CS310 ASSIGNMENT 2
SEMESTER 1, 2025

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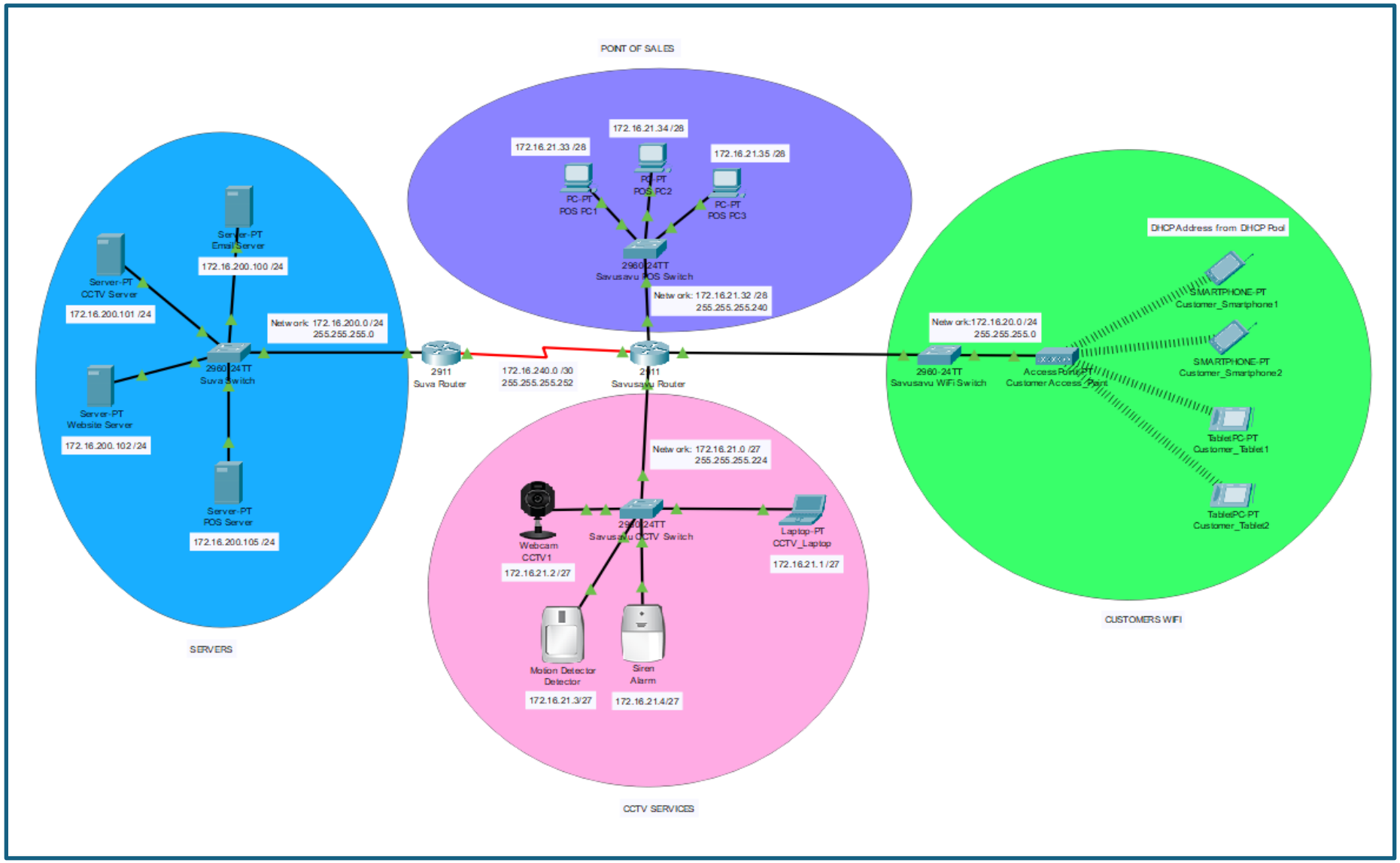
Table of Contents

Topology Design 1
Subnet Calculation using VSLM 2
Router Configuration 9
DHCP Pool Configuration 11
Routing Protocol (RIP) Configuration 12
Access Control List (ACL) Configuration 13
Checklist Part 1 & 2 14
Checklist Part 3 21
Additional Configurations 25
    POS Users Email Configuration 25
    CCTV Monitoring System Configuration 28
    Internet/Web Configuration 30
Appendix 32
    Running-config for Suva Router 32
    Running-config for Savusavu Router 35
Mark Allocation 39

Topology Design



Subnet Calculation Using VSLM

Step1:

172.16.20.0 /23

172 – First octet is between 128 – 191, thus the address is class B

/23 – 255.255.254.0 (decimal)

/23 – 11111111.11111111.11111110.00000000 (binary)

Step 2:

Default subnet mask for class B is 255.255.0.0

Default subnet mask for class B in binary is: 11111111.1111111.00000000.00000000

Step 3:

Identify the largest network and sort in descending order.

Site	*Total Hosts*
Customer WIFI	***250***
CCTV Services	***15***
Point of Sales Machines	***10***

To accommodate for 250 IP Address, we use the formula

Usable address = $2^H - 2$

$2^H - 2 \geq 250$

H = 8, since $2^8 - 2 = 254$

We require 250 addresses and 254 is supplied

Step 4:

Identify the new subnet mask

Default subnet mask: 11111111.11111111.00000000.00000000

Reserve 8 bits from right and turn the remaining bits into 1s

New subnet Mask is: 11111111.11111111.11111111.00000000

New subnet in decimal: 255.255.255.0

New subnet mask in CIDR: /24.

Step 5:

Calculate the network address

256 – last octet of change

256 – 255 = 1

Step 6:

Network listing

Network Address	***Subnet Mask***	***Usable IP Address***	***Broadcast IP Address***
172.16.20.0/24	*255.255.255.0*	*172.16.20.1 – 172.16.20.254*	*172.16.20.255*
172.16.21.0/24	*255.255.255.0*	*172.16.21.0 – 172.16.21.254*	*172.16.21.255*
172.16.22.0/24	*255.255.255.0*	*172.16.22.0 – 172.16.22.254*	*172.16.22.255*

Step 7:

Thus, the first network 172.16.20.0/24 can be allocated to Customer Wi-Fi.

Step 8:

Consider the 2nd largest network.

The 2nd largest network is CCTV Services with 15 IP address.

172.16.21.0/24

Step 9:

Default subnet 255.255.255.0

Default subnet mask in binary is: 11111111.1111111.11111111.00000000

Step 10:

To accommodate for 15 IP Address, we use the formula

Usable address = $2^H - 2$

$2^H - 2 \geq 15$

H = 5, since $2^5 - 2 = 30$

We require 15 addresses and 30 is supplied

Step 11:

Identify the new subnet mask

Default subnet mask: 11111111.11111111.11111111.00000000

Reserve 5 bits from right and turn the remaining bits into 1s

New subnet Mask is: 11111111.11111111.11111111.11100000

New subnet in decimal: 255.255.255.224

New subnet mask in CIDR: /27.

Step 12:

Calculate the network address

256 – last octet of change

256 – 224 = 32

Step 13:

Network listing

Network Address	***Subnet Mask***	***Usable IP Address***	***Broadcast IP Address***
172.16.21.0/27	*255.255.255.224*	*172.16.21.1 – 172.16.21.30*	*172.16.21.31*
172.16.21.32/27	*255.255.255.224*	*172.16.21.33 – 172.16.21.62*	*172.16.21.63*
172.16.21.64/27	*255.255.255.224*	*172.16.21.65 – 172.16.21.94*	*172.16.21.95*

Step 14:

Thus, the first network 172.16.21.0/27 can be allocated to CCTV Services.

Step 15:

Consider the 3rd largest network.

The 3rd largest network is Point of Sales Machines with 10 IP address.

172.16.21.32/27

Step 16:

Default subnet 255.255.255.224

Default subnet mask in binary is: 11111111.1111111.11111111.11100000

Step 17:

To accommodate for 10 IP Address, we use the formula

Usable address = $2^H - 2$

$2^H - 2 \geq 10$

H = 4, since 2^4 -2 = 14

We require 10 addresses and 14 is supplied

Step 18:

Identify the new subnet mask

Default subnet mask: 11111111.11111111.11111111.11100000

Reserve 4 bits from right and turn the remaining bits into 1s

New subnet Mask is: 11111111.11111111.11111111.11110000

New subnet in decimal: 255.255.255.240

New subnet mask in CIDR: /28.

Step 19:

Calculate the network address

256 – last octet of change

256 – 240 = 16

Step 20:

Table 1 - Network listing

Network Address	***Subnet Mask***	***Usable IP Address***	***Broadcast IP Address***
172.16.21.32/28	*255.255.255.240*	*172.16.21.32 – 172.16.21.46*	*172.16.21.47*
172.16.21.48/28	*255.255.255.240*	*172.16.21.49 – 172.16.21.62*	*172.16.21.63*
172.16.21.64/28	*255.255.255.240*	*172.16.21.65 – 172.16.21.78*	*172.16.21.79*

Step 21:

Thus, the first network 172.16.21.32/28 can be allocated to Point of Sales Machines.

Table 2 – Subnet Allocation using VLSM

	Network	***Usable IP Range***	***Subnet Mask***	***Broadcast IP Address***
Customer WIFI	*172.16.20.0/24*	*172.16.20.1 – 172.16.20.254*	*255.255.255.0*	*172.16.20.255*
CCTV Services	*172.16.21.0/27*	*172.16.21.1 – 172.16.21.30*	*255.255.255.224*	*172.16.21.31*
Point of Sales Machines	*172.16.21.32/28*	*172.16.21.33 – 172.16.21.46*	*255.255.255.240*	*172.16.21.47*

Table 3 - IP Address Table

Device	Interface	IP Address	Subnet Mask	Default Gateway
Email Server	Fa0/0	172.16.200.100	255.255.255.0	172.16.200.254
POS Server	Fa0/0	172.16.200.105	255.255.255.0	172.16.200.254
CCTV Server	Fa0/0	172.16.200.101	255.255.255.0	172.16.200.254
Web Server	Fa0/0	172.16.200.102	255.255.255.0	172.16.200.254
Suva Router	G0/0	172.16.200.254	255.255.255.0	
	S0/0/0	172.16.240.1	255.255.255.252	
Savusavu Router	G0/0	172.16.21.46	255.255.255.240	
	G0/1	172.16.20.0	255.255.255.0	
	G0/2	172.16.21.30	255.255.255.224	
	S0/0/0	172.16.240.2	255.255.255.252	
POS PC1	NIC	172.16.21.33	255.255.255.240	172.16.21.46
POS PC2	NIC	172.16.21.34	255.255.255.240	172.16.21.46
POS PC3	NIC	172.16.21.35	255.255.255.240	172.16.21.46
Customer Smartphone1	Wireless	DHCP	255.255.255.0	172.16.20.254
Customer Smartphone2	Wireless	DHCP	255.255.255.0	172.16.20.254
Customer Tablet1	Wireless	DHCP	255.255.255.0	172.16.20.254
Customer Tablet2	Wireless	DHCP	255.255.255.0	172.16.20.254
CCTV_Laptop	NIC	172.16.21.1	255.255.255.224	172.16.21.30
Camera	NIC	172.16.21.2	255.255.255.224	172.16.21.30
Motion Detector	NIC	172.16.21.4	255.255.255.224	172.16.21.30
Siren Alarm	NIC	172.16.21.3	255.255.255.224	172.16.21.30

Part 1: Router Configuration

Suva

Router>enable
Router#configure terminal
Router(config)#hostname Suva_Router
Suva_Router(config)#no ip domain-lookup
Suva_Router(config-router)#enable secret PASSWORD
Suva_Router(config-router)#banner motd "Authorized Personnel Only"
Suva_Router(config-router)#service password-encryption

Suva_Router(config-router)#line console 0
Suva_Router(config-line)#password PASSWORD
Suva_Router(config-line)#login
Suva_Router(config-line)#logging synchronous
Suva_Router(config-line)#exec-timeout 0 0
Suva_Router(config-line)#exit
Suva_Router(config)#do write

Suva_Router(config)#interface g0/1
Suva_Router(config-if)#description TO SERVER
Suva_Router(config-if)#ip address 172.16.200.254 255.255.255.0
Suva_Router(config-if)#no shutdown
Suva_Router(config)#exit

Suva_Router(config)#interface s0/0/0
Suva_Router(config-if)#description TO SAVUSAVU ROUTER
Suva_Router(config-if)#ip address 172.16.240.1 255.255.255.252
Suva_Router(config-if)#no shutdown
Suva_Router(config)#exit
Suva_Router(config)#do write

Savusavu

Router>enable
Router#configure terminal
Router(config)#hostname Savusavu_Router
Savusavu_Router (config)#no ip domain-lookup
Savusavu_Router (config-router)#enable secret PASSWORD
Savusavu_Router (config-router)#banner motd "Authorized Personnel Only"
Savusavu_Router (config-router)#service password-encryption

Savusavu_Router (config-router)#line console 0
Savusavu_Router (config-line)#password PASSWORD
Savusavu_Router (config-line)#login
Savusavu_Router (config-line)#logging synchronous
Savusavu_Router (config-line)#exec-timeout 0 0
Savusavu_Router (config-line)#exit
Savusavu_Router (config)#do write

Savusavu_Router (config)#interface g0/0
Savusavu_Router (config-if)#description To POS_LAN
Savusavu_Router (config-if)#ip address 172.16.21.46 255.255.255.240
Savusavu_Router (config-if)#no shutdown
Savusavu_Router (config)#exit

Savusavu_Router (config)#interface g0/1
Savusavu_Router (config-if)#description To Cust_WIFI
Savusavu_Router (config-if)#ip address 172.16.20.254 255.255.255.0
Savusavu_Router (config-if)#no shutdown
Savusavu_Router (config)#exit

Savusavu_Router (config)#interface g0/2
Savusavu_Router (config-if)#description To CCTV_LAN
Savusavu_Router (config-if)#ip address 172.16.21.30 255.255.255.224
Savusavu_Router (config-if)#no shutdown
Savusavu_Router (config)#exit

Savusavu_Router (config)#interface s0/0/0
Savusavu_Router (config-if)#description To SUVA ROUTER
Savusavu_Router (config-if)#ip address 172.16.240.2 255.255.255.252
Savusavu_Router (config-if)#no shutdown
Savusavu_Router (config)#exit
Savusavu_Router (config)#do write

Part 2: DHCP Pool Configuration

Savusavu_Router >enable
Savusavu_Router #configure terminal

Savusavu_Router (config)#ip dhcp pool Customer_WiFi
Savusavu_Router (dhcp-config)# network 172.16.20.0 255.255.255.0
Savusavu_Router (dhcp-config)# default-router 172.16.20.254
Savusavu_Router (dhcp-config)# dns-server 172.16.200.102
Savusavu_Router (dhcp-config)#exit

Savusavu_Router (config)# ip dhcp excluded-address 172.16.20.250 172.16.20.254
Savusavu_Router (config)# do write

```
ip dhcp excluded-address 172.16.20.250 172.16.20.254
!
ip dhcp pool WiFi
 network 172.16.20.0 255.255.255.0
 default-router 172.16.20.254
 dns-server 172.16.200.102
 domain-name wr
!
```

Table 4 – DHCP Pool Summary

Department	***DHCP Pool Range***	***Subnet Mask***	***Default Gateway***
Customer WIFI	*172.16.20.1 –172.16.20.249*	*255.255.255.0*	*172.16.0.254*

Part 3: Routing Protocol (RIP) Configuration

Suva_Router >enable
Suva_Router #configure terminal
Suva_Router (config)#router rip
Suva_Router (config-router)# version 2
Suva_Router (config-router)# no auto-summary
Suva_Router (config-router)# network 172.16.200.0
Suva_Router (config-router)# network 172.16.240.0
Suva_Router (config-router)#exit
Suva_Router (config)# do write

Savusavu_Router >enable
Savusavu_Router #configure terminal
Savusavu_Router (config)#router rip
Savusavu_Router (config-router)# version 2
Savusavu_Router (config-router)# no auto-summary
Savusavu_Router (config-router)# network 172.16.20.0
Savusavu_Router (config-router)# network 172.16.21.32
Savusavu_Router (config-router)# network 172.16.21.0
Savusavu_Router (config-router)# network 172.16.240.0
Savusavu_Router (config-router)#exit
Savusavu_Router (config)# do write

Part 4: Access Control List (ACL) Configuration

Savusavu_Router #config terminal
Savusavu_Router (config)#ip access-list extended Customer_WiFi
Savusavu_Router(config-ext-nacl)#deny icmp 172.16.20.0 0.0.0.255 any
Savusavu_Router(config-ext-nacl)#permit udp any any eq 67
Savusavu_Router(config-ext-nacl)#permit tcp any host 172.16.200.102 eq www
Savusavu_Router(config-ext-nacl)#permit ip any any
Savusavu_Router (config-ext-nacl)#exit
Savusavu_Router(config-ext-nacl)#do write

Savusavu_Router (config)#interface GigabitEthernet0/1
Savusavu_Router (config-subif)#ip access-group Customer_WiFi in
Savusavu_Router (config-subif)#exit

```
ip access-list extended Customer_WiFi
 deny icmp 172.16.20.0 0.0.0.255 any
 permit udp any any eq bootps
 permit tcp any host 172.16.200.102 eq www
 permit ip any any
!
```

```
interface GigabitEthernet0/1
 description TO CUST_WIFI
 ip address 172.16.20.254 255.255.255.0
 ip access-group Customer_WiFi in
 duplex auto
 speed auto
!
```

Check List Part 1 & 2

- *Suva Router able to ping Email Server and POS Server.*

```
Suva_Router#ping 172.16.200.100

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.200.100, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

Suva_Router#
```

```
Suva_Router#ping 172.16.200.105

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.200.105, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

Suva_Router#
```

PDU List Window

Fire	Last Status	Source	Destination	Type	Color
	Successful	Suva Router	Email Server	ICMP	
	Successful	Suva Router	POS Server	ICMP	

- *Savusavu Router able to ping Savusavu POS PC*

```
Savusavu_Router#ping 172.16.21.33

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.21.33, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/0/0 ms

Savusavu_Router#
```

PDU List Window

Fire	Last Status	Source	Destination	Type	Color
	Successful	POS PC1	Savusavu Router	ICMP	
	Successful	POS PC2	Savusavu Router	ICMP	
	Successful	POS PC3	Savusavu Router	ICMP	

- *Savusavu WIFI Device able to ping Savusavu router*

```
Savusavu_Router#ping 172.16.20.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.20.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 17/21/25 ms

Savusavu_Router#ping 172.16.20.2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.20.2, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 13/18/24 ms

Savusavu_Router#ping 172.16.20.3

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.20.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 21/23/27 ms

Savusavu_Router#ping 172.16.20.4

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.20.4, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 19/27/40 ms

Savusavu_Router#
```

PDU List Window

Fire	Last Status	Source	Destination	Type	Color
	Successful	Customer_Smartphone1	Savusavu Router	ICMP	
	Successful	Customer_Smartphone2	Savusavu Router	ICMP	
	Successful	Customer_Tablet1	Savusavu Router	ICMP	
	Successful	Customer_Tablet2	Savusavu Router	ICMP	

- *Savusavu CCTV Laptop able to ping Savusavu Router*

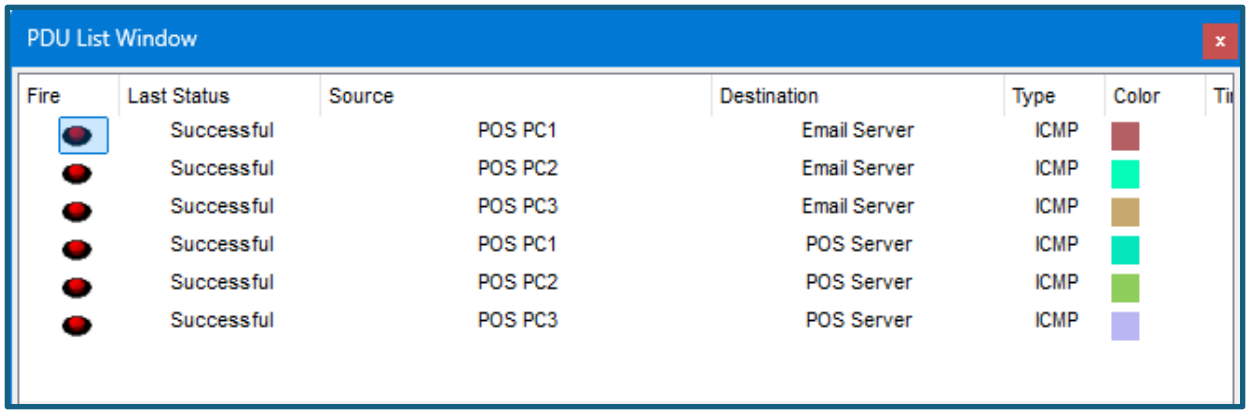
```
Savusavu_Router#ping 172.16.21.1

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 172.16.21.1, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/2/14 ms

Savusavu_Router#
```

PDU List Window

Fire	Last Status	Source	Destination	Type	Color
	Successful	CCTV_Laptop	Savusavu Router	ICMP	

- *Savusavu POS PC able to ping Email Server and POS Server*

```
C:\>ping 172.16.200.100

Pinging 172.16.200.100 with 32 bytes of data:

Reply from 172.16.200.100: bytes=32 time=6ms TTL=128
Reply from 172.16.200.100: bytes=32 time=11ms TTL=128
Reply from 172.16.200.100: bytes=32 time<1ms TTL=128
Reply from 172.16.200.100: bytes=32 time=15ms TTL=128

Ping statistics for 172.16.200.100:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 15ms, Average = 8ms

C:\>ping 172.16.200.105

Pinging 172.16.200.105 with 32 bytes of data:

Reply from 172.16.200.105: bytes=32 time<1ms TTL=128
Reply from 172.16.200.105: bytes=32 time<1ms TTL=128
Reply from 172.16.200.105: bytes=32 time<1ms TTL=128
Reply from 172.16.200.105: bytes=32 time<1ms TTL=128

Ping statistics for 172.16.200.105:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```



- *Savusavu WIFI Device able to ping Email Server and POS Server*

```
C:\>ping 172.16.20.2

Pinging 172.16.20.2 with 32 bytes of data:

Reply from 172.16.20.2: bytes=32 time=5ms TTL=128
Reply from 172.16.20.2: bytes=32 time=19ms TTL=128
Reply from 172.16.20.2: bytes=32 time<1ms TTL=128
Reply from 172.16.20.2: bytes=32 time=6ms TTL=128

Ping statistics for 172.16.20.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 19ms, Average = 7ms

C:\>ping 172.16.20.3

Pinging 172.16.20.3 with 32 bytes of data:

Reply from 172.16.20.3: bytes=32 time=32ms TTL=128
Reply from 172.16.20.3: bytes=32 time=28ms TTL=128
Reply from 172.16.20.3: bytes=32 time=29ms TTL=128
Reply from 172.16.20.3: bytes=32 time=24ms TTL=128

Ping statistics for 172.16.20.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 24ms, Maximum = 32ms, Average = 28ms

C:\>ping 172.16.20.4

Pinging 172.16.20.4 with 32 bytes of data:

Reply from 172.16.20.4: bytes=32 time=59ms TTL=128
Reply from 172.16.20.4: bytes=32 time=34ms TTL=128
Reply from 172.16.20.4: bytes=32 time=38ms TTL=128
Reply from 172.16.20.4: bytes=32 time=22ms TTL=128

Ping statistics for 172.16.20.4:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 22ms, Maximum = 59ms, Average = 38ms

C:\>
```

PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Tim
	Successful	Customer_Smartphone1	Email Server	ICMP		
	Successful	Customer_Smartphone2	Email Server	ICMP		
	Successful	Customer_Tablet1	Email Server	ICMP		
	Successful	Customer_Tablet2	Email Server	ICMP		
	Successful	Customer_Smartphone1	POS Server	ICMP		
	Successful	Customer_Smartphone2	POS Server	ICMP		
	Successful	Customer_Tablet1	POS Server	ICMP		
	Successful	Customer_Tablet2	POS Server	ICMP		

- *Savusavu CCTV Laptop able to ping Email Server and POS Server*

```
C:\>ping 172.16.200.100

Pinging 172.16.200.100 with 32 bytes of data:

Reply from 172.16.200.100: bytes=32 time=6ms TTL=128
Reply from 172.16.200.100: bytes=32 time=11ms TTL=128
Reply from 172.16.200.100: bytes=32 time<1ms TTL=128
Reply from 172.16.200.100: bytes=32 time=15ms TTL=128

Ping statistics for 172.16.200.100:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 15ms, Average = 8ms

C:\>ping 172.16.200.105

Pinging 172.16.200.105 with 32 bytes of data:

Reply from 172.16.200.105: bytes=32 time<1ms TTL=128
Reply from 172.16.200.105: bytes=32 time<1ms TTL=128
Reply from 172.16.200.105: bytes=32 time<1ms TTL=128
Reply from 172.16.200.105: bytes=32 time<1ms TTL=128

Ping statistics for 172.16.200.105:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Tim
	Successful	CCTV_Laptop	Email Server	ICMP		
	Successful	CCTV_Laptop	POS Server	ICMP		

➢ *Tablet and Smart Phone able to ping each other*

```
C:\>ping 172.16.20.1

Pinging 172.16.20.1 with 32 bytes of data:

Reply from 172.16.20.1: bytes=32 time=51ms TTL=128
Reply from 172.16.20.1: bytes=32 time=20ms TTL=128
Reply from 172.16.20.1: bytes=32 time=21ms TTL=128
Reply from 172.16.20.1: bytes=32 time=40ms TTL=128

Ping statistics for 172.16.20.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 20ms, Maximum = 51ms, Average = 33ms

C:\>ping 172.16.20.2

Pinging 172.16.20.2 with 32 bytes of data:

Reply from 172.16.20.2: bytes=32 time=38ms TTL=128
Reply from 172.16.20.2: bytes=32 time=26ms TTL=128
Reply from 172.16.20.2: bytes=32 time=21ms TTL=128
Reply from 172.16.20.2: bytes=32 time=37ms TTL=128

Ping statistics for 172.16.20.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 21ms, Maximum = 38ms, Average = 30ms

C:\>ping 172.16.20.3

Pinging 172.16.20.3 with 32 bytes of data:

Reply from 172.16.20.3: bytes=32 time=36ms TTL=128
Reply from 172.16.20.3: bytes=32 time=23ms TTL=128
Reply from 172.16.20.3: bytes=32 time=20ms TTL=128
Reply from 172.16.20.3: bytes=32 time=40ms TTL=128

Ping statistics for 172.16.20.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 20ms, Maximum = 40ms, Average = 29ms

C:\>
```

PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Tim
	Successful	Customer_Smartphone1	Customer_Tablet1	ICMP		
	Successful	Customer_Smartphone1	Customer_Tablet2	ICMP		
	Successful	Customer_Smartphone2	Customer_Tablet1	ICMP		
	Successful	Customer_Smartphone2	Customer_Tablet2	ICMP		

➢ *Tablet and Smart Phone able to ping POS PC and CCTV Laptop*

```
C:\>ping 172.16.21.33

Pinging 172.16.21.33 with 32 bytes of data:

Reply from 172.16.21.33: bytes=32 time=29ms TTL=127
Reply from 172.16.21.33: bytes=32 time=15ms TTL=127
Reply from 172.16.21.33: bytes=32 time=40ms TTL=127
Reply from 172.16.21.33: bytes=32 time=11ms TTL=127

Ping statistics for 172.16.21.33:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 11ms, Maximum = 40ms, Average = 23ms

C:\>ping 172.16.21.1

Pinging 172.16.21.1 with 32 bytes of data:

Reply from 172.16.21.1: bytes=32 time=20ms TTL=127
Reply from 172.16.21.1: bytes=32 time=23ms TTL=127
Reply from 172.16.21.1: bytes=32 time=16ms TTL=127
Reply from 172.16.21.1: bytes=32 time=24ms TTL=127

Ping statistics for 172.16.21.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 16ms, Maximum = 24ms, Average = 20ms

C:\>
```

PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time
	Successful	Customer_Smartphone1	POS PC1	ICMP		
	Successful	Customer_Smartphone1	POS PC2	ICMP		
	Successful	Customer_Smartphone1	POS PC3	ICMP		
	Successful	Customer_Smartphone1	CCTV_Laptop	ICMP		
	Successful	Customer_Smartphone2	POS PC1	ICMP		
	Successful	Customer_Smartphone2	POS PC2	ICMP		
	Successful	Customer_Smartphone2	POS PC3	ICMP		
	Successful	Customer_Smartphone2	CCTV_Laptop	ICMP		
	Successful	Customer_Tablet1	POS PC1	ICMP		
	Successful	Customer_Tablet1	POS PC2	ICMP		
	Successful	Customer_Tablet1	POS PC3	ICMP		
	Successful	Customer_Tablet1	CCTV_Laptop	ICMP		
	Successful	Customer_Tablet2	POS PC1	ICMP		
	Successful	Customer_Tablet2	POS PC2	ICMP		
	Successful	Customer_Tablet2	POS PC3	ICMP		
	Successful	Customer_Tablet2	CCTV_Laptop	ICMP		

Check List Part 3

- *Savusavu WIFI not able to ping Email Server and POS Server after ACL was applied.*

```
C:\>ping 172.16.200.100

Pinging 172.16.200.100 with 32 bytes of data:

Reply from 172.16.20.254: Destination host unreachable.
Reply from 172.16.20.254: Destination host unreachable.
Reply from 172.16.20.254: Destination host unreachable.
Reply from 172.16.20.254: Destination host unreachable.

Ping statistics for 172.16.200.100:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 172.16.200.105

Pinging 172.16.200.105 with 32 bytes of data:

Reply from 172.16.20.254: Destination host unreachable.
Reply from 172.16.20.254: Destination host unreachable.
Reply from 172.16.20.254: Destination host unreachable.
Reply from 172.16.20.254: Destination host unreachable.

Ping statistics for 172.16.200.105:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```

PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time
	Failed	Customer_Smartphone1	Email Server	ICMP		
	Failed	Customer_Smartphone1	POS Server	ICMP		
	Failed	Customer_Smartphone2	Email Server	ICMP		
	Failed	Customer_Smartphone2	POS Server	ICMP		
	Failed	Customer_Tablet1	Email Server	ICMP		
	Failed	Customer_Tablet1	POS Server	ICMP		
	Failed	Customer_Tablet2	Email Server	ICMP		
	Failed	Customer_Tablet2	POS Server	ICMP		

➢ *Tablet and Smart Phone able to ping each other*

```
C:\>ping 172.16.20.1

Pinging 172.16.20.1 with 32 bytes of data:

Reply from 172.16.20.1: bytes=32 time=51ms TTL=128
Reply from 172.16.20.1: bytes=32 time=20ms TTL=128
Reply from 172.16.20.1: bytes=32 time=21ms TTL=128
Reply from 172.16.20.1: bytes=32 time=40ms TTL=128

Ping statistics for 172.16.20.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 20ms, Maximum = 51ms, Average = 33ms

C:\>ping 172.16.20.2

Pinging 172.16.20.2 with 32 bytes of data:

Reply from 172.16.20.2: bytes=32 time=38ms TTL=128
Reply from 172.16.20.2: bytes=32 time=26ms TTL=128
Reply from 172.16.20.2: bytes=32 time=21ms TTL=128
Reply from 172.16.20.2: bytes=32 time=37ms TTL=128

Ping statistics for 172.16.20.2:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 21ms, Maximum = 38ms, Average = 30ms

C:\>ping 172.16.20.3

Pinging 172.16.20.3 with 32 bytes of data:

Reply from 172.16.20.3: bytes=32 time=36ms TTL=128
Reply from 172.16.20.3: bytes=32 time=23ms TTL=128
Reply from 172.16.20.3: bytes=32 time=20ms TTL=128
Reply from 172.16.20.3: bytes=32 time=40ms TTL=128

Ping statistics for 172.16.20.3:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 20ms, Maximum = 40ms, Average = 29ms

C:\>
```

PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Tim
	Successful	Customer_Smartphone1	Customer_Tablet1	ICMP		
	Successful	Customer_Smartphone1	Customer_Tablet2	ICMP		
	Successful	Customer_Smartphone2	Customer_Tablet1	ICMP		
	Successful	Customer_Smartphone2	Customer_Tablet2	ICMP		

- *Tablet and Smart Phone not able to ping POS PC and CCTV Laptop at Savusavu after ACL was applied.*

```
C:\>ping 172.16.21.1

Pinging 172.16.21.1 with 32 bytes of data:

Reply from 172.16.20.254: Destination host unreachable.
Reply from 172.16.20.254: Destination host unreachable.
Reply from 172.16.20.254: Destination host unreachable.
Reply from 172.16.20.254: Destination host unreachable.

Ping statistics for 172.16.21.1:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 172.16.21.33

Pinging 172.16.21.33 with 32 bytes of data:

Reply from 172.16.20.254: Destination host unreachable.
Reply from 172.16.20.254: Destination host unreachable.
Reply from 172.16.20.254: Destination host unreachable.
Reply from 172.16.20.254: Destination host unreachable.

Ping statistics for 172.16.21.33:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 172.16.21.34

Pinging 172.16.21.34 with 32 bytes of data:

Reply from 172.16.20.254: Destination host unreachable.
Reply from 172.16.20.254: Destination host unreachable.
Reply from 172.16.20.254: Destination host unreachable.
Reply from 172.16.20.254: Destination host unreachable.

Ping statistics for 172.16.21.34:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>
```

PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time
	Failed	Customer_Smartphone1	POS PC1	ICMP		
	Failed	Customer_Smartphone1	POS PC2	ICMP		
	Failed	Customer_Smartphone1	POS PC3	ICMP		
	Failed	Customer_Smartphone1	CCTV_Laptop	ICMP		
	Failed	Customer_Smartphone2	POS PC1	ICMP		
	Failed	Customer_Smartphone2	POS PC2	ICMP		
	Failed	Customer_Smartphone2	POS PC3	ICMP		
	Failed	Customer_Smartphone2	CCTV_Laptop	ICMP		
	Failed	Customer_Tablet1	POS PC1	ICMP		
	Failed	Customer_Tablet1	POS PC2	ICMP		
	Failed	Customer_Tablet1	POS PC3	ICMP		
	Failed	Customer_Tablet1	CCTV_Laptop	ICMP		
	Failed	Customer_Tablet2	POS PC1	ICMP		
	Failed	Customer_Tablet2	POS PC2	ICMP		
	Failed	Customer_Tablet2	POS PC3	ICMP		
	Failed	Customer_Tablet2	CCTV_Laptop	ICMP		

- *Savusavu POS PC able to ping Email Server and POS Server*

```
C:\>ping 172.16.200.100

Pinging 172.16.200.100 with 32 bytes of data:

Reply from 172.16.200.100: bytes=32 time=6ms TTL=128
Reply from 172.16.200.100: bytes=32 time=11ms TTL=128
Reply from 172.16.200.100: bytes=32 time<1ms TTL=128
Reply from 172.16.200.100: bytes=32 time=15ms TTL=128

Ping statistics for 172.16.200.100:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 15ms, Average = 8ms

C:\>ping 172.16.200.105

Pinging 172.16.200.105 with 32 bytes of data:

Reply from 172.16.200.105: bytes=32 time<1ms TTL=128
Reply from 172.16.200.105: bytes=32 time<1ms TTL=128
Reply from 172.16.200.105: bytes=32 time<1ms TTL=128
Reply from 172.16.200.105: bytes=32 time<1ms TTL=128

Ping statistics for 172.16.200.105:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

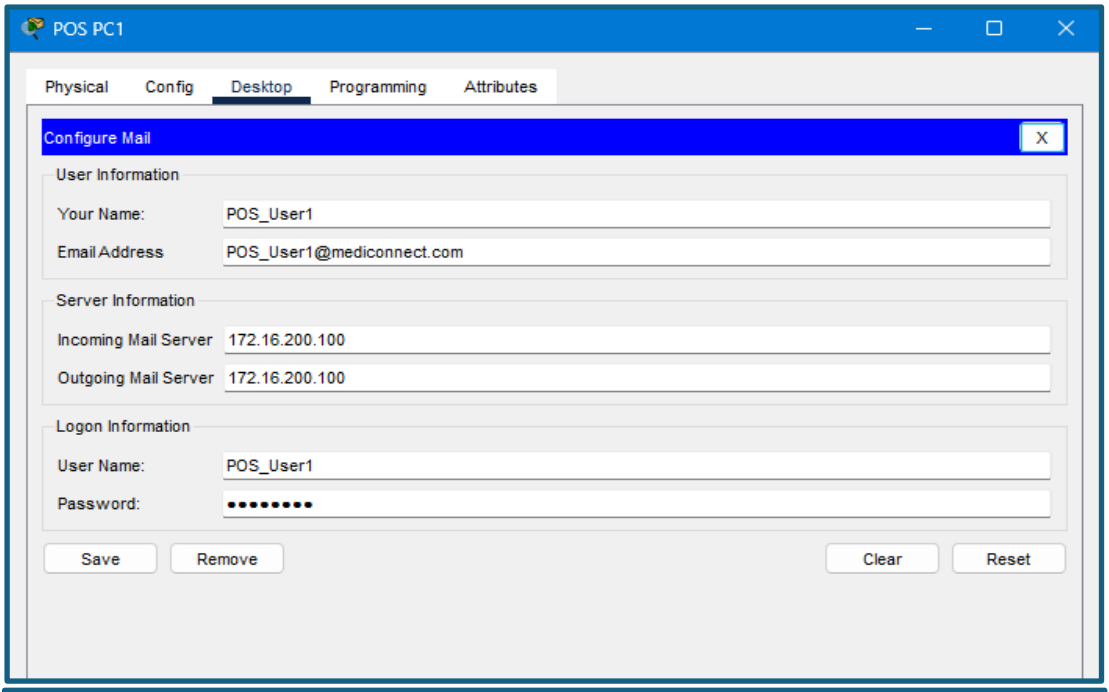
PDU List Window

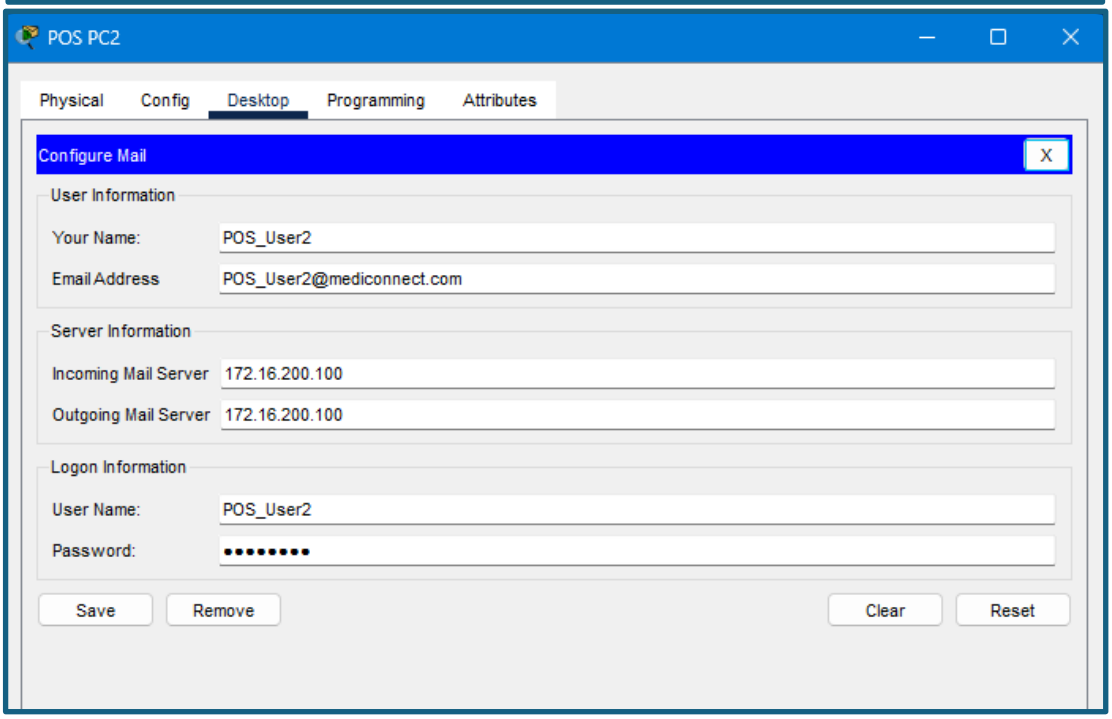
Fire	Last Status	Source	Destination	Type	Color	Ti
	Successful	POS PC1	Email Server	ICMP		
	Successful	POS PC2	Email Server	ICMP		
	Successful	POS PC3	Email Server	ICMP		
	Successful	POS PC1	POS Server	ICMP		
	Successful	POS PC2	POS Server	ICMP		
	Successful	POS PC3	POS Server	ICMP		

Additional Configurations

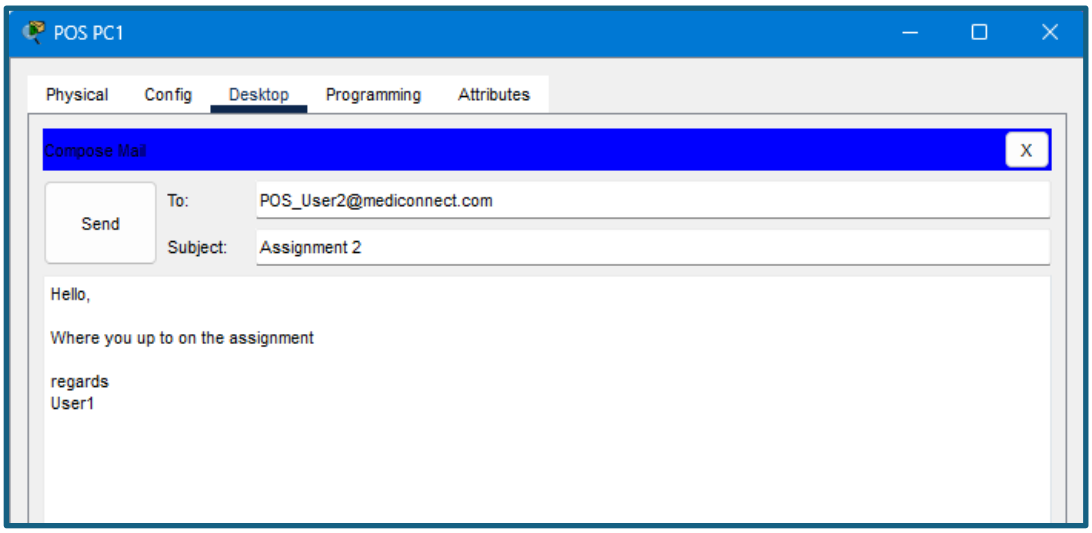
POS Users Email Configuration

- *Setting up email clients on each POS PC*

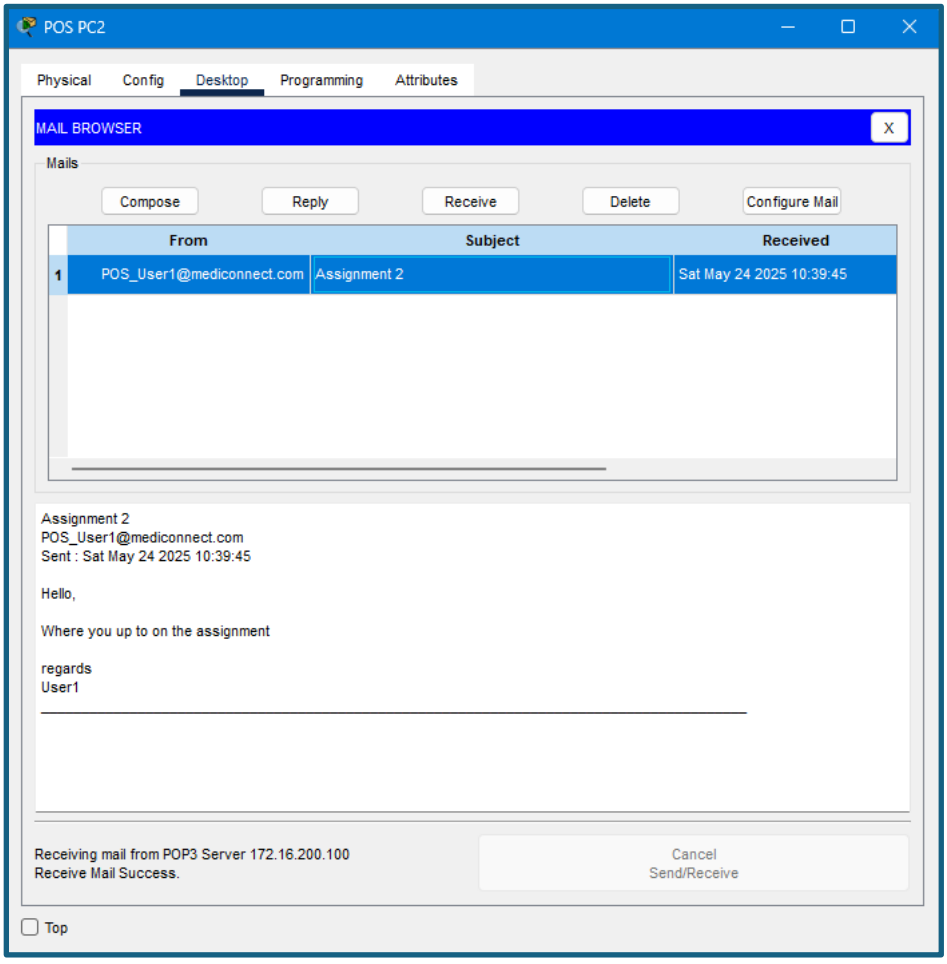




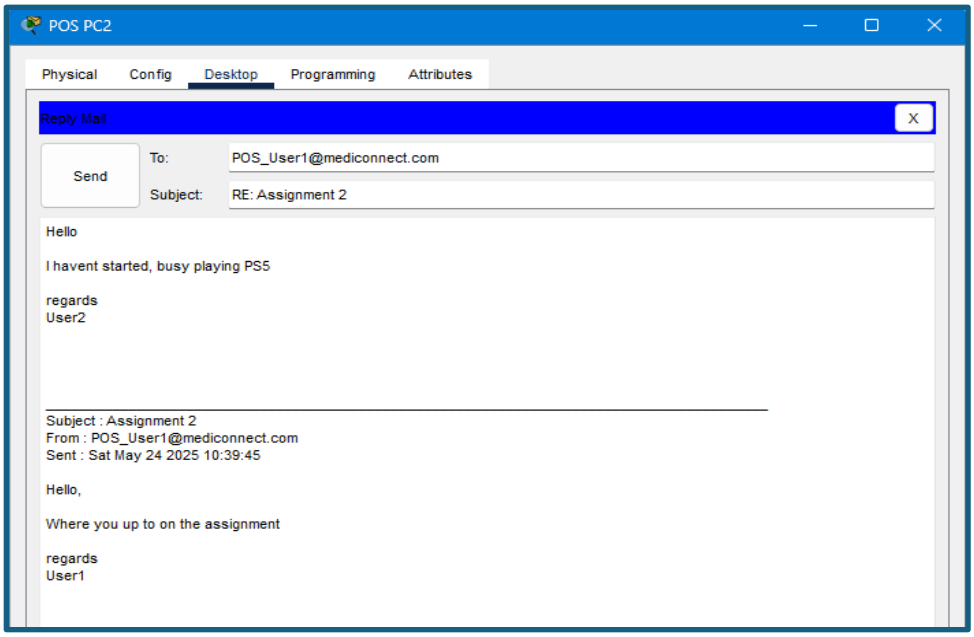
- *User1 on POS PC1 sends a message to User2 on POS PC2*



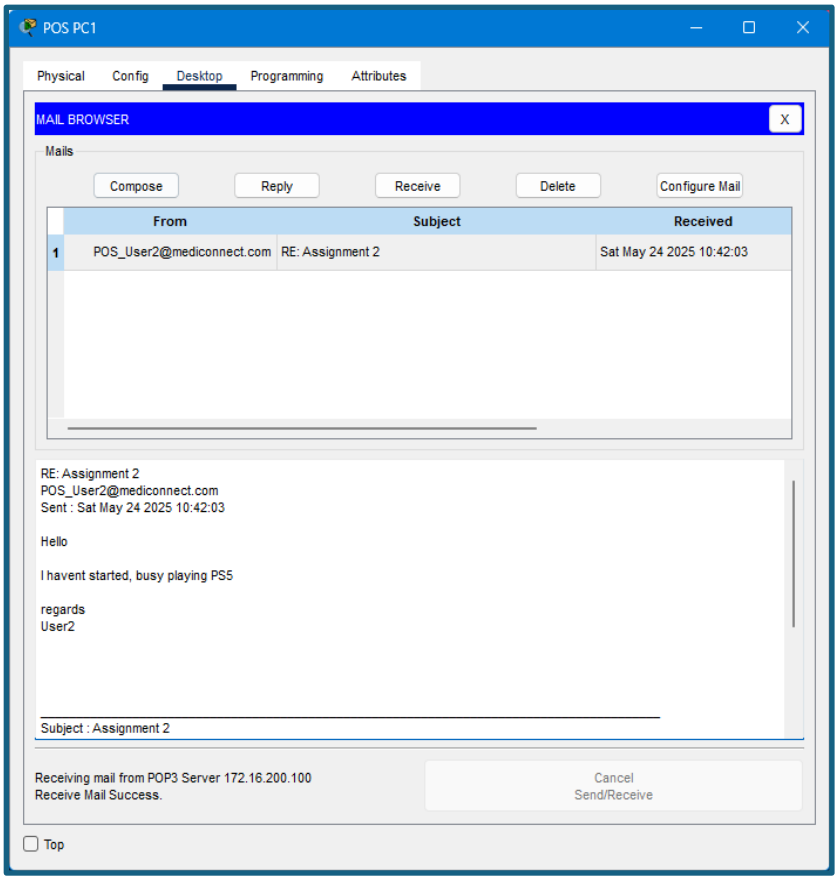
- *POS PC2 opens the mail browser and clicks "Receive" to download email from the POP mail server 172.16.200.100. Message is received and displayed.*



- *User2 on POS PC2 replies to User1 email*

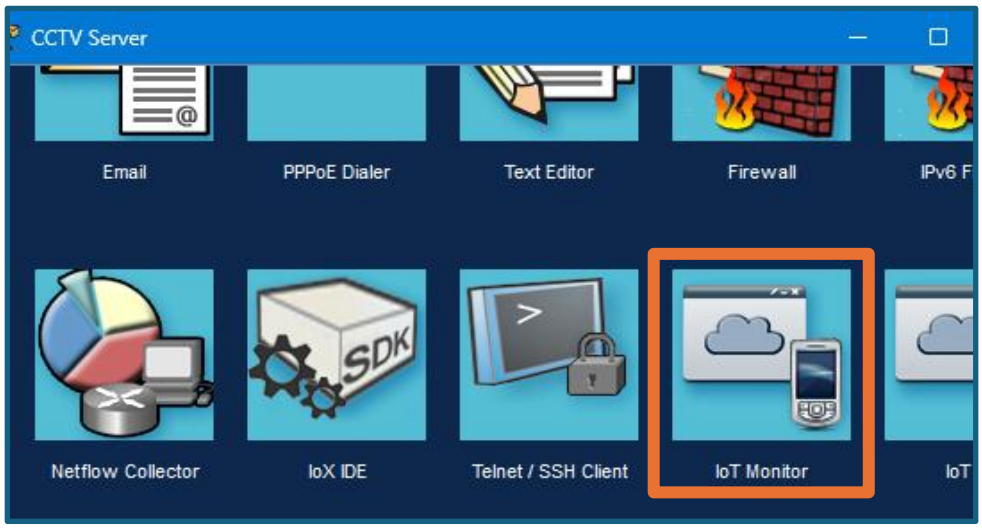


- *User1 on POS PC1, clicks on "Receive" to view the response from POS User2*

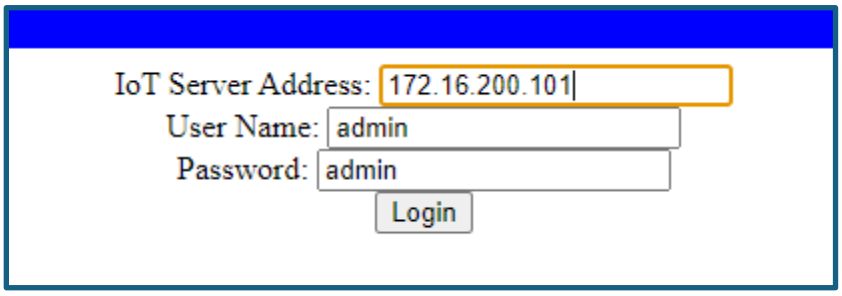


CCTV Monitoring System Configuration

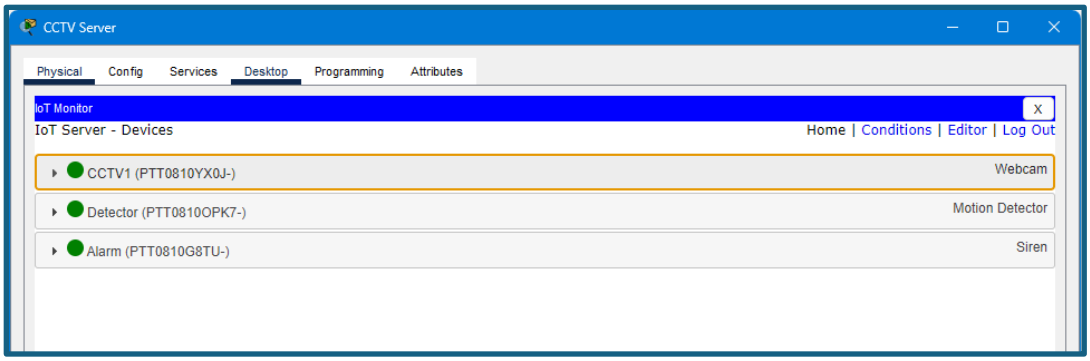
- *Launch IoT Monitor of the CCTV Server*



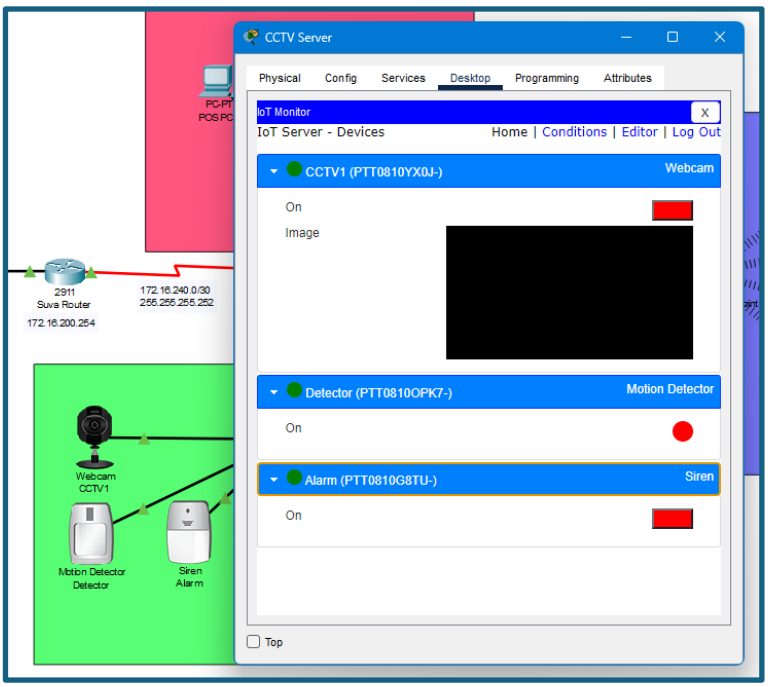
- *Input the IoT Server IP (172.16.200.101) along with the default login credentials to log in.*



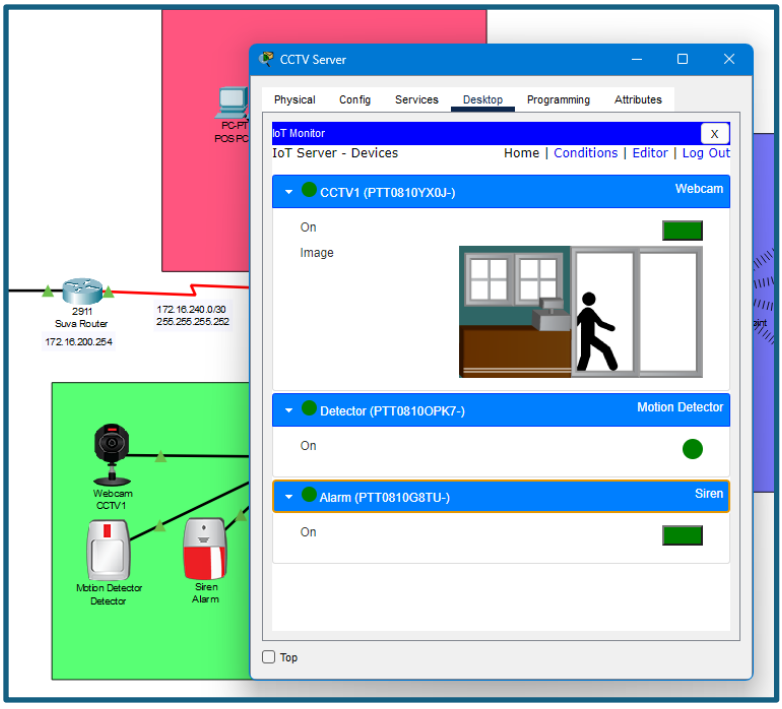
- *Once logged in, all registered IoT devices (CCTV, Motion detector, Alarm) will be displayed.*



- *The system detects and displays 3 active devices as shown below. Initially when all devices are ON, the camera feed shows a blank image. Motion detection and alarm are not triggered indicated by the red status icons.*

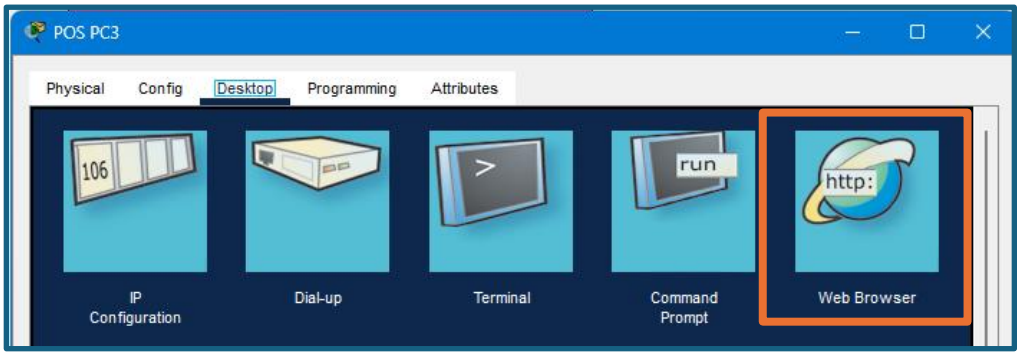


- *The system is activated when motion is detected. The CCTV feed updated to show a person entering a room, the motion detector turns green and alarm is triggered also indicated by a green status icon.*

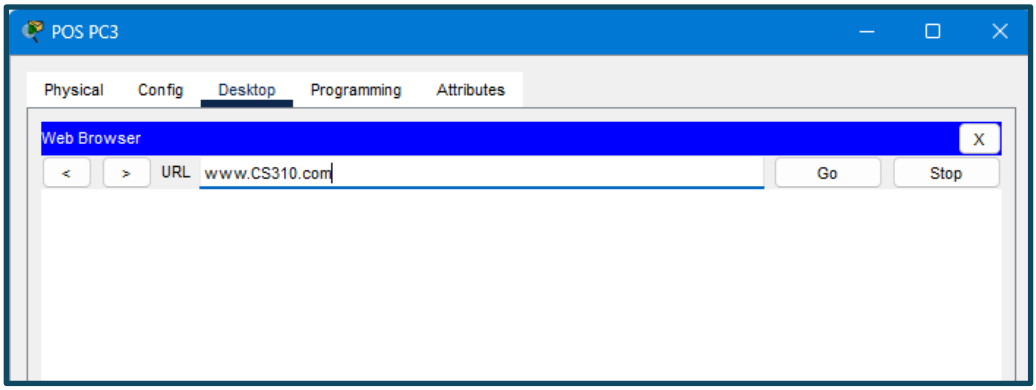


Internet / Web Configuration

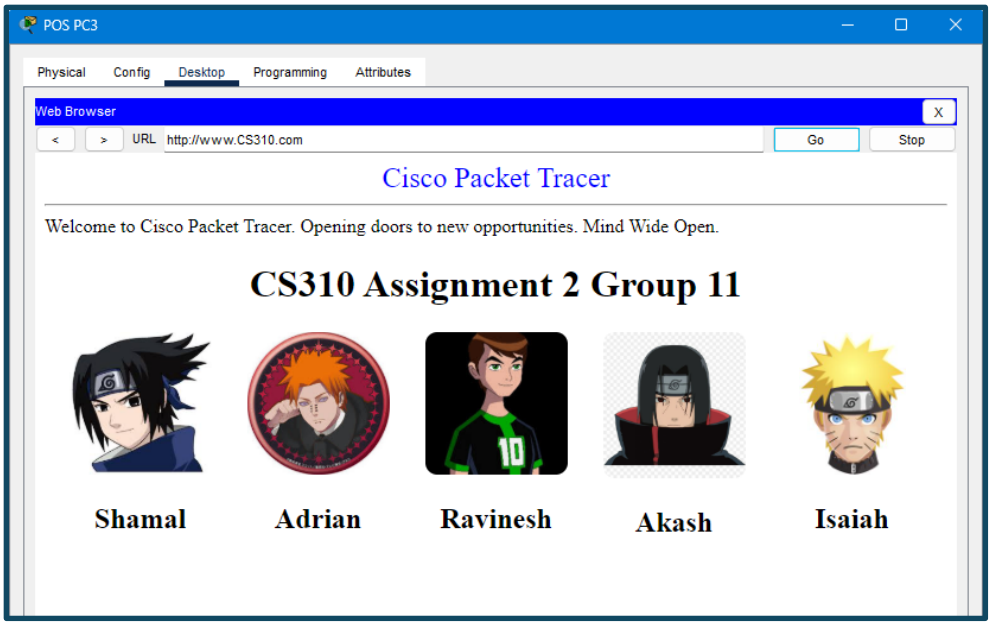
- *Click on the Web Brower on any POS PC*



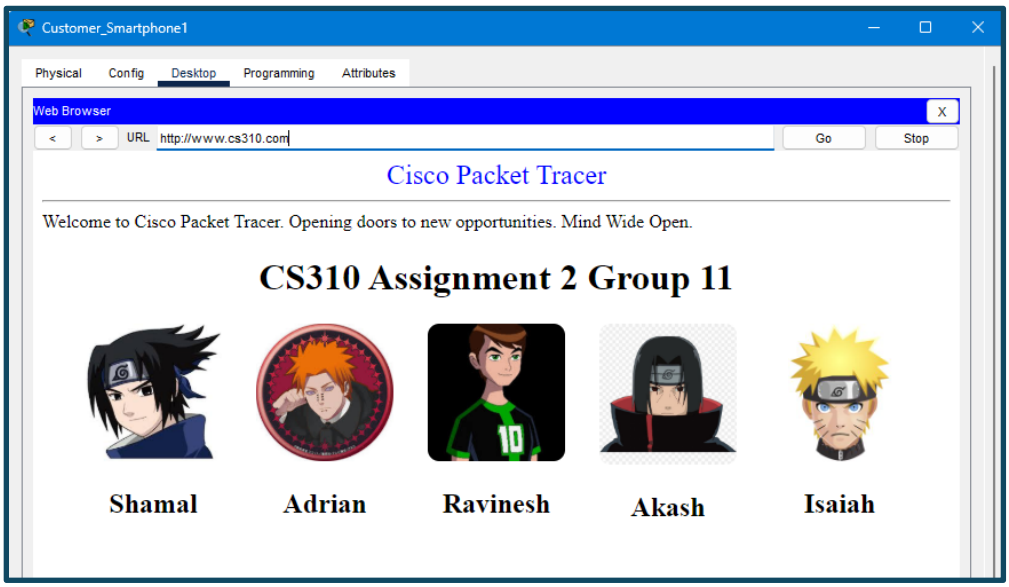
- *Enter the URL:www.CS310.com and click Go to load the webpage.*



- *The browser will attempt to access the webpage (www.CS310.com) from the web server 172.16.200.102. if the DNS and HTTP configuration on the server are correct, the website will load successfully as shown below.*



- *The same URL is entered on a customer smartphone. The page loads successfully.*



This simulation indicates that the website is accessible from any device, wired (PC) or wireless (customers smartphone or tablet) on any network whether from Suva or Savusavu.

Appendix

Running-config for Suva Router

```
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname Suva_Router
!
enable secret 5 $1$mERr$cP1uxB/ASHbnPQTLzT8H10
!
no ip cef
no ipv6 cef
!
license udi pid CISCO2911/K9 sn FTX1524241U-
!
no ip domain-lookup
!
spanning-tree mode pvst
!
interface GigabitEthernet0/0
 no ip address
 duplex auto
 speed auto
 shutdown
!
```

interface GigabitEthernet0/1

description TO SERVERS

ip address 172.16.200.254 255.255.255.0

duplex auto

speed auto

!

interface GigabitEthernet0/2

no ip address

duplex auto

speed auto

shutdown

!

interface Serial0/0/0

description TO SAVUSAVU ROUTER

ip address 172.16.240.1 255.255.255.252

clock rate 2000000

!

interface Serial0/0/1

no ip address

clock rate 2000000

shutdown

!

interface Vlan1

no ip address

shutdown

!

router rip

```
 version 2
 network 172.16.0.0
 no auto-summary
!
ip classless
!
ip flow-export version 9
!
banner motd " Authorized Personnel Only"
!
line con 0
 password 7 08116D7D3A2E2A2536
 logging synchronous
 login
!
line aux 0
!
line vty 0 4
 login
!
end
```

Running-config for Savusavu Router

```
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
service password-encryption
!
hostname Savusavu_Router
!
enable secret 5 $1$mERr$cP1uxB/ASHbnPQTLzT8H10
!
ip dhcp excluded-address 172.16.20.250 172.16.20.254
!
ip dhcp pool WiFi
 network 172.16.20.0 255.255.255.0
 default-router 172.16.20.254
 dns-server 172.16.200.102
 domain-name wr
!
no ip cef
no ipv6 cef
!
license udi pid CISCO2911/K9 sn FTX15242HHP-
!
no ip domain-lookup
!
```

spanning-tree mode pvst

!

interface GigabitEthernet0/0

description TO POS_LAN

ip address 172.16.21.46 255.255.255.240

duplex auto

speed auto

!

interface GigabitEthernet0/1

description TO CUST_WIFI

ip address 172.16.20.254 255.255.255.0

ip access-group Customer_WiFi in

duplex auto

speed auto

!

interface GigabitEthernet0/2

description TO CCTV_LAN

ip address 172.16.21.30 255.255.255.224

duplex auto

speed auto

!

interface Serial0/0/0

description TO SUVA ROUTER

ip address 172.16.240.2 255.255.255.252

!

interface Serial0/0/1

no ip address

clock rate 2000000

!

interface Vlan1

no ip address

!

router rip

version 2

network 172.16.0.0

no auto-summary

!

ip classless

!

ip flow-export version 9

!

ip access-list extended Customer_WiFi

deny icmp 172.16.20.0 0.0.0.255 any

permit udp any any eq bootps

permit tcp any host 172.16.200.102 eq www

permit ip any any

!

banner motd "Authorize Personnel Only"

!

line con 0

password 7 08116D7D3A2E2A2536

logging synchronous

login

!

line aux 0

!

line vty 0 4

login

!

end

Mark Allocation Sheet

Student Name	Contribution	Justification	Signature
Adrian Obadiah	100%	Write-up	Aobadiah
Akash Mishra	100%	Write-up	Amishra
Ravinesh Narayan	100%	Packet Tracer Config	Rnarayan
Shamal Prasad	100%	Packet Tracer Config	Sprasad
Isaiah Narayan	100%	Packet Tracer Config	Inarayan

Group Name: *Group 11*

Date: *24/05/25*