Cisco ASA 5506-X Firewall Configuration on a 3-Tier Campus LAN Architecture

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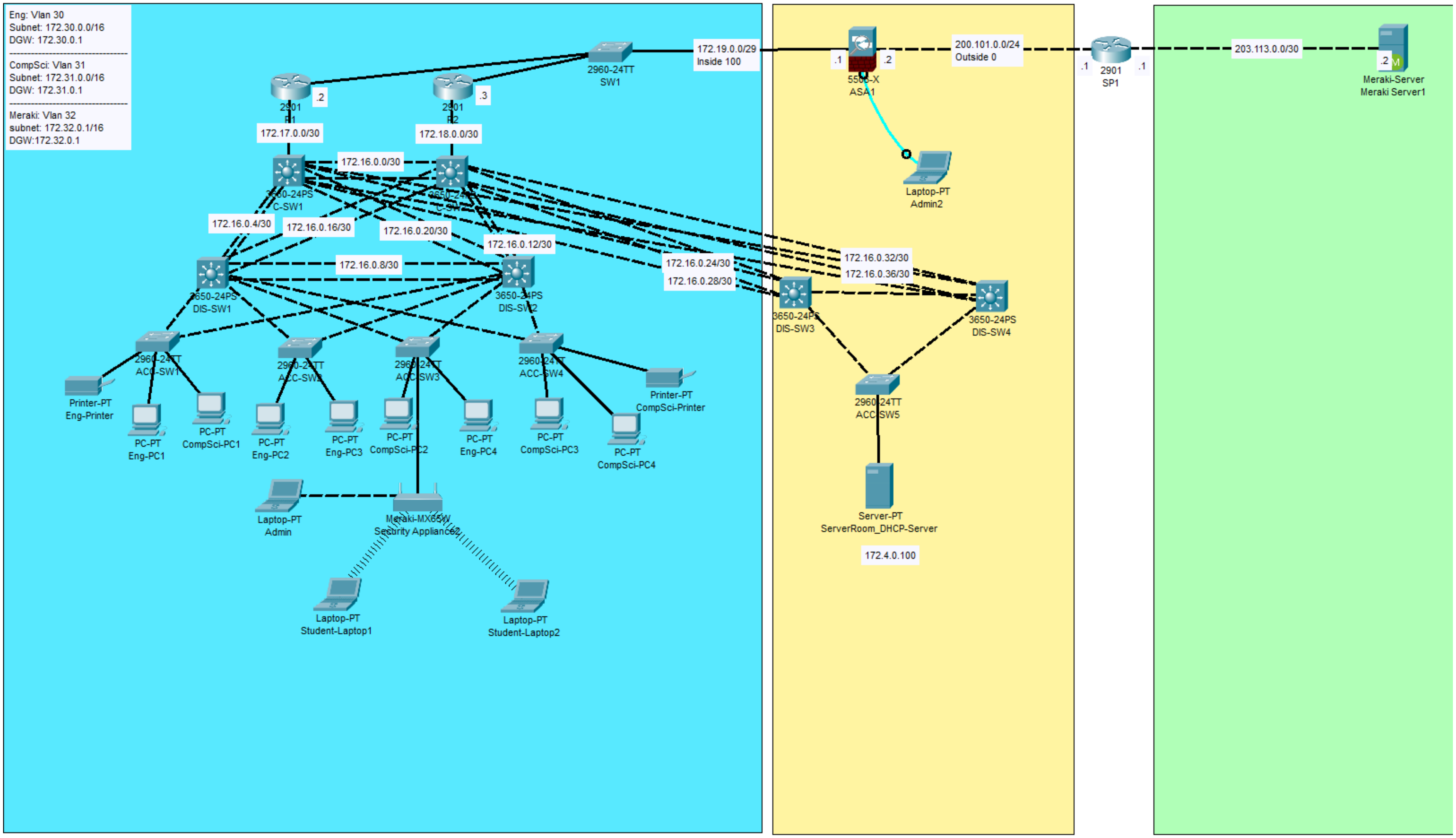
Table of Contents

Abstract

In this packet tracer project, I was able to implement a firewall using the Cisco ASA 5506-X appliance. This is a continuation from a previous project titled as "Cisco Meraki Centralized WLC on a 3-Tier Campus LAN Architecture". Security levels were configured on the inside and outside interface on the firewall. I then successfully configured dynamic routes to/from the inside interface on the firewall using the OSPF routing protocol. A static default route to the outside was configured on the firewall. An object network was implemented to represent the inside network. That object was used to create address translation to the outside interface using PAT. ACLs were implemented to mange the flow of key traffic, especially the https connection to the Meraki server on the other side of the service provider gateway.


Eng: Vlan 30
Subnet: 172.30.0.0/16
DGW: 172.30.0.1
CompSci: Vlan 31
Subnet: 172.31.0.0/16
DGW: 172.31.0.1
Meraki: Vlan 32
subnet: 172.32.0.1/16
DGW:172.32.0.1
2960-24TT
SW1
172.19.0.0/29
Inside 100
.1
.2
5506-X
ASA1
200.101.0.0/24
Outside 0
.1
2901
SP1
.1
203.113.0.0/30
.2
Meraki-Server
Meraki Server1
2901
R1
.2
2901
R2
.3
172.17.0.0/30
172.18.0.0/30
172.16.0.0/30
3650-24PS
C-SW1
3650-24PS
C-SW2
172.16.0.4/30
172.16.0.16/30
172.16.0.20/30
172.16.0.12/30
172.16.0.8/30
172.16.0.24/30
172.16.0.28/30
172.16.0.32/30
172.16.0.36/30
3650-24PS
DIS-SW1
3650-24PS
DIS-SW2
3650-24PS
DIS-SW3
3650-24PS
DIS-SW4
Laptop-PT
Admin2
2960-24TT
ACC-SW1
2960-24TT
ACC-SW2
2960-24TT
ACC-SW3
2960-24TT
ACC-SW4
2960-24TT
ACC-SW5
Printer-PT
Eng-Printer
PC-PT
Eng-PC1
PC-PT
CompSci-PC1
PC-PT
Eng-PC2
PC-PT
Eng-PC3
PC-PT
CompSci-PC2
PC-PT
Eng-PC4
PC-PT
CompSci-PC3
PC-PT
CompSci-PC4
Printer-PT
CompSci-Printer
Server-PT
ServerRoom_DHCP-Server
172.4.0.100
Laptop-PT
Admin
Meraki-MX65W
Security Appliance2
Laptop-PT
Student-Laptop1
Laptop-PT
Student-Laptop2

Introduction

The goal is to secure the LAN implemented in the previous project titled as "Cisco Meraki Centralized WLC on a 3-Tier Campus LAN Architecture ", using the Cisco ASA 5506-X firewall. After configuring a hostname on the Cisco ASA appliance, names, service-levels, and IP addresses will be assigned to the outside and inside interfaces on the Cisco ASA appliance. I will update the static routes on the service provider router so that traffic from the service provider router has a route to the LAN with the firewall outside interface IP address as the next hop address. The interfaces on routers R1 and R2 facing the inside interface of the firewall will be added to the same subnet as the firewall inside interface using static IP assignment. Default routes to the inside interface on the firewall will also be configured on routers R1 and R2. The OSPF configuration will be updated to reflect the changes on R1 and R2. OSPF will also be configured on the inside interface of the ASA appliance and a default route outside the LAN will be implemented. An object network will be used to translate the LAN network to the outside interface using Port Address Translation (PAT).

Method and Equipment

Update Static Routes on SP1

SP1

```
SP1>en
SP1#show run | include ip route
!
ip route 172.0.0.0 255.0.0.0 200.101.0.2
ip route 172.0.0.0 255.0.0.0 200.101.0.3
!
SP1#config t
Enter configuration commands, one per line. End with CNTL/Z.
SP1(config)#no ip route 172.0.0.0 255.0.0.0 200.101.0.3
SP1(config)#do show run | include ip route
!
ip route 172.0.0.0 255.0.0.0 200.101.0.2
```

Hostname Configuration on ASA1

```
ciscoasa>en
Password:
ciscoasa#config t
ciscoasa(config)#hostname ASA1
ASA1(config)#exit
ASA1#copy run start
Source filename [running-config]?
Cryptochecksum: 3242414f 76390dfd 4d1b3eb0 56931cb5

1102 bytes copied in 1.422 secs (774 bytes/sec)
ASA1#
```

Ip Subnetting on ASA1, R1 and R2

ASA1

```
ASA1#config t
ASA1(config)#int g1/1
ASA1(config-if)#ip address 200.101.0.2 255.255.255.0
ASA1(config-if)#no shutdown
ASA1(config-if)#nameif outside
INFO: Security level for "outside" set to 0 by default.
ASA1(config-if)#security-level 0
ASA1(config-if)#int g1/2
ASA1(config-if)#ip address 172.19.0.1 255.255.255.248
ASA1(config-if)#nameif inside
INFO: Security level for "inside" set to 100 by default.
ASA1(config-if)#security-level 100
ASA1(config-if)#no shutdown
```

R1

```
R1>en
R1#config t
R1(config)#do show run | incl ip address
!
ip address 172.17.0.1 255.255.255.252
ip address 200.101.0.2 255.255.255.0
no ip address
!
R1(config)#int g0/1
R1(config-if)#no ip address 200.101.0.2 255.255.255.0
R1(config-if)#ip address 172.19.0.2 255.255.255.248
```

R2

```
R2>en
R2#config t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#do show run | incl ip address
!
ip address 172.18.0.1 255.255.255.252
ip address 200.101.0.3 255.255.255.0
no ip address
!
R2(config)#int g0/1
R2(config-if)#no ip address 200.101.0.3 255.255.255.0
R2(config-if)#ip address 172.19.0.3 255.255.255.248
```

Update OSPF configuration and default route on R1 and R2

R1

```
R1#show run | section ospf
!
router ospf 1
log-adjacency-changes
network 172.17.0.0 0.0.255.255 area 0
network 200.101.0.0 0.0.0.255 area 0
default-information originate
!
R1#config t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#router ospf 1
R1(config-router)#no network 172.17.0.0 0.0.255.255 area 0
R1(config-router)# no network 200.101.0.0 0.0.0.255 area 0
R1(config-router)#network 172.0.0.0 0.255.255.255 area 0
R1(config-router)#exit
R1(config)#ip route 0.0.0.0 0.0.0.0 172.19.0.1
R1(config)#router ospf 1
R1(config-router)#default-information originate
```

R2

```
R2#show run | section ospf
!
router ospf 1
log-adjacency-changes
network 172.18.0.0 0.0.255.255 area 0
network 200.101.0.0 0.0.0.255 area 0
!
R2#config t
Enter configuration commands, one per line. End with CNTL/Z.
R2(config)#router ospf 1
R2(config-router)#no network 172.18.0.0 0.0.255.255 area 0
R2(config-router)#no network 200.101.0.0 0.0.0.255 area 0
R2(config-router)#network 172.0.0.0 0.255.255.255 area 0
R2(config-router)#exit
R2(config)# ip route 0.0.0.0 0.0.0.0 172.19.0.1
```

Configure OSPF and default route on ASA1

ASA1

```
ASA1#config t
ASA1(config)#router ospf 1
```

```
ASA1(config-router)#network 172.19.0.0 255.255.255.248 area 0
ASA1(config)#route outside 0.0.0.0 0.0.0.0 200.101.0.1
```

Create Object Network and Configure Address Translation using PAT on ASA1

ASA1

```
ASA1#config t
ASA1(config)#object network INSIDE-NET
ASA1(config-network-object)#subnet 172.0.0.0 255.0.0.0
ASA1(config-network-object)#nat (inside,outside) dynamic interface
ASA1(config-network-object)#exit
```

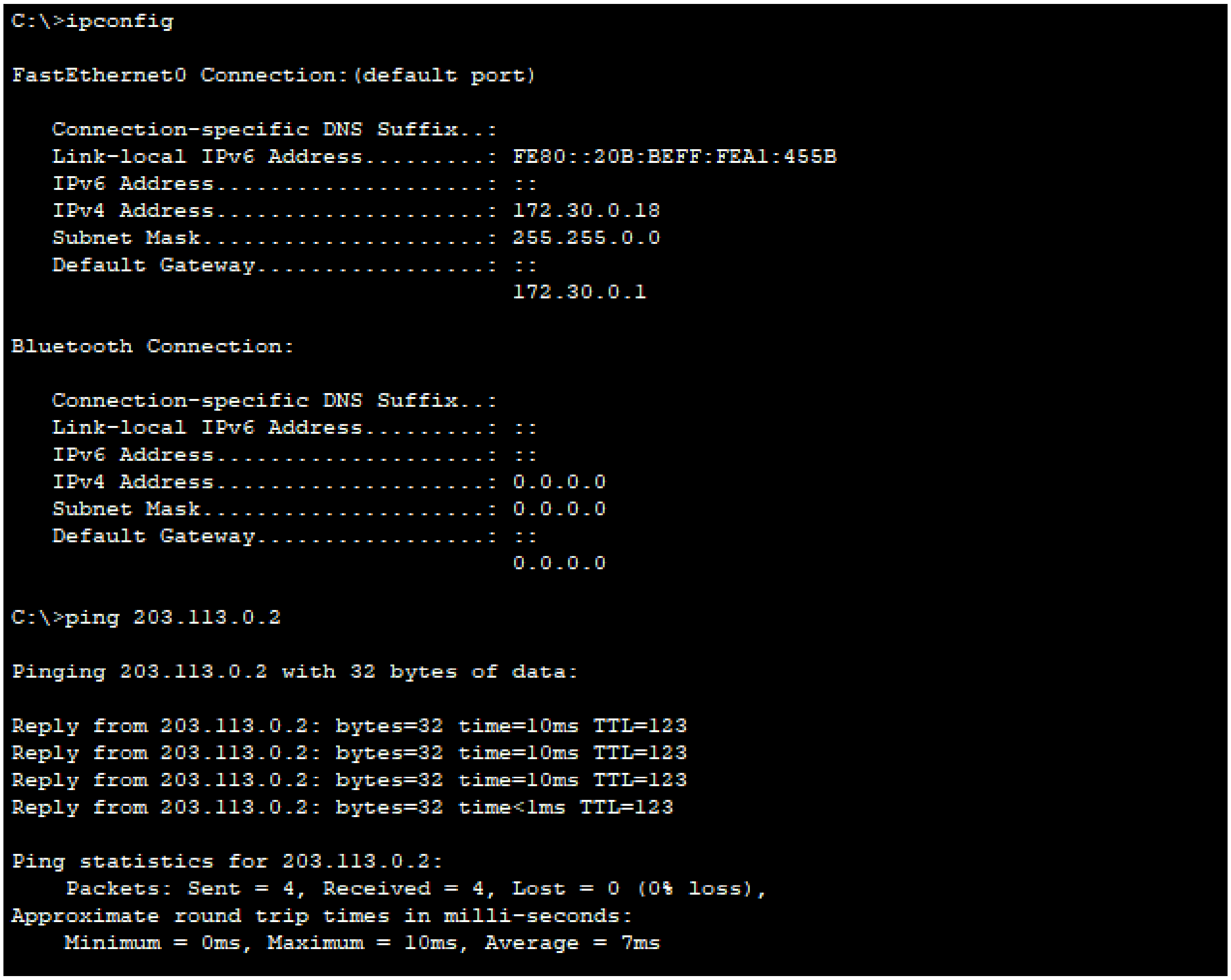
Create ACL on ASA1

ASA1

```
ASA1# config t
ASA1(config)#access-list NAT-IP-ALL extended permit tcp any any
ASA1(config)#access-list NAT-IP-ALL extended permit icmp any any
ASA1(config)#access-list NAT-IP-ALL extended permit udp any any
ASA1(config)#access-group NAT-IP-ALL in interface outside
ASA1(config)#exit
ASA1#copy run start
Source filename [running-config]?
Cryptochecksum: 3242414f 76390dfd 4d1b3eb0 56931cb5

1397 bytes copied in 2.726 secs (512 bytes/sec)
```

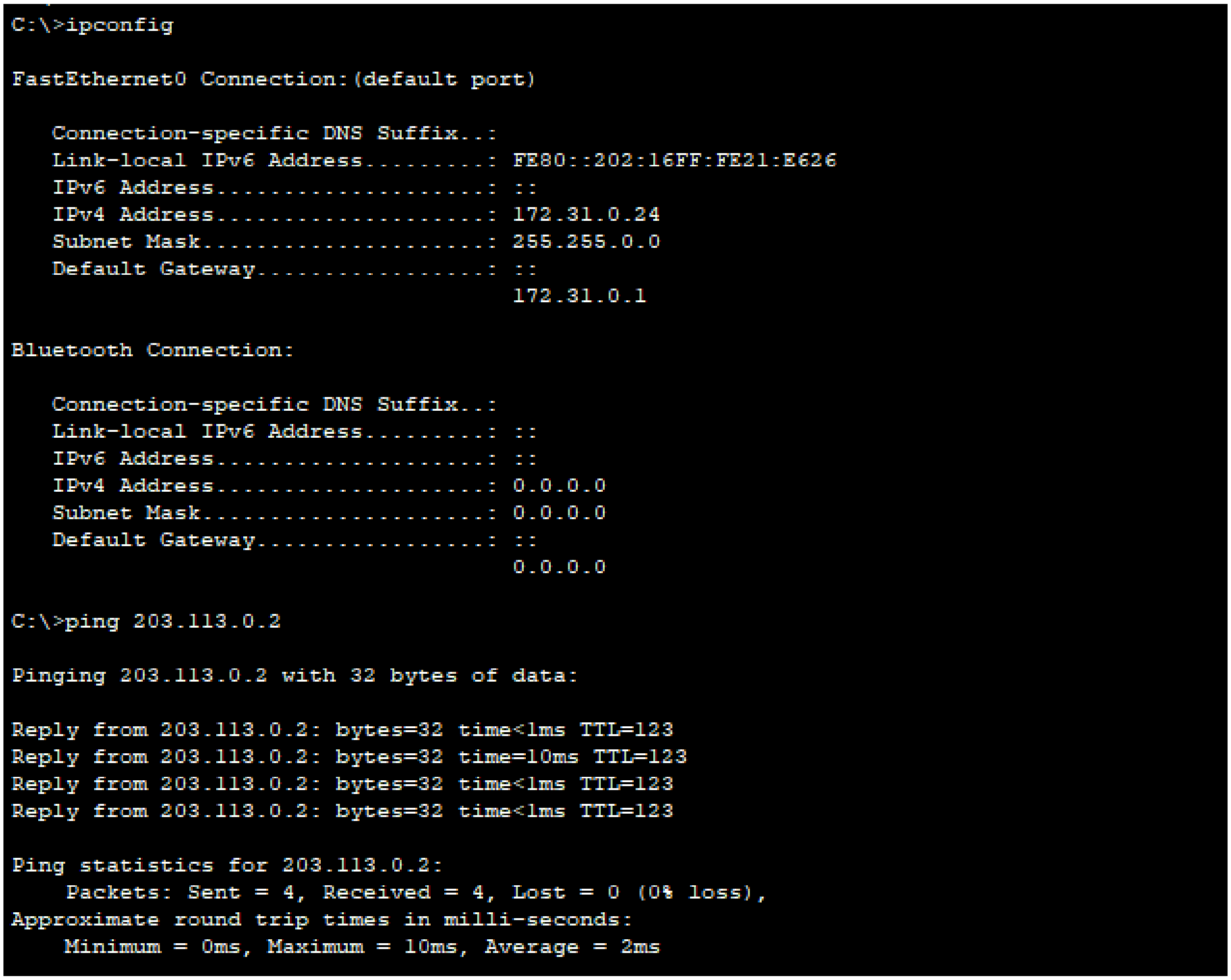
Verification & Discussion

Traffic from the LAN and WLAN subnets can now travel in and out the Cisco ASA 5506-X firewall that stands between the service provider router and the 3-Tier Campus LAN. With OSPF enabled on the inside interface of the ASA 5506-X appliance, routes to/from the firewall inside interface are established. A static default route on the firewall is established, directing traffic to the service provider gateway. All traffic on the network 172.0.0.0 255.0.0.0 is now being translated using PAT to the outside interface on the firewall. Figure 1 &2 show that end hosts in VLAN 30 and 31 on the LAN have two way connectivity to end host on the other side of the service provider gateway. Figure 3 demonstrates that wireless end host in the WLAN configured on the Meraki Security Appliance also have two connectivity to the Meraki server. Finally, we see in figure 4 that HTTPS connection is allowed to the Meraki server and corresponding return traffic is allowed inside the network.



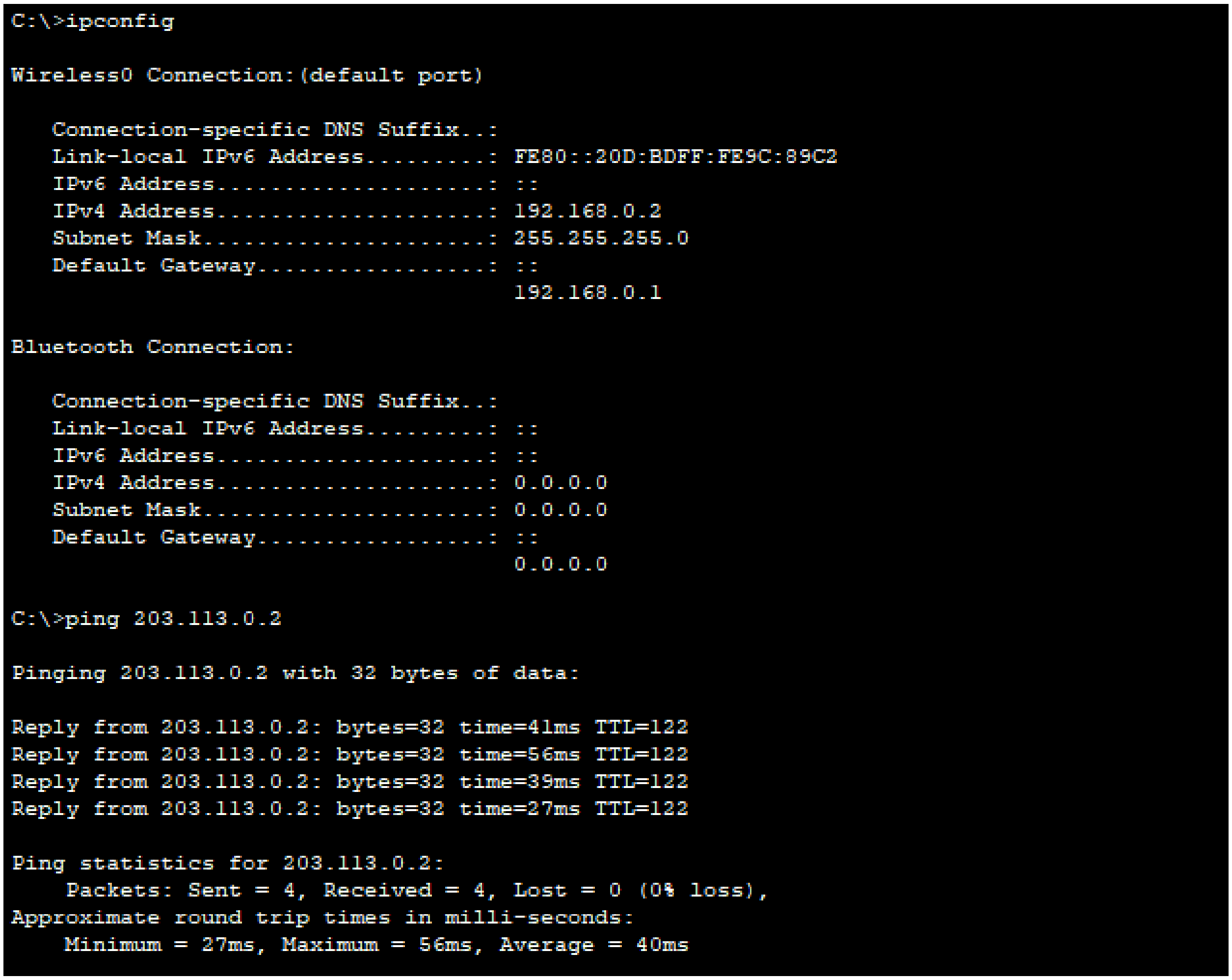
```
C:\>ipconfig

FastEthernet0 Connection:(default port)

   Connection-specific DNS Suffix..:
   Link-local IPv6 Address.........: FE80::20B:BEFF:FEA1:455B
   IPv6 Address....................: ::
   IPv4 Address....................: 172.30.0.18
   Subnet Mask.....................: 255.255.0.0
   Default Gateway.................: ::
                                     172.30.0.1

Bluetooth Connection:

   Connection-specific DNS Suffix..:
   Link-local IPv6 Address.........: ::
   IPv6 Address....................: ::
   IPv4 Address....................: 0.0.0.0
   Subnet Mask.....................: 0.0.0.0
   Default Gateway.................: ::
                                     0.0.0.0

C:\>ping 203.113.0.2

Pinging 203.113.0.2 with 32 bytes of data:

Reply from 203.113.0.2: bytes=32 time=10ms TTL=123
Reply from 203.113.0.2: bytes=32 time=10ms TTL=123
Reply from 203.113.0.2: bytes=32 time=10ms TTL=123
Reply from 203.113.0.2: bytes=32 time<1ms TTL=123

Ping statistics for 203.113.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 10ms, Average = 7ms
```

Figure 1-Eng-PC4 in VLAN 30 on the LAN is pinging the Meraki Server



```
C:\>ipconfig

FastEthernet0 Connection:(default port)

   Connection-specific DNS Suffix..:
   Link-local IPv6 Address.........: FE80::202:16FF:FE21:E626
   IPv6 Address....................: ::
   IPv4 Address....................: 172.31.0.24
   Subnet Mask.....................: 255.255.0.0
   Default Gateway.................: ::
                                     172.31.0.1

Bluetooth Connection:

   Connection-specific DNS Suffix..:
   Link-local IPv6 Address.........: ::
   IPv6 Address....................: ::
   IPv4 Address....................: 0.0.0.0
   Subnet Mask.....................: 0.0.0.0
   Default Gateway.................: ::
                                     0.0.0.0

C:\>ping 203.113.0.2

Pinging 203.113.0.2 with 32 bytes of data:

Reply from 203.113.0.2: bytes=32 time<1ms TTL=123
Reply from 203.113.0.2: bytes=32 time=10ms TTL=123
Reply from 203.113.0.2: bytes=32 time<1ms TTL=123
Reply from 203.113.0.2: bytes=32 time<1ms TTL=123

Ping statistics for 203.113.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 10ms, Average = 2ms
```

Figure 2-CompSci-PC1 in VLAN 31 on the LAN is pinging the Meraki Server



```
C:\>ipconfig

Wireless0 Connection:(default port)

   Connection-specific DNS Suffix..:
   Link-local IPv6 Address.........: FE80::20D:BDFF:FE9C:89C2
   IPv6 Address....................: ::
   IPv4 Address....................: 192.168.0.2
   Subnet Mask.....................: 255.255.255.0
   Default Gateway.................: ::
                                     192.168.0.1

Bluetooth Connection:

   Connection-specific DNS Suffix..:
   Link-local IPv6 Address.........: ::
   IPv6 Address....................: ::
   IPv4 Address....................: 0.0.0.0
   Subnet Mask.....................: 0.0.0.0
   Default Gateway.................: ::
                                     0.0.0.0

C:\>ping 203.113.0.2

Pinging 203.113.0.2 with 32 bytes of data:

Reply from 203.113.0.2: bytes=32 time=41ms TTL=122
Reply from 203.113.0.2: bytes=32 time=56ms TTL=122
Reply from 203.113.0.2: bytes=32 time=39ms TTL=122
Reply from 203.113.0.2: bytes=32 time=27ms TTL=122

Ping statistics for 203.113.0.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 27ms, Maximum = 56ms, Average = 40ms
```

Figure 3-Student-Laptop2 on the WLAN can ping the Meraki Server

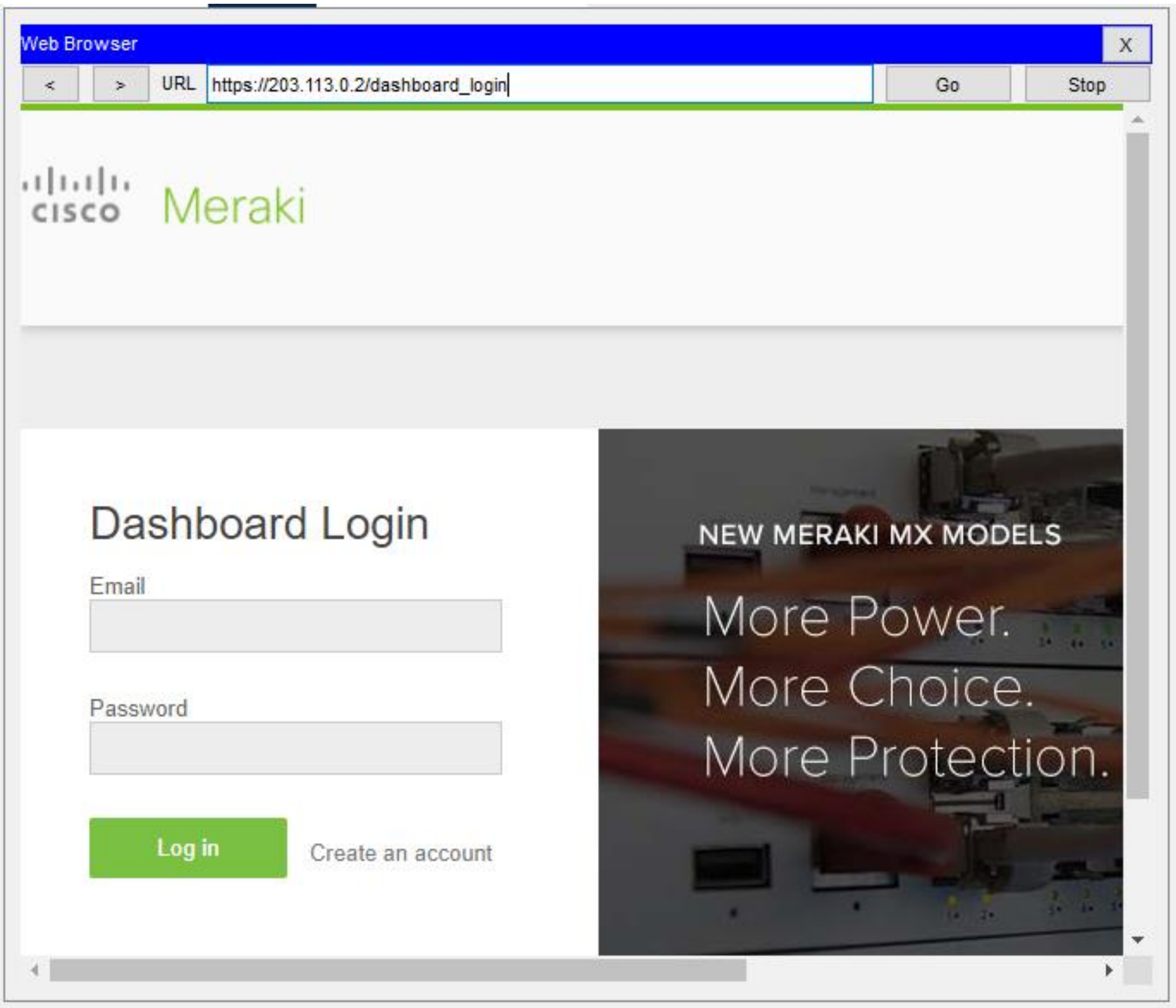


Figure 4-Https traffic from the Meraki Security Appliance is allowed through the ASA 5506-X

Reference

https://www.cisco.com/c/en/us/td/docs/security/asa/asa96/configuration/firewall/asa-96-firewall-config.html