

SIMPLE COMPANY NETWORKING PROJECT

XYZ company is a fast-growing company in Eastern Australia with more than 2 million customers globally. The company deals with selling and buying of food items, which are basically operated from the headquarters. The company is intending to open a branch near the local village Bonalbo. Thus, the company requires young IT graduates to design the network for the branch. The network is intended to operate separately from the HQ network.

Being a small network, the company has the following requirements during implementation;

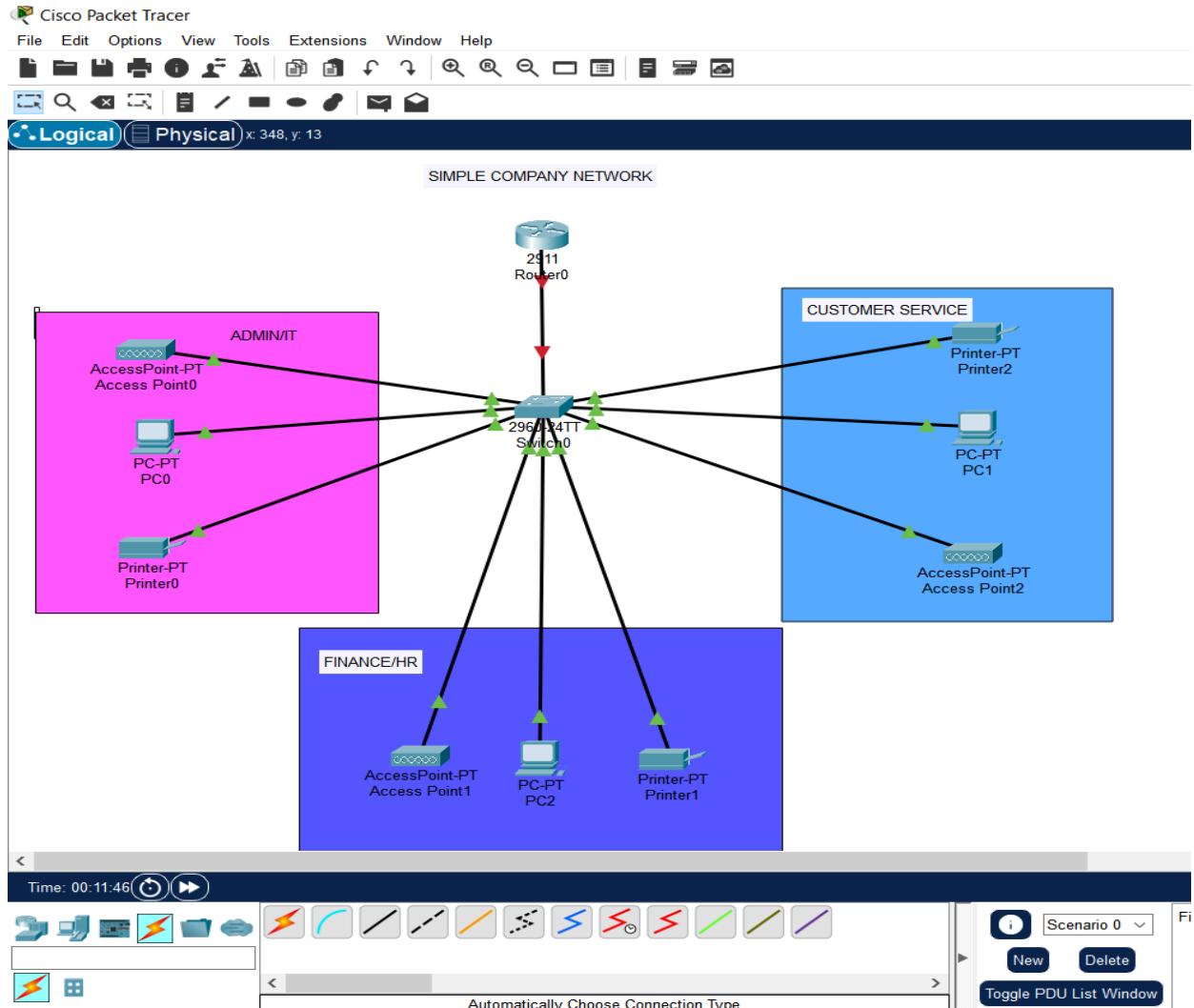
- a) One router and one switch to be used (all CISCO products).
- b) 3 departments (Admin/IT, Finance/HR and Customer service/Reception)
- c) Each department is required to be in different VLANs.
- d) Each department is required to have wireless network for the users.
- e) Host devices in the network are required to obtain IPv4 address automatically.
- f) Devices in all the departments are required to communicate with each other.

Assume the ISP gave out a base network of 192.168.1.0, you as the young network engineer who has been hired, design and implement a network considering the above requirements.

Some of the important things to keep in mind while designing the above network are;

- The network is intended to operate separately from HQ network which means they are 2 different autonomous systems.
- It has 3 departments with each department having its own VLAN. and each will have its own wireless access points to provide wifi for users.
- In order to achieve part (e), we will use a DHCP server and use a router as the server.
- We will need to use subnetting to allocate an IP for each department.

The Design



Subnetting

The base network 192.168.1.0

Number of subnets required = 3 (one for each department)

No. of subnets formula = 2^n where n is no of borrowed bits

Therefore; $2^n = 3 \rightarrow n=2$

Class C = 255.255.255.0 → 11111111.11111111.11111111.00000000

The new binary form after borrowing 2 bits = 11111111.11111111.11111111.11000000

.....→ 255.255.255.192 This is the **subnet mask**.

The slash notation is the number of 1 bits in the subnet mask → 26

The block size is 64 which tells us how to move from one subnet to another i.e. add 64 to the last octet for every subnet network ID.

The broadcast ID is the last IP before moving to the next subnet

1st subnet:

Network ID = 192.168.1.0

Broadcast ID = 192.168.1.63

Host range = 192.168.1.1 - 192.168.1.62

2nd subnet:

Network ID = 192.168.1.64

Broadcast ID = 192.168.1.127

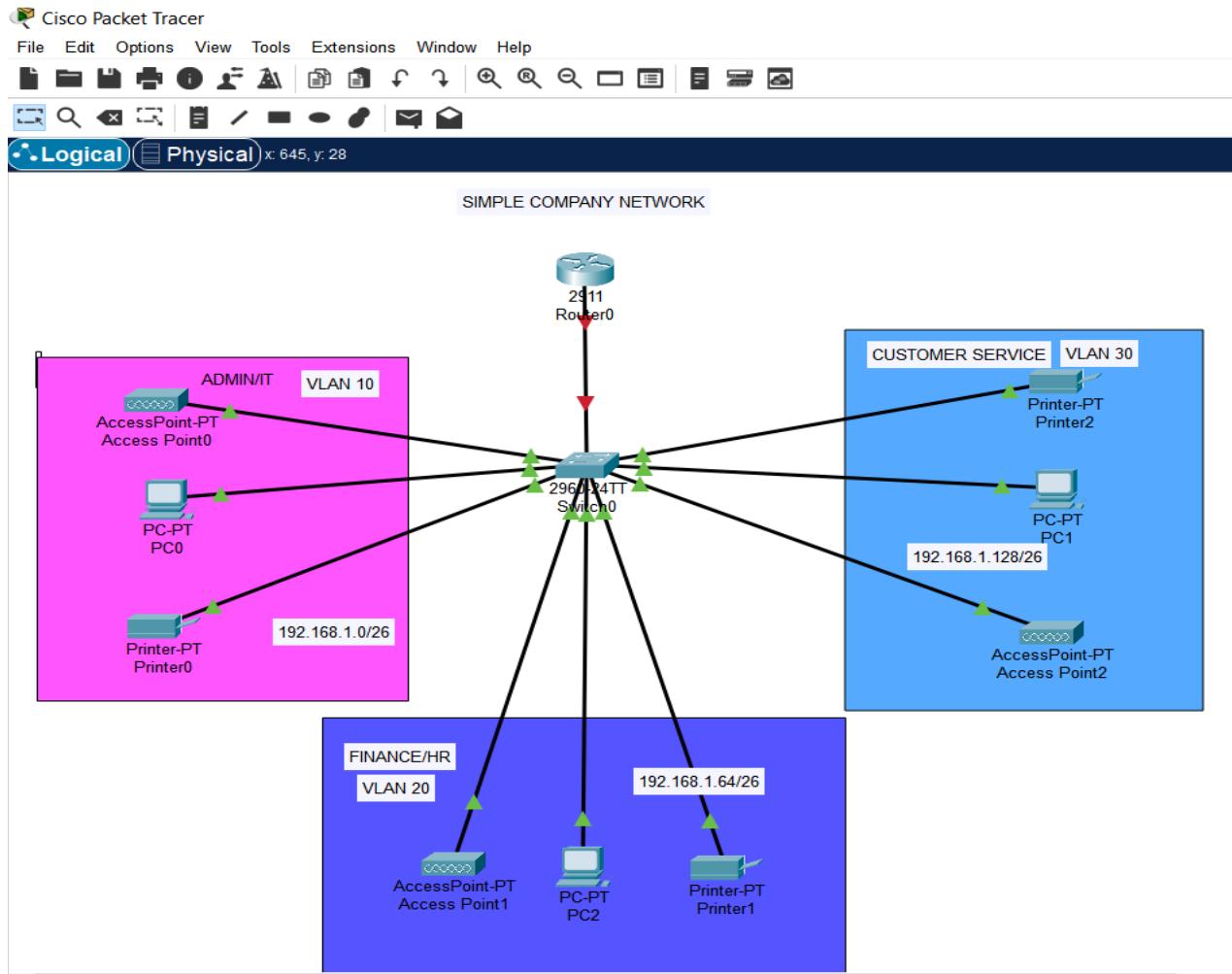
Host range = 192.168.1.65 - 192.168.1.126

3rd subnet:

Network ID = 192.168.1.128

Broadcast ID = 192.168.1.191

Host range = 192.168.1.129 - 192.168.1.190



Configuration

Configuring VLAN

They are configured in the switch

In the command line:

en

Conf t

Int range fa0/2-4

Switchport mode access

Switchport access vlan 10

Int range fa0/5-7

Switchport access vlan 20

Int range fa0/8-10

Switchport access vlan 30

Do wr

Exit

Do sh start

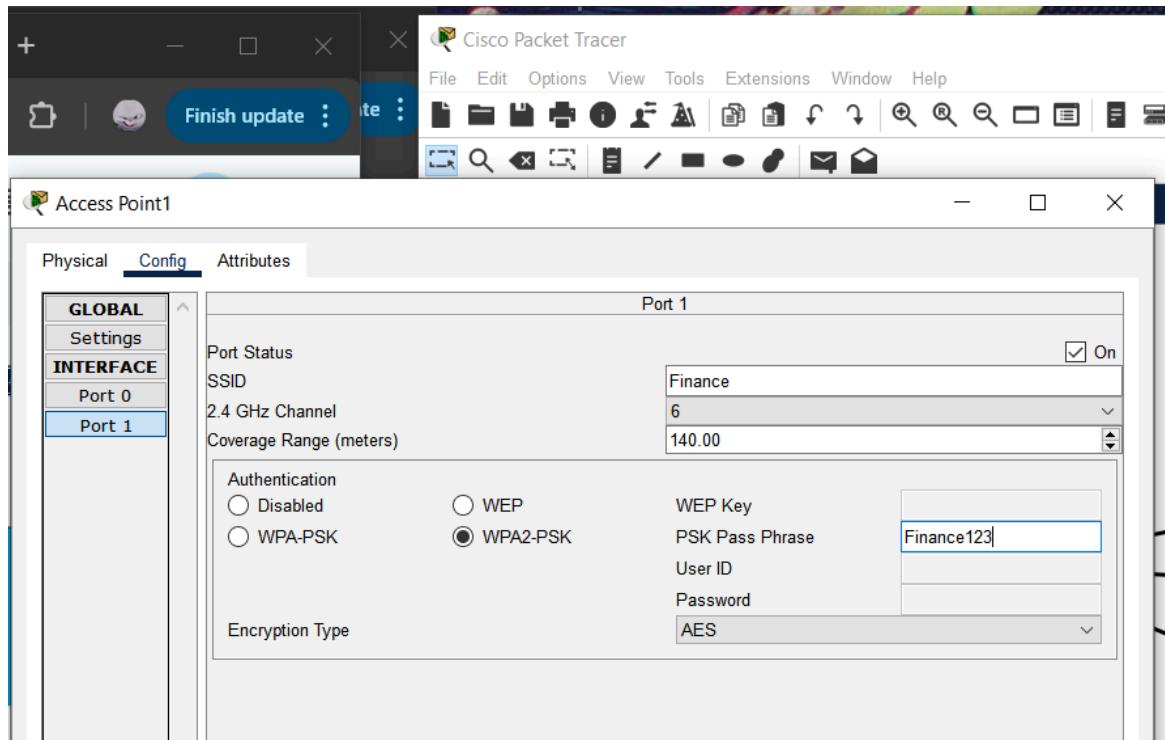
```
$LINK-5-CHANGED: Interface FastEthernet0/9, changed state to up
$LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/9, changed state to up
$LINK-5-CHANGED: Interface FastEthernet0/10, changed state to up
$LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/10, changed state to up

Switch>EN
Switch#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#int range fa0/2-4
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 10
  * Access VLAN does not exist. Creating vlan 10
Switch(config-if-range)#int range fa0/5-7
Switch(config-if-range)#switchport access vlan 20
  * Access VLAN does not exist. Creating vlan 20
Switch(config-if-range)#int range fa0/8-10
Switch(config-if-range)#switchport access vlan 30
  * Access VLAN does not exist. Creating vlan 30
Switch(config-if-range)#do wr
Building configuration...
[OK]
Switch(config-if-range)#
Switch(config-if-range)#exit
Switch(config)#do sh start
Using 1395 bytes
!
version 15.0
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Switch
!
!
!
!
!
!
spanning-tree mode pvst
spanning-tree extend system-id
!
interface FastEthernet0/1
!
interface FastEthernet0/2
  switchport access vlan 10
  switchport mode access
--More-- |
```

Configuring Wireless Network

At the access points:

Set up for wireless access.



Repeat this for every access point changing the name and password accordingly

From the switch the interface should be a trunk Interface to allow multiple VLANs to access the router so from the switch command line again:

Int fa0/1

Switchport mode trunk

Do wr

```
!
! spanning-tree mode pvst
! spanning-tree extend system-id
!
interface FastEthernet0/1
!
interface FastEthernet0/2
  switchport access vlan 10
  switchport mode access
!
interface FastEthernet0/3
  switchport access vlan 10
  switchport mode access

Switch(config)#int fa0/1
Switch(config-if)#switchport mode trunk
Switch(config-if)#do wr
Building configuration...
[OK]
Switch(config-if)#

```

Top

On the router CLI:

En

Conft

Int gig0/0

No shutdown

Do wr

```
--- System Configuration Dialog ---

Would you like to enter the initial configuration dialog? [yes/no]: no

Press RETURN to get started!

Router>en
Router>conf t
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#int gig0/0
Router(config-if)#no shutdown

Router(config-if)#
#LINK-5-CHANGED: Interface GigabitEthernet0/0, changed state to up

#LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up
do wr
Building configuration...
[OK]
Router(config-if)#

```

To configure the inter-VLAN route:

The way to go about this is to create subinterfaces from one physical interface in this case the gig0/0. These subinterfaces will act as the default gateways to the respective VLAN.

To create a subinterface, go to the interface connected to your network gig0/0:

Int gig0/0.10

Encapsulation dot1Q 10

Ip address 192.168.1.1 255.255.255.192

Exit

Int gig0/0.20

Encapsulation dot1Q 20

Ip address 192.168.1.65 255.255.255.192

Do wr

Exit

Int gig0/0.30

Encapsulation dot1Q 30

Ip address 192.168.1.129 255.255.255.192

Do wr

Exit

Do sh start

Router0

Physical Config **CLI** Attributes

```
Router(config)#int gig0/0.10
Router(config-subif)#ip address 192.168.1.1 255.255.255.192
% Configuring IP routing on a LAN subinterface is only allowed if that
subinterface is already configured as part of an IEEE 802.10, IEEE 802.1Q,
or ISL vLAN.

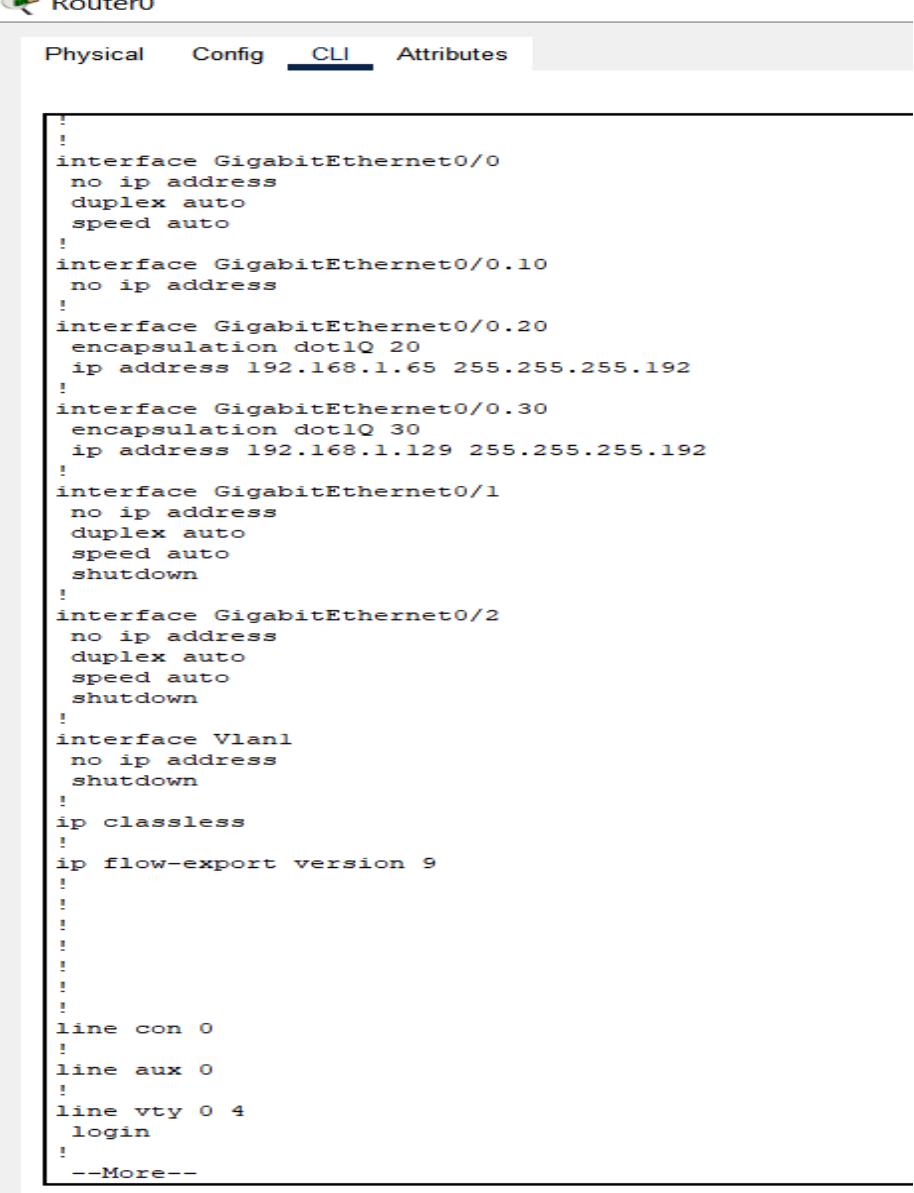
Router(config-subif)#exit
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#
Router(config)#int gig0/0.20
Router(config-subif)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0.20, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.20, changed state to up

Router(config-subif)#Encapsulation dot1Q 20
Router(config-subif)#Ip address 192.168.1.65 255.255.255.192
Router(config-subif)#Do wr
Building configuration...
[OK]
Router(config-subif)#exit
Router(config)#
%LINK-5-CHANGED: Interface GigabitEthernet0/0.30, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0.30, changed state to up

Router(config-subif)#Encapsulation dot1Q 30
Router(config-subif)#Ip address 192.168.1.129 255.255.255.192
Router(config-subif)#do wr
Building configuration...
[OK]
Router(config-subif)#exit
Router(config)#do sh start
Using 927 bytes
!
version 15.1
no service timestamps log datetime msec
no service timestamps debug datetime msec
no service password-encryption
!
hostname Router
!
!
```



The screenshot shows a network configuration interface for a device named "Router0". At the top, there are tabs for "Physical", "Config", "CLI", and "Attributes", with "CLI" being the active tab. The main area displays the router's running configuration in text form.

```
!
! interface GigabitEthernet0/0
no ip address
duplex auto
speed auto
!
! interface GigabitEthernet0/0.10
no ip address
!
! interface GigabitEthernet0/0.20
encapsulation dot1Q 20
ip address 192.168.1.65 255.255.255.192
!
! interface GigabitEthernet0/0.30
encapsulation dot1Q 30
ip address 192.168.1.129 255.255.255.192
!
! interface GigabitEthernet0/1
no ip address
duplex auto
speed auto
shutdown
!
! interface GigabitEthernet0/2
no ip address
duplex auto
speed auto
shutdown
!
! interface Vlan1
no ip address
shutdown
!
! ip classless
!
! ip flow-export version 9
!
!
!
!
!
!
line con 0
!
line aux 0
!
line vty 0 4
login
!--More--
```

To configure DHCP Server:

Go to the router:

Service dhcp

Ip dhcp pool Admin-Pool

Network 192.168.1.0 255.255.255.192

Default-router 192.168.1.1

Dns-server 192.168.1.1

Domain-name Admin.com

Exit

For the second subnet:

Ip dhcp pool Finance-pool

Network 192.168.1.64 255.255.255.192

default-router 192.168.1.65

Dns-server 192.168.1.65

Domain-name Finance.com

exit

3rd subnet:

Ip dhcp pool CS-pool

Network 192.168.1.128 255.255.255.192

Default-router 192.168.1.129

Dns-server 192.168.1.129

Domain-name CSS.com

Exit

Do wr

```
Router(config)#cit
^
* Invalid input detected at '^' marker.

Router(config)#Service dhcp
Router(config)#Ip dhcp pool Admin-Pool
Router(dhcp-config)#Network 192.168.1.0 255.255.255.192
Router(dhcp-config)#Default-router 192.168.1.1
Router(dhcp-config)#Dns-server 192.168.1.1
Router(dhcp-config)#Domain-name Admin.com
Router(dhcp-config)#exit
Router(config)#
Router(config)#
Router(config)#Ip dhcp pool Finance-pool
Router(dhcp-config)#Network 192.168.1.64 255.255.255.192
Router(dhcp-config)#default -router 192.168.1.65
^
* Invalid input detected at '^' marker.

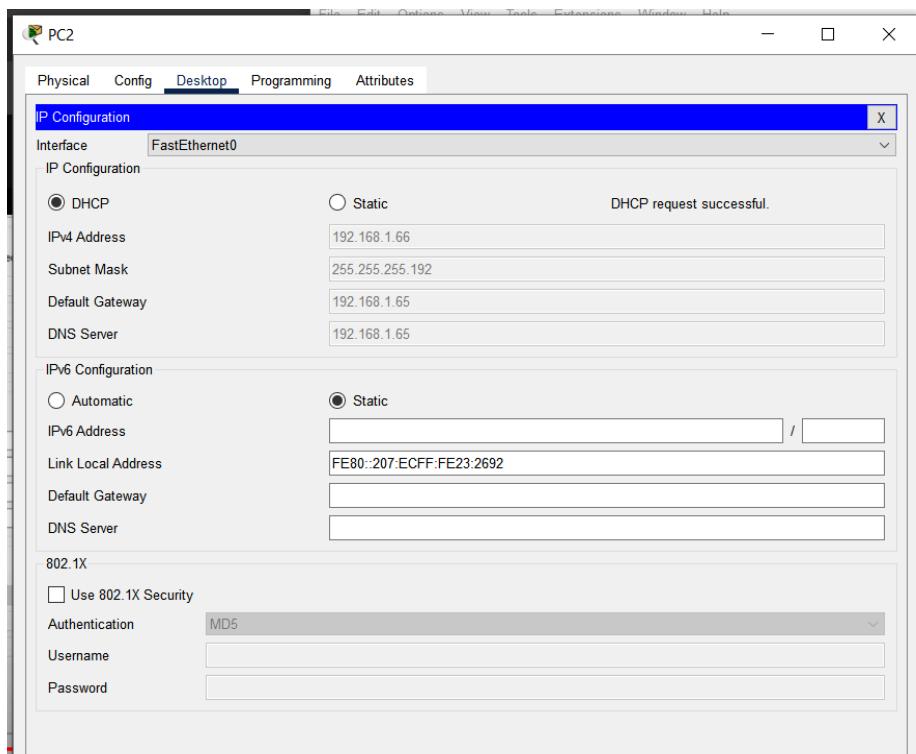
Router(dhcp-config)#default-router 192.168.1.65
Router(dhcp-config)#Dns-server 192.168.1.65
Router(dhcp-config)#Domain-name Finance.com
Router(dhcp-config)#exit
Router(config)#
Router(config)#
Router(config)#Ip dhcp pool CS-pool
Router(dhcp-config)#Network 192.168.1.128 255.255.255.192
Router(dhcp-config)#Default-router 192.168.1.129
Router(dhcp-config)#Dns-server 192.168.1.129
Router(dhcp-config)#Domain-name CSS.com
Router(dhcp-config)#exit
Router(config)#do wr
Building configuration...
[OK]
Router(config)#

```

To test communication and Change Ip allocation method to DHCP on the devices (PCs and printers)

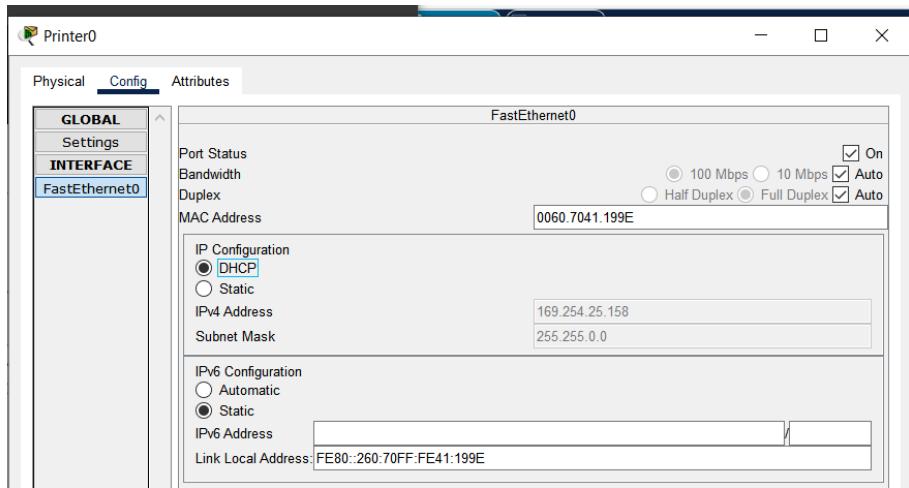
On the PC:

Go to desktop, IP configuration and change the radio button from static to dhcp

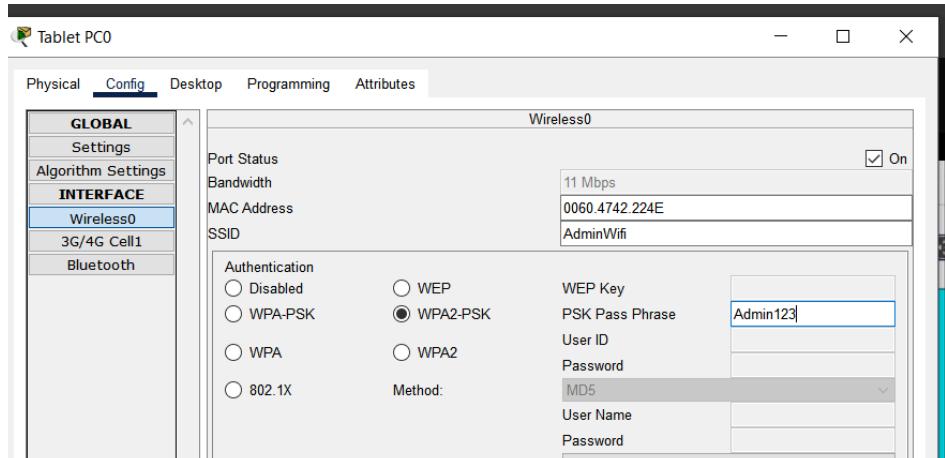


Do this for all PCs.

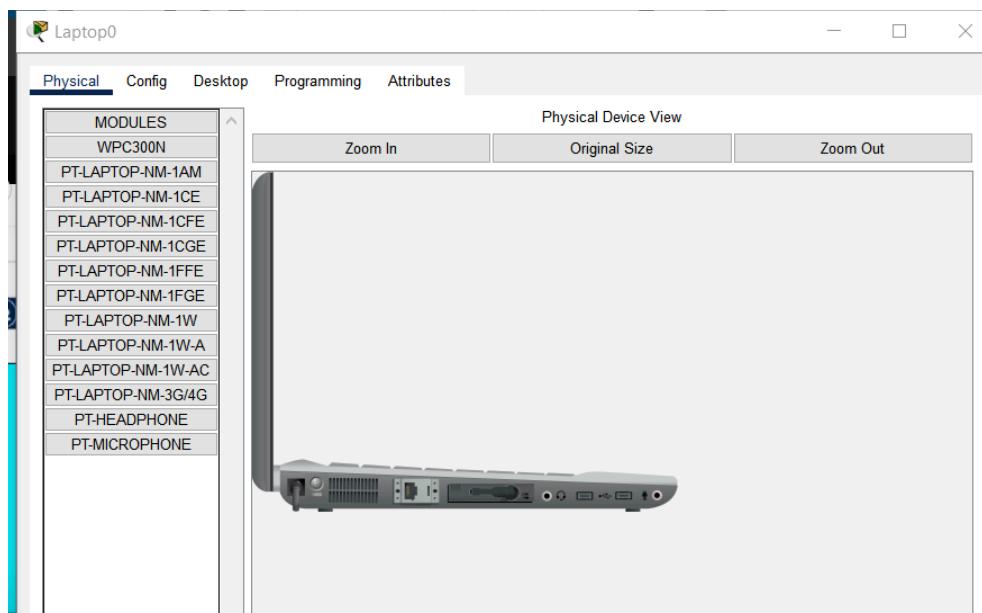
Do the same on the printers by clicking on them > config > fast ethernet



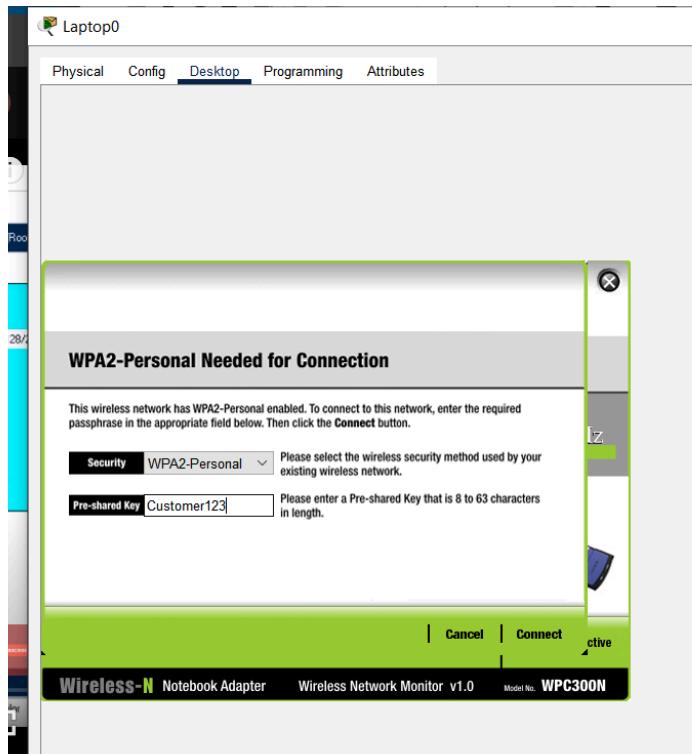
Add mobile devices such as laptops and smartphones to the subnets to test the wireless connection. Connect them to the wifi with the respective AP name and password.



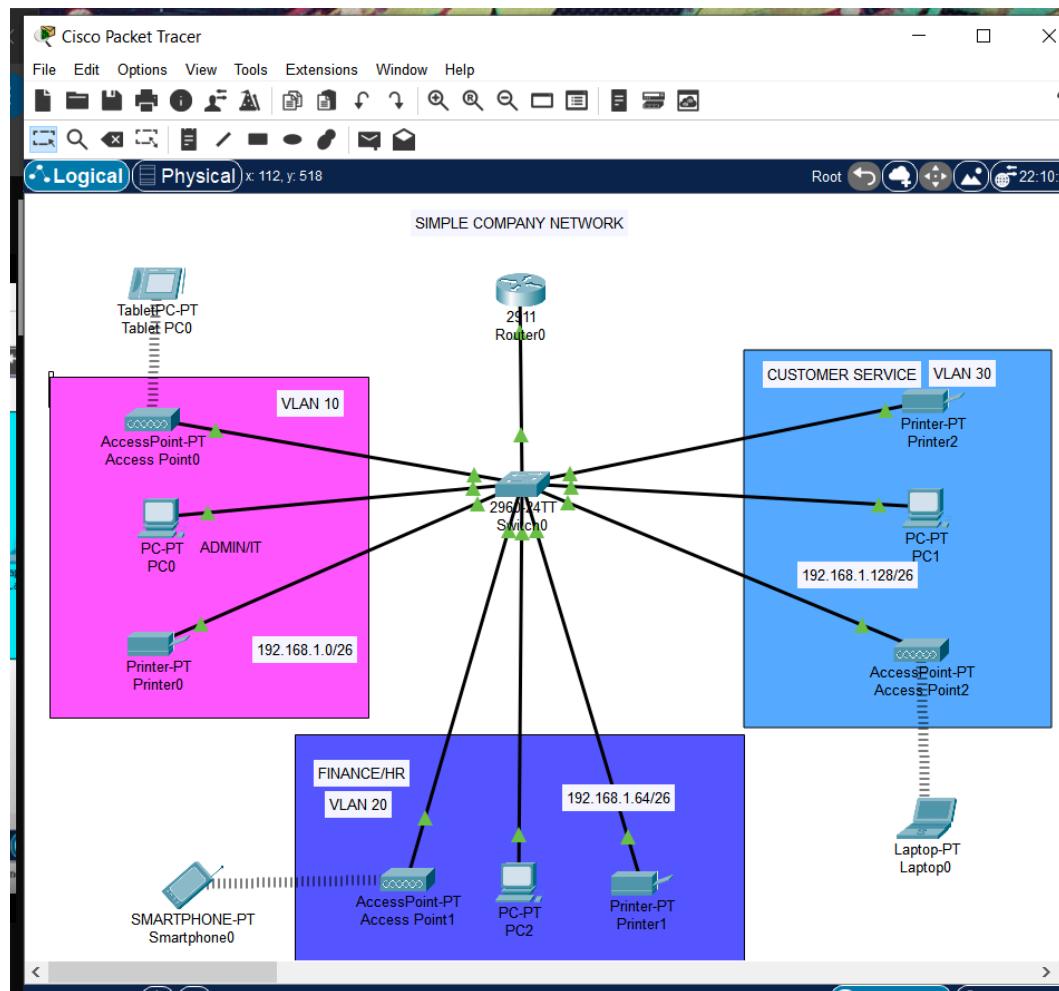
For the laptop, you will have to change the port to WPC300N at the physical tag as shown below.



Then you need to connect through the desktop Ip wireless to get the wifi



The full connections should look like this



Make a couple of pings from any and devices like the PCs to another on a different subnet