make an exception, and permit traffic from the WAN to the LAN then this can be accomplished with an access-list.

- Most companies will have one or more servers that should be reachable from the Internet. Perhaps a mail or web server. Instead of placing these on the INSIDE, we use a third zone called the **DMZ (Demilitarized Zone)**. Take a look at the picture below:



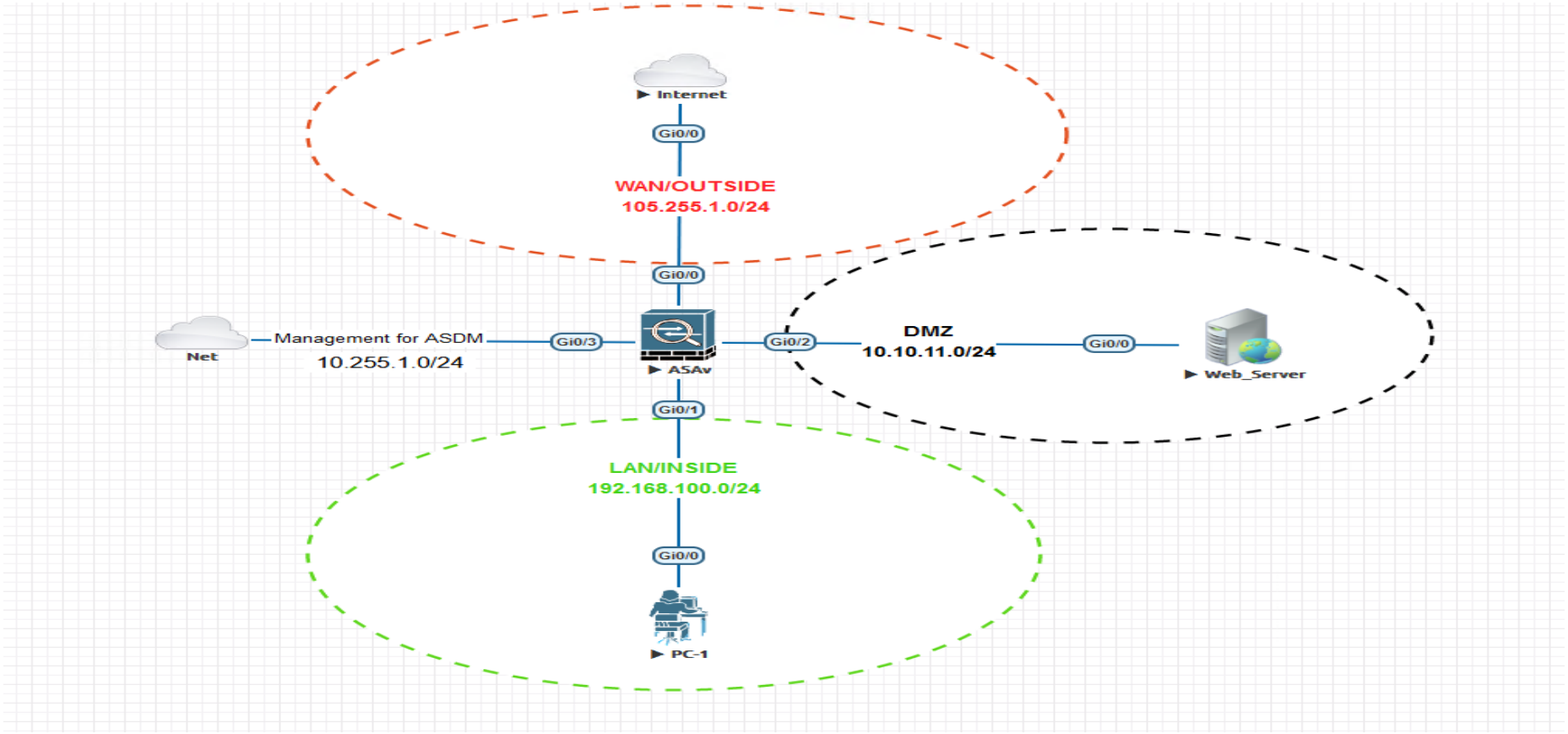
- Traffic from INSIDE to OUTSIDE is permitted.
- Traffic from INSIDE to DMZ is permitted.
- Traffic from DMZ to OUTSIDE is permitted.
- Traffic from DMZ to INSIDE is denied.
- Traffic from OUTSIDE to DMZ is denied.
- Traffic from OUTSIDE to INSIDE is denied.

Cisco ASA ASDM Initial Configuration

Cisco's ASDM (Adaptive Security Device Manager) is the GUI that Cisco offers to configure and monitor your Cisco ASA firewall.

1. **TASK: Apply the initial setup to get the ASDM working for management**

ASDM Initial Setup Lab Project_1



1. **Assign IP address on the management interface to be use for the GUI, by default ASA use 192.168.1.1 which can be changed**

Boston-ASAFW(config)# interface GigabitEthernet0/3

Boston-ASAFW(config-if)#nameif OUTSIDE

Boston-ASAFW(config-if)#security-level 0

Boston-ASAFW(config-if)#ip address 10.255.1.101 255.255.255.0

2. **ASDM requires HTTP and it's disabled by default, let's enable it:**

Boston-ASAFW (config)#http server enable

3. **Instead of giving everyone access to the HTTP server we will specify which network and interface are permitted to use the HTTP server:**

ASA-FW(config)# http 10.255.1.0 255.255.255.0 Management

4. **Create a user account to be use by the ASDM**

ASA-FW(config)#Username admin pass cisco

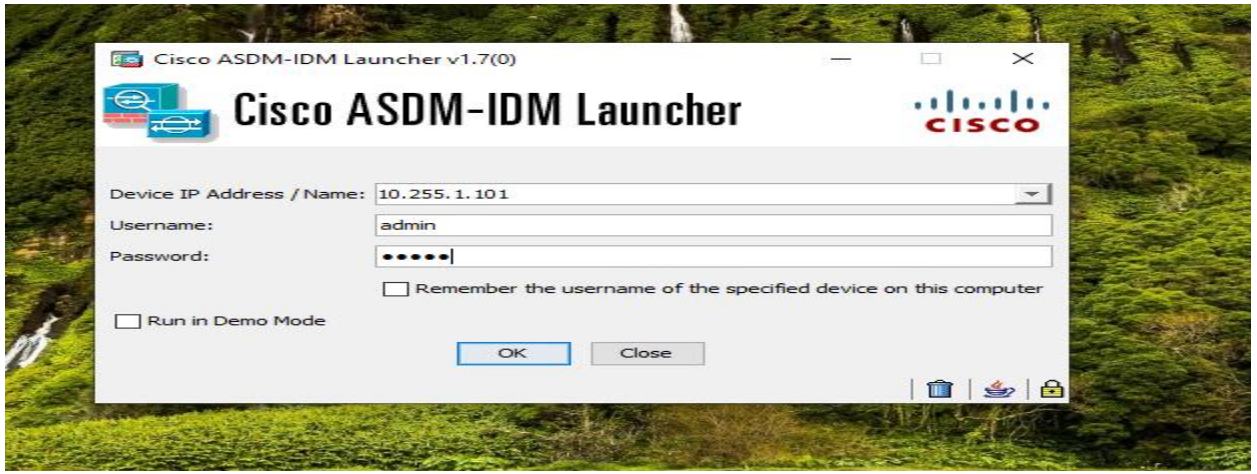
That's all we have to do on the ASA. Now you can open a web browser on your computer. Open the following URL:

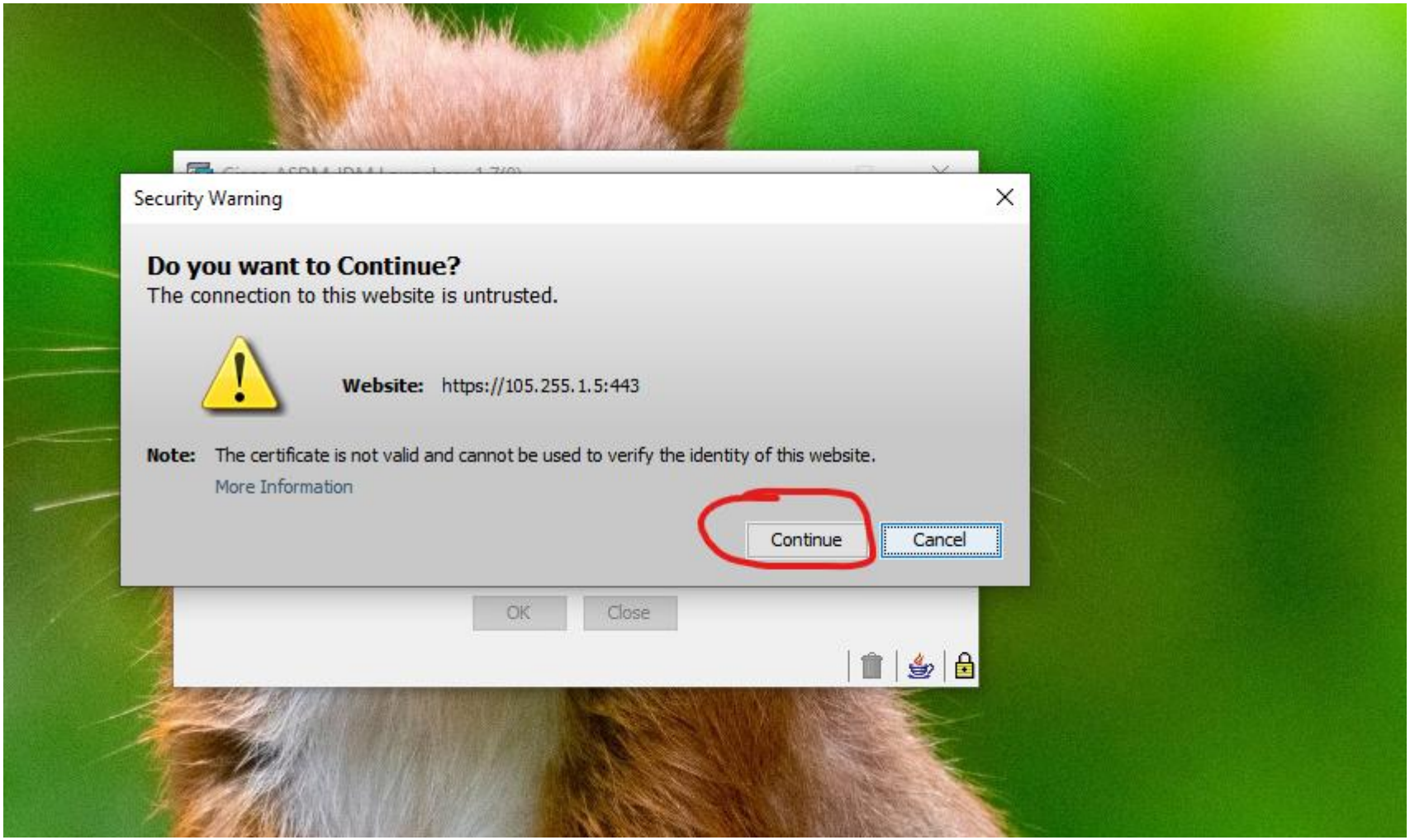
The ASA uses a self-signed certificate so that's why you see this error above. Just click on Continue to this website and you will see the following screen:

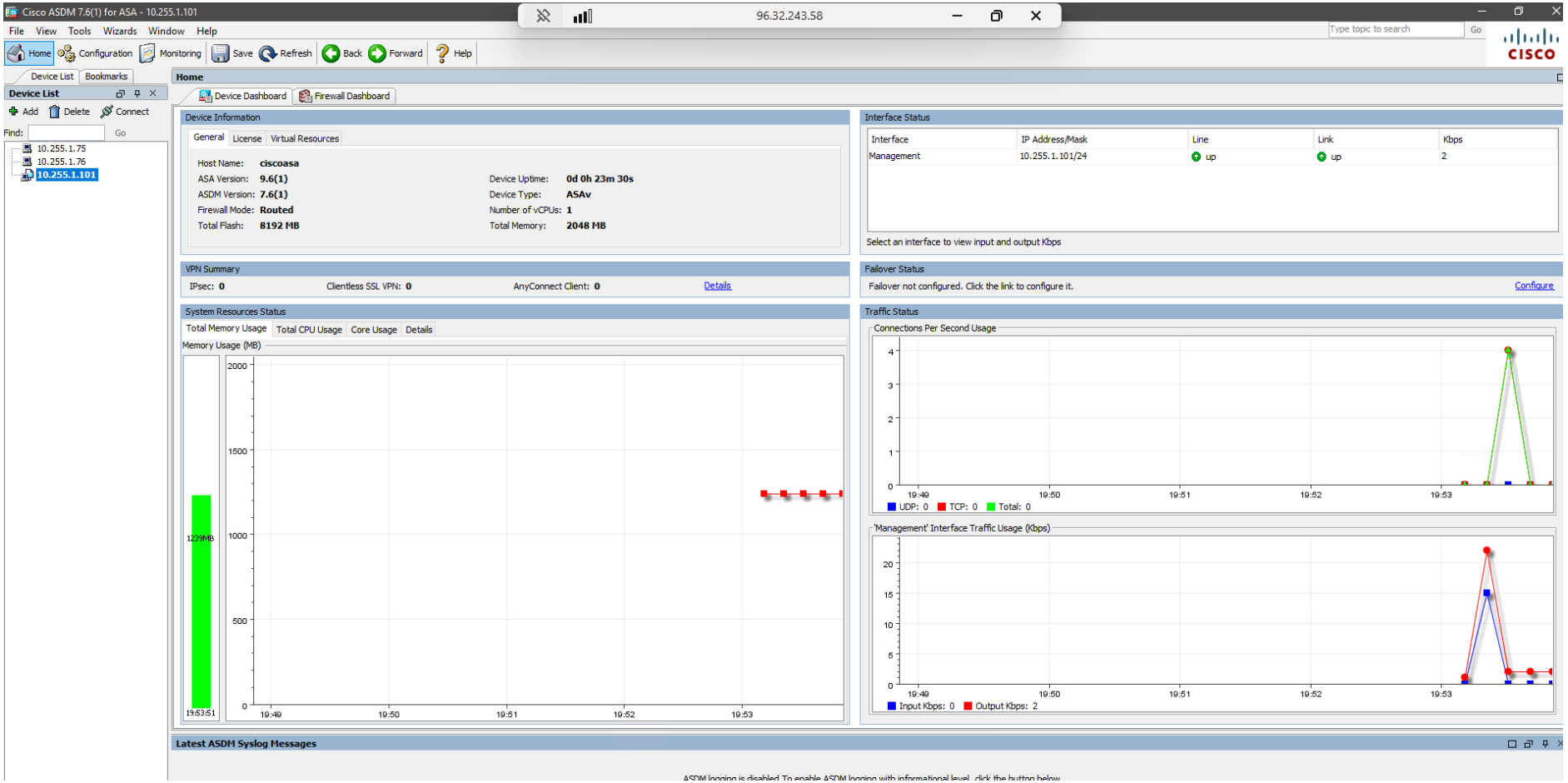
```
https://10.255.1.101
```

1. **You now have two options…you can run ASDM directly from the ASA's flash memory or you can install it on your computer first. This lab has it installed already**

Enter the IP address of the ASA and the username/password that we created earlier. Click on OK and you will see this:

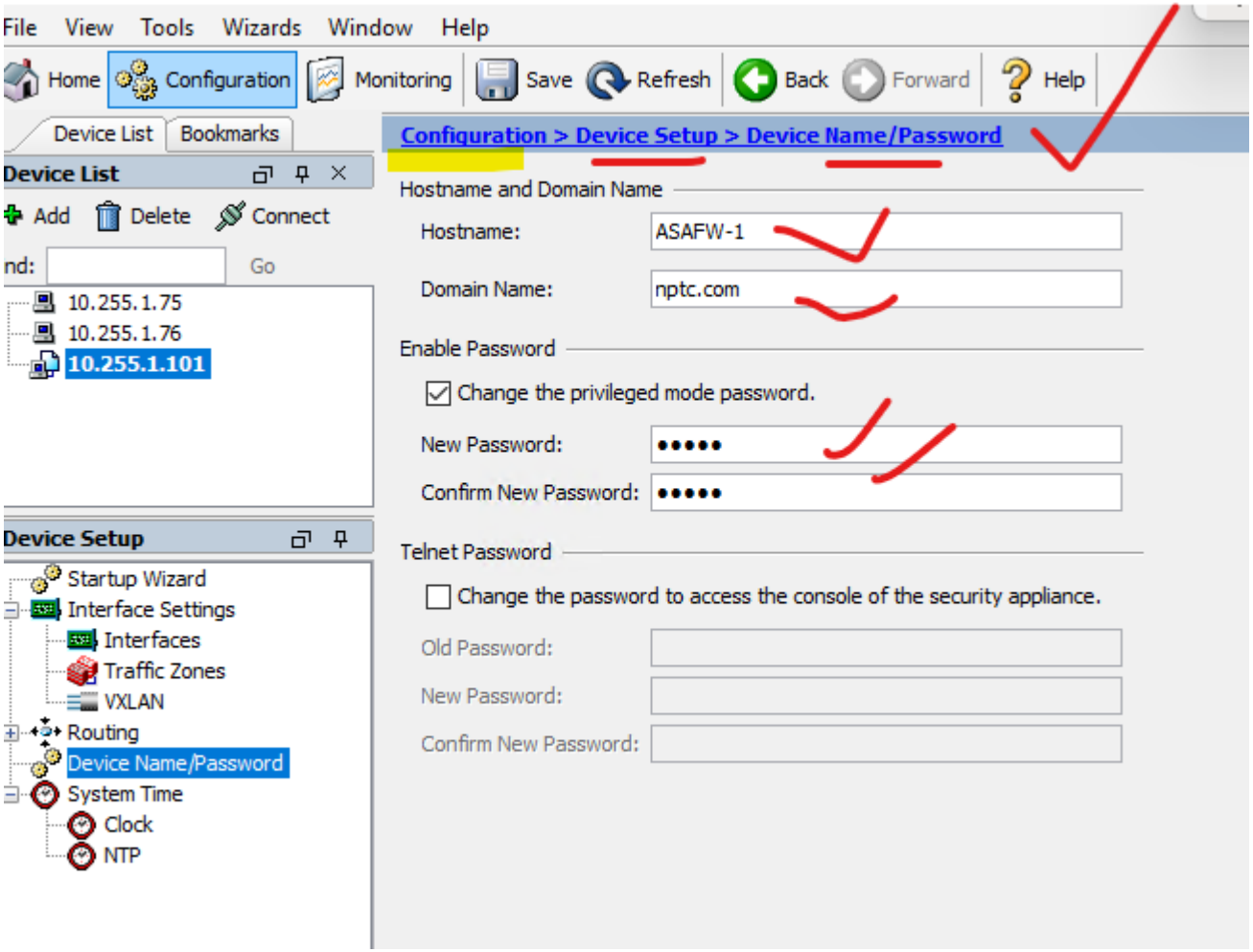



Security Warning
Do you want to Continue?
The connection to this website is untrusted.
Website: https://105.255.1.5:443
Note: The certificate is not valid and cannot be used to verify the identity of this website.
More Information
Continue
Cancel
OK
Close

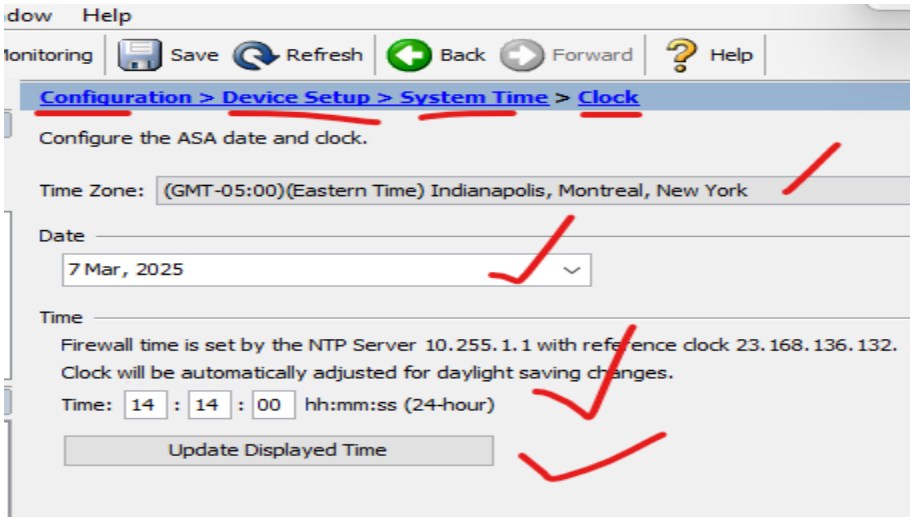

Cisco ASDM 7.6(1) for ASA - 10.255.1.101
96.32.243.58
File View Tools Wizards Window Help
Home Configuration Monitoring Save Refresh Back Forward Help
Device List Bookmarks
Device List
Add Delete Connect
Find: Go
10.255.1.75
10.255.1.76
10.255.1.101
Home
Device Dashboard Firewall Dashboard
Device Information
General License Virtual Resources
Host Name: ciscoasa
ASA Version: 9.6(1)
ASDM Version: 7.6(1)
Firewall Mode: Routed
Total Flash: 8192 MB
Device Uptime: 0d 0h 23m 30s
Device Type: ASAv
Number of vCPUs: 1
Total Memory: 2048 MB
Interface Status
Interface IP Address/Mask Line Link Kbps
Management 10.255.1.101/24 up up 2
Select an interface to view input and output Kbps
VPN Summary
IPsec: 0 Clientless SSL VPN: 0 AnyConnect Client: 0 Details
Failover Status
Failover not configured. Click the link to configure it. Configure
System Resources Status
Total Memory Usage Total CPU Usage Core Usage Details
Memory Usage (MB)
1239MB
19:53:51
Traffic Status
Connections Per Second Usage
UDP: 0 TCP: 0 Total: 0
'Management' Interface Traffic Usage (Kbps)
Input Kbps: 0 Output Kbps: 2
Latest ASDM Syslog Messages

Using ASDM for Basic Configuration and AAA access

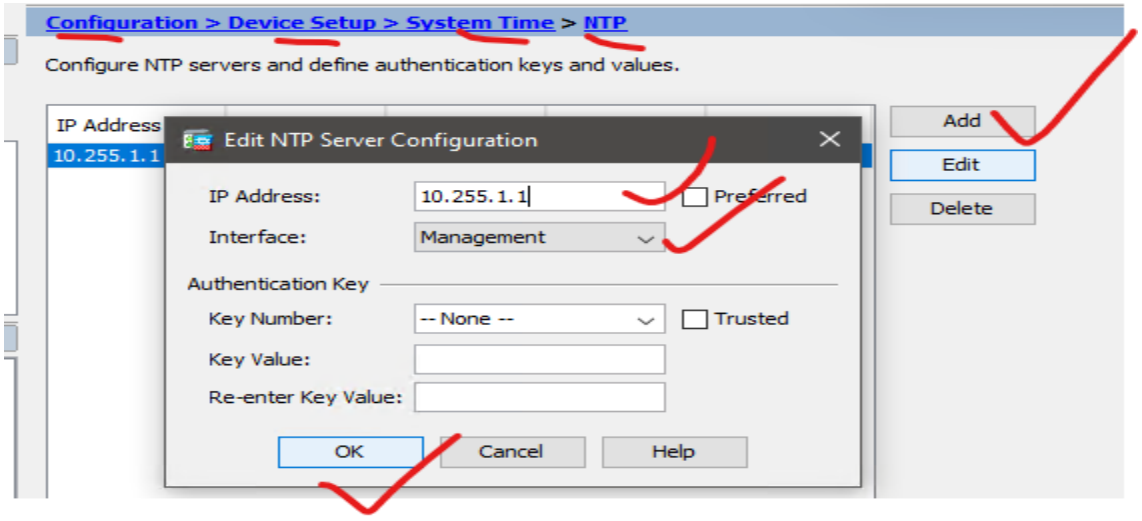
1. Configure the hostname , domain name and the enable password



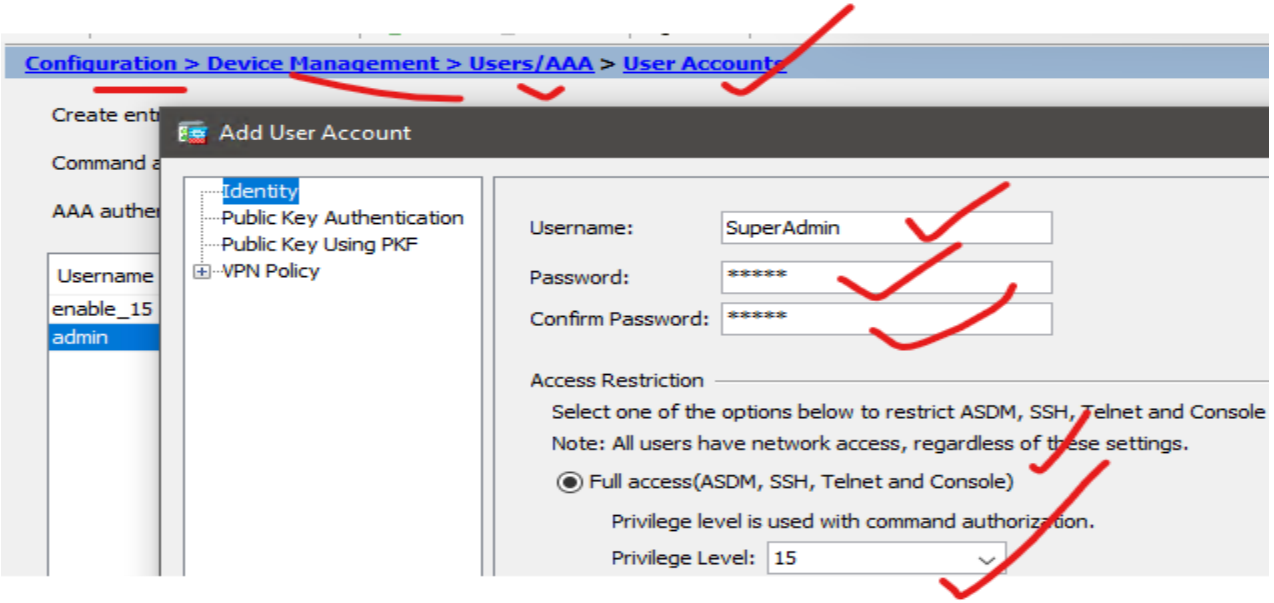
2. Configure the clock time , date and time zone



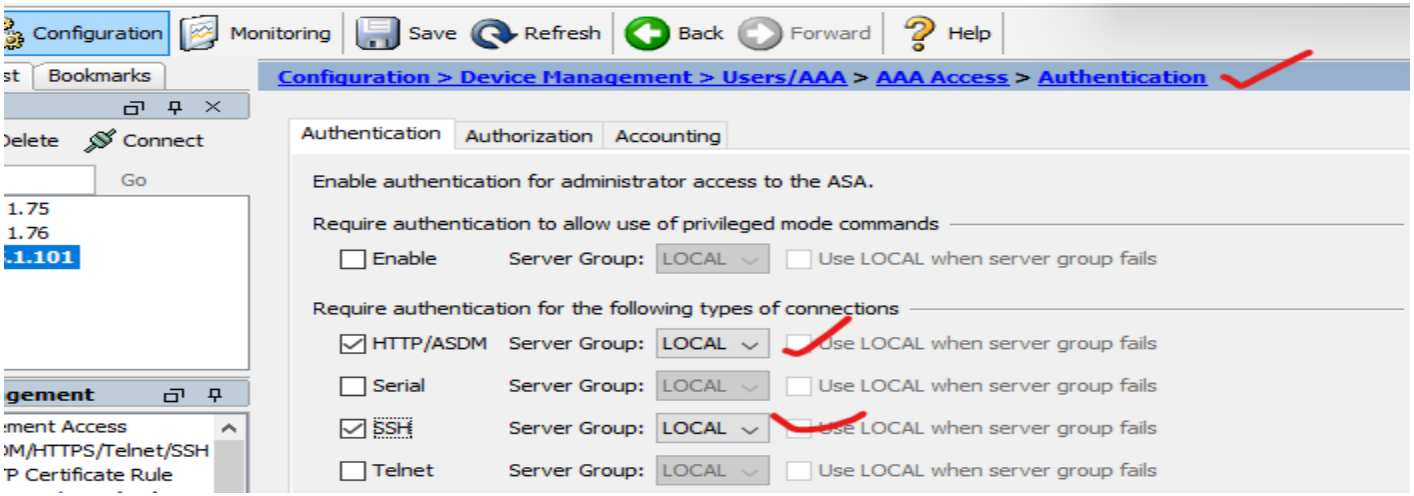
3. Configure the NTP server



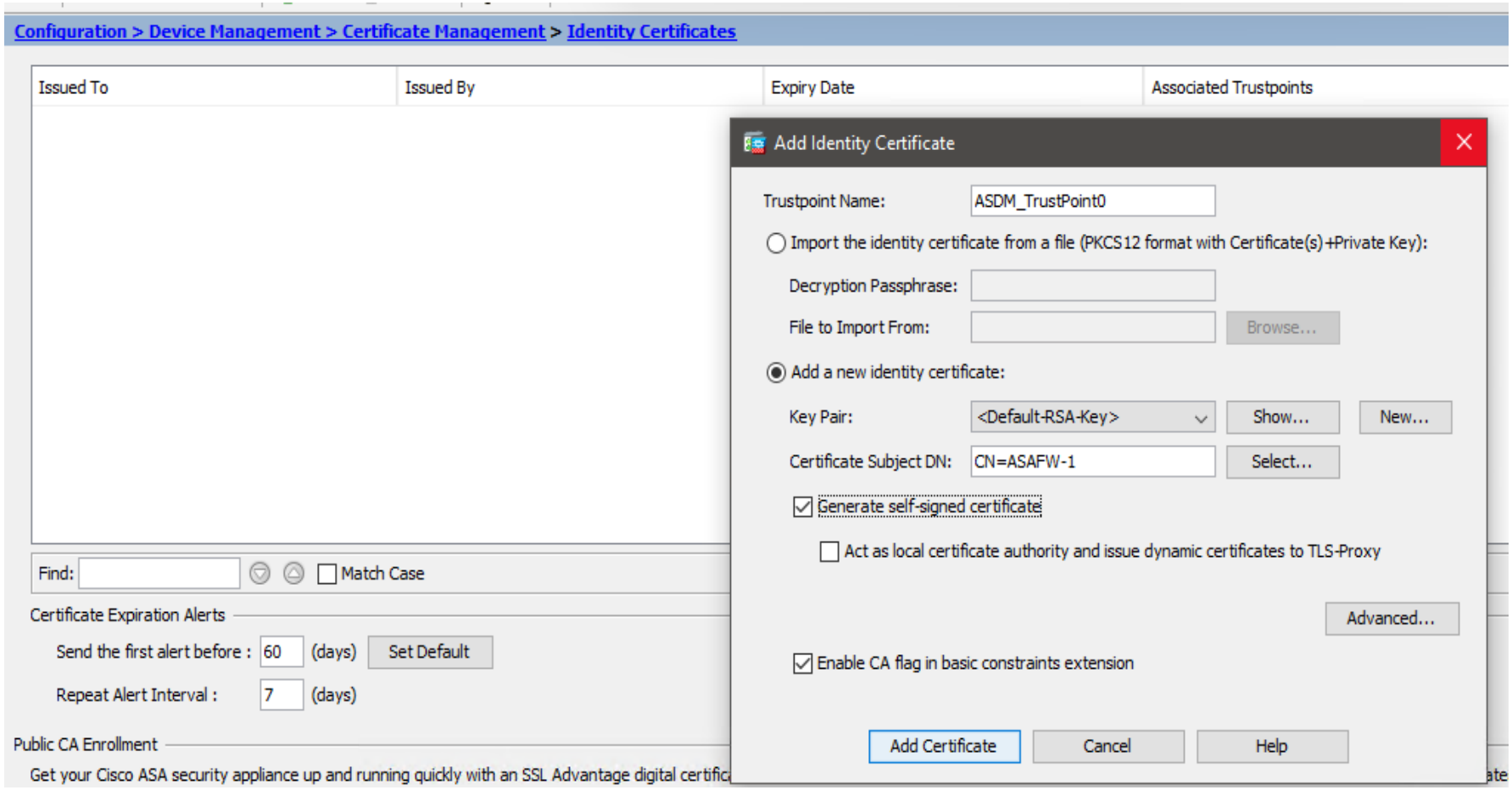
4. Create a user account



5. Giving AAA access to an Account

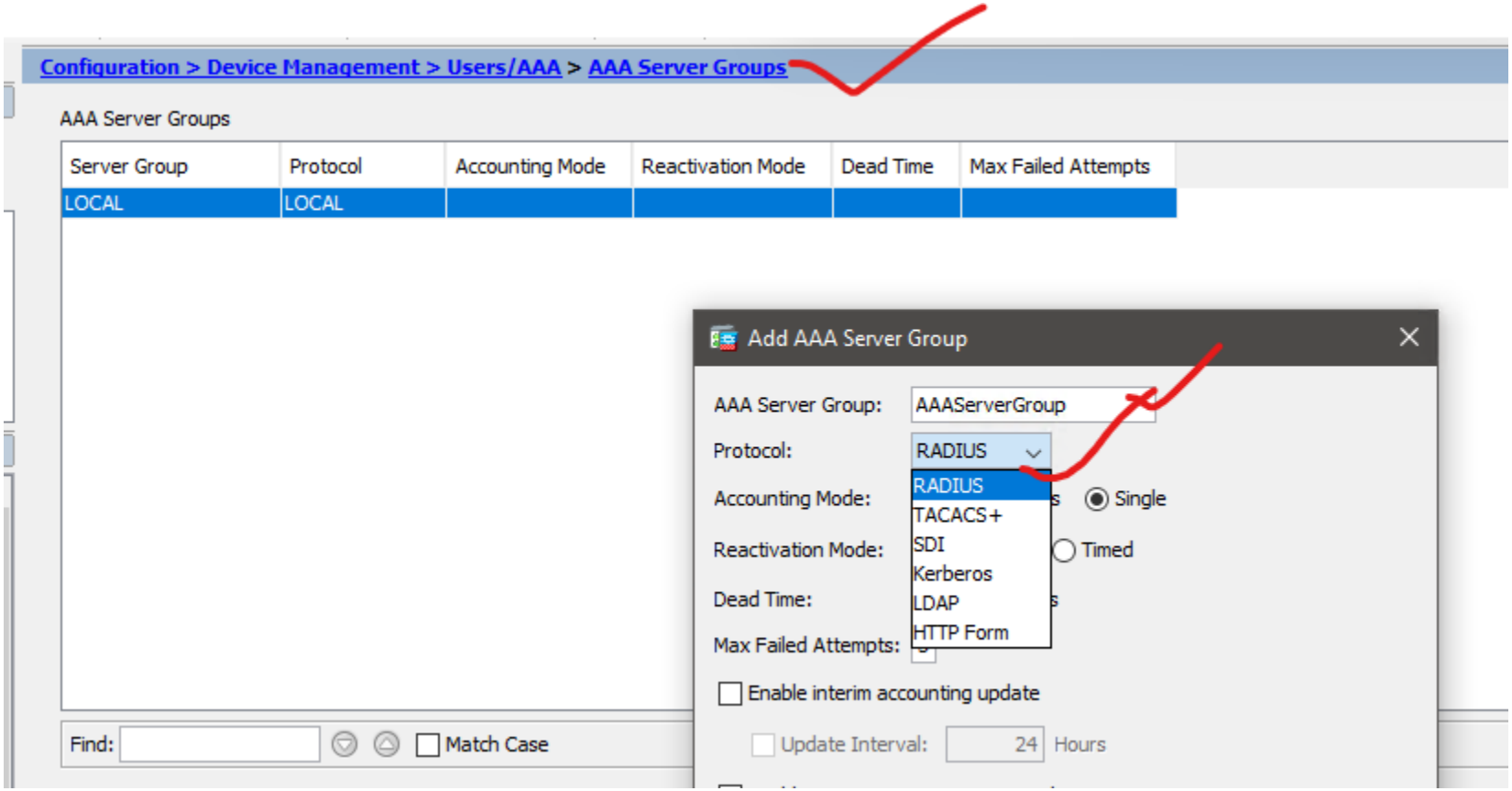


6. Configure the identity certificate

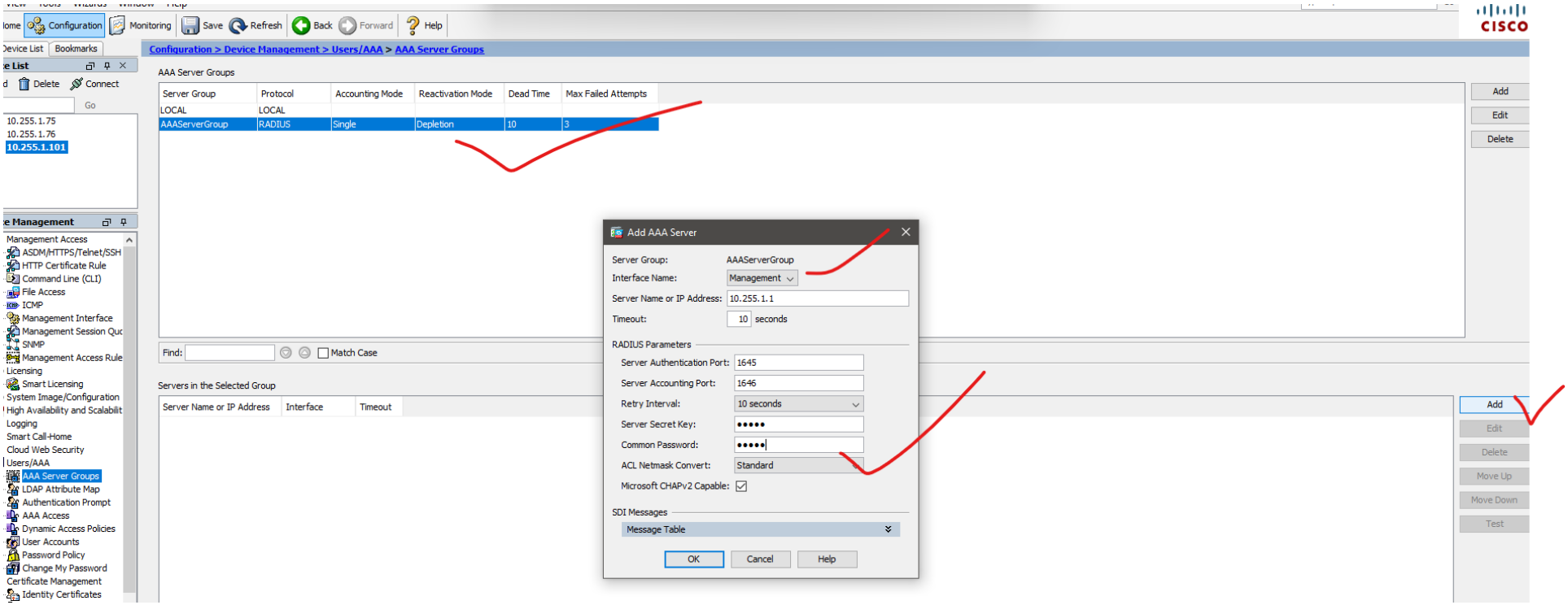


7. Adding a AAA Server to your ASA

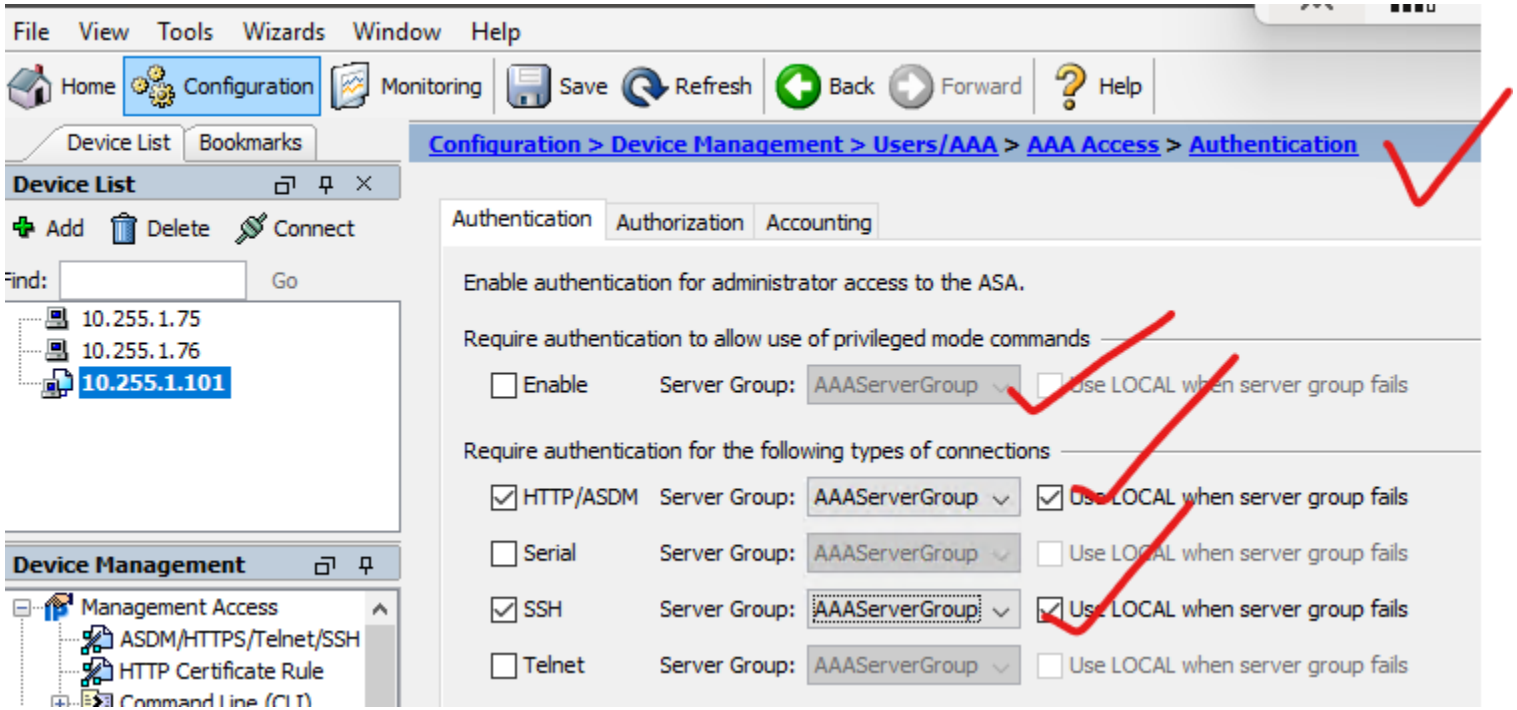
The first step is to create the server group and add the a server to the group



Now we can add a server to the group


Configuration
Monitoring
Save
Refresh
Back
Forward
Help
Configuration > Device Management > Users/AAA > AAA Server Groups
AAA Server Groups
Server Group
Protocol
Accounting Mode
Reactivation Mode
Dead Time
Max Failed Attempts
LOCAL
LOCAL
AAAServerGroup
RADIUS
Single
Depletion
10
3
Add
Edit
Delete
Add AAA Server
Server Group:
AAAServerGroup
Interface Name:
Management
Server Name or IP Address:
10.255.1.1
Timeout:
10
seconds
RADIUS Parameters
Server Authentication Port:
1645
Server Accounting Port:
1646
Retry Interval:
10 seconds
Server Secret Key:
Common Password:
ACL Netmask Convert:
Standard
Microsoft CHAPv2 Capable:
SDI Messages
Message Table
OK
Cancel
Help
Servers in the Selected Group
Server Name or IP Address
Interface
Timeout
Move Up
Move Down
Test
Find:
Match Case

8. Enable access to the box with the new group



Cisco ASA Access Control-List (Firewall Policy)

The Cisco ASA firewall uses access-lists that are similar to the ones on IOS routers and switches. Without any access-lists, the ASA will allow traffic **from a higher security level to a lower security level**. All other traffic is dropped

Access-lists are created globally and then applied with the **access-group** command. They can be applied in- or outbound.

In firewalls, an Access Control List (ACL) is a set of rules that determines which network traffic is allowed or denied based on source and destination, acting as a gatekeeper for network access and security.

- **How it works:**

Each rule in an ACL specifies a condition (e.g., source IP address, destination port, protocol) and an action (allow or deny). When traffic arrives at the firewall, it's compared against the ACL rules, and the specified action is taken.

- **Purpose:**

ACLs are used to control which users or devices can access specific network resources or services, enhancing security by restricting unauthorized access.

- **Examples**

An ACL might allow only specific IP addresses or group of IP address to access a web server. While denying traffic from other IP addresses.

- An ACL mightdeny all traffic to a specific port.
- An ACL might allow traffic from a untrusted network to access internal resources.
- An ACL might block all traffic on port 21 (FTP) except for traffic from a trusted network.

Benefits of using ACLs:

- **Enhanced Security:** ACLs help to prevent unauthorized access to network resources.
- **Traffic Control:** ACLs allow administrators to control the flow of network traffic, improving network performance and security.
- **Granular Control:** ACLs provide granular control over network traffic, allowing administrators to fine-tune security policies.

Types ACL

ACLs come in 2 main types used in ASAs: Standard, Extended. Each ACL type has a different application, depending on where it's deployed.

Standard. A standard ACL is designed to protect a network using only the destination address. These are typically used in simple deployments, and are used by only a few protocols like VPN filters and route maps (though route maps can also use extended ACLs, so it's rarely used in this case either). Standard ACLs do not provide robust security.

Extended. Building on a standard ACL, using extended ACLs means you can also allow or block source addresses in addition to destination. Extended ACLs can also be applied to traffic based on a variety of protocols: IP, ICMP, TCP, and UDP, as well as service policies, AAA rules, WCCP, Botnet Traffic Filter, and VPN group and DAP policies. Among the most common ACLs you will encounter.

Firewall rules

Firewall rules are often based on port numbers, specifying which ports can be accessed from specific IP addresses or networks.

By controlling which ports are open, firewalls can prevent unauthorized access to services and applications, protecting the network from malicious traffic.

Port Numbers

In the context of firewalls, port numbers are crucial for identifying specific services or applications on a network, allowing firewalls to control network traffic based on which ports are being used.

Port number is not a physical connection but a logical connection that is use by **programs** and **services** to exchange information.

It basically determines which program or services on a computer or server is going to be used.

Port numbers ranges from, 0 – 65535

Port number is always associated with an IP address to exchange data. The IP address determines the location of the server or computer and the port number determines which application or program on the server it wants to use

Systems or Well-Known Ports

Ranges from 0-1023

Commonly used TCP PORT

80,443 – Web pages (HTTP, HTTPS)
21- FTP (File Transfer Protocol)
25- Email (SMTP)
53 – DNS communication

TCP Real life applications
Web browsing, Email, FTP, Remote Desktop

UDP Real Life applications
Online Gaming, Voice over IP, Streaming Video, DNS

Register Ports or User Port

Ranges from 1024 – 49151, these are ports that can be registered by companies and developers for particular services.

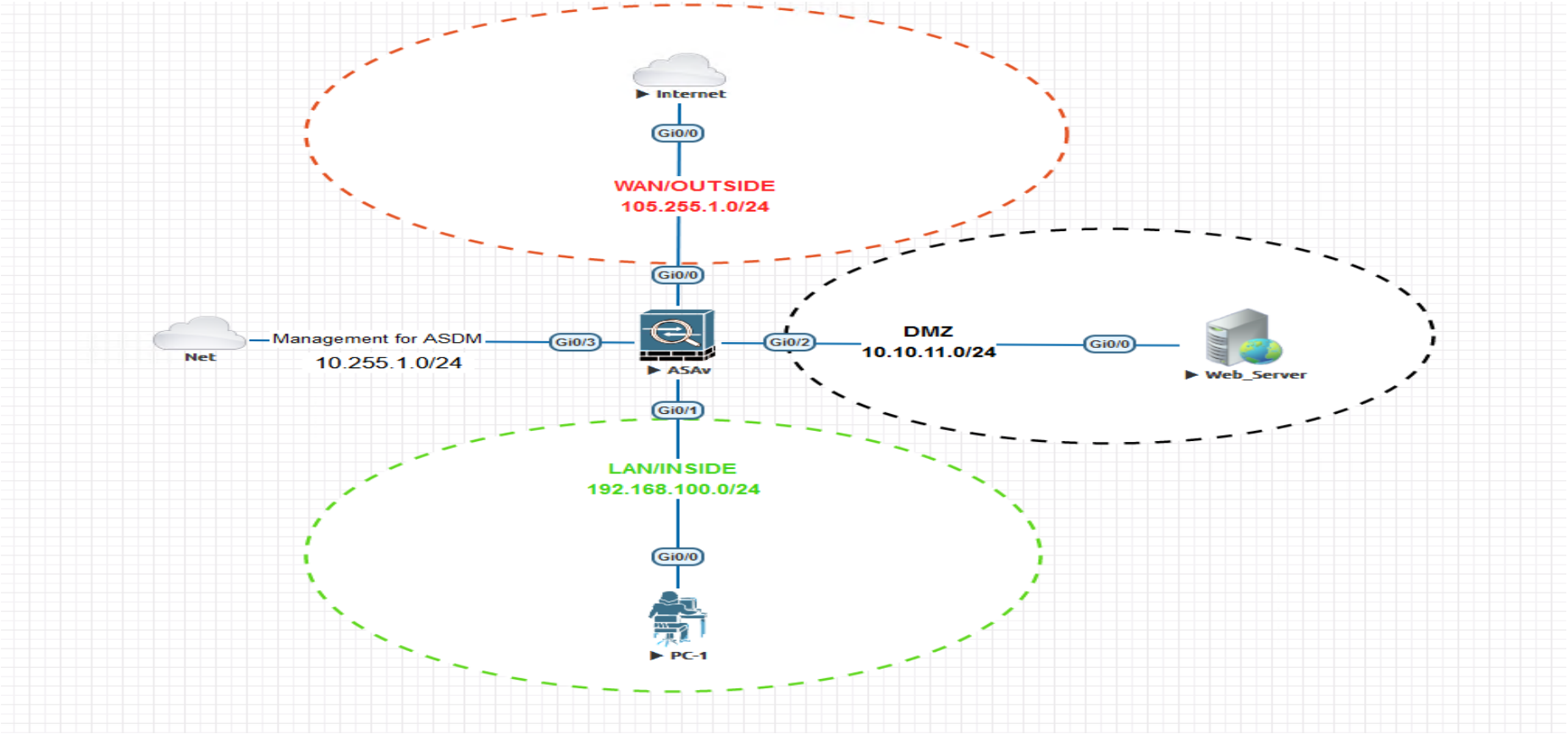
1102 – Adobe Server
1433- Microsoft SQL Server
1416- Novell
1527 – Oracle

Dynamic Port Numbers

Ranges 49152 – 65535, these are ports that your computer assigns temporarily to itself during a session. They are client side ports which are free to use.

To check active connections on your computer type netstat –n / netstat-an (if your computer is acting as server)

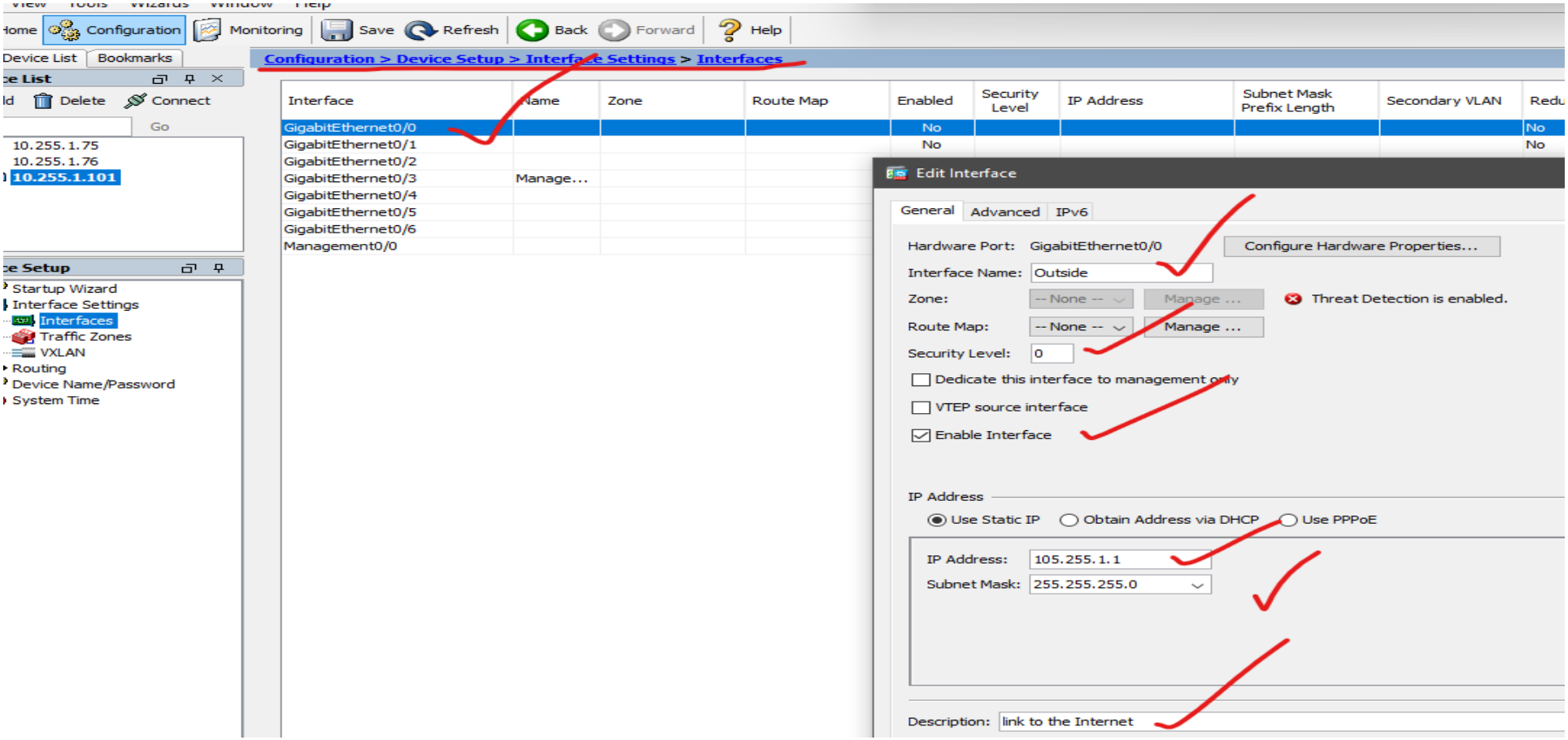
ACL -Lab Project _1



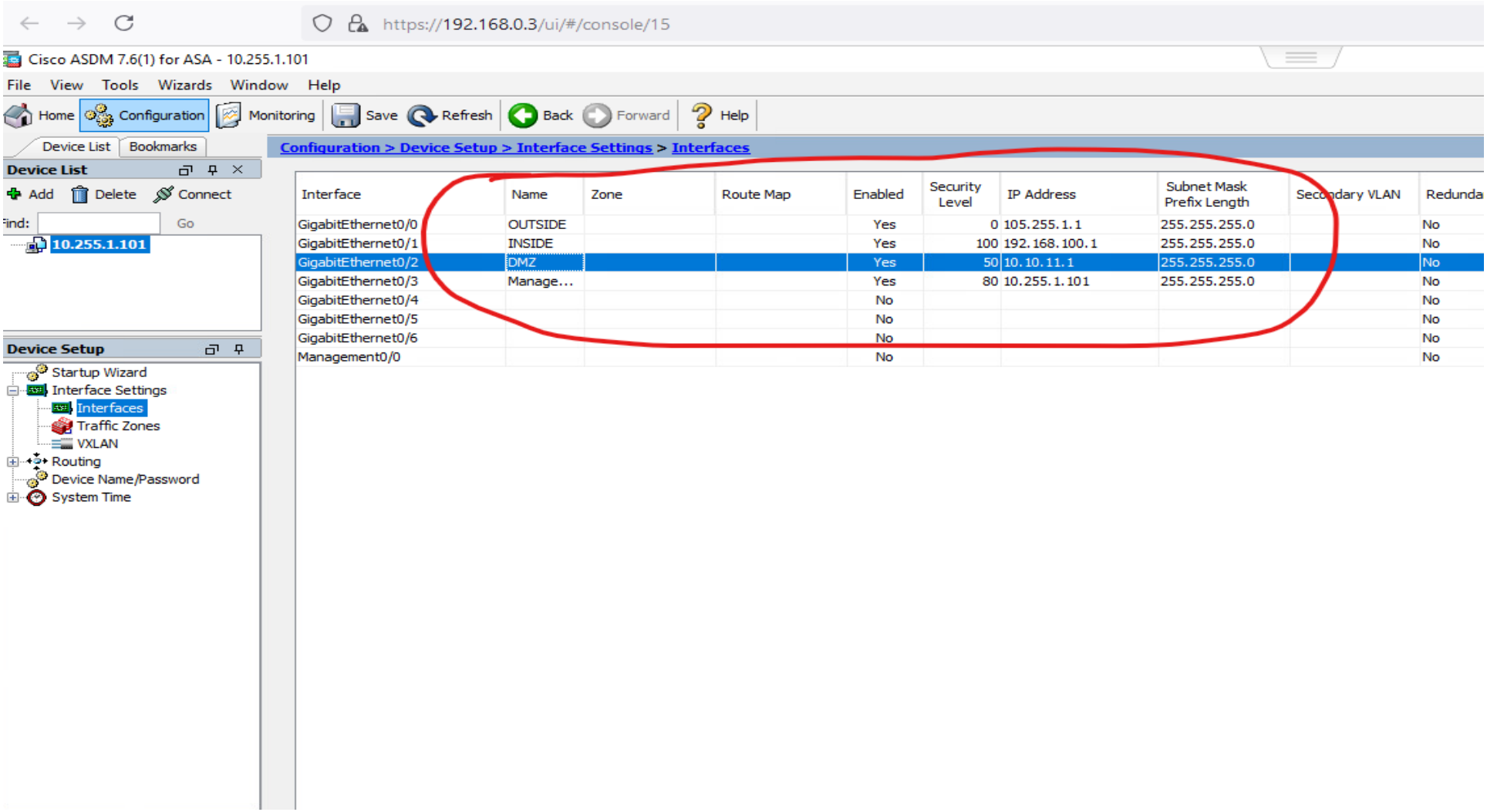
1. **Project Task 1**: Configure firewall policy that will permit any source outside (any IP address) access a web server 10.10.11.2 on TCP port 80 (WWW) using ASDM

1. Assign IP address to the LAN , DMZ and the outside interface base on the topology using ASDM

Configuration>Device setup >interfaces



2. Repeat the same process for the reaming interfaces



NB: But users form the LAN with higher security level can communicate on the service port 80

PC-1#10.10.11.2 80

Trying 10.10.11.2, 80 ... Open

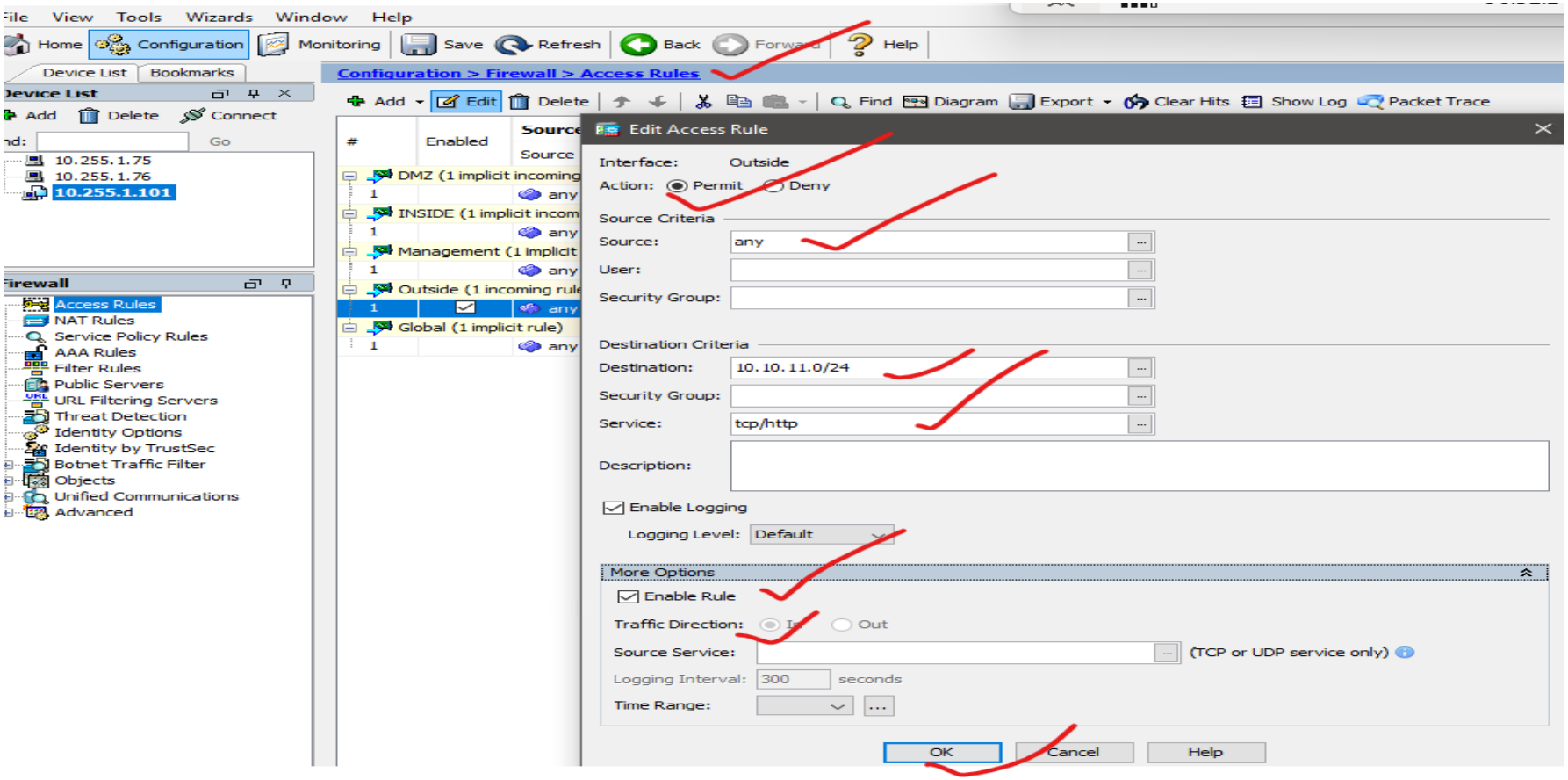
Now let's test if port 80 is open out the internet

Internet#10.10.11.2 80

Trying 10.10.11.2, 80 ...

% Connection timed out; remote host not responding

This traffic is deny by default, because is coming from low Security Zone to high Security zone. Let's create an access-list that allow HTTP traffic. We'll create something so that users on the internet are allowed to connect to the Webserver on port 80. All other traffic will be deny



Let's do the testing on the internet to see if the port can open

Internet#

Internet#

Internet#10.10.11.2 80

Trying 10.10.11.2, 80 ... Open

Network object in Cisco ASA firewall

In a Cisco ASA firewall, network objects are reusable components that represent IP addresses, subnets, or FQDNs, simplifying configuration and maintenance by allowing you to reference them in multiple rules and policies instead of repeating the same values.

Imagine you have to manage a Cisco ASA firewall that has hundreds of hosts and dozens of servers behind it, and for each of these devices we require access-list rules that permit or deny traffic.

With so many devices you will have a LOT of access-list statements and it might become an administrative nightmare to read, understand and update the access-list.

To make our lives a bit easier, Cisco introduced the **object-group** on Cisco ASA Firewalls (and also on IOS routers since IOS 12.4.20T).

- **Purpose:**

Network objects are designed to make firewall configuration easier and more manageable.

- **What they represent:**

They can represent a single IP address, a range of IP addresses, a subnet (CIDR notation), or a fully qualified domain name (FQDN).

- **How they are used:**

Once defined, network objects can be used in various configurations, such as access control lists (ACLs), Network Address Translation (NAT) rules, and service policies.

Benefits:

Simplified Configuration: Instead of typing IP addresses or subnets multiple times, you can simply use the object name.

Centralized Management: If you need to change an IP address or subnet, you only need to modify the object definition, and the change will be reflected everywhere it's used.

Improved Readability: Using descriptive object names makes the configuration easier to understand and maintain.

Types of Network Objects:

Host: A single IP address.

Network: A subnet or range of IP addresses.

FQDN: A fully qualified domain name.

Example:

Imagine you have a group of servers with IP addresses in the 192.168.1.0/24 network. Instead of specifying this subnet in every access rule, you can create a network object named "WebServers" and use that object in the rules.

Object Groups:

You can also group multiple network objects into object groups, which can further simplify configuration and management.

Examples of object-group:

- **icmp-type** can be used to select all the different ICMP types, for example echo, echo-reply, traceroute, unreachable, etc.
- **Network** is used to select IP addresses and/or network addresses.
- **Protocol** lets you select an entire protocol. For example, TCP, UDP, GRE, ESP, AH, OSPF, EIGRP, and many others.
- **Security** is used for Cisco TrustSec.
- **Service** is used to select TCP and/or UDP port numbers.
- **User** is to select local user groups for Identity Firewall.

Service Objects in Cisco ASA Firewall

On a Cisco ASA firewall, a service object defines a specific protocol and port combination, which can then be used in access control lists (ACLs) and other security configurations, simplifying rule creation and maintenance.

- **Example:**

A service object named "Web" could represent the TCP protocol on port 80 (HTTP).

- **Purpose:**

Service objects are reusable components that represent a specific service or protocol (like HTTP, SSH, or FTP) and its associated port(s).

Service Groups:

- **Concept:**

You can also create service groups, which are collections of service objects.

- **Example:**

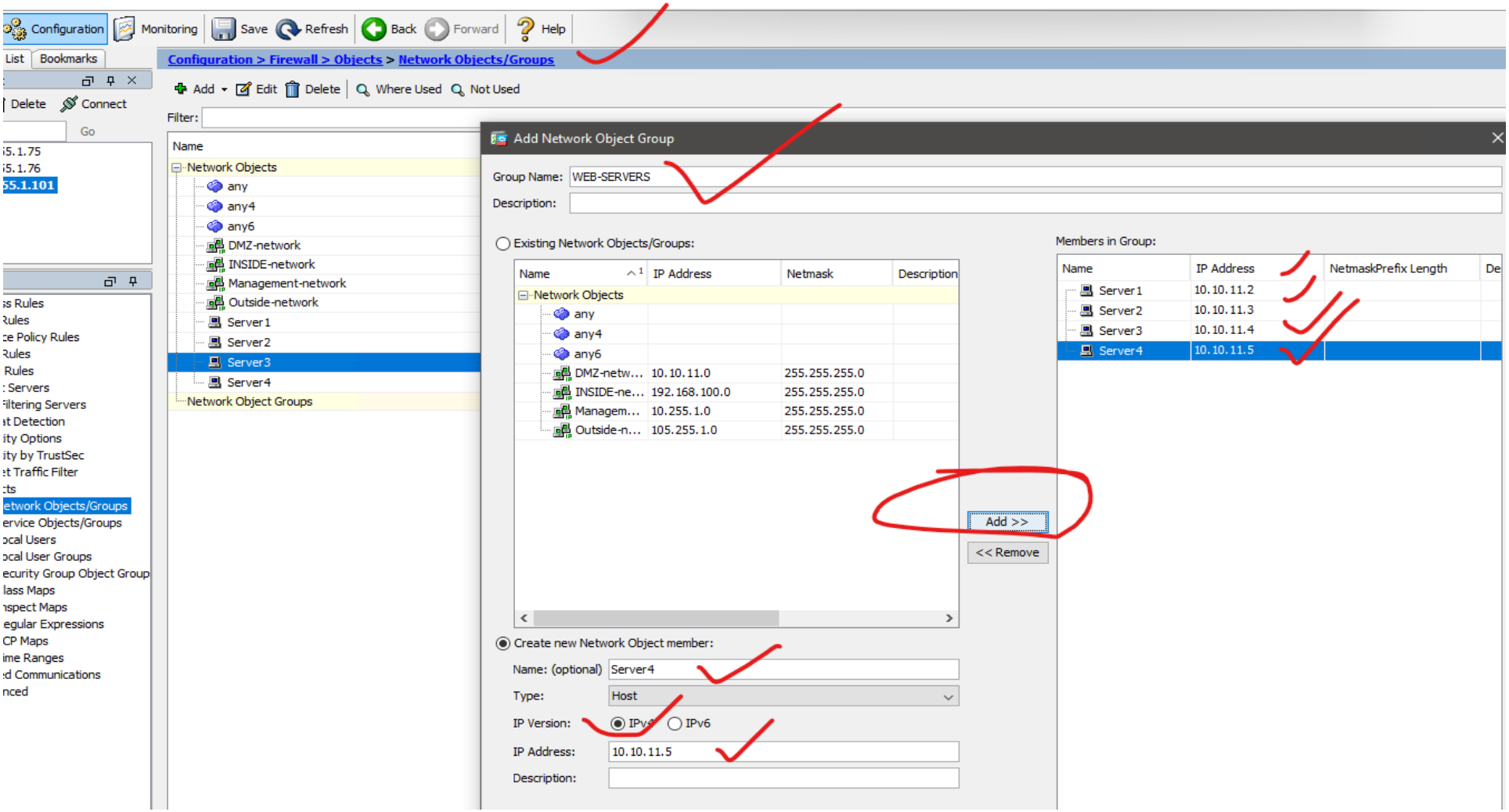
A "Web Services" group could contain service objects for HTTP (port 80), HTTPS (port 443), and potentially other web-related services.

- **Benefits:**

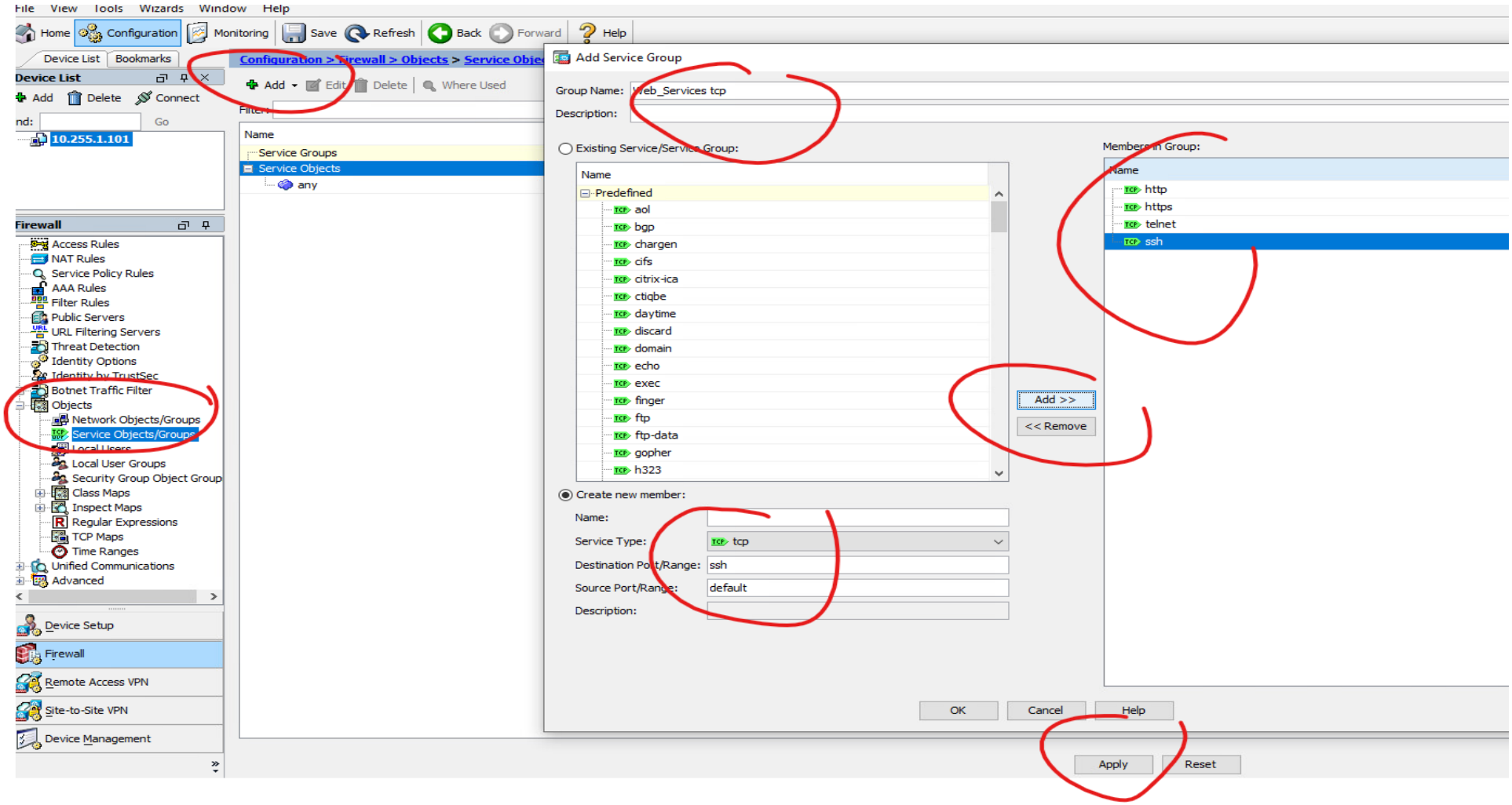
Service groups further simplify ACLs by allowing you to refer to a group of services instead of individual ones.

Project Task2: Use same topology to create network object group for Webservers

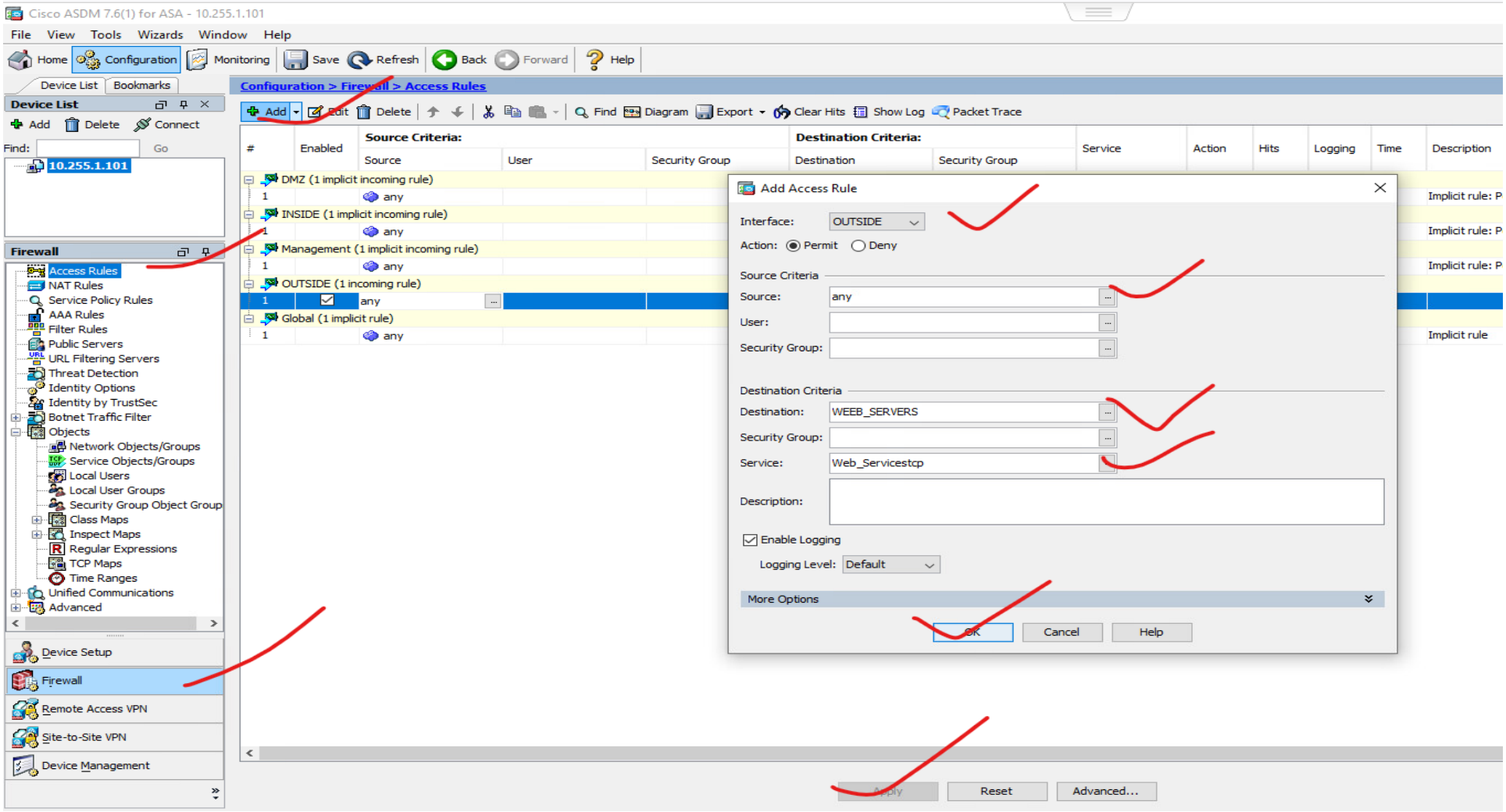
Configure>firewall>object>network object



Project Task3: Use same topology to create Service object group for Webservers



Project Task4: Configure a firewall policy allowing all users from the internet to access all the DMZ webservers on the following port 80,443



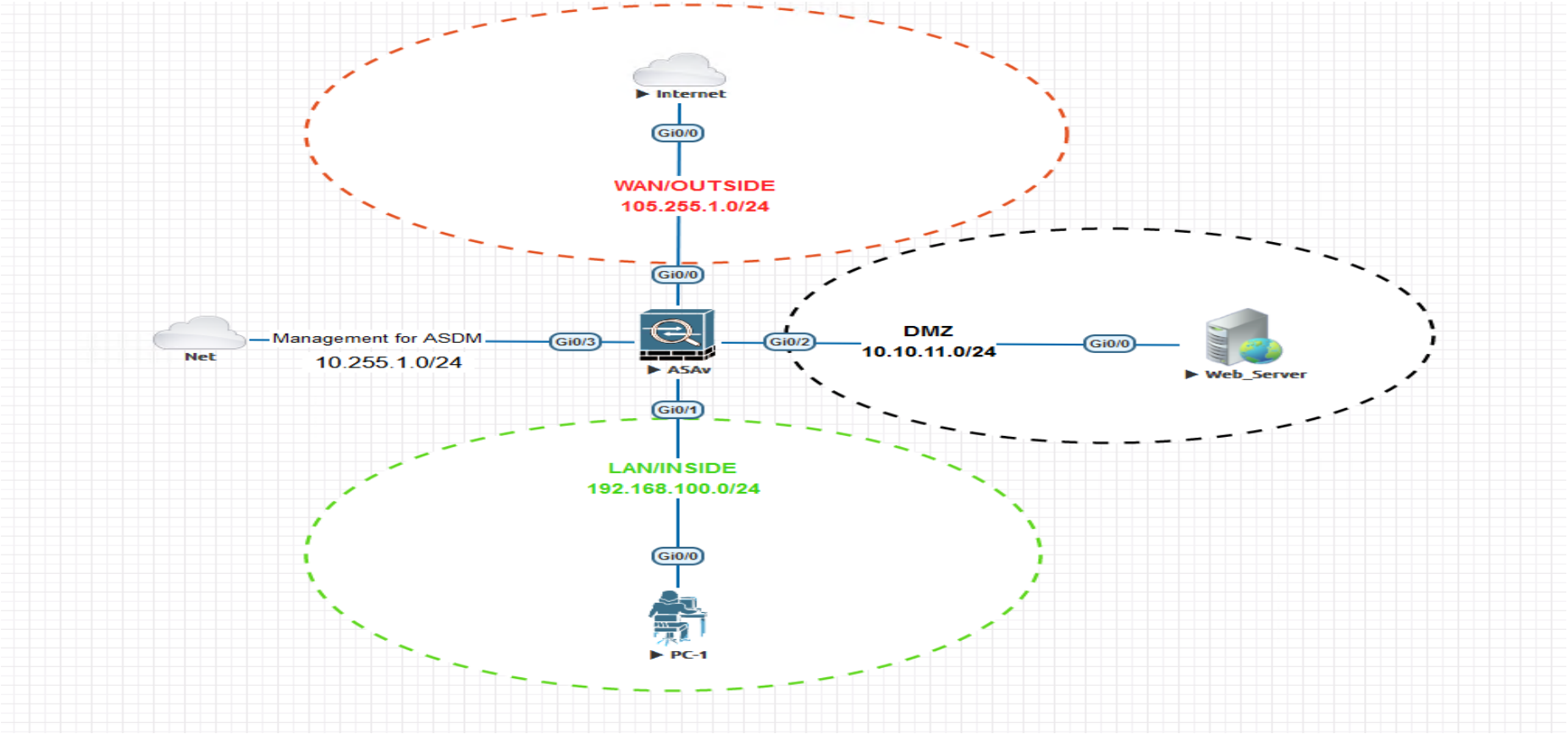
Now let's test if the ACL is working

```
Internet#
Internet#telnet 10.10.11.2 80
Trying 10.10.11.2, 80 ... Open
X
HTTP/1.1 400 Bad Request
Date: Fri, 14 Mar 2025 17:35:18 GMT
Server: cisco-IOS
Accept-Ranges: none

400 Bad Request
[Connection to 10.10.11.2 closed by foreign host]
Internet#telnet 10.10.11.2 443
Trying 10.10.11.2, 443 ... Open
X
```

ASA ACL Project Using Cli

ACL -Lab Project _1



3. **Project Task 1**: Configure firewall policy that will permit any source outside (any IP address) access a web server 10.10.11.2 on TCP port 80 (WWW) using Cli

2. Apply basic Config on cisco ASA Boston Office using cli

- **Host name** – configure hostname which provide identity for the ASA device

  Ciscoasa> en
  Password: hit enter to go to privileged mode
  Ciscoasa# conf t
  Ciscoasa(config)# **hostname ASA-FW1**

- **Enable password** - configures an enable password for the Cisco ASA that is required for users to access the privileged mode to configure all ASA features.

ASA-FW1 (config)# **enable password nptc123**

- **Timezone:** configures the time-zone and day-light savings time the firewall will use for logging and other events.
  ASA-FW1 (config) # **clock timezone EST -5 0**

ASA-FW1 (config) # **clock summer-time EST recurring**

- **Username and Password:** adds a user account with a username, password, and privilege level. Privilege level 15 allows our user to login directly into the enabled mode of the ASA to perform configuration changes.
  ASA-FW1 (config) #**username admin password cisco privilege 15**

3. Configure AAA to use the local ASA database for telnet and ssh user authentication

ASA-FW1 (config) **# aaa authentication ssh console LOCAL**

ASA-FW1 (config) **# aaa authentication telnet console LOCAL**

4. Configure your inside, outside and dmz network

ASA-FW1 (config) # **Int g0/0**
ASA-FW1 (config) # **Des link to Internet**
ASA-FW1 (config) # Nameif outside
INFO: Security level for ‘’outside” set to 0 by default
ASA-FW1 (config) # **Security-level 0**
ASA-FW1 (config) # **ip add 105.255.1.1 255.255.255.0**
ASA-FW1 (config) # **No shut**

ASA-FW1 (config) # **Int g0/1**
ASA-FW1 (config)**# Des LAN**
ASA-FW1 (config) # **Nameif Inside**
INFO: Security level for ‘’inside” set to 100 by default
ASA-FW1 (config) # **Security-level 100**
ASA-FW1 (config) # **Ip add 192.168.100.1 255.255.255.0**
ASA-FW1 (config) # **No shut**
Int

ASA-FW1 (config) # **Int g0/2**
ASA-FW1 (config) # **Des DMZ-Servers**
ASA-FW1 (config) # **Nameif DMZ**
ASA-FW1 (config) # **security-level 50**
ASA-FW1 (config) # **ip add 10.10.11.1 255.255.255.0**
ASA-FW1 (config) # **no shut**

```
Interface                  IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0         105.255.1.1     YES manual up                    up
GigabitEthernet0/1         192.168.100.1   YES manual up                    up
GigabitEthernet0/2         10.10.11.1      YES manual up                    up
```

```
ASA-FW1# show nameif
Interface                  Name                        Security
GigabitEthernet0/0         OUTSIDE                       0
GigabitEthernet0/1         INSIDE                      100
GigabitEthernet0/2         DMZ                          50
```

5. Configure telnet

To enable Telnet we will specify which hosts or subnets can telnet into the ASA including which interface we can telnet to. As a best practice telnet will only be enabled on our inside interface for any computer on the inside subnet (192.168.100.0) to telnet into the ASA. Telnet 192.168.100.0 255.255.252.0 inside

ASA-FW1 (config**)** # **telnet 192.168.100.0 255.255.255.0 inside**

6. Configure SSH

Next we will enable SSH the same way we enabled telnet, but first we need to configure the domain name and generate our local RSA keys (1024 bits).

ASA-FW1 (config**)** # **domain-name nptc.com**
ASA-FW1 (config**)** # **crypto key generate rsa modulus 1024**

NB: Once our RSA keys has been generated we will enable SSH access for any host from the inside network (192.168.100.0) and a host located outside the network (105.255.1.0).

ASA-FW1 (config)**# ssh 105.255.1.101 255.255.255.0 outside**
ASA-FW1 (config**)** # **ssh 192.168.100.0 255.255.255.0 inside**

7. Configure firewall policy that will permit any source (any IP address) access a web server 10.10.11.2 on TCP port 80 (WWW)

Now let's test if port 80 is open out the internet

```
Internet#telnet 10.10.11.2 80
Trying 10.10.11.2, 80 ...
% Connection timed out; remote host not responding
```

This traffic is deny by default, because is coming from low Security Zone to high Security zone. Let's create an access-list that allow HTTP traffic. We'll create something so that users on the internet are allowed to connect to the Webserver on port 80. All other traffic will be deny

ASA-FW1 (config)# **access-list OUTSIDE_DMZ extended permit tcp any host 10.10.11.2 eq 80**

ASA-FW1 (config)# **access-group OUTSIDE_DMZ in interface OUTSIDE**

Let's verify if the ACL is working

```
Internet#telnet 10.10.11.2 80
Trying 10.10.11.2, 80 ... Open
```

```
ASA-FW1(config)# show access-list
access-list cached ACL log flows: total 0, denied 0 (deny-flow-max 4096)
            alert-interval 300
access-list OUTSIDE_DMZ; 1 elements; name hash: 0xf68adb0a
access-list OUTSIDE_DMZ line 1 extended permit tcp any host 10.10.11.2 eq www (hitcnt=1) 0xdba32ba0
```

Global Access-List

The global access-list is useful when you have many interfaces and you don't want to enable an access-list on each one of them. When you use this, you create an access-list like you normally do but instead of enabling on an interface, we enable it globally.

When you do this…the access-list is applied to **all outbound traffic on all interfaces**. It doesn't work for outbound traffic.

Texas-ASAFW (config)# no **access-group OUTSIDE_DMZ in interface OUTSIDE**

Texas-ASAFW (config)# **access-group OUTSIDE_DMZ global**

And it will achieve the same result

```
Internet#telnet 10.10.11.2 80
Trying 10.10.11.2, 80 ... Open
```

Now I will create a network object-group using host ip addresses of mail servers at the DMZ:

```
ASA-FW1 (config) # object-group network WEB_SERVERS

ASA-FW1 (config-network-object-group) # network-object host 10.10.11.2

ASA-FW1 (config-network-object-group) # network-object host 10.10.11.3

ASA-FW1 (config-network-object-group) # network-object host 10.10.11.4

ASA-FW1 (config-network-object-group) # network-object host 10.10.11.5

ASA-FW1 (config-network-object-group) # network-object host 10.10.11.5
```

```
ASA-FW1(config)# show run object-group
object-group network WEB_SERVERS
 network-object host 10.10.11.2
 network-object host 10.10.11.3
 network-object host 10.10.11.4
 network-object host 10.10.11.5
 network-object host 10.10.11.6
```

Now let's configure the firewall policy or ACL using the object group to allow users from outside access the internet

ASA-FW1 (config)# **access-list HTTP_TO_DMZ permit tcp any object-group WEB_SERVERS eq 80**

Without the object group the ACL will have 5 lines instead of the above

```
ASA-FW1(config)# show access-list
access-list cached ACL log flows: total 0, denied 0 (deny-flow-max 4096)
            alert-interval 300
access-list HTTP_TO_DMZ; 5 elements; name hash: 0x6ce713ae
access-list HTTP_TO_DMZ line 1 extended permit tcp any object-group WEB_SERVERS eq www (hitcnt=0) 0x0964f55b
  access-list HTTP_TO_DMZ line 1 extended permit tcp any host 10.10.11.2 eq www (hitcnt=0) 0xbe25da03
  access-list HTTP_TO_DMZ line 1 extended permit tcp any host 10.10.11.3 eq www (hitcnt=0) 0xbace7e6d
  access-list HTTP_TO_DMZ line 1 extended permit tcp any host 10.10.11.4 eq www (hitcnt=0) 0x303325f3
  access-list HTTP_TO_DMZ line 1 extended permit tcp any host 10.10.11.5 eq www (hitcnt=0) 0x29dcf20a
  access-list HTTP_TO_DMZ line 1 extended permit tcp any host 10.10.11.6 eq www (hitcnt=0) 0x967a574d
```

We can also will create Service object-group that combines all our TCP ports. Eg port 22, 23, and 80,443 and apply it to the Webservers we have at the DMZ

ASA-FW1 (config) # **object-group service WEB_SERVICES tcp**

ASA-FW1 (config-service-object-group) # **port-object eq 22**

ASA-FW1 (config-service-object-group) # **port-object eq 23**

ASA-FW1 (config-service-object-group) # **port-object eq 80**

ASA-FW1 (config-service-object-group) # **port-object eq 443**

```
ASA-FW1(config-service-object-group)# show run object-group
object-group network WEB_SERVERS
 network-object host 10.10.11.2
 network-object host 10.10.11.3
 network-object host 10.10.11.4
 network-object host 10.10.11.5
 network-object host 10.10.11.6
object-group service DMZ_WEB_SERVICES tcp
 port-object eq ssh
 port-object eq telnet
 port-object eq www
 port-object eq https
```

Let's now configure the ACL using both the network object group and the service object group

ASA-FW1 (config) # **access-list HTTP_TO_DMZ permit tcp any object-group WEB_SERVERS object-group DMZ_WEB_SERVICES**

Let's apply the ACL to an interface

ASA-FW1 (config) # **access-group HTTP_TO_DMZ global**

```
ASA-FW1(config)# show access-list
access-list cached ACL log flows: total 0, denied 0 (deny-flow-max 4096)
            alert-interval 300
access-list HTTP_TO_DMZ; 20 elements; name hash: 0x6ce713ae
access-list HTTP_TO_DMZ line 1 extended permit tcp any object-group WEB_SERVERS object-group DMZ_WEB_SERVICES (hitcnt=0) 0x25002ebc
  access-list HTTP_TO_DMZ line 1 extended permit tcp any host 10.10.11.2 eq ssh (hitcnt=0) 0x588491df
  access-list HTTP_TO_DMZ line 1 extended permit tcp any host 10.10.11.2 eq telnet (hitcnt=0) 0x8fa088ea
  access-list HTTP_TO_DMZ line 1 extended permit tcp any host 10.10.11.2 eq www (hitcnt=0) 0xbe25da03
  access-list HTTP_TO_DMZ line 1 extended permit tcp any host 10.10.11.2 eq https (hitcnt=0) 0x624a41a8
  access-list HTTP_TO_DMZ line 1 extended permit tcp any host 10.10.11.3 eq ssh (hitcnt=0) 0x6a506109
  access-list HTTP_TO_DMZ line 1 extended permit tcp any host 10.10.11.3 eq telnet (hitcnt=0) 0x26f11125
  access-list HTTP_TO_DMZ line 1 extended permit tcp any host 10.10.11.3 eq www (hitcnt=0) 0xbace7e6d
  access-list HTTP_TO_DMZ line 1 extended permit tcp any host 10.10.11.3 eq https (hitcnt=0) 0xf49f500a
  access-list HTTP_TO_DMZ line 1 extended permit tcp any host 10.10.11.4 eq ssh (hitcnt=0) 0x6367c289
  access-list HTTP_TO_DMZ line 1 extended permit tcp any host 10.10.11.4 eq telnet (hitcnt=0) 0x587077f8
  access-list HTTP_TO_DMZ line 1 extended permit tcp any host 10.10.11.4 eq www (hitcnt=0) 0x303325f3
  access-list HTTP_TO_DMZ line 1 extended permit tcp any host 10.10.11.4 eq https (hitcnt=0) 0x6653c3c2
  access-list HTTP_TO_DMZ line 1 extended permit tcp any host 10.10.11.5 eq ssh (hitcnt=0) 0x569d9d04
  access-list HTTP_TO_DMZ line 1 extended permit tcp any host 10.10.11.5 eq telnet (hitcnt=0) 0xab6d8651
  access-list HTTP_TO_DMZ line 1 extended permit tcp any host 10.10.11.5 eq www (hitcnt=0) 0x29dcf20a
  access-list HTTP_TO_DMZ line 1 extended permit tcp any host 10.10.11.5 eq https (hitcnt=0) 0x07087f43
  access-list HTTP_TO_DMZ line 1 extended permit tcp any host 10.10.11.6 eq ssh (hitcnt=0) 0x7b8c9500
  access-list HTTP_TO_DMZ line 1 extended permit tcp any host 10.10.11.6 eq telnet (hitcnt=0) 0xfd4356a2
  access-list HTTP_TO_DMZ line 1 extended permit tcp any host 10.10.11.6 eq www (hitcnt=0) 0x967a574d
  access-list HTTP_TO_DMZ line 1 extended permit tcp any host 10.10.11.6 eq https (hitcnt=0) 0x2c3e6a5f
```

Cisco ASA Remove Access-List

If you want to remove an access-list from a Cisco ASA Firewall then you'll find out that removing it doesn't work the same as on Cisco IOS routers or switches. Let me give you an example of creating an access-list and then try to remove it:

```
ASA-FW1(config)# no access-list OUTSIDE_DMZ
ERROR: % Incomplete command
```

Using "no" in front of it doesn't work…the ASA thinks that we want to remove a single entry, not delete the entire access-list. The following command will work or you can apply no using the complete ACL command

ASA-FW1(config)# **clear configure access-list OUTSIDE_DMZ**

Use the **clear configure** command to get rid of the entire access-list, let's verify this:

```
ASA-FW1(config)# clear  configure access-list OUTSIDE_DMZ
ASA-FW1(config)# show run ac
ASA-FW1(config)# show run access-l
ASA-FW1(config)#
```

ASA-FW1(config)# show run access-g

NB: this configuration will also affect the access-group interface and should not be done on production

Cisco ASA ACL Best Practices

1. Always apply ACLs inbound on all interfaces

I don't like to apply ACLs outbound on the interfaces because I want to use the firewall's internal compute and memory resources as efficiently as possible.

2. Name the ACL after the interface on which the rule will be applied

Eg OUTSIDE-to-DMZ, inside-to-in , https-to-DMZ

3. Use remarks in your ACLs to internally document your intentions

The more you can make the configuration of your firewall self-documenting, the easier it will be to manage it going forward

4. Use object groups

For example, I might want to block a particular set of malicious IP addresses from ever accessing my network from the outside. If I use the same object-group on the inside interface, I can also prevent anybody inside my network from ever accessing these same malicious external hosts. And if I add a new host to that object-group, I automatically update both those inbound and outbound rules.

Only use object-groups when you have several TCP/UDP ports or source/destination addresses that need to be grouped. Always using object-groups even for rules that have low amount of services or network defined might eventually make the configuration harder to read

5. Make your ACL as specific as possible.

Don’t permit “any” hosts if you can narrow it down. Make those “permit” rules as specific as possible. The same goes for protocols. Don’t permit all IP protocols if you really mean a particular protocol. So don’t undermine your security.

Generally, I like to build my ACLs in a structured way. First, I include a relatively small and very specific whitelist. It includes things that I know are always allowed, and overrides any blacklist rules that might come later.

6. The blacklist

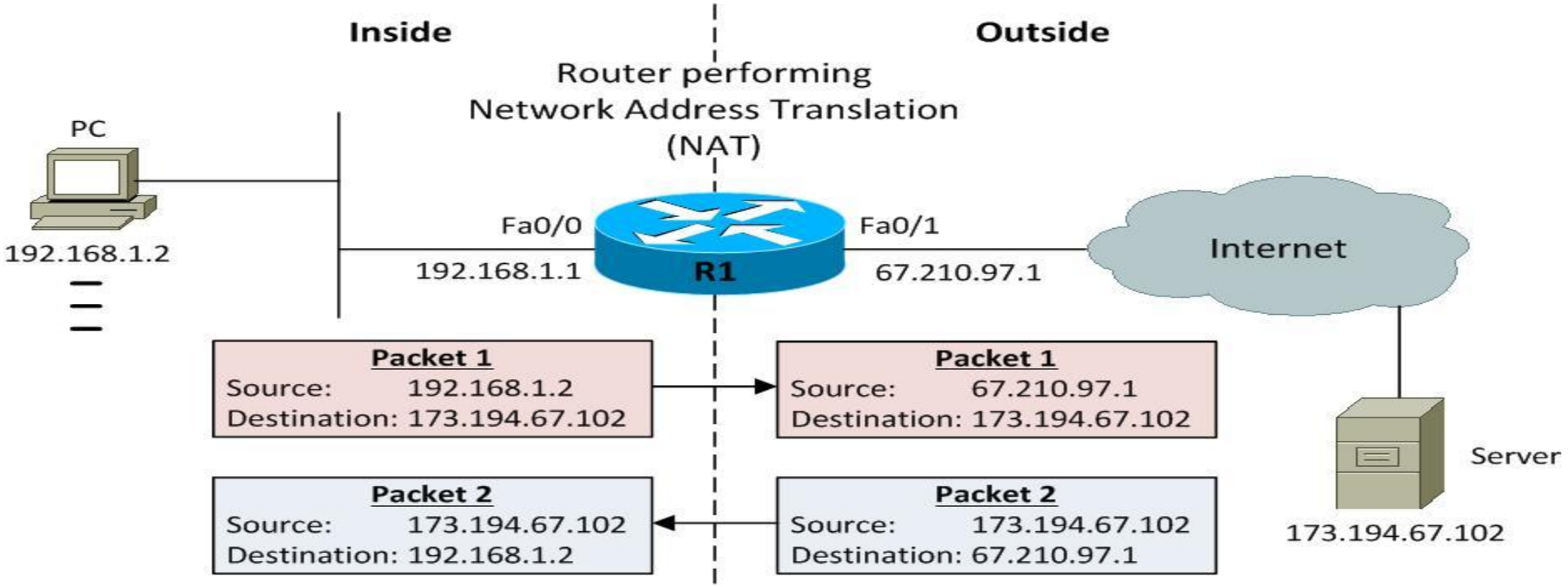
My general blacklist is usually a list of sites or IP address ranges representing geographic regions that I will never accept anything

Cisco ASA NAT Configuration

Network Address Translation (NAT) is a service that enables private IP networks to use the internet and cloud. NAT translates private IP addresses in an internal network to a public IP address before packets are sent to an external network.

Network Address Translation (NAT) is a service that operates on an edge (Router, Firewall) to connect private networks to public networks like the internet. NAT is often implemented at the WAN edge to enable internet access in core, campus, branch, and colocation sites

How it Works



What are the Situations where Nat is required?

1. When we need to connect to the internet and our host don't have globally unique IP addresses
2. When we want to hide Internal IP addresses from outside for security purpose
3. A company is going to merge in another company which uses same address space

Advantages of NAT

- NAT conserves legally registered IP addresses.
- It provides privacy as the device's IP address, sending and receiving the traffic, will be hidden.
- Eliminates address renumbering when a network evolves.
- Nat also allow individuals and organizations use to establish cost effective and simple connection
- Nat prevents IP address overlapping

Disadvantage of NAT

- Translation results in switching path delays.
- Certain applications will not function while NAT is enabled.
- Complicates tunneling protocols such as IPsec.
- Also, the router being a network layer device, should not tamper with port numbers(transport layer) but it has to do so because of NAT.

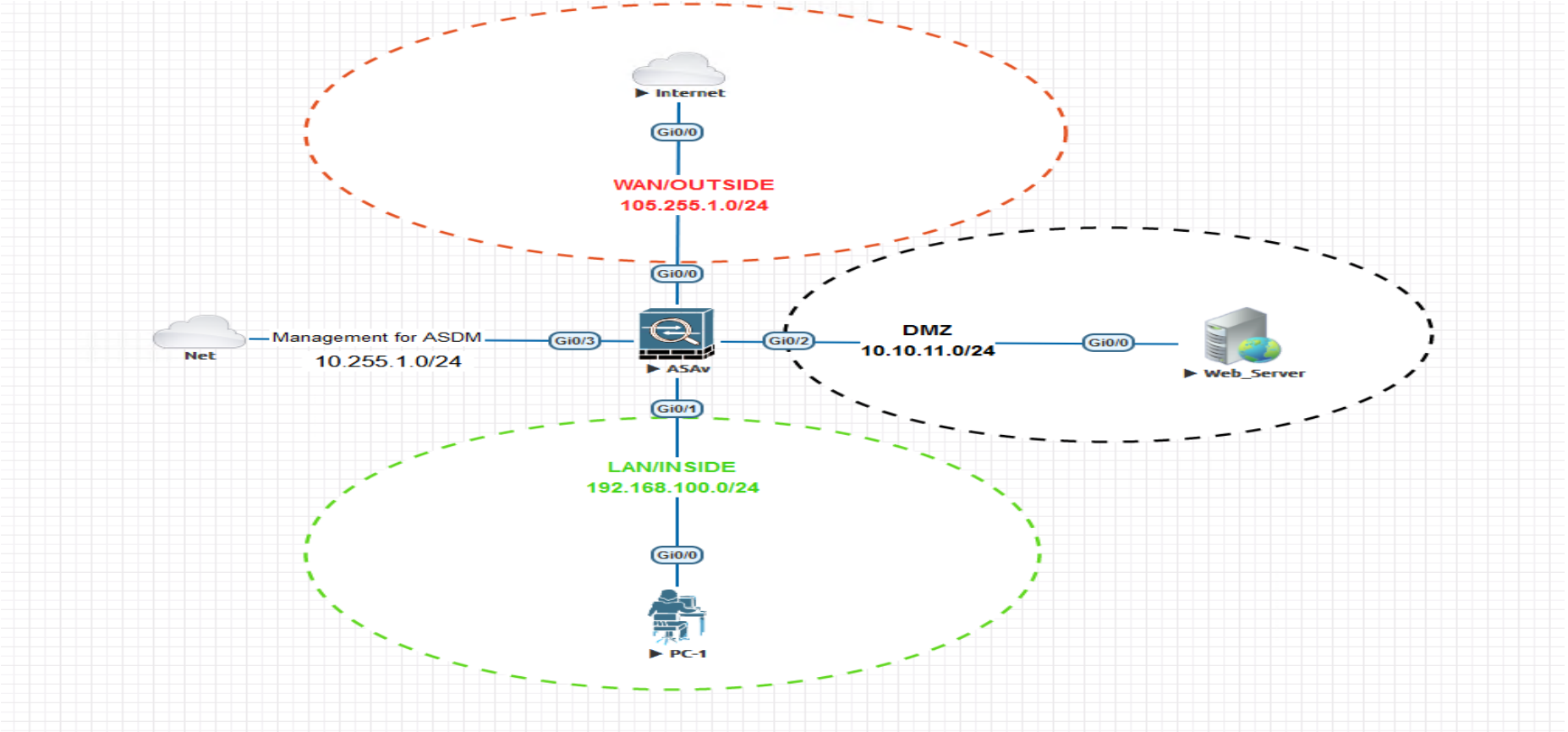
Network Address Translation (NAT) Types –
There are 3 ways to configure NAT:

Static NAT – In this, a single unregistered (Private) IP address is mapped with a legally registered (Public) IP address i.e one-to-one mapping between local and global addresses. This is generally used for Web hosting. These are not used in organizations as there are many devices that will need Internet access and to provide Internet access, a public IP address is needed.

Dynamic NAT – In this type of NAT, an unregistered IP address is translated into a registered (Public) IP address from a pool of public IP addresses. If the IP address of the pool is not free, then the packet will be dropped as only a fixed number of private IP addresses can be translated to public addresses.
Suppose, if there is a pool of 2 public IP addresses then only 2 private IP addresses can be translated at a given time. If 3rd private IP address wants to access the Internet then the packet will be dropped therefore many private IP addresses are mapped to a pool of public IP addresses. NAT is used when the number of users who want to access the Internet is fixed. This is also very costly as the organization has to buy many global IP addresses to make a pool.

Port Address Translation (PAT) – This is also known as NAT overload. In this, many local (private) IP addresses can be translated to a single registered IP address. Port numbers are used to distinguish the traffic i.e., which traffic belongs to which IP address. This is most frequently used as it is cost-effective as thousands of users can be connected to the Internet by using only one real global (public) IP address.

Dynamic NAT Project



Network Object

In ASA every configuration of NAT requires object. When a packet enters the ASA, both the source and destination IP addresses are checked against the network object NAT rules. Object represents any one item.

- **Network Object**- Represents a single **IP address, Subnet or Range**
- **Service Object** – Represents a single Port/Protocol

  Port- eq=equal,gt=greater than,lt=less than, neq=not equal, range
  Protocol-tcp, udp, icmp, gres,esp etc

Dynamic Nat Project

1. **Configure network object ip pool to be use for dynamic NAT for both public pool and DMZ pool**

ASA-FW1(config)# object network Public_Pool

ASA-FW1(config-network-object)# range 105.255.1.100 105.255.1.200

ASA-FW1(config-network-object)# object network DMZ_Pool

ASA-FW1(config-network-object)# range 10.10.11.100 10.10.11.200

2. **Configure dynamic NAT for users over the internet to access the Application of Web facing servers on port 23**

ASA-FW1(config)# object network DMZ_TO_OUTSIDE
ASA-FW1(config-network-object)# subnet 10.10.11.0 255.255.255.0
ASA-FW1(config-network-object)# nat (DMZ,outside) dynamic Public_Pool

3. Generate traffic the DMZ to the internet to see if their IP packets are correctly translated.

Web_Server#**telnet 105.255.1.2 23**
Trying 105.255.1.2 ... Open

```
**********************************************************************
* IOSv is strictly limited to use for evaluation, demonstration and IOS  *
* education. IOSv is provided as-is and is not supported by Cisco's      *
* Technical Advisory Center. Any use or disclosure, in whole or in part, *
* of the IOSv Software or Documentation to any third party for any       *
* purposes is expressly prohibited except as otherwise authorized by     *
* Cisco in writing.                                                      *
**********************************************************************
```

User Access Verification

Password:

We have a connection, so let's see if we have a translation:

ASA-FW1(config-network-object)# **show nat**

Auto NAT Policies (Section 2)
1 (DMZ) to (outside) source dynamic DMZ_TO_OUTSIDE Public_Pool
translate_hits = 1, untranslate_hits = 0
ASA-FW1(config-network-object)# show nat

Auto NAT Policies (Section 2)
1 (DMZ) to (outside) source dynamic DMZ_TO_OUTSIDE Public_Pool
translate_hits = 2, untranslate_hits = 0

ASA-FW1(config-network-object)# **show nat de**

Auto NAT Policies (Section 2)
1 (DMZ) to (outside) source dynamic DMZ_TO_OUTSIDE Public_Pool
translate_hits = 2, untranslate_hits = 0
Source - Origin: 10.10.11.0/24, Translated: 105.255.1.100-105.255.1.200

ASA-FW1(config-network-object)#**show xlate**
1 in use, 1 most used
Flags: D - DNS, e - extended, I - identity, i - dynamic, r - portmap,
s - static, T - twice, N - net-to-net

NAT from DMZ: 10.10.11.2 to outside: 105.255.1.157 flags i idle 0:05:01 timeout 3:

4. Remove the following and use ASDM to configure same

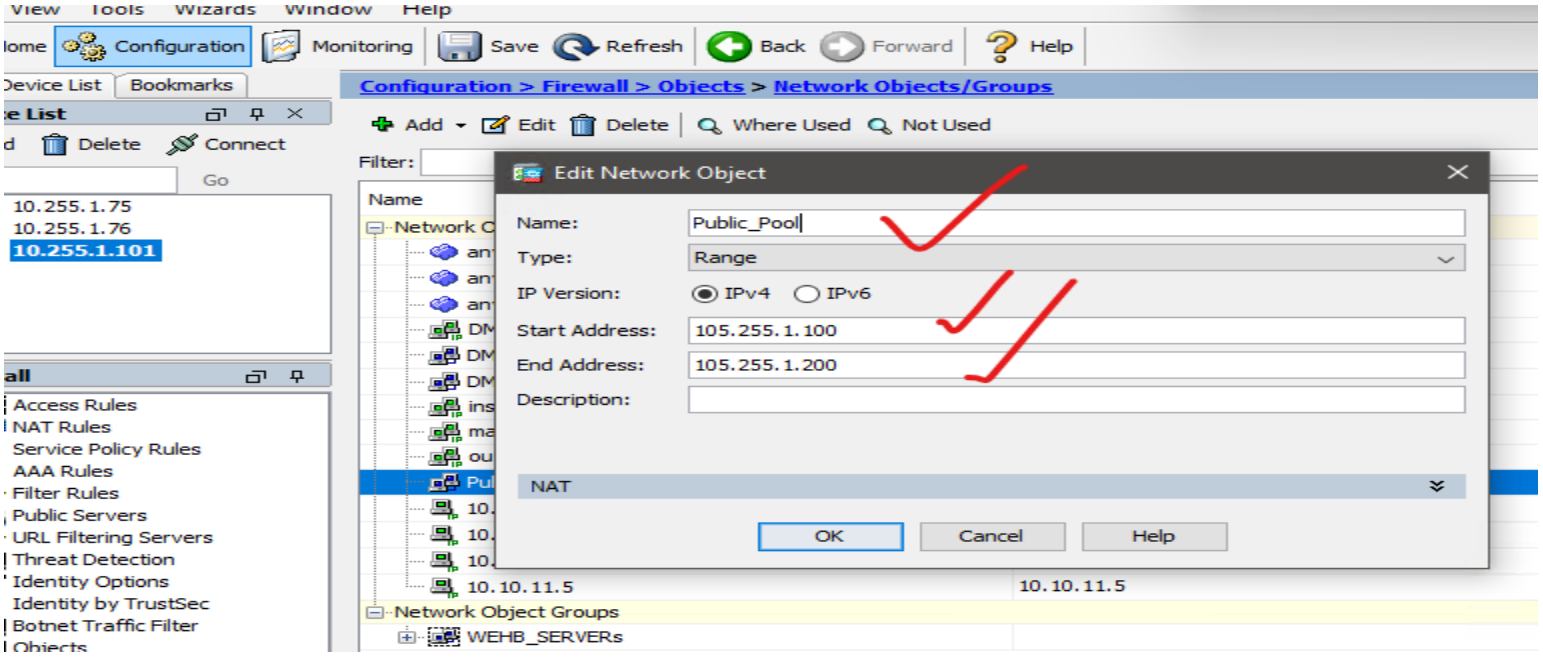
a. NAT config –under nat rules
b. Nat object – under object

5. Apply ASDM configuration to configure same by remove nat configuration on cli

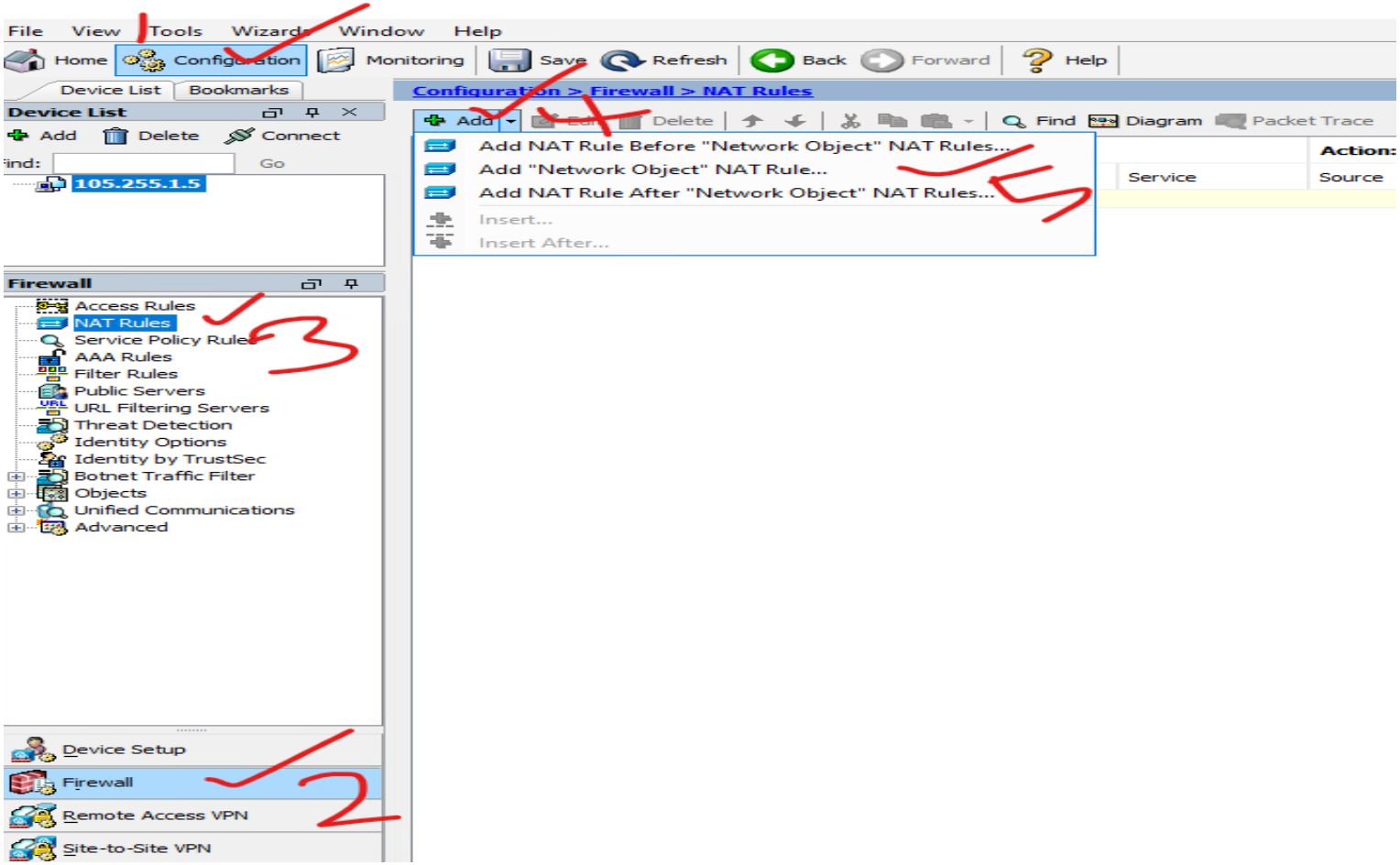
Using ASDM to create dynamic Nat

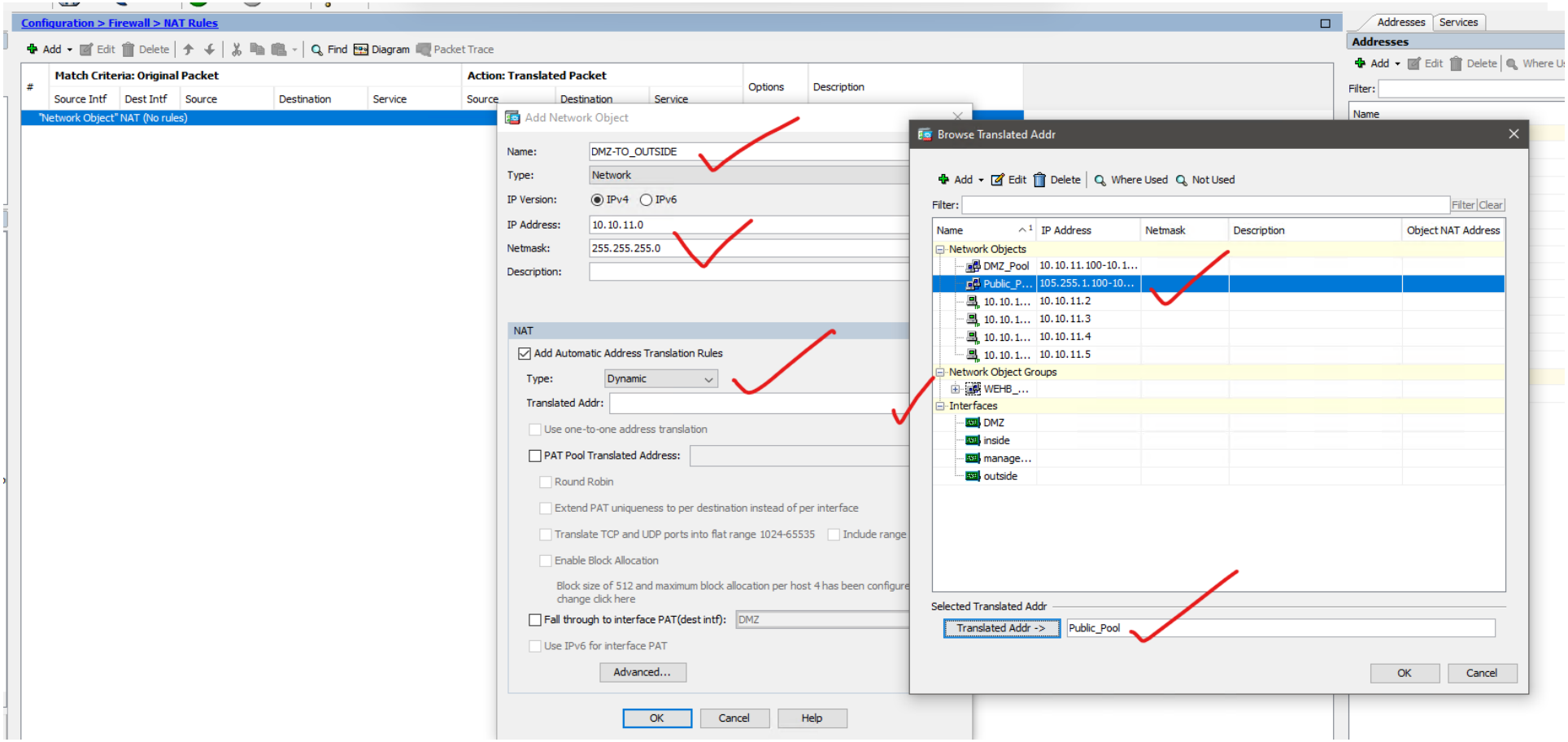
Step 1 Create your public object pool

Configuration > firewall > object> Add > add network object



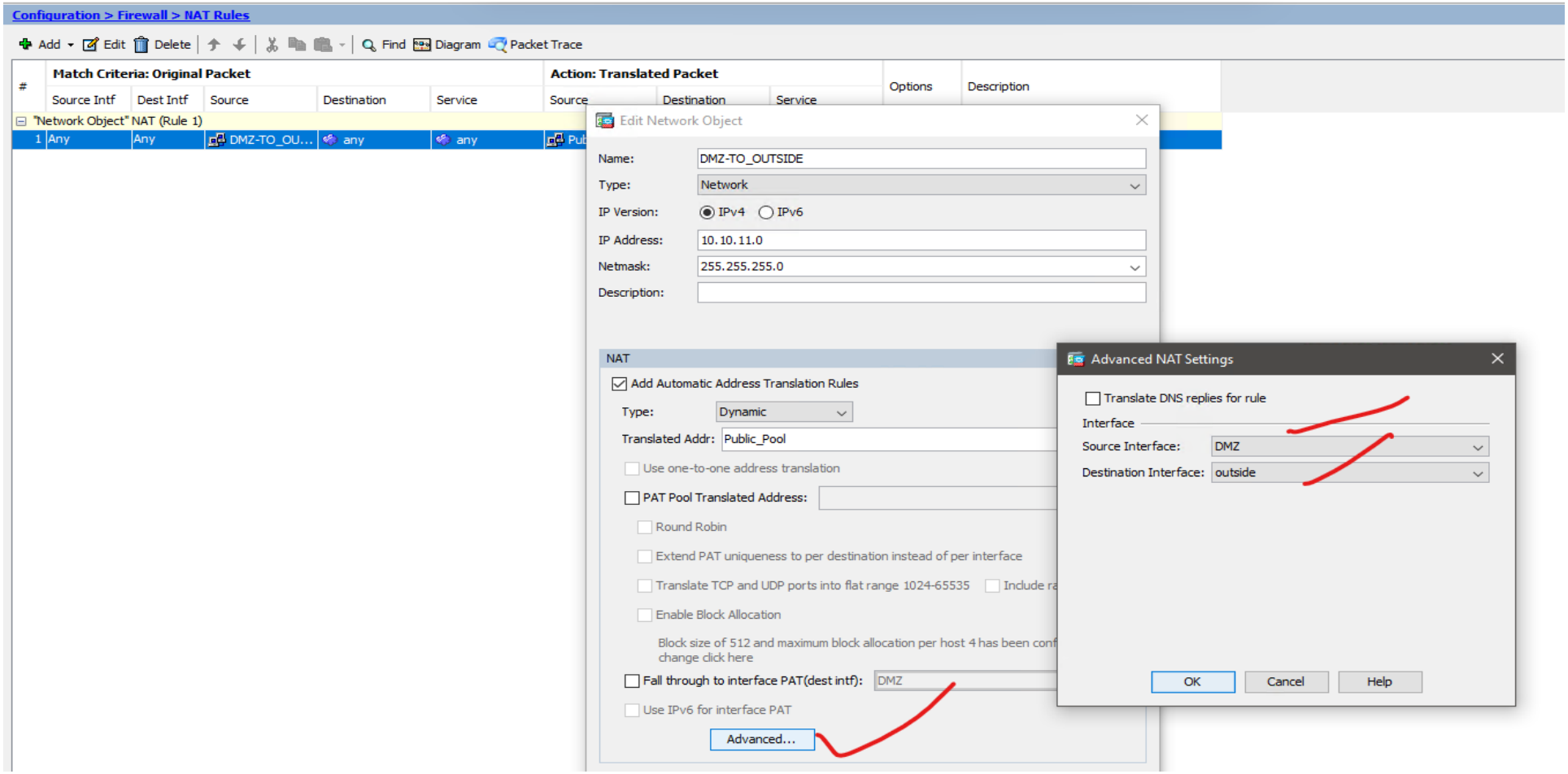
Step 2 Configure the Nat object for the outside



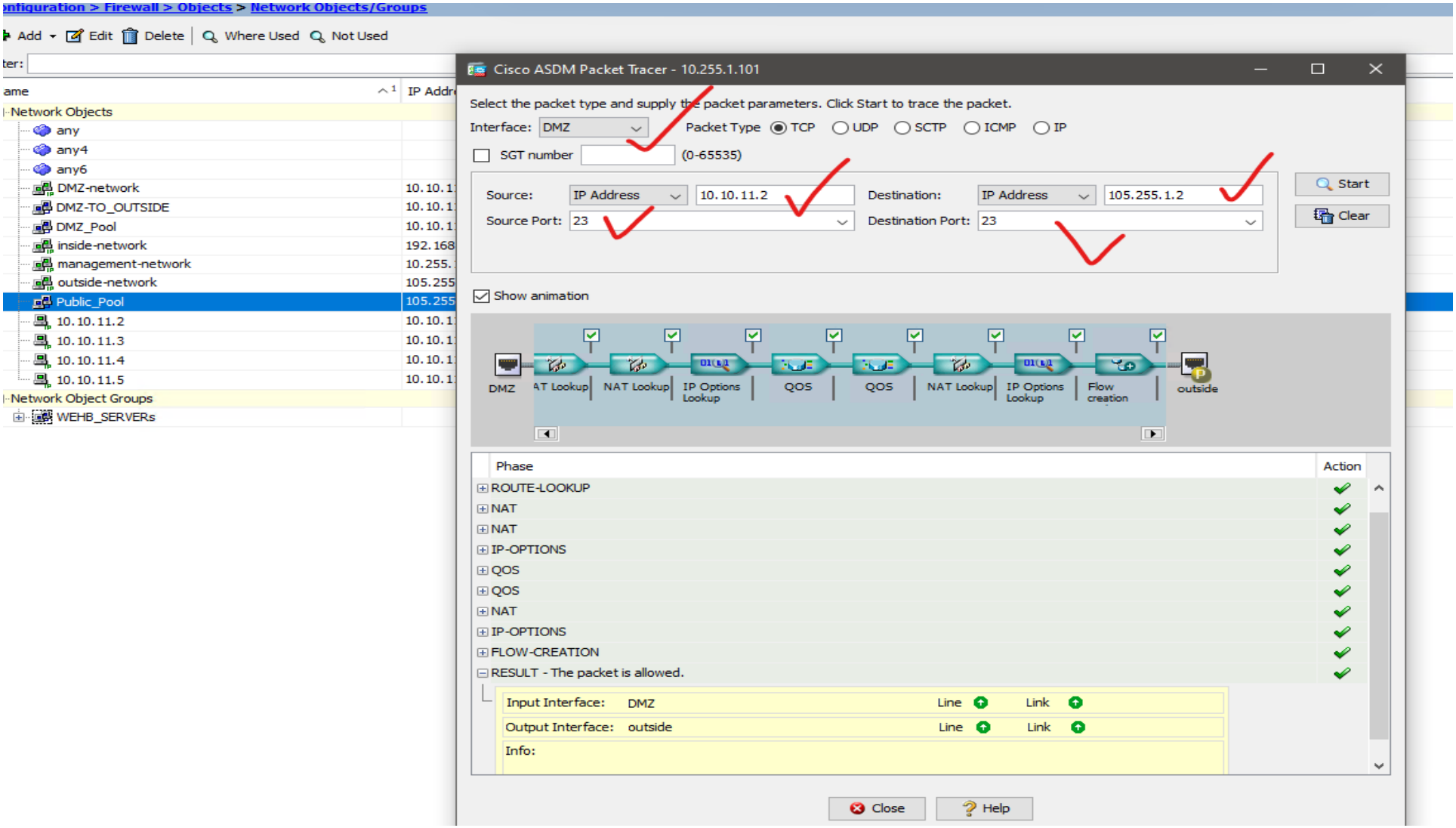

Configuration > Firewall > NAT Rules
Add
Edit
Delete
Find
Diagram
Packet Trace
Match Criteria: Original Packet
Action: Translated Packet
Source Intf
Dest Intf
Source
Destination
Service
Options
Description
"Network Object" NAT (No rules)
Add Network Object
Name: DMZ-TO_OUTSIDE
Type: Network
IP Version: IPv4 IPv6
IP Address: 10.10.11.0
Netmask: 255.255.255.0
Description:
NAT
Add Automatic Address Translation Rules
Type: Dynamic
Translated Addr:
Use one-to-one address translation
PAT Pool Translated Address:
Round Robin
Extend PAT uniqueness to per destination instead of per interface
Translate TCP and UDP ports into flat range 1024-65535
Include range
Enable Block Allocation
Block size of 512 and maximum block allocation per host 4 has been configure
change click here
Fall through to interface PAT(dest intf): DMZ
Use IPv6 for interface PAT
Advanced...
OK
Cancel
Help
Browse Translated Addr
Add
Edit
Delete
Where Used
Not Used
Filter:
Filter
Clear
Name
IP Address
Netmask
Description
Object NAT Address
Network Objects
DMZ_Pool 10.10.11.100-10.1...
Public_P... 105.255.1.100-10...
10.10.1... 10.10.11.2
10.10.1... 10.10.11.3
10.10.1... 10.10.11.4
10.10.1... 10.10.11.5
Network Object Groups
WEHB_...
Interfaces
DMZ
inside
manage...
outside
Selected Translated Addr
Translated Addr ->
Public_Pool
OK
Cancel
Addresses
Services
Addresses
Add
Edit
Delete
Filter:
Name

Step3: apply the interface for the NAT

Click on the Nat rule > click on advance > apply on the right interface



1. **Step 4.Generate traffic from the internet to DMZ using packet tracer to test if the NAT is working.**



Verify on the cli

ASA-FW1# **show nat**

Auto NAT Policies (Section 2)
1 (DMZ) to (outside) source dynamic DMZ-TO_OUTSIDE Public_Pool
translate_hits = 1, untranslate_hits = 0

ASA-FW1# **show nat de**

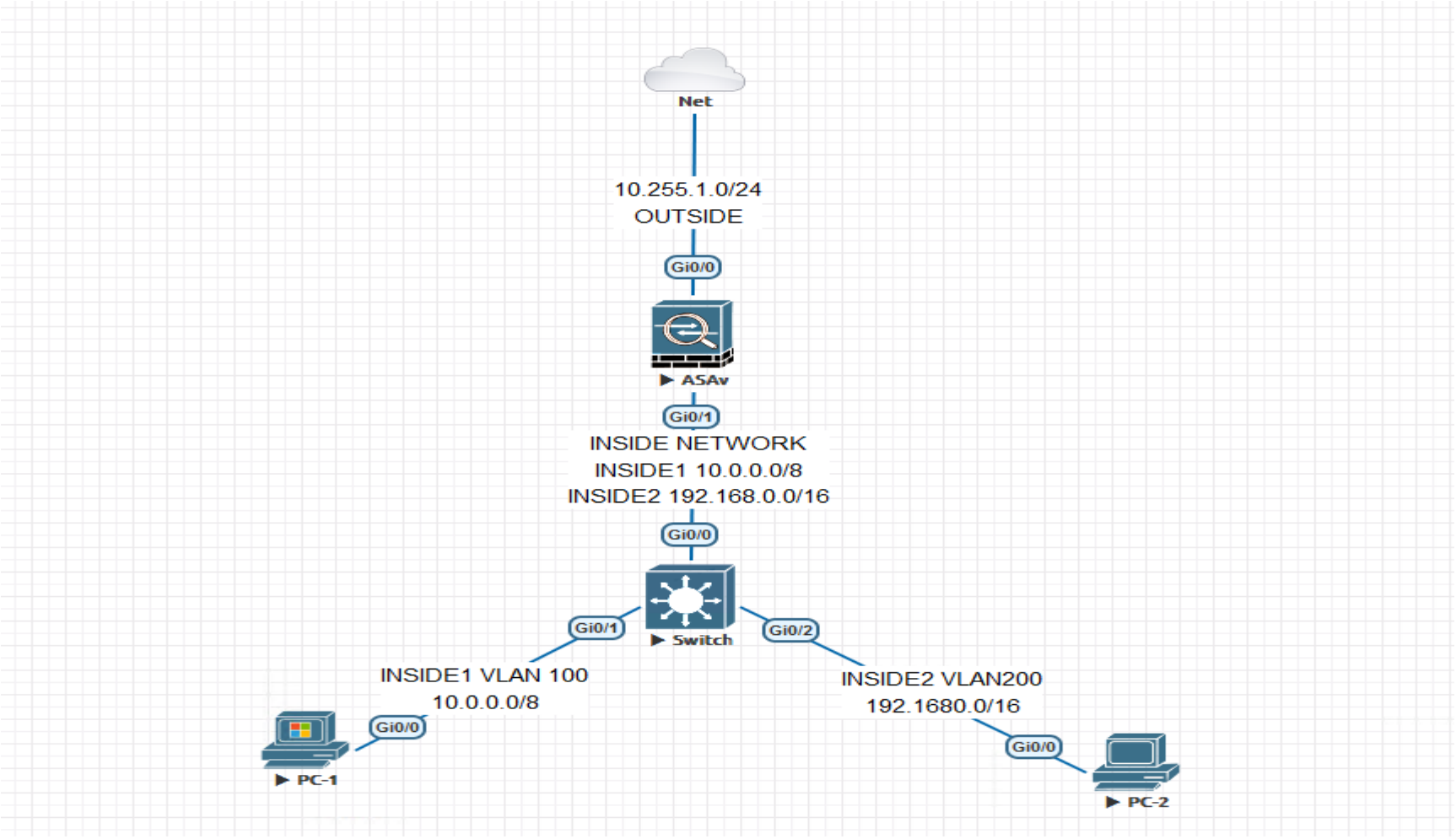
Auto NAT Policies (Section 2)
1 (DMZ) to (outside) source dynamic DMZ-TO_OUTSIDE Public_Pool
translate_hits = 1, untranslate_hits = 0
Source - Origin: 10.10.11.0/24, Translated: 105.255.1.100-105.255.1.200

ASA-FW1# **show xlate**
1 in use, 1 most used
Flags: D - DNS, e - extended, I - identity, i - dynamic, r - portmap,
s - static, T - twice, N - net-to-net

NAT from DMZ:10.10.11.2 to outside:105.255.1.105 flags i idle 0:01:11 timeout 30

PAT (NAT Overload)

PAT is primarily required when LAN users are translated to public IP (interface IP or IP from Public Pool). This type of **Dynamic NAT/PAT** configuration is used to provide internet access to LAN Users by translating LAN Subnet with Outside Interface of Firewall or any Public IP address.



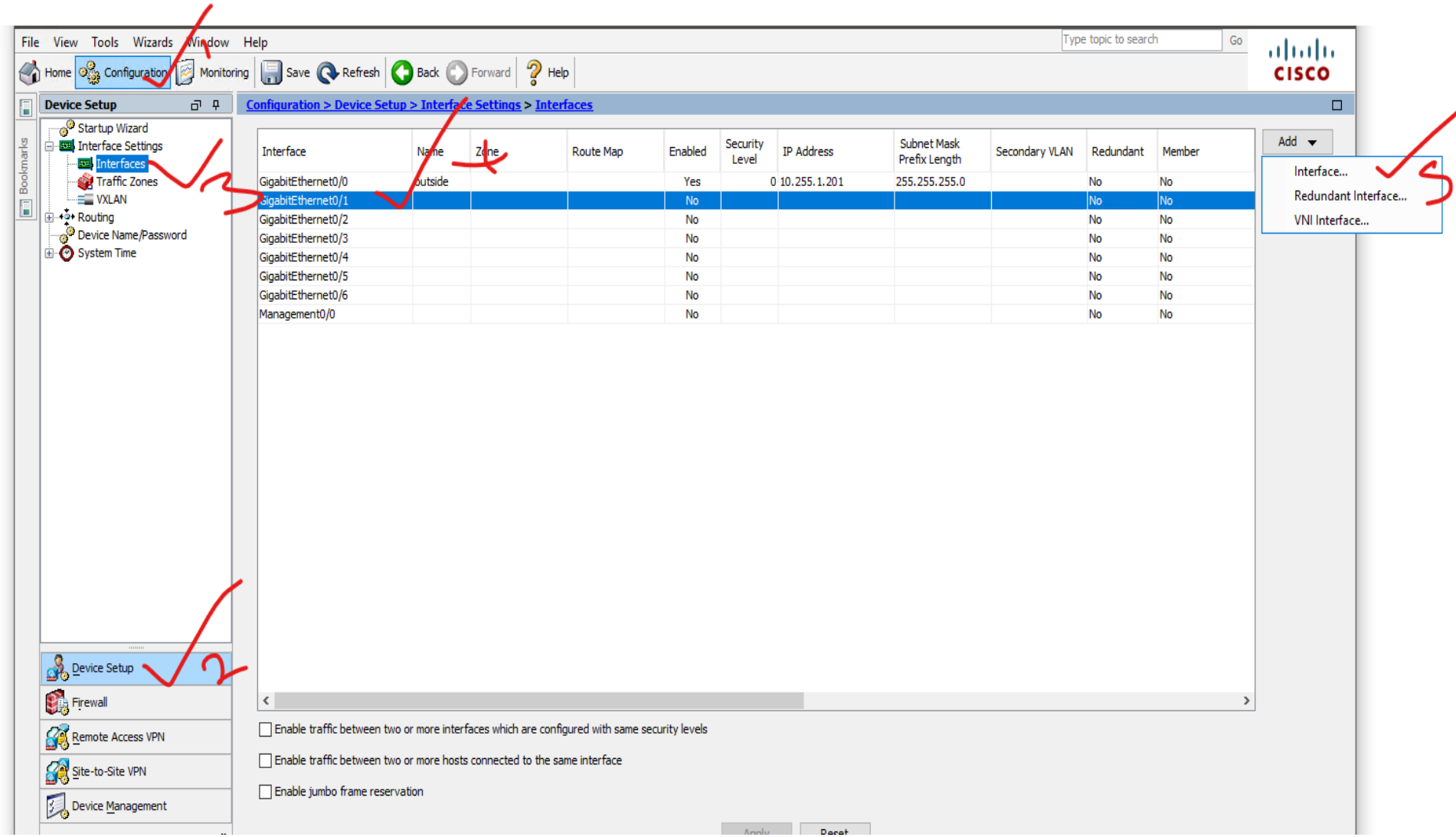
1. Configuring ASDM access using the OUTSIDE interface for management and use the ASDM to create your LAN

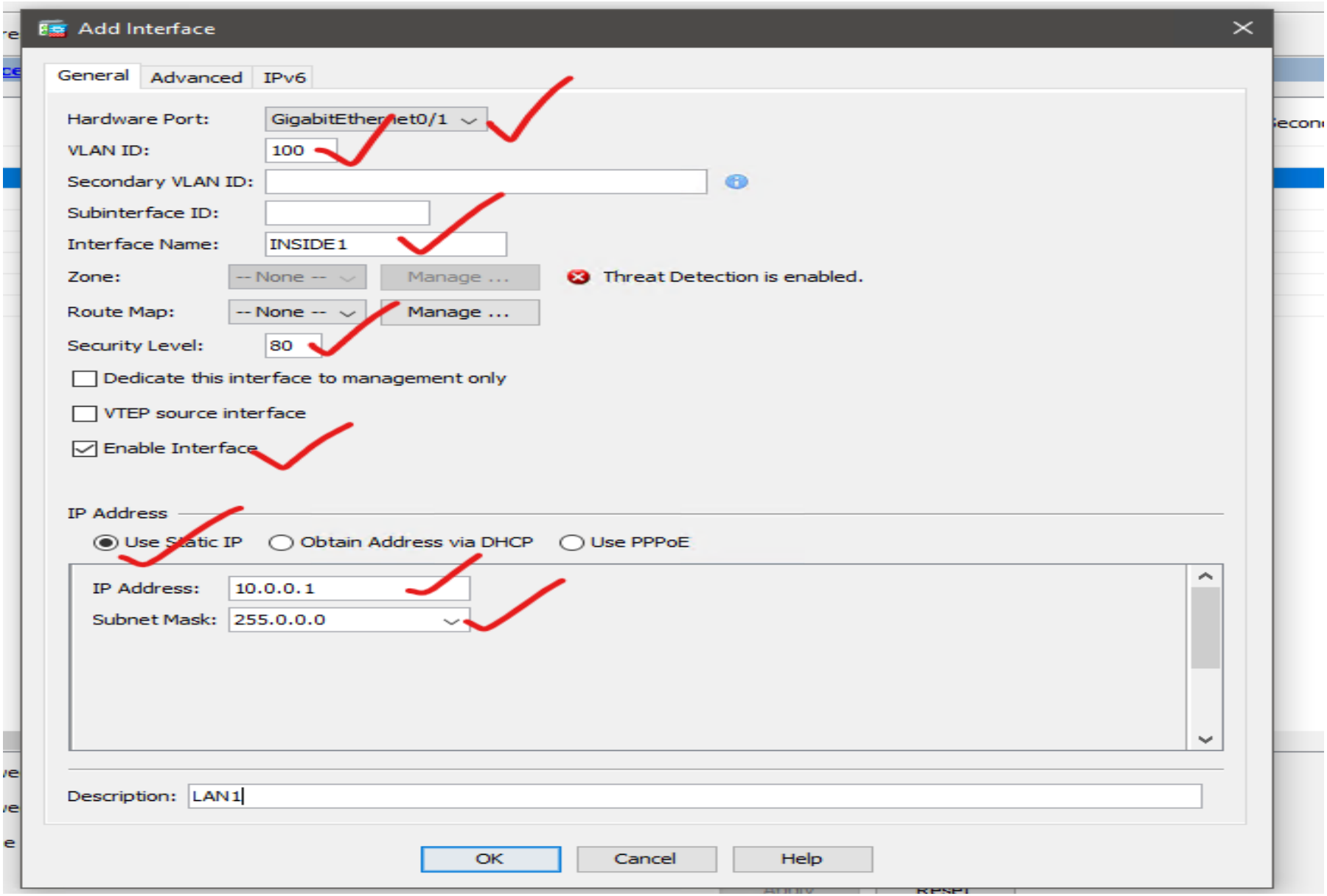
ciscoasa(config)# int g0/0
ciscoasa(config-if)# des link to the Internet
ciscoasa(config-if)# nameif outside
ciscoasa(config-if)# security-level 0
ciscoasa(config-if)# ip add 10.255.1.201 255.255.255.0
ciscoasa(config-if)# no shut
ciscoasa(config-if)#
ciscoasa(config-if)#
ciscoasa(config-if)# http server enable
ciscoasa(config)# http 10.255.1.0 255.255.255.0 outside
ciscoasa(config)# username admin pass cisco

NB: With this configuration we can now access the ASDM

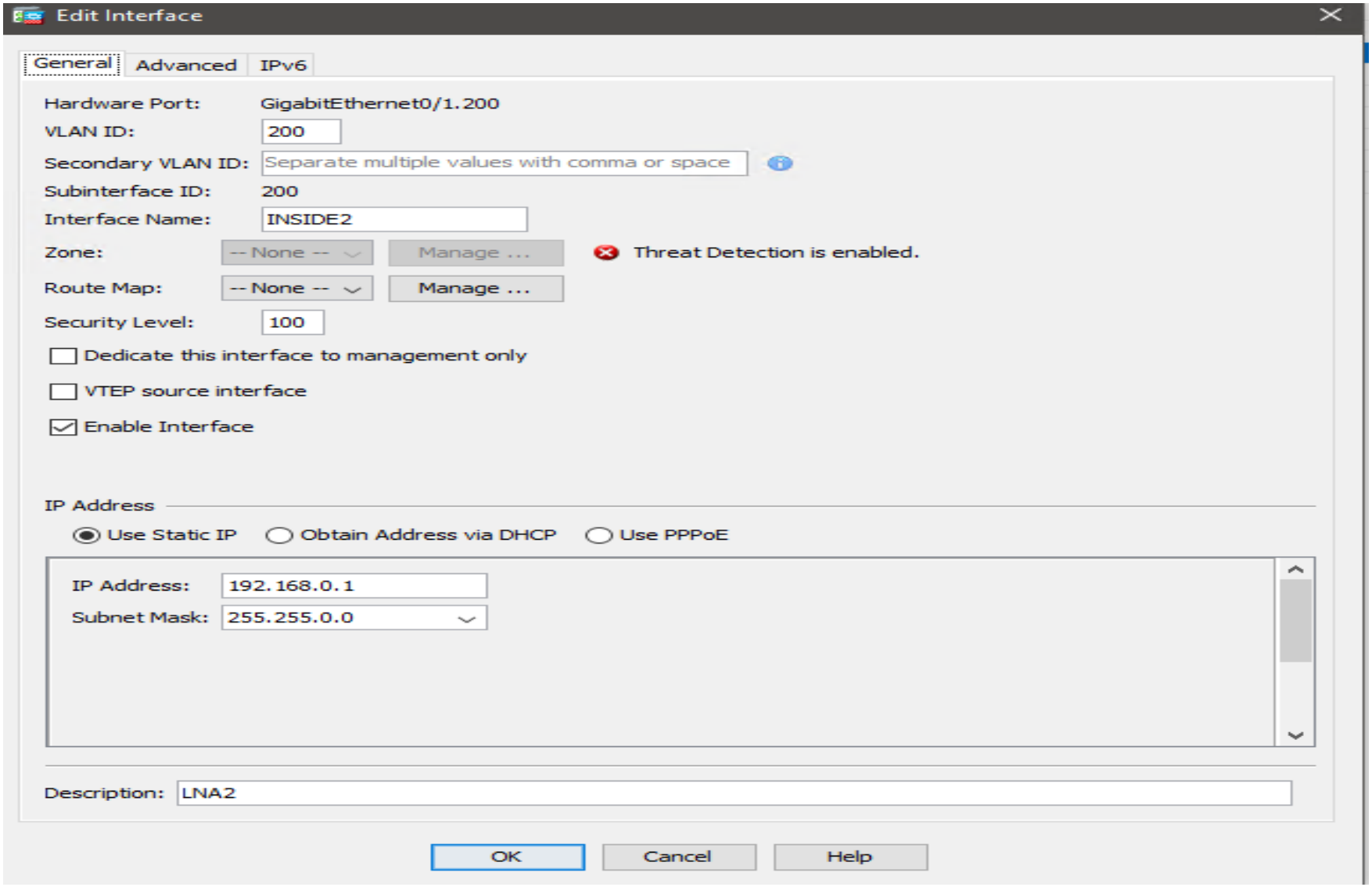
2. Using the ASDM to Create the Interfaces for the LAN

Configure >Device setup>interface settings > interfaces >add




Add Interface
General
Advanced
IPv6
Hardware Port:
GigabitEthernet0/1
VLAN ID:
100
Secondary VLAN ID:
Subinterface ID:
Interface Name:
INSIDE1
Zone:
-- None --
Manage ...
Threat Detection is enabled.
Route Map:
-- None --
Manage ...
Security Level:
80
Dedicate this interface to management only
VTEP source interface
Enable Interface
IP Address
Use Static IP
Obtain Address via DHCP
Use PPPoE
IP Address:
10.0.0.1
Subnet Mask:
255.0.0.0
Description:
LAN1
OK
Cancel
Help

3. Repeat same for the second sub interface using vlan 200

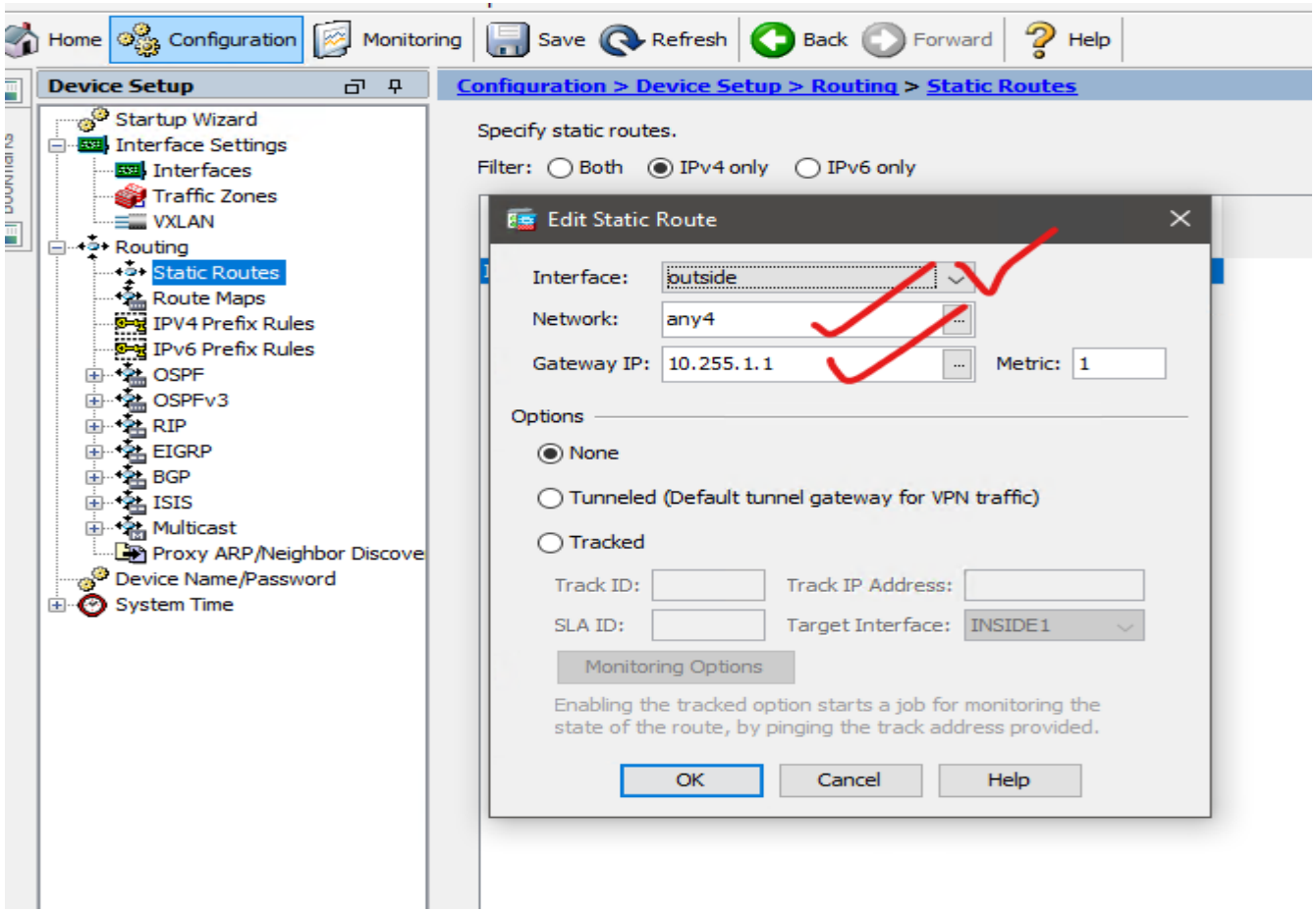


Verify with the command line

```
ASA-FW1(config-if)# show int ip br
Interface                  IP-Address      OK? Method Status                Prot
ocol
GigabitEthernet0/0         10.255.1.101    YES manual up                    up
GigabitEthernet0/1         unassigned      YES unset  up                    up
GigabitEthernet0/1.100     10.0.0.1        YES manual up                    up
GigabitEthernet0/1.200     192.168.0.1     YES manual up                    up
GigabitEthernet0/2         unassigned      YES unset  administratively down up
GigabitEthernet0/3         unassigned      YES unset  administratively down up
GigabitEthernet0/4         unassigned      YES unset  administratively down up
GigabitEthernet0/5         unassigned      YES unset  administratively down up
GigabitEthernet0/6         unassigned      YES unset  administratively down up
Management0/0              unassigned      YES unset  administratively down up
ASA-FW1(config-if)# show nameif
Interface                  Name                        Security
GigabitEthernet0/0         outside                       0
GigabitEthernet0/1.100     INSIDE1                      80
GigabitEthernet0/1.200     INSIDE2                     100
```

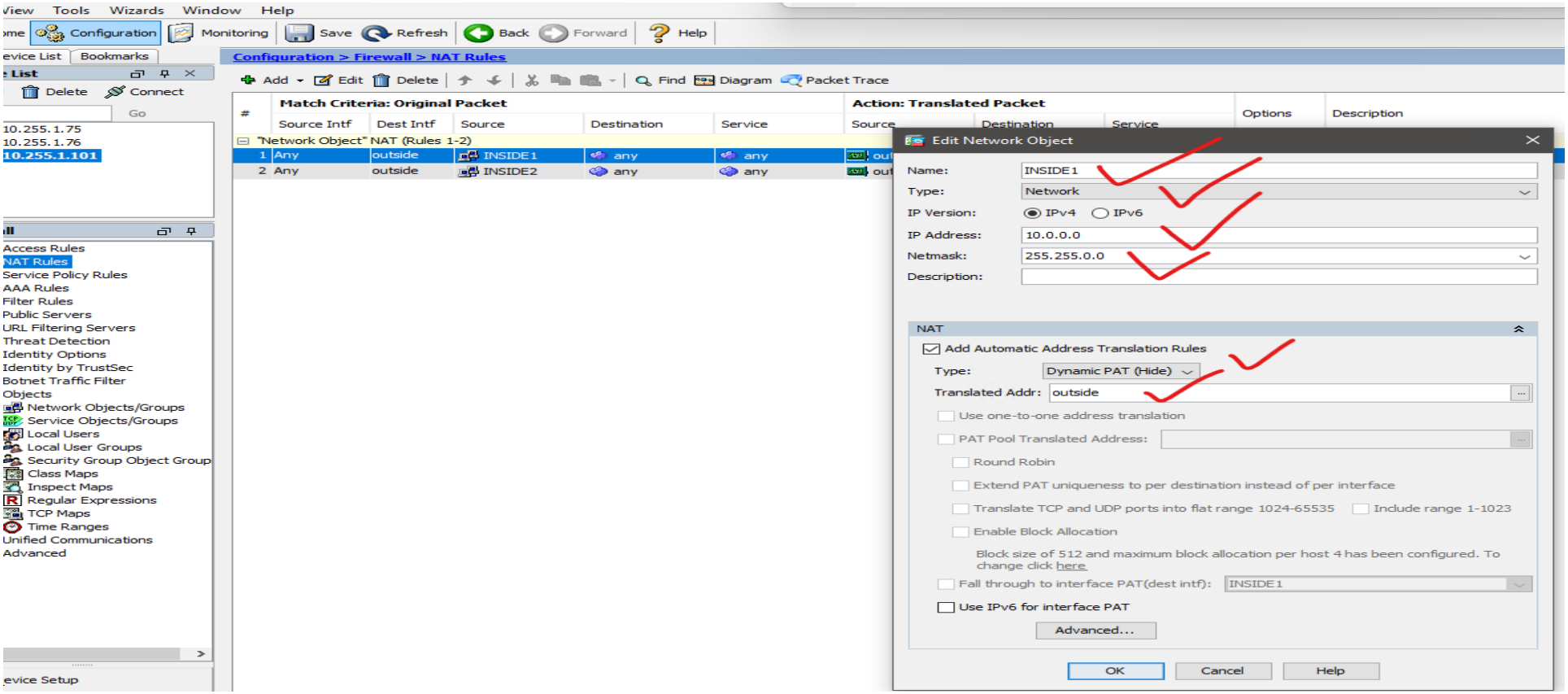
4. Configure default route using ASDM

Configure >device setup>static route >add

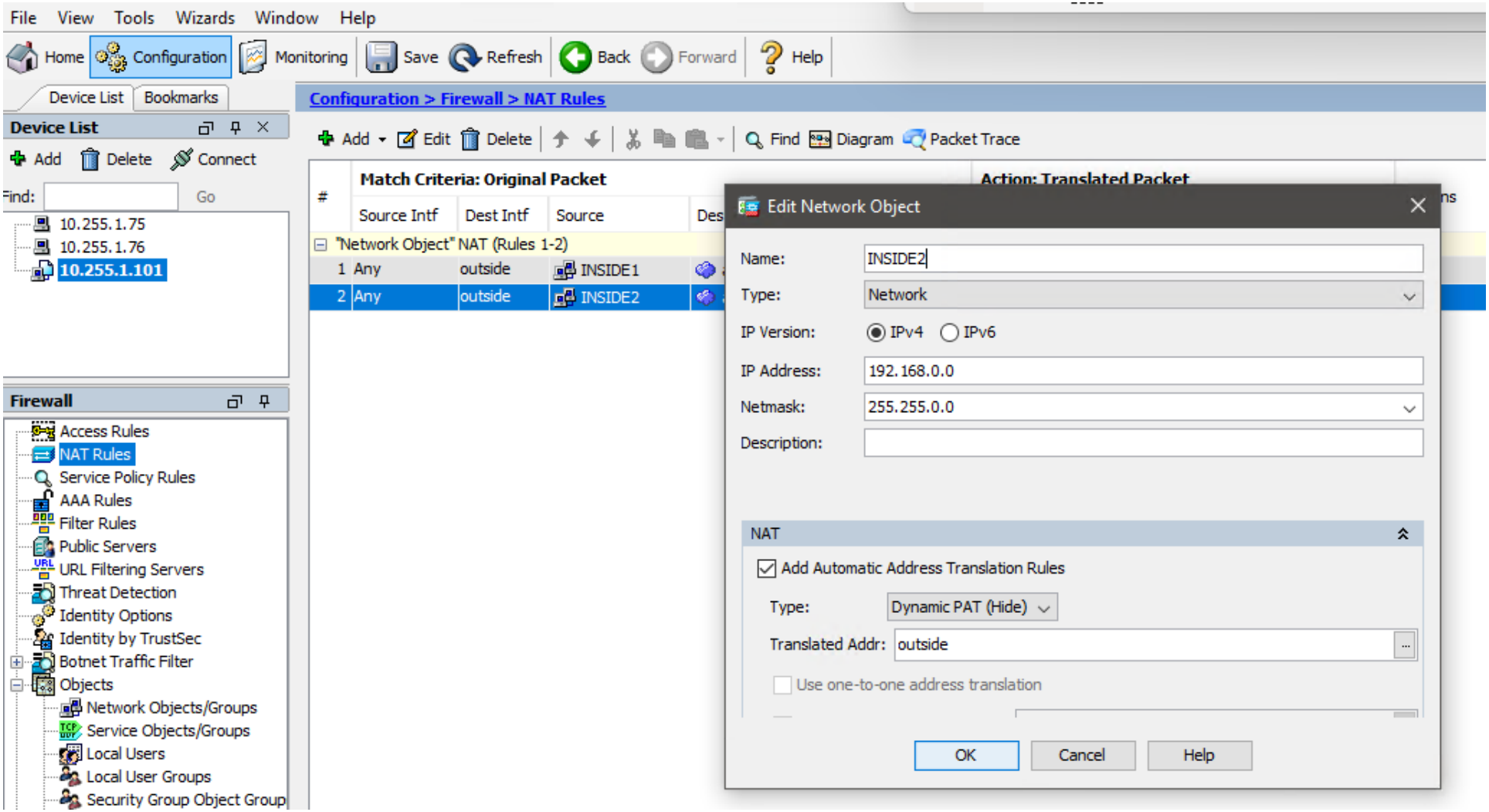


5. Configure PAT as your NAT protocol to give internet access to your inside network

Let's create for inside1 on network of 10.0.0.0/16

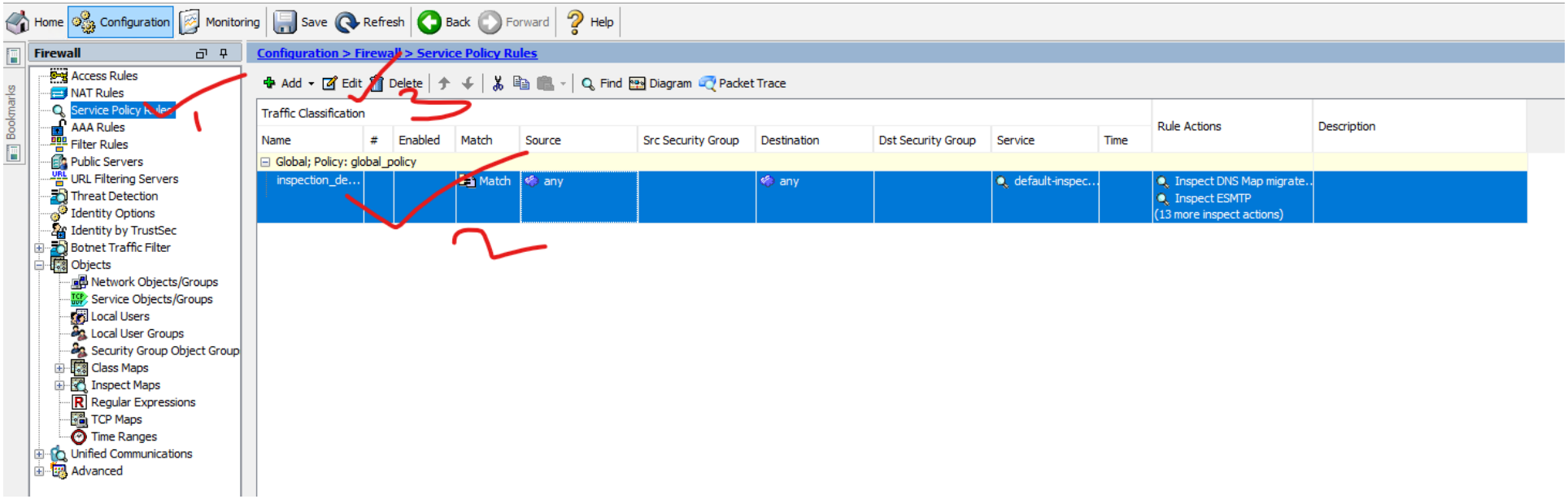


Let's create for inside2 on network of 192.168.0.0/16

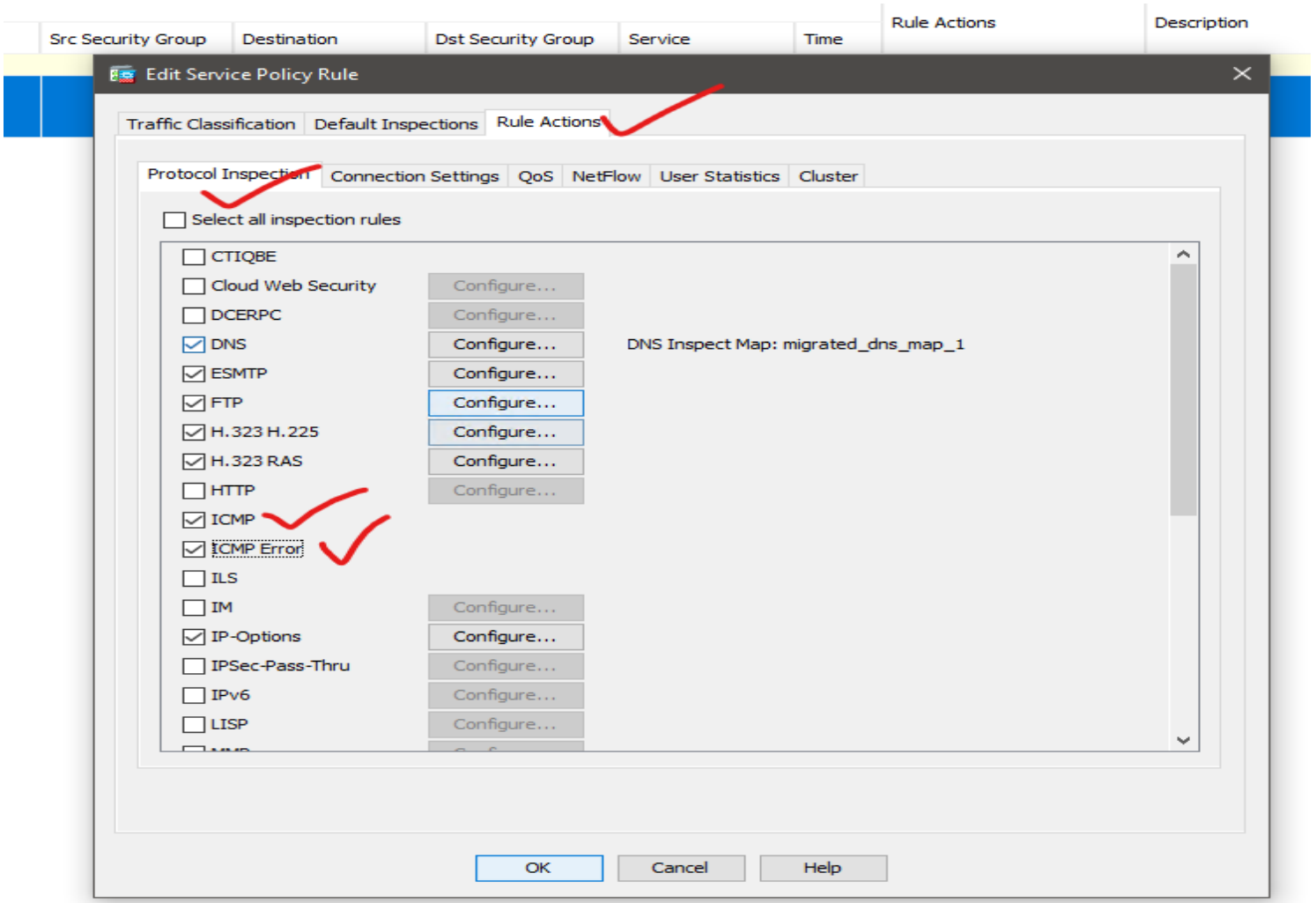


6. Configure ICMP inspection on ASDM to allow ping access

Configure>firewall>Service Policy Rules



1. Select Rule Actions
2. Click Protocol Inspection
3. Check “ICMP” and “ICMP Error” and hit OK



Now we can verify on both PCs for internet access

Configurations to be done on the switch

SW1(config)#**interface g0/0**

SW1(config-if)#**switchport trunk encapsulation dot1q**

SW1(config-if)#**switchport mode trunk**

SW1(config)#**interface g0/1**

SW1(config-if)#**switchport mode access**

SW1(config-if)#**switchport access vlan 100**

Router USERs Configuration as seen on the topology

PC-1(config)#**hostname PC1**

PC-1(config)#**int g0/0**

PC-1(config-if)#**ip add 10.0.0.2 255.255.0.0**

PC-1(config-if)#**no shut**

PC-1(config-if)#**ip route 0.0.0.0 0.0.0.0 10.0.0.1**

PC-1(config)#**ip domain-lookup(Do be able to ping a domain name)**

PC-1(config)#**ip name-server 8.8.8.8 (to give access to public DNS Server)**

PC1(config)#**do ping 8.8.8.8**
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 8.8.8.8, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 30/32/34 ms

PC1(config)#**do ping facebook.com**
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 31.13.66.35, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 27/34/41 ms

PC2 Configuration

PC-2(config)#**int g0/0**

PC-2(config-if)#**ip add 192.168.0.2 255.255.0.0**

PC-2(config-if)#**no shut**

PC-2(config-if)#**ip route 0.0.0.0 0.0.0.0 192.168.0.1**

PC-2(config)#**ip domain-lookup(Do be able to ping a domain name)**

PC-2(config)#**ip name-server 8.8.8.8 (to give access to public DNS Server)**

PC2 (config)#**do ping 8.8.8.8**
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 8.8.8.8, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 28/31/33 ms

PC2(config)#**do ping ghanaweb.com**
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 104.21.41.135, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 28/33/41 ms

Let's now verify the NAT on the ASA

ASA-FW1 (config-if)# **show nat**

Auto NAT Policies (Section 2)

1 (any) to (outside) source dynamic INSIDE1 interface
translate_hits = 5, untranslate_hits = 0

2 (any) to (outside) source dynamic INSIDE2 interface
translate_hits = 3, untranslate_hits = 0

ASA-FW1 (config-if) #**show xlate**
1 in use, 3 most used
Flags: D - DNS, e - extended, I - identity, i - dynamic, r - portmap,
s - Static, T - twice, N - net-to-net

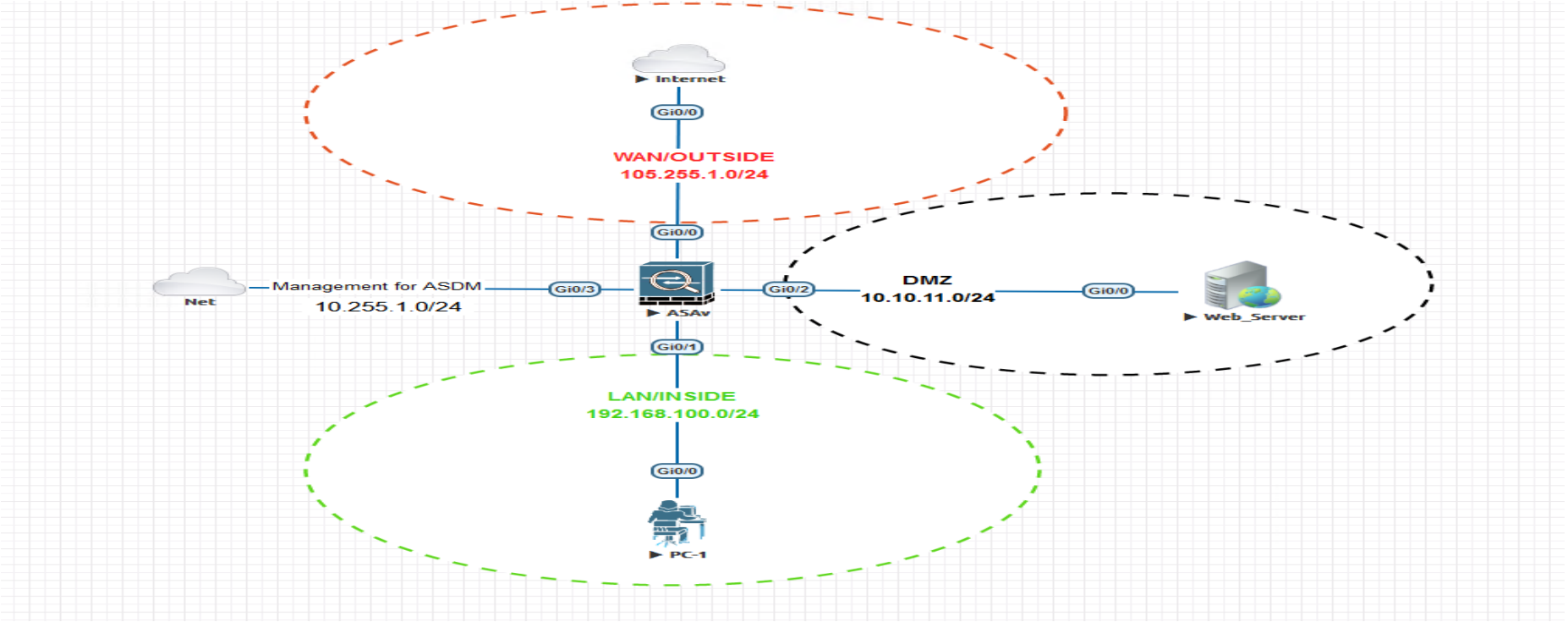
ICMP PAT from any:192.168.0.2/6 to outside:10.255.1.101/6 flags ri idle 0:00:04 timeout 0:00:30

STATIC NAT PROJECT

Static NAT is primarily required when a Data Center or Hub site has WEB Facing Server in **DMZ Zone** or **Inside Zone** and Users over the **Internet** need to access the Application of Web Facing server. The applications may be **Web (HTTP/HTTPs) Server, Email Server** or even **FTP server**. Below is a sample scenario where an Application server is hosted in DMZ Zone and needs to be accessed from outside (Internet)

Project Task. Configure an inbound rule to allow users on the internet to connect to our DMZ E-Commerce Webserver (10.10.11.2) listening on port 443

Static NAT Project LAB



Step 1. First, we will create a network object that defines our "webserver" in the DMZ and also configure to what IP address it should be translated

ASA-1(config) # **object network WEB-SERVER**

ASA-1(config-network-object) # **host 10.10.11.2**

ASA-1(config-network-object) # **nat (DMZ, OUTSIDE) static 105.255.1.200**

NB: The configuration above tells the ASA that whenever an outside device connects to IP address 105.255.1.200, it should be translated to IP address 10.10.11.2. This takes care of NAT, but we still have to create an access-list or traffic will be dropped

ASA1(config)# **access-list OUTSIDE_TO_DMZ extended permit tcp any host 10.10.11.2 eq 443**

ASA1 (config)# **access-group OUTSIDE_TO_DMZ in interface OUTSIDE**

This enables the access-list on the outside interface

Internet#**telnet 105.255.1.200 443**
Trying 105.255.1.200, 443 ... Open

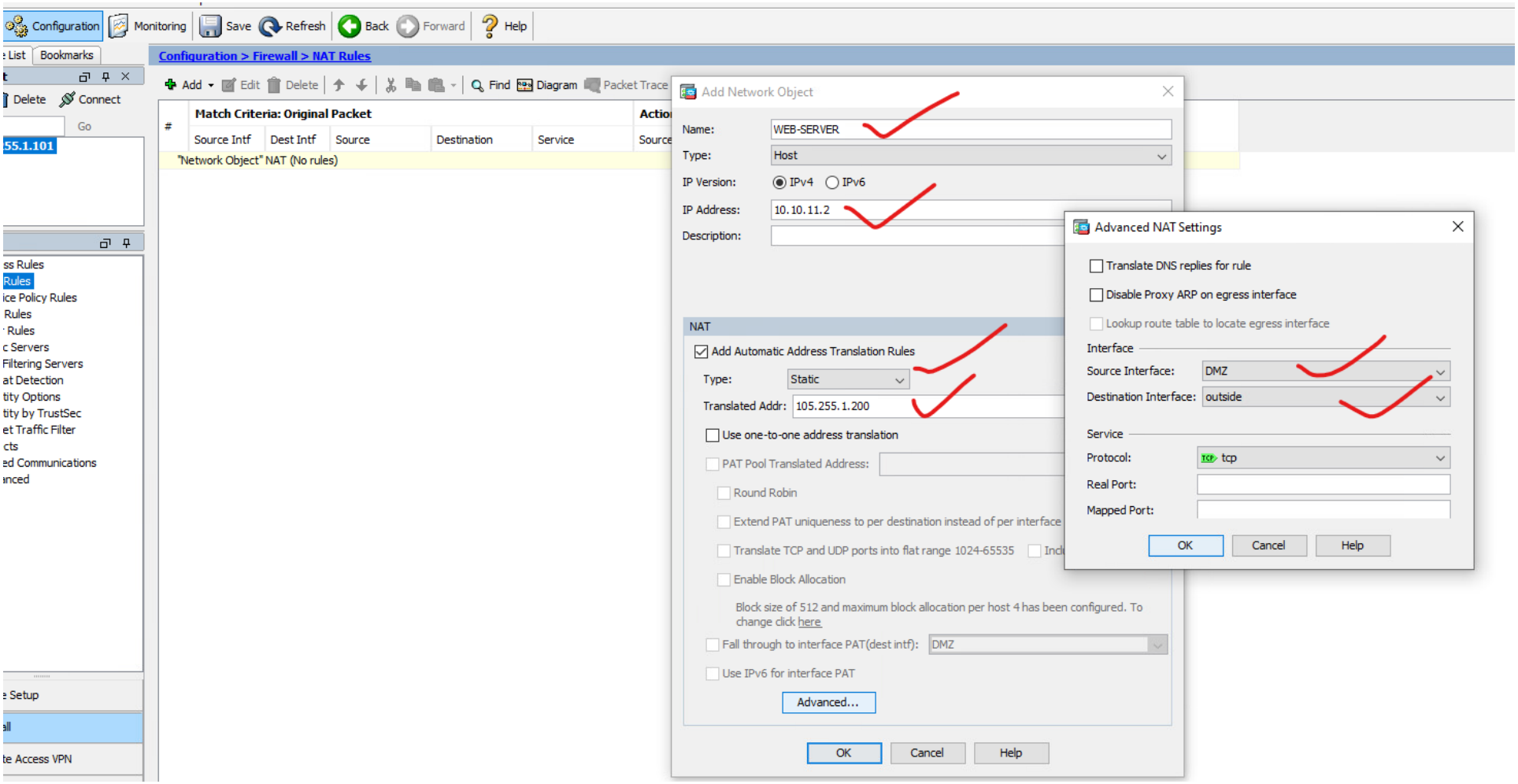
ASA-FW1(config)# **show access-list**

access-list cached ACL log flows: total 0, denied 0 (deny-flow-max 4096)
        alert-interval 300
access-list outside_access_in; 1 elements; name hash: 0x6892a938
access-list outside_access_in line 1 extended permit tcp any object Web_Server eq https (hitcnt=1) 0xf2417cc4

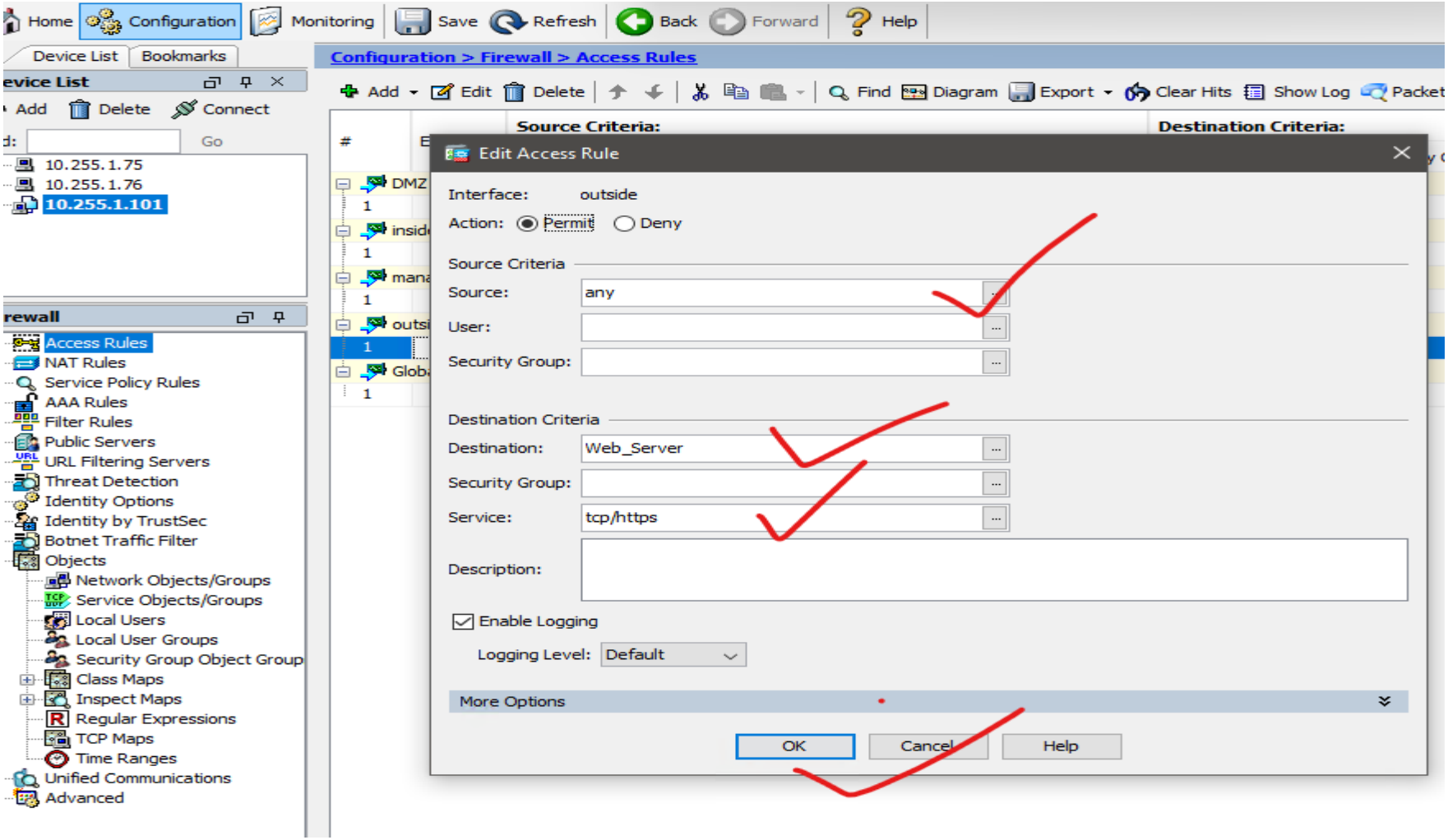
ASA-FW1(config)# **show xlate**
1 in use, 1 most used
Flags: D - DNS, e - extended, I - identity, i - dynamic, r - portmap,
     s - Static, T - twice, N - net-to-net
NAT from DMZ: 10.10.11.2 to outside: 105.255.1.200
   Flags s idle 0:00:09 timeout 0:00:00

Apply same configuration using ASDM the same Project Task

Step-1 create a network object that defines our “webserver” in the DMZ and also configure to what IP address it should be translated.



Step.2 Apply ACL allow inbound traffic



```
Internet#telnet 105.255.1.200 443
Trying 105.255.1.200, 443 ... Open
```

```
ASA-FW1(config)# show access-list

access-list cached ACL log flows: total 0, denied 0 (deny-flow-max 4096)
        alert-interval 300
access-list outside_access_in; 1 elements; name hash: 0x6892a938
access-list outside_access_in line 1 extended permit tcp any object Web_Server eq https (hitcnt=1) 0xf2417cc4
```

```
ASA-FW1(config)# show xlate
1 in use, 1 most used
Flags: D - DNS, e - extended, I - identity, i - dynamic, r - portmap,
     s - Static, T - twice, N - net-to-net
NAT from DMZ: 10.10.11.2 to outside: 105.255.1.200
   Flags s idle 0:00:09 timeout 0:00:00
```

STATIC NAT Port Forwarding

NAT Port Forwarding is useful when you have a single public IP address and multiple devices behind it that you want to reach from the outside world

Project Task-1: Whenever someone connects on IP address 105.255.1.1 TCP port 80 we will forward them to 10.10.11.2 TCP port 80.

Step-1: We create a network object that specifies the real IP address of the web server and then we create our NAT rule. By using the keyword **interface** we tell the ASA to use the IP address on the (outside) interface. The first port number is the port that the server is **listening on**, the second port number is the outside port number

Using command Line to configure

ASA-1(config) # **object network WEB-SERVER**

ASA-1(config-network-object) #**host 10.10.11.2**

ASA-1(config-network-object) # **nat (DMZ,OUTSIDE) static interface service tcp 80 80**

We can also use the keyword **interface** we tell the ASA to use the IP address on the (outside) interface.

Step 2: let's configure Access List to allow traffic from the outside to the sever

ASA-1(config)# **access-list out_DMZ extended permit tcp any host 192.168.3.1 eq 80**

ASA1(config)# **access-group out_DMZ in interface OUTSIDE**

Let’s generate some traffic for testing

Internet#**telnet 105.255.1.200 80**

Trying 105.255.1.200, 80 ... Open

X

ASA-FW1(config)# **show xlate**

1 in use, 2 most used

Flags: D - DNS, e - extended, I - identity, i - dynamic, r - portmap,

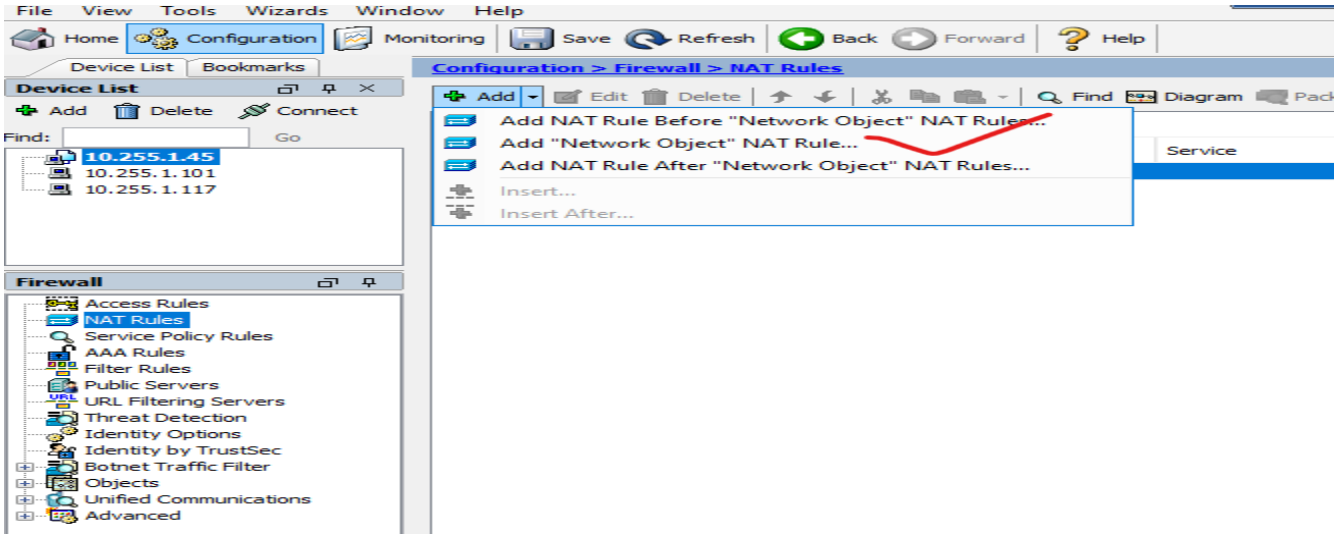
s - static, T - twice, N - net-to-net

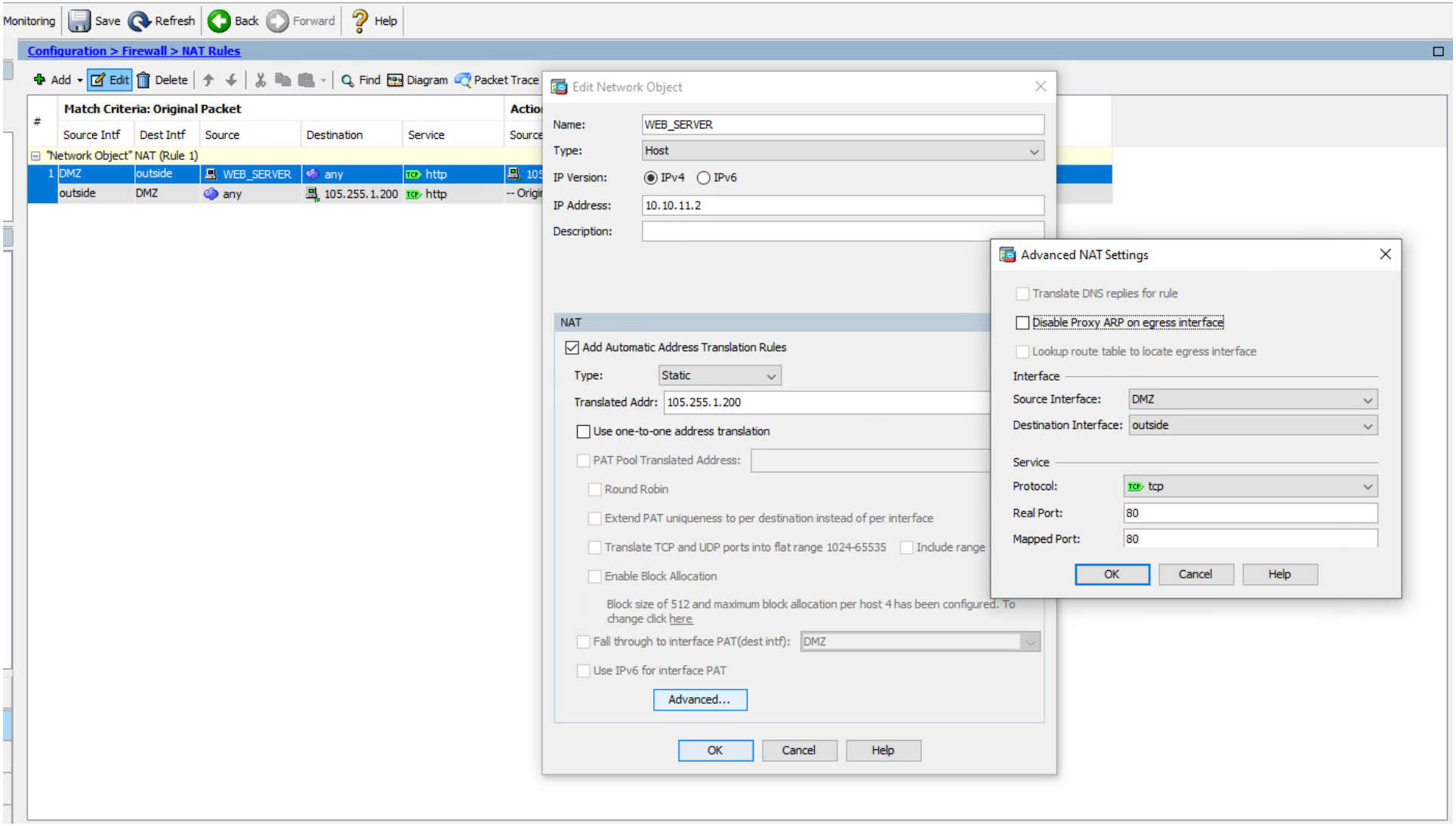
TCP PAT from DMZ: 10.10.11.2 80-80 to outside: 105.255.1.1 80-80

flags sr idle 0:00:18 timeout 0:00:00

Using ASDM to configure same

Step 1; Creating the static Nat port forwarding on port 80 80




Monitoring
Save
Refresh
Back
Forward
Help
Configuration > Firewall > NAT Rules
Add
Edit
Delete
Find
Diagram
Packet Trace
Match Criteria: Original Packet
Source Intf
Dest Intf
Source
Destination
Service
"Network Object" NAT (Rule 1)
1 DMZ outside WEB_SERVER any http
outside DMZ any 105.255.1.200 http
Edit Network Object
Name: WEB_SERVER
Type: Host
IP Version: IPv4 IPv6
IP Address: 10.10.11.2
Description:
NAT
Add Automatic Address Translation Rules
Type: Static
Translated Addr: 105.255.1.200
Use one-to-one address translation
PAT Pool Translated Address:
Round Robin
Extend PAT uniqueness to per destination instead of per interface
Translate TCP and UDP ports into flat range 1024-65535
Include range
Enable Block Allocation
Block size of 512 and maximum block allocation per host 4 has been configured. To change click here
Fall through to interface PAT(dest intf): DMZ
Use IPv6 for interface PAT
Advanced...
OK
Cancel
Help
Advanced NAT Settings
Translate DNS replies for rule
Disable Proxy ARP on egress interface
Lookup route table to locate egress interface
Interface
Source Interface: DMZ
Destination Interface: outside
Service
Protocol: tcp
Real Port: 80
Mapped Port: 80
OK
Cancel
Help

Let generate traffic on the internet

Internet#telnet 105.255.1.200 80
Trying 105.255.1.200, 80 ... Open

Let's take look at the ASA NAT table

```
ciscoasa(config)# show xlate
1 in use, 1 most used
Flags: D - DNS, e - extended, I - identity, i - dynamic, r - portmap,
       s - static, T - twice, N - net-to-net
TCP PAT from DMZ:10.10.11.2 80-80 to outside:105.255.1.200 80-80
    flags sr idle 0:00:17 timeout 0:00:00

ciscoasa(config)# show nat

Auto NAT Policies (Section 2)
1 (DMZ) to (outside) source static WEB_SERVER 105.255.1.200  service tcp www www
    translate_hits = 1, untranslate_hits = 0
ciscoasa(config)# show xlate
1 in use, 1 most used
Flags: D - DNS, e - extended, I - identity, i - dynamic, r - portmap,
       s - static, T - twice, N - net-to-net
TCP PAT from DMZ:10.10.11.2 80-80 to outside:105.255.1.200 80-80
    flags sr idle 0:03:36 timeout 0:00:00

ciscoasa(config)#
```

Introduction Firewall Architecture Design

These are different design topologies where we describe how a customer is connected (using BGP or default route) to one or more ISPs.

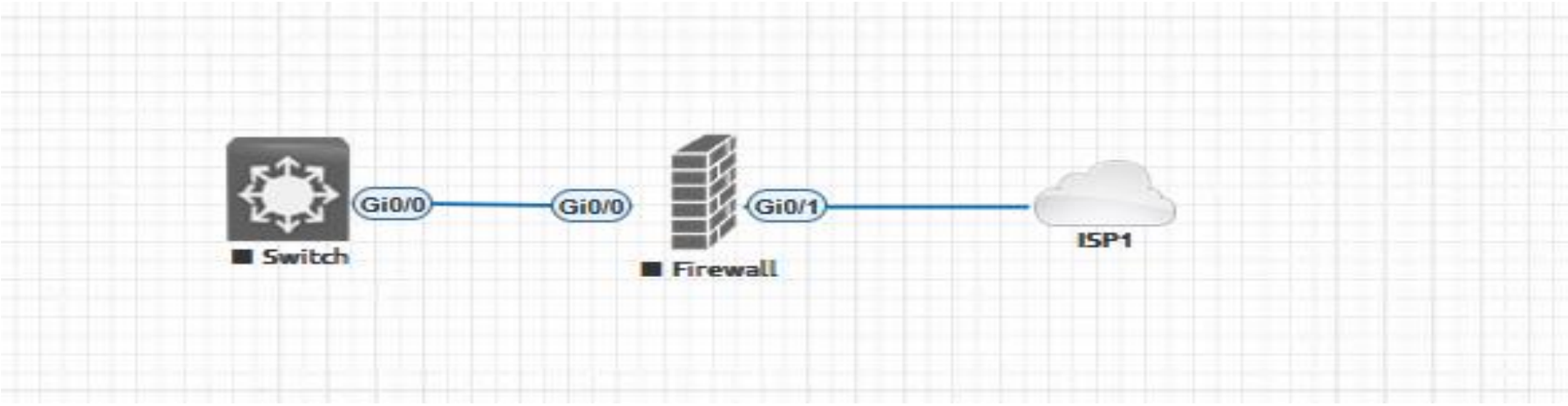
Various ISP Connection Types

- **Single homed**: you are connected to a single ISP using a single link.
- **Dual homed**: you are connected to a single ISP using dual links.
- **Single multi-homed**: you are connected to two ISPs using single links.
- **Dual multi-homed**: you are connected to two ISPs using dual links

Single Homed Architecture

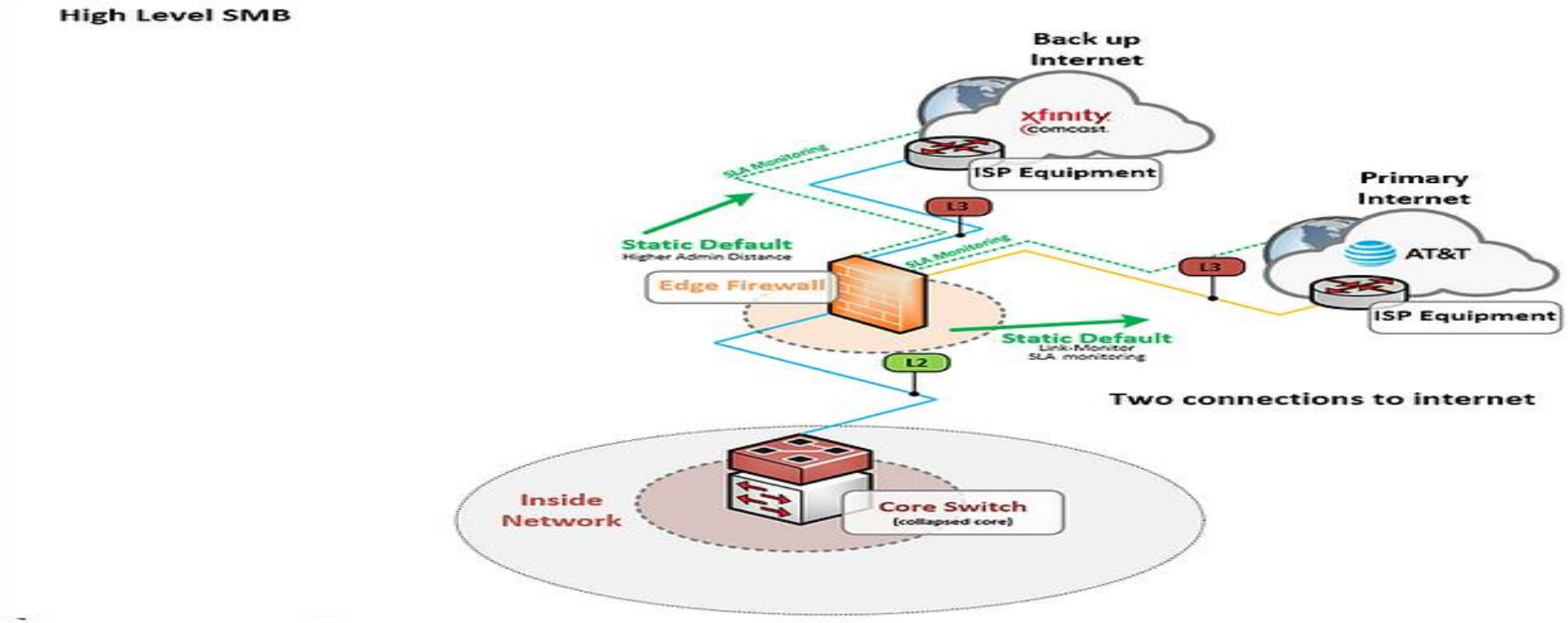
The single homed design means you have a single connection to a single ISP. With this design, you don't need BGP since there is only one exit path in your network. You might as well just use a static default route that points to the ISP.

The advantage of a single-homed link is that it's cost effective, the disadvantage is that you don't have any redundancy. Your link is a single point of failure but so is using a single ISP



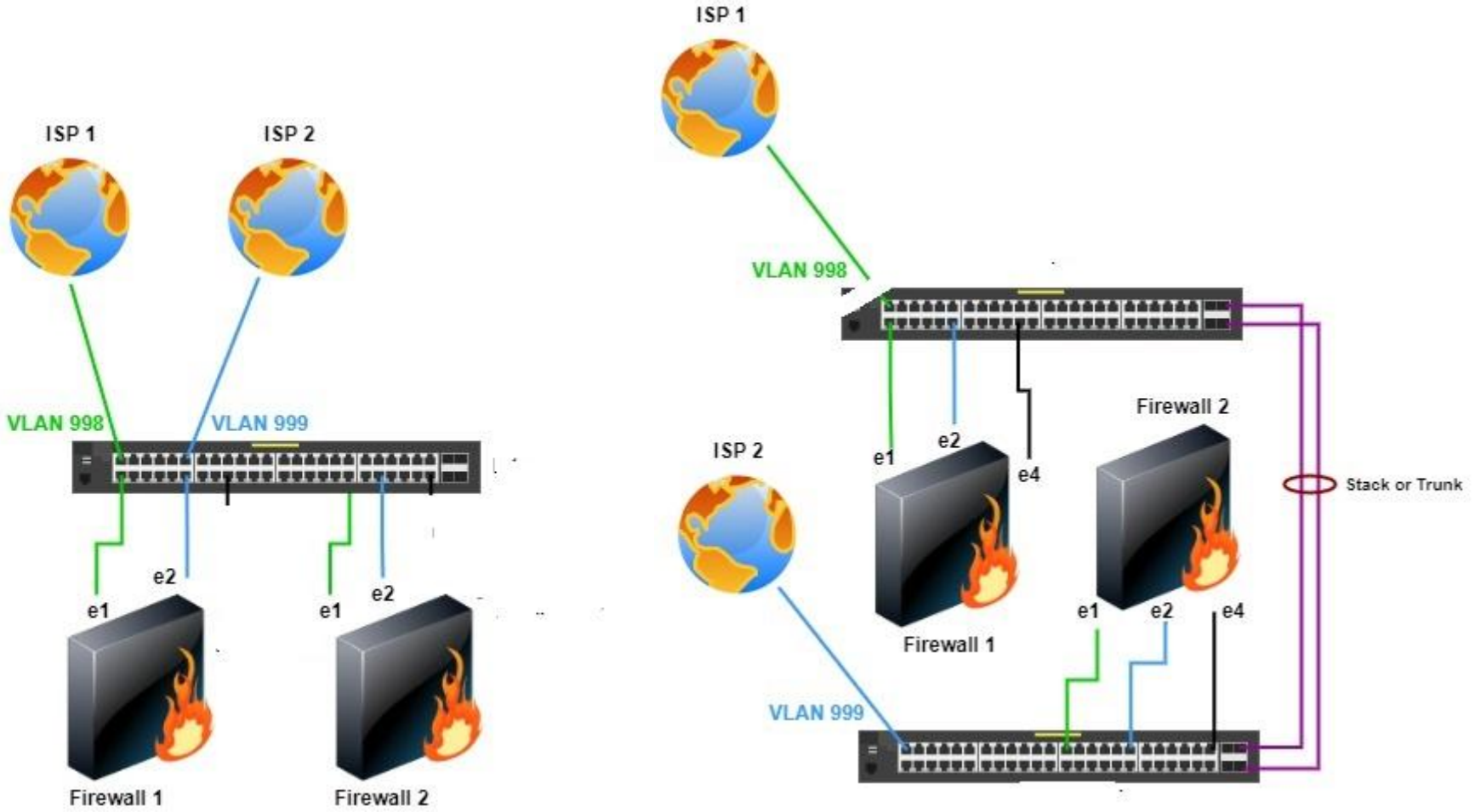
Single Multi-homed Architecture

Multihomed means we are connected to at least two different ISPs. The simplest design looks like this:



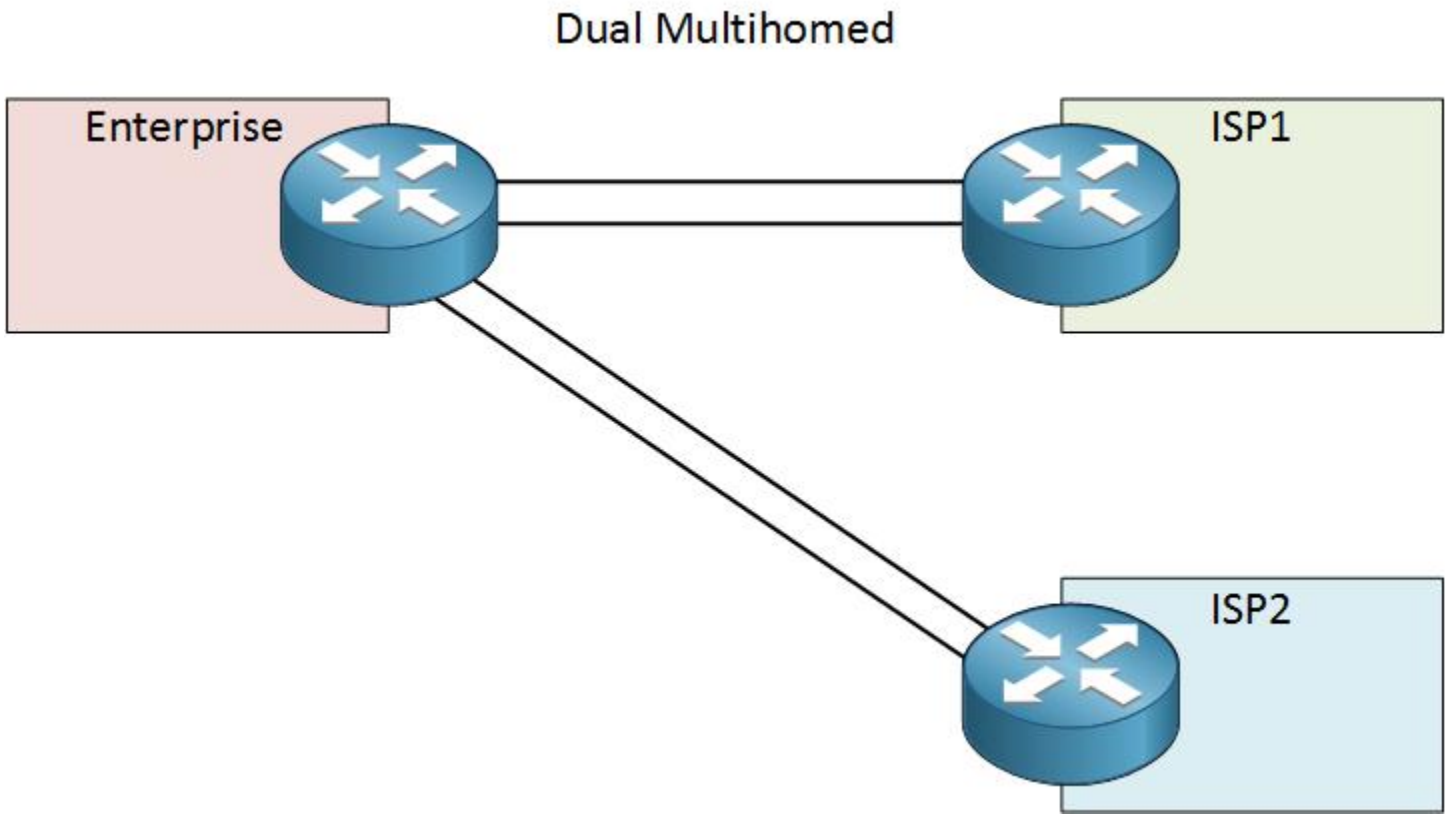
Above you see that we have a single ASA or Router at the customer, connected to two different ISPs. The single point of failure in this design is that you only have one ASA at the customer. When it fails, you won't be able to connect to any ISP.

We can improve this by adding a second ASA shown below, this is a pretty good design, we only use single links, but we are connected to two different ISPs using different routers.

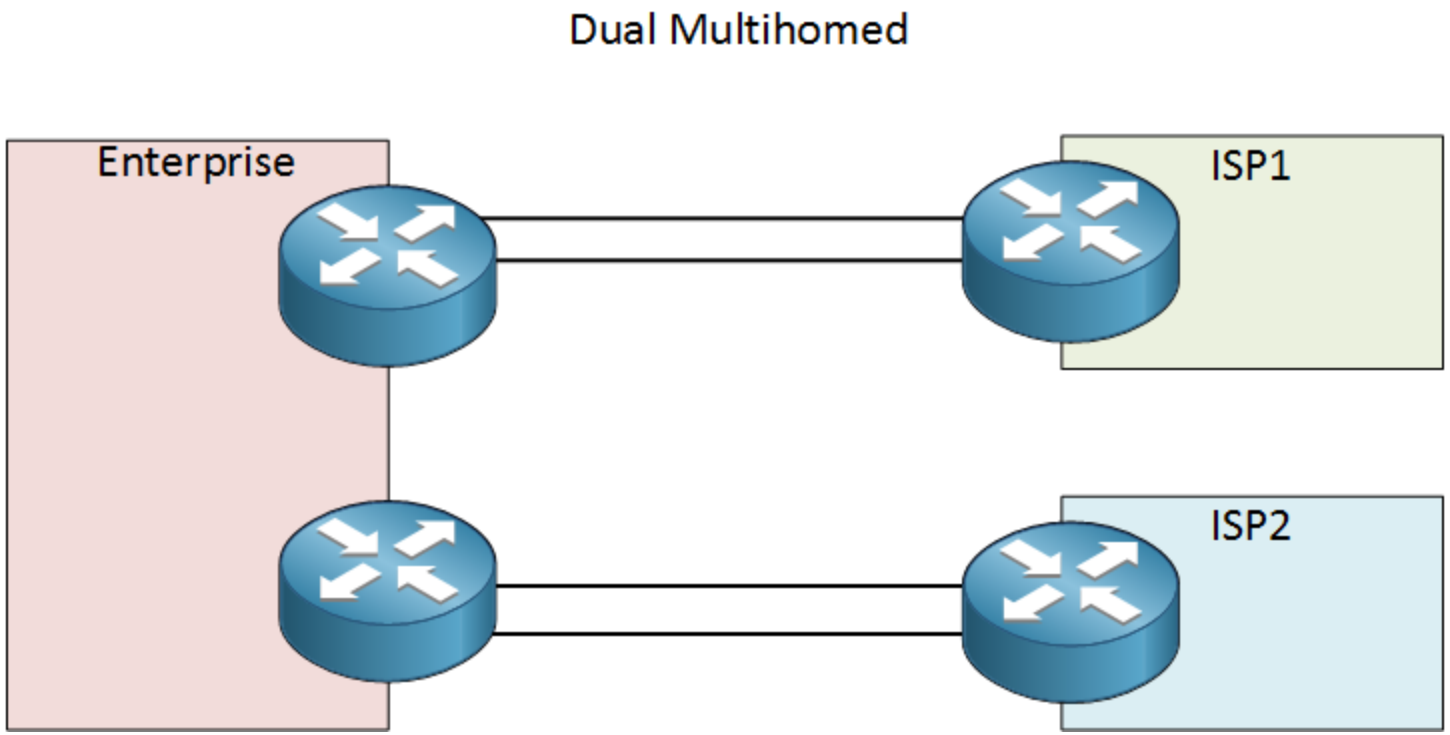


Dual Multihomed

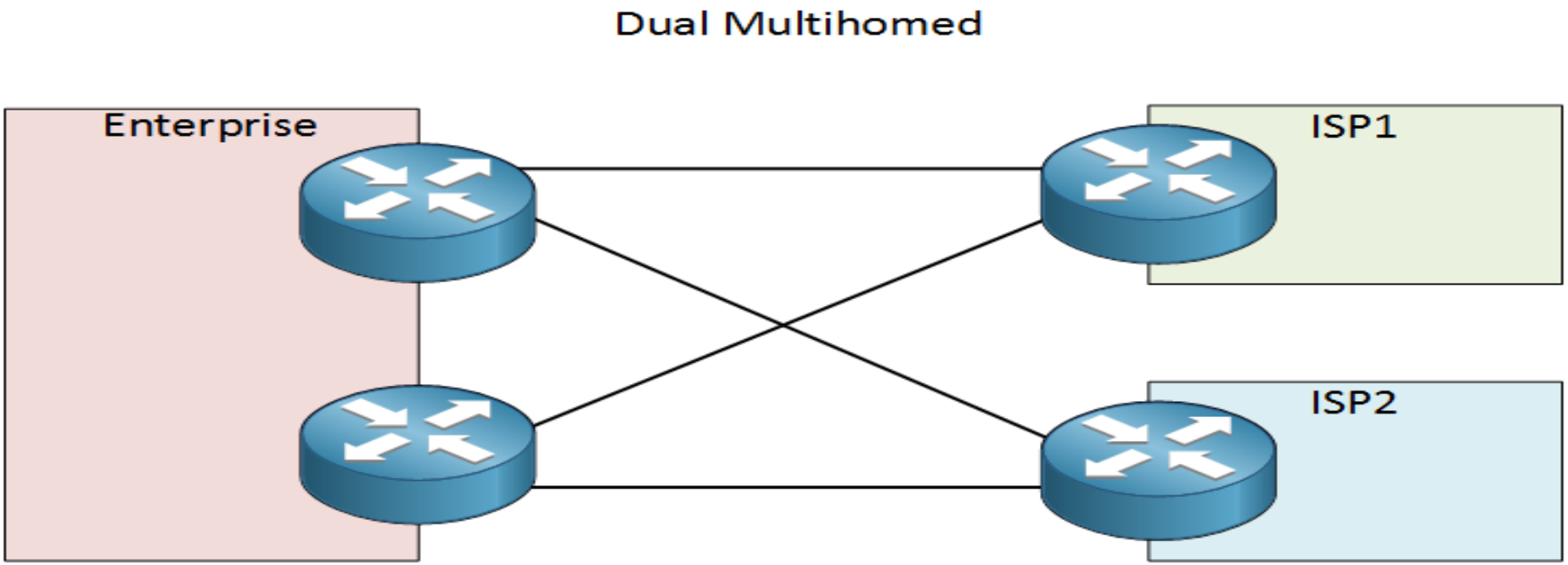
The dual multihomed designs means we are connected to two different ISPs, and we use redundant links. There are some variations, here's the first one



Using one router and two links to each ISP. We have redundant ISPs and links, but the router is still a single point of failure. We can improve this by adding a second router



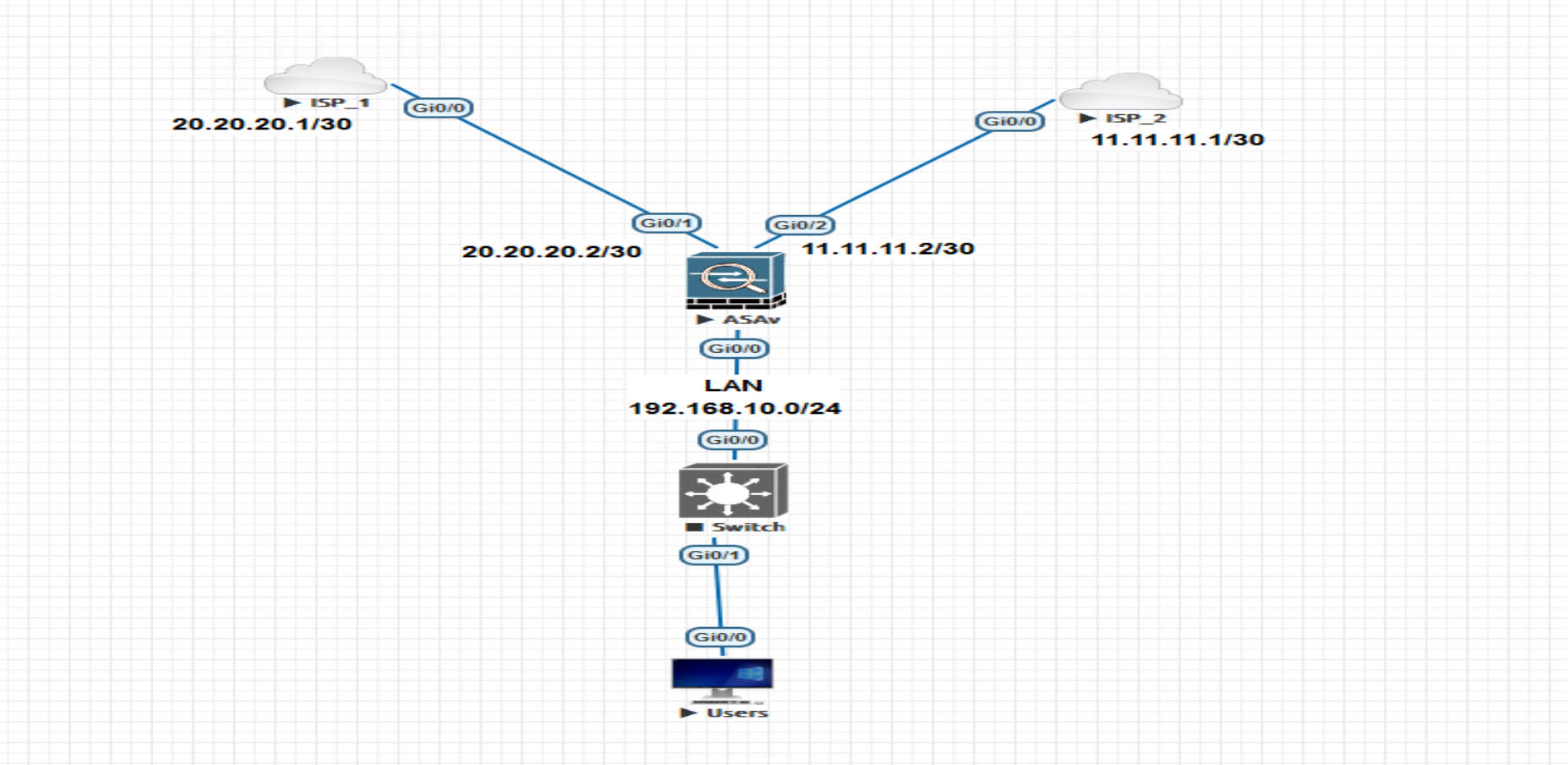
The design above is better; it has two customer routers. One disadvantage, however, is that once one of your router fails, you will lose the connection to one of the ISPs. Using the same number of routers and links, the following design might be better:



This design has redundant ISPs, routers, and links. Both customer routers are connected to both ISPs. This design does offer the highest redundancy but it's also an expensive option.

DUAL WAN ON CISCO ASA

Cisco ASA 5500 series firewall supports now the **Dual-ISP** capability. You can connect two interfaces of the firewall to two different ISPs and use the new "**SLA Monitor**" feature (SLA=Service Level Monitoring) to monitor the link to the primary ISP, and if that fails, the traffic is routed to the Backup ISP.



1. Configure all interfaces required including the one to be use for secondary ISP

```
ciscoasa(config-if)# interface GigabitEthernet0/0
ciscoasa(config-if)#  nameif inside
ciscoasa(config-if)#  security-level 100
ciscoasa(config-if)#  ip address 192.168.10.1 255.255.255.0
ciscoasa(config-if)#  no shut

ciscoasa(config-if)# interface GigabitEthernet0/1
ciscoasa(config-if)#  nameif outside
ciscoasa(config-if)#  security-level 0
ciscoasa(config-if)#  ip address 20.20.20.2 255.255.255.252
ciscoasa(config-if)# no shut
```

ciscoasa(config-if)# interface GigabitEthernet0/2

cocoas(config-if)# nameif outside_backup00

ciscoasa(config-if)# security-level 0

ciscoasa(config-if)# ip address 11.11.11.2 255.255.255.252

cocoasa(config-if)# no shut

2. **Configure the two ISP routers base on the topology and define a default route**

Router(config)#hostname ISP

ISP-1(config)#int g0/0

ISP-1(config-if)#ip add 20.20.20 .1 255.255.255.252

ISP-1(config-if)#no shut

ISP-1(config-if)#int l0

ISP-1(config-if)#ip add 8.8.8.8 255.255.255.255

ISP-1(config-if)#ip route 0.0.0.0 0.0.0.0 20.20.20.2

ISP-1(config)#do ping 20.20.20.2

Typ escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 20.20.20.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 3/4/8 ms

Router(config)#hostname ISP_2

ISP-2(config-if)#ip add 11.11.11.1 255.255.255.252

ISP-2(config-if)#no shut

ISP-2(config-if)#

ISP-2(config-if)#int l0

ISP-2(config-if)#ip add 8.8.8.8 255.255.255.255

ISP-2(config-if)#

ISP-2(config-if)#ip route 0.0.0.0 0.0.0.0 11.11.11.2

ISP-2(config)#do ping 11.11.11.2

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 11.11.11.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 3/4/8 ms

USER1(config)# Hostname USER1

USER1(config)#int g0/0

USER1(config-if)#ip add 192.168.10.2 255.255.255.0

USER1(config-if)#ip route 0.0.0.0 0.0.0.0 192.168.10.1

USER1(config)#do ping 192.168.10.1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 192.168.10.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 10/12/15 ms

3. Enable icmp inspection on the cisco ASA to allow users to ping across the ASA

```
policy-map global_policy
class inspection_default
  inspect icmp
```

USER1(config)#do ping 20.20.20.1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 20.20.20.1, timeout is 2 seconds:

!!!!!

USER1 (config)#do ping 11.11.11.1

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 11.11.11.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 18/22/33

Let's test for 8.8.8.8 that is not supposed to work till we define the Active path

USER1 (config)#do ping 8.8.8.8

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 8.8.8.8, timeout is 2 seconds:

.....

Success rate is 0 percent (0/5)

4. Configure monitoring of the ISP's availability

In order for the firewall **Cisco ASA** to monitor the availability of the primary channel, we need to configure the "**ip sla monitor**" function. It allows to send a ping request (an **ICMP** echo request) to the ISP 1's gateway address at configured time intervals. Receiving a response (**ICMP** echo reply) will mean that the channel is available.

Additional information:

timeout 3000 – is the timeframe within which Cisco ASA will await for an **ICMP** response. **3000** => **3 seconds**
frequency 10 – how often to send the requests. Here is every **10 seconds**

```
ciscoasa(config)# sla monitor 100
ciscoasa (config-sla-monitor)# type echo protocol ipIcmpEcho 20.20.20.1 interface outside
ciscoasa (config-sla-monitor-echo)# timeout 3000
ciscoasa (config-sla-monitor-echo)# frequency 10
ciscoasa (config)# sla monitor schedule 100 life forever start-time now
ciscoasa (config)# track 1 rtr 100 reachability
```

5. Configure the default gateway for the backup ISP

Just like with the primary ISP, the backup ISP needs to have its **default gateway** configured on the **Cisco ASA**, so that the firewall will send all the unknown packets in its direction. The only difference is that this gateway should **only** be used in case the **primary** ISP is unavailable and not clog the routing table in all other cases. To achieve this, we need to change the **administrative distance** of the route – make it bigger, thus **lowering** the priority of this route. By default, all static routes have an administrative distance of **1**. We will configure an administrative distance of **254** for our **backup** channel, bringing it closer to the highest possible value

ciscoasa(config-if)# route outside 0.0.0.0 0.0.0.0 20.20.20.1 1 track 1

ciscoasa(config)# route outside_backup 0.0.0.0 0.0.0.0 11.11.11.1 254

6. Checking the IP SLA monitoring function state

ciscoasa(config)# **show sla monitor operational-state**

Entry number: 100

Modification time: 21:14:48.683 UTC Mon Sep 23 2024

Number of Octets Used by this Entry: 1456

Number of operations attempted: 30

Number of operations skipped: 0

Current seconds left in Life: Forever

Operational state of entry: Active

Last time this entry was reset: Never

Connection loss occurred: FALSE

Timeout occurred: TRUE

Over thresholds occurred: FALSE

Latest RTT (milliseconds): NoConnection/Busy/Timeout

Latest operation start time: 01:49:18.706 UTC Tue Sep 24 2024

Latest operation return code: Timeout

7. Test to see it the users can access the internet

USER1#ping 8.8.8.8

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 8.8.8.8, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 15/20/29 ms

8. Do a ping test on a user and disable the primary connections and see if the packet will drop

USER1#ping 8.8.8.8 re 1000

User1#ping 8.8.8.8

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 8.8.8.8, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 20/22/25 ms

User1#ping 8.8.8.8 re 1000

Type escape sequence to abort.

Sending 1000, 100-byte ICMP Echos to 8.8.8.8, timeout is 2 seconds:

!!!

!!!

!!!

!!!!!!!!!!!!!!!!!......!!!

!!

!!

Success rate is 99 percent (994/1000), round-trip min/avg/max = 6/18/55 ms

NB: when shut the on ISP we had just a few drop

Cisco ASA Policy Based Routing (PBR) with Dual ISP

Policy Based Routing (PBR) is a feature that has been supported on Cisco Routers for ages. However, Cisco ASA firewalls didn't support this until version 9.4.1 and later. **Policy-based routing** (**PBR**) is a technique used to make routing decisions based on policies set by the network administrator.

When a router receives a packet it normally decides where to forward it based on the destination address in the packet, which is then used to look up an entry in a routing table. However, in some cases, there may be a need to forward the packet based on other criteria

PBR allows routing to be performed based on criteria other than destination IP address. The traditional form of routing (which is used by default on any routing device) is based on the destination IP address of the packet.

With PBR, the network device can make routing decisions based on various other criteria such as source IP address, source port, protocol, destination port etc. and also combination of these.

This means for example that a routing device can receive a packet and look at its source IP address (instead of destination) and route the packet according to its PBR policy.

Many Enterprises utilize two ISP connections for redundancy and for bandwidth efficiency reasons.

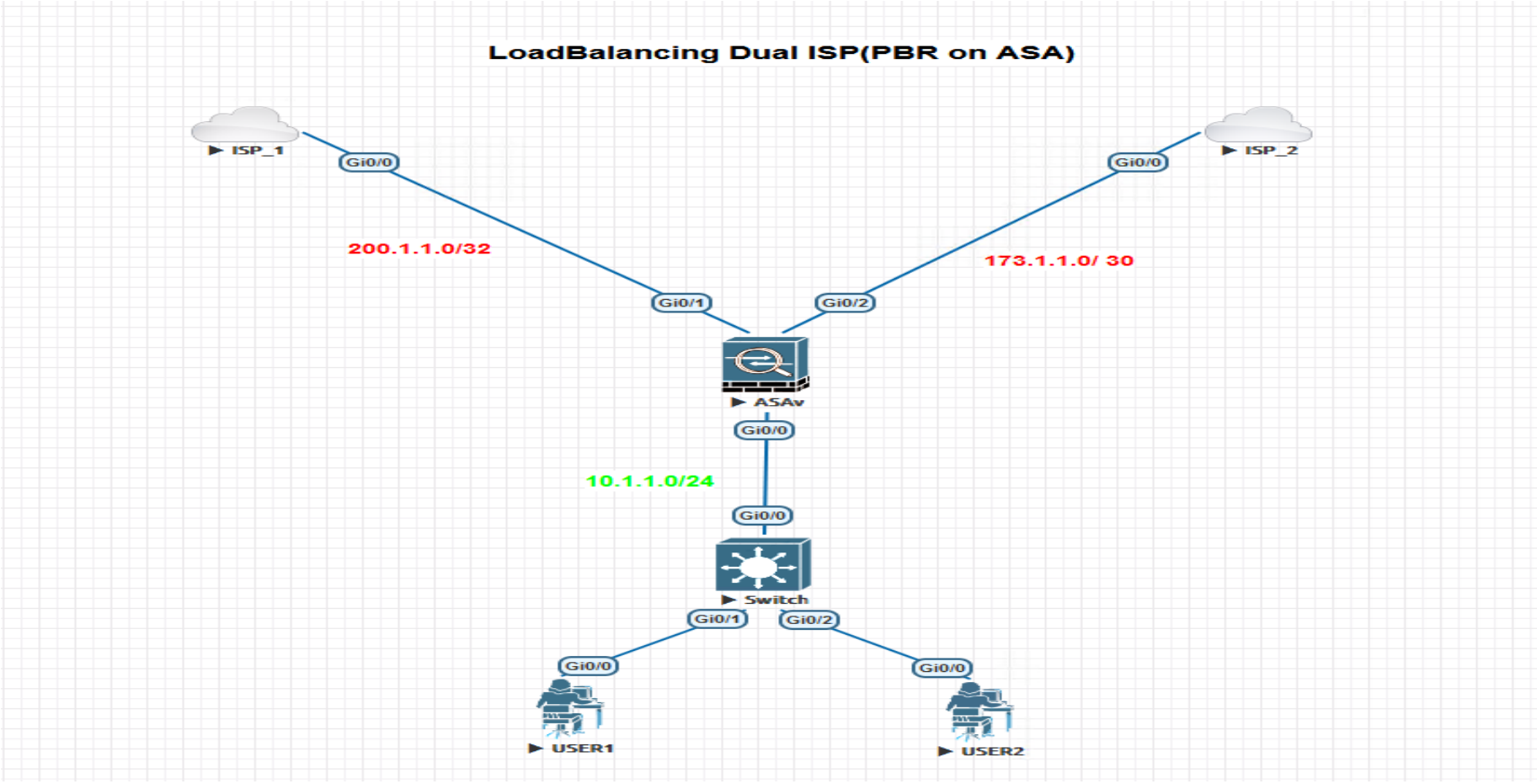
One popular scenario therefore is to route some traffic to ISP1 and some other traffic to ISP2. For example, you can route all Web traffic (HTTP, HTTPs) through ISP1 and all other traffic through ISP2.

Another example could be to route traffic originating from the Engineering department via ISP1 and traffic originating from the Accounting department to go through ISP2.

Policy Based Routing According to the Destination Protocol

Many Enterprises utilize two ISP connections for redundancy and for bandwidth efficiency reasons.

One popular scenario therefore is to route some traffic to ISP1 and some other traffic to ISP2. For example, you can route all Web traffic (HTTP, HTTPs) through ISP1 and all other traffic through ISP2.



Project Task: The requirement is to route Web traffic (HTTP port 80 and HTTPs port 443) via ISP01 and all the other Internet traffic via ISP02.

Step1. First configure the interfaces

ciscoasa(config)# int g0/0

ciscoasa(config-if)# des link to LAN

ciscoasa(config-if)# nameif inside

INFO: Security level for "inside" set to 100 by default.

ciscoasa(config-if)# security-level 100

ciscoasa(config-if)# ip add 10.1.1.1 255.255.255.0

ciscoasa(config-if)# no shut

ciscoasa(config-if)# int g0/1

ciscoasa(config-if)# des link to ISP_1

INFO: Security level for "ISP01" set to 0 by default.

ciscoasa(config-if)# security-level 0

ciscoasa(config-if)# ip add 200.1.1.2 255.255.255.252

ciscoasa(config-if)# no shut

ciscoasa(config-if)# int g0/2

ciscoasa(config-if)# nameif ISP02

INFO: Security level for "ISP02" set to 0 by default.

ciscoasa(config-if)# security-level 0

ciscoasa(config-if)# ip add 173.1.1.2 255.255.255.252

ciscoasa(config-if)# no shut

Step2. Configure both ISPs with the following

Router(config)#hostname ISP_1

ISP_1(config)#

ISP_1(config)#int g0/0

ISP_1(config-if)#ip add 200.1.1.1 255.255.255.252

ISP_1(config-if)#no shut

ISP_1(config)#ip route 0.0.0.0 0.0.0.0 200.1.1.2

ISP_1(config)#ip http server

ISP_1(config)#ip http secure-server

ISP_1(config)#do ping 200.1.1.2

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 200.1.1.2, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 3/8/23 ms

Router(config)#hostname ISP_2

ISP_2(config)#int g0/0

ISP_2(config-if)#ip add 173.1.1.1 255.255.255.252

ISP_2(config-if)#no shut

ISP_2(config)#ip route 0.0.0.0 0.0.0.0 173.1.1.2

ISP_2(config)#ip dns server

ISP_2(config-if)#line vty 0 4

ISP_2(config-line)#pass cisco

ISP_2(config-line)#transport input telnet

ISP_2(config-line)#login local

Router(config)#hostname USER1

USER1(config)#int g0/0

USER1(config-if)#ip add 10.1.1.2 255.255.255.0

USER1(config-if)#no shut

USER1(config-if)#ip route 0.0.0.0 0.0.0.0 10.1.1.1

USER1(config)#do ping 10.1.1.1

Sending 5, 100-byte ICMP Echos to 10.1.1.1, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 8/12/18 ms

USER2(config)#int g0/0

USER2(config-if)#ip add 10.1.1.3 255.255.255.0

USER2(config-if)#no shut

USER2(config-if)#ip route 0.0.0.0 0.0.0.0 10.1.1.1

USER2(config)#do ping 10.1.1.1

Sending 5, 100-byte ICMP Echos to 10.1.1.1, timeout is 2 seconds:

!!!!!

Step.3 : Define a default route on the ASA with http and https traffic via ISP01 using a AD 50 and all other traffic to ISP02 with AD of 1

Cocoasa (config-if) # route ISP01 0 0 200.1.1.1 50

Ciscoasa(config) # route ISP02 0 0 173.1.1.1 1

ciscoasa(config)# show route

Gateway of last resort is 173.1.1.1 to network 0.0.0.0

S* 0.0.0.0 0.0.0.0 [1/0] via 173.1.1.1, ISP02

C 10.1.1.0 255.255.255.0 is directly connected, inside

L 10.1.1.1 255.255.255.255 is directly connected, inside

C 173.1.1.0 255.255.255.252 is directly connected, ISP02

L 173.1.1.2 255.255.255.255 is directly connected, ISP02

C 200.1.1.0 255.255.255.252 is directly connected, ISP01

L 200.1.1.2 255.255.255.255 is directly connected, ISP01

Step 4 Configure NAT rules (PAT) using the corresponding outgoing interface of the ASA for traffic going from “inside” to “ISP01” and also for “inside” to “ISP02”.

ciscoasa(config**)# nat (inside,ISP01) 1 source dynamic any interface**

ciscoasa(config**)# nat (inside,ISP02) 2 source dynamic any interface**

ciscoasa(config)# sho nat de

Manual NAT Policies (Section 1)

1 (inside) to (ISP01) source dynamic any interface

translate_hits = 0, untranslate_hits = 0

Source - Origin: 0.0.0.0/0, Translated: 200.1.1.2/30

2 (inside) to (ISP02) source dynamic any interface

translate_hits = 0, untranslate_hits = 0

Source - Origin: 0.0.0.0/0, Translated: 173.1.1.2/30

Step 5 Create an Access Control List (ACL) which will match the traffic that we want to be handled by our PBR policy.

create an object group for ports 80,443

ciscoasa(config)# object-group service WEB-ports tcp

ciscoasa(config-service-object-group)# port-object eq 443

ciscoasa(config-service-object-group)# port-object eq 80

ciscoasa(config)# access-list PBR_ACL extended permit tcp any any object-group WEB-ports

The ACL above matches traffic from any inside network having destination ports of 80 and 443

Step 6 we need to create a route-map which will match the traffic in ACL created above and then apply a routing policy to this traffic flow.

ciscoasa(config)# route-map PBR permit 2

match ip address PBR_ACL **(match the traffic identified in ACL created above)**

ciscoasa(config-route-map)# set ip next-hop 200.1.1.1 (set the next hop of the traffic to be ISP01)

ciscoasa(config)# show route-map

route-map PBR, permit, sequence 2

Match clauses:

ip address (access-lists): PBR_ACL

Set clauses:

ip next-hop 200.1.1.1

Step 7. Apply the PBR policy to the "Ingress" interface that we want to enforce this routing policy

ciscoasa(config-route-map)# int g0/0

ciscoasa(config-if)# policy-route route-map PBR (**apply the PBR policy to this interface)**

ciscoasa(config-if)# show run int g0/0

interface GigabitEthernet0/0

nameif inside

security-level 100

ip address 10.1.1.1 255.255.255.0

policy-route route-map PBR

Let generate traffic to test connection

USER!**#telnet 8.8.8.8 443**
Trying 8.8.8.8, 443 ... Open

USER!**#telnet 8.8.8.8 80**
Trying 8.8.8.8, 80 ... Open

Test Connection using Packet-TRACER

ciscoasa(config-if)# packet-tracer input inside tcp 10.1.1.2 1 8.8.8.8 443

Result:

input-interface: inside

input-status: up

input-line-status: up

output-interface: ISP01

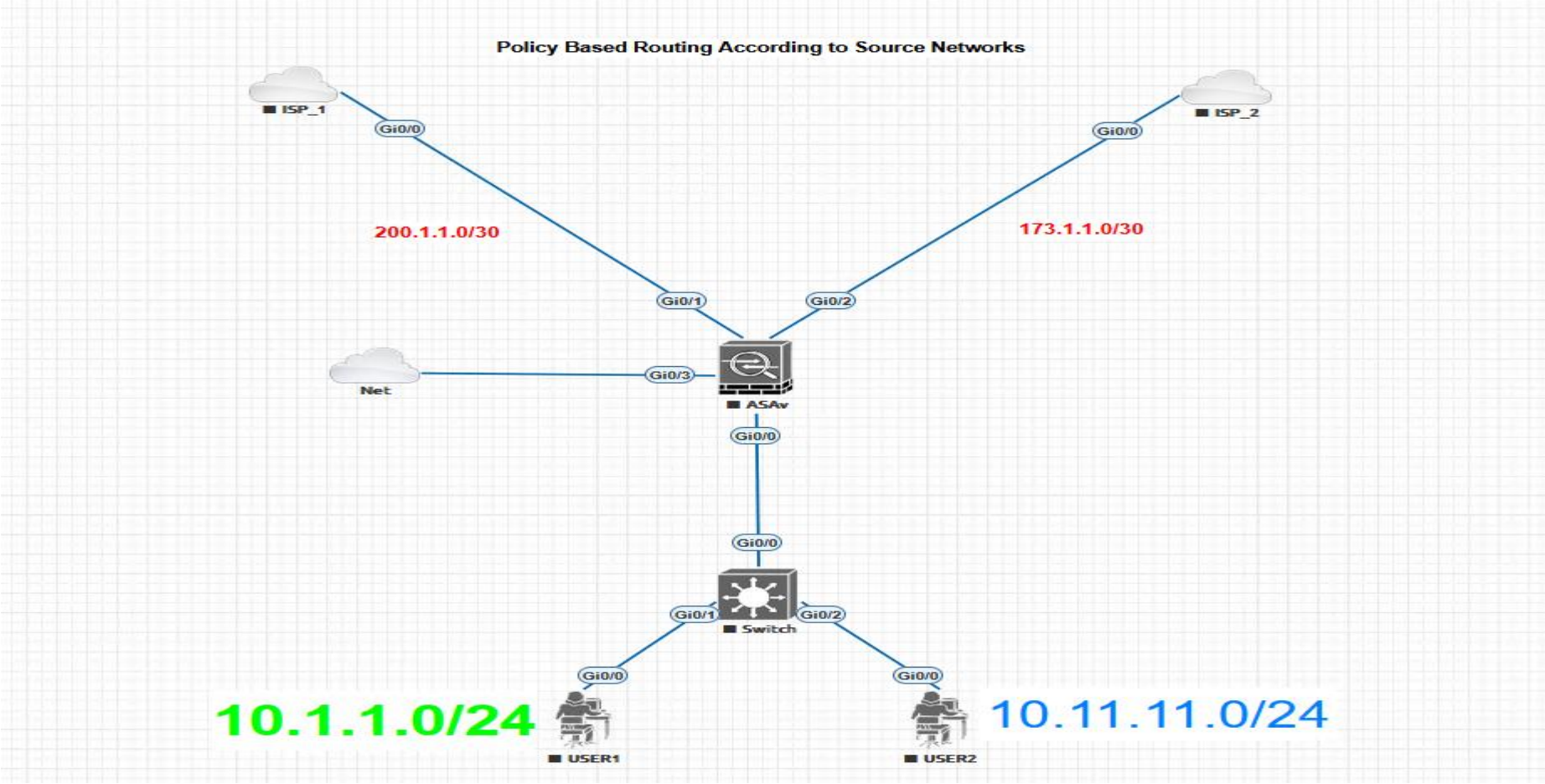
output-status: up

output-line-status: up

Action: allow

Policy Based Routing According to Source Networks

Another example could be to route traffic originating from the Engineering department via ISP1 and traffic originating from the Accounting department to go through ISP2.



Project Task: The requirement is to route traffic originating from the Engineering department via ISP1 and traffic originating from the Accounting department to go through ISP2

Step1.Create the interface for the LAN1 and LAN2

ciscoasa(config)# interface GigabitEthernet0/0

ciscoasa(config-if)# no nameif

ciscoasa(config-if)# no security-level

ciscoasa(config-if)# no ip address

ciscoasa(config-if)# do show run no shut

ciscoasa(config-if)# interface GigabitEthernet0/0.100

ciscoasa(config-subif)# vlan 100

ciscoasa(config-subif)# nameif LAN1

ciscoasa(config-subif)# security-level 100

ciscoasa(config-subif)# ip address 10.1.1.1 255.255.255.0

ciscoasa(config-subif)# interface GigabitEthernet0/0.200

ciscoasa(config-subif)# vlan 200

ciscoasa(config-subif)# nameif LAN2

ciscoasa(config-subif)# security-level 100

ciscoasa(config-subif)# ip address 10.11.11.1 255.255.255.0

Step.2 Create an Access Control List (ACL) which will match the traffic that we want to be handled by our PBR policy.

ciscoasa(config)#access-list PBR_ACL1 extended permit ip 10.1.1.0 255.255.255.0 any

ciscoasa(config)#access-list PBR_ACL2 extended permit ip 10.11.11.0 255.255.255.0 any

Step-3 we'll configure the route-map which will match the traffic in ACLs created above and then apply a routing policy to the traffic flows.

route-map PBR permit 2 **create the route-map and give it a name "PBR"**

match ip address PBR_ACL1**<– match the traffic of LAN1 identified in ACL1 created**

set ip next-hop 200.1.1.1**<– set the next hop of LAN1 traffic to be ISP1**

route-map PBR permit 3**<– create another entry in the same route-map**

match ip address PBR_ACL2**<– match the traffic of LAN2 identified in ACL2 created**

set ip next-hop 173.1.1.1**<– set the next hop of LAN2 traffic to be ISP2**

Step.4 **Apply the PBR policy to the "Ingress" interfaces that we want to enforce this routing policy. In our case we will apply the same policy to both internal networks (LAN1, LAN2)**

interface GigabitEthernet0/0.100

policy-route route-map PBR

interface GigabitEthernet0/0.200

policy-route route-map PBR

Step-5 Again, we need to take care of NAT since we must translate the private internal IP networks to public IP address in order to access the Internet.

nat (LAN1,ISP01) source dynamic any interface

nat (LAN2,ISP02) source dynamic any interface

lets verify

packet-tracer input LAN2 tcp 10.11.11.3 80 8.8.8.8 80

Phase: 1

Type: PBR-LOOKUP

Subtype: policy-route

Result: ALLOW

Config:

route-map PBR permit 3

match ip address PBR_ACL2

set ip next-hop 173.1.1.1

Additional Information:

Matched route-map PBR, sequence 3, permit

Found next-hop 173.1.1.1 using egress ifc ISP02

Phase: 2

Type: NAT

Subtype:

Result: ALLOW

Config:

nat (LAN2,ISP02) source dynamic any interface

Additional Information:

Dynamic translate 10.11.11.3/80 to 173.1.1.2/8

Result:

output-interface: ISP02

output-status: up

output-line-status: up

Action: allow

ciscoasa(config)# packet-tracer input LAN1 tcp 10.1.1.3 1 8.8.8.8 80

Phase: 1

Type: PBR-LOOKUP

Subtype: policy-route

Result: ALLOW

Config:

route-map PBR permit 2

 match ip address PBR_ACL1

set ip next-hop 200.1.1.1

Additional Information:

 Matched route-map PBR, sequence 2, permit

 Found next-hop 200.1.1.1 using egress ifc ISP01

Phase: 2

Type: NAT

Subtype:

Result: ALLOW

Config:

nat (LAN1,ISP01) source dynamic any interface

Additional Information:

Dynamic translate 10.1.1.3/1 to 200.1.1.2/1

Result:

output-interface: ISP01

output-status: up

output-line-status: up

Action: allow

Firewall redundancy

Using just a single ASA is a single point of failure and usually catastrophically reflects in the network when the device experiences common setbacks such as hardware issues, link/cable problems, or just a simple misconfiguration.

Therefore, using a second ASA to the primary one will provide a backup solution in case something goes wrong with the active unit

Overall, the deployment of multiple firewalls offers a variety of benefits, ranging from greater performance to enhanced security. If your security environment warrants this type of scenario, it's definitely an option worth considering.

There are 3 common Firewall redundancy designs generally practice in the industries.

Common Deployment scenarios

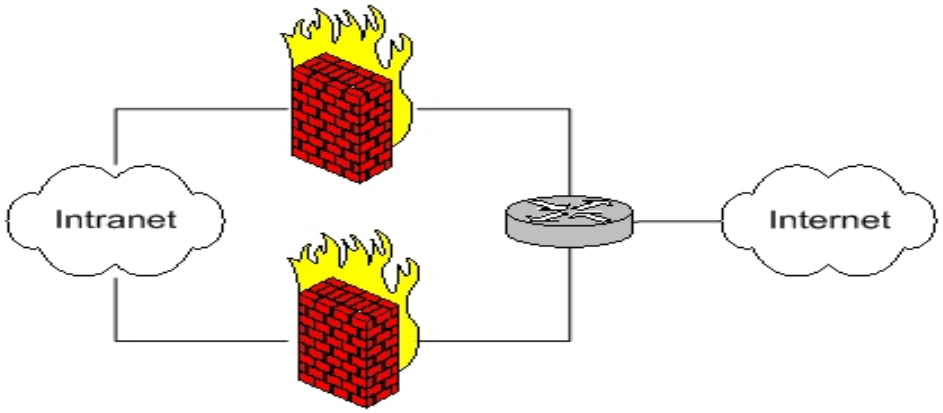
1. Fault tolerance and load balancing

2. Enhanced perimeter protection
3. Protected subnets Redundancy firewall Design

Deployment scenarios and benefits

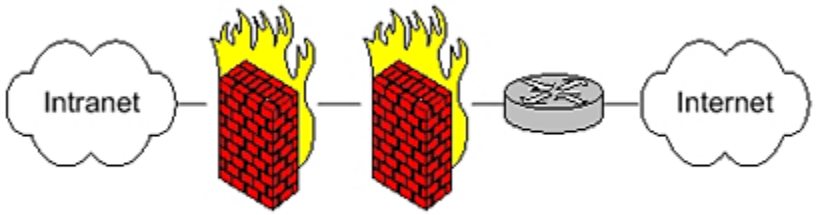
1. Fault tolerance and load balancing Redundancy Firewall Design

Many organizations choose to implement dual firewalls in a parallel fashion, as shown in the figure below. When the router is properly configured, this provides the added benefits of fault tolerance and load balancing. Both firewalls should be configured to "fail-safe," that is, in the event of a failure, they should automatically block all traffic. When configured in this fashion, the firewalls provide fault tolerance; when one fails, the other is able to carry the network traffic and keep the failure transparent to users.



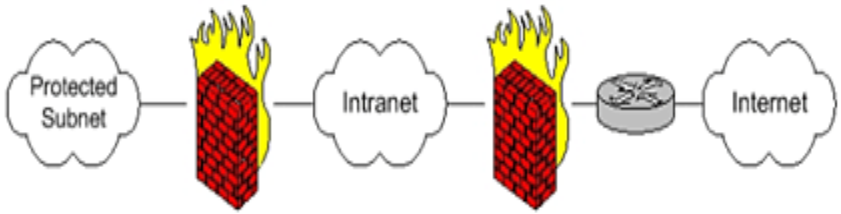
2. **Enhanced perimeter protection Redundancy Firewall design**

It's also possible to deploy the two firewalls in a series circuit, as shown in the illustration below. When configured in this fashion, all traffic passing into or out of the network must pass through both firewalls. This setup is sometimes deployed in high-security environments to protect against firewall-specific vulnerabilities. In this case, the two firewalls are from different vendors and may even run on different operating systems.



3. Protected subnets Redundancy firewall Design

The final scenario we'll discuss is shown in the figure below. In this case, secondary firewall(s) are used to protect subnets of the internal network that have greater security requirements than the network as a whole. This type of scenario may be used, for example, to provide an accounting department added protection for sensitive financial data they wish to protect from other internal users.



ASA Failover

ASA failover refers to the capability of Cisco Adaptive Security Appliances (ASAs) to automatically switch to a backup unit in the event of a primary unit failure. It creates a seamless transition, maintaining network connectivity without any noticeable interruption. ASA failover operates in Active/Standby and Active/Active modes.

Cisco ASA Failover Modes

ASA supports two failover modes, Active/Active failover and Active/Standby failover.

In **Active/Standby** failover, one device functions as the **Active Unit** and passes the traffic. The second**Standby Unit**does not actively pass traffic. When a failover occurs, the Standby unit assumes the active role and starts passing the traffic.

In an **Active/Active** failover **both** ASAs can pass traffic. Please note that Active/Active failover is **only** available to ASAs in **multiple context models**. In Active/Active failover, you divide the security contexts on the ASA into 2 failover groups. A failover group is simply a logical group of one or more security contexts. One group is assigned to be Active on the primary ASA, and the other group is assigned to be active on the Secondary ASA. When a failover occurs, it occurs at the failover group level

Failover Types

Within these two different failover modes, there are also two different failover types: stateless and stateful.

When using **stateless failover,** if a failover should need to occur, all active connections will be dropped and will have to be reestablished to continue communications.

When using **stateful failover**, connection state information is exchanged between the failover partners (or groups). If a failover should need to occur, the active connections (that are supported) can be seamlessly transferred and will not need to be reestablished.

Failover Triggers

Failover can be triggered at the unit level if one of the following events occurs:

- The unit has a hardware failure.
- The unit has a power failure.
- The unit has a software failure.

ASA Failover Requirement

If you want to use failover, you must meet the following requirements:

Hardware:

- ASA failover platform must be the same model.For example, 2x ASA 5510 or 2x ASA 5522.
- ASA failover platform must have the same number and types of interfaces.
- ASA failover platform must have the same modules installed (if any are to be installed).
- ASA failover platform must have the same amount of RAM installed (it is also preferred if the Flash sizes are the same as well).

Software:

- Both ASA failover platform must be using the same firewall mode (routed or transparent).
- Both ASA failover platform must be using the same context mode (single or multiple).
- Both ASA failover platform must be using the same major and minor software version (there are exceptions during upgrade).
- Both ASA failover platform must use the same AnyConnect images.

The failover mechanism is stateful which means that the active ASA sends all stateful connection information state to the standby ASA. This includes TCP/UDP states, NAT translation tables, ARP table, VPN information and more.

Benefits of Cisco ASA Failover

ASA Failover offers numerous benefits for businesses.

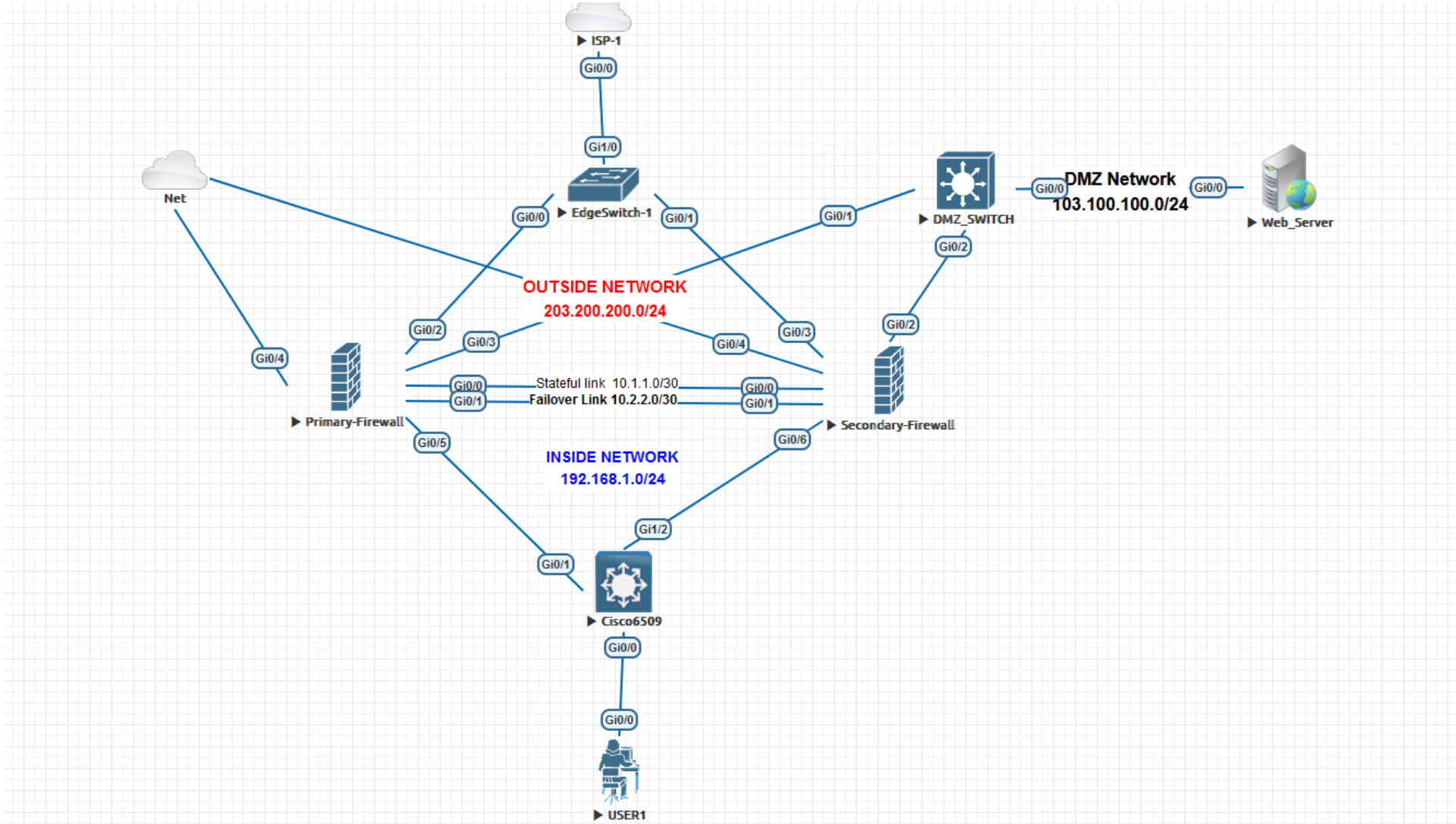
Enhanced Network Uptime: Organizations can achieve uninterrupted network connectivity with Cisco ASA failover. In the event of a primary unit failure, the secondary unit seamlessly takes over, ensuring minimal disruption to network operations.

ASA Failover enhances security by providing seamless failover for security policies, preventing potential vulnerabilities during critical moments

Load Balancing: Cisco ASA failover enables load balancing, distributing incoming network traffic across multiple units. This optimizes resource utilization and prevents any single unit from becoming overloaded.

Improved Scalability: Failover setup allows for easy scalability, as additional units can be added to the configuration. This helps accommodate growing network demands without compromising on security or performance.

Active/Standby ASA Firewall Project



Active Unit Configuration:

Note: Always start with the active ASA first.

Step-1 Assign IP address to outside interface. During Failover the primary IP address will be assigned to Standby Unit

PrimaryFW(config-if)# int g0/2

PrimaryFW(config-if)# des to ISP

PrimaryFW(config-if)# nameif outside

PrimaryFW(config-if)# security-level 0

PrimaryFW(config-if)# ip add 203.200.200.1 255.255.255.0 standby 203.200.200.2

Step-2Assign IP address to inside interface. During Failover the primary IP address will be assigned to Standby Unit

PrimaryFW(config-if)# int g0/5

PrimaryFW(config-if)# des to CoreSwitch

PrimaryFW(config-if)# nameif inside

PrimaryFW(config-if)# security-level 100

PrimaryFW(config-if)# ip add 192.168.1.1 255.255.255.0 standby 192.168.1.2

Step-3Assign IP address to DMZ interface. During Failover the primary IP address will be assigned to Standby Unit

PrimaryFW(config-if)# int g0/3

des link to DMZ

nameif DMZ

ip add 103.100.100.1 255.255.255.0 standby 103.100.100.2

no shut

Step-4 Configure routing protocol to allow users to communicate to the ISP

route outside 0.0.0.0 0.0.0.0 203.200.200.3

router eigrp 10

network 192.168.1.0 255.255.255.0

network 103.100.100.0 255.255.255.0

redistribute static

USER#ping 8.8.8.8

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 8.8.8.8, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 15/17/19 ms

USER#ping 103.100.100.3

Type escape sequence to abort.

Sending 5, 100-byte ICMP Echos to 103.100.100.3, timeout is 2 seconds:

!!!!!

Success rate is 100 percent (5/5), round-trip min/avg/max = 13/15/21 ms

Step-5Set ASA1 as primary unit

PrimaryFW(config-if)# failover lan unit primary

Step-6 Define Failover Interface.

NB: used to determine the operating status of each unit, as well as to replicate and synchronize any configuration between both units in the pair.

In order to accomplish this, a dedicated Ethernet interface must be used on each Cisco ASA, which will be used exclusively for passing failover information. The connection between these interfaces on the ASAs can either be a direct link or through a switch.

PrimaryFW(config-if)# failover lan interface FAILOVER-LINK G0/1

INFO: Non-failover interface config is cleared on GigabitEthernet0/1 and its sub-interfaces

Step-7Assign IP address to Failover Interfaces

PrimaryFW(config-if)# failover interface ip FAILOVER-LINK 10.2.2.1 255.255.255.252 standby 10.2.2.2

Step-8 Define stateful Failover interface

NB: Without this data, anytime a failover happens, all end-user applications must re-establish connections and there will be an interruption from the client's point of view. The stateful failover interface can either be a dedicated interface or shared with any other interface including the LAN failover interface .

Some of the information exchanged over the stateful failover link is:

- Network Address Translation (NAT) table
- Address Resolution Protocol (ARP) table
- TCP connection table
- UDP connection table
- HTTP connection table
- MAC address table

PrimaryFW(config-if)# failover link Stateful-link G0/0

INFO: Non-failover interface config is cleared on GigabitEthernet0/0 and its subs-interfaces

Step-9 Assign IP addresses to Stateful Failover interfaces

PrimaryFW(config-if)# failover interface ip stateful-link 10.1.1.1 255.255.255.252 standby 10.1.1.2

Step-10 Enable Failover

PrimaryFW(config-if)# failover

Note: Issue the failover command on the primary device first, and then issue it on the secondary device. After you issue the failover command on the secondary device, the secondary device immediately pulls the configuration from the primary device and sets itself as standby.

The primary ASA stays up and passes traffic normally and marks itself as the active device. From that point on, whenever a failure occurs on the active device, the standby device comes up as active.

Step-11 Enable the interfaces for Failover and State Link

PrimaryFW(config-if)# int g0/0

PrimaryFW(config-if)# no shut

PrimaryFW(config-if)# int g0/1

Lets verify what is configured

PrimaryFW(config-if)# show run failover

failover

failover lan unit primary

failover lan interface FAILOVER-LINK GigabitEthernet0/1

failover link Stateful-link GigabitEthernet0/0

failover interface ip FAILOVER-LINK 10.2.2.1 255.255.255.252 standby 10.2.2.2

failover interface ip Stateful-link 10.1.1.1 255.255.255.252 standby 10.1.1.2

The ASA requires something that triggers the failover mechanism. An interface that fails is a good trigger. When the inside or outside interface fails, we should failover. By default all physical interfaces are monitored but let me show you the command anyway:

PrimaryFW(config)# monitor-interface inside

PrimaryFW(config)# monitor-interface outside

PrimaryFW(config)# monitor-interface DMZ

Configuration on Secondary ASA

Step-1 Set ASA1 as primary unit

SecondaryFW(config-if)# failover lan unit Secondary

Step-2 Define Failover Interface.

SecondaryFW(config-if)# failover lan interfaceFAILOVER-LINK G0/1

INFO: Non-failover interface config is cleared on GigabitEthernet0/1 and its

Step-3Assign IP address to Failover Interfaces

SecondaryFW(config-if)# failover interface ip FAILOVER 10.2.2.1 255.255.255.252 standby 10.2.2.2

Step-4 Enable the interfaces for Failover and State Link

SecondaryFW(config-if)# int g0/0

SecondaryFW(config-if)# no shut

SecondaryFW(config-if)# int g0/1

SecondaryFW(config-if)# no shut

Step-5 Enable Failover

SecondaryFW(config-if)# failover

Step-6 Change the prompt to show primary or secondary

Once the configuration is replicated on both ASAs, they both use the same hostname. This means that every time you access the ASAs over a console, Secure Shell (SSH), or Telnet connection, it will not be easy to differentiate between the units being managed.

Therefore, it is recommended to change the CLI prompt to include additional information next to the hostname, such as the priority and state of the managed device

PrimaryFW(config-if)# prompt hostname priority state

PrimaryFW/pri/act(config)#

PrimaryFW/pri/act(config)#

Now let's check on Secondary FW

PrimaryFW/sec/stby>

PrimaryFW/sec/stby>

This is what you will see on Primary ASA1

PrimaryFW(config)#

Switchover enabled

Configuration has changed, replicate to mate.

Beginning configuration replication: Sending to mate.

End Configuration Replication to mate

Switching to Standby

Primary: Switching to Ok for reason Interface check.

Switching to Active

This is what you will see on Secondary ASA2

Switchover enabled

Configuration has changed, replicate to mate.

State check detected an Active mate

Beginning configuration replication from mate.

End configuration replication from mate.

PrimaryFW(config)# show failover

PrimaryFW/pri/act(config)# show failover

Failover On

Failover unit Primary

Failover LAN Interface: FAILOVER-LINK GigabitEthernet0/1 (up)

Reconnect timeout 0:00:00

Unit Poll frequency 1 seconds, holdtime 15 seconds

Interface Poll frequency 5 seconds, holdtime 25 seconds

Interface Policy 1

Monitored Interfaces 4 of 61 maximum

MAC Address Move Notification Interval not set

Version: Ours 9.6(1), Mate 9.6(1)

Serial Number: Ours 9AQFS5U27GJ, Mate 9AKXX77E3FA

Last Failover at: 22:40:12 UTC Oct 7 2024

This host: Primary - Active

Active time: 5576 (sec)

slot 0: empty

Interface outside (203.200.200.1): Normal (Monitored)

Interface dmz (103.100.100.1): Normal (Monitored)

Interface Management (10.255.1.201): Normal (Monitored)

Interface inside (192.168.1.1): Normal (Monitored)

Other host: Secondary - Standby Ready

Active time: 0 (sec)

Interface outside (203.200.200.2): Normal (Monitored)

Interface dmz (103.100.100.2): Normal (Monitored)

Interface Management (10.255.1.202): Normal (Monitored)

PrimaryFW/pri/act(config)# show monitor-interface

This host: Primary - Active

Interface outside (203.200.200.1): Normal (Monitored)

Interface dmz (103.100.100.1): Normal (Monitored)

Interface Management (10.255.1.201): Normal (Monitored)

Interface inside (192.168.1.1): Normal (Monitored)

Other host: Secondary - Standby Ready

Interface outside (203.200.200.2): Normal (Monitored)

Interface dmz (103.100.100.2): Normal (Monitored)

Interface Management (10.255.1.202): Normal (Monitored)

Interface inside (192.168.1.2): Normal (Monitored)

Verification

Ping the internet and power off the Primary FW

Router#ping 8.8.8.8 re 1000

Type escape sequence to abort.

Sending 1000, 100-byte ICMP Echos to 8.8.8.8, timeout is 2 seconds:

!!!

!!!!!!!!!!!!!!!!!!!!!!!!!.

*Oct 8 00:21:39.809: %DUAL-5-NBRCHANGE: EIGRP-IPv4 10: Neighbor 192.168.1.1 (GigabitEthernet0/0) is down: peer restarted...!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!

*Oct 8 00:21:44.588: %DUAL-5-NBRCHANGE: EIGRP-IPv4 10: Neighbor 192.168.1.1 (GigabitEthernet0/0) is up: new adjacency!!!!!

!!!

!!!

Failover exec

To execute a command on a specific unit in a failover pair, use the **failover exec** command in privileged EXEC or global configuration mode.

PrimaryFW/pri/act(config)# failover exec standby show failover

Failover On
Failover unit Secondary
Failover LAN Interface: FAILOVER_LINK GigabitEthernet0/1 (up)
Reconnect timeout 0:00:00
Unit Poll frequency 1 seconds, holdtime 15 seconds
Interface Poll frequency 5 seconds, holdtime 25 seconds
Interface Policy 1
Monitored Interfaces 4 of 61 maximum
MAC Address Move Notification Interval not set
Failover replication http
Version: Ours 9.6(1), Mate 9.6(1)
Serial Number: Ours 9AKXX77E3FA, Mate 9AQFS5U27GJ
Last Failover at: 01:21:45 UTC Oct 10 2024
This host: Secondary - Standby Ready
Active time: 0 (sec)
slot 0: empty
Interface outside (203.200.200.2): Normal (Monitored)
Interface DMZ (103.100.100.2): Normal (Monitored)
Interface Management (10.255.1.202): Normal (Monitored)
Interface inside (192.168.1.2): Normal (Monitored)
Other host: Primary - Active
Active time: 225420 (sec)
Interface outside (203.200.200.1): Normal (Monitored)

PrimaryFW/pri/act(config)#**failover exec mate show running-config failover**

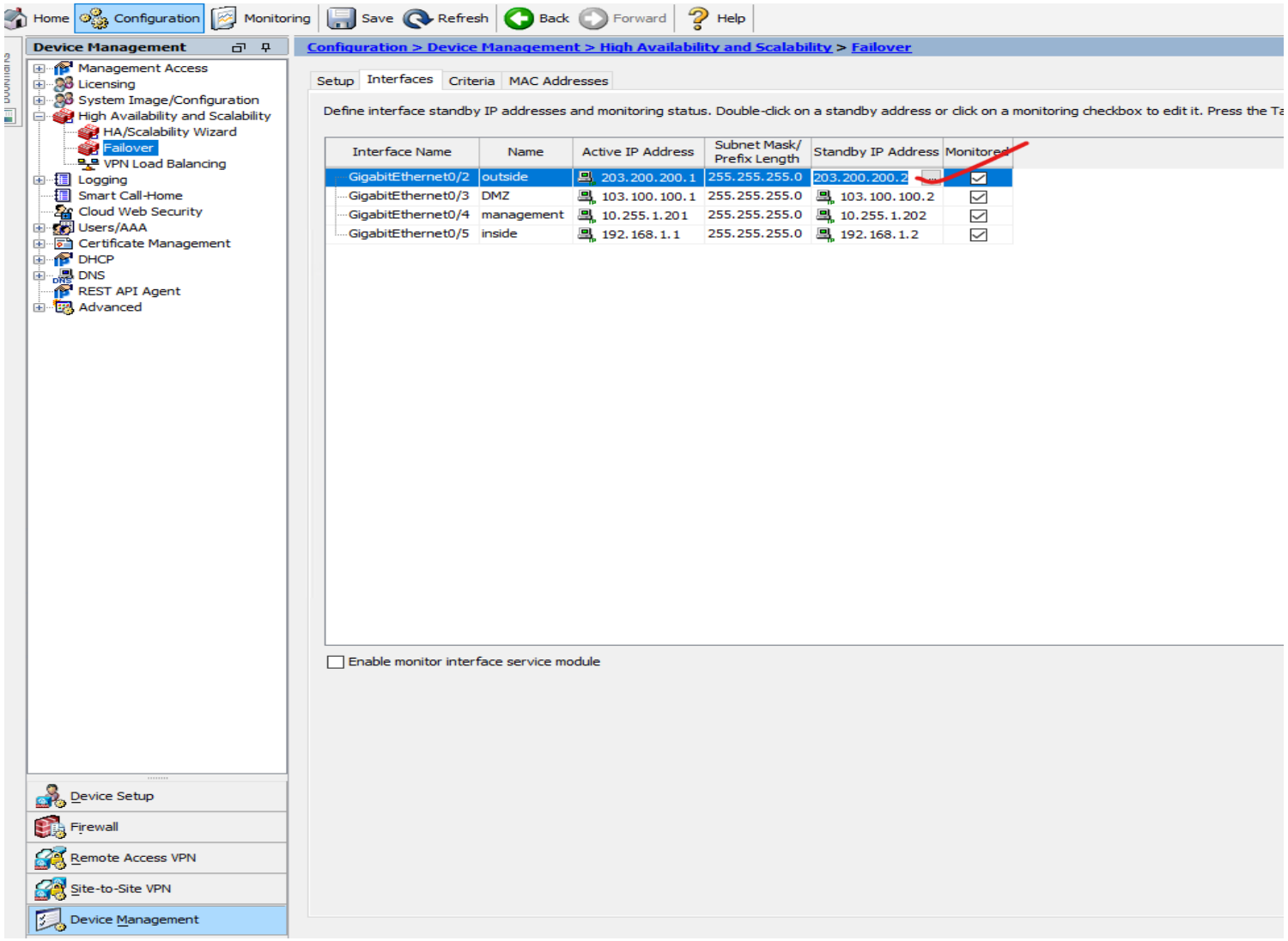
failover
failover lan unit secondary
failover lan interface FAILOVER_LINK GigabitEthernet0/1
failover replication http
failover link Stateful-link GigabitEthernet0/0
failover interface ip FAILOVER_LINK 10.2.2.1 255.255.255.252 standby 10.2.2.2
failover interface ip Stateful-link 10.1.1.1 255.255.255.252 standby 10.1.1.2

PrimaryFW/pri/act(config)#**failover exec standby show interface**

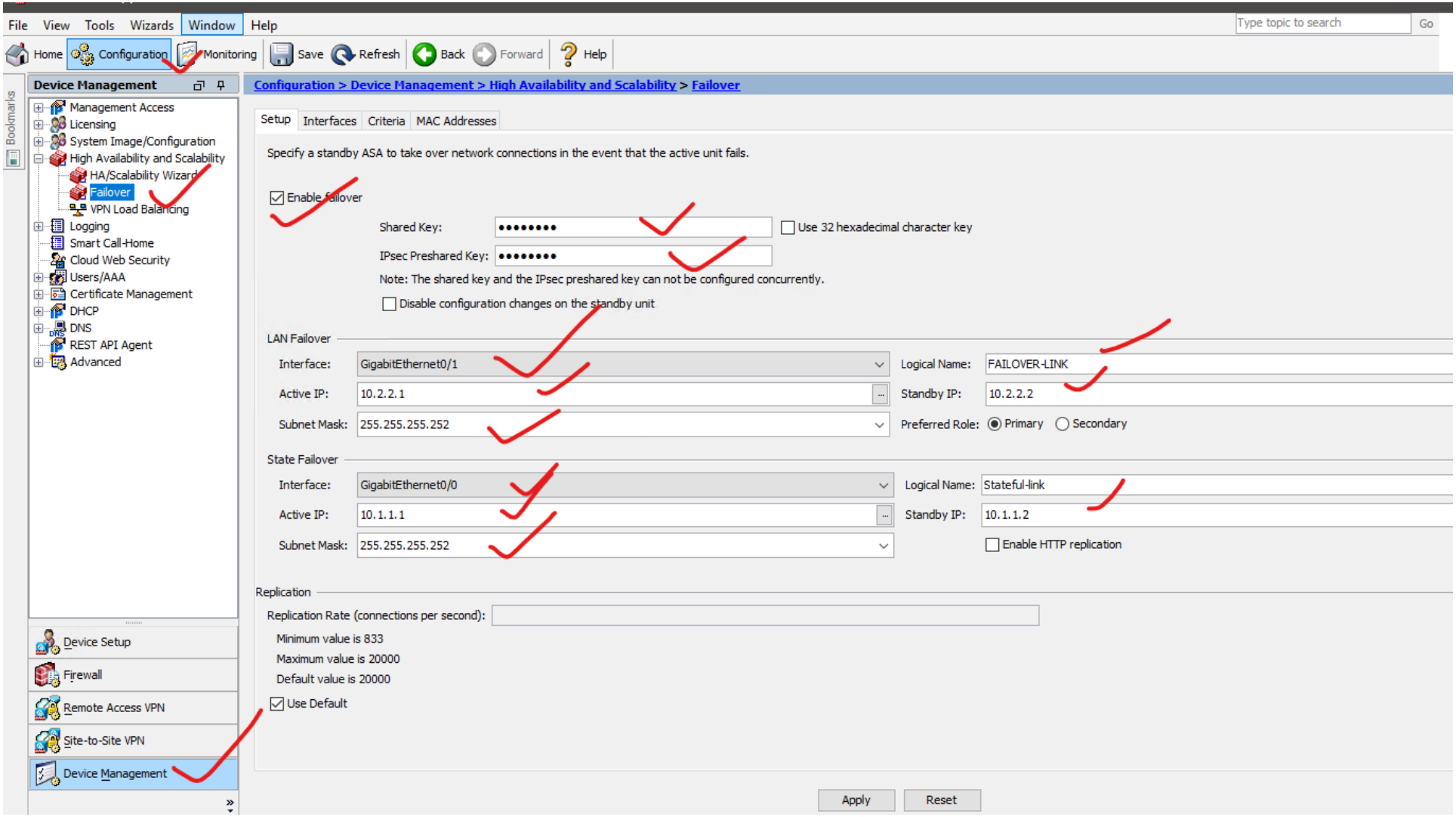
PrimaryFW/pri/act(config)#**failover reload-standby**

Using ASDM to Configure ASA Failover

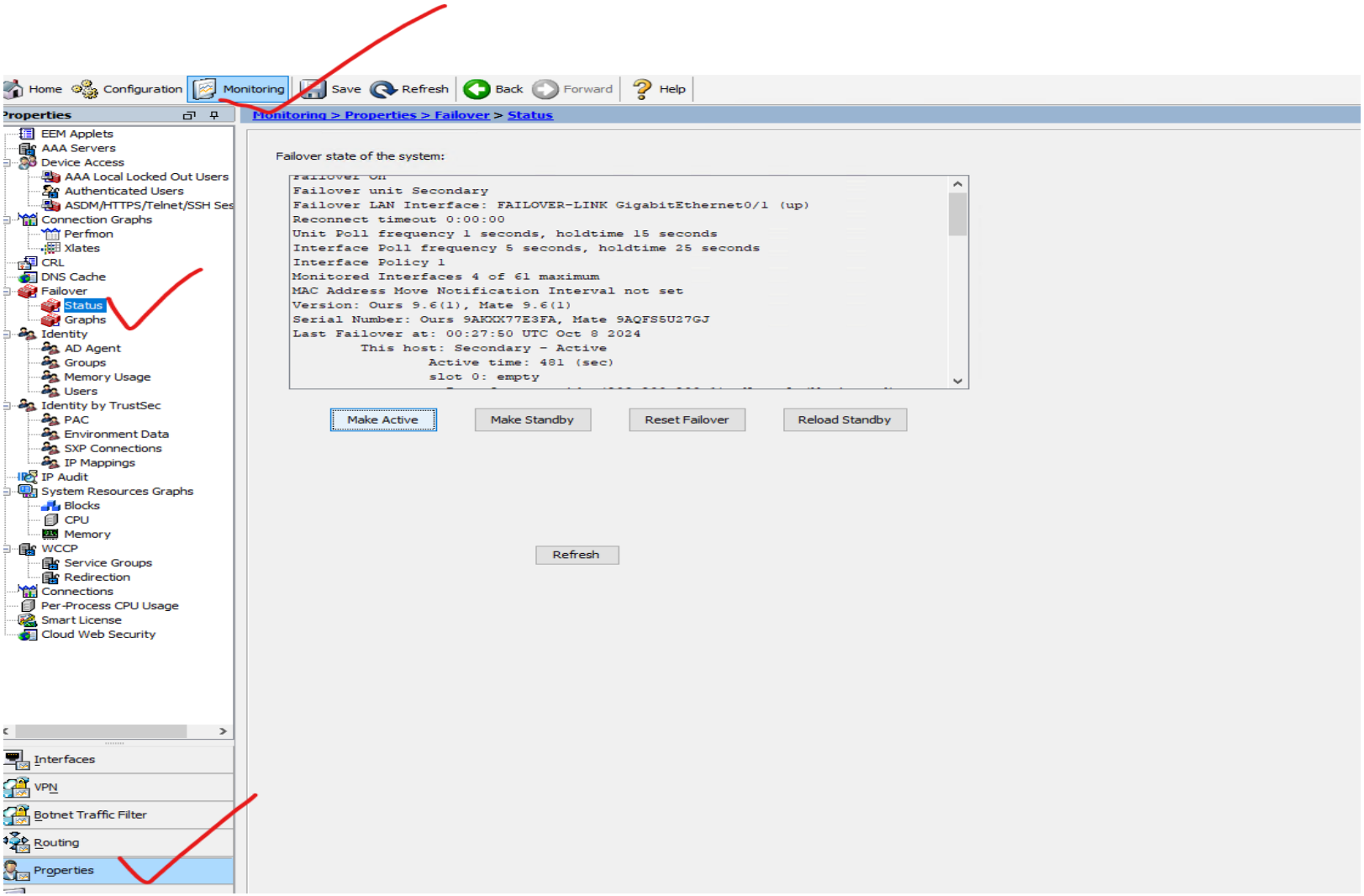
Set up standby ip address



Step.2 Configure failover for Primary ASA



Step3. Very your config



ASA Redundant Interface

A logical redundant interface consists of a pair of physical interfaces: an active and a standby interface. When the active interface fails, the standby interface becomes active and starts passing traffic. You can configure a redundant interface to increase the ASA reliability. This feature is separate from device-level failover, but you can configure redundant interfaces as well as device-level failover if desired.

The logical redundant interface is only available on ASA platforms and not on devices running FirePower.

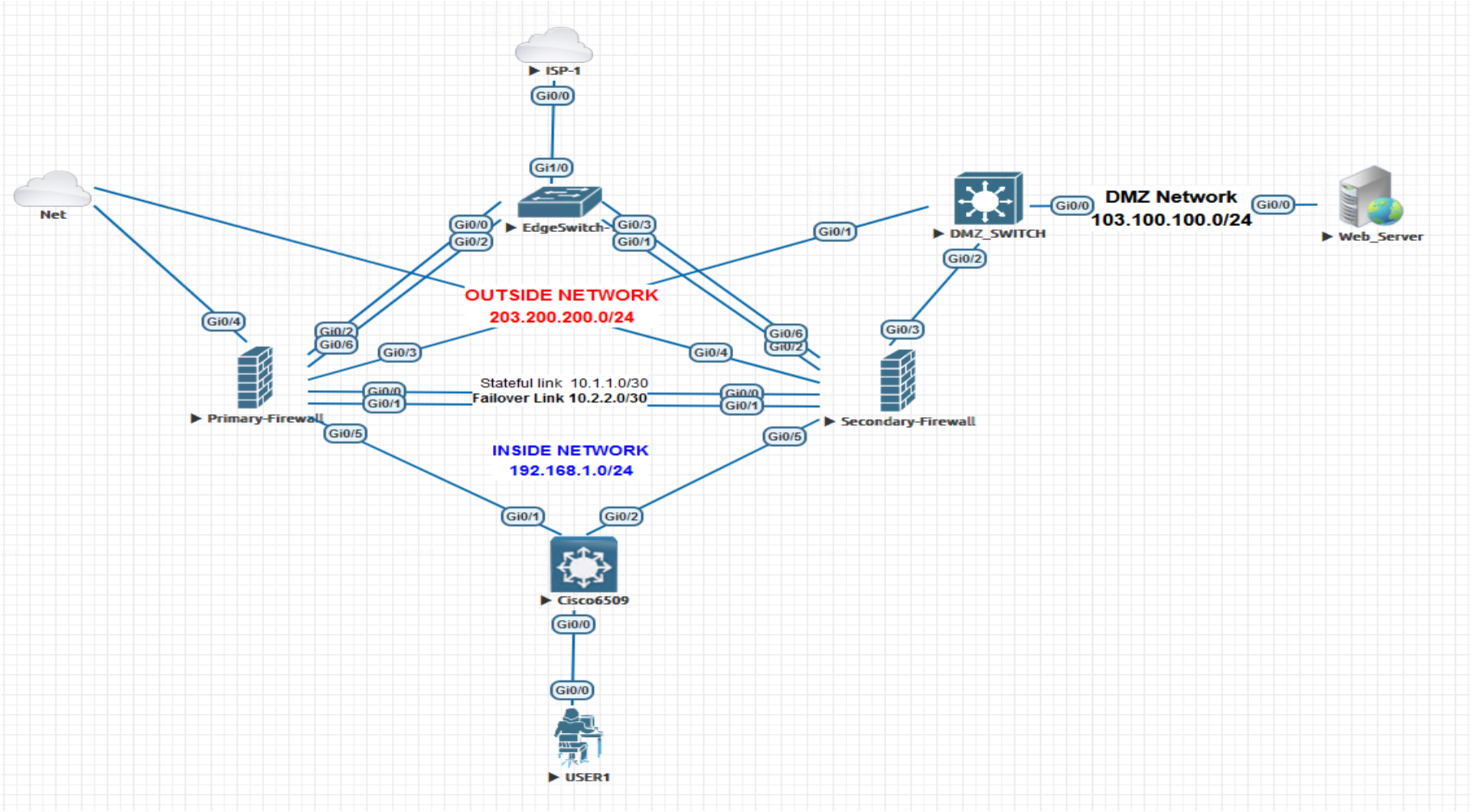
We can configure upto 8 redundant interfaces.

Redundant interface are number from 1 to 8 and have the name redundant X. When adding physical interfaces to the redundant pair, please make sure there is no configuration on it and interface is also in no shutdown state. This is just a precaution, the firewall will remove these settings when adding the physical interface to a new group.

The logical redundant interface will take the MAC address of the first interface added to the group. This MAC address is not changed with the member interface failures, but changes when you swap the order of the physical interfaces to the pair.

Once we have configured a redundant interface, we can assign it a name and a security level, followed by an IP address. The procedure is the same as with any interface in the system.

ASA Redundant Interface Project



Using Command Line

interface GigabitEthernet0/2

no nameif

no security-level

no ip address

interface GigabitEthernet0/6

no nameif

no security-level

no ip address

interface Redundant1

member-interface GigabitEthernet0/2

member-interface GigabitEthernet0/6

nameif outside

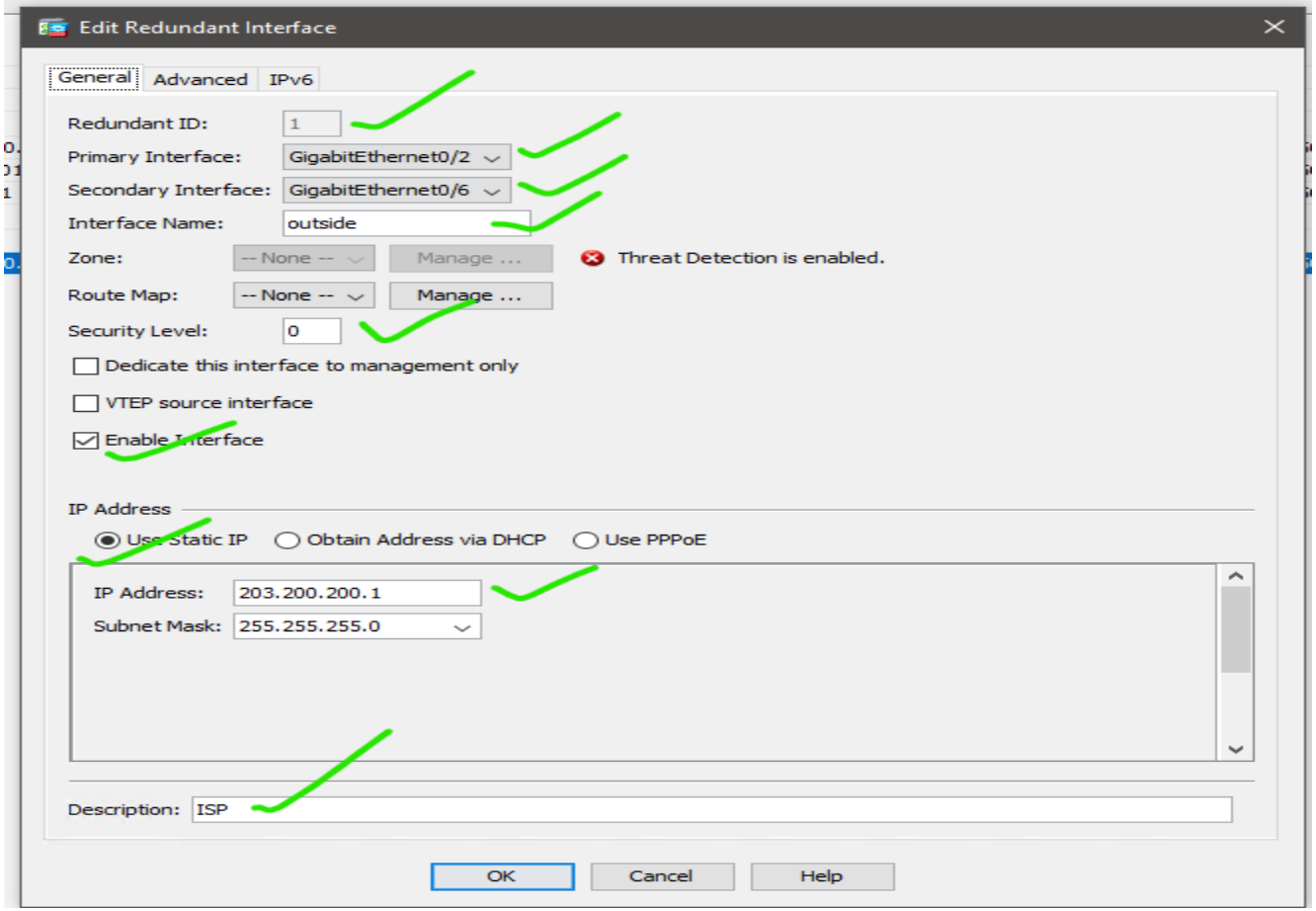
security-level 0

ip address 203.200.200.1 255.255.255.0 standby 203.200.200.2

Using ASDM to configure redundant interface

Configure> device setup> interfaces>add

NB: Please make sure there is no configuration on it and interface is also in no shutdown state



Verify

PrimaryFW/pri/act(config)# show run int r1

interface Redundant1

 description ISP

 member-interface GigabitEthernet0/2

 member-interface GigabitEthernet0/6

 nameif outside

 security-level 0

 ip address 203.200.200.1 255.255.255.0 standby 203.200.200.2

PrimaryFW/pri/act(config)# show interface redundant1

Interface Redundant1 "outside", is up, line protocol is up

  Hardware is i82540EM rev03, BW 1000 Mbps, DLY 10 usec

      Auto-Duplex(Full-duplex), Auto-Speed(1000 Mbps)

      Input flow control is unsupported, output flow control is off

      Description: ISP

  Redundancy Information:

Member GigabitEthernet0/2(Active), GigabitEthernet0/6

Last switchover at 20:37:17 UTC Oct 14 2024

You can also force failover on the interface

PrimaryFW/pri/act(config)# redundant-interface redundant 1 active-member GigabitEthernet0/6

PrimaryFW/pri/act(config)# show int r1

Redundancy Information:

Member GigabitEthernet0/6(Active), GigabitEthernet0/2

Last switchover at 22:59:28 UTC Oct 14 2024

Cisco ASA BotNet Filtering

Cisco ASA Adaptive Security Appliance is a Cisco proprietary firewall appliance device. ASA offers features like inspection, policing & prioritizing traffic, filters packet based on ACL's and Anti-X protection. The Anti-X features, enables us to configure botnet attack filter in Cisco ASA.

Botnet Filtering

The Cisco ASA Botnet Traffic Filter is an effective tool that enterprises can use to gain insights in one of today's leading threats. In conjunction with accurate threat data provided by Cisco Security Intelligence Operations and Cisco Global Correlation for IPS, the Botnet Traffic Filter offers an industry-leading solution to combat modern botnet threats in a dynamic business environment. These lists are stored in a database as per their reputations. Cisco ASA accesses the database, performing reputation based filtering to identify the hacker

Traffic classifications:

Traffic that passes through the Botnet Traffic Filter is classified into four categories:

Blacklist:

This is traffic to or from an IP address that is considered to be malicious. This IP address can be either an IP address/network entry in the dynamic blacklist or administrator-configured blacklist or it can be a snooped IP address that was found in a DNS reply for a blacklisted domain.

Whitelist:

This is traffic to or from an IP address that is considered to be good. It is part of the administrator-configured lists.

Greylist:

These addresses are associated with multiple domain names, but not all of these domain names are on the blacklist.

Unknown/None:

An IP address that does not map to a domain in either a blacklist or whitelist, and no syslog's will be generated for this traffic.

NB: Unlisted addresses do not generate any syslog messages, but addresses on the blacklist, whitelist, and greylist generate syslog messages

Enabling Adaptive Security Appliance to use Botnet Filtering requires a certain set of processes. Please remember, this feature works only with a license. The Cisco ASA appliance with the Botnet Traffic Filter should be deployed at the edge of the enterprise, as the botnet database contains information only about external botnets. It is also best to address the external threat as close to the source as possible. This feature is restricted to IPv4 traffic. The Botnet Traffic Filter is supported in all firewall modes (single and multiple) and in routed and transparent modes.

Requirement for Botnet Filtering

Cisco ASA Firewall must have valid Botnet Filtering license and have access to Cisco's Security Intelligence Operation (CSIO) dynamic database, which is in the internet. This is essential as Botnet Filtering features would communicate with CSIO dynamic database and verify with its White & Black listed database

DNS is required on ASA primarily for two reasons

To make sure the ASA is capable of resolving the Cisco Security Intelligence Operations server IP

Allow to have a static whitelist site, even if the site is blacklisted

Configuration Steps

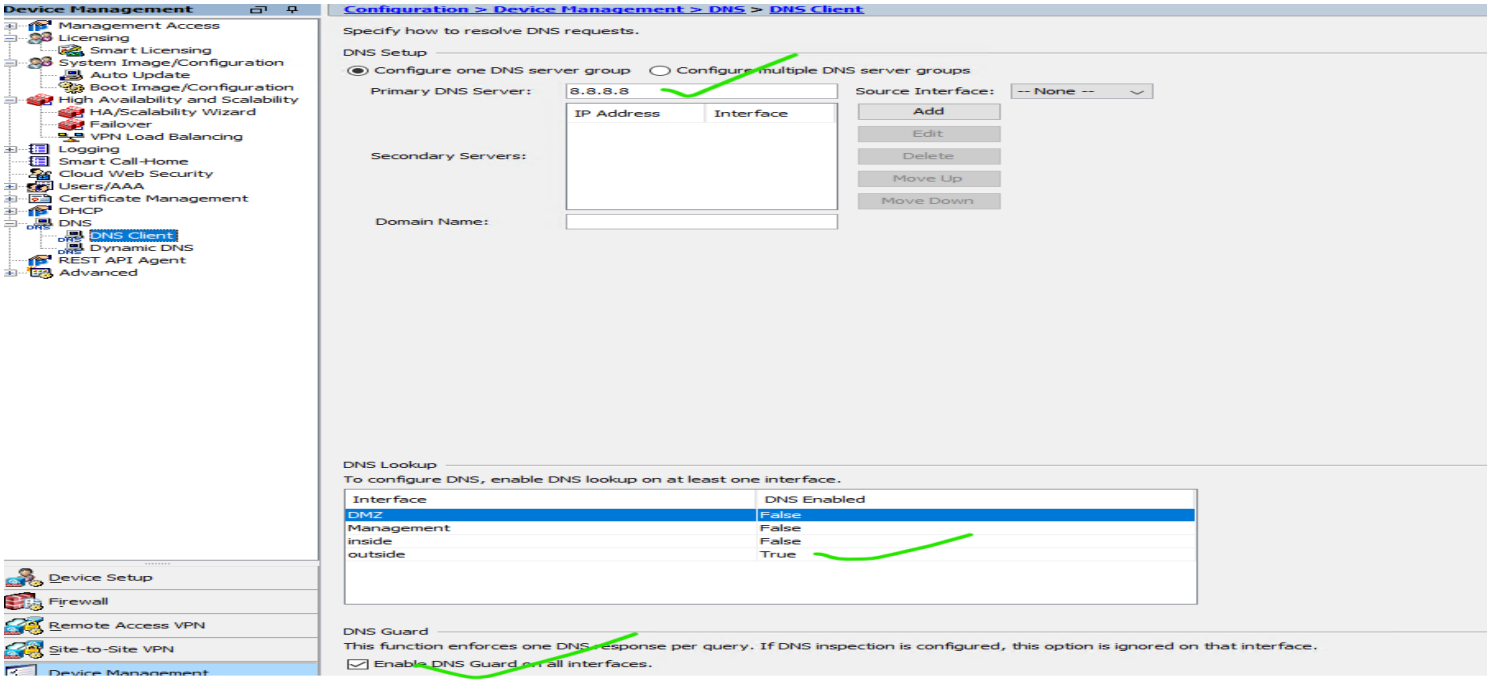
1. Enable DNS on the ASA
2. Configure dynamic database
3. Configure the static database
4. Enable DNS snooping
5. Enable the Botnet traffic filter

Step.1 Configure the dynamic database

Via ASDM the database can be configured through:

Step-1 Enable DNS on the ASA

Configuration ▸ Device Management ▸ DNS▸ DNS client



Step-2 Turn on Enable DNS Snooping

Configuration ▸ Firewall ▸ Botnet Traffic Filter ▸DNS Snooping

Under Botnet Traffic Filter select DNS Snooping.

For global DNS Snooping, simply check the DNS Snooping Enabled option under the global interface

This procedure enables inspection of DNS packets and enables Botnet Traffic Filter snooping, which compares the domain name with those on the dynamic database or static database, and adds the name and IP address to the Botnet Traffic Filter DNS reverse lookup cache. This cache is then used by the Botnet Traffic Filter when connections are made to the suspicious address.

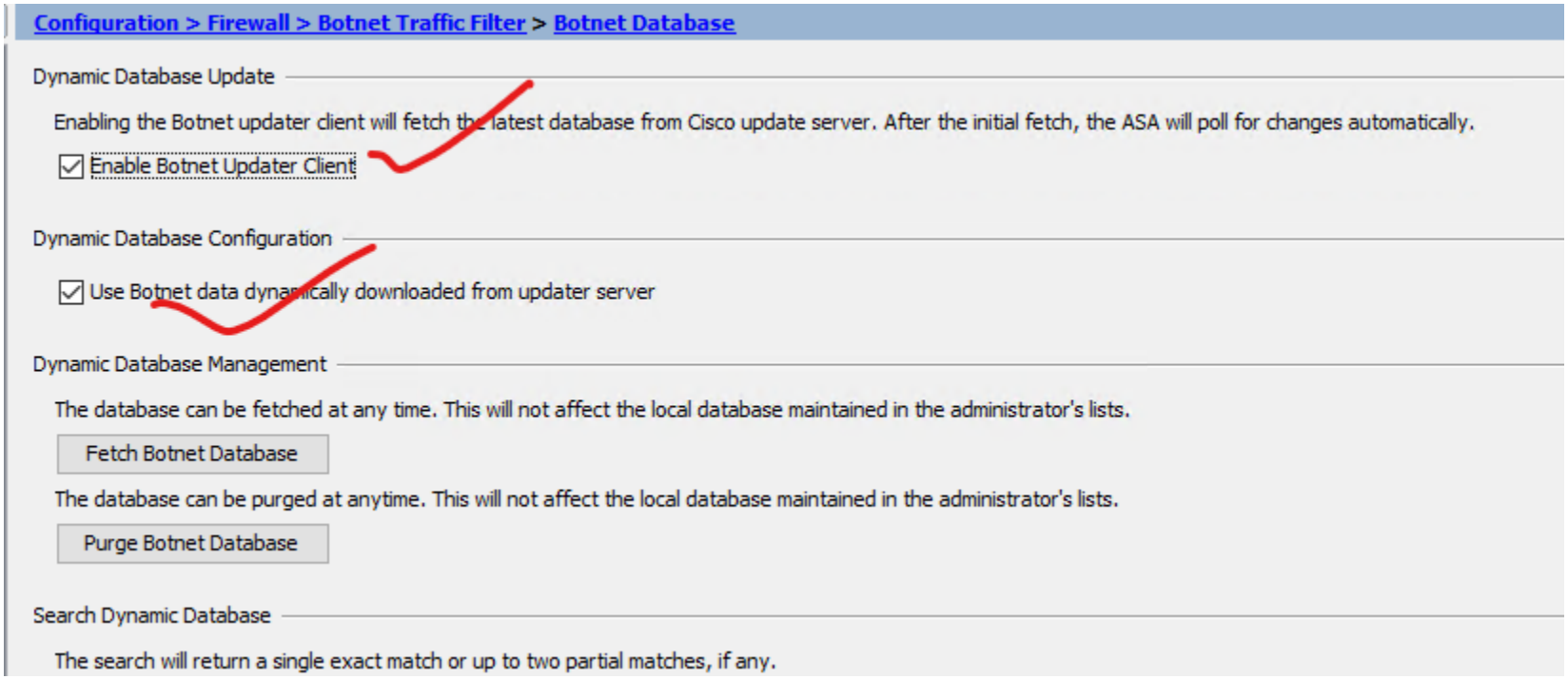
DNS snooping should only be enabled for DNS traffic. Failure to do so will result in non-DNS traffic being dropped because it is not

Adhering to the DNS protocol. DNS snooping should only be enabled for the interface that is facing the Internet, since the Botnet Traffic Filter database is aimed at addressing the external threat of botnets.

Step-3 Enable the client and use the dynamic database

Configuration ▸ Firewall ▸ Botnet Traffic Filter ▸Botnet Database

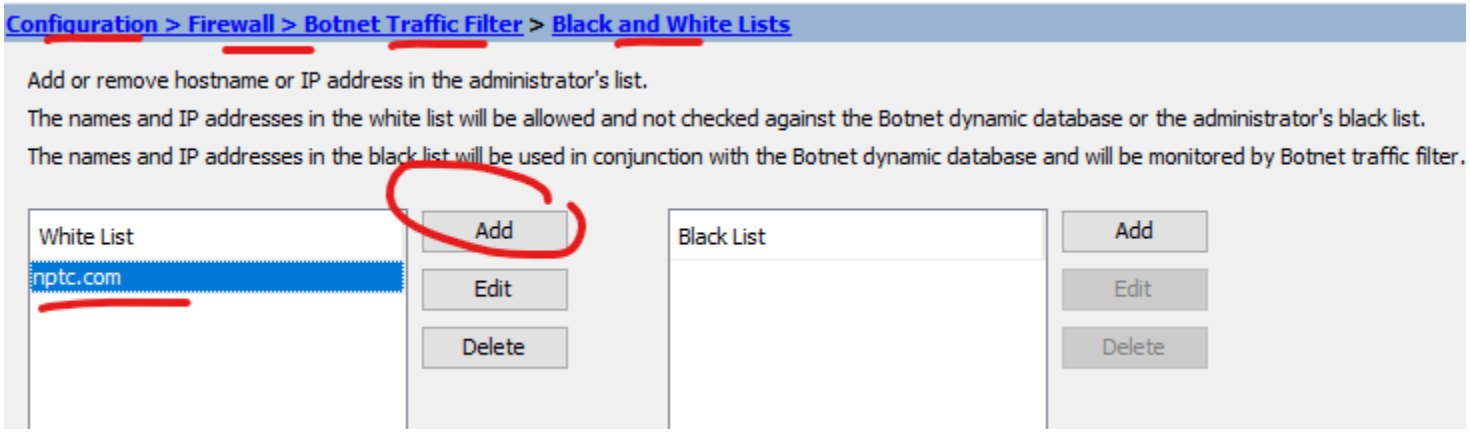
Enabling ASA for being a client, this will download all dynamic databases from SIO and then make decision based on the downloaded dynamic database. Failing this setting, ASA will not have an updated database to verify with.



Step-4 Configure the static database (Optional)

Configuration ▸ Firewall ▸ Botnet Traffic Filter ▸blacklist and Whitelist

This procedure lets you augment the dynamic database with domain names or IP addresses that you want to blacklist or whitelist.



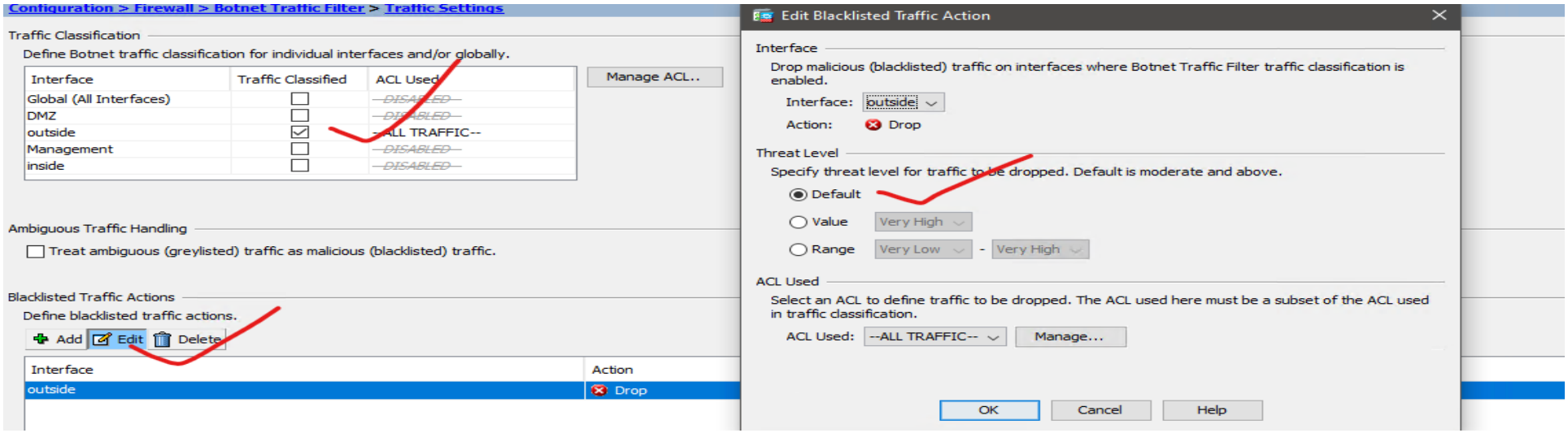
Step-5 Turn on the actions for Botnet Traffic Filter and traffic Classification

Configuration ▸ Firewall ▸ Botnet Traffic Filter ▸Traffic settings

This procedure enables the Botnet Traffic Filter, which compares the source and destination IP address in each initial connection packet to the IP addresses in the dynamic database, static database, DNS reverse lookup cache, and DNS host cache, and sends a syslog message or drops any matching traffic.

Traffic Classification
Given to us dynamically from the database by default is (Medium , High, Very high)

Static black list by default are rated very high



It is also possible to only filter specific traffic, this can be done by selecting Manage ACL and defining the appropriate traffic. It's also possible to specific what level of traffic will be dropped.

Monitoring the Botnet Traffic Filter

Whenever a known address is classified by the Botnet Traffic Filter, then a syslog message is generated. You can also monitor Botnet Traffic Filter statistics and other parameters by entering commands on the ASA.

Lab verification result

PrimaryFW/pri/act(config)# **show dynamic-filter reports top malware-sites**

Malware Sites (since last clear)

Site	Connections	Logged	Dropped	Threat-level	Category

Sample output from the show dynamic-filter reports top malware-sites **command in real life concept**

ciscoasa# **show dynamic-filter reports top malware-sites**

Site	Connections	logged	dropped	Threat Level	Category
bad1.example.com (10.67.22.34)	11	0	2		Botnet
bad2.example.com (209.165.200.225)	8	8	3		Virus
bad1.cisco.example (10.131.36.158)	6	6	3		Virus
bad2.cisco.example (209.165.201.1)	2	2	3		Trojan
horrible.example.net (10.232.224.2)	2	2	3		Botnet
nono.example.org (209.165.202.130)	1	1	3		Virus

ciscoasa# **show dynamic-filter reports top malware-ports**

Port	Connections logged
tcp 1000	617
tcp 2001	472
tcp 23	22
tcp 1001	19
udp 2000	17
udp 2001	17
tcp 8080	9
tcp 80	3
tcp >8192	2

ciscoasa# **show dynamic-filter reports top infected-hosts**

Host	Connections logged
10.10.10.51(inside)	1190
10.12.10.10(inside)	10
10.10.11.10(inside)	5

Verification to check on domain name black listed or whitelisted

PrimaryFW/pri/act(config-llist)# show run dynamic-filter

dynamic-filter updater-client enable

dynamic-filter use-database

dynamic-filter enable interface outside

dynamic-filter drop blacklist interface outside

dynamic-filter whitelist

 name nptc.com

dynamic-filter blacklist

 name bad.com

Impact of Botnet Filtering

Post implementing the entire process of Botnet Filtering, there is a high chance that, Botnet Filtering can drop some websites which are most commonly used for business needs. Thus it is mandatory for us to get an analysis done post the implementation.

- Infrastructure analysis
- Scheduling a downtime
- Run a pilot test
- Recovery action

Recovery Action

Cisco Security Intelligent Operations (CSIO) has the list of updated botnet hackers collected across the globe. It includes websites of various risk levels – low to medium to high. There is a possibility that some websites which one may need for business is also in the list of CSIO database hence get blocked. It is the administrator's responsibility to analyze the risk factor of any given website with their respective infrastructure security team. This will enable one to decide if the website can be added under static whitelist if it is important for a business.

Virtual private network (VPN) - Customer Provision VPNs

A VPN is a technology use to extend access to a private network to users who do not have direct access to it, such as an office network allowing secure access from off-site over the Internet.

This is achieved by creating a link between computer networks by the use of network tunneling protocols. The goal of a virtual private network is to allow network hosts (PCs, servers, etc.) to exchange network messages across another network to access private content, as if they were part of the same network

How a VPN Works:

Connection: Your device connects to a VPN server, which is usually located in a different geographical location.

Encryption: The VPN encrypts all your internet traffic before it leaves your device.

Tunneling: The encrypted data is sent through a secure tunnel to the VPN server.

Decryption: The VPN server decrypts the data and sends it to its intended destination.

Masked IP Address: Your IP address is masked by the VPN server, so your original IP address is not visible.

Benefits of Using a VPN:

- **Enhanced Privacy:**

  VPNs encrypt your data and hide your IP address, making it harder for third parties to track your online activities and personal information.

- **Increased Security:**

  VPNs protect your data when using public Wi-Fi networks, which are often insecure.

- **Access to Geographically Restricted Content:**

  VPNs can bypass regional restrictions and allow you to access content from different locations.

- **Secure Remote Access:**

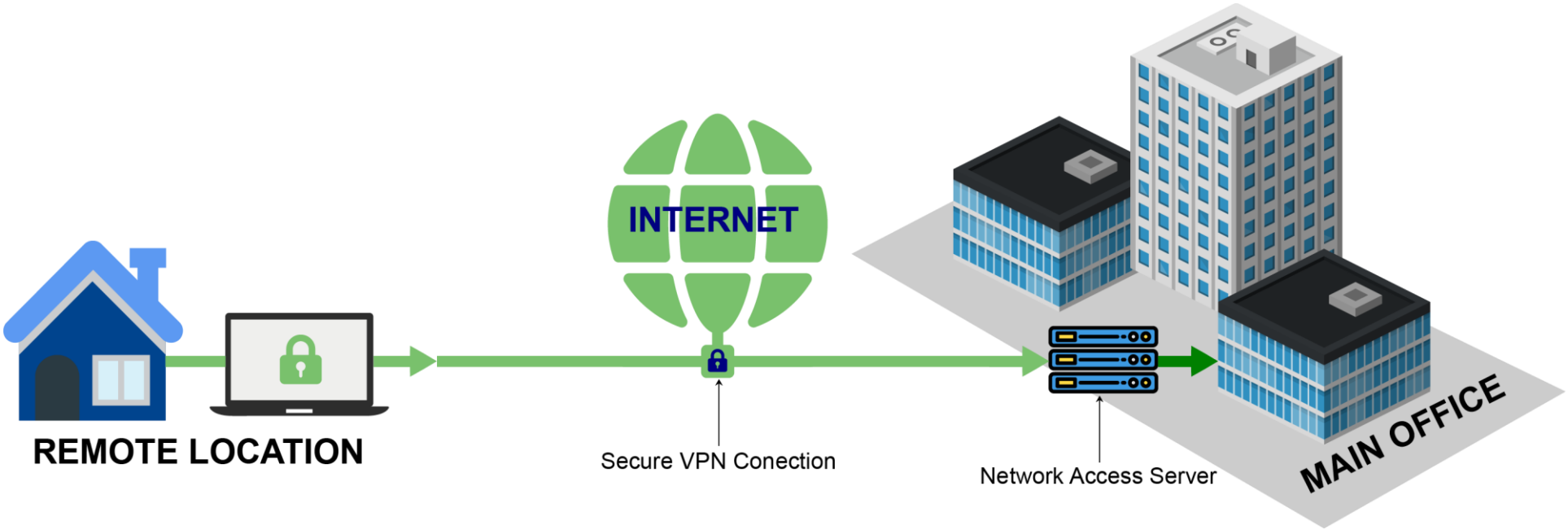
  VPNs allow users to access private networks and company resources securely from remote locations

Types of VPN.

Remote Access: This method use to a host to network, this type of extension provides computer access to local area network of a remote site, or any wider enterprise networks.

This may be employed for remote workers, or to enable people accessing their private company resources without exposing them to the public Internet.

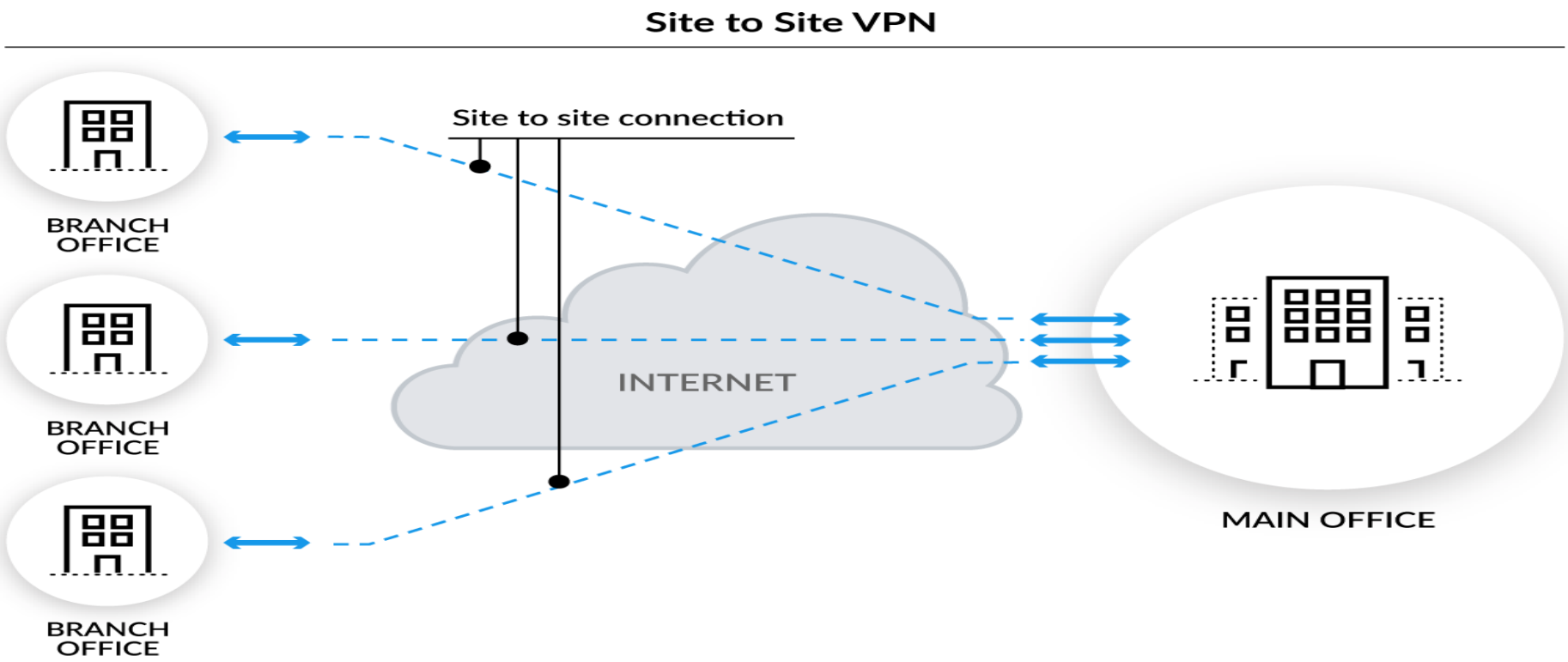
Remote-access VPNs, which are typically user-initiated, may use passwords, biometrics, two-factor authentication, or other cryptographic methods.



Site-to-site: This method is use to connect two networks. Tunneling is only done between two devices (like routers, firewalls, VPN Concentrators, Servers, etc.) located at both network locations.

Businesses tend to make use of site-to-site connections for business-to-business, cloud computing, and branch office scenarios.

Site-to-site VPNs often use passwords (pre-shared keys) or digital certificates. Depending on the VPN protocol, they may store the key to allow the VPN tunnel to establish automatically, without intervention from the administrator.



VPN Technologies Used

A virtual private network is based on a tunneling protocol. Cisco ASA support two types Internet Protocol Security (IPsec) VPN and Secure Sucket Tunnel SSL/TLS VPN tunnel protocols.

Site to Site

Site to Site VPN uses IPsec tunnels **to** protect data flows between a pair of hosts (*host-to-host*), between a pair of security gateways (*network-to-network*), or between a security gateway and a host (*network-to-host*).

Remote Access VPN

Remote access can use either SSL or IPsec technology for the remote secure connections.

SSL VPN- There are mainly two types of SSL VPNs supported by Cisco devices

Clientless Mode WebVPN: This is the first implementation of SSL WebVPN supported. Let's users establish a secure remote access VPN tunnel using just a Web browser. There is no need for a software or hardware VPN client. However, only limited applications can be accessed remotely.

Any Connect WebVPN: A special Java based client is installed on the user's computer. Providing an SSL secure tunnel to the central site. Provides full network connectivity (similar with IPsec Remote Access client).All applications and network resources at the central site can be accessed remotely.

Implementing SSL AnyConnect VPN on Cisco ASA

Cisco AnyConnect is a Virtual Private Network (VPN) client software that allows users to establish a secure, encrypted connection to a corporate network from off-campus locations

Key Features and Functionality:

- **Secure VPN Connection:**

AnyConnect uses encryption protocols like SSL and IPSec to create a secure, private tunnel for data transmission between the user's device and the corporate network.

- **Client-Side Software:**

It's a software application that users install on their devices (Windows, macOS, iOS, Android).

Authentication Options:

It supports various authentication methods, including username/password, two-factor authentication, and digital certificate

Network Roaming:
AnyConnect can seamlessly re-establish the VPN connection after network changes or device standby

Use Cases:

- **Remote Access to Corporate Resources:**

  Allows users to access email, file servers, databases, and other restricted resources from off-campus locations.

- **Secure Remote Work:**

  Enables employees to work securely from anywhere by connecting to the corporate network.

- **University/School Access:**

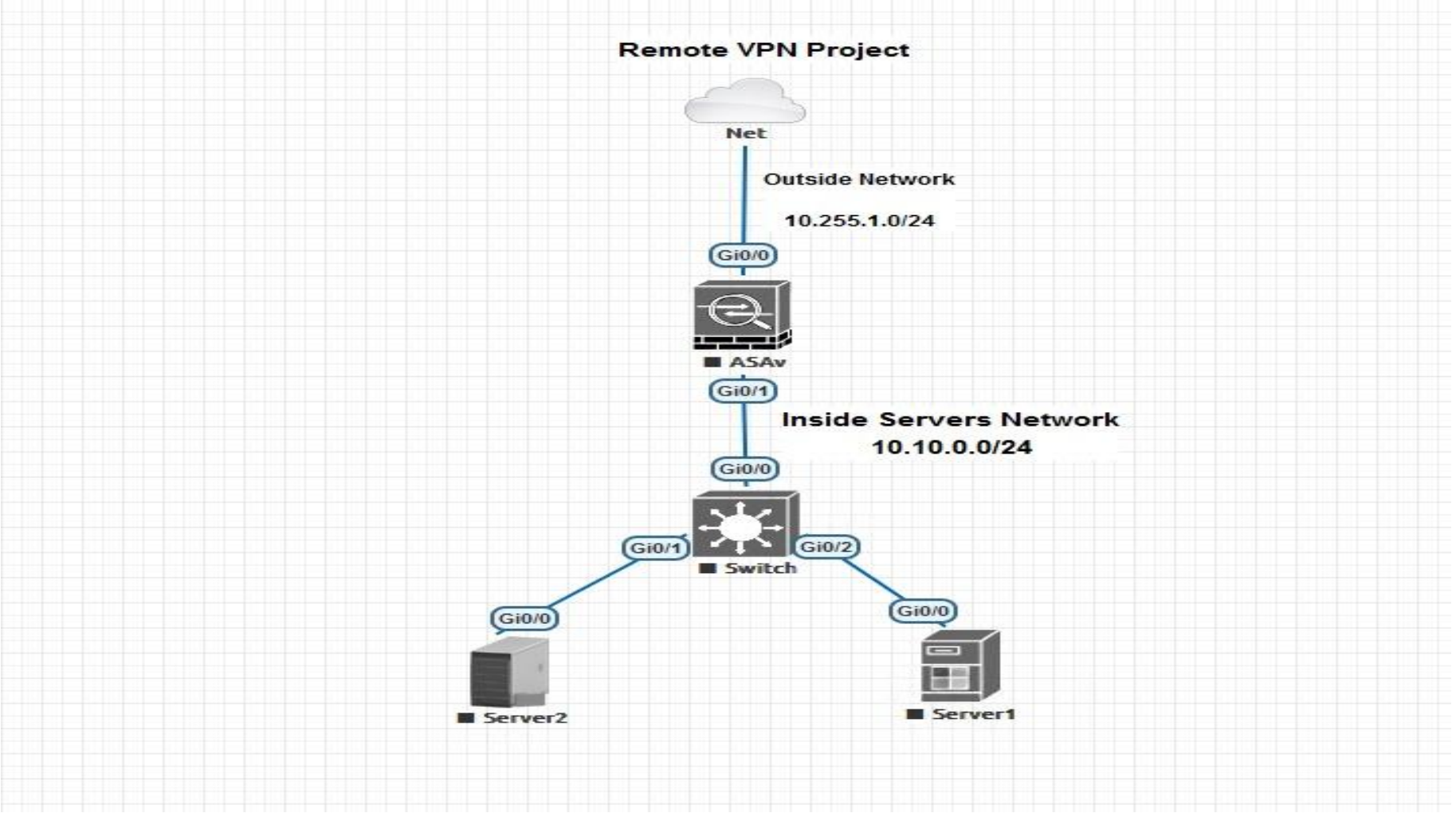
  Provides students and faculty with secure access to university networks and resources.

- **Secure Application Connectivity:**

  Allows users to access specific applications on the corporate network, even if the applications are not directly exposed to the internet.

SSL AnyConnect VPN Project Task

Project Task: Create SSL Anyconnect VPN client using the Topology below

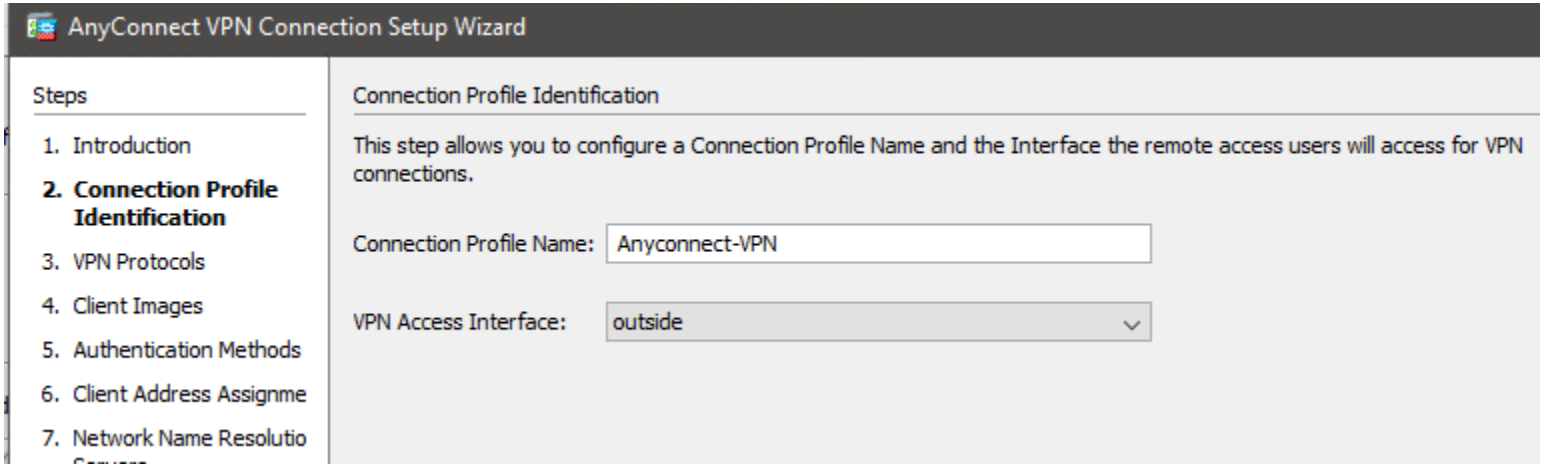


SSL AnyConnect VPN Project Task

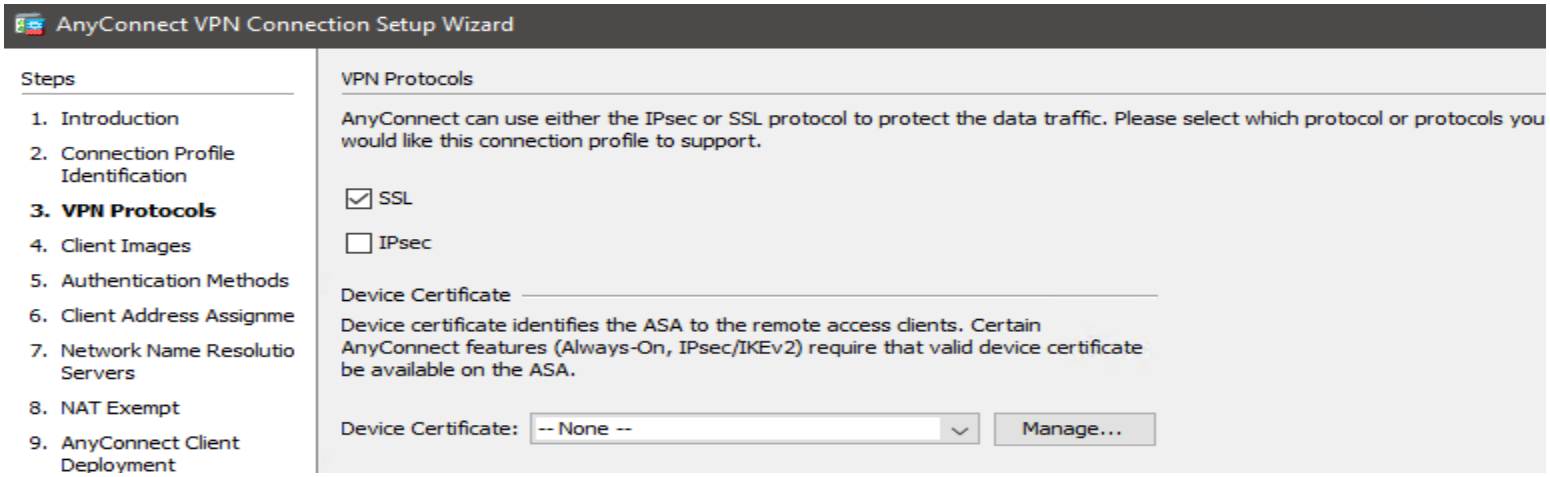
Create SSl Anyconnect VPN client using the Topology above

Step 1. Use the wizard to create a new SSL anyconnect

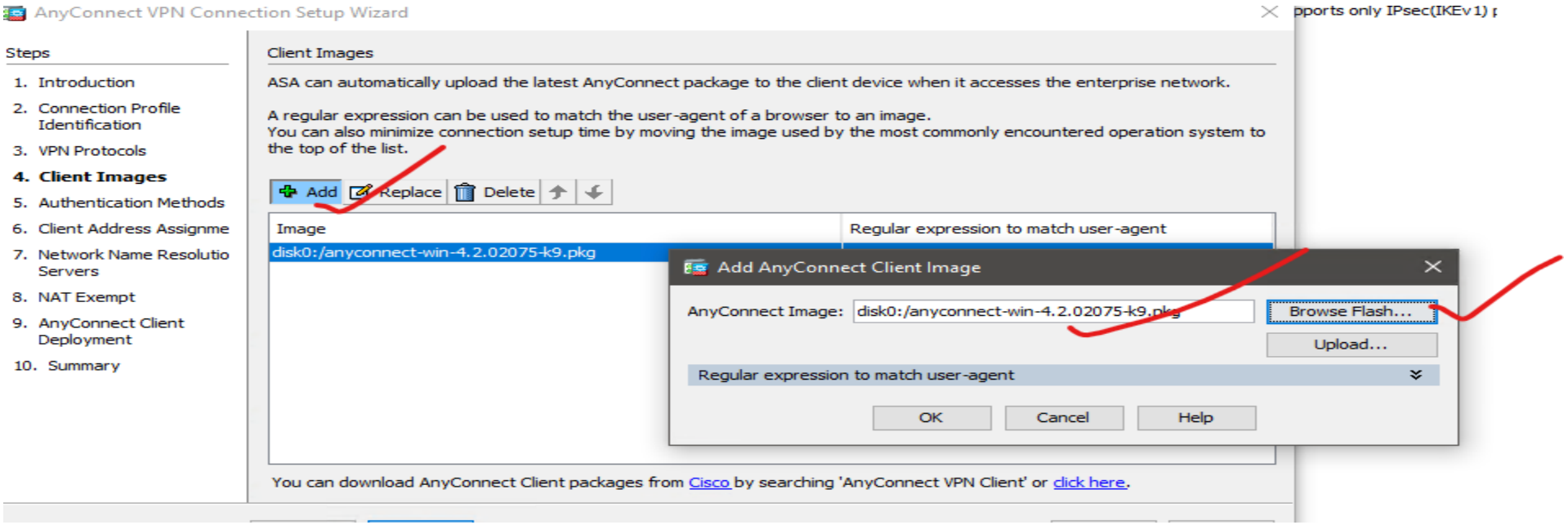
Define connection profile name



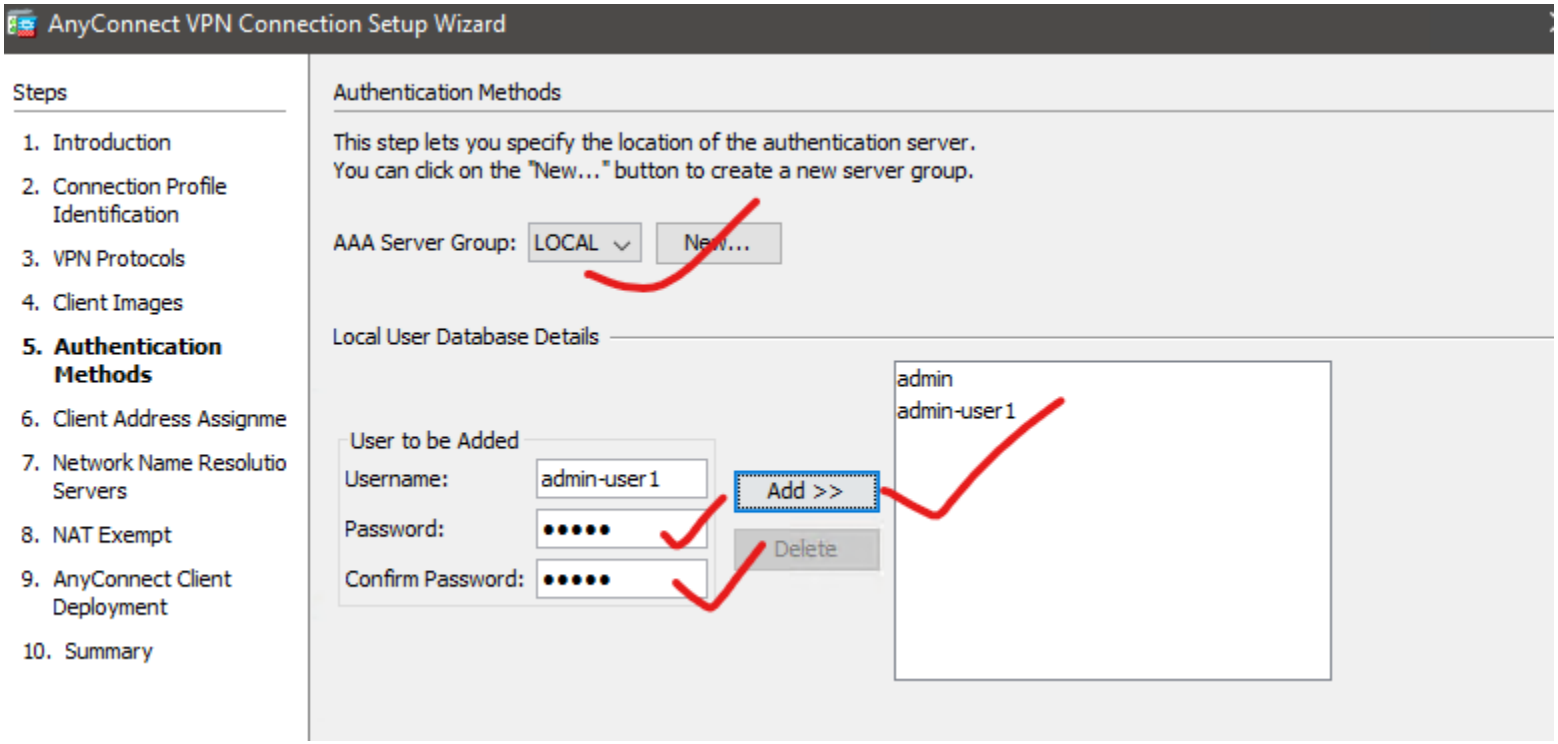
Step.2Select which protocol u want to use to protect the data either IPsec or SSL and select the device certificate if any



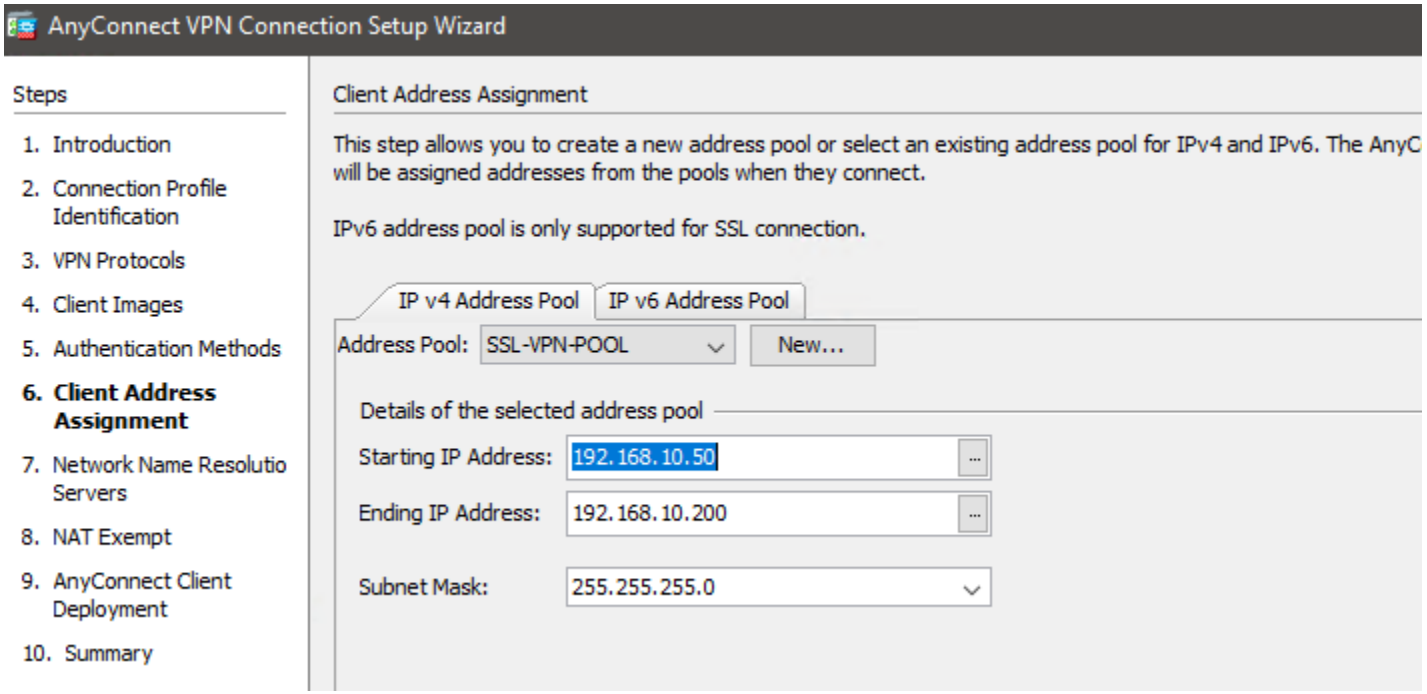
Step.3 Allow ASA to automatically upload the latest AnyConnect package to the client



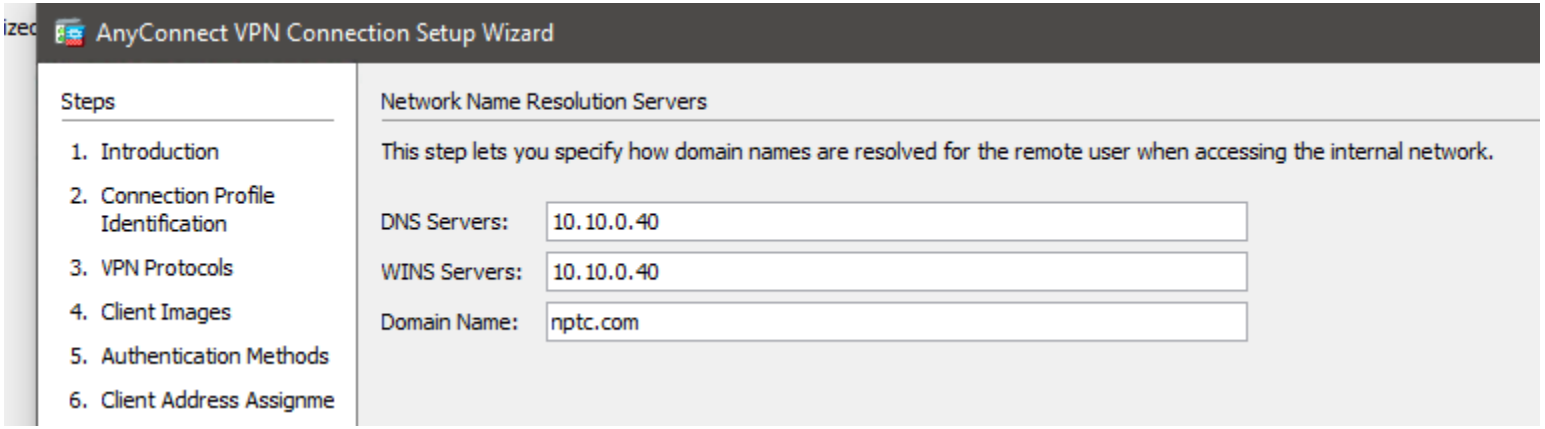
Step-4 Create the authentication method either with a AAA server or use LOCAL and create account if is local



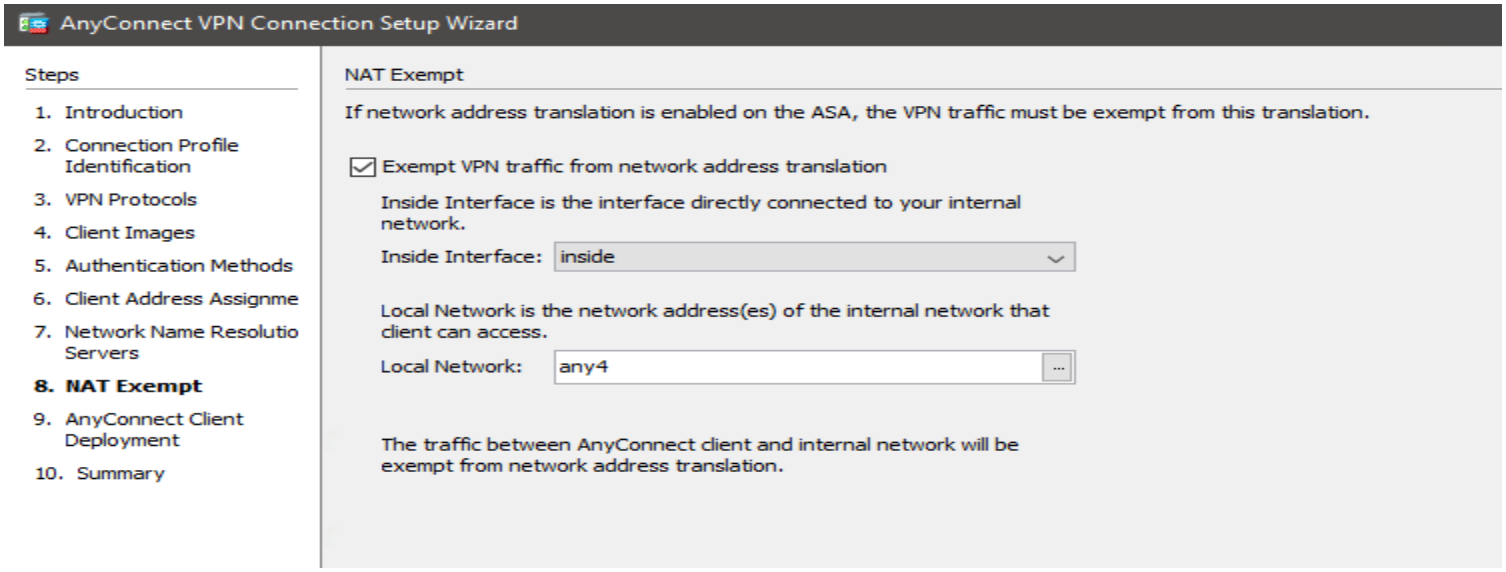
Step.5 Create DHCP pool for the remote vpn client

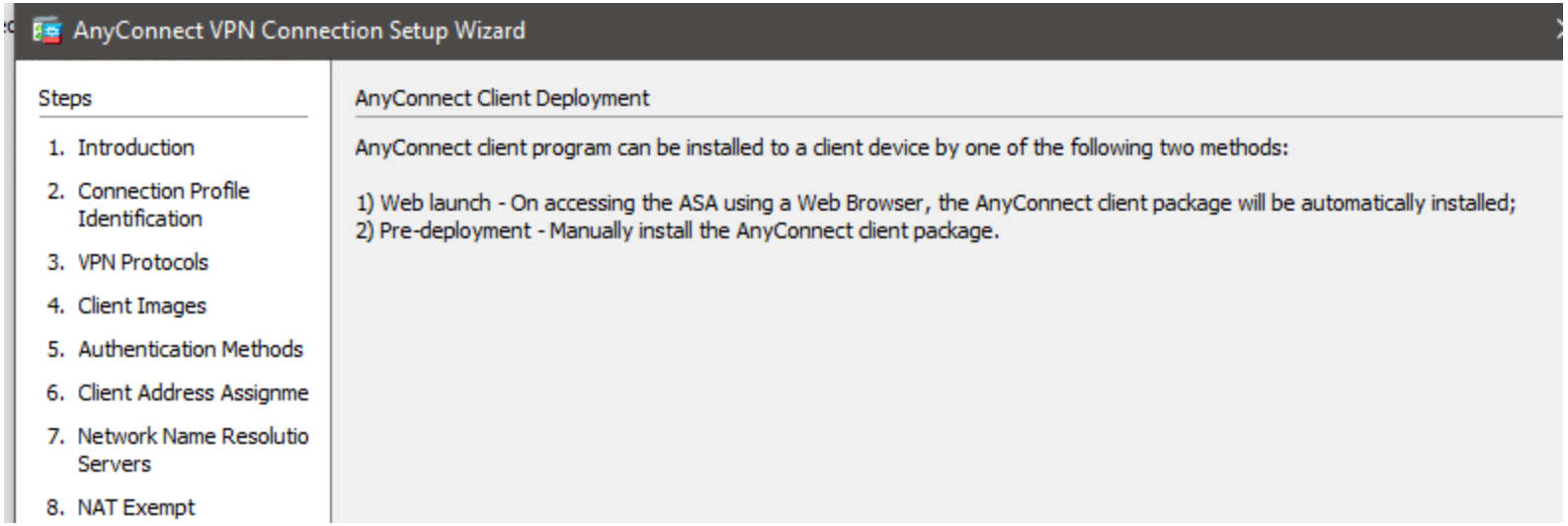


Step.6 Add your dns server info (should be corporate info)

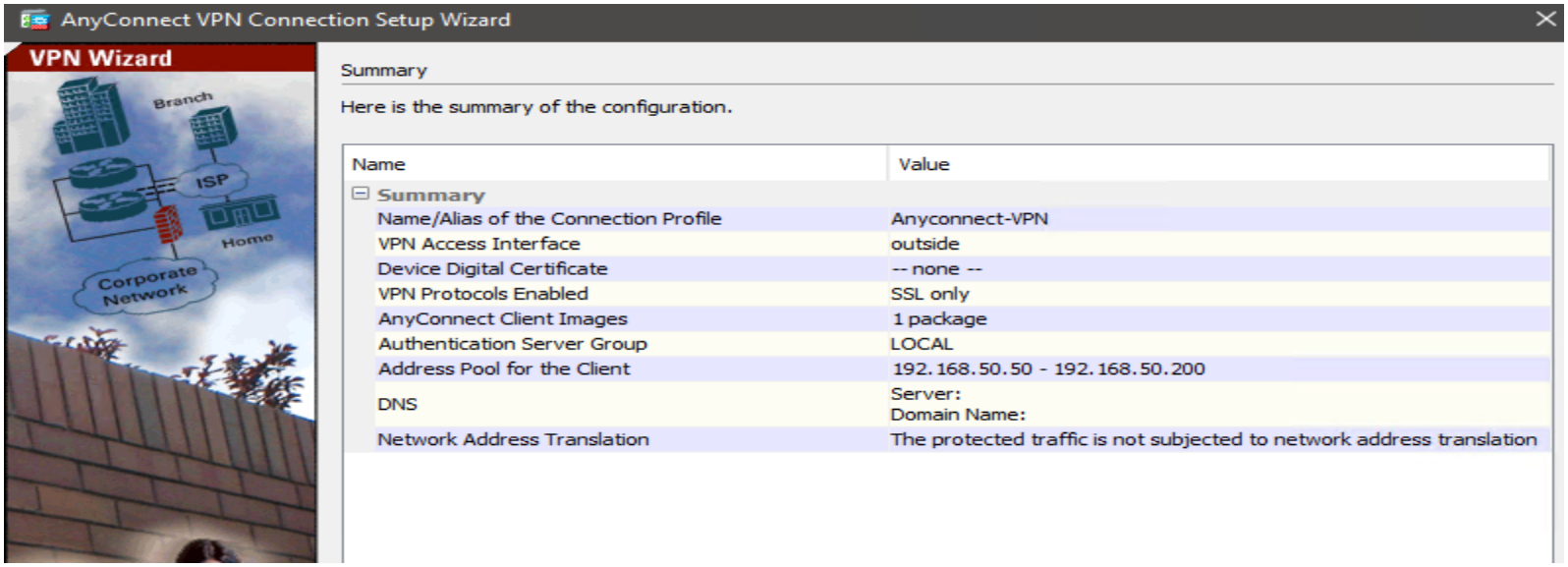


Step.7 Exempt NAT from vpn traffic if NAT is enable on this ASA

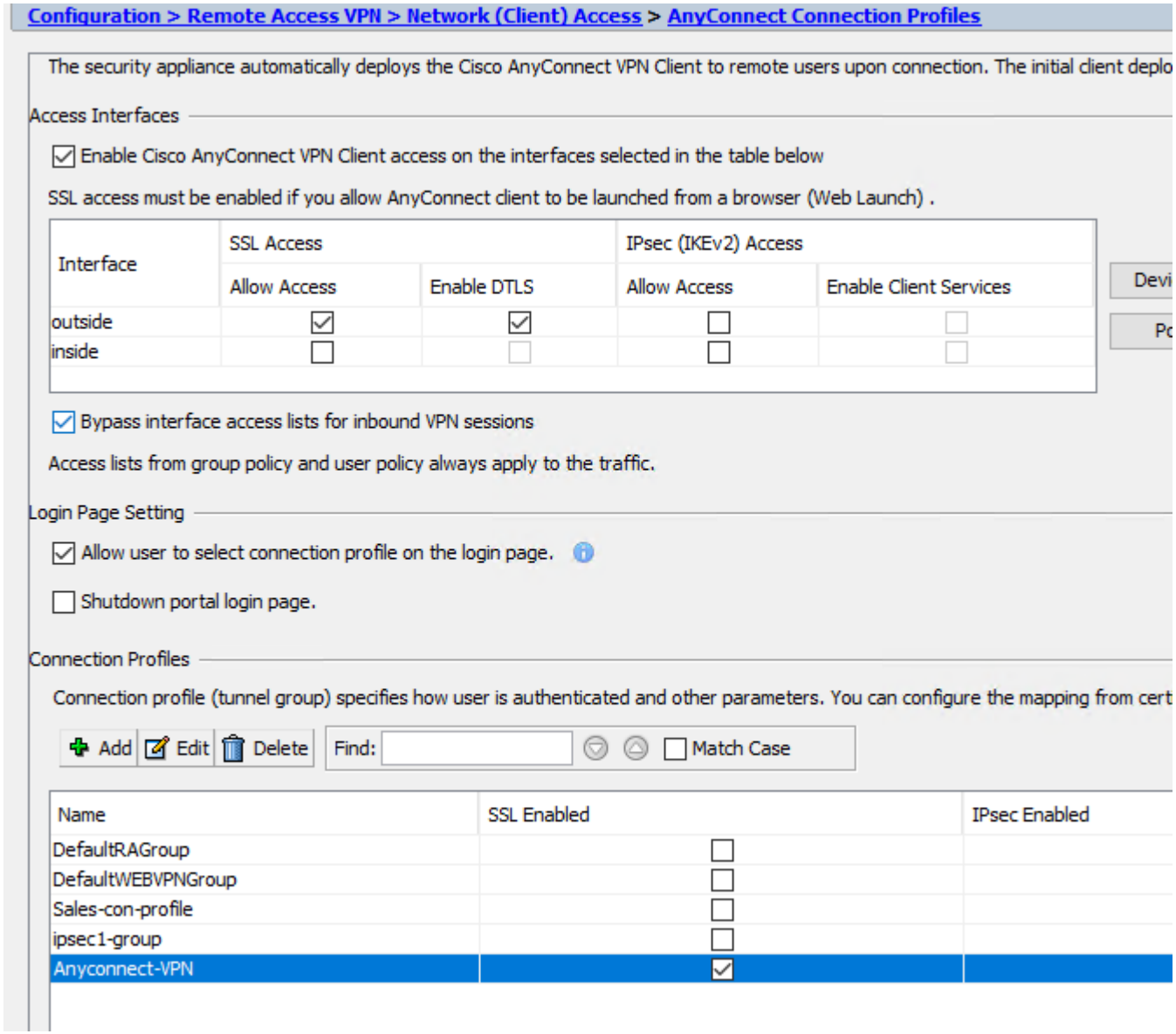




Step.8 Go through the Summary of the configuration before clicking finish



Step.9 Ensure all this are check with your connection profile



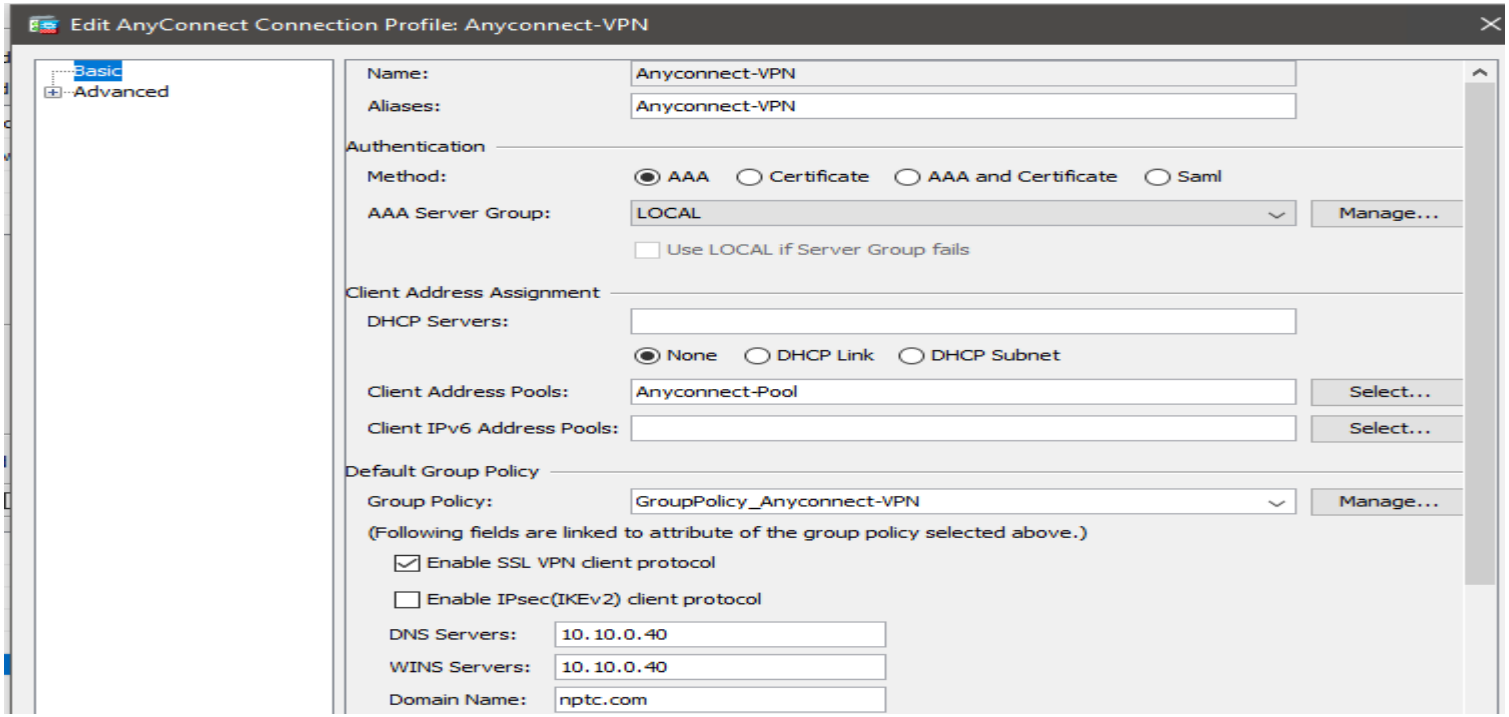
Split Tunnel

By default all traffic will be sent through the tunnel once the remote user is connected. If you want to allow remote users to access the Internet once they are connected then you need to configure split tunneling. We will configure an access-list that specifies what networks we want to reach through the tunnel.

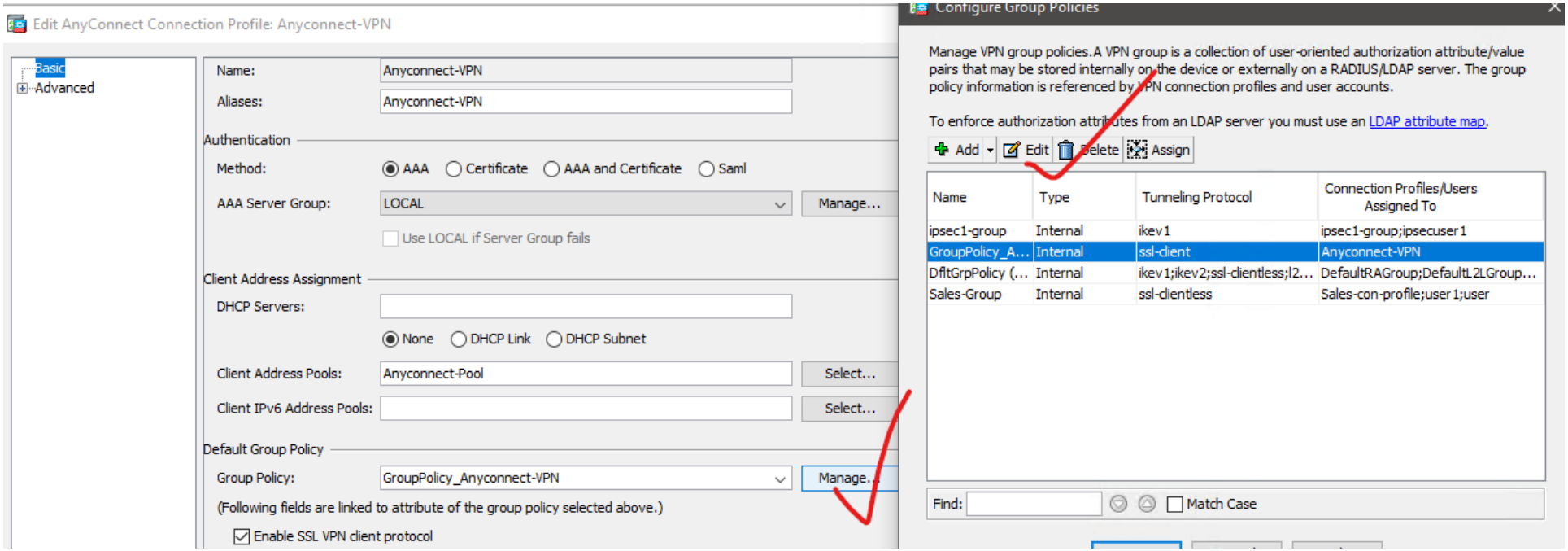
So let now configure the split tunnel

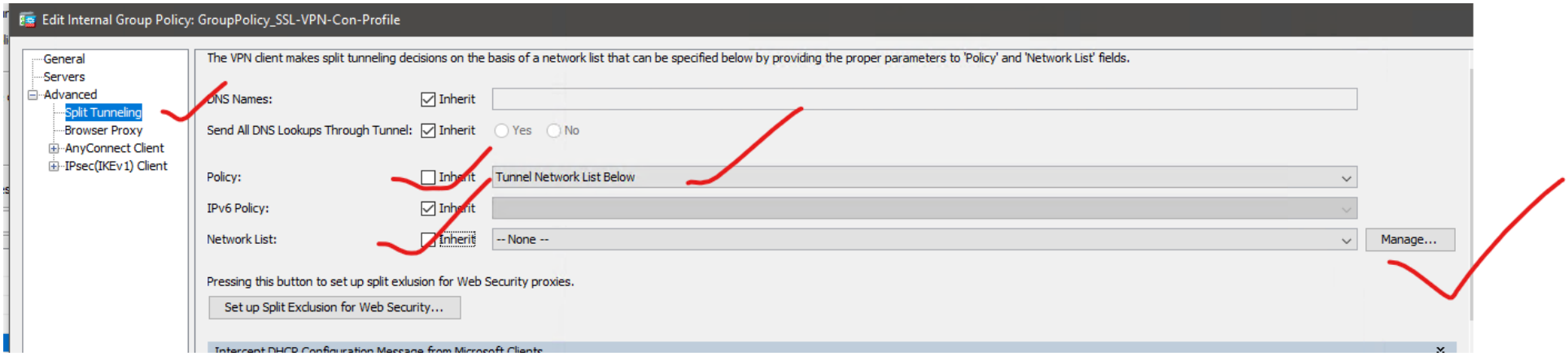
Configuration > Remote Access VPN > Network (Client) Access > AnyConnect Connection Profiles

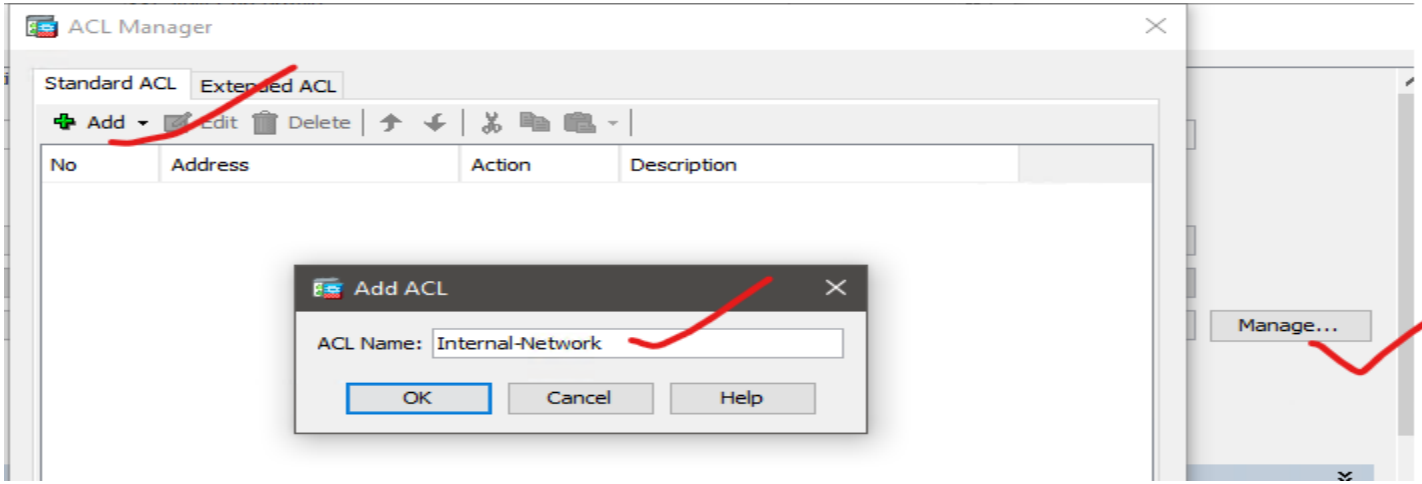
Click on the connection profile > edit

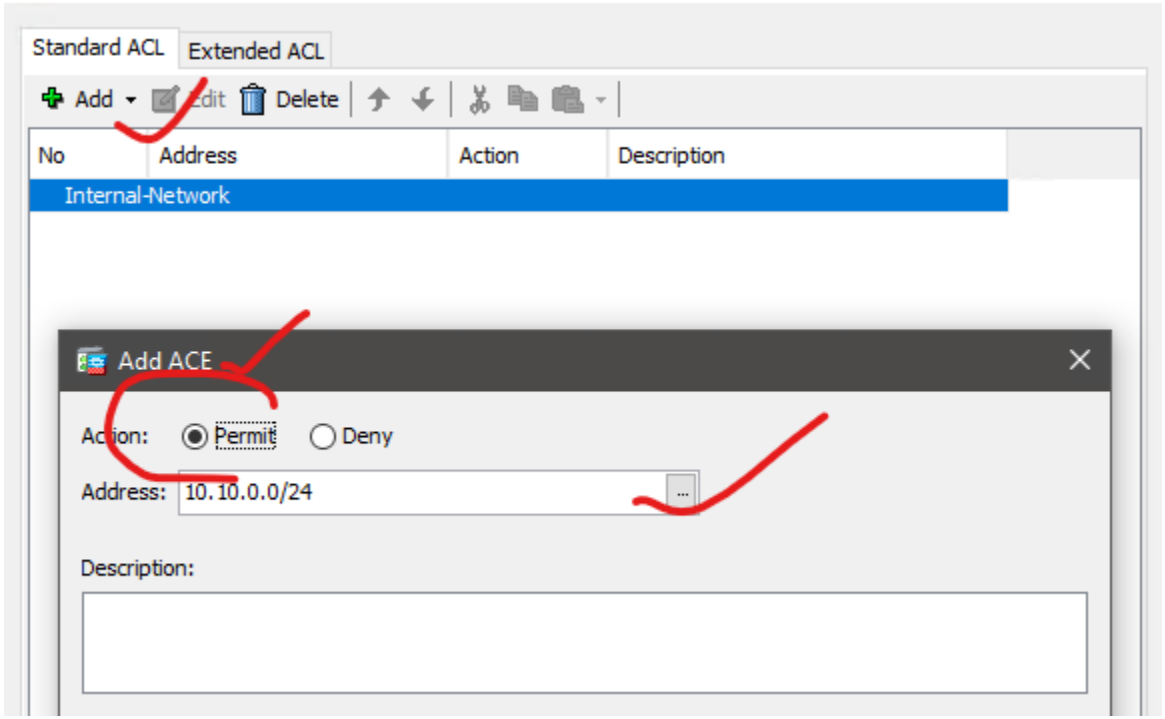


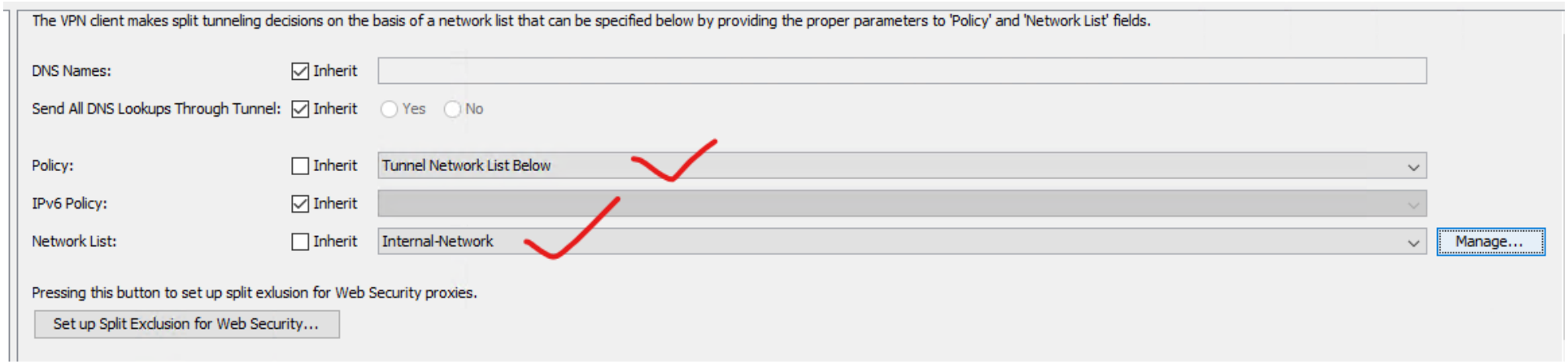
Click on manage under default



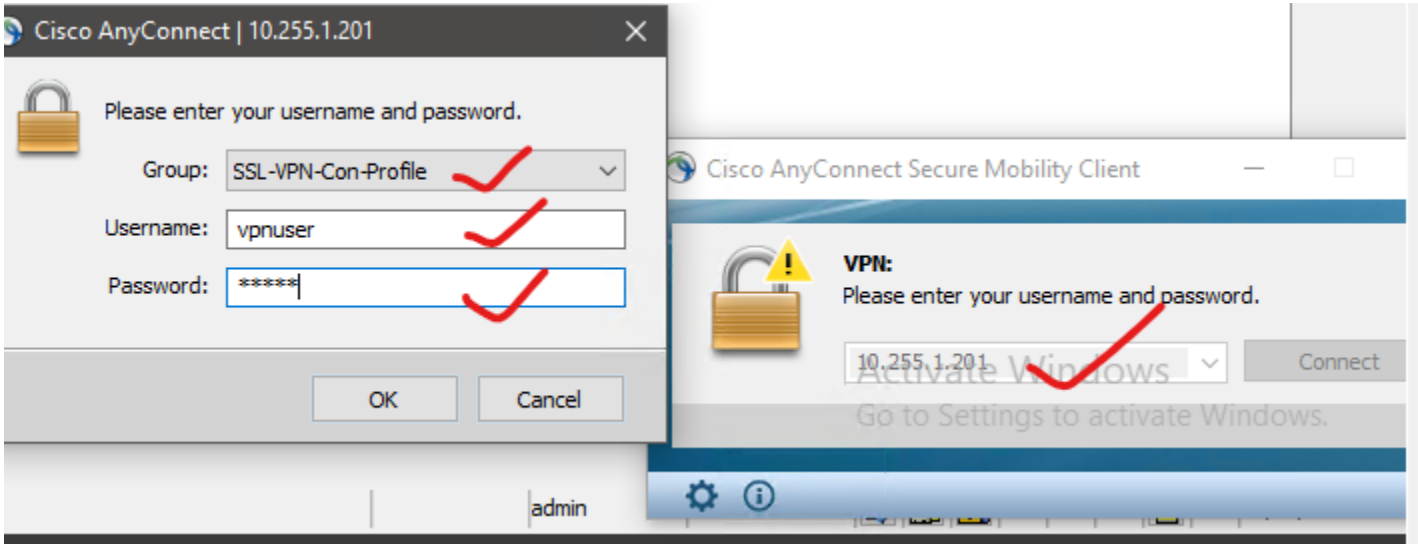



ACL Manager
Standard ACL
Extended ACL
Add
Edit
Delete
No
Address
Action
Description
Add ACL
ACL Name: Internal-Network
OK
Cancel
Help
Manage...


Standard ACL
Extended ACL
Add
Edit
Delete
No
Address
Action
Description
Internal-Network
Add ACE
Action:
Permit
Deny
Address: 10.10.0.0/24
Description:



Now we can test our vpn



Now you can connect as local user but not with rdp so use anydesk for testing purpose


AnyConnect Secure Mobility Client
Virtual Private Network (VPN)
Preferences
Statistics
Route Details
Firewall
Message History
05:30:09 AnyConnect was not able to establish a connection to the specified secure gateway. Please try connecting again.
05:30:09 VPN session ended.
05:36:08 Contacting 10.255.1.201.
05:36:21 User credentials entered.
05:36:21 Establishing VPN session...
05:36:21 The AnyConnect Downloader is performing update checks...
05:36:21 Checking for profile updates...
05:36:27 Downloading AnyConnect VPN Profile - 100%
05:36:27 Checking for product updates...
05:36:27 Checking for customization updates...
05:36:28 Performing any required updates...
05:36:28 The AnyConnect Downloader updates have been completed.
05:36:32 Establishing VPN session...
05:36:32 Establishing VPN - Initiating connection...
05:36:32 Establishing VPN - Examining system...
05:36:32 Establishing VPN - Activating VPN adapter...
05:36:36 Establishing VPN - Configuring system...
05:36:37 Establishing VPN...
05:36:37 Connected to 10.255.1.201.

```
ciscoasa# show vpn-sessiondb summary
----------------------------------------------------------------------------
----
VPN Session Summary

----------------------------------------------------------------------------
----
                            Active : Cumulative : Peak Concur : Inac
tive
                          ------------------------------------------
----
AnyConnect Client           :      1 :          4 :            1 :
   0
  SSL/TLS/DTLS              :      1 :          4 :            1 :
   0
```

Implementing clientless VPN on Cisco ASA

Cisco clientless SSL VPNs allow organizations to provide secure remote access to protected network resources in the headquarters, even when the remote user device is not managed or has no VPN client installed.

In other words, it provides the simplest way for users to access mainly web-based (and some non-web-based) applications over a web browser.

The VPN gateway that acts as a proxy between the remote user and protected resources is responsible for the overall VPN permissions, such as services allowed, bookmarks available

Keep in mind that the Cisco Firepower NGFW firewall doesn't support clientless VPN deployment.

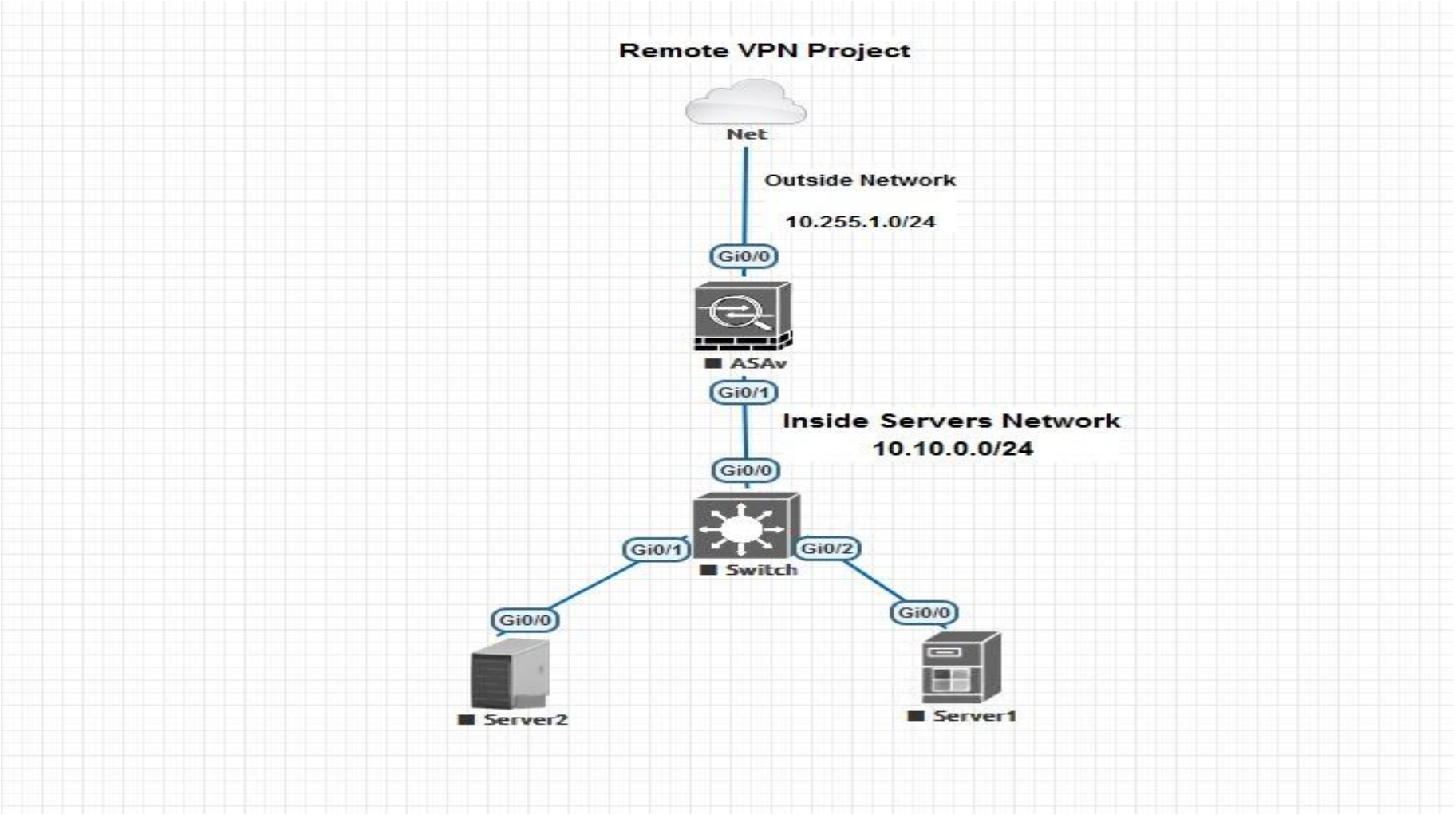
Typical use cases include internet kiosks, on demand and business partners that require access only to a specific set of services and resources in general, which works perfectly with the clientless VPN limitation.

However, the clientless TLS VPN solution has some limitations. Because everything is done through the web portal, it may require user training so that users can learn how to use the navigation portal before they begin using it.

Furthermore, due to its proxying nature, real-time applications often experience latency and delay, which makes them unusable at times.

Finally, since this VPN solution doesn't support all IP applications, sometimes you have to choose a different option

Clientless SSL VPN on ASA Project



SSL Clientless Project Task

Project requirement is to create clientless VPN where any random machines on the internet can connect to internal sales server for corporate work

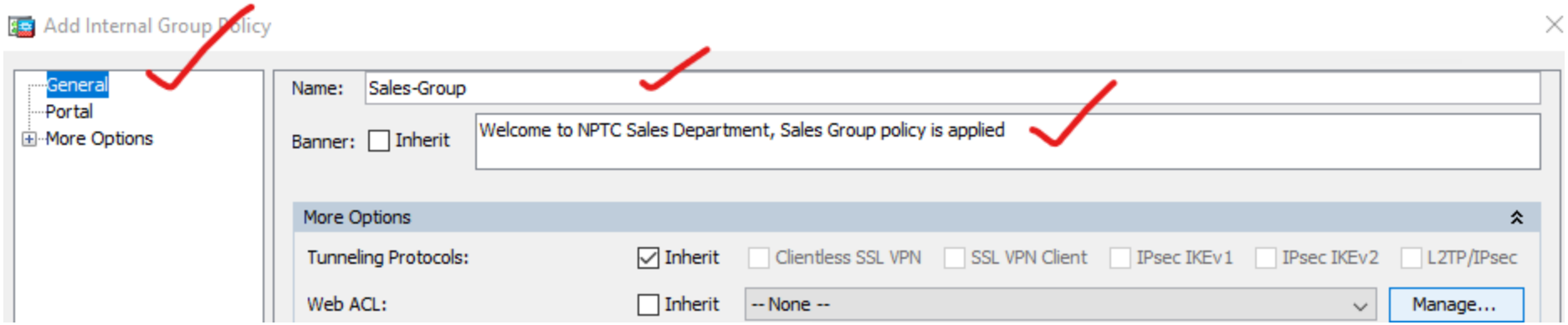
The **clientless WebVPN** method does not require a VPN client to be installed on the user's computer. You just open your web browser, enter the IP address of the ASA and you will get access through a web portal. You only have limited access to a number of applications, for example:

- Internal websites (HTTP and HTTPS)
- Web applications
- Windows file shares
- Email servers (POP3, IMAP, SMTP)
- Microsoft Outlook Web Access

There is **no full network access** when you use clientless WebVPN

Step1. Create a new vpn policies for sales users

Configuration ▸Remote Access ▸ Clientless SSL VPN Access ▸ Group Policies ▸ Add

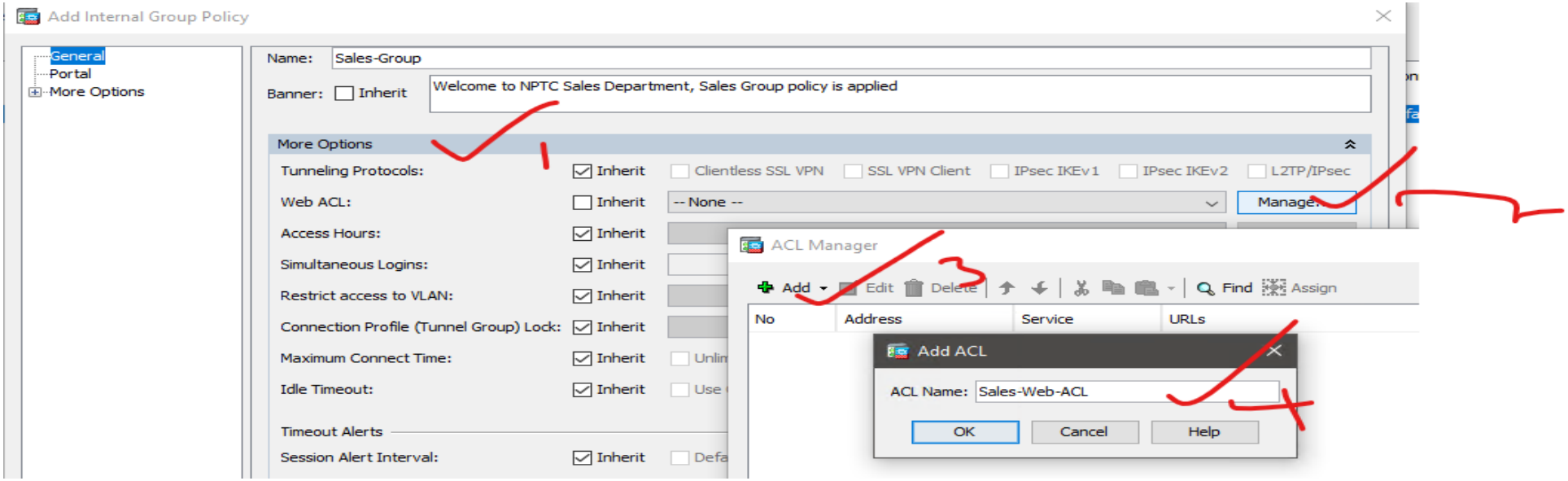


Step2. Apply web type ACL to prevent sales users from accessing certain services (Optional)

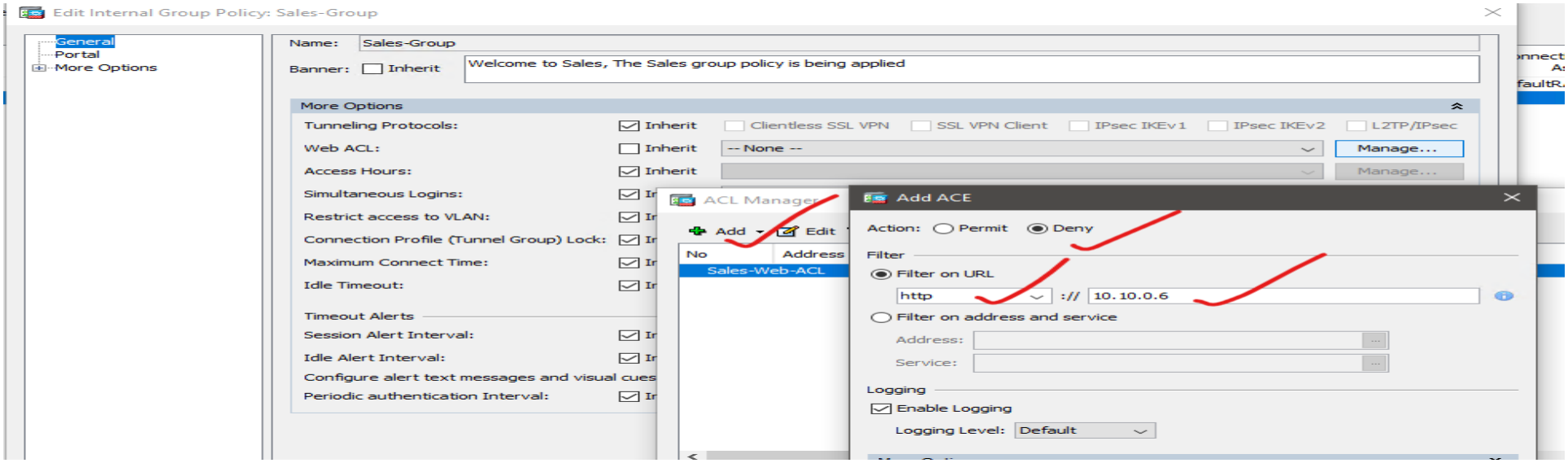
1. First is to create web acl

2. Second Create ACE – Access Control Entry

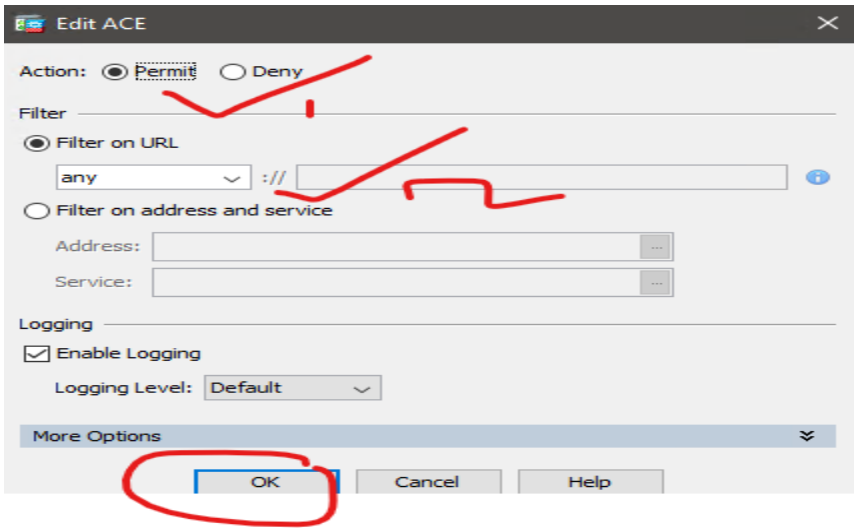
1. First is to create web acl

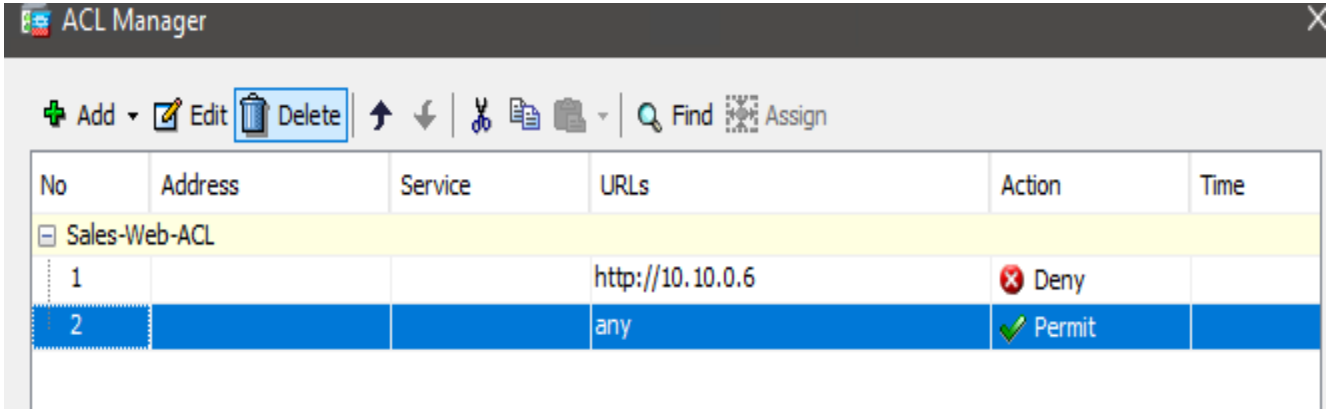


Second Create ACE – Access Control Entry

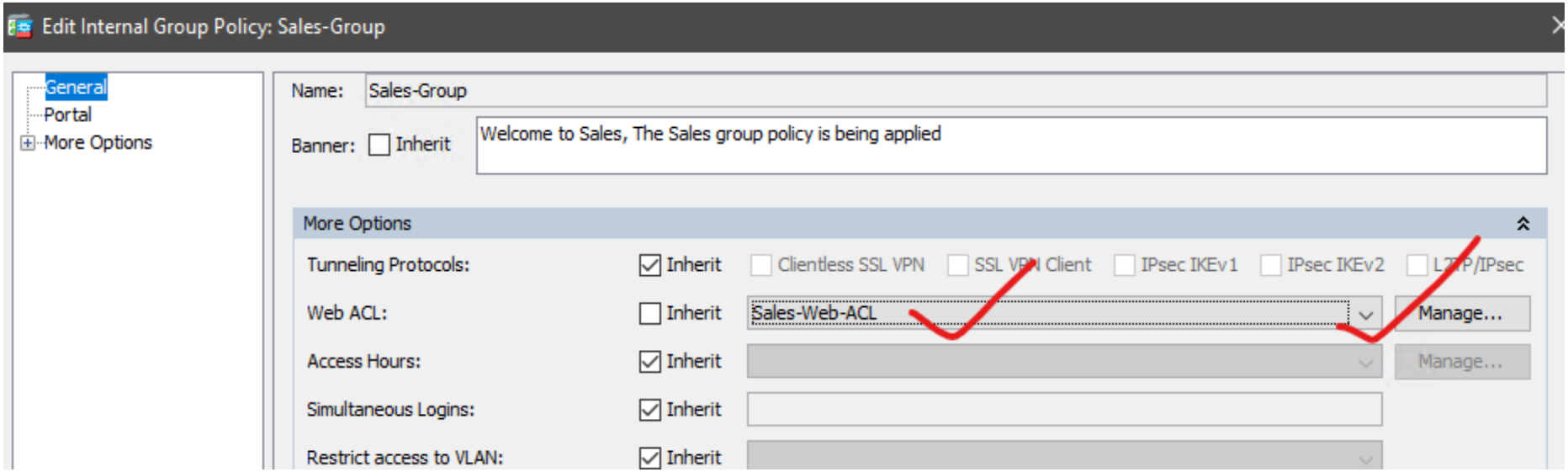


Now permit all other traffic without this everything will be drop



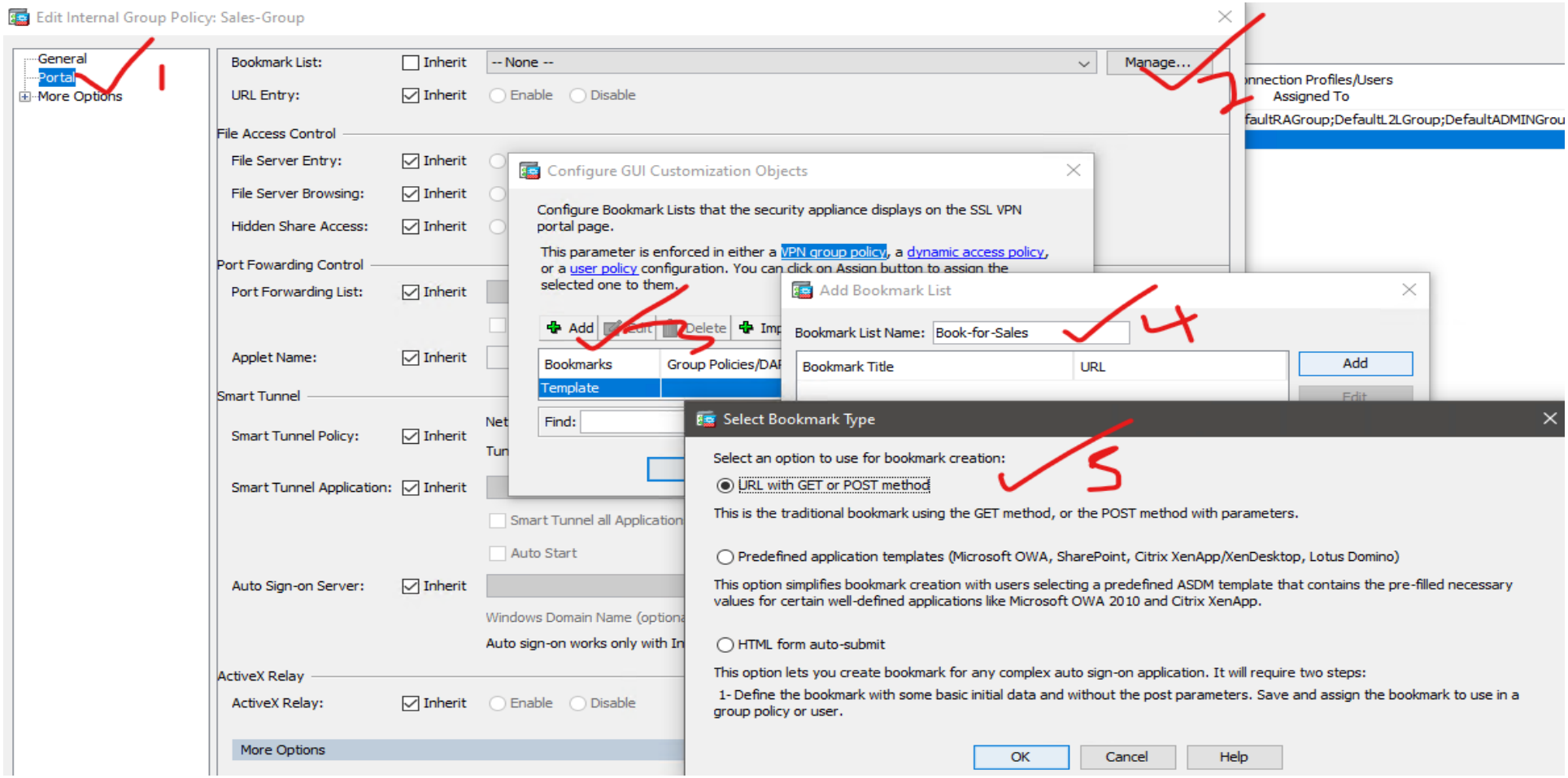


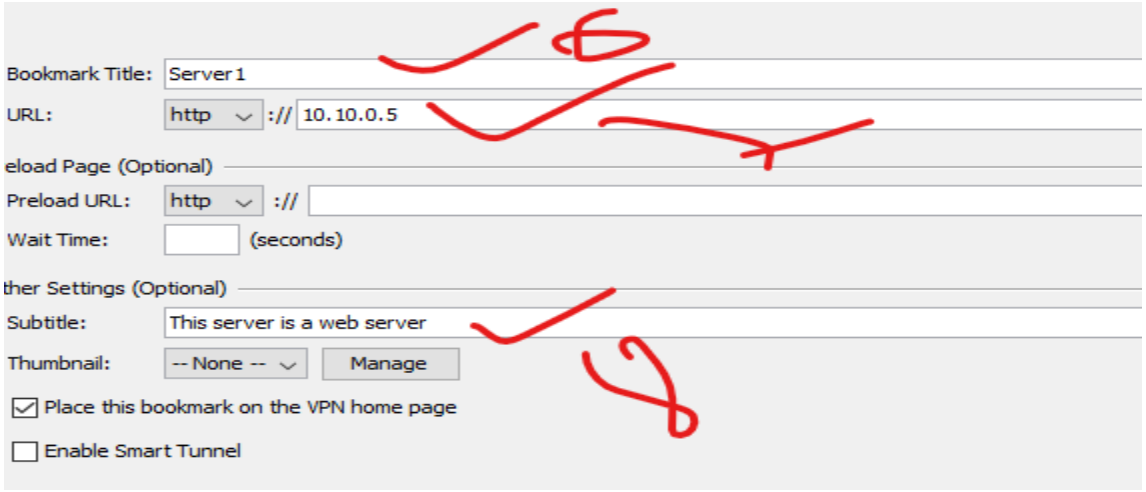
Last step for the ACL is to select it on the drop menu



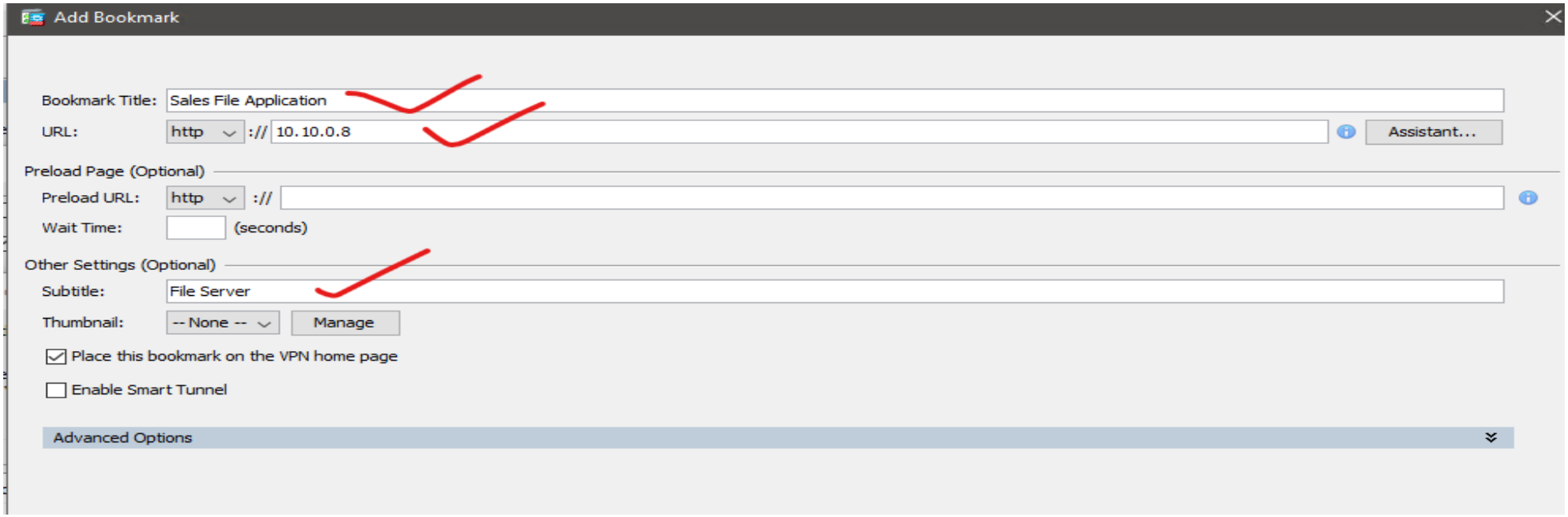
Step-3 Create the bookmark list

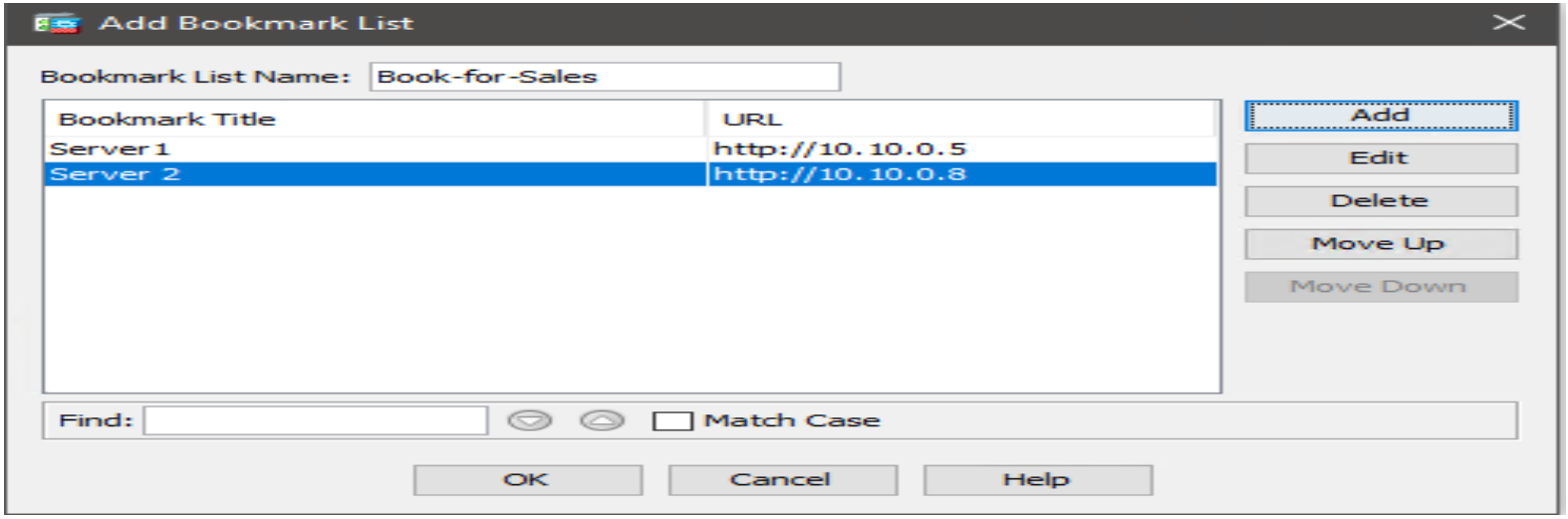
Add internal Group Policy ▸ Portal ▸ un-chick Bookmark list▸ Manage ▸ Add



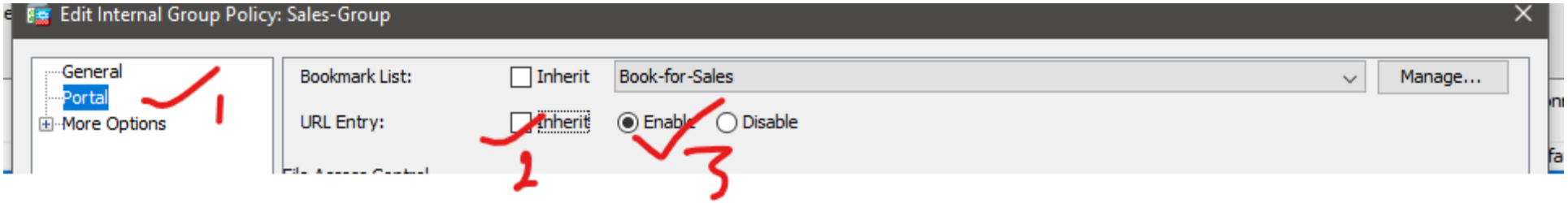


Creating another Bookmark starting item 6 as reference





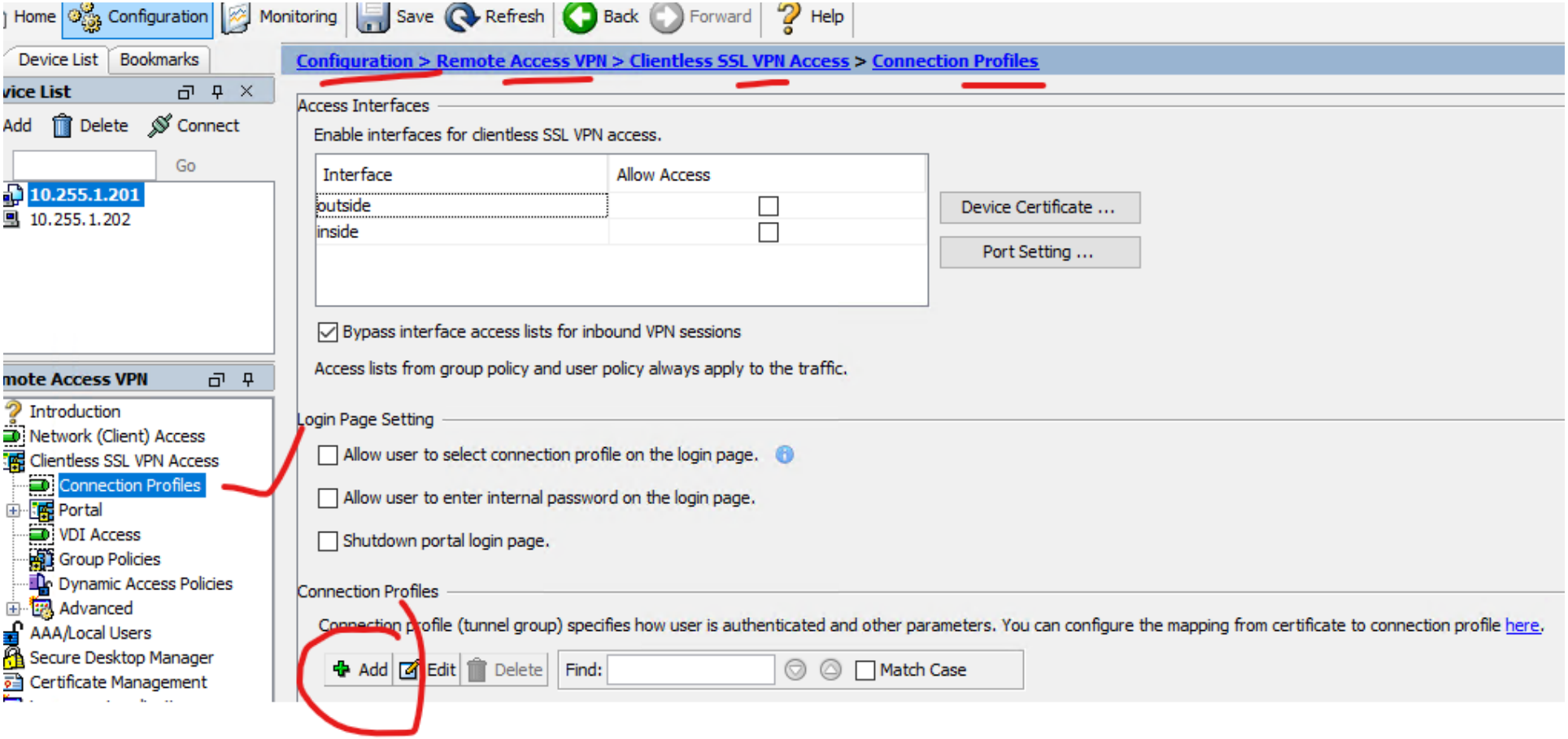
Enable the URL Entry on the ASA under the Portal

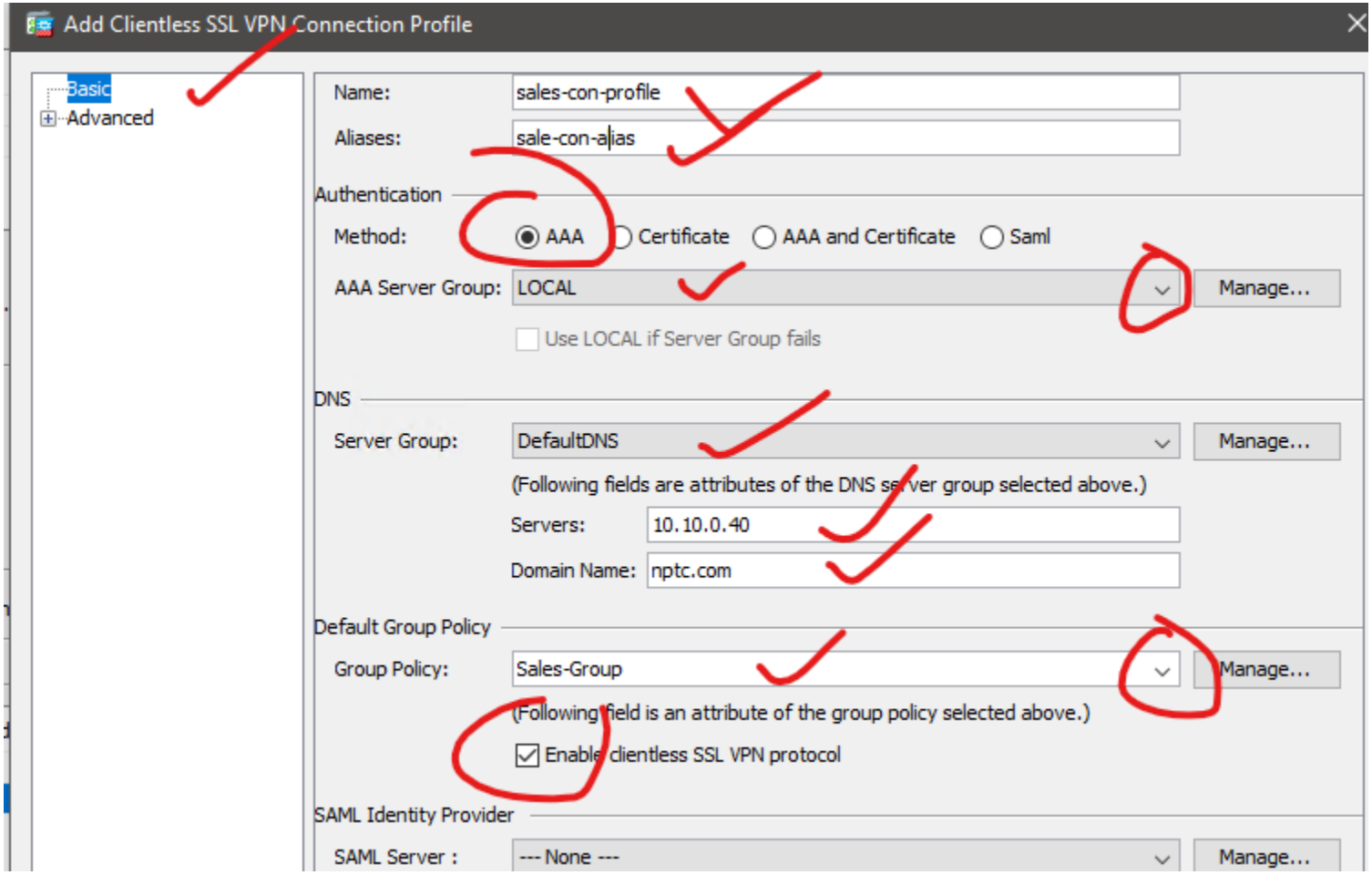


Final Step is to click Apply for all the group policy configuration to take effect

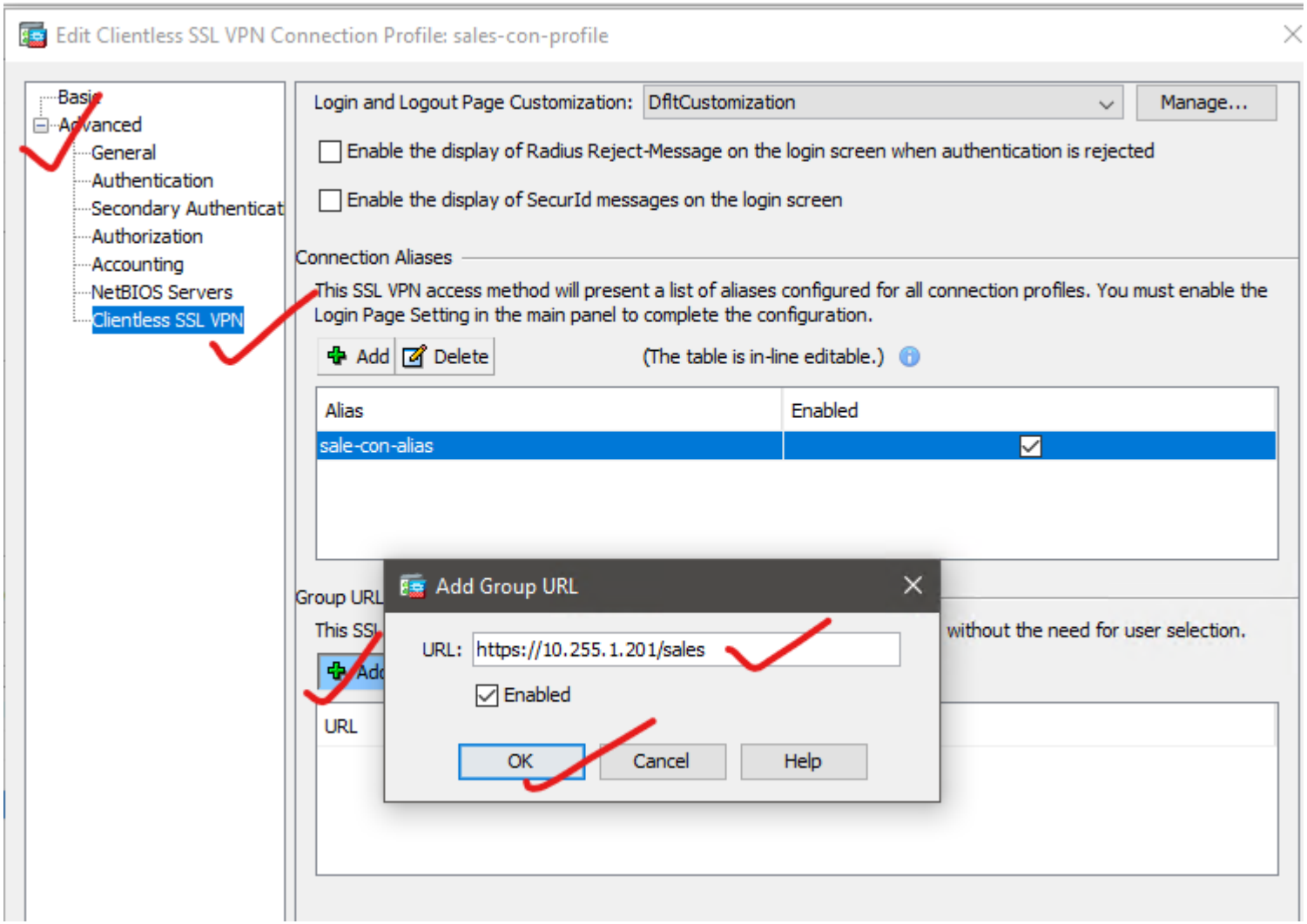
Step 4 Create the Connection profiles to be use for this group

Configuration ▸Remote Access ▸ Clientless SSL VPN ▸ Connection Profile ▸ Add

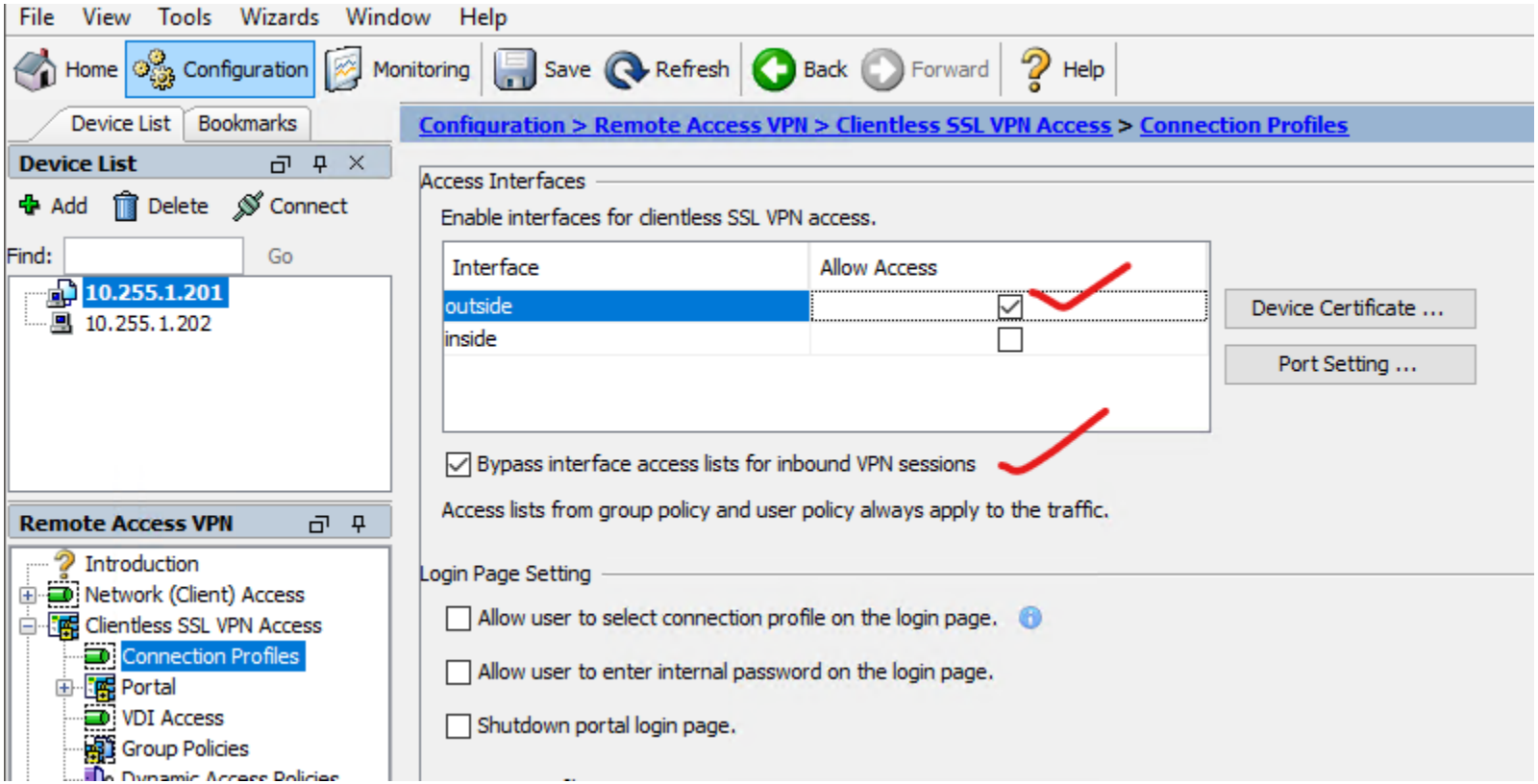



Add Clientless SSL VPN Connection Profile
Basic
Advanced
Name:
sales-con-profile
Aliases:
sale-con-alias
Authentication
Method:
AAA
Certificate
AAA and Certificate
Saml
AAA Server Group:
LOCAL
Manage...
Use LOCAL if Server Group fails
DNS
Server Group:
DefaultDNS
Manage...
(Following fields are attributes of the DNS server group selected above.)
Servers:
10.10.0.40
Domain Name:
nptc.com
Default Group Policy
Group Policy:
Sales-Group
Manage...
(Following field is an attribute of the group policy selected above.)
Enable clientless SSL VPN protocol
SAML Identity Provider
SAML Server :
--- None ---
Manage...

Now Create the URL the users are going to connect with

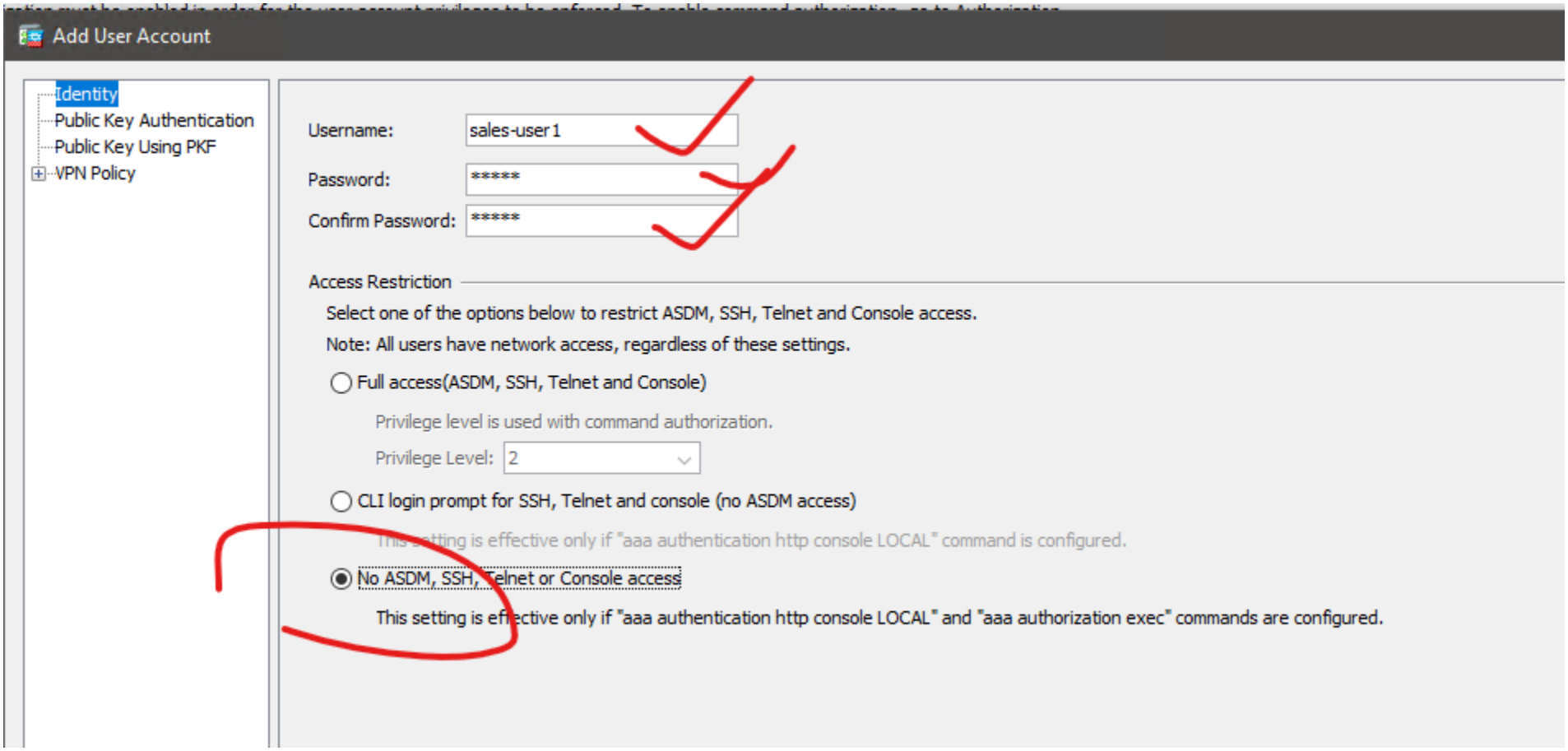


Enable clientless SSL VPN traffic termination on Cisco ASA's interface where the remote sessions will arrive.

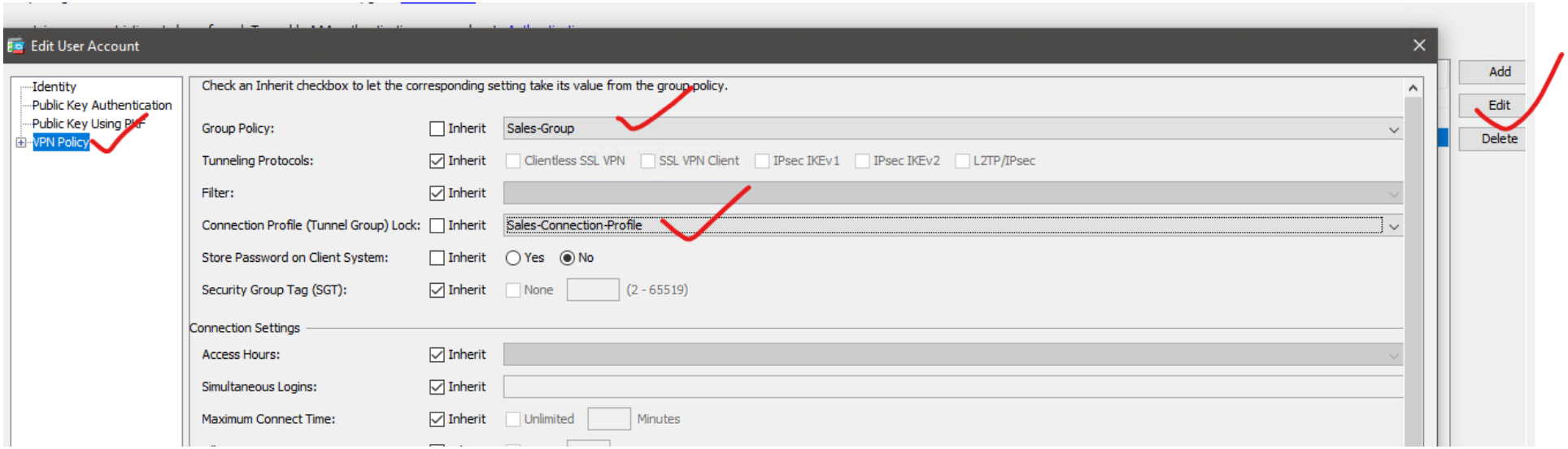


Final stage is to click Apply for the configuration to take effect

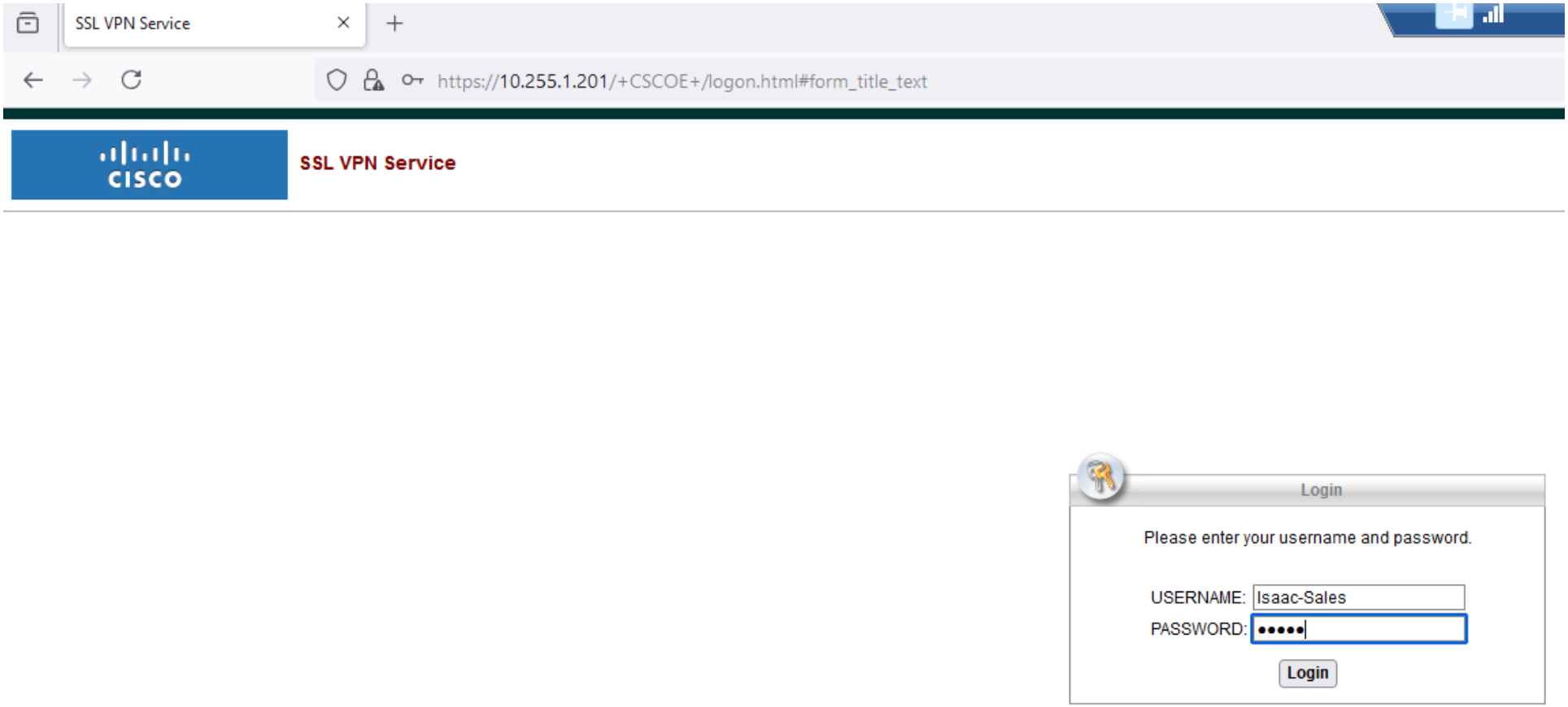
Let's create users who can access this VPN by using cisco as password

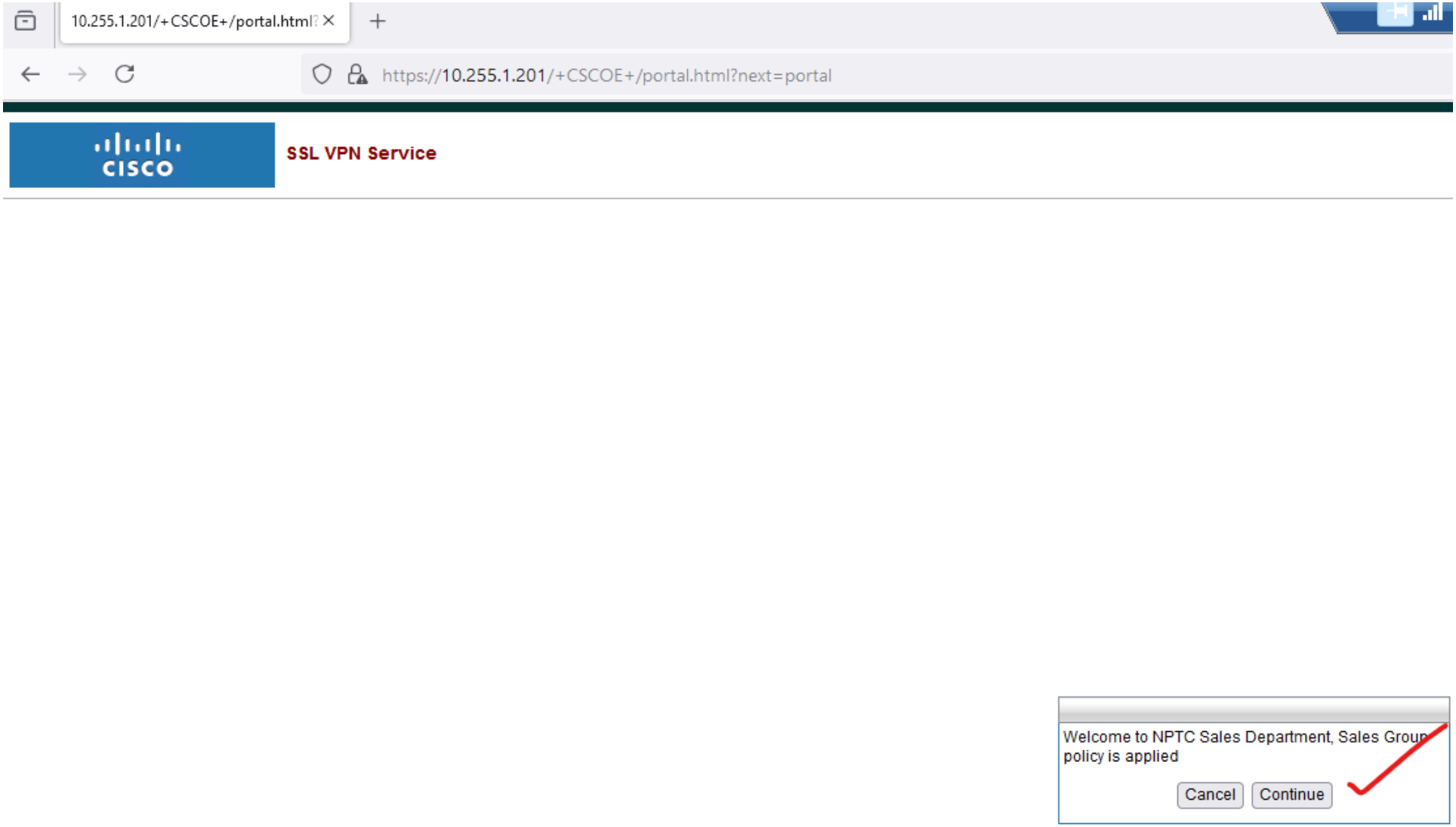


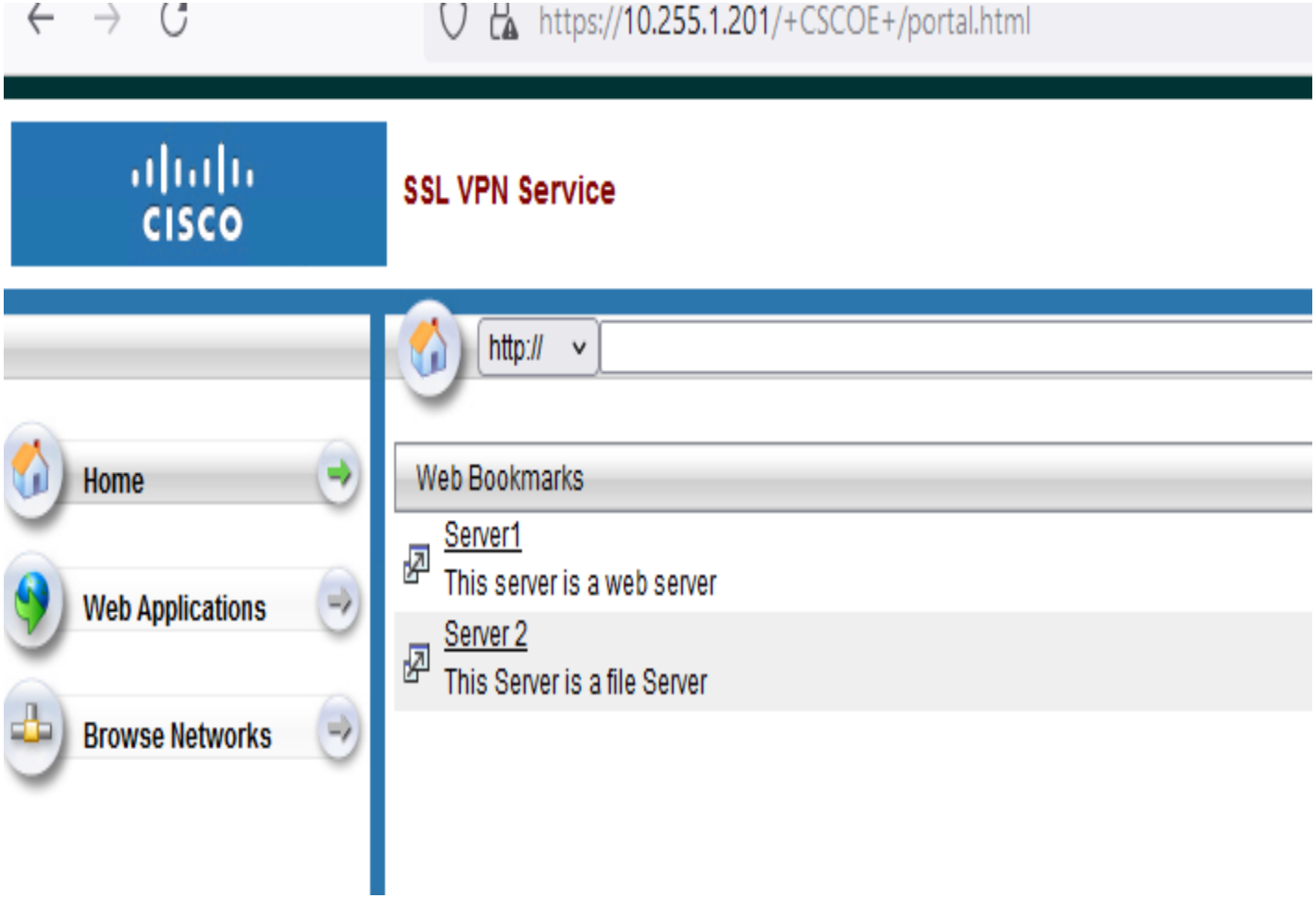
Add the User to the right vpn policy group and connection profile group



Let's verify


SSL VPN Service
https://10.255.1.201/+CSCOE+/logon.html#form_title_text
SSL VPN Service
Login
Please enter your username and password.
USERNAME: Isaac-Sales
PASSWORD:
Login


10.255.1.201/+CSCOE+/portal.html?
https://10.255.1.201/+CSCOE+/portal.html?next=portal
SSL VPN Service
Welcome to NPTC Sales Department, Sales Group policy is applied
Cancel
Continue


https://10.255.1.201/+CSCOE+/portal.html
SSL VPN Service
http://
Home
Web Applications
Browse Networks
Web Bookmarks
Server1
This server is a web server
Server 2
This Server is a file Server