Title:

Problem Statement:

A medium-sized company requires a robust and efficient computer network topology that supports VLANs to separate and manage traffic between different departments while ensuring connectivity. The network should be able to handle the wired connections for regular office workstations and provide wireless access for mobile devices and guests.

Solution:

Title:

Implementation of a Hybrid Computer Network Topology with VLAN Support

Introduction

The project aims to design and implement a computer network topology for a medium-sized company that has different departments requiring both wired and wireless connections. The network should ensure data security, manage traffic efficiently, and be scalable for future expansions. We have employed a combination of switches, routers, access points, and PCs to create a hybrid topology integrating VLANs for enhanced security and efficiency.

Network Design

The network is divided into three VLANs to segregate data traffic according to the departments' requirements.

VLAN 1 consists of two PCs connected wirelessly through WRT300N Wireless Router.

VLAN 2 has one PC connected via Ethernet cable ensuring high-speed data transfer for tasks requiring substantial bandwidth. When can say it the Admin Side.

VLAN 3 is designed for guests or mobile users connecting wirelessly through an Access Point.

A ***3560 Multilayer Switch*** is central in managing the traffic between different VLANs ensuring efficient data flow and security.

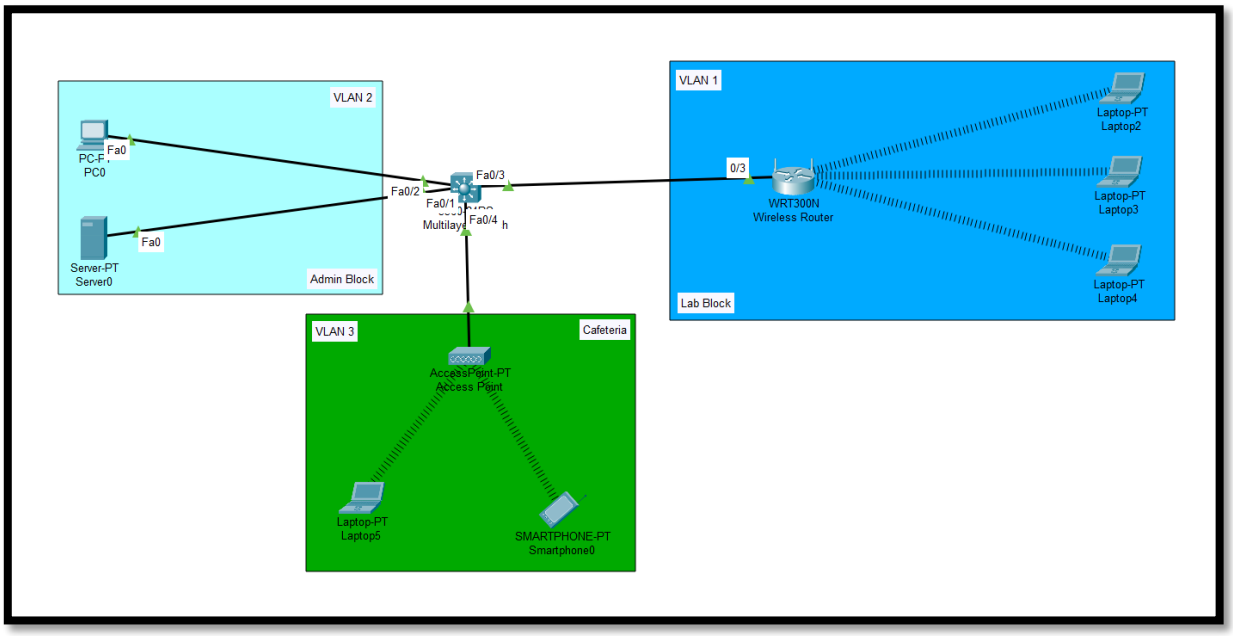
Implementation Details

Each PC in the VLANs has been assigned specific IP addresses to ensure proper identification and communication within the network.

The multilayer switch plays a crucial role in routing data packets between different VLANs while maintaining the segregation of data traffic.

Necessary firewalls and security protocols are implemented at each access point to prevent unauthorized access.

The final topology Diagram is as Follows:



Setting up Multilayer Switch

Multilayer Switch VLAN naming and port configuration:

```
Switch>en
Switch#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#VLAN 2
Switch(config-vlan)#name Admin
Switch(config-vlan)#exit
Switch(config)#VLAN 3
Switch(config-vlan)#name Cafe
Switch(config-vlan)#exit
Switch(config)#int fa0/1
Switch(config-if)#switchport access VLAN 2
Switch(config-if)#exit
Switch(config)#int fa0/2
Switch(config-if)#switchport access VLAN 2
Switch(config-if)#exit
Switch(config)#int fa0/3
Switch(config-if)#switchport access VLAN 1
Switch(config-if)#exit
Switch(config)#int fa0/4
Switch(config-if)#switchport access VLAN 3
Switch(config-if)#exit
Switch(config)#exit
Switch#
%SYS-5-CONFIG_I: Configured from console by console

Switch#show VLAN

VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/3, Fa0/5, Fa0/6, Fa0/7
                                                 Fa0/8, Fa0/9, Fa0/10, Fa0/11
                                                 Fa0/12, Fa0/13, Fa0/14, Fa0/15
                                                 Fa0/16, Fa0/17, Fa0/18, Fa0/19
                                                 Fa0/20, Fa0/21, Fa0/22, Fa0/23
                                                 Fa0/24, Gig0/1, Gig0/2
2    Admin                             active    Fa0/1, Fa0/2
3    Cafe                              active    Fa0/4
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                   active
1005 trnet-default                     active

VLAN Type  SAID       MTU   Parent RingNo BridgeNo Stp  BrdgMode Trans1 Trans2
---- ----- ---------- ----- ------ ------ -------- ---- -------- ------ ------
1    enet  100001     1500  -      -      -        -    -        0      0
2    enet  100002     1500  -      -      -        -    -        0      0
3    enet  100003     1500  -      -      -        -    -        0      0
1002 fddi  101002     1500  -      -      -        -    -        0      0
1003 tr    101003     1500  -      -      -        -    -        0      0
1004 fdnet 101004     1500  -      -      -        ieee -        0      0
1005 trnet 101005     1500  -      -      -        ibm  -        0      0
```

Multilayer Switch ip address assigning to each VLAN:

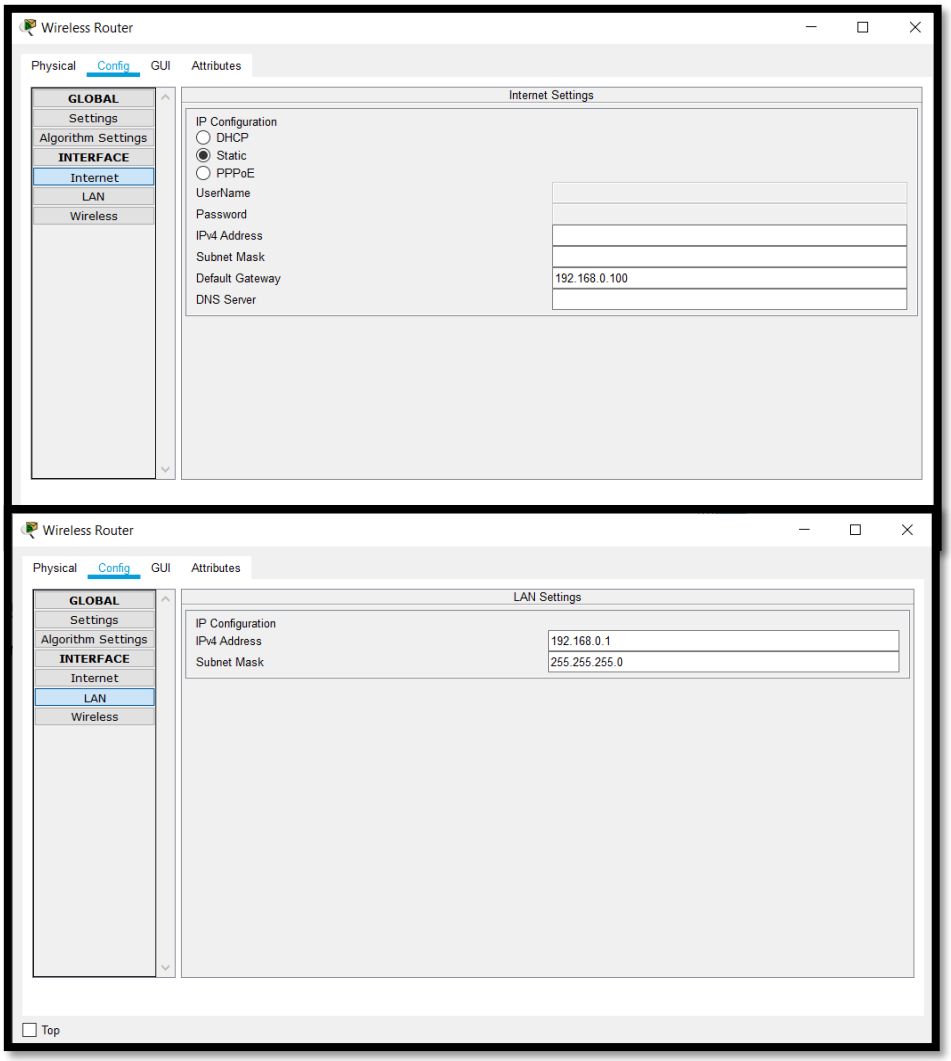
```
Switch#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#int VLAN 1
Switch(config-if)#ip address 192.168.0.100 255.255.255.0
Switch(config-if)#no shut

Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan1, changed state to up

Switch(config-if)#exit
Switch(config)#int VLAN 2
Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan2, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan2, changed state to up

Switch(config-if)#ip address 192.168.1.100 255.255.255.0
Switch(config-if)#no shut
Switch(config-if)#exit
Switch(config)#int VLAN 3
Switch(config-if)#
%LINK-5-CHANGED: Interface Vlan3, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan3, changed state to up

Switch(config-if)#ip address 192.168.2.100 255.255.255.0
Switch(config-if)#no shut
Switch(config-if)#exit
Switch(config)#ip routing
Switch(config)#exit
Switch#
%SYS-5-CONFIG_I: Configured from console by console
```

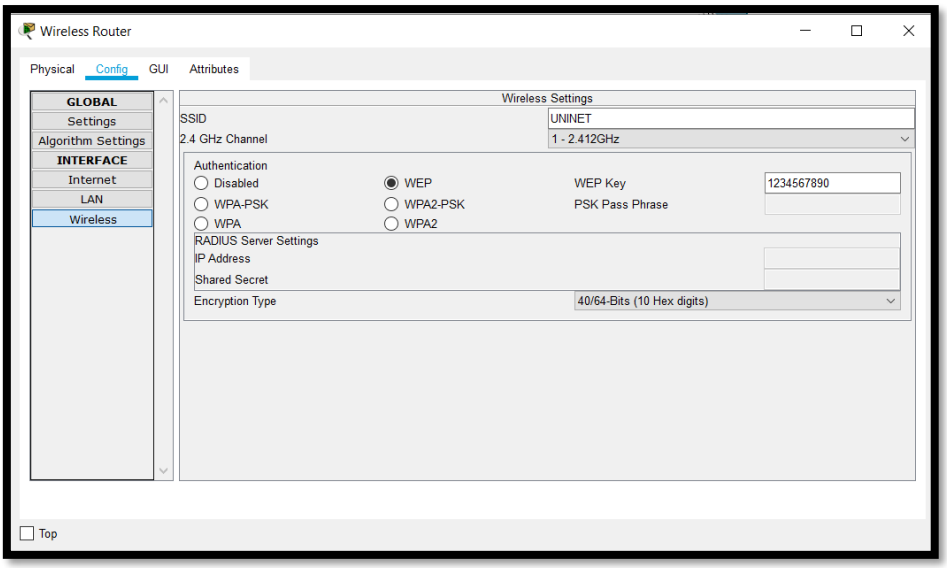
Multilayer Switch DHCP enabling:

```
Switch#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#ip dhcp pool 1
Switch(dhcp-config)#network 192.168.0.0 255.255.255.0
Switch(dhcp-config)#default-router 192.168.0.100
Switch(dhcp-config)#exit
Switch(config)#ip dhcp excluded-address 192.168.0.100 192.168.0.105
Switch(config)#exit
Switch#
%SYS-5-CONFIG_I: Configured from console by console

Switch#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#ip dhcp pool 2
Switch(dhcp-config)#network 192.168.1.0 255.255.255.0
Switch(dhcp-config)#default-router 192.168.1.100
Switch(dhcp-config)#exit
Switch(config)#ip dhcp excluded-address 192.168.1.100 192.168.1.105
Switch(config)#exit
Switch#
%SYS-5-CONFIG_I: Configured from console by console

Switch#config t
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#ip dhcp pool 3
Switch(dhcp-config)#network 192.168.2.0 255.255.255.0
Switch(dhcp-config)#default-router 192.168.2.100
Switch(dhcp-config)#exit
Switch(config)#ip dhcp excluded-address 192.168.2.100 192.168.2.105
Switch(config)#exit
Switch#
%SYS-5-CONFIG_I: Configured from console by console
exit
```

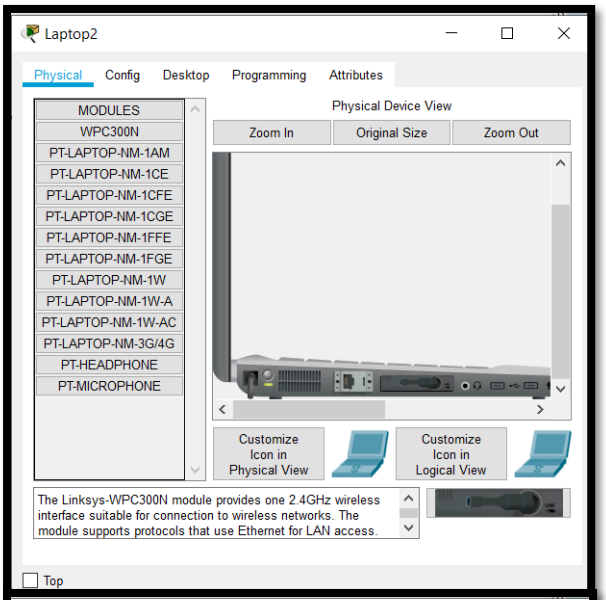
Setting in VLAN 1. Wireless connection of all laptops

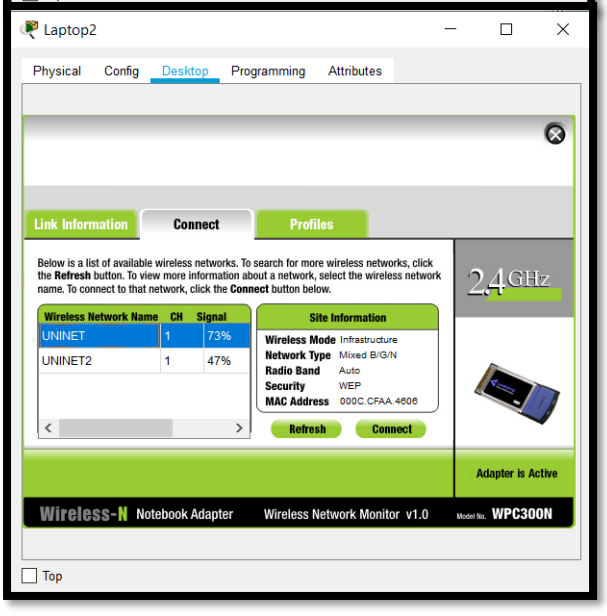
From wireless router:

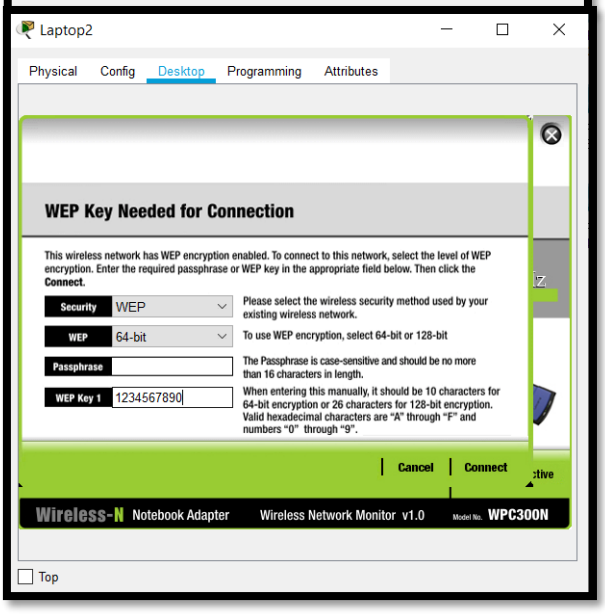


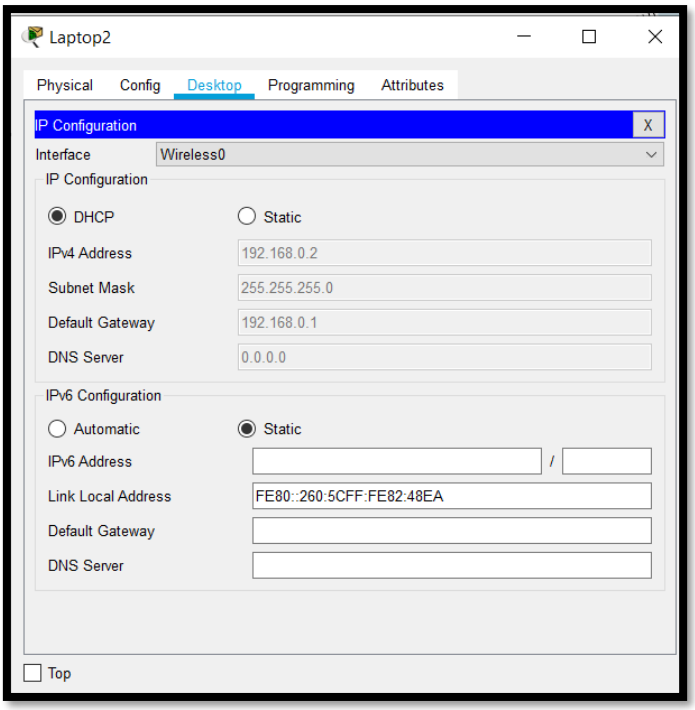


From Laptop 2:

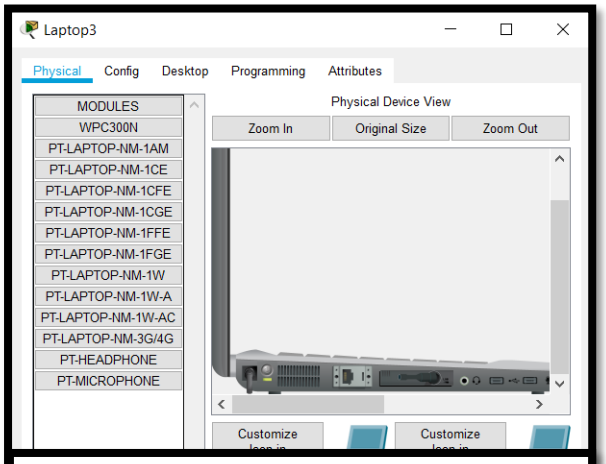


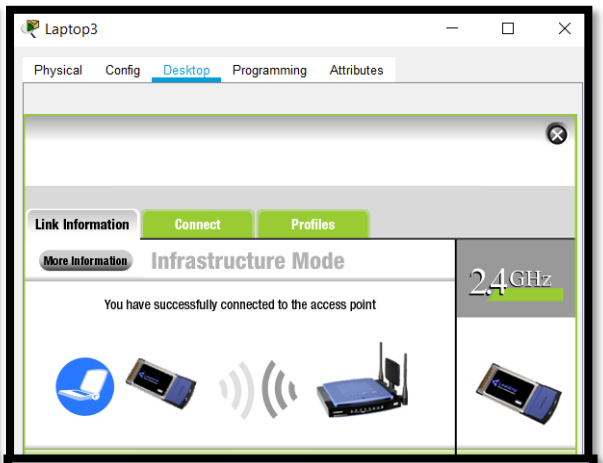


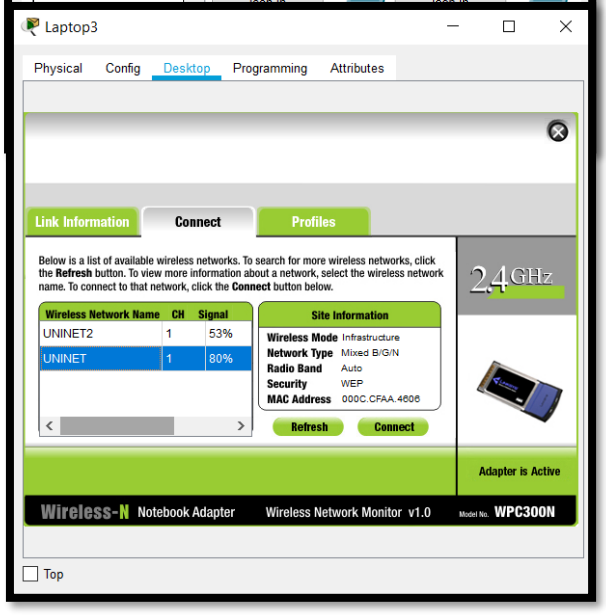


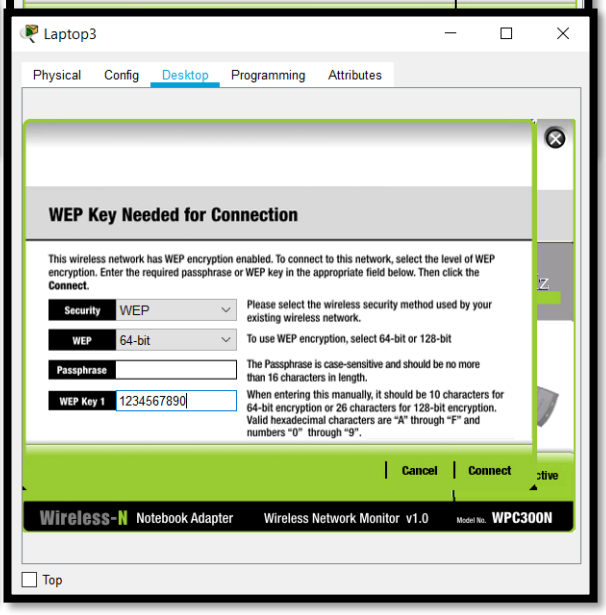


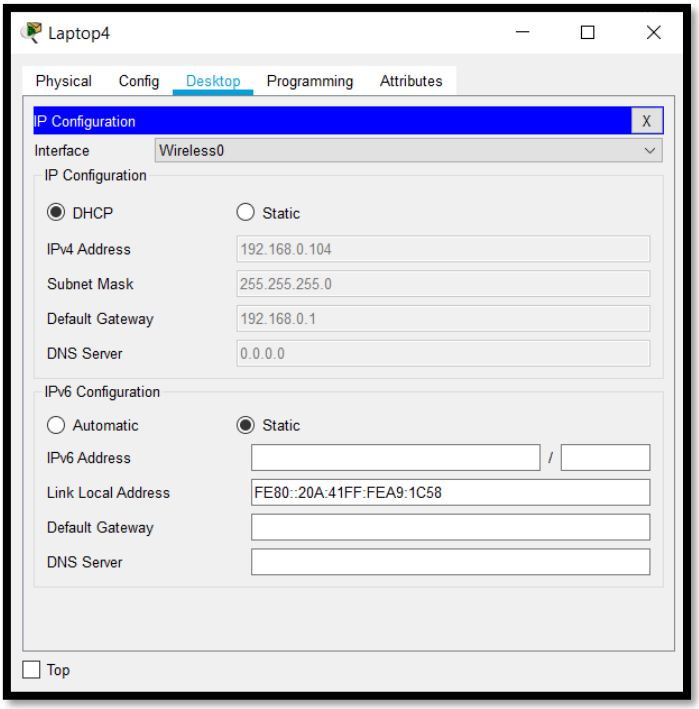
From Laptop 3:



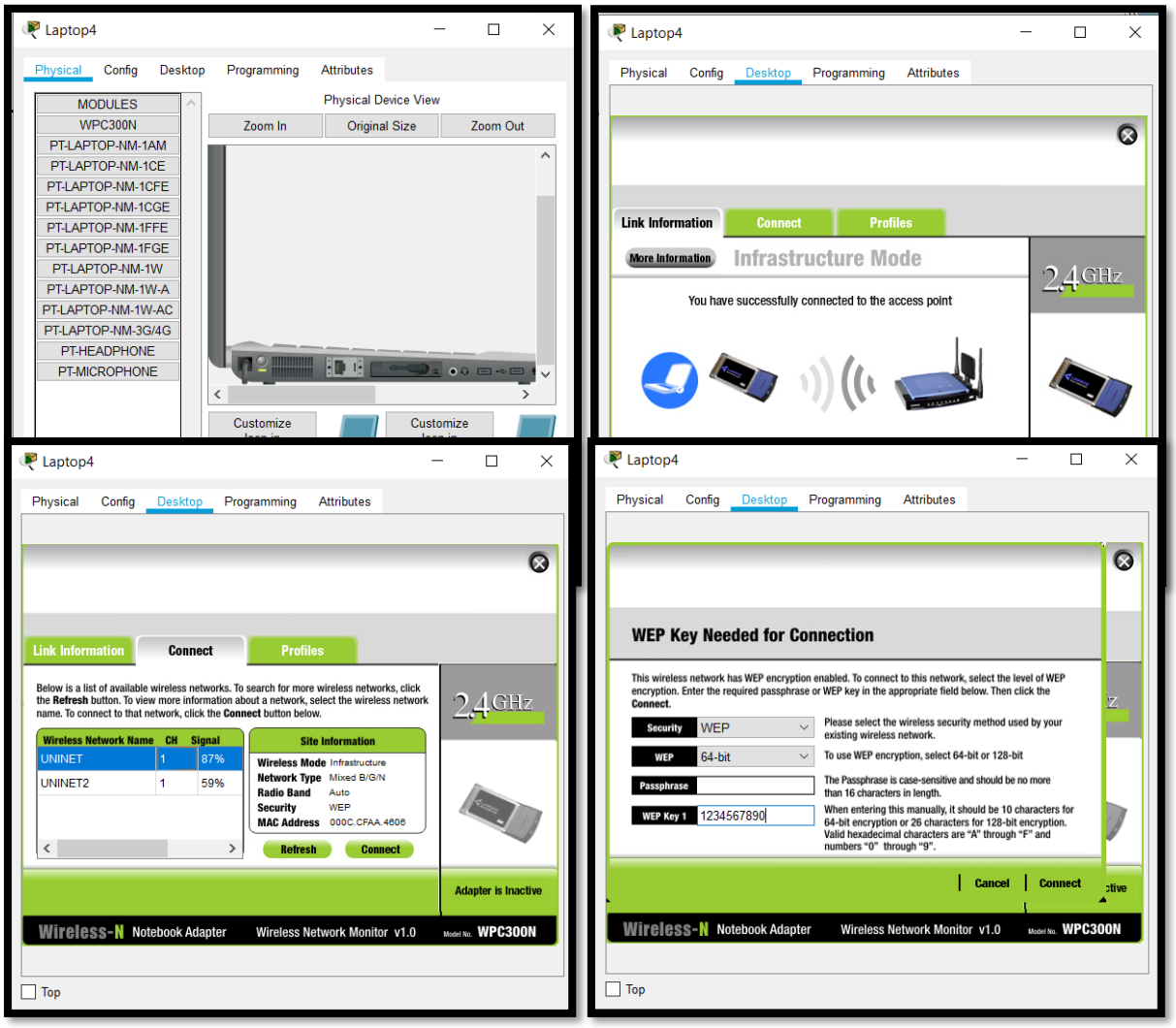


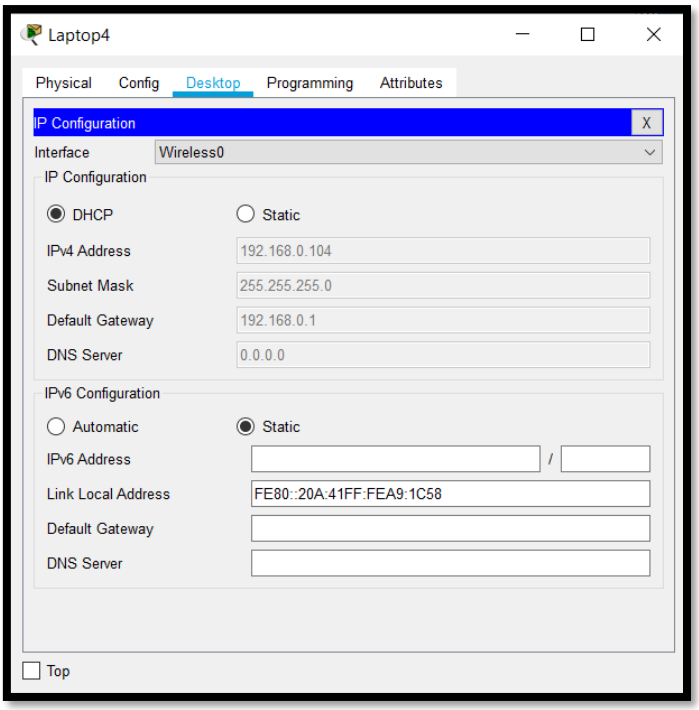




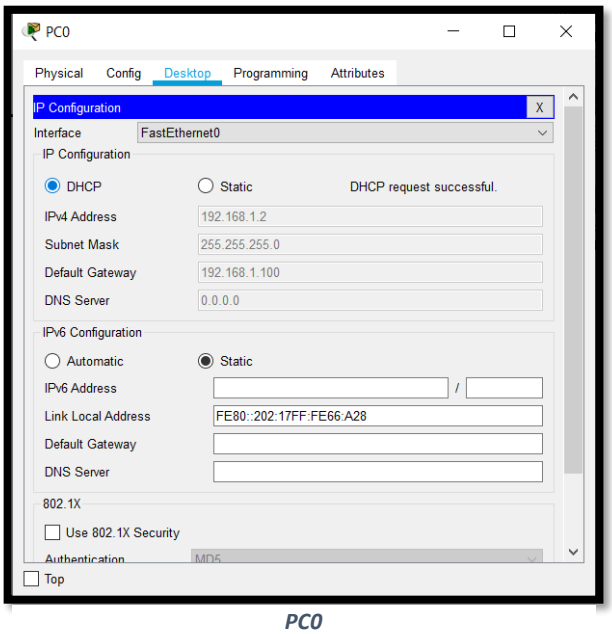


From Laptop 4:

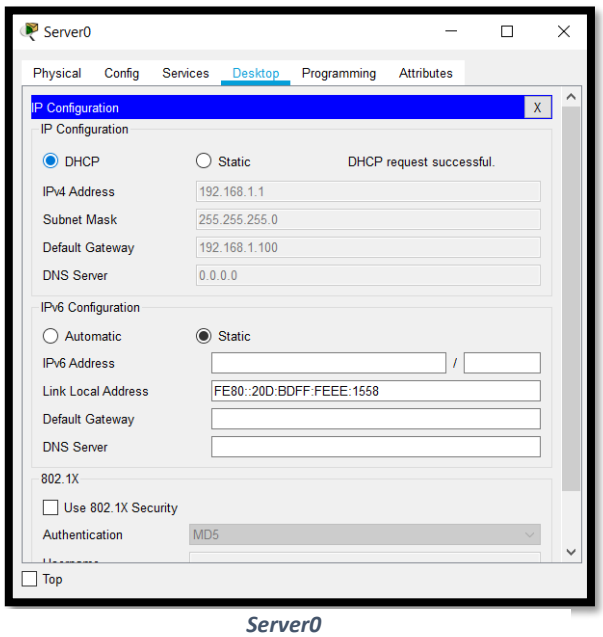




Setting in VLAN 2. Just enable DHCP from PC0 and server0



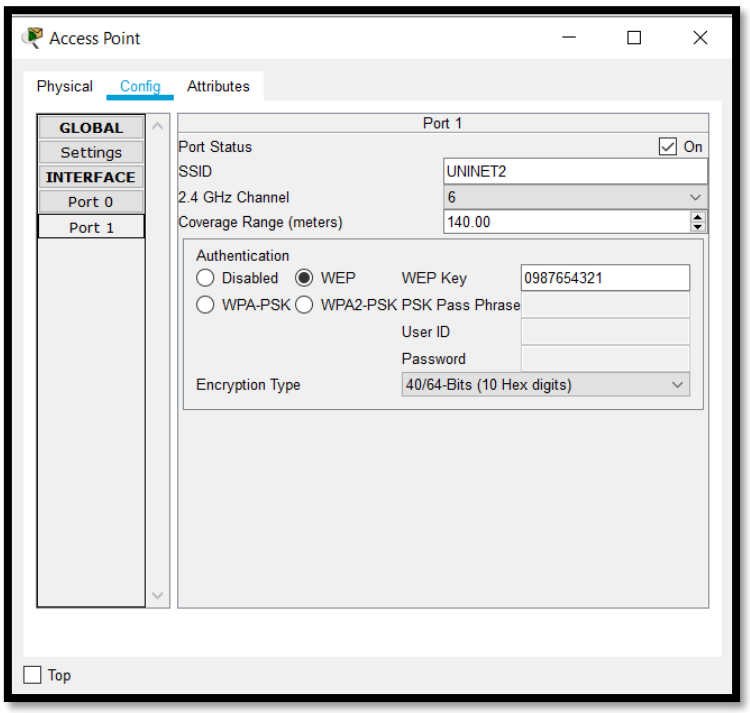
PC0



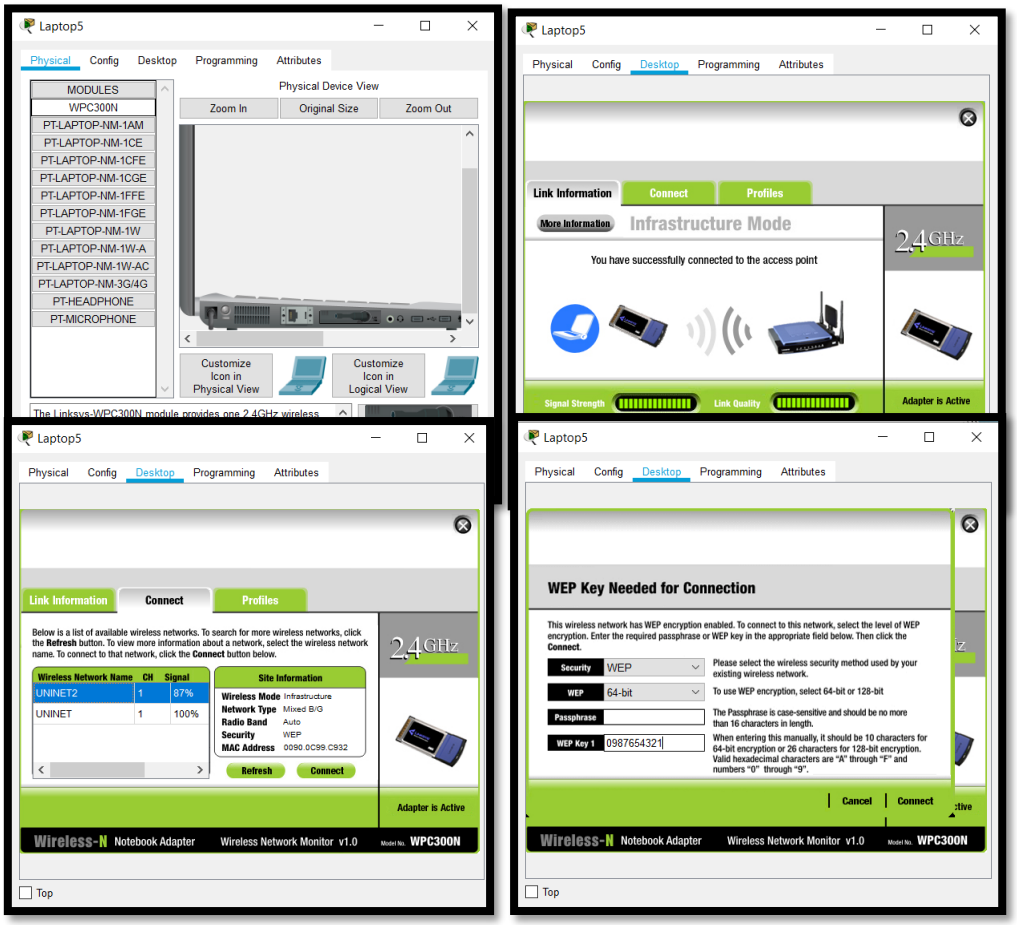
Server0

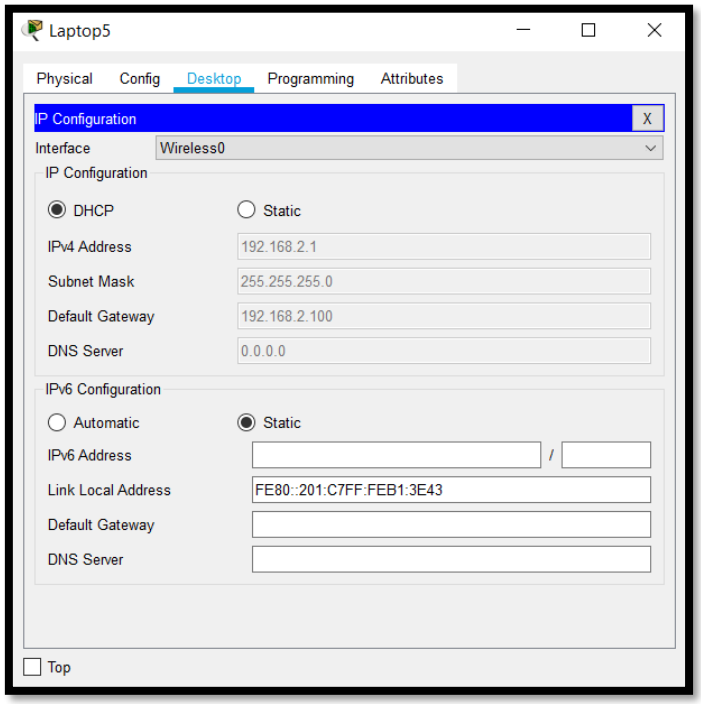
Setting up VLAN 3

From Access point:

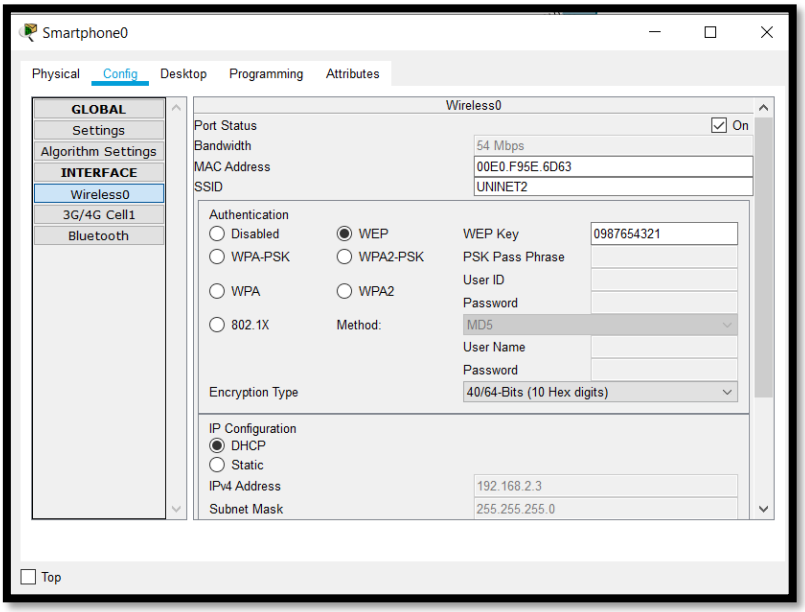


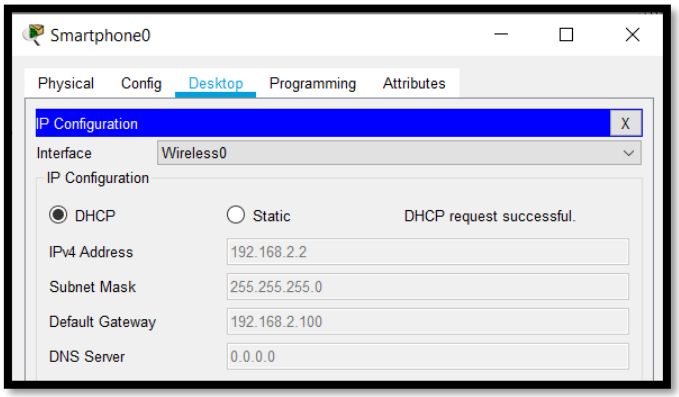
From Laptop 5:





From Smart Phone0:





Real Time Packet sending:

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit
	Successful	Server0	Laptop5	ICMP		0.000	N	0	(edit)
	Successful	Server0	Smartphone0	ICMP		0.000	N	1	(edit)
	Successful	Server0	Laptop4	ICMP		0.000	N	2	(edit)
	Successful	Server0	Laptop3	ICMP		0.000	N	3	(edit)
	Successful	Server0	Laptop2	ICMP		0.000	N	4	(edit)
	Successful	PC0	Laptop5	ICMP		0.000	N	5	(edit)
	Successful	PC0	Smartphone0	ICMP		0.000	N	6	(edit)
	Successful	PC0	Laptop4	ICMP		0.000	N	7	(edit)
	Successful	PC0	Laptop3	ICMP		0.000	N	8	(edit)
	Successful	PC0	Laptop2	ICMP		0.000	N	9	(edit)

Simulation Packet Sending:

Simulation Panel

Event List

Vis.	Time(sec)	Last Device	At Device	Type
	0.000	--	Laptop2	ICMP
	0.001	Laptop2	Wireless ...	ICMP
	0.002	Wireless R...	Multilayer ...	ICMP
	0.003	Multilayer S...	Server0	ICMP
	0.004	Server0	Multilayer ...	ICMP
	0.005	Multilayer S...	Wireless ...	ICMP
	0.005	--	Wireless ...	ICMP
	0.006	Wireless R...	Laptop4	ICMP
	0.006	Wireless R...	Laptop2	ICMP
	0.006	Wireless R...	Laptop3	ICMP
	0.009	--	Wireless ...	ICMP
	0.010	Wireless R...	Laptop4	ICMP
	0.010	Wireless R...	Laptop2	ICMP
	0.010	Wireless R...	Laptop3	ICMP

Evaluation & Future Work

Post-implementation, the network will be evaluated for its performance, speed, reliability, and security features. Regular audits will ensure that it meets the organizational needs effectively.

For future work, we plan on integrating more advanced security features like intrusion detection systems (IDS) and enhancing scalability options to accommodate more devices as the organization grows.