ಮೈಸೂರುವಿಶ್ವವಿದ್ಯಾನಿಲಯ
UNIVERSITY OF MYSORE
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MYSORE UNIVERSITY SCHOOL OF ENGINEERING
Manasagangotri campus, Mysuru-570006
(Approved by AICTE, New Delhi)

A Summer Internship-I (21INT49) Report

On
"NETWORK DESIGN AND IMPLEMENTATION OF SMALL HOME OFFICE"

Submitted in partial fulfilment for the award of degree of
Bachelor of Engineering
in
Department of Artificial Intelligence and Machine Learning

Submitted By
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21SEAI37
V Semester,
Department of AI&ML
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Asst. Professor	Asst. Professor,
Dept. of AI&ML,	Dept. of AI&ML,
MUSE, UOM, Mysuru.	MUSE, UOM, Mysuru.

Dr. Ananthapadmanabha.T
Director,
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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

MYSORE UNIVERSITY SCHOOL OF ENGINEERING,

UNIVERSITY OF MYSORE,

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MYSORE UNIVERSITY SCHOOL OF ENGINEERING
Manasagangotri campus, Mysuru-570006
(Approved by AICTE, New Delhi)

DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

CERTIFICATE

This is to certify that the **Summer Internship-1 (21INT49)** entitled **"NETWORK DESIGN AND IMPLEMENTATION OF SMALL HOME OFFICE"** is a bonafide work carried out by **Srujana HB, V Semester** bearing **Register No.21SEAI37,** a student of **Mysore University School of Engineering in** partial fulfillment for the award of **Bachelor of Engineering** in **Department of Artificial Intelligence and Machine Learning, University of Mysore, Mysuru**. It is certified that all corrections/suggestions indicated for have been executed by the above mentioned candidate.

External Guide
Mr. Raghuveer Shetty
Employee,
Intersect India Pvt Ltd,
Rajajjinagar 4th block,
Bengaluru -560013, India.

Signature of Faculty Incharge
Mrs. Manasa K.J
Asst. Professor,
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MUSE, UOM, Mysuru.

Signature of the Head of the Department
Mr. K. S. Santhosh Kumar
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MUSE, UOM, Mysuru.

Signature of the Director
Dr. Ananthapadmanabha. T
Director
MUSE, UOM, Mysuru.

Name of the Examiners:

1.

2.

Signature with date

11.10.2023

To whom it may concern,

SRUJANA H B
Mysore University School of Engineering,
Manasagangotri campus, Mysore-570006

Subject: Internship Certificate for Project on Basic Concepts of Networking and IT Equipment's

This is to certify that Srujana H B, a Engineering student at Mysore University School of Engineering, successfully completed an internship on the project titled "Basic Concepts of Networking and IT Equipment's" at Intersect India Pvt Ltd from 06.09.2023 to 11.10.2023.

During this internship Srujana H B demonstrated a keen interest and enthusiasm for learning and applying fundamental concepts related to networking and IT equipment. The project involved researching and understanding the basic principles of networking, including network topologies, protocols, and communication technologies. Furthermore, Srujana H B gained hands-on experience with various IT equipment, such as routers, switches, and other network devices.

Key Accomplishments and Learning Outcomes:

Developed a comprehensive understanding of networking concepts and terminologies.
Analyzed and configured different network topologies and protocols.
Gained practical experience in setting up and managing IT equipment.
Demonstrated effective problem-solving skills in troubleshooting network issues.

Srujana H B exhibited dedication, teamwork, and a strong work ethic throughout the internship. She was able to contribute effectively to the project by actively participating in discussions, collaborating with the team, and completing assigned tasks with professionalism and enthusiasm.

We believe that Srujana H B has acquired valuable skills and knowledge during this internship, making her well-prepared for future endeavors in the field of networking and IT.
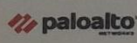
Sincerely,

Nagaraja A J

Director
Intersect India Pvt Ltd

(Seal: INTERSECT INDIA PRIVATE LIMITED, Bangalore-10)

DECLARATION

I, **Srujana H B** bearing the Register No. **21SEAI37** student of 5th semester, **Bachelor of Engineering** in **Department of Artificial Intelligence and Machine Learning, University of Mysore, Mysuru**. Declare that the **Summer Internship-I (21INT49) entitled on "NETWORK DESIGN AND IMPLEMENTATION OF SMALL HOME OFFICE"**, has been duly executed by me under incharge Faculty **Mrs. Manasa K.J.**

The Summer Internship-I project report of above entitled is submitted by me in the view of partial fulfillment of the requirement for the award of Bachelor of Engineering degree in Department of Artificial Intelligence and Machine Learning by University of Mysore, during the academic year **2023-24** further, the matter embodied in the report has not been submitted previously by anybody for the award of any degree.

Date: 24/02/2024   **Srujana H B**

Place: Mysuru   Reg. No.21SEAI37

ACKNOWLEDGEMENT

The satisfaction that accompanies the successful completion of the **Summer Internship I (21INT49)** project report which would be complete only with the mention of the almighty God and the people who made it possible, whose report rewarded the effort with success of project presentation.

We are grateful to **Department of Artificial Intelligence and Machine Learning, Mysore University School of Engineering, University of Mysore, Manasagangotri campus, Mysuru** for providing us an opportunity to enhance our knowledge through the Summer Internship-1.

We express our sincere thanks to **Dr. Ananthapadmanabha. T Director, Mysore University School of Engineering, University of Mysore, Manasagangotri campus, Mysuru** for providing us an opportunity, extensive support, encouragement and means to present the Summer Internship-1 on the activity programme.

We express our heart full thanks to the **Mr. K. S. Santhosh Kumar, Head of the Department**, **Mysore University School of Engineering, University of Mysore, Manasagangotri campus, Mysuru** for encouragement in our Summer Internship-1 Project work.

We express our deep gratitude to **Mr. Raghuveer Shetty, Employee, Intersect India Pvt Ltd, Rajajinagar 4th block, Bengaluru -560013, India**, for his longstanding support and valuable suggestions throughout the course of this Internship-I project work.

Sincere thanks to the for encouragement in our Summer Internship-I Project work. We would like to express profound thanks to the **Mrs. Manasa K.J , Faculty Incharge**, **Mysore University School of Engineering, University of Mysore, Manasagangotri campus, Mysuru**, the keen interest and encouragement in our Summer Internship-1 project presentation.

Finally, we would like to thank our family members and friends for standing with us all the time.

Srujana H B
Reg.No.21SEAI37

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TABLE OF DIAGRAMS:

Chapter 1:

ABBREVIATIONS

SI N0.	Abbreviation	Full Form
1.	LAN	Local Area Network
2.	WAN	Wide Area Network
3.	MAN	Metropolitan Area Network
4.	VLAN	Virtual Local Area Network
5.	MAC	Media Access Control
6.	IP	Internet Protocol
7.	IPV4	Internet Protocol Version 4
8.	IPV6	Internet Protocol Version 6
9.	DHCP	Dynamic Host Configuration Protocol
10.	WAP	Wireless Access Point
11.	DNS	Domain Name System
12.	ISP	Internet Service Provider
13.	Net-ID	Network ID
14.	TCP/IP	Transmission Control Protocol
15.	CIDR	Classless Inter-Domain Routing
16.	HQ	Head Quarters
17.	NIC	Network Interface Card

Fig 1.1 – Abbreviations table

Chapter 2:
ABSTRACT

Networking is informed as connecting computers electronically for the purpose of sharing information. Resources such as files, application, printers and software are common information shared in a networking. The advantage of networking can be seen clearly in terms of security and efficiency, manageability and cost effectiveness as it allows collaboration between users in a wide range. Basically, network consists of hardware component such as computer, switches, routers, firewalls and other devices which form the network infrastructure. These are the devices that play an important role in data transfer from one place to another using different technologies such as radio waves and wires.

There are many types of networks available in the networking industries and the most common network are Local Area Network (LAN), Wide Area Network (WAN) and Metropolitan Area Network (MAN). LAN network is made up of two or more computers connected together in a short distance usually at home, office, buildings/school, WAN is a network that covers wider area than LAN and usually covers cities, countries and the whole world. MAN network is located in a single geographic area that is smaller than a WAN.

In the process learning computer network systems, the use of virtual laboratories is very important. Cisco Packet Tracer, enables us to work on test scenarios without using any physical components virtually to design an advanced computer network The Cisco Packet Tracer is used not only to simulate computer networks but also to learn computer networks. The report outlined the steps involved in structured network design and deployment for a small home office need. It presented the steps of a structured network design and design was simulated using cisco packet tracer.

Chapter 3:

COMPANY PROFILE

Intersect India Private Limited is a global IT company focused on innovation and producing stunning business outcomes. That can mean helping clients join up the dots between storage, computer networking and collaboration

Intersect India Private Limited is formerly known as Intersect Technologies and established in 2014 with registered office at Bangalore with more than 1 million man hour experienced technical team. The company vision is to grow as networking information integration organization. The focus is to cater technical knowledge demanding networking field. From their modest beginning in 2014 providing network product sales organization, today they have grown into the level where they can take up the complicated structured network projects for voice, data and video applications. The company provides multiple benefits, one is that of adding value to the customers plans thereby building much required stickiness.

THE COMPANY'S ESTEEMED PRODUCTS

- CISCO
- ALLIED TELESIS
- D-LINK
- HP INVENT
- SOPHOS
- FORTNET
- DELL
- LENOVO
- PALOALTO NETWORKS
- ACER
- QNAP CLOUD NAS

- CAMBIUM NETWORKS

- ARUBA NETWORKS

- RUCKUS WIRELESS

- RADWIN THE WIRELESS CHOICE

- UNV

- CP PLUS

- HIK VISION

- AHUA

- MOLEX

- COMMSCOPE

- SCHNEIDER ELECTRIC

THE COMPANY'S CLIENTS

GOVERNMENT SECTOR:

- BANGALORE

Karnataka Milk Federation (KMF)Indian Statistical Institute

- MYSORE

Administrative Training Institute State Institute Of Urban Development

EDUCATION SECTOR:

Adhichunchanagiri Institute Of Medical Science

BGS Institute Of Technology

Bangalore University

Nitte Meenakshi Institute of Technology

Sri Krishna Institute Of Technology

Sri Venkateshwara College Of Engg

St.Joseph's Art's & Science College

BANKING & FINANCE SECTOR :

Controllers Bank Bangalore

GOCC Bank Bijapur

Kalidasa Credit Co-operative Society Kamatagi

Krishna Bhīma Samruddhi Local Area Bank Ltd Mahabubnagar

KSRTC Employees Credit Co-operative Society Limited Bangalore

CORPORATE SECTOR

3Q IT Solutions

All Time Support

Amararaja Group Tirupathi

Angel Electronics & Security Systems

Atria Power Solar Bangalore

Ayurwin Pharma Pvt Ltd Bangalore

Bhima Soft Bangalore

Chapter 4:

INTRODUCTION

A computer network is a system that connects numerous independent computers in order to share information (data) and resources. The integration of computers and other different devices allows users to communicate more easily.There are many types of networks available in the networking industries and the most common network are Local Area Network (LAN), Wide Area Network (WAN) and Metropolitan Area Network (MAN). LAN network is made up of two or more computers connected together in a short distance usually at home, office, buildings/school, WAN is a network that covers wider area than LAN and usually covers cities, countries and the whole world. MAN network is located in a single geographic area that is smaller than a WAN. The link which carries the information is called communicaton links. Communication links can be wired or wireless.

A switch is a device used on a computer network to physically connect devices together. Multiple cables can be connected to a switch to enable networked devices to communicate with each other. Switches manage the flow of data across a network by only transmitting a received message to the device for which the message was intended. Each networked device connected to a switch can be identified using a MAC address, allowing the switch to regulate the flow of traffic. This maximises security and efficiency of the network. Because of these features, a switch is often considered more "intelligent" than a network hub. Hubs neither provide security, or identification of connected devices. This means that messages have to be transmitted out of every port of the hub, greatly degrading the efficiency of the network.MAC address (media access control address) is a 12-digit hexadecimal number assigned to each device connected to the network. Primarily specified as a unique identifier during device manufacturing, the MAC address is often found on a device's network interface card (NIC).

A router is a device that connects two or more packet-switched networks or subnetworks. It serves two primary functions: managing traffic between these networks by forwarding data packets to their intended IP addresses, and allowing multiple devices to use the same Internet connection. Internet Protocol (IP) address is the unique identifying number assigned to every device connected to the internet. An IP address definition is a numeric label assigned to

devices that use the internet to communicate. There are two categories in IP address. They are, IPV4 and IPV6. IPV4 is a logical address because it can be changed based on the location of the device. IPV4 address are 32 bit numbers that are typically displayed in dotted decimal location and contains two primary parts one is

network id and the other is host id. IPV4 can be assigned by manually or dynamically. IPV4 address is represented in decimal and it has four octets. The range of IPV4 address is represented as 0.0.0.0 to 255.255.255.255

When a bigger network is divided into smaller networks, to maintain security, then that is known as Subnetting. A virtual local area network or VLAN is a logical grouping of devices connected to a single Ethernet segment. It helps networks by reducing the number of broadcast domains per network device and network subnet. And This allows multiple networks to share the same physical infrastructure without interfering. Dynamic Host Configuration Protocol (DHCP) is a client/server protocol that automatically provides an Internet Protocol (IP) host with its IP address and other related configuration information such as the subnet mask and default gateway. Wireless access point (WAP) is a networking device that allows wireless-capable devices to connect to a wired network. It is simpler and easier to install WAPs to connect all the computers or devices in your network than to use wires and cables.

In the process learning computer network systems, the use of virtual laboratories is very important. In this study, we also implemented Cisco Packet Tracer, which enable sus to work on test scenarios without using any physical components virtually to design an advanced computer network. The Cisco Packet Tracer is used not only to simulate computer networks but also to learn computer networks.

Chapter 5:

PROJECT WORKOUT PLAN

Project Title: Network Design of Small Home Office

Project Overview:

This project is aimed to create a network infrastructure of the small home office in order to provide fast and efficient service for the company workers and customers. Cisco Packet Tracer is a cross-platform visual simulation tool designed by Cisco Systems that allows users to create network topologies and imitate modern computer networks. Network design and installation is concerned on how can interconnect the computers in organization, how to enable the communication between the device and how to share the resource between them.

Introduction of tasks during the project:

To design and implement upgraded, scalable and valuable LAN network services and high speed internet connection for the company. VLANs are set up and configured that offers network segmentation, which can enhance management, security and performance. VLANs can increase security by preventing unwanted access to critical data and network resources by segregating network traffic and limiting access to particular network resources. A subnet is a separate and identifiable portion of an organization's network, typically arranged on one floor, building or geographical location. Whereas a subnet mask is a 32-bit number used to differentiate the network component of an IP address by dividing the IP address into a network address and host address. Dynamic Host Configuration Protocol (DHCP) is a network protocol that is used to configure network devices to communicate on an IP network. A DHCP client uses the DHCP protocol to acquire configuration information, such as an IP address, a default route, and one or more DNS server addresses from a DHCP server. This helps us to build a secure network system of the small home office.

Project Timeline:

Week	Date From - To	Tasks
Week 1	06/09/2023 To 09/09/2023	Introduction to Networking Hubs & Switches Networking Devices
Week 2	11/09/2023 To 16/09/2023	Types of cables Switches Router
Week 3	18/09/2023 To 23/09/2023	MAC Address Introduction to IP Address VLANs
Week 4	25/09/2023 To 30/09/2023	Subnetting Practice problems of Subnetting Switch and Router Configuration
Week 5	02/10/2023 To 07/10/2023	Practical of Basic Routing and Switch Configuration

Fig 5.1 – Project timeline table

Chapter 6:

CASE STUDY OF THE PROJECT

Problem Statement:

'Alpha' company/office is a fast growing company in South India with more than 2 million customers globally. The company deals with selling and buying of hardware components, which are basically operated from the head quarters. The company is intending to open a branch in Bangalore South. 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) Three departments (admin, finance, customer care)

c) Each department is required to be in different Vlans

d) Each department to have wireless network for the users

e) Host devices in the network are required to obtain IPV4 addresses 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, we as the young network engineer who has been hired, design and implement a network considering the above requirements.

Chapter 7:

REQUIREMENTS

1. Three departments – admin, finance, customer care.

2. One 2911 Router

3. One 2960-24TT Switch

4. Three PCs for each department

5. Three printers for each department

6. Three Wireless access points PT for each department

7. Three smartphones for each department

8. Three laptops for each department

9. Each departments configured with different VLANs

10. Cisco Packet Tracer tool which provides a network simulation to practice networks.

Chapter 8:

METHODOLOGY

Model:
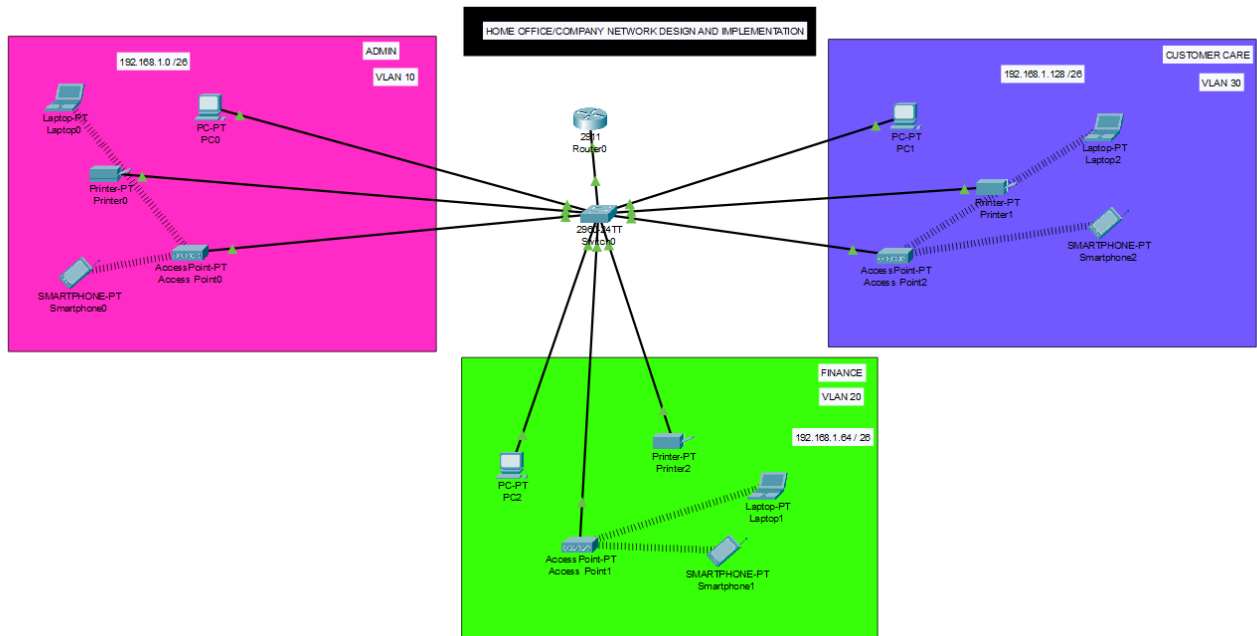
Fig 8.1 – Complete Network Model

IP addresses and Subnetting:

IP stands for "Internet Protocol," which is the set of rules governing the format of data sent via the internet or local network. In essence, IP addresses are the identifier that allows information to be sent between devices on a network: they contain location information and make devices accessible for communication. There are two different versions of IP in operation today: IP version 4 (IPv4), and IP version 6 (IPv6). IPv4 has for long been the dominating, but during the last decade, IPv6 is being increasingly deployed. Internet can be considered to be a network of networks. Some networks are big, others are smaller and the ones closest to the edges of the Internet are the smallest (e.g., home office network).

An IPv4 address is a 32-bit binary number that is normally presented as four 8-bit numbers with dots in between, e.g., 130.238.1.1, 192.168.0.1, 127.0.0.1 etc.

Historically, there were five different classes of IP addresses for networks of different

sizes. However, as the Internet grew, these classes were not enough to meet the demand for new networks on the Internet. Therefore, they were abandoned and classless inter-domain routing(CIDR) was introduced.

An IPv4 address is divided into two parts:

1. Network identifier
2. Host identifier

Specifying the network part of an IP address is commonly done by using either subnet mask or a prefix length .A subnetwork mask is a binary number that gives the network identifier of an IP address by performing a bitwise AND between the IP address and the network mask. It is specified in a format that resembles of an IP address, i.e., 4 byte values separated by dots. A netmask that would identify the UU network would be 255.255.0.0 while a netmask that would identify SUBNET would be 255.0.0.0.

Class name	Range	Subnet mask	CIDR notation
Class A	0-127	255.0.0.0	/8
Class B	128-191	255.255.0.0	/16
Class C	192-223	255.255.255.0	/24
Class D	224-239	Multicast	-
Class E	240-255	Research &development	-

Fig 8.2 – Classes and Subnets Table

The address 255.255.255.255 is used to broadcast a packet to all other computers on the same network

Routing is the process of building a "map" of the network and how different parts of it are connected. This map is represented in a routing table that specifies how packets should be sent through the network. This is usually formulated by a list of rules that use the destination P of a packet to decide which rule that should be applied.

In order to be able to communicate using TCP/IP, a computer needs to know:

Its IP address

Its network prefix (often specified as a netmask)

The IP of the default router

This is needed to be able to build IP packets and send them into the network for best-effort forwarding to the destination.

Server is basically a dedicated computer that provides services on behalf of clients such as ordinary desktop computers. It is a centralized machine where multiple clients connect to either over the internet or in a LAN and they connect to a server for s specific service. In addition to these, a fourth configuration parameter that is commonly used is the default DNS server, which is used for IP address translation (described in the next section).

Configuration can be done manually, or by obtaining the configuration from an address server, e.g. a DHCP server

Dynamic Host Configuration Protocol (DHCP) is the most commonly used protocol for automatic host configuration. When a computer starts up, it sends out a broadcast message to all computers on the same network, asking for a configuration.

In this virtual network design,

The basic network is: 192.168.1.0

No. of subnets: 3 (as there are three departments)

Formula to calculate number of subnets is: 2^n

$2^n=3$

n=2 (number of borrowed bits)

For class C IP address the subnet mask is : 255.255.255.0

Class C IP address binary representation: 11111111.11111111.11111111.00000000

After borrowing two bits from the host id the subnet mask is : 255.255.255.192

Binary representation after borrowing two bits from the host id:
11111111.11111111.11111111.11000000

Block size=64

Admin department: 1st subnet

Network id – 192.168.1.0

Broadcast id – 192.168.1.63

Host range – 192.168.1.1 – 192.168.1.62

Subnet mask – 192.168.1.0/26

Finance department: 2nd subnet

Network id – 192.168.1.64

Broadcast id – 192.168.1.127

Host range – 192.168.1.65 – 192.168.1.126

Subnet mask – 192.168.1.64/26

Customer care department: 3rd subnet

Network id – 192.168.1.128

Broadcast id – 192.168.1.191

Host range – 192.168.1.129 – 192.168.1.190
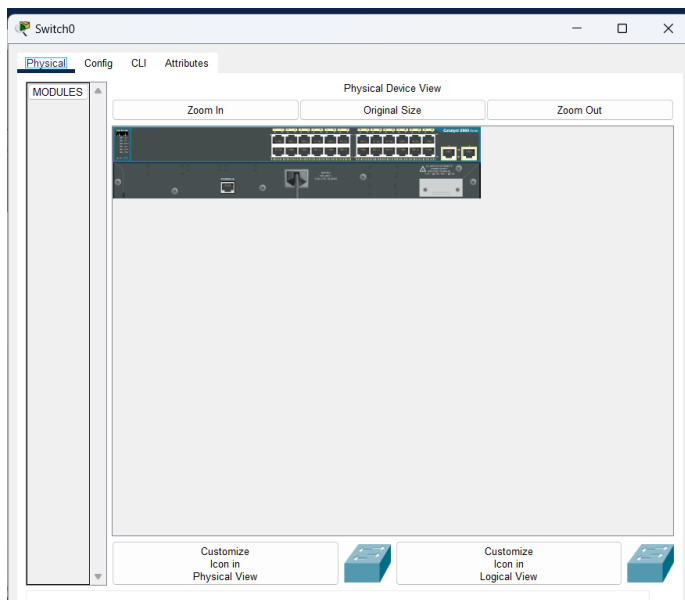
Subnet mask – 192.168.1.0/26

Switch and Router:
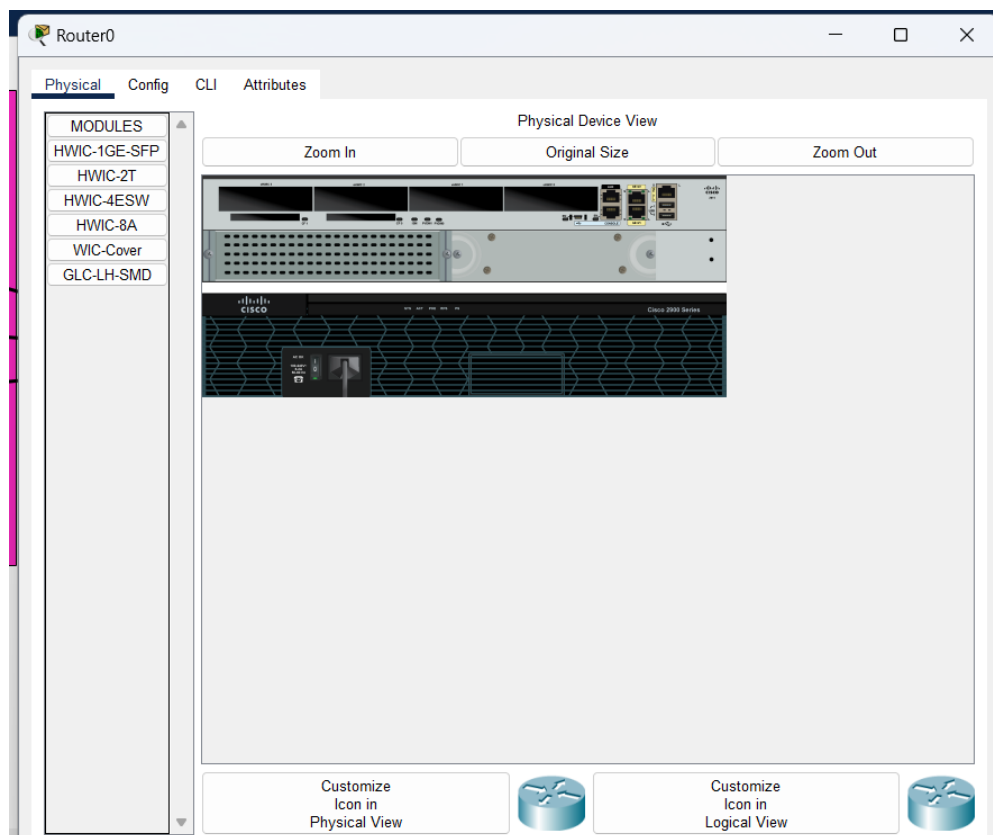

Fig 8.3 – Switch Physical View
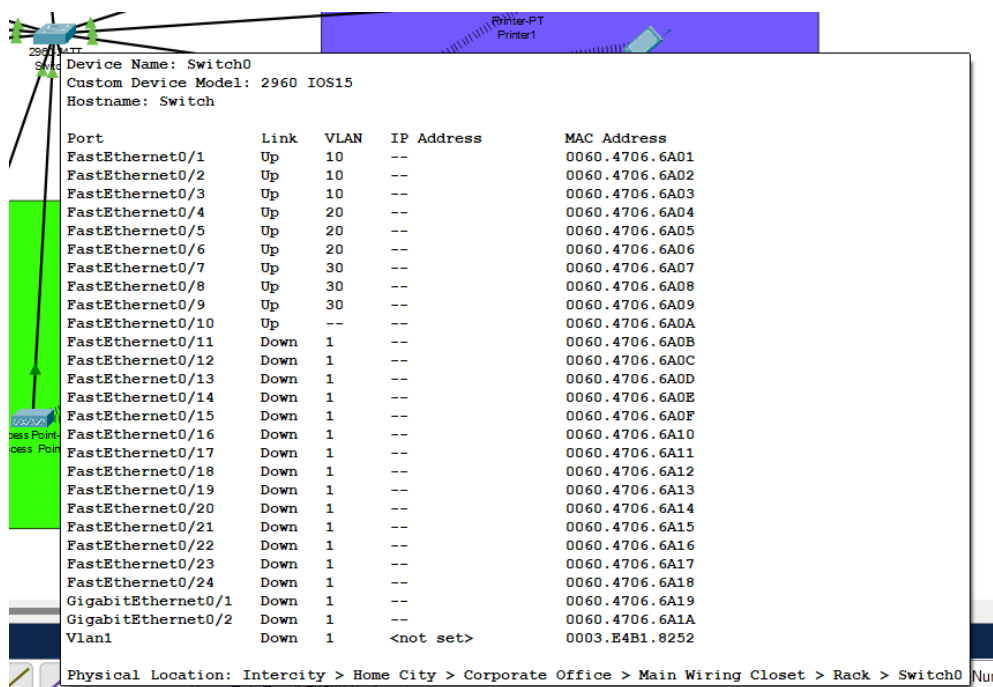
Fig 8.4 – Router Physical View

Device Name: Switch0
Custom Device Model: 2960 IOS15
Hostname: Switch

Port	Link	VLAN	IP Address	MAC Address
FastEthernet0/1	Up	10	--	0060.4706.6A01
FastEthernet0/2	Up	10	--	0060.4706.6A02
FastEthernet0/3	Up	10	--	0060.4706.6A03
FastEthernet0/4	Up	20	--	0060.4706.6A04
FastEthernet0/5	Up	20	--	0060.4706.6A05
FastEthernet0/6	Up	20	--	0060.4706.6A06
FastEthernet0/7	Up	30	--	0060.4706.6A07
FastEthernet0/8	Up	30	--	0060.4706.6A08
FastEthernet0/9	Up	30	--	0060.4706.6A09
FastEthernet0/10	Up	--	--	0060.4706.6A0A
FastEthernet0/11	Down	1	--	0060.4706.6A0B
FastEthernet0/12	Down	1	--	0060.4706.6A0C
FastEthernet0/13	Down	1	--	0060.4706.6A0D
FastEthernet0/14	Down	1	--	0060.4706.6A0E
FastEthernet0/15	Down	1	--	0060.4706.6A0F
FastEthernet0/16	Down	1	--	0060.4706.6A10
FastEthernet0/17	Down	1	--	0060.4706.6A11
FastEthernet0/18	Down	1	--	0060.4706.6A12
FastEthernet0/19	Down	1	--	0060.4706.6A13
FastEthernet0/20	Down	1	--	0060.4706.6A14
FastEthernet0/21	Down	1	--	0060.4706.6A15
FastEthernet0/22	Down	1	--	0060.4706.6A16
FastEthernet0/23	Down	1	--	0060.4706.6A17
FastEthernet0/24	Down	1	--	0060.4706.6A18
GigabitEthernet0/1	Down	1	--	0060.4706.6A19
GigabitEthernet0/2	Down	1	--	0060.4706.6A1A
Vlan1	Down	1	<not set>	0003.E4B1.8252

Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > Switch0

Fig 8.5 –Ports in Switch

```
Device Name: Router0
Device Model: 2911
Hostname: Router

Port                   Link   VLAN   IP Address        IPv6 Address                    MAC Address
GigabitEthernet0/0     Up     --     <not set>         <not set>                       0060.2FAC.6801
GigabitEthernet0/0.10  Up     --     192.168.1.1/26    <not set>                       0060.2FAC.6801
GigabitEthernet0/0.20  Up     --     192.168.1.65/26   <not set>                       0060.2FAC.6801
GigabitEthernet0/0.30  Up     --     192.168.1.129/26  <not set>                       0060.2FAC.6801
GigabitEthernet0/1     Down   --     <not set>         <not set>                       0060.2FAC.6802
GigabitEthernet0/2     Down   --     <not set>         <not set>                       0060.2FAC.6803
Vlan1                  Down   1      <not set>         <not set>                       00D0.D306.0499

Physical Location: Intercity > Home City > Corporate Office > Main Wiring Closet > Rack > Router0
```

Fig 8.6- Ports in Router

Switch configuration-

Block 1: Admin Department

Switch> en

Switch#config

Switch(config)#

Switch(config)# int range fa0/1-3

Switch(config-if-range)#switchport mode access

Switch(config-if-range)#switchport access vlan10

Creating vlan 10

Switch(config-if-range)#do wr

Building configuration…

[OK]

Block 2: Finance department

Switch(config)# int range fa0/4-6

Switch(config-if-range)#switchport mode access

Switch(config-if-range)#switchport access vlan20

Creating vlan 20

Switch(config-if-range)#do wr

Building configuration…

[OK]

Block 3: Customer Care

Switch(config)# int range fa0/7-9

Switch(config-if-range)#switchport mode access

Switch(config-if-range)#switchport access vlan30

Creating vlan 30

Switch(config-if-range)#do wr

Building configuration…

[OK]

Switch to router configuration:

Switch(config)# int fa0/10

Switch(config-if)#stwitchport mode trunk

Switch(config-if)# do wr

Building configuration…

[OK]

```
Switch>
Switch>
Switch>en
Switch#config
Configuring from terminal, memory, or network [terminal]?
Enter configuration commands, one per line.  End with CNTL/Z.
Switch(config)#int range fa0/1-3
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)#
Switch(config-if-range)#do wr
Building configuration...
[OK]
Switch(config-if-range)#
Switch(config-if-range)#
```

Fig 8.7 – Creating VLAN 10

```
Switch(config-if-range)#switchport access vlan 10
Switch(config-if-range)#
Switch(config-if-range)#
Switch(config-if-range)#do wr
Building configuration...
[OK]
Switch(config-if-range)#
Switch(config-if-range)#
Switch(config-if-range)#
Switch(config-if-range)#int range fa0/4-6
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 20
% Access VLAN does not exist. Creating vlan 20
Switch(config-if-range)#
Switch(config-if-range)#do wr
Building configuration...
[OK]
Switch(config-if-range)#
Switch(config-if-range)#int range fa0/7-9
Switch(config-if-range)#switchport mode access
Switch(config-if-range)#switchport access vlan 30
% Access VLAN does not exist. Creating vlan 30
Switch(config-if-range)#
Switch(config-if-range)#do wr
Building configuration...
[OK]
Switch(config-if-range)#
Switch(config-if-range)#
Switch(config-if-range)#
```

Fig 8.8- Creating VLAN 20 and VLAN30

Access Point PT:

An access point (AP) is a term used for a network device that bridges wired and wireless networks. Consumer APs are often called a "wireless routers" because they typically also serve as both internet routers and firewalls.

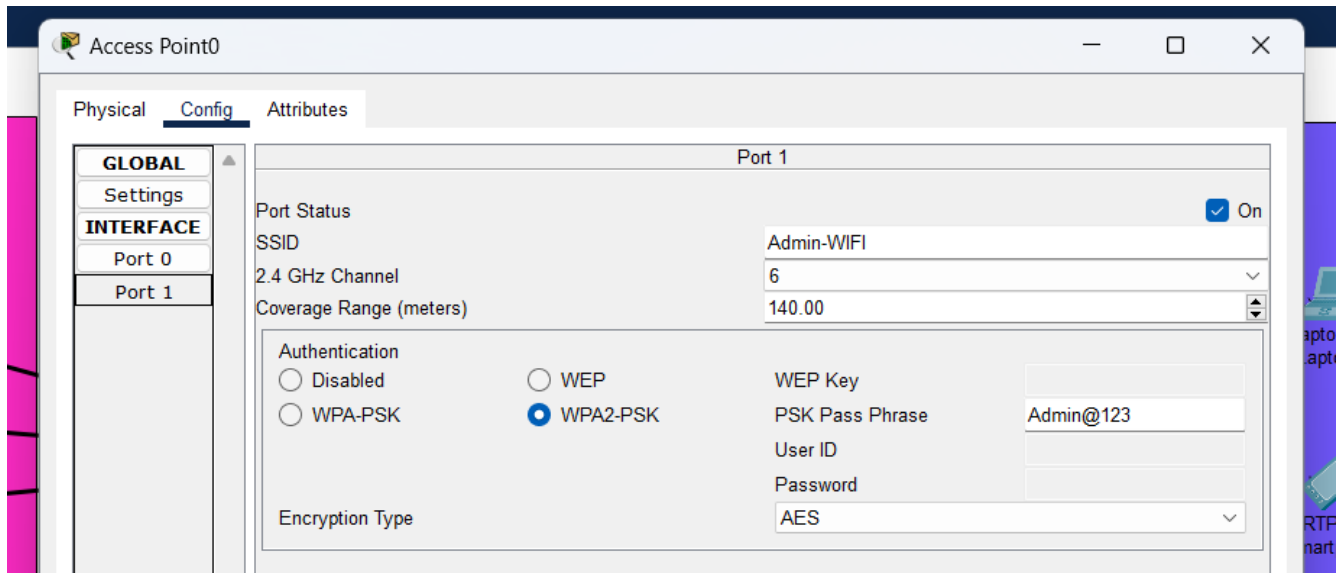**Fig 8.9 – Access Point Physical View**

Block 1: Admin department

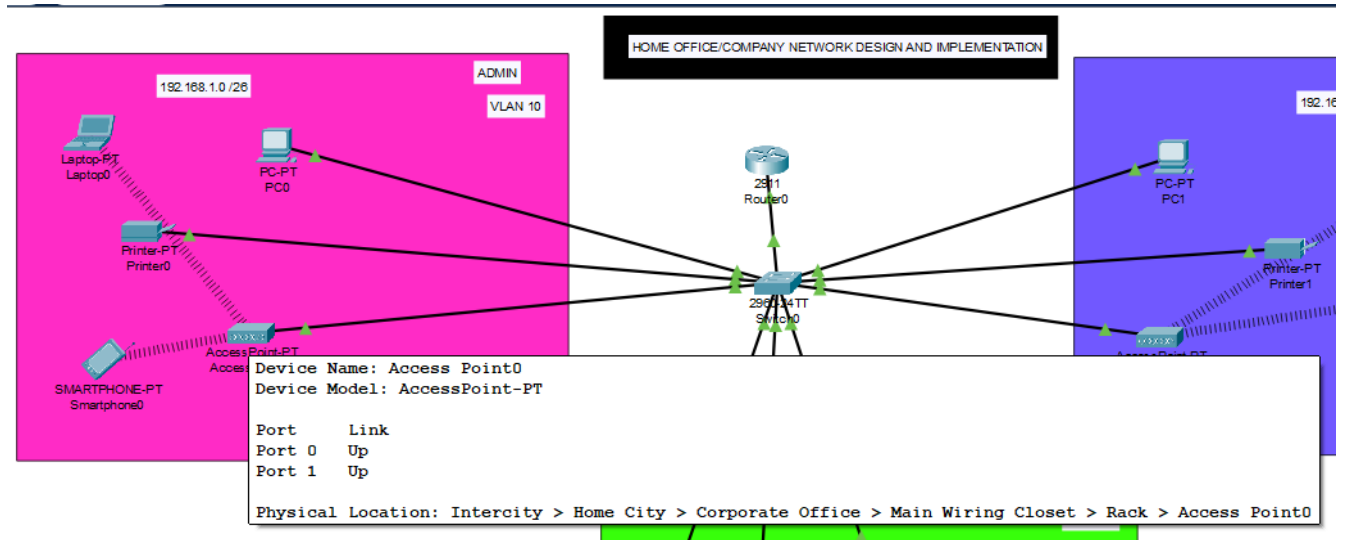

Fig 8.10 – Admin Department access point Configuration

Fig 8.11 – Port Status of Access Point 0

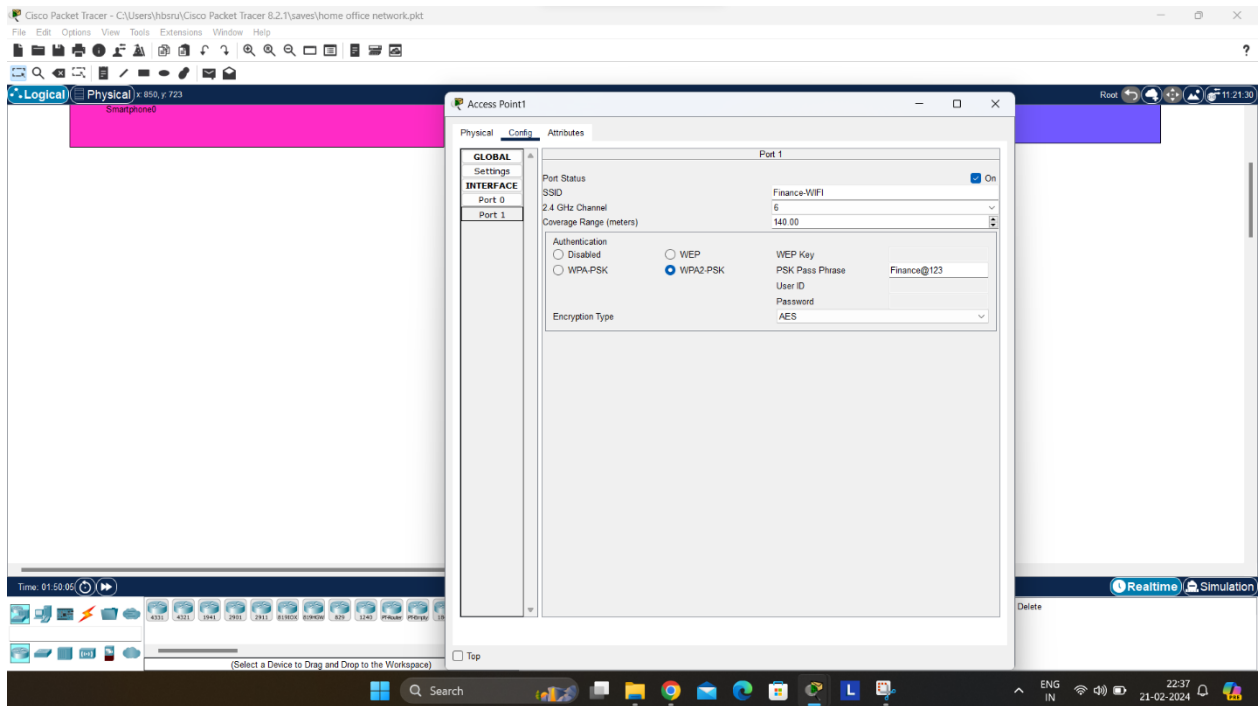## Block 2: Finance department

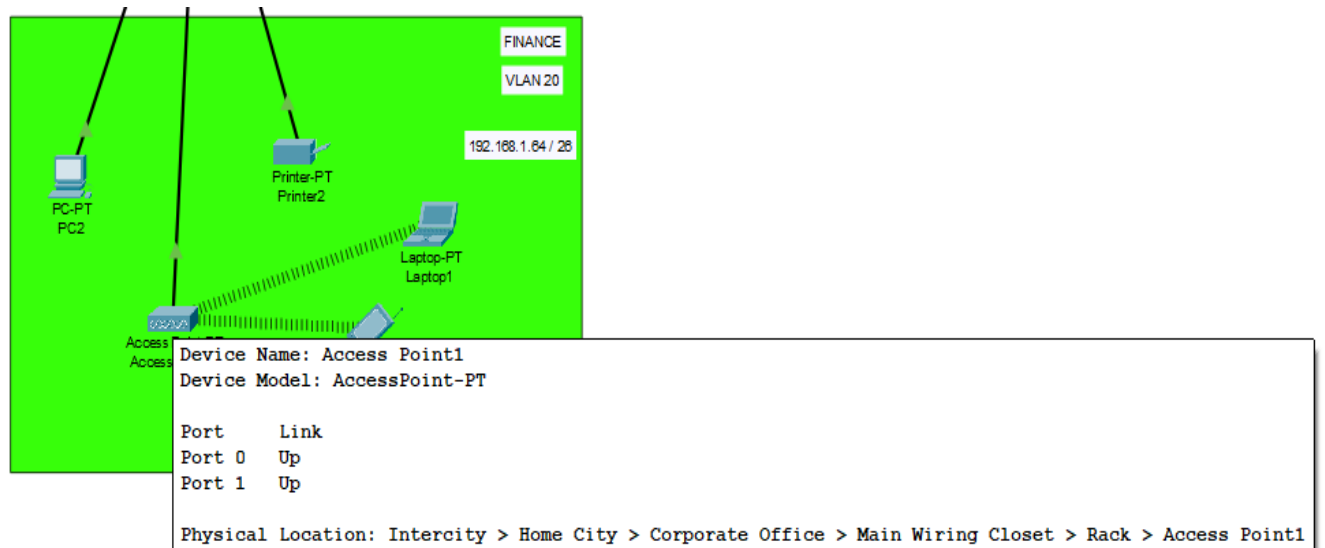**Fig 8.12 – Finance Department access point Configuration**

Fig 8.13 – Port Status of Access Point 1
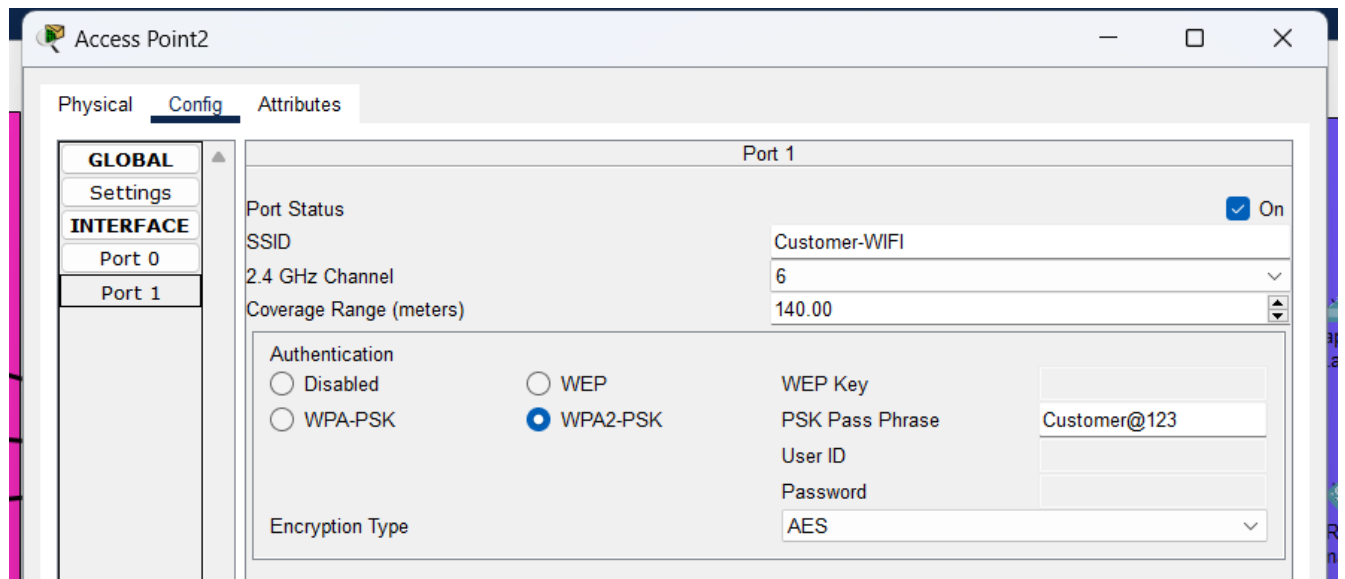
Block 3: Customer care

Fig 8.14 – Customer Care Department access point Configuration
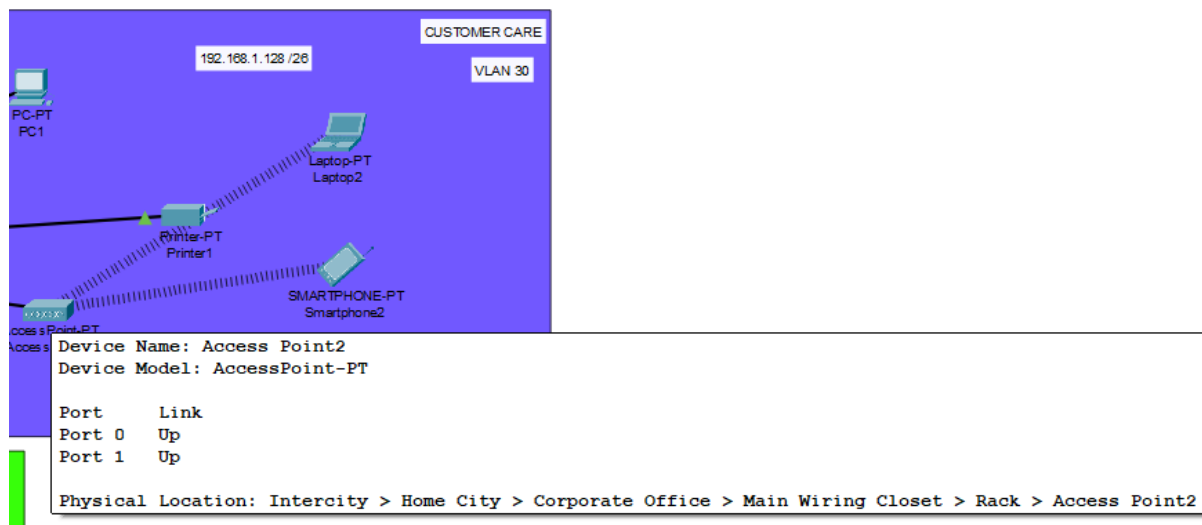

Fig 8.15 – Port Status of Access Point 2

Router configuration:

Router> en

Router#config t

Router(config)# int gig0/0

Router(config-if)# no shut
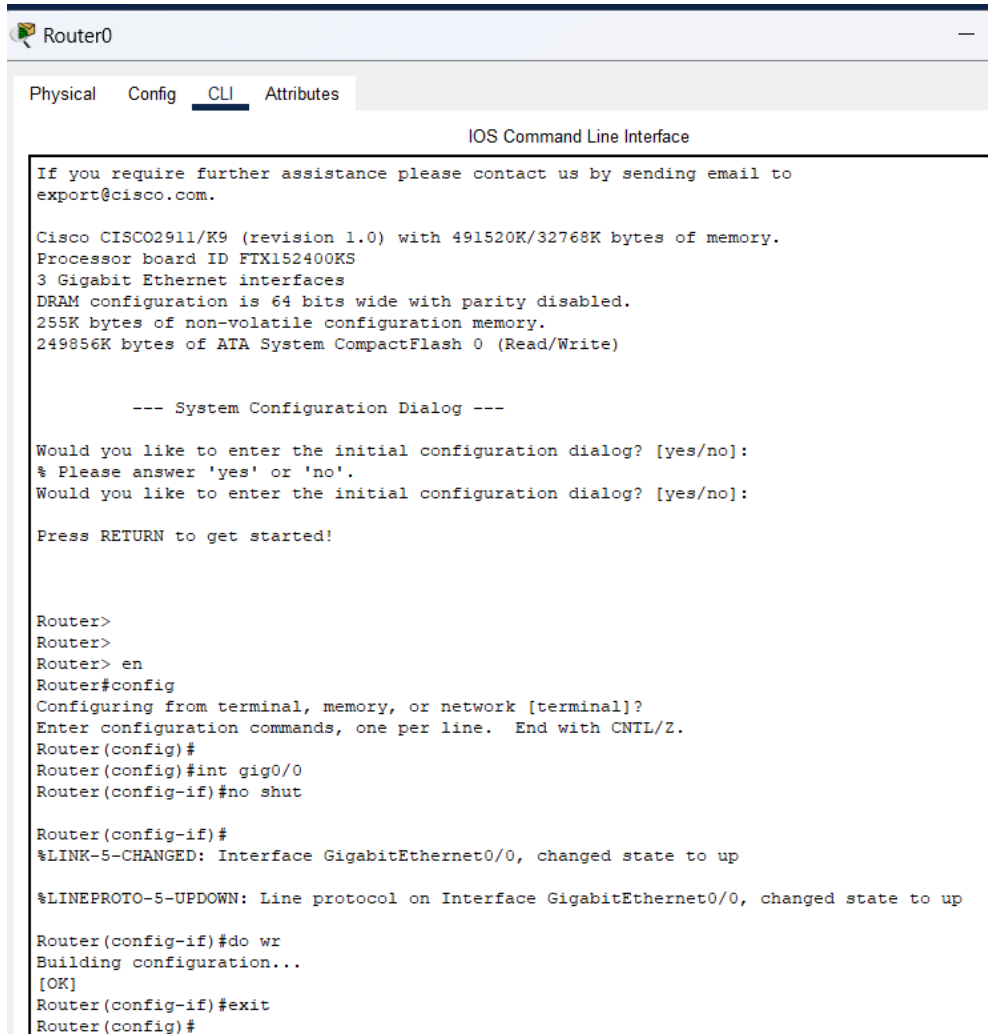
Interface gigabit ethernet 0/0, changed state to up

Router(config-if)# do wr

Building configuration…..

[OK]

Router(config-if)#exit

```
Router0                                                                    —

Physical   Config   CLI   Attributes
                           IOS Command Line Interface

If you require further assistance please contact us by sending email to
export@cisco.com.

Cisco CISCO2911/K9 (revision 1.0) with 491520K/32768K bytes of memory.
Processor board ID FTX152400KS
3 Gigabit Ethernet interfaces
DRAM configuration is 64 bits wide with parity disabled.
255K bytes of non-volatile configuration memory.
249856K bytes of ATA System CompactFlash 0 (Read/Write)


        --- System Configuration Dialog ---

Would you like to enter the initial configuration dialog? [yes/no]:
% Please answer 'yes' or 'no'.
Would you like to enter the initial configuration dialog? [yes/no]:

Press RETURN to get started!



Router>
Router>
Router> en
Router#config
Configuring from terminal, memory, or network [terminal]?
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)#
Router(config)#int gig0/0
Router(config-if)#no shut

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

Router(config-if)#do wr
Building configuration...
[OK]
Router(config-if)#exit
Router(config)#
```

Fig 8.16 – Router to Switch Configuration

Block 1: Admin department

Router(config-if)# int gig0/0.10

Router(config-subif)#encapsulation dot1Q 10

Router(config-subif)# ip address 192.168.1.1 255.255.255.192

```
Building configuration...
 [OK]
Router(config-subif)#exit
Router(config)#int gig0/0.10
Router(config-subif)#encapsulation dot1Q 10
Router(config-subif)#ip address 192.168.1.1 255.255.255.192
Router(config-subif)#exit
```

Fig 8.17 - Router to Admin department configuration

Block 2: Finance department

Router(config-if)# int gig0/0.20

Router(config-subif)#encapsulation dot1Q 20

Router(config-subif)# ip address 192.168.1.65 255.255.255.192

```
Router(config-subif)#exit
Router(config)#int gig0/0.20
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
```

Fig 8.18 – Router to Finance department configuration

Block 3: Customer care department

Router(config-if)# int gig0/0.30

Router(config-subif)#encapsulation dot1Q 30

Router(config-subif)# ip address 192.168.1.129 255.255.255.192

Router(config-subif)#do wr

Router(config-subif)#exit

```
Router(config)#int gig0/0.30
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)#
```

Fig 8.19 – Router to Customer Care department configuration

DHCP configuration:

Block 1: Admin department

Router(config)# service dhcp

Router(config)# ip dhcp pool1 Admin-pool

Router(config)#network 192.168.1.0 255.255.255.192

Router(config)#default- router 192.168.1.1

Router(config)#dns -server 192.168.1.1

Router(config)#domain-name Admin.com

Router(config)#exit
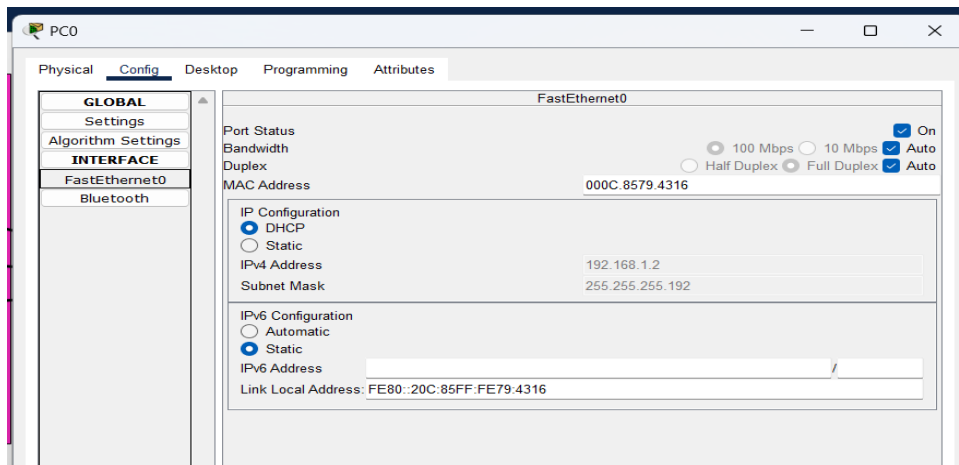

Fig 8.20 – DHCP Configuration in Admin Block

Block 2: Finance department

Router(config)# service dhcp

Router(config)# ip dhcp pool Finance-pool

Router(config)#network 192.168.1.64 255.255.255.192

Router(config)#default- router 192.168.1.65

Router(config)#dns -server 192.168.1.1

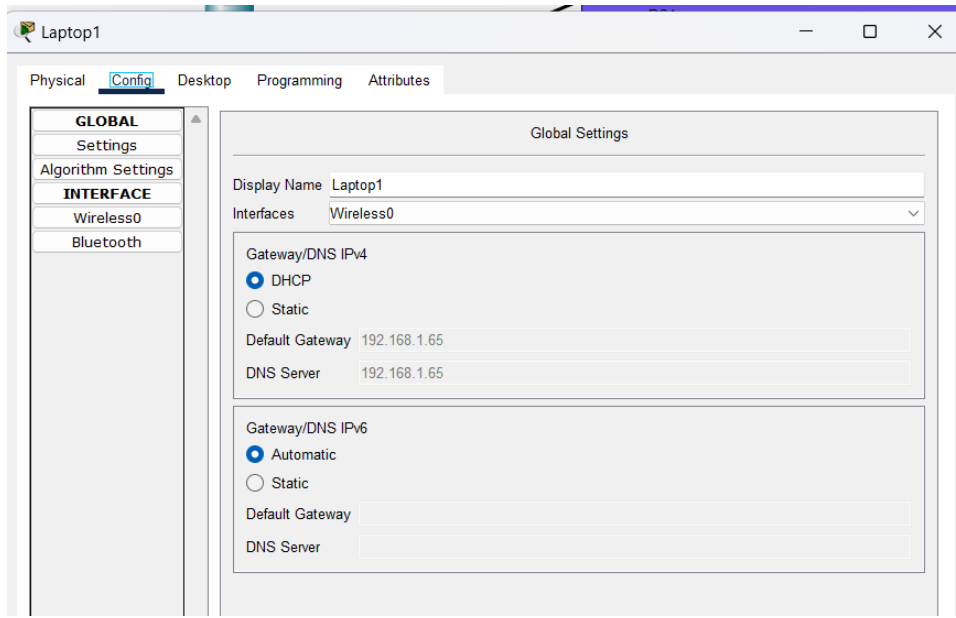Router(config)#domain-name Finance.com

Router(config)#exit

Fig 8.21 – DHCP Configuration in Finance Block

Block 3: Customer care department

Router(config)# service dhcp

Router(config)# ip dhcp pool Customer-pool

Router(config)#network 192.168.1.128 255.255.255.192

Router(config)#default- router 192.168.1.129

Router(config)#dns -server 192.168.1.1

Router(config)#domain-name Customer.com

Router(config)#exit

Router(config)#do wr
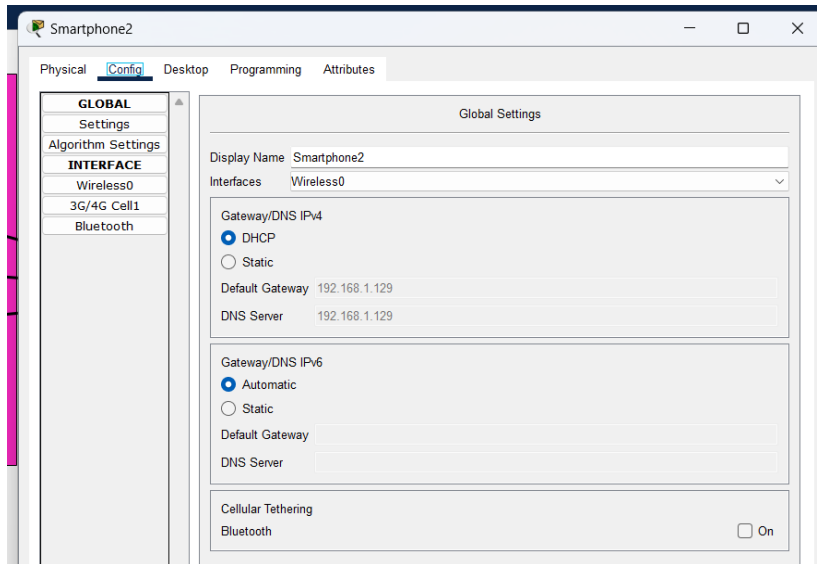
Building configuration…

[OK]

Fig 8.22 – DHCP Configuration in Customer Care Department

```
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)#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
Router(dhcp-config)#dns-server 192.168.1.65
Router(dhcp-config)#domain-name Finance.com
Router(dhcp-config)#exit
Router(config)#ip dhcp pool customer-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 Customer.com
Router(dhcp-config)#exit
Router(config)#
```

Fig 8.23 – DHCP Enabling Commands

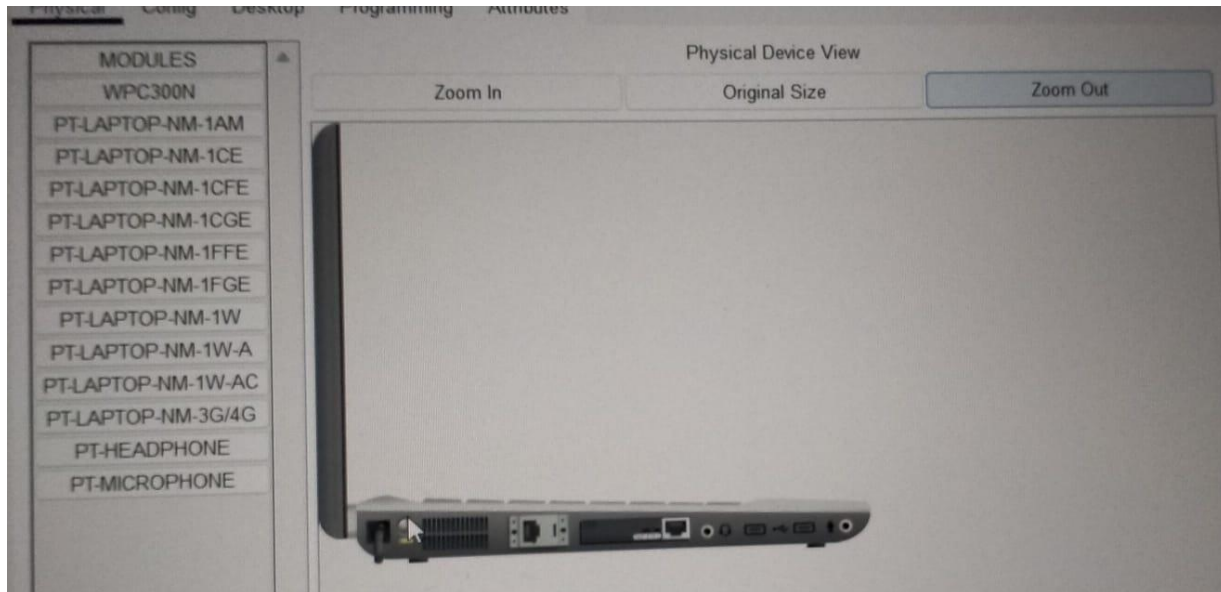## Laptop Wireless Connection:

Block 1:

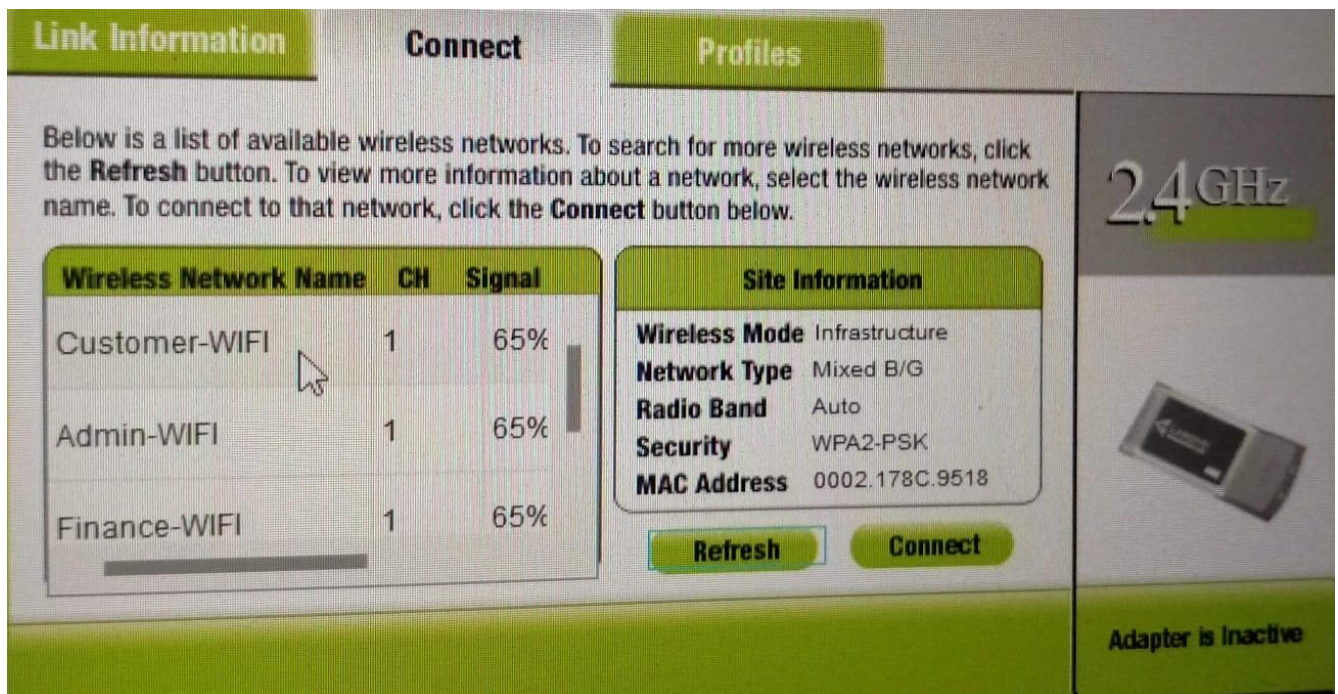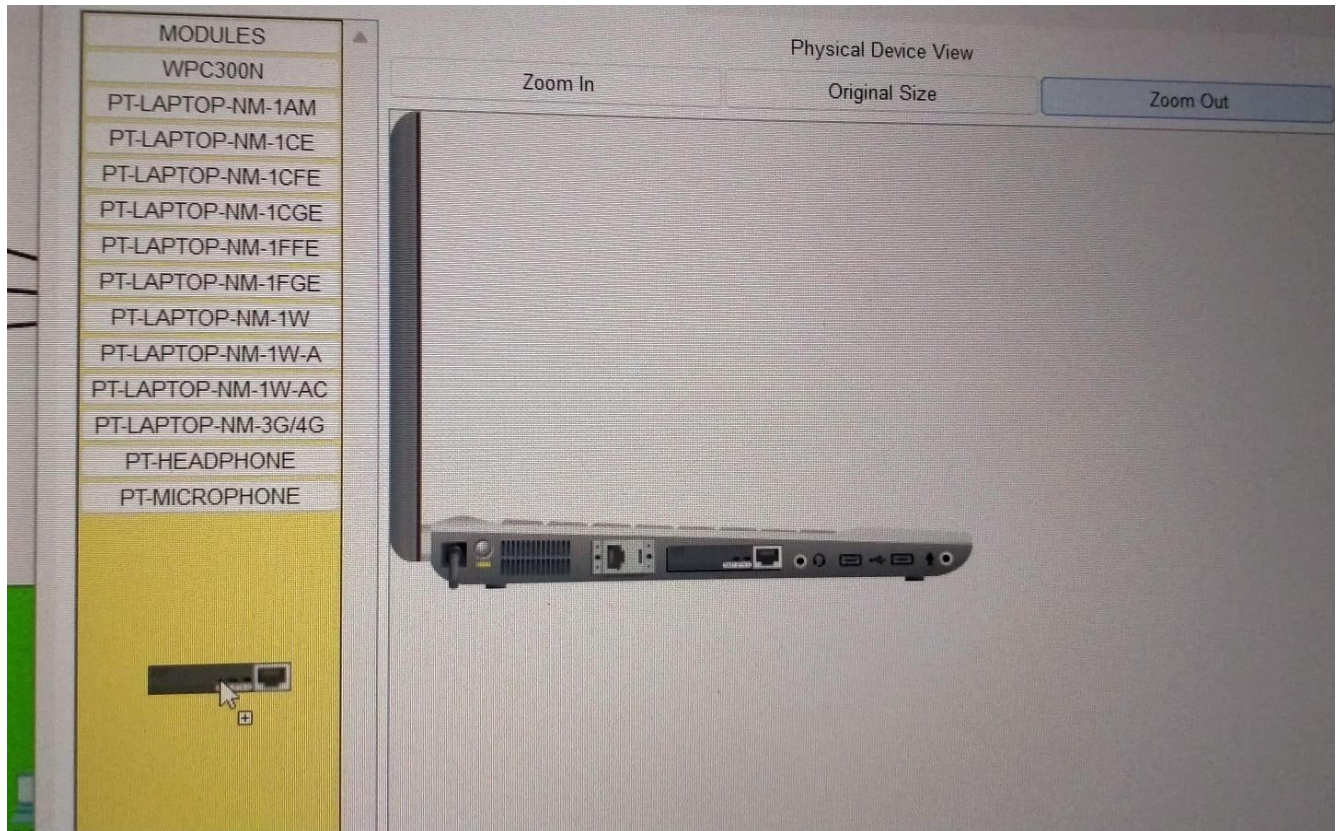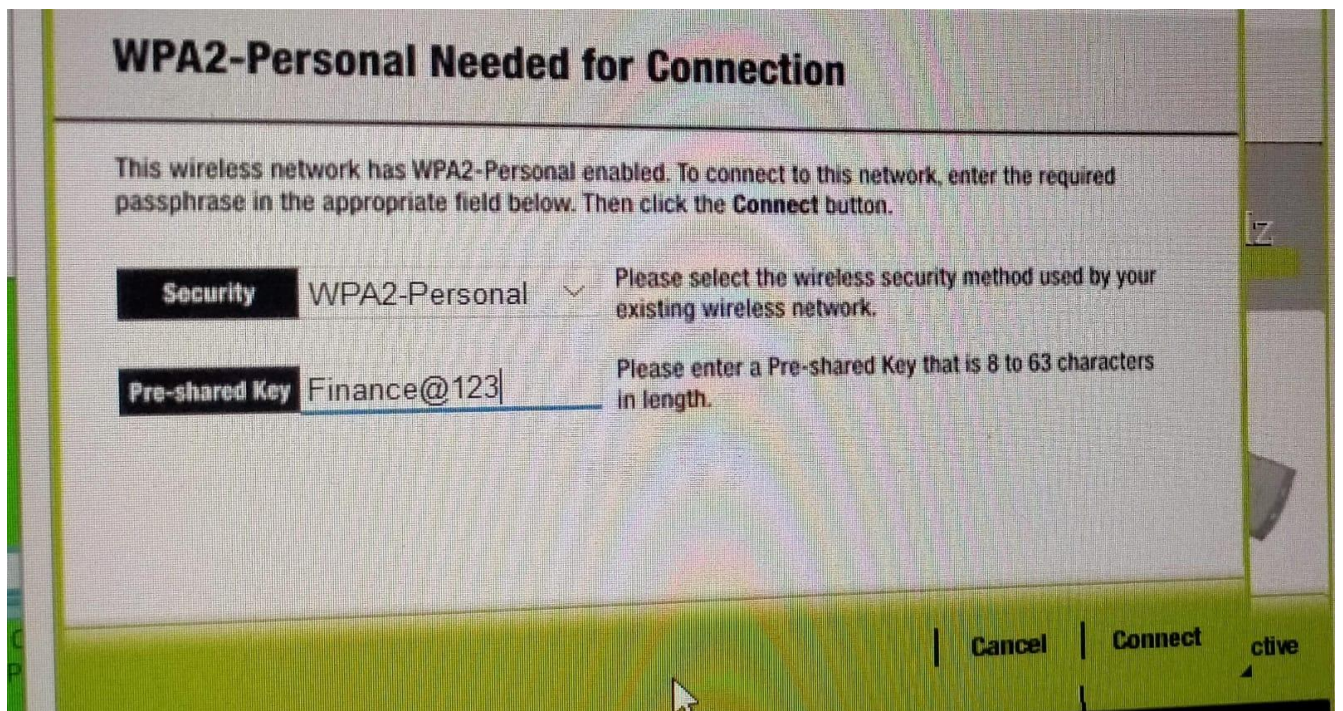**Fig 8.24 –Laptop Module insertion in Block 1**

Fig 8.25 –Wi-Fi Connection in Block 1

Block 2:

Fig 8.26 - Laptop Module insertion in Block 2

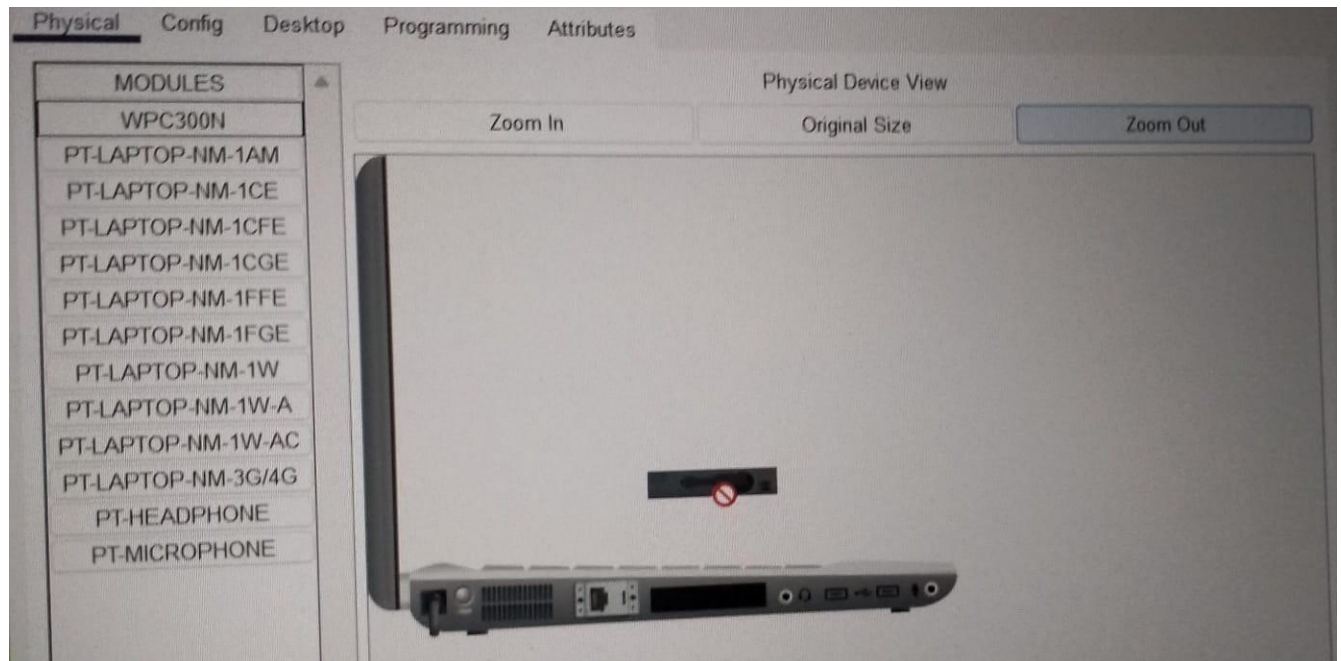

Fig 8.27 - Wi-Fi Connection in Block 2

Block 3:

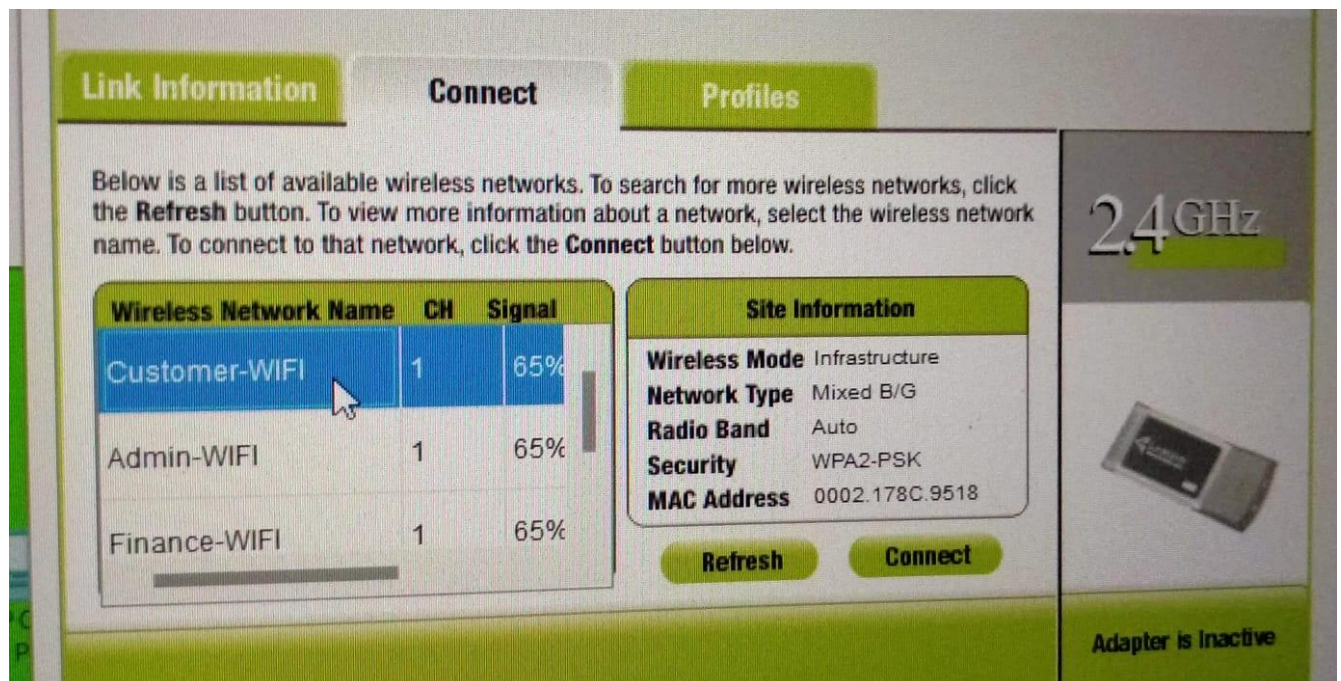

Fig 8.28 - Laptop Module insertion in Block 3

Fig 8.29 - Wi-Fi Connection in Block 3
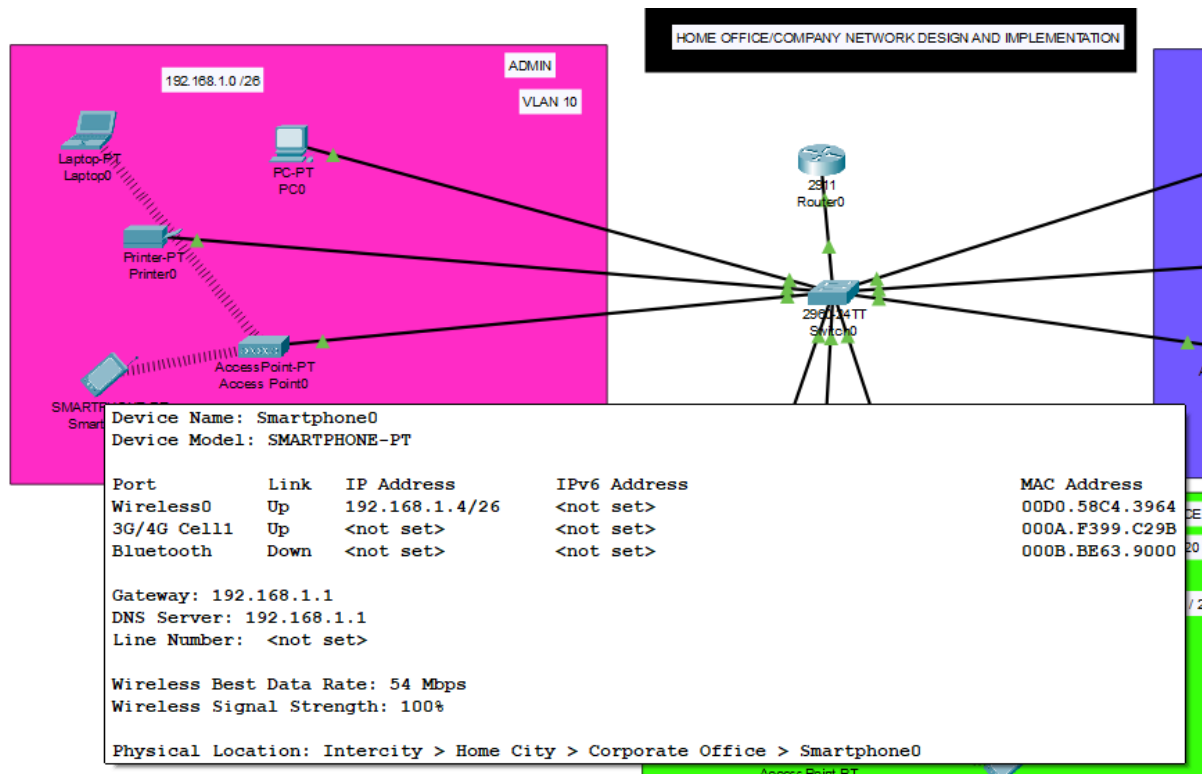
Smartphone Wireless Connection:

Block 1:

HOME OFFICE/COMPANY NETWORK DESIGN AND IMPLEMENTATION

192.168.1.0 /26

ADMIN
VLAN 10

Laptop-PT
Laptop0

PC-PT
PC0

2911
Router0

Printer-PT
Printer0

2960-24TT
Switch0

AccessPoint-PT
Access Point0

```
Device Name: Smartphone0
Device Model: SMARTPHONE-PT

Port          Link    IP Address          IPv6 Address            MAC Address
Wireless0     Up      192.168.1.4/26      <not set>               00D0.58C4.3964
3G/4G Cell1   Up      <not set>           <not set>               000A.F399.C29B
Bluetooth     Down    <not set>           <not set>               000B.BE63.9000

Gateway: 192.168.1.1
DNS Server: 192.168.1.1
Line Number:   <not set>

Wireless Best Data Rate: 54 Mbps
Wireless Signal Strength: 100%

Physical Location: Intercity > Home City > Corporate Office > Smartphone0
```

Access Point-PT

Fig 8.30 – Configuration Overview of Smartphone0

Block 2:

FINANCE
VLAN 20

192.168.1.64 / 26

PC-PT
PC2

Printer-PT
Printer2

Laptop-PT
Laptop1

Access Point-PT
Access Point1

```
Device Name: Smartphone1
Device Model: SMARTPHONE-PT

Port          Link    IP Address          IPv6 Address            MAC Address
Wireless0     Up      192.168.1.69/26     <not set>               0002.1673.389E
3G/4G Cell1   Up      <not set>           <not set>               0003.E434.6C99
Bluetooth     Down    <not set>           <not set>               00E0.A33B.A87E

Gateway: 192.168.1.65
DNS Server: 192.168.1.65
Line Number:  <not set>

Wireless Best Data Rate: 54 Mbps
Wireless Signal Strength: 100%

Physical Location: Intercity > Home City > Corporate Office > Smartphone1
```

Fig 8.31 - Configuration Overview of Smartphone1

Block 3:


```
Device Name: Smartphone2
Device Model: SMARTPHONE-PT

Port          Link   IP Address         IPv6 Address                    MAC Address
Wireless0     Up     192.168.1.133/26   <not set>                       0003.E4D3.6C72
3G/4G Cell1   Up     <not set>          <not set>                       00E0.F930.C9B9
Bluetooth     Down   <not set>          <not set>                       0090.2B21.E87E

Gateway: 192.168.1.129
DNS Server: 192.168.1.129
Line Number:  <not set>

Wireless Best Data Rate: 54 Mbps
Wireless Signal Strength: 88%

Physical Location: Intercity > Home City > Corporate Office > Smartphone2
```

Fig 8.32 -Configuration Overview of Smartphone2

Chapter 9:

RESULT

Fig 9.1 – Devices Pinging to each other

APPLICATIONS

1. Resource Sharing

   Resource sharing is an application of a computer network. Resource sharing means you can share one Hardware and Software among multiple users. Hardware includes printers, Disks, Fax Machines, etc. Computing devices. And Software includes Atom, Oracle VM Virtual Box, Postman, Android Studio, etc.

2. Information Sharing

Using a Computer network, we can share Information over the network, and it provides Search capabilities such as WWW. Over the network, a single information can be shared among the many users over the internet.

3. Communication

Communication includes email, calls, message broadcast, electronic funds transfer system etc.

4. Entertainment Industry

In Entertainment industry also uses computer networks widely. Some of the Entertainment industries are Video on demand, Multiperson real-time simulation games, movie/TV programs, etc.

5. Access to Remote Databases

Computer networks allow us to access the Remote Database of the various applications by the end-users. Some applications are Reservation for Hotels, Airplane Booking, Home Banking, Automated Newspaper, Automated Library etc.

6. Home applications

There are many common uses of the computer network are as home applications. For example, you can consider user-to-user communication, access to remote instruction, electronic commerce, and entertainment. Another way is managing bank accounts, transferring money to some other banks, paying bills electronically. A computer network arranges a robust connection mechanism between users.

7. Business applications

The result of business application here is resource sharing. And the purpose of resource sharing is that without moving to the physical location of the resource, all the data, plans, and tools can be shared to any network user. Most of the companies are doing business electronically with other companies and with other clients worldwide with the help of a computer network.

8. Mobile users

The rapidly growing sectors in computer applications are mobile devices like notebook computers and PDAs (personal digital assistants). Here mobile users/device means portable device. The computer network is widely used in new-age technology like smartwatches, wearable devices, tablets, online transactions, purchasing or selling products online, etc.

9. Social media

Social media is also a great example of a computer network application. It helps people to share and receive any information related to political, ethical, and social issues

ADVANTAGES

A network is very useful for connection and communication purposes. Not just that, it also has many other advantages. Below are some of the prominent ones:

1. Ease of accessibility

Computer networks provide easy accessibility to resources, information, and online services from anywhere. Users can work remotely, access educational resources, and retrieve personal files. Communication and collaboration are seamless through email, instant messaging, and video conferencing. Resources can be shared and distributed, reducing costs and enabling efficient utilization. Modern computer networks are easy to explore. So, even if you are a kid or a person new to technology, you'll find it easy to connect.

2. Flexibility

Here, flexibility means that different people will be able to explore different things as per their requirements. For this purpose, computer networks provide you with a wide array of choices to share a particular piece of information. For example, e-mail or messaging apps like WhatsApp.

3. Convenient resource sharing

The main aim of a computer network is to enable sharing of resources among its users. You can use resources such as printers, scanners and photocopy machines that can be shared across multiple users. This resource sharing is important for big companies as they can use one single common network to connect with their employees.

4.Connectivity

Computer networks improve connectivity irrespective of a person's location. The pandemic brought this advantage to the forefront, with people regularly using video call apps like Zoom or Google Documents to connect with their friends and colleagues.

5. Security

Computer networks provide security through authorization. Authorization is done via user ID and password. So, it ensures that when we log in, we are only able to do it when there is a perfect match between our details and the details stored in the database.

6. Great storage capacity

Organizations have an abundance of data that needs to be stored. For that purpose, they are required to store them in a central server. A central server is a remote server that is accessible to every employee. So, if in case one loses the data, others have it.

7. Reduced cost

Cost is one of the crucial factors that one needs to consider while evaluating the pros and cons of a particular technology. In networking, a central server is used that enables companies to store files in one place, thus reducing file storage expenses.

8. Enhanced Collaboration

With a computer network, individuals can easily share files, documents, and information with each other, making it easier to work together on projects and tasks. This can lead to increased productivity and efficiency in the workplace. Additionally, computer networks often include communication tools such as email and instant messaging, allowing for real-time communication and collaboration regardless of physical location. Overall, computer networks facilitate seamless collaboration and teamwork.

DISADVANTAGES

While computer networks aid our work, they also come with their own set of disadvantages such as:

1. Lack of robustness

Computer networks rely on the main server called the central server. If the central server malfunctions or there is an issue in the central server, then the entire network will stop functioning. So, this is a major disadvantage due to dependency on a single server.

2. Spread of computer virus

As computers in a network are interconnected, there is a high probability that if one of the computers is affected by the virus, others too can get affected. This spread can actually damage the entire system. Also, if the central server gets corrupted, then it's quite dangerous as the network depends on the central server.

3. Costly to set-up and maintain

While computer networks save costs in terms of resource sharing and data storage, they also incur considerable implementation costs. Moreover, maintaining computer networks is a costly and time-consuming affair.

4. Lack of productivity

Since a network has a lot of advantages and applications, it certainly results in the simultaneous use of many services that cause distraction. Thus, due to employees focusing on a myriad of tasks, productivity issues are quite common.

5. Health issues

Computer network provides access to a gamut of services including entertainment, gaming, and movies. These result in making you addicted to the content and thus result in overuse of these services. This excessive screen time makes you feel lethargic and causes eye strain and body pain.

6. Lowers the ability to retain and analyze information

With computer networks storing vast amounts of data and processing basic requests in a fraction of the time, people are losing the ability to retain important information. Even processing basic information is a task, as individuals are becoming increasingly dependent on computer networks to do these tasks for them.

7. Unauthorized access

When multiple devices are connected to a network, there is a greater potential for unauthorized access and data breaches. Hackers can exploit vulnerabilities in the network infrastructure or gain access to sensitive information through one compromised device. This can lead to the theft of personal or confidential data, financial loss, and damage to the reputation of individuals or organizations. To mitigate this risk, network administrators must implement robust security

measures, such as firewalls, encryption, and regular software updates, to protect the network and its connected devices from cyber threats.

FUTURE SCOPE:

With the future of networking, cybersecurity is becoming an increasingly important factor to take into consideration. Network engineers are required to be more knowledgeable than ever before which has lead to a greater demand for courses and qualifications within this particular field.

Networking in 2025 and Beyond. An increasingly hybrid workforce, multicloud adoption and more intelligent (and complex) networks have given rise to new network architectures. It's now critical for organizations to shift to a modern, cloud-based, software-defined and data-driven network infrastructure.

CONCLUSION:

Here we have successfully designed and implemented the small home office topology for three blocks with the minimum requirements. Everything that can be done in Cisco trainings were applied to this network simulation system. Finally, basic devices and protocols that were supposed to be in a network were used and as a result, it was seen that the network system was operated without any problem. We developed the basic small home office topology network. In this study, we show that anyone who wants to establish a topology, will do it using the methodology that we mentioned.

REFRENCES:

https://www.netacad.com/courses/packet-tracer

http://intersectindia.com/

http://quescol.com

https://unstop.com/