



Bahria University
Islamabad

Data Communication & Networking - Fall 2020

CEP Report

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Remarks:

Data Communication & Networking

CEP

Abstract

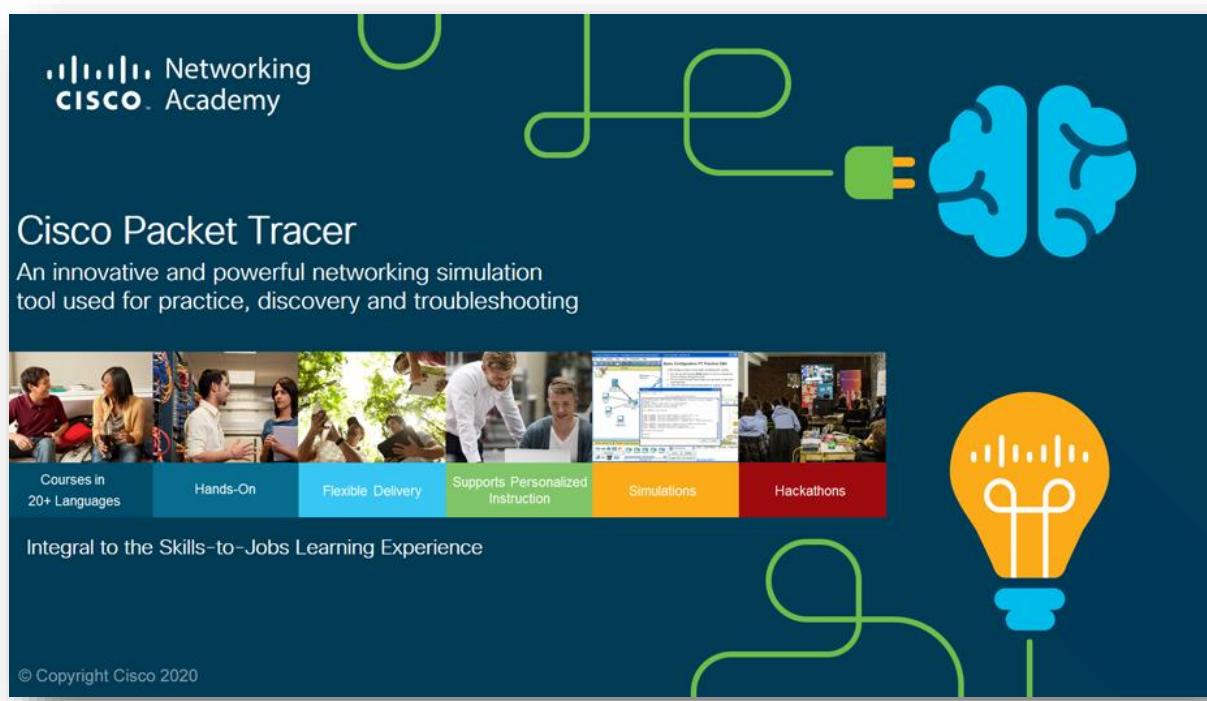
CEP report has been compiled after completing the project. Problem statement was carefully understood and project has been completed to the best of my knowledge and abilities. This report includes details about the different networks and the configurations used to complete this project. This report discusses the created network in detail.

Keywords: IP Address, Subnet Mask, Configuration, Interface, Server, VLAN.

Introduction

Cisco Packet Tracer

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. The software allows users to simulate the configuration of Cisco routers and switches using a simulated command line interface. Packet Tracer makes use of a drag and drop user interface, allowing users to add and remove simulated network devices as they see fit. The software is mainly focused towards Certified Cisco Network Associate Academy students as an educational tool for helping them learn fundamental CCNA concepts.

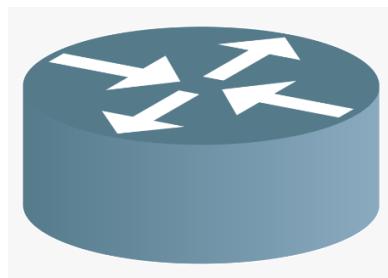


Components used in Network

In order to create a fully functional CEP, the following key components:

- **Routers:** Routers are networking devices operating at layer 3 or a network layer of the OSI model. They are responsible for receiving, analyzing, and forwarding data packets among the connected computer networks. When a data packet arrives, the router inspects the destination address, consults its routing tables to decide the optimal route and then transfers the packet along this route. Routers used are:

- | | |
|--------------|-----|
| 1. PT Router | x 2 |
| 2. 2811 | x 3 |
| 3. WRT300N | x 1 |



- **Switches:** A network switch is networking hardware that connects devices on a computer network by using packet switching to receive and forward data to the destination device.

- | | |
|---------|------|
| 1. 2960 | x 10 |
|---------|------|



- **Access points:** An access point is a wireless network device that acts as a portal for devices to connect to a local area network. Access points are used for extending the wireless coverage of an existing network and for increasing the number of users that can connect to it.

- | | |
|----------|-----|
| 1. AP-PT | x 7 |
|----------|-----|



- **Servers:** A server is a computer or system that provides resources, data, services, or programs to other computers, known as clients, over a network. In theory, whenever computers share resources with client machines, they are considered servers.

1. Server-PT x 7



- **Modem:** A modem converts data to a signal so it can be easily sent and received over a phone line, cable, or satellite connection. For transmission over an analog telephone line—which was once the most popular way to access the internet—the modem converts data between analog and digital formats in real time for two-way network communication.

1. DSL Modem PT x 4



- **Cloud:** The cloud" refers to servers that are accessed over the Internet, and the software and databases that run on those servers. Cloud servers are located in data centers all over the world. By using cloud computing, users and companies don't have to manage physical servers themselves or run software applications on their own machines.

1. Cloud PT-Empty x 1



- **PC:** A personal computer (PC) is a multi-purpose computer whose size, capabilities, and price make it feasible for individual use. Personal computers are intended to be operated directly by an end user, rather than by a computer expert or technician.

1. PC-PT x 19
2. Laptop-PT x 10



- **Printer:** A printer is an external hardware output device that takes the electronic data stored on a computer or other device and generates a hard copy.

1. Printer-PT x 3



- **Smart phone & Tablet:** A smartphone is a mobile device that combines cellular and mobile computing functions into one unit. They are distinguished from feature phones by their stronger hardware capabilities and extensive mobile operating systems, which facilitate wider software, internet, and multimedia functionality, alongside core phone functions such as voice calls and text messaging.

A tablet computer, commonly shortened to tablet, is a mobile device, typically with a mobile operating system and touchscreen display processing circuitry, and a rechargeable battery in a single, thin and flat package. Tablets, being computers, do what other personal computers do, but lack some input/output (I/O) abilities that others have.

1. Smart Phone-PT x 2
2. Tablet PC-PT x 2



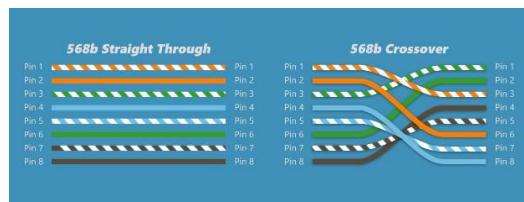
- **IP Phones:** A VoIP phone or IP phone uses voice over IP technologies for placing and transmitting telephone calls over an IP network, such as the Internet, instead of the traditional public switched telephone network (PSTN).

1. 7960 x 6



- **Connection Wires:**

1. Copper Straight-Through



2. Phone



3. Serial DTE



Network Protocols

Network protocols are a set of rules, conventions, and data structures that dictate how devices exchange data across networks. In other words, network protocols can be equated to languages that two devices must understand for seamless communication of information, regardless of their infrastructure and design disparities. I would only discuss protocols used in my CEP.

DHCP: Dynamic Host Configuration Protocol

DHCP is a communication protocol that enables network administrators to automate the assignment of IP addresses in a network. In an IP network, every device connecting to the internet requires a unique IP. DHCP lets network admins distribute IP addresses from a central point and automatically send a new IP address when a device is plugged in from a different place in the network. DHCP works on a client-server model.

Advantages of using DHCP

- Centralized management of IP addresses.
- Seamless addition of new clients into a network.
- Reuse of IP addresses, reducing the total number of IP addresses required.

Disadvantages of using DHCP

- Tracking internet activity becomes tedious, as the same device can have multiple IP addresses over a period of time.
- Computers with DHCP cannot be used as servers, as their IPs change over time.

DNS: Domain Name System protocol

The DNS protocol helps in translating or mapping host names to IP addresses. DNS works on a client-server model, and uses a distributed database over a hierarchy of name servers.

Hosts are identified based on their IP addresses, but memorizing an IP address is difficult due to its complexity. IPs are also dynamic, making it all the more necessary to map domain names to IP addresses. DNS helps resolve this issue by converting the domain names of websites into numerical IP addresses.

Advantages

- DNS facilitates internet access.
- Eliminates the need to memorize IP addresses.

Disadvantages

- DNS queries don't carry information pertaining to the client who initiated it. This is because the DNS server only sees the IP from where the query came from, making the server susceptible to manipulation from hackers.
- DNS root servers, if compromised, could enable hackers to redirect to other pages for phishing data.

HTTP: Hyper Text Transfer Protocol

HTTP is an application layer protocol used for distributed, collaborative, and hypermedia information systems. It works on a client-server model, where the web browser acts as the client. Data such as text, images, and other multimedia files are shared over the World Wide Web using HTTP. As a request and response type protocol, the client sends a request to the server, which is then processed by the server before sending a response back to the client.

HTTP is a stateless protocol, meaning the client and server are only aware of each other while the connection between them is intact. After that, both the client and server forget about each other's existence. Due to this phenomenon, the client and server can't both retain information between requests.

Advantages

- Memory usage and CPU usage are low because of lesser concurrent connections.
- Errors can be reported without closing connections.
- Owing to lesser TCP connections, network congestion is reduced.

Disadvantages

- HTTP lacks encryption capabilities, making it less secure.
- HTTP requires more power to establish communication and transfer data.

IP: Internet Protocol (IPv4)

IPv4 is a network layer protocol that contains addressing and control information, which helps packets be routed in a network. IP works in tandem with TCP to deliver data packets across the network. Under IP, each host is assigned a 32-bit address comprised of two major parts: the network number and host number. The network number identifies a network and is assigned by the internet, while the host number identifies a host on the network and is assigned by a network admin. The IP is only responsible for delivering the packets, and TCP helps puts them back in the right order.

Advantages

- IPv4 encrypts data to ensure privacy and security.
- With IP, routing data becomes more scalable and economical.

Disadvantages

- IPv4 is labor intensive, complex, and prone to errors.

Routing

Routing Protocols are the set of defined rules used by the routers to communicate between source & destination. They do not move the information to the source to a destination, but only update the routing table that contains the information.

Static Routing Protocols

Static routing protocols are used when an administrator manually assigns the path from source to the destination network. It offers more security to the network.

Advantages

- No overhead on router CPU.
- No unused bandwidth between links.
- Only the administrator is able to add routes

Disadvantages

- The administrator must know how each router is connected.
- Not an ideal option for large networks as it is time intensive.
- Whenever link fails all the network goes down which is not feasible in small networks.

OSPF

The Open Shortest Path First (OSPF) protocol calculates the most efficient network routes based on a variety of factors, including distance and bandwidth. The OSPF protocol is a link-state routing protocol, which means that the routers exchange topology information with their nearest neighbors. The topology information is flooded throughout the AS, so that every router within the AS has a complete picture of the topology of the AS. This picture is then used to calculate end-to-end paths through the AS, normally using a variant of the Dijkstra algorithm. Therefore, in a link-state routing protocol, the next hop address to which data is forwarded is determined by choosing the best end-to-end path to the eventual destination.

TFTP

Trivial File Transfer Protocol (TFTP) is a simple protocol used for transferring files. TFTP uses the User Datagram Protocol (UDP) to transport data from one end to another. TFTP is mostly used to read and write files/mail to or from a remote server.

Problem Statement

Description

Design and implement a group of networks (at least 10) connected with each other. Use “192.168.x.” (where x = your last part of enrollment number. E.g. in ‘01-132178-023’, “23” is the last part of the enrollment number) as first three octets for serial port addresses (use 255.255.255.252 subnet mask). At least 2 networks must assign addresses dynamically to the connected computers. One network should have at least 3 VLANs which are connected to router using single port. These VLANs should be able to communicate with each other as well. Moreover, computers in all these networks must be able to reach few (at least 3) websites. At least 2 WLANs should be connected with these networks. A VOIP call should be carried out between users of two different networks.

Deliverables:

- Labeled Diagram (Addresses, Networks, Names)
- Names of Devices and Protocols used.
- Connected and working networks (Packet Tracer)
- Detail Report

Solution:**IP Address: 192.168.25.0****Subnetting**

| | |
|-------------------------|-------------------------------------|
| Network Address: | 192.168.25.0 |
| Total Number of Hosts: | 16 |
| Number of Usable Hosts: | 14 |
| Subnet Mask: | 255.255.255.240 |
| Wildcard Mask: | 0.0.0.15 |
| Binary Subnet Mask: | 11111111.11111111.11111111.11110000 |
| IP Class: | C |
| CIDR Notation: | /28 |
| IP Type: | Private |

| Network Address | Usable Host Range | Broadcast Address: |
|--|---------------------------------|--------------------|
| We will further subnet this network on Subnet Mask 255.255.255.252 for Serial Ports. | | |
| 192.168.25.0 | 192.168.25.1 - 192.168.25.14 | 192.168.25.15 |
| These networks will be used as it is for Fast Ethernet Interfaces. | | |
| 192.168.25.16 | 192.168.25.17 - 192.168.25.30 | 192.168.25.31 |
| 192.168.25.32 | 192.168.25.33 - 192.168.25.46 | 192.168.25.47 |
| 192.168.25.48 | 192.168.25.49 - 192.168.25.62 | 192.168.25.63 |
| 192.168.25.64 | 192.168.25.65 - 192.168.25.78 | 192.168.25.79 |
| 192.168.25.80 | 192.168.25.81 - 192.168.25.94 | 192.168.25.95 |
| 192.168.25.96 | 192.168.25.97 - 192.168.25.110 | 192.168.25.111 |
| 192.168.25.112 | 192.168.25.113 - 192.168.25.126 | 192.168.25.127 |
| 192.168.25.128 | 192.168.25.129 - 192.168.25.142 | 192.168.25.143 |
| We will further subnet this network on Subnet Mask 255.255.255.248 for VLANs. | | |
| 192.168.25.144 | 192.168.25.145 - 192.168.25.158 | 192.168.25.159 |
| 192.168.25.160 | 192.168.25.161 - 192.168.25.174 | 192.168.25.175 |
| 192.168.25.176 | 192.168.25.177 - 192.168.25.190 | 192.168.25.191 |
| 192.168.25.192 | 192.168.25.193 - 192.168.25.206 | 192.168.25.207 |
| 192.168.25.208 | 192.168.25.209 - 192.168.25.222 | 192.168.25.223 |
| These networks will be used as it is for Fast Ethernet Interfaces. | | |
| 192.168.25.224 | 192.168.25.225 - 192.168.25.238 | 192.168.25.239 |
| 192.168.25.240 | 192.168.25.241 - 192.168.25.254 | 192.168.25.255 |

For Serial Ports

| | |
|-------------------------|-------------------------------------|
| Network Address: | 192.168.25.0 |
| Total Number of Hosts: | 4 |
| Number of Usable Hosts: | 2 |
| Subnet Mask: | 255.255.255.252 |
| Wildcard Mask: | 0.0.0.3 |
| Binary Subnet Mask: | 11111111.11111111.11111111.11111100 |
| IP Class: | C |
| CIDR Notation: | /30 |
| IP Type: | Private |

| Network Address | Usable Host Range | Broadcast Address |
|-----------------|-------------------------------|-------------------|
| 192.168.25.0 | 192.168.25.1 - 192.168.25.2 | 192.168.25.3 |
| 192.168.25.4 | 192.168.25.5 - 192.168.25.6 | 192.168.25.7 |
| 192.168.25.8 | 192.168.25.9 - 192.168.25.10 | 192.168.25.11 |
| 192.168.25.12 | 192.168.25.13 - 192.168.25.14 | 192.168.25.15 |

For VLAN

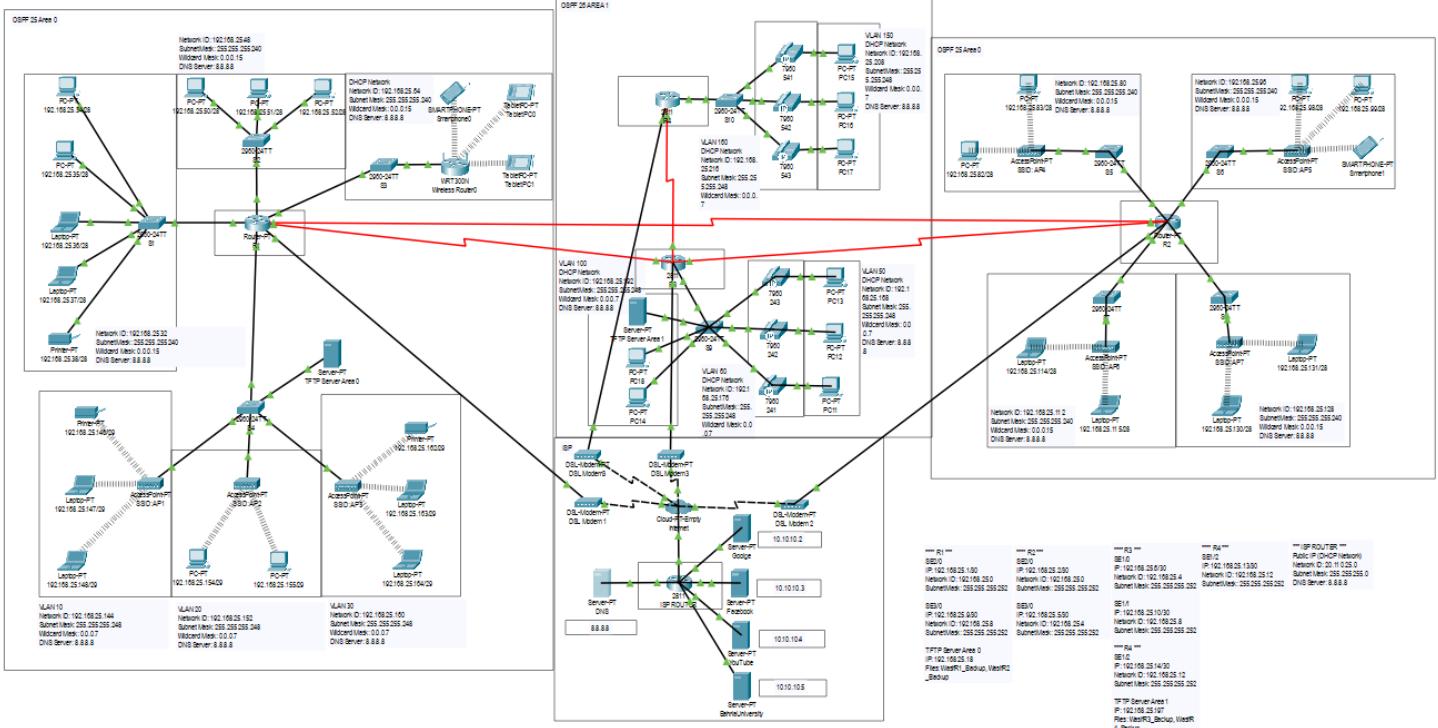
| | |
|-------------------------|-------------------------------------|
| Network Address: | 192.168.25.0 |
| Total Number of Hosts: | 8 |
| Number of Usable Hosts: | 6 |
| Subnet Mask: | 255.255.255.248 |
| Wildcard Mask: | 0.0.0.7 |
| Binary Subnet Mask: | 11111111.11111111.11111111.11111000 |
| IP Class: | C |
| CIDR Notation: | /29 |
| IP Type: | Private |

| Network Address | Usable Host Range | Broadcast Address |
|-----------------|---------------------------------|-------------------|
| 192.168.25.144 | 192.168.25.145 - 192.168.25.150 | 192.168.25.151 |
| 192.168.25.152 | 192.168.25.153 - 192.168.25.158 | 192.168.25.159 |
| 192.168.25.160 | 192.168.25.161 - 192.168.25.166 | 192.168.25.167 |
| 192.168.25.168 | 192.168.25.169 - 192.168.25.174 | 192.168.25.175 |
| 192.168.25.176 | 192.168.25.177 - 192.168.25.182 | 192.168.25.183 |
| 192.168.25.184 | 192.168.25.185 - 192.168.25.190 | 192.168.25.191 |
| 192.168.25.192 | 192.168.25.193 - 192.168.25.198 | 192.168.25.199 |

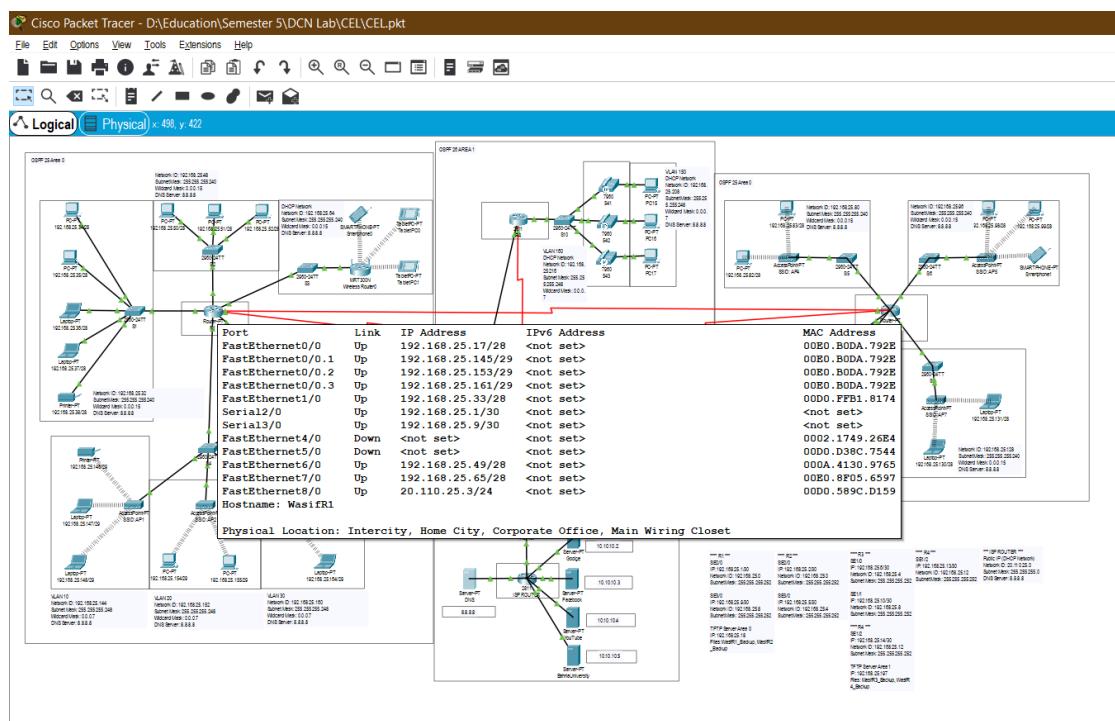
| | | |
|----------------|---------------------------------|----------------|
| 192.168.25.200 | 192.168.25.201 - 192.168.25.206 | 192.168.25.207 |
| 192.168.25.208 | 192.168.25.209 - 192.168.25.214 | 192.168.25.215 |
| 192.168.25.216 | 192.168.25.217 - 192.168.25.222 | 192.168.25.223 |

Detailed Network Diagrams

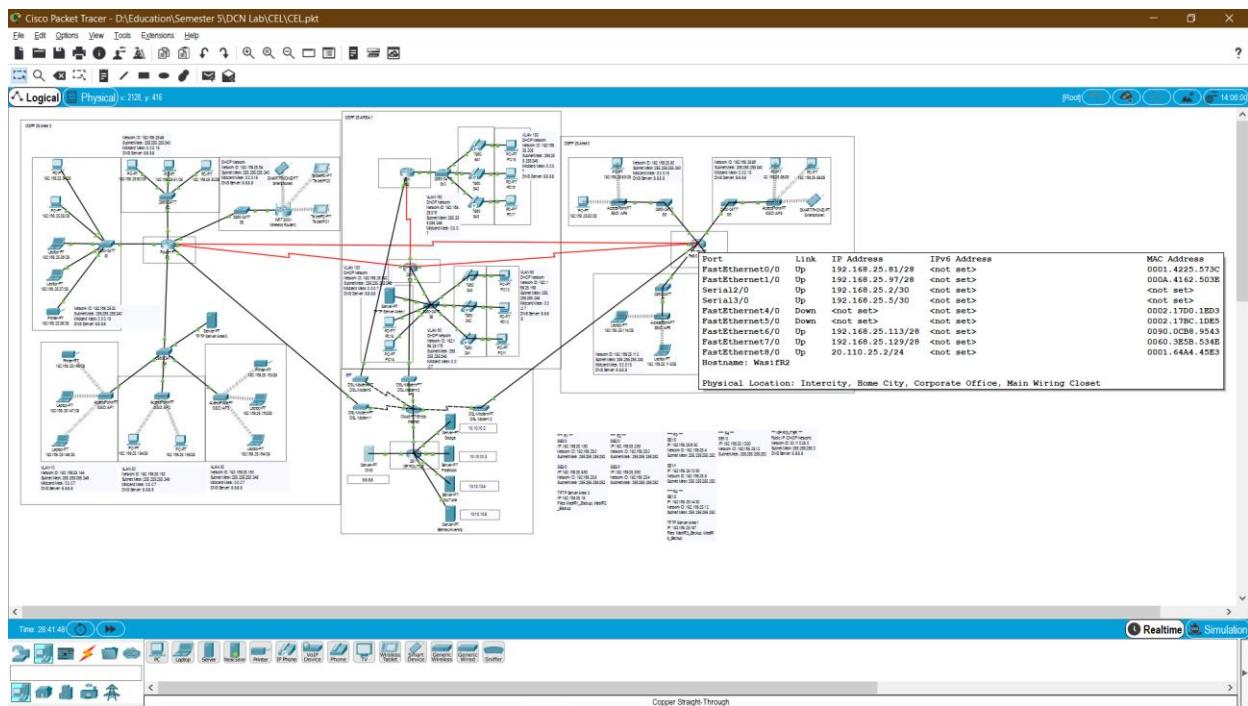
Complete Network



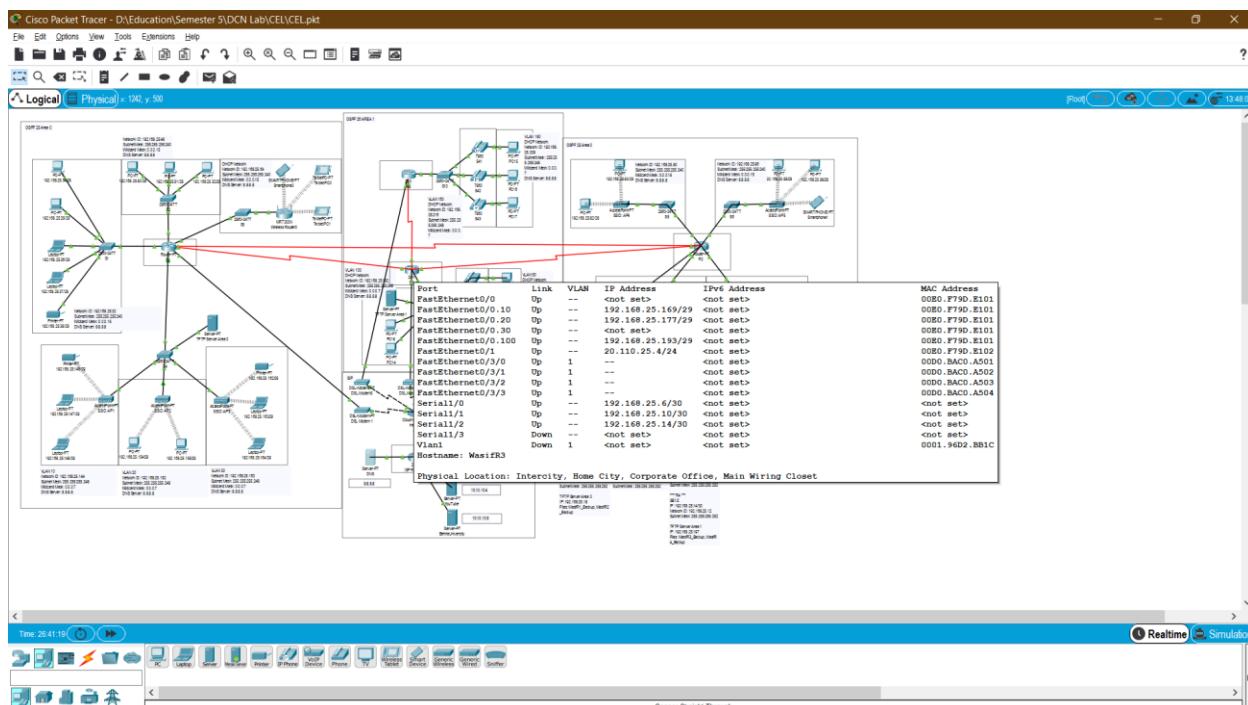
WasifR1:



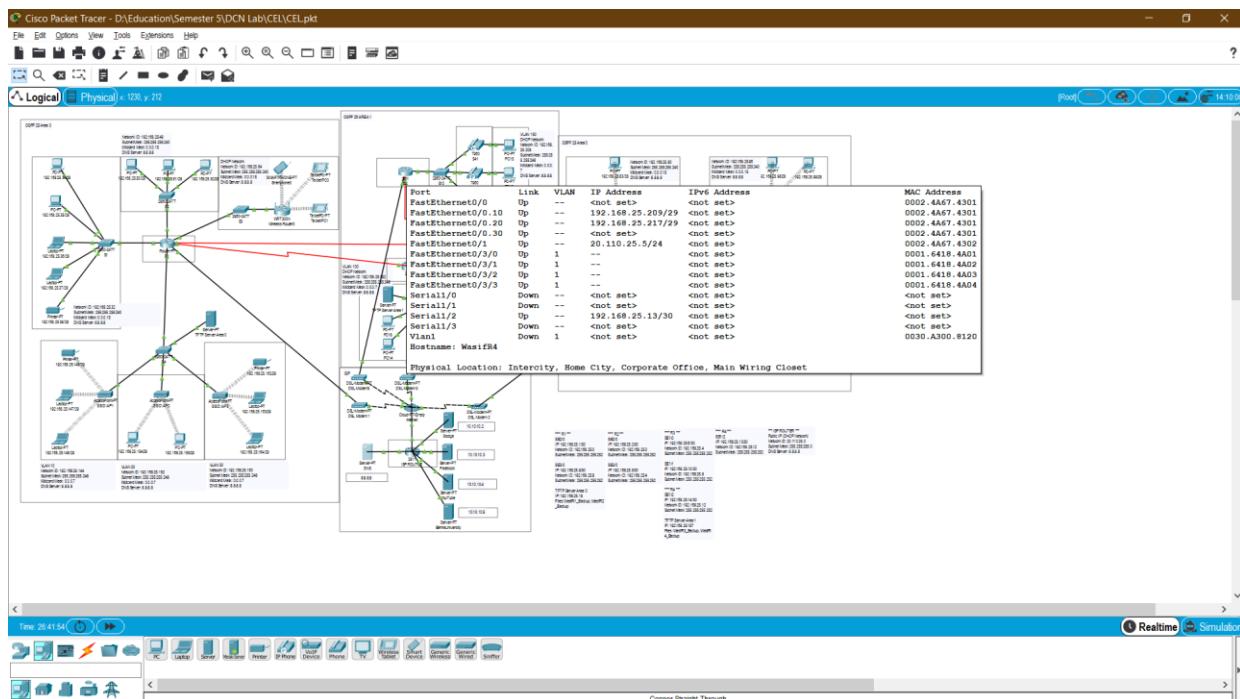
WasifR2:



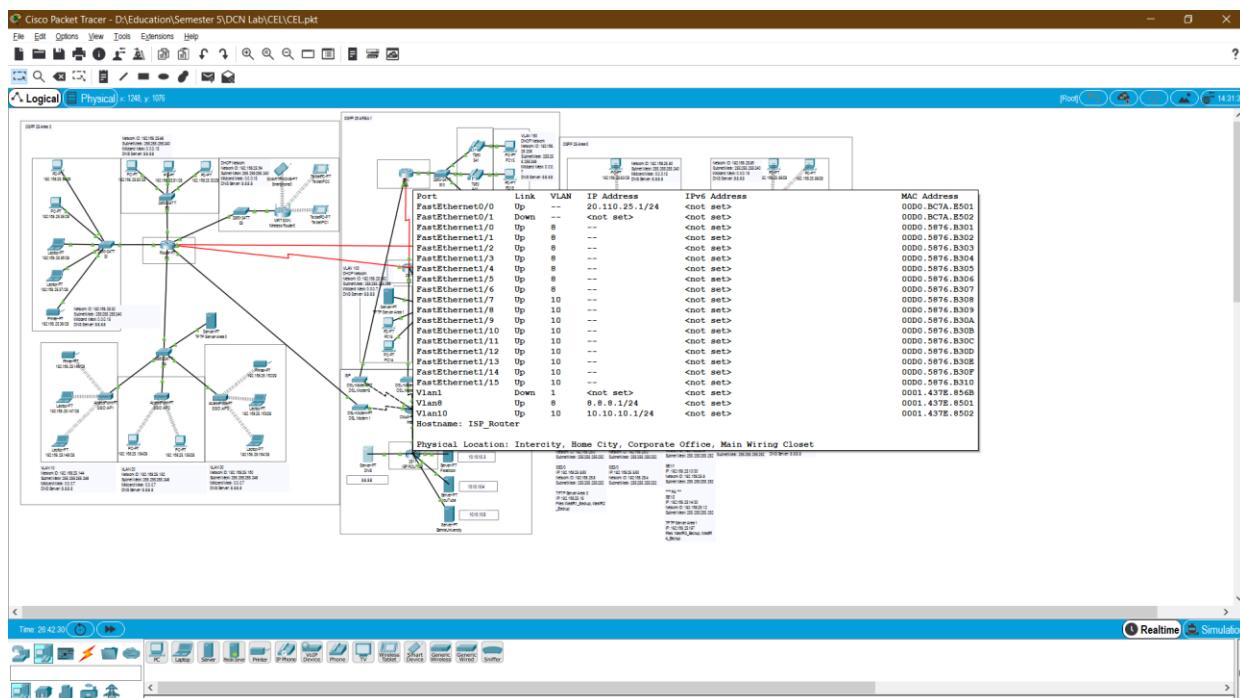
WasifR3:



WasifR4:

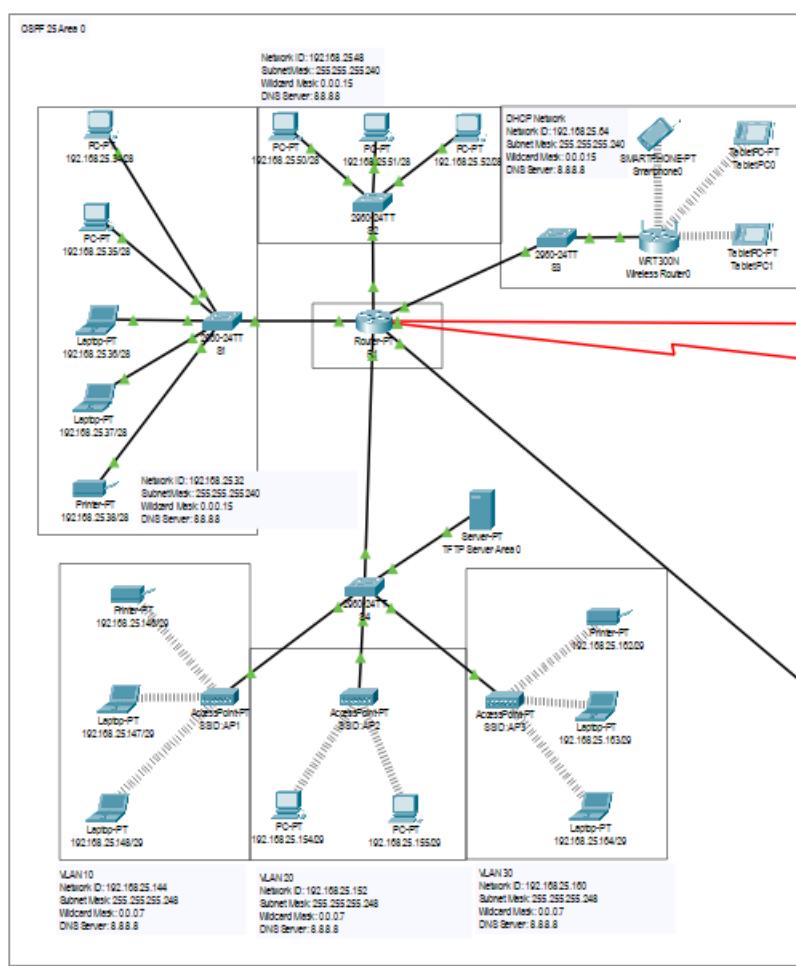


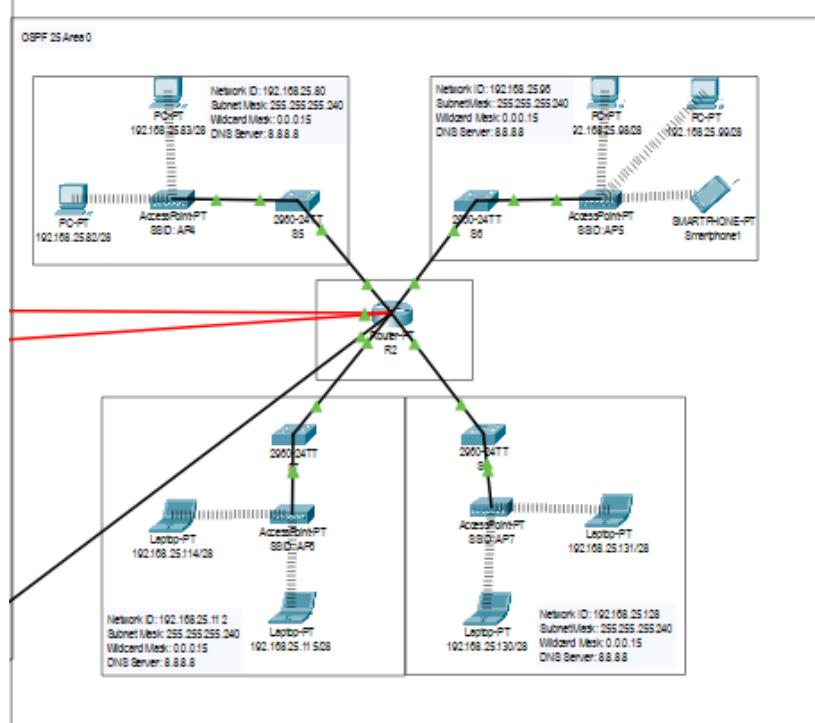
ISP_Router:



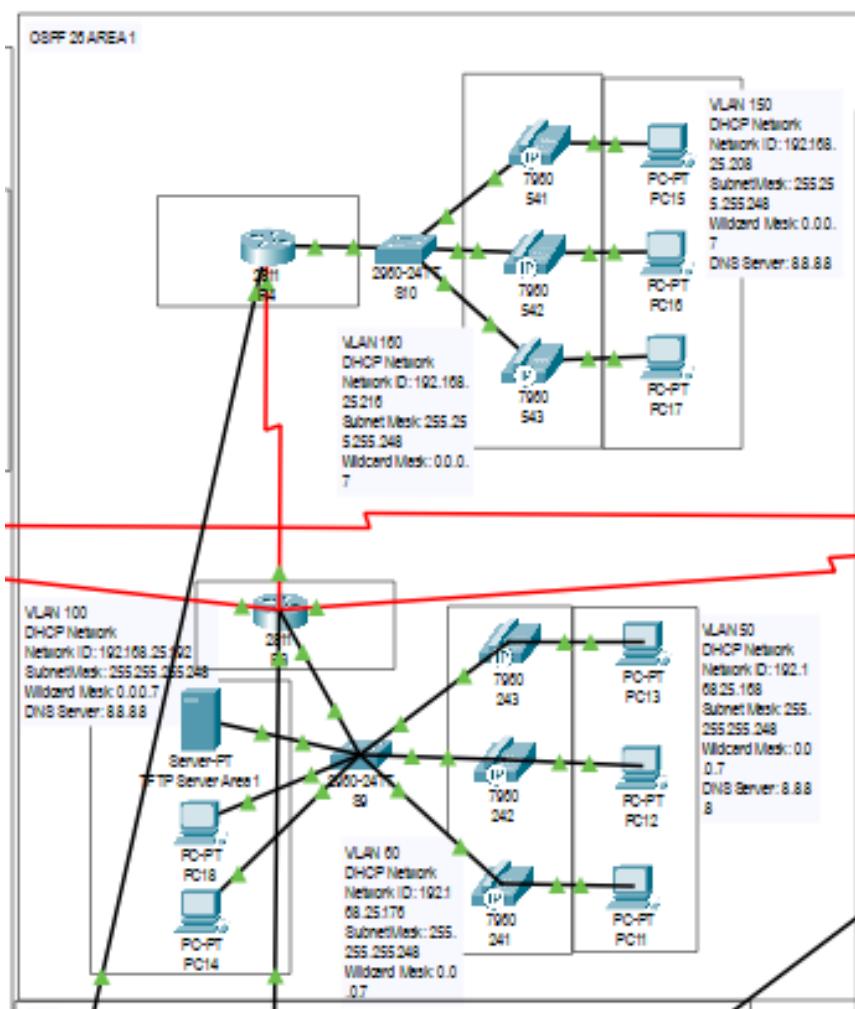
| | | | | |
|--|--|--|--|--|
| *** R1 *** | *** R2 *** | *** R3 *** | *** R4 *** | *** ISP ROUTER *** |
| SE2/0 IP: 192.168.25.1/30 Network ID: 192.168.25.0 Subnet Mask: 255.255.255.252 | SE2/0 IP: 192.168.25.2/30 Network ID: 192.168.25.0 Subnet Mask: 255.255.255.252 | SE1/0 IP: 192.168.25.6/30 Network ID: 192.168.25.4 Subnet Mask: 255.255.255.252 | SE1/2 IP: 192.168.25.13/30 Network ID: 192.168.25.12 Subnet Mask: 255.255.255.252 | Public IP (DHCP Network) Network ID: 20.110.25.0 Subnet Mask: 255.255.255.0 DNS Server: 8.8.8 |
| SE3/0 IP: 192.168.25.9/30 Network ID: 192.168.25.8 Subnet Mask: 255.255.255.252 | SE3/0 IP: 192.168.25.5/30 Network ID: 192.168.25.4 Subnet Mask: 255.255.255.252 | SE1/1 IP: 192.168.25.10/30 Network ID: 192.168.25.8 Subnet Mask: 255.255.255.252 | | |
| TFTP Server Area 0 IP: 192.168.25.18 Files: WasifR1_Backup, WasifR2_Backup | | SE1/2 IP: 192.168.25.14/30 Network ID: 192.168.25.12 Subnet Mask: 255.255.255.252 | | |
| | | TFTP Server Area 1 IP: 192.168.25.197 Files: WasifR3_Backup, WasifR4_Backup | | |

OSPF Area 0

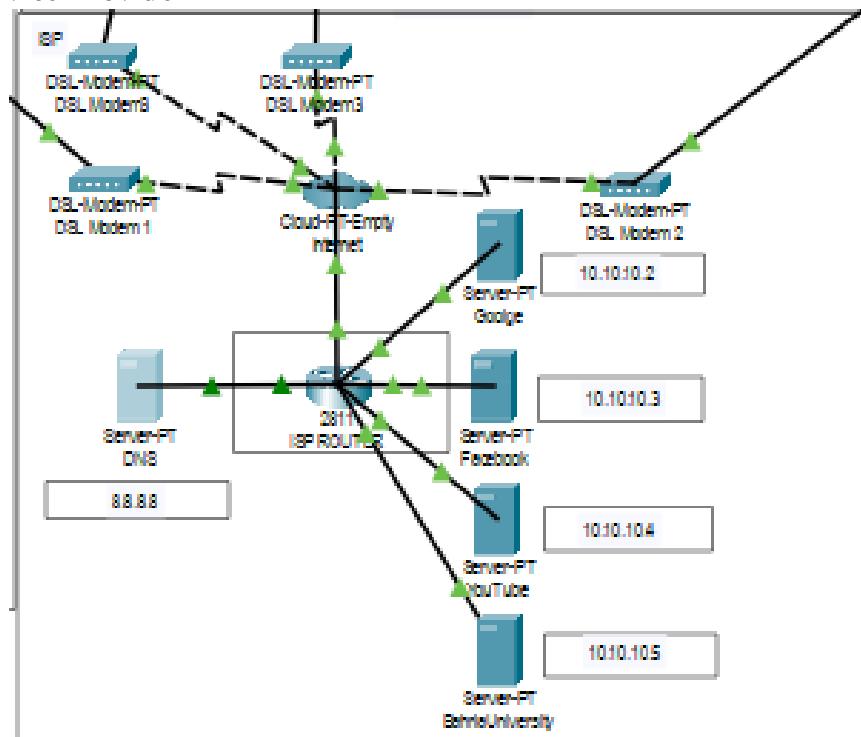




OSPF Area 1

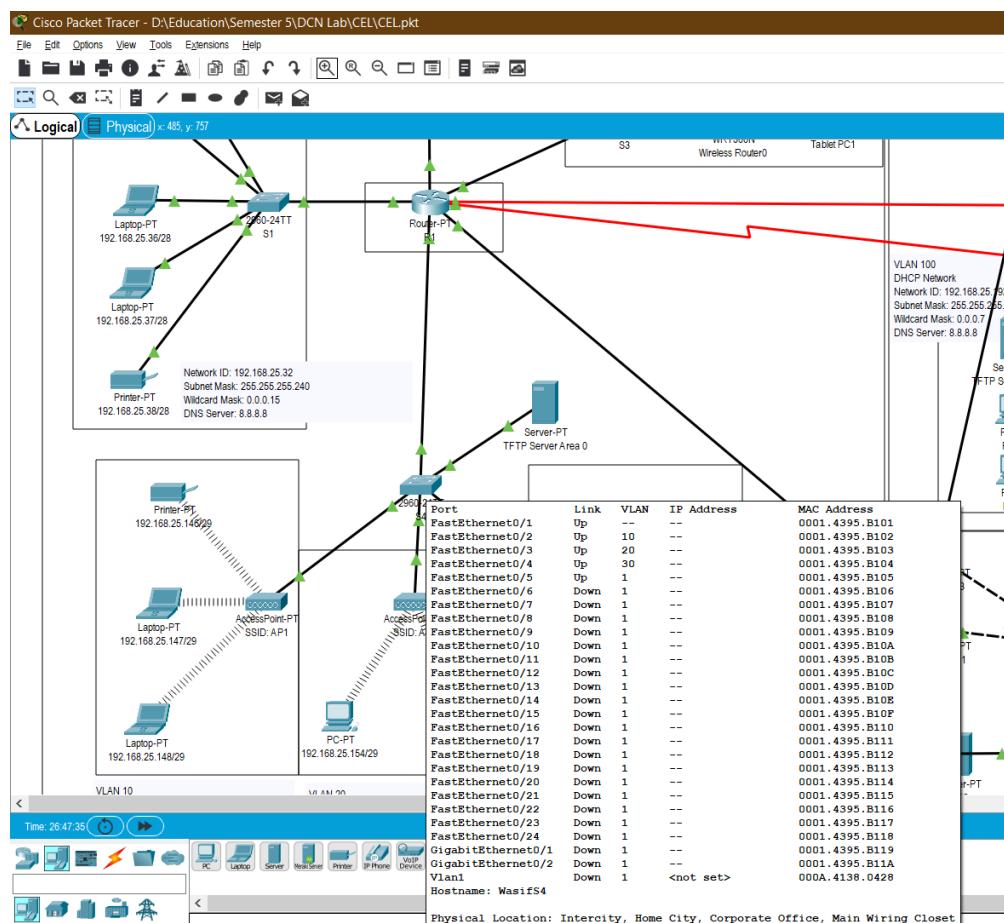


Internet Service Provider

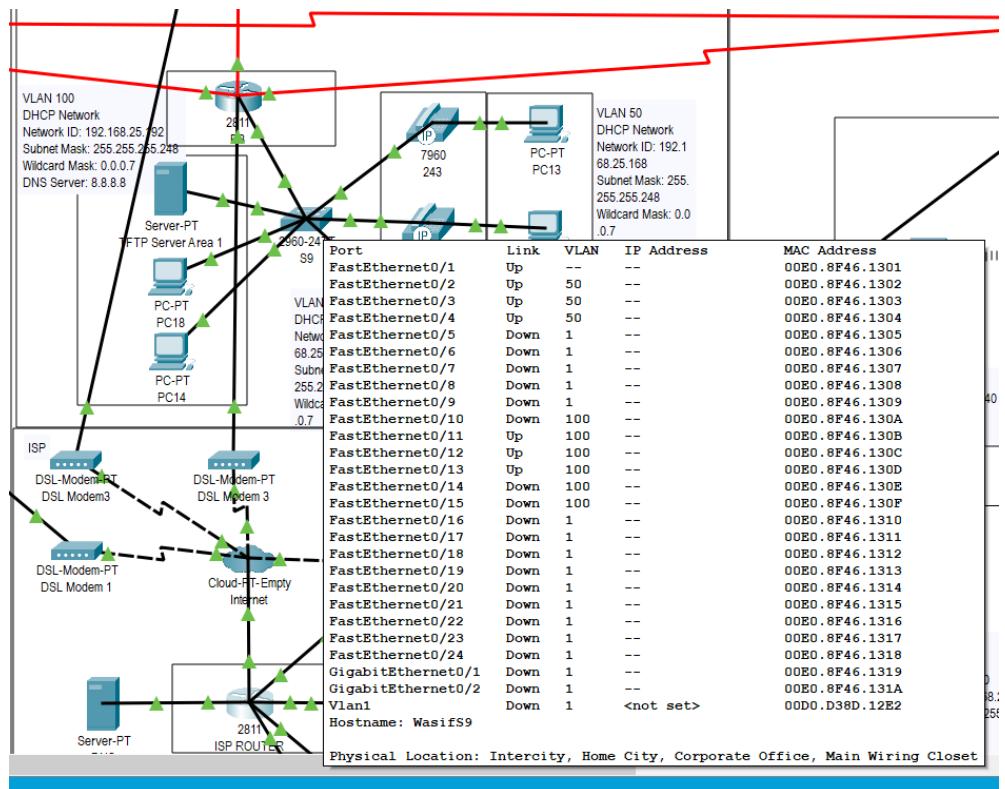


VLANs

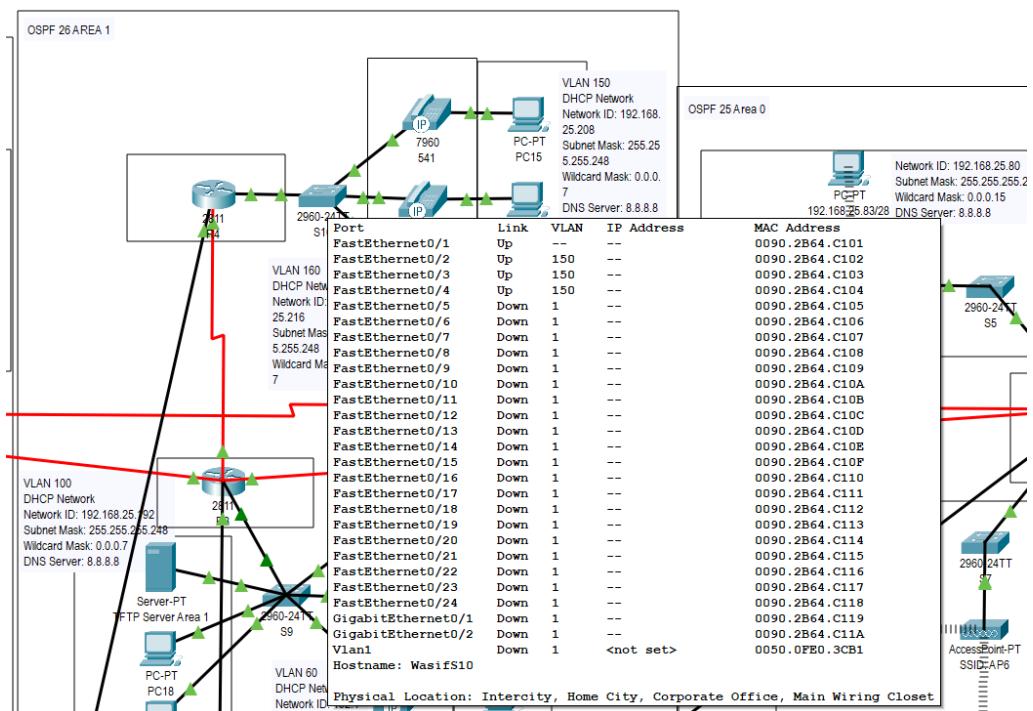
WasifS4:



WasifS9:



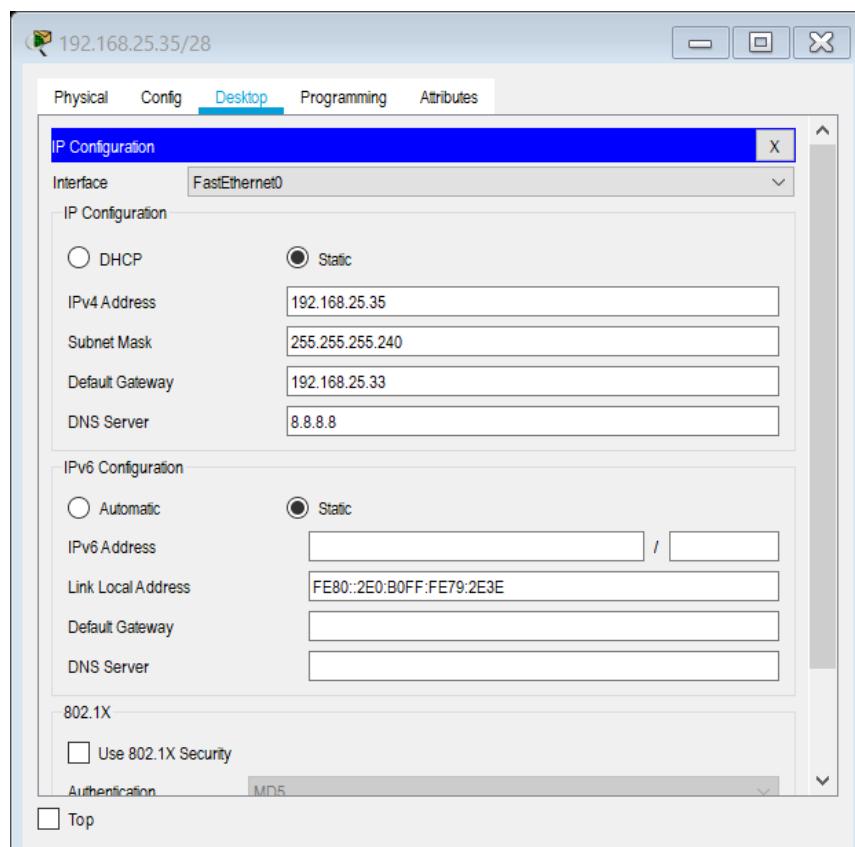
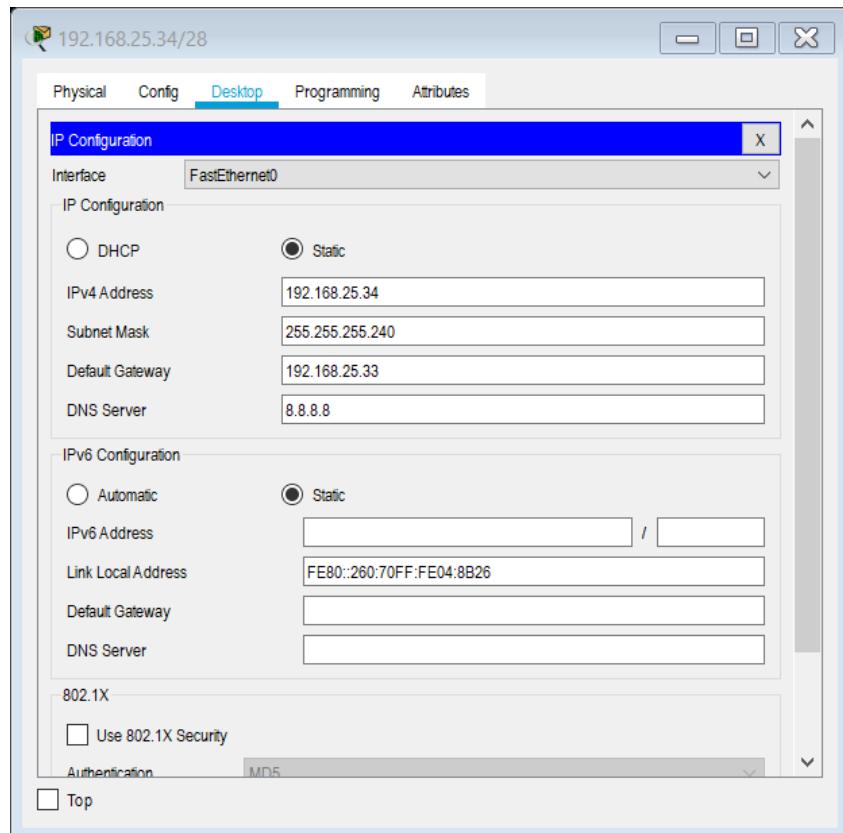
WasifS10:

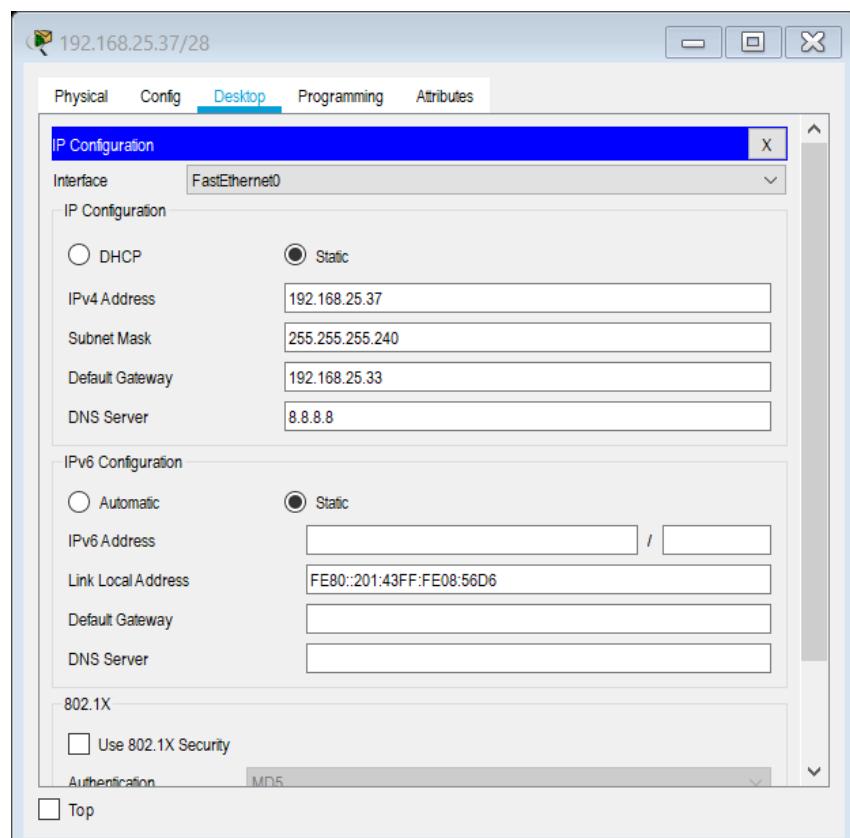
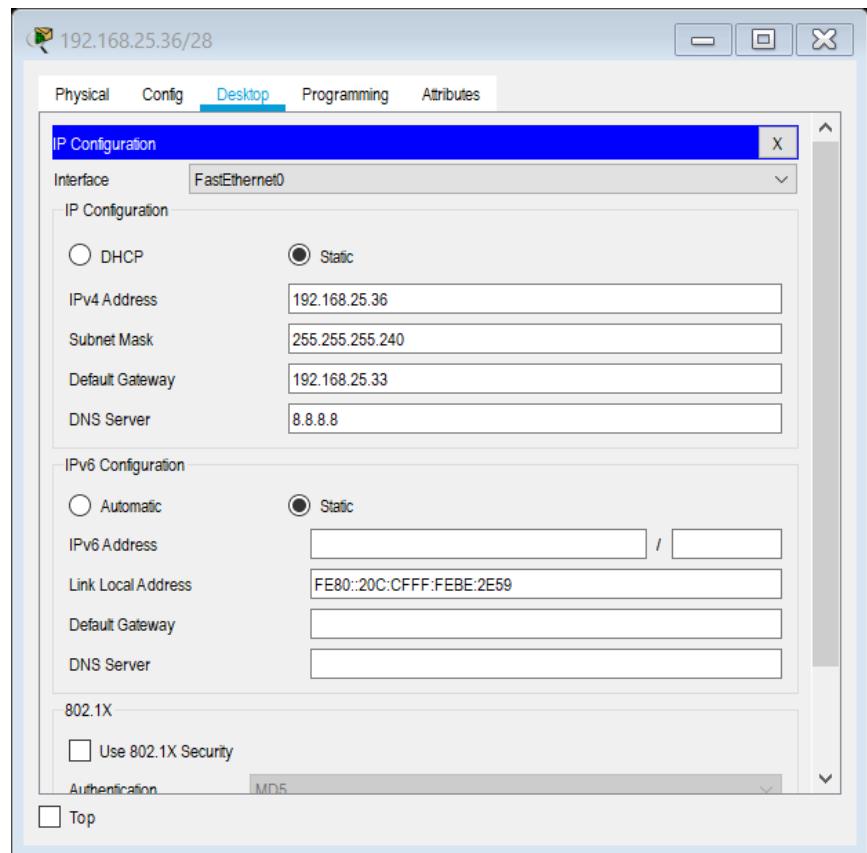


Network Details

| Network ID | WLAN | VLAN | Internet | DHCP | Static | OSPF | Users | Port |
|----------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------------|-------------------------|
| 192.168.25.0 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | √ | √ | | R1: SE2/0, R2: SE2/0 |
| 192.168.25.4 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | √ | √ | | R2: SE3/0, R3: SE1/0 |
| 192.168.25.8 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | √ | √ | | R1: SE3/0, R3: SE1/1 |
| 192.168.25.12 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | √ | √ | | R3: SE1/2, R4: SE1/2 |
| 192.168.25.16 | <input type="checkbox"/> | <input type="checkbox"/> | √ | <input type="checkbox"/> | √ | √ | TFTP Sever Area 0 | R1: FA0/0 |
| 192.168.25.32 | <input type="checkbox"/> | <input type="checkbox"/> | √ | <input type="checkbox"/> | √ | √ | 2 Laptops, 2 PCs, 1 Printer | R1: FA1/0 |
| 192.168.25.48 | <input type="checkbox"/> | <input type="checkbox"/> | √ | <input type="checkbox"/> | √ | √ | 3 PCs | R1: FA6/0 |
| 192.168.25.64 | √ | <input type="checkbox"/> | <input type="checkbox"/> | √ | <input type="checkbox"/> | √ | 1 Smart Phone, 2 Tablets | R1: FA7/0 |
| 192.168.25.80 | √ | <input type="checkbox"/> | √ | <input type="checkbox"/> | √ | √ | 2 PCs | R2: FA0/0 |
| 192.168.25.96 | √ | <input type="checkbox"/> | √ | <input type="checkbox"/> | √ | √ | 2 PCs, 1 Smart Phone | R2: FA1/0 |
| 192.168.25.112 | √ | <input type="checkbox"/> | √ | <input type="checkbox"/> | √ | √ | 2 Laptops | R2: FA6/0 |
| 192.168.25.128 | √ | <input type="checkbox"/> | √ | <input type="checkbox"/> | √ | √ | 2 Laptops | R2: FA7/0 |
| 192.168.25.144 | √ | √ | √ | <input type="checkbox"/> | √ | √ | 1 Printer, 2 Laptops | R1: FA0/0.1 |
| 192.168.25.152 | √ | √ | √ | <input type="checkbox"/> | √ | √ | 2 PCs | R1: FA0/0.2 |
| 192.168.25.160 | √ | √ | √ | <input type="checkbox"/> | √ | √ | 1 Printer, 2 Laptops | R1: FA0/0.3 |
| 192.168.25.168 | <input type="checkbox"/> | √ | √ | √ | <input type="checkbox"/> | √ | 3 PCs | R3: FA0/0.10 |
| 192.168.25.176 | <input type="checkbox"/> | √ | √ | √ | <input type="checkbox"/> | √ | 3 VoIPs | R3: FA0/0.20 |
| 192.168.25.184 | <input type="checkbox"/> | | |
| 192.168.25.192 | <input type="checkbox"/> | √ | √ | √ | <input type="checkbox"/> | √ | 1 TFTP Server Area 1, 2 PCs | R3: FA0/0.100 |
| 192.168.25.200 | <input type="checkbox"/> | | |
| 192.168.25.208 | <input type="checkbox"/> | √ | √ | √ | <input type="checkbox"/> | √ | 3 PCs | R4: FA0/0.10 |
| 192.168.25.216 | <input type="checkbox"/> | √ | √ | √ | <input type="checkbox"/> | √ | 3 VoIPs | R4: FA0/0.20 |
| 192.168.25.224 | <input type="checkbox"/> | <input type="checkbox"/> | √ | <input type="checkbox"/> | √ | √ | | R4:FA0/1 |
| 192.168.25.240 | <input type="checkbox"/> | <input type="checkbox"/> | √ | <input type="checkbox"/> | √ | √ | | R3: FA0/0 |
| 20.110.25.0 | <input type="checkbox"/> | <input type="checkbox"/> | √ | √ | <input type="checkbox"/> | <input type="checkbox"/> | Cloud PT | ISP_Router: FA0/0 |
| 8.8.8.0 | <input type="checkbox"/> | √ | √ | <input type="checkbox"/> | √ | <input type="checkbox"/> | 1 DNS Server | ISP_Router: VLAN 8 |
| 10.10.10.0 | <input type="checkbox"/> | √ | √ | <input type="checkbox"/> | √ | <input type="checkbox"/> | 4 Web Server | ISP_Router: VLAN 10 |

IP Configuration





192.168.25.38/28

Physical Config Attributes

GLOBAL

INTERFACE

FastEthernet0

Port Status: On
Bandwidth: 100 Mbps 10 Mbps Auto
Duplex: Half Duplex Full Duplex Auto
MAC Address: 0001.C798.5124

IP Configuration:
 DHCP
 Static
IPv4 Address: 192.168.25.38
Subnet Mask: 255.255.255.240

IPv6 Configuration:
 Automatic
 Static
IPv6 Address:
Link Local Address: FE80::201:C7FF:FE98:5124

Top

192.168.25.146/29

Physical Config Attributes

GLOBAL

INTERFACE

Wireless0

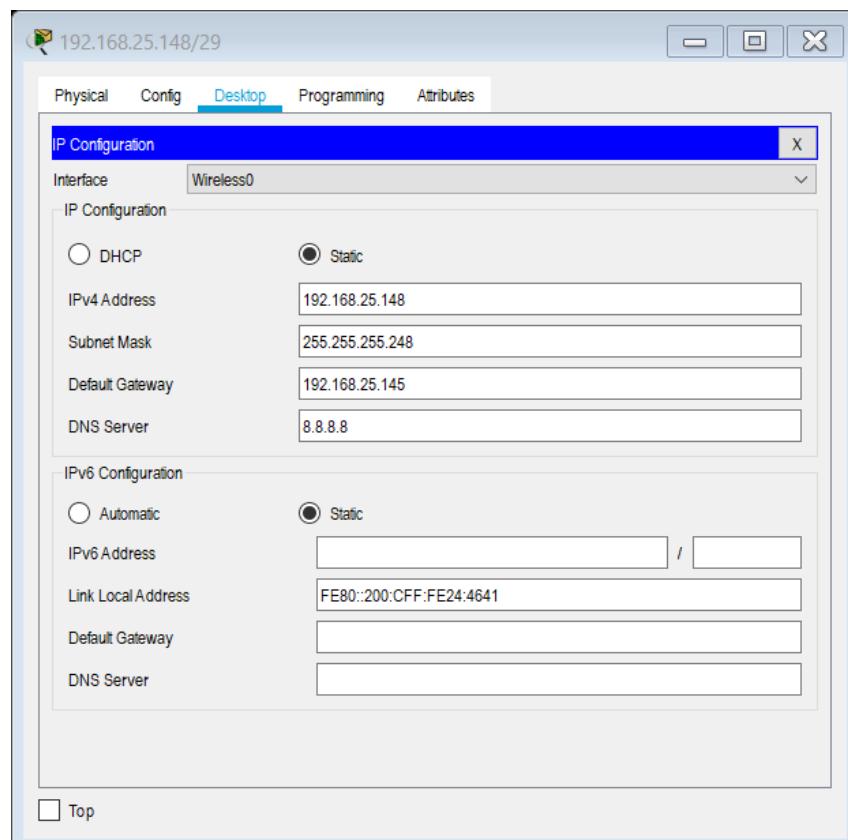
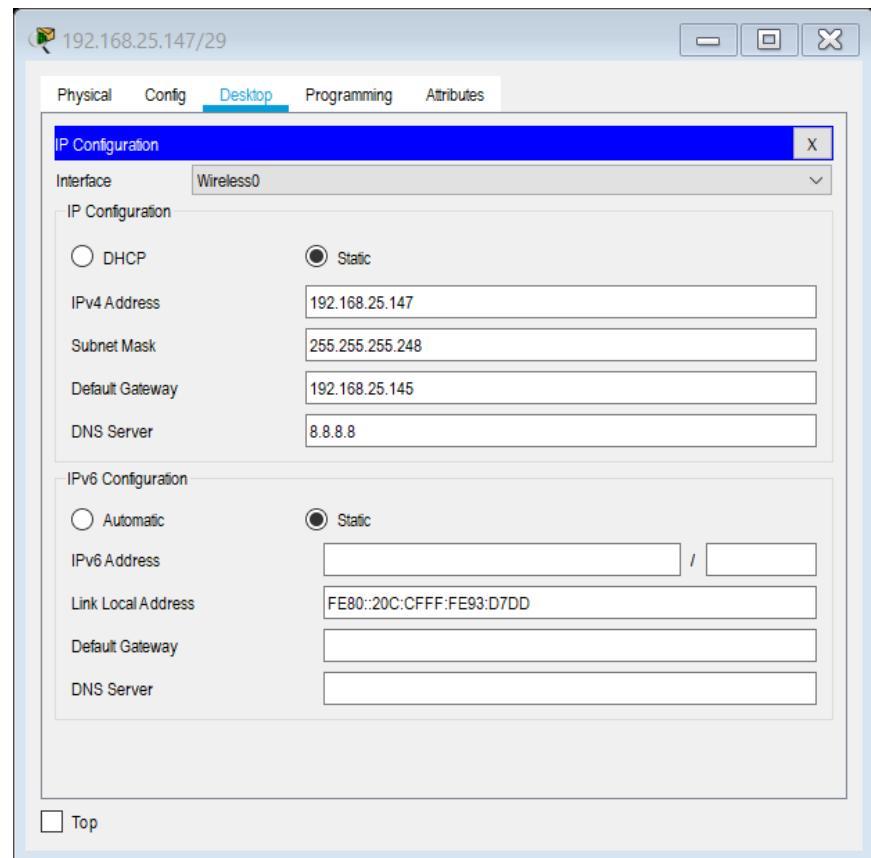
Port Status: On
Bandwidth: 24 Mbps
MAC Address: 0030.A3B9.E430
SSID: AP1

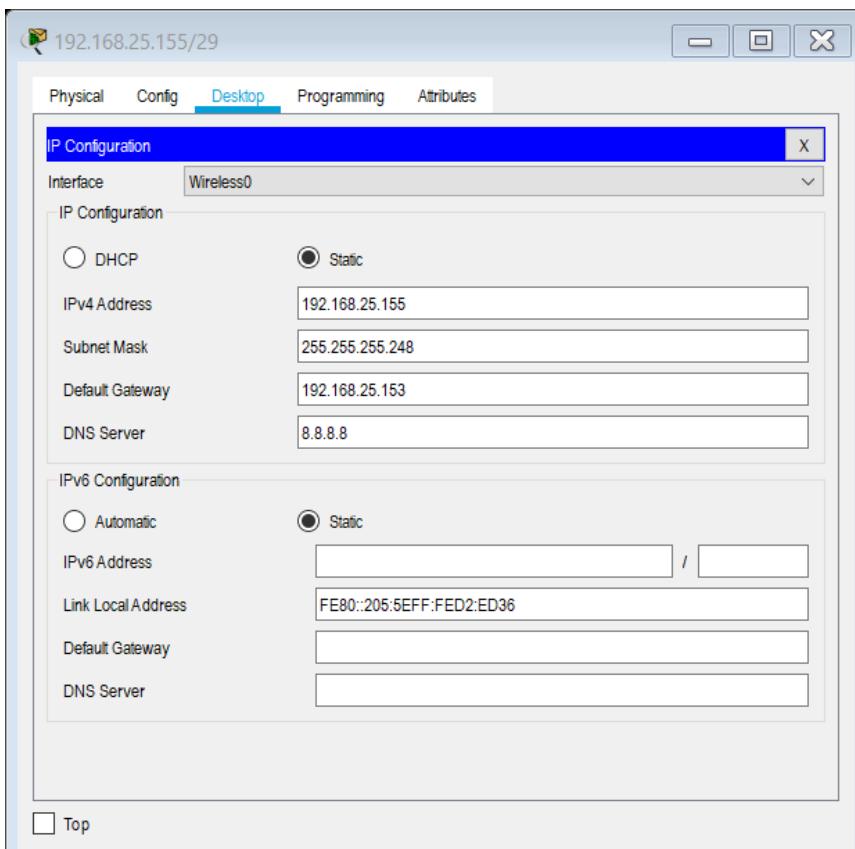
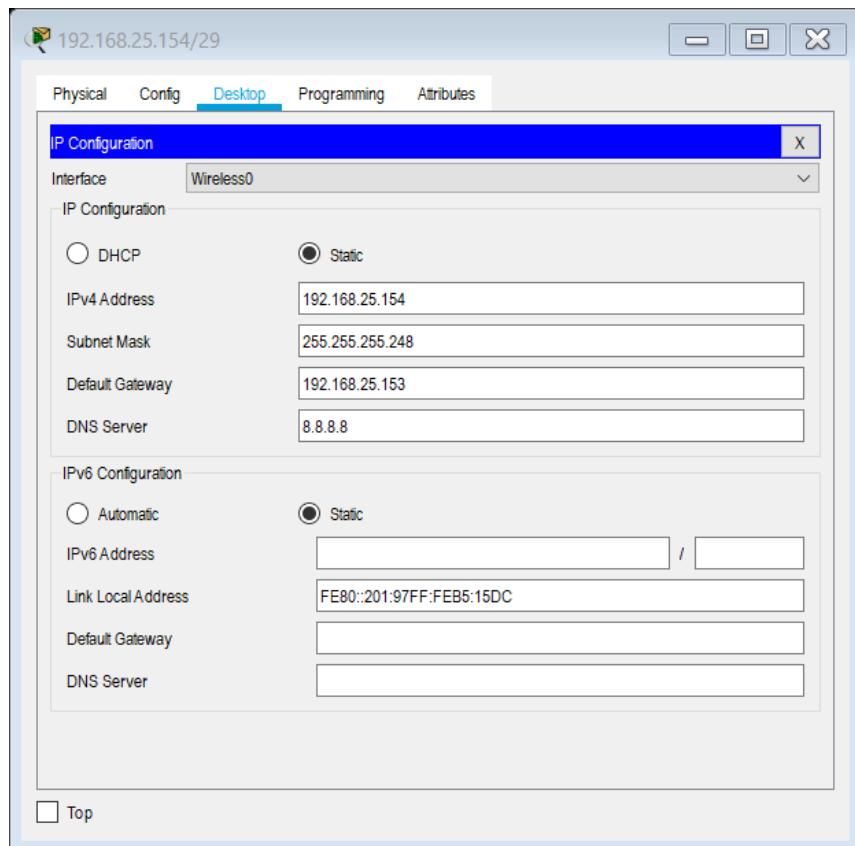
Authentication:
 Disabled
 WPA-PSK
 WPA
 802.1X
 WEP
 WPA2-PSK
 WPA2
Method: MD5
WEP Key:
PSK Pass Phrase:
User ID:
Password:
Encryption Type: Disabled

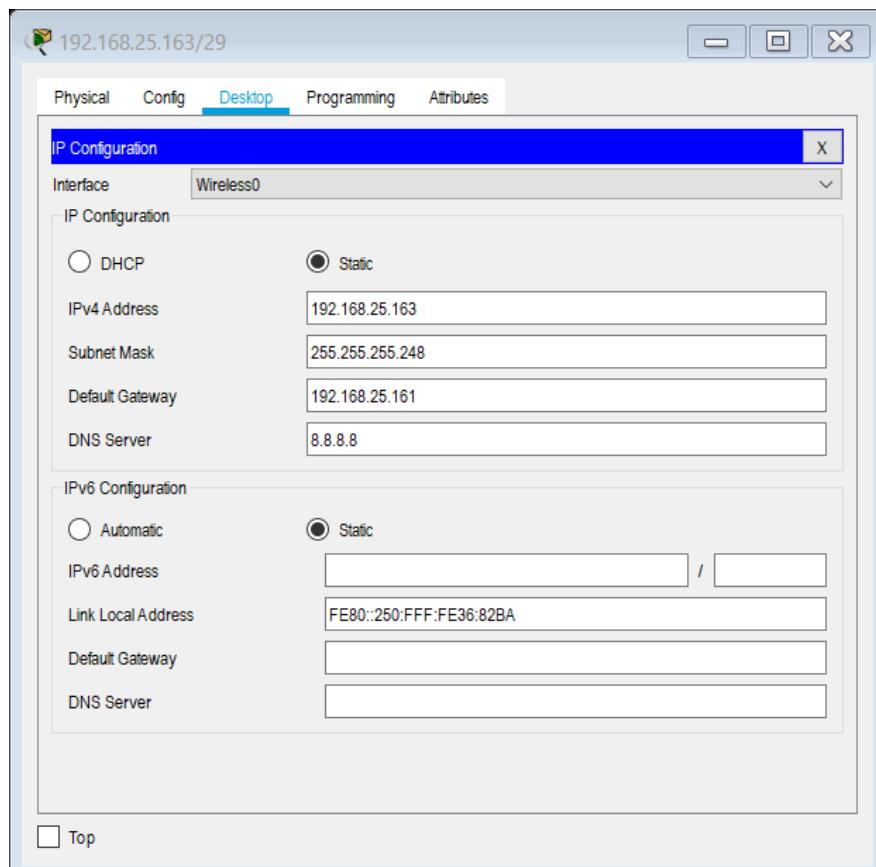
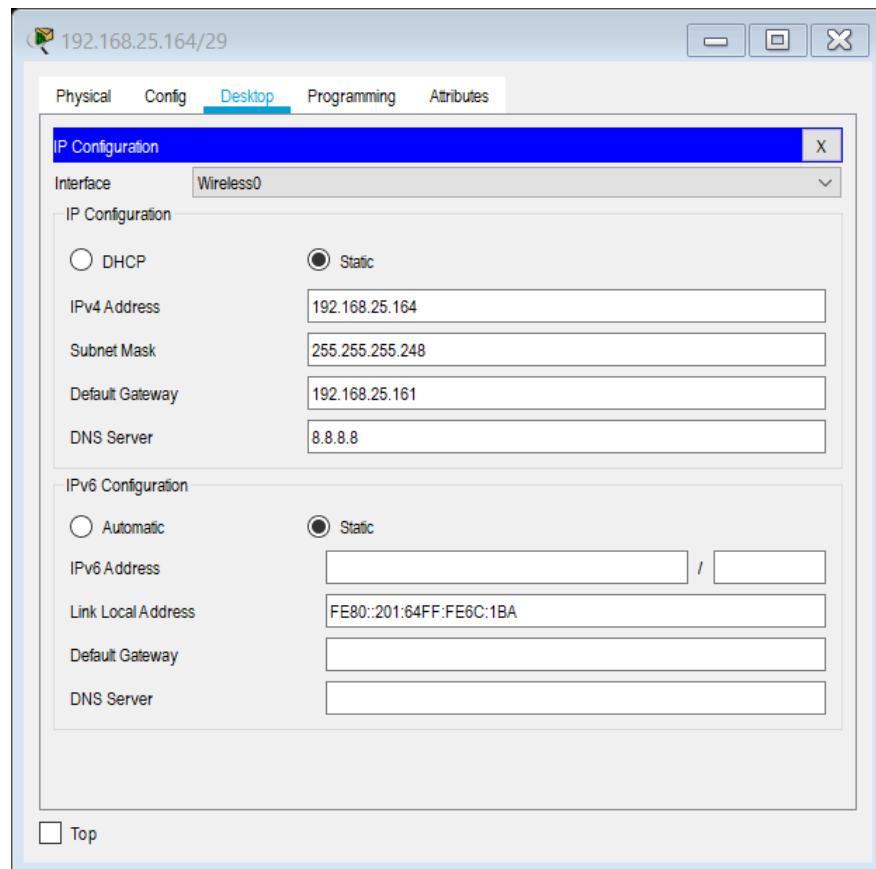
IP Configuration:
 DHCP
 Static
IPv4 Address: 192.168.25.146
Subnet Mask: 255.255.255.248

IPv6 Configuration:
 Automatic
 Static
IPv6 Address:
Link Local Address: FE80::230:A3FF:FE89:E430

Top







192.168.25.162/29

Physical Config Attributes

GLOBAL

INTERFACE

Wireless0

Port Status: Wireless0 On

Bandwidth: 24 Mbps

MAC Address: 00D0.BAE6.2AC6

SSID: AP3

Authentication:

Disabled WEP WEP Key:
 WPA-PSK WPA2-PSK PSK Pass Phrase:
 WPA WPA2 User ID:
 802.1X Method: MD5 Password:
User Name:
Password:

Encryption Type: Disabled

IP Configuration:

DHCP Static

IPv4 Address: 192.168.25.162

Subnet Mask: 255.255.255.248

IPv6 Configuration:

Automatic Static

Top

192.168.25.50/28

Physical Config Desktop Programming Attributes

IP Configuration

Interface: FastEthernet0

IP Configuration:

DHCP Static

IPv4 Address: 192.168.25.50

Subnet Mask: 255.255.255.240

Default Gateway: 192.168.25.49

DNS Server: 8.8.8.8

IPv6 Configuration:

Automatic Static

IPv6 Address: /

Link Local Address: FE80::2D0:D3FF:FEB8:A5E0

Default Gateway:

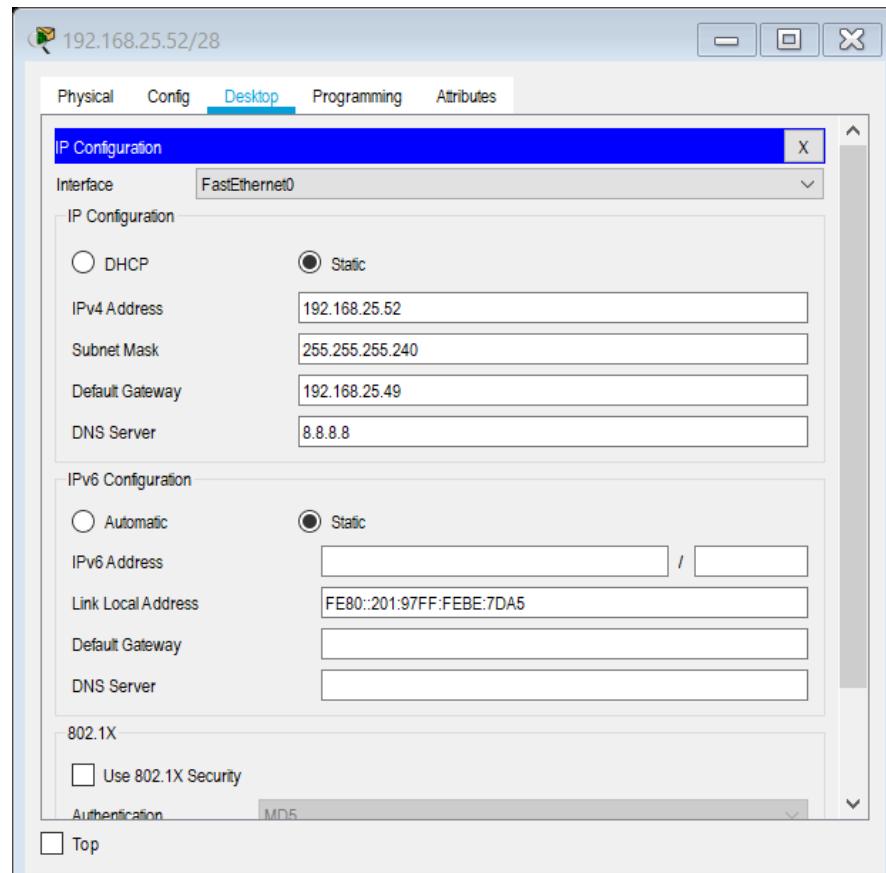
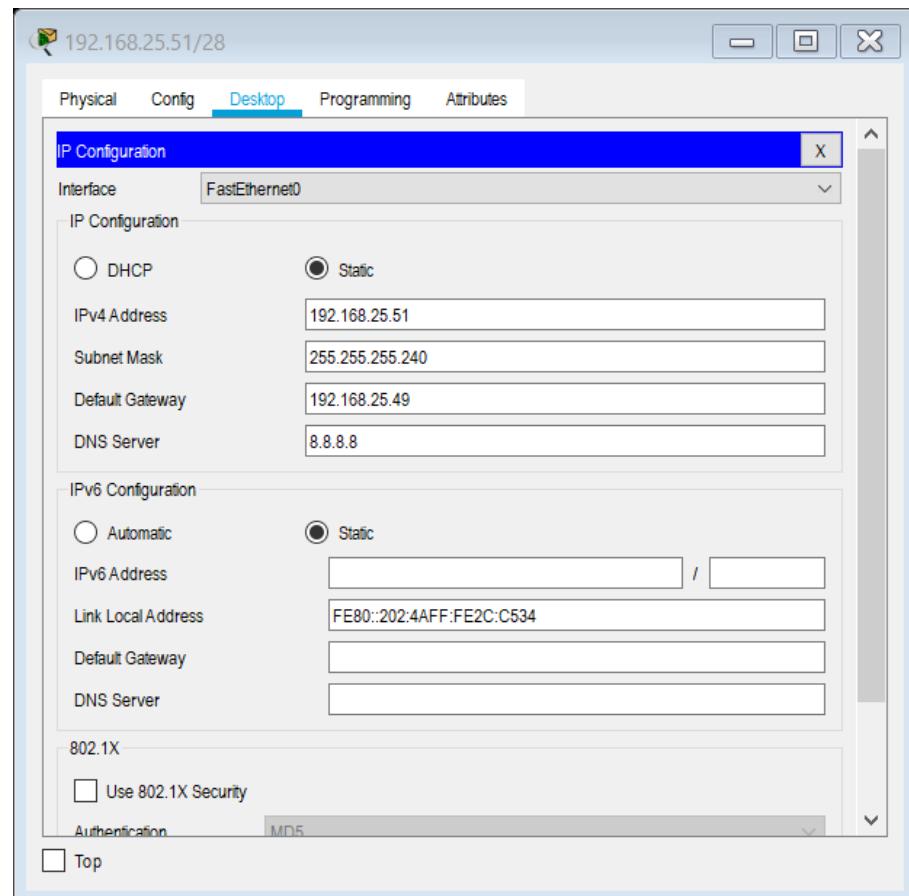
DNS Server:

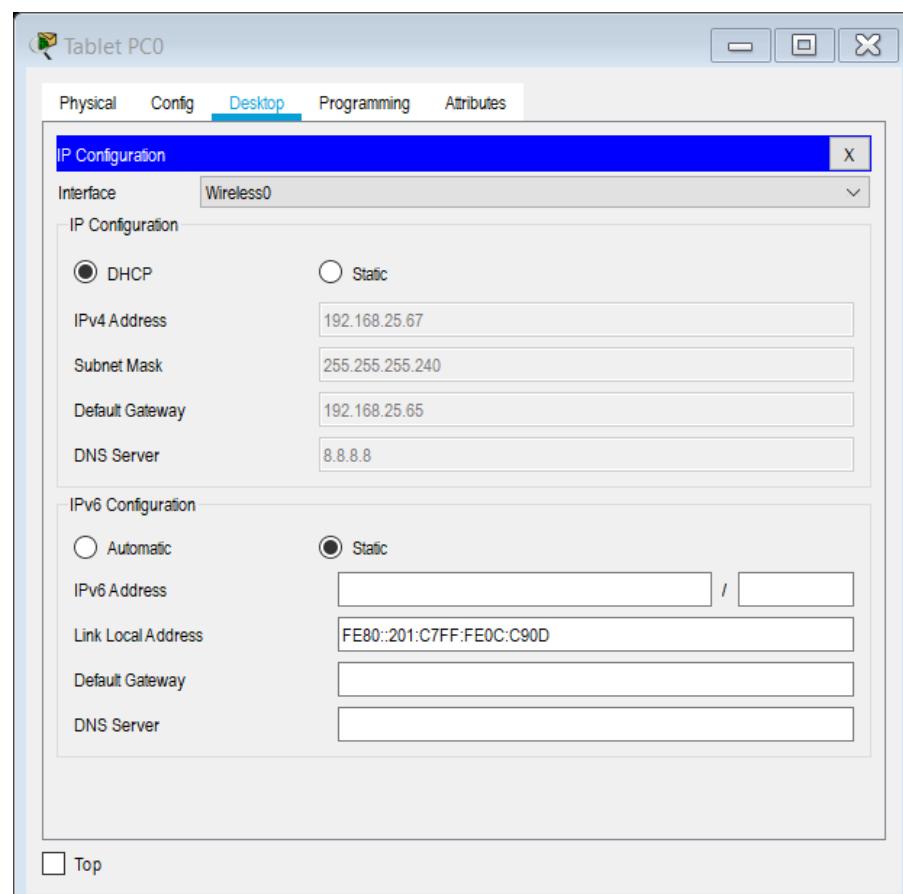
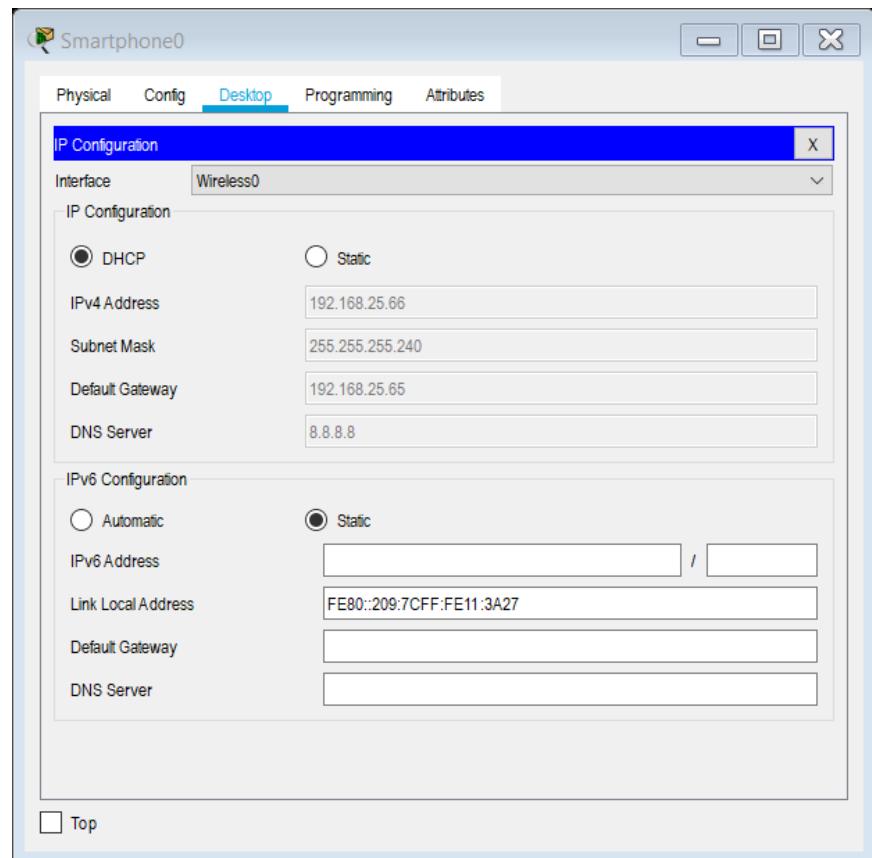
802.1X:

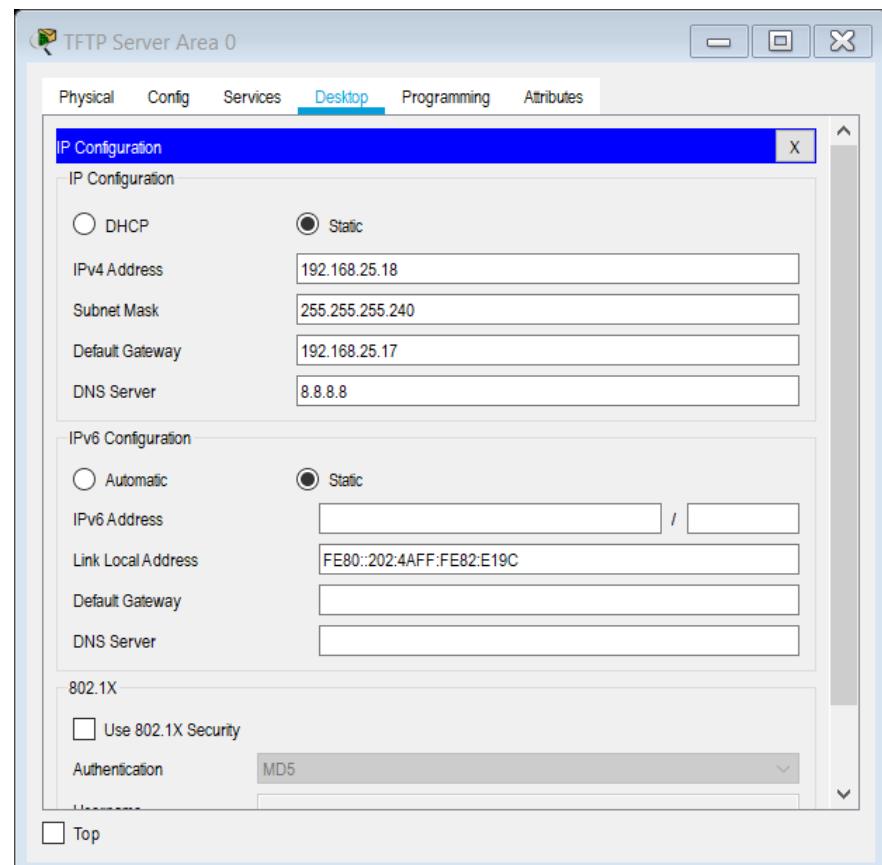
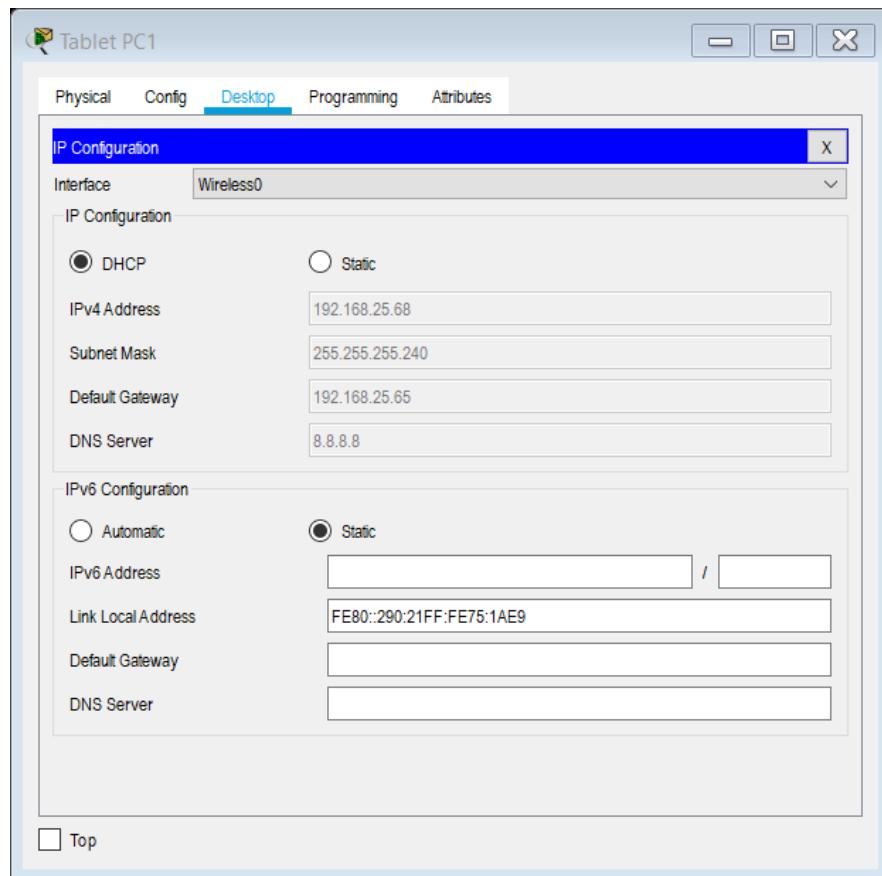
Use 802.1X Security

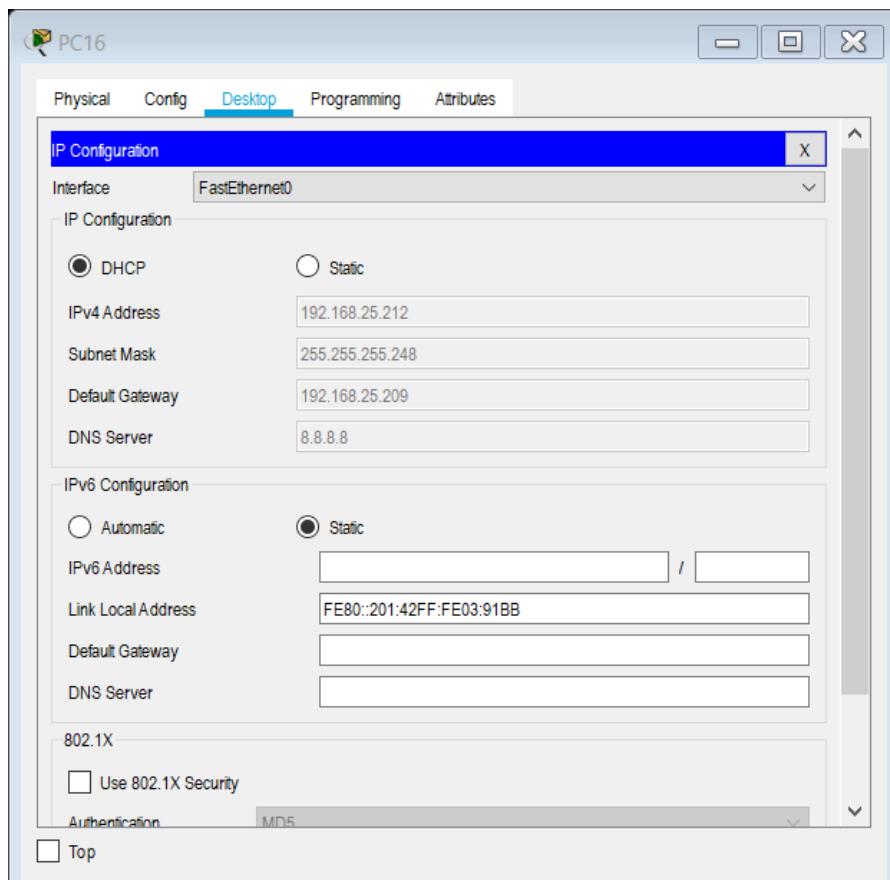
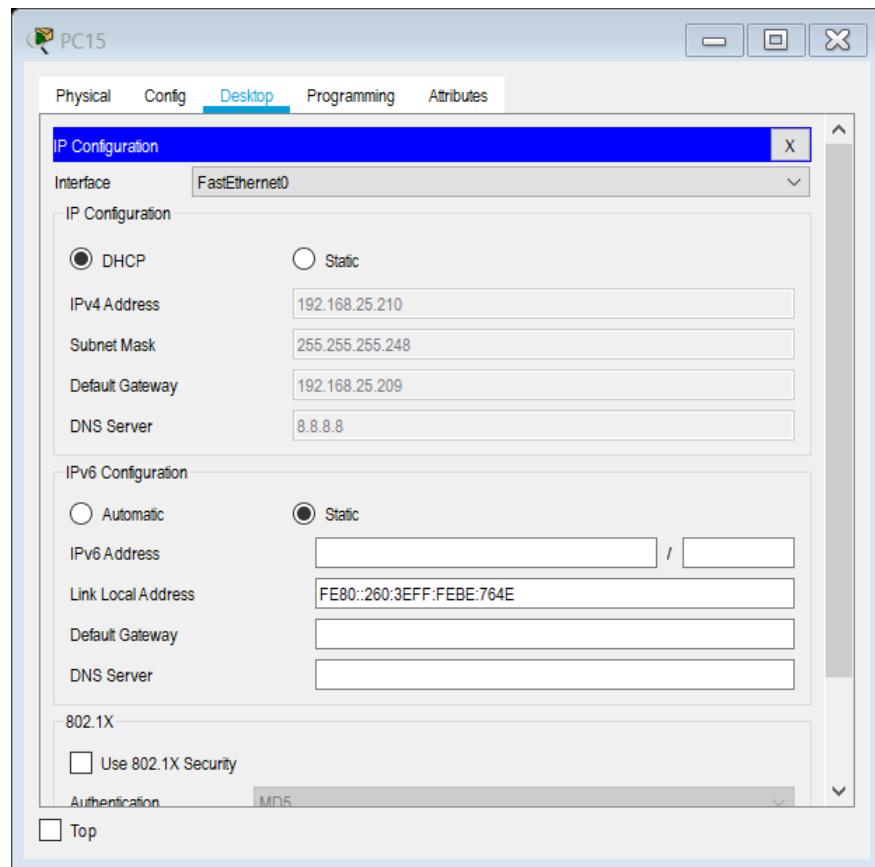
Authentication: MD5

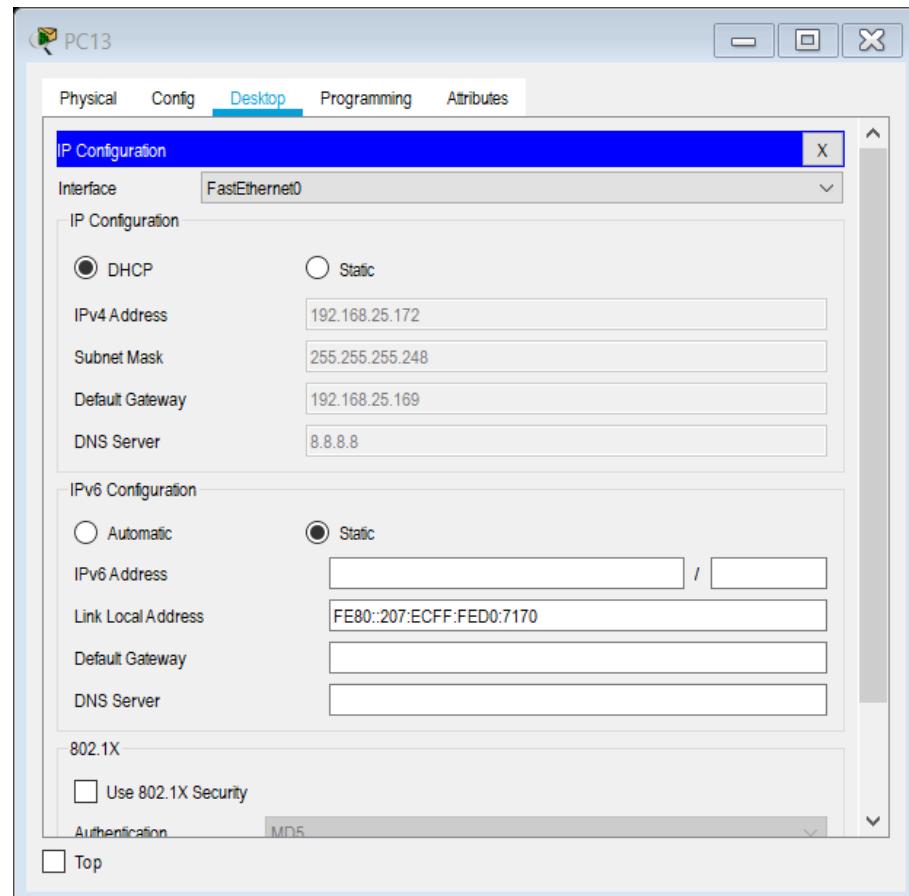
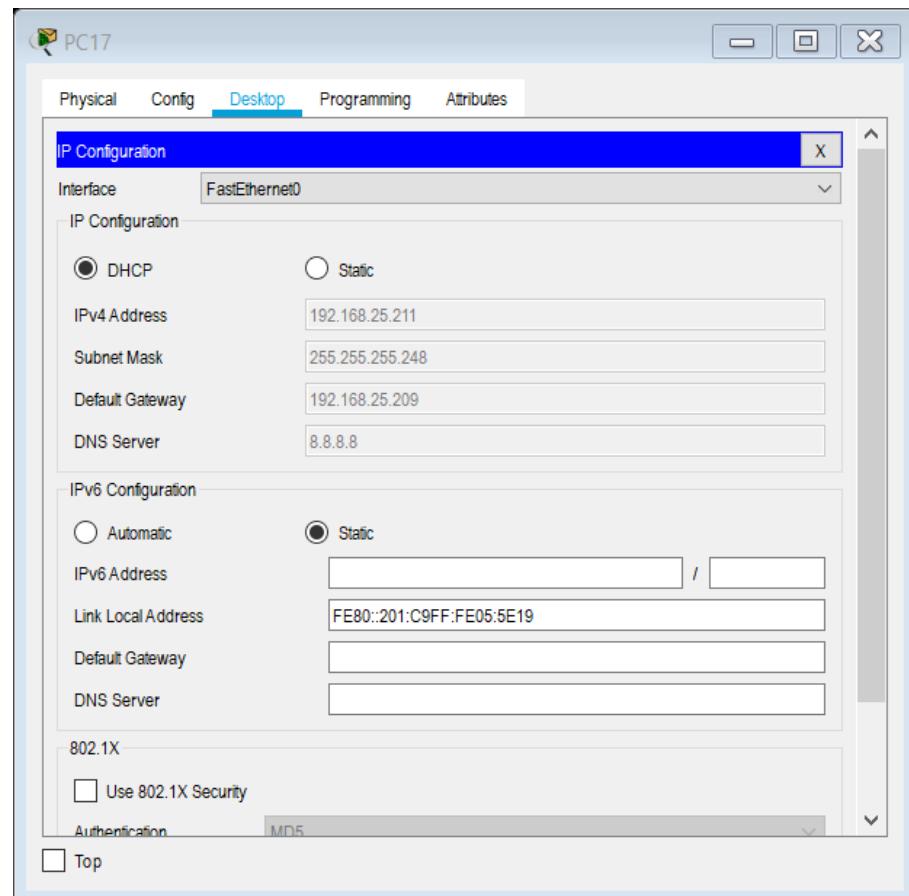
Top

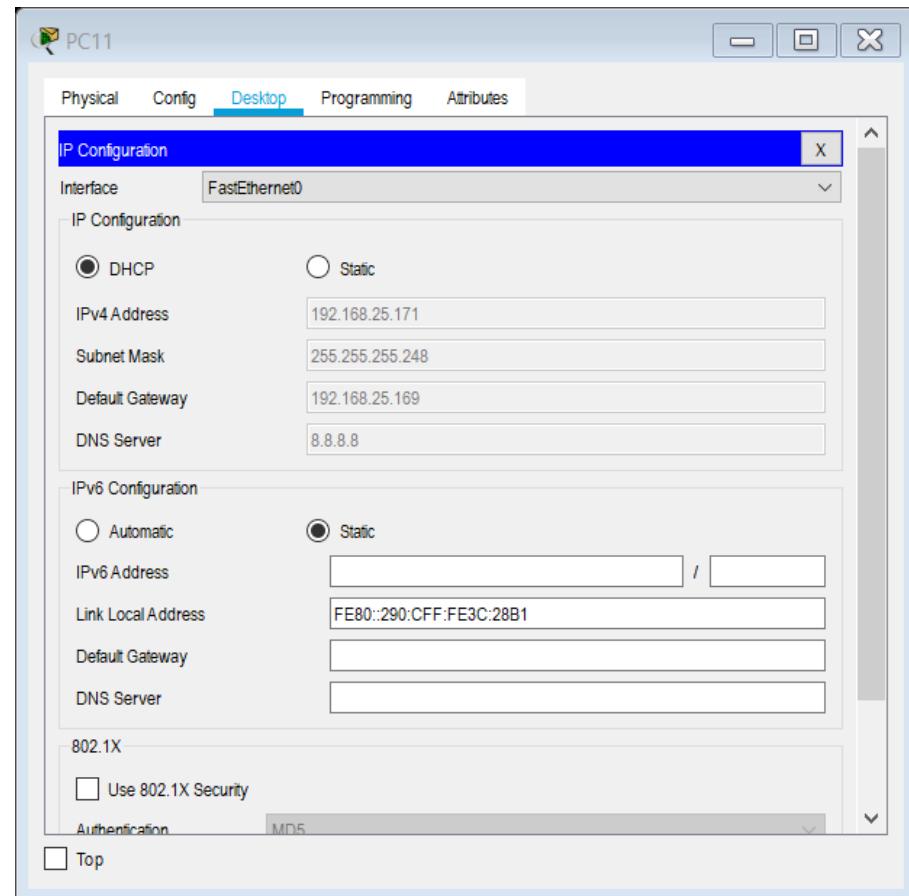
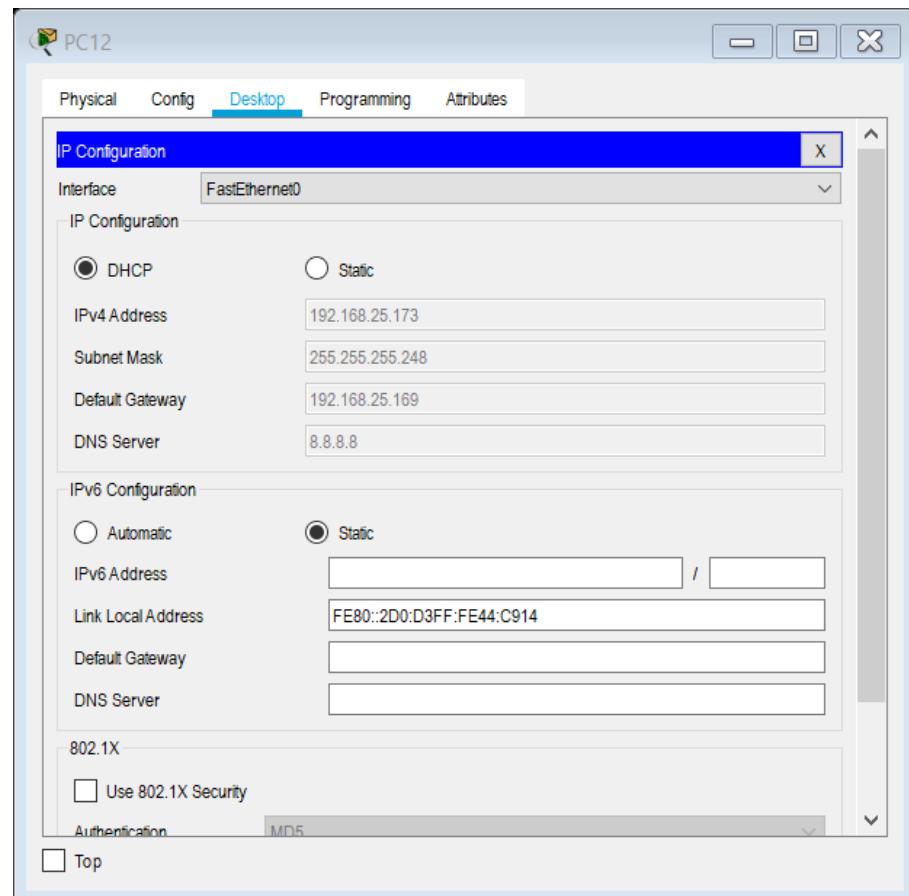


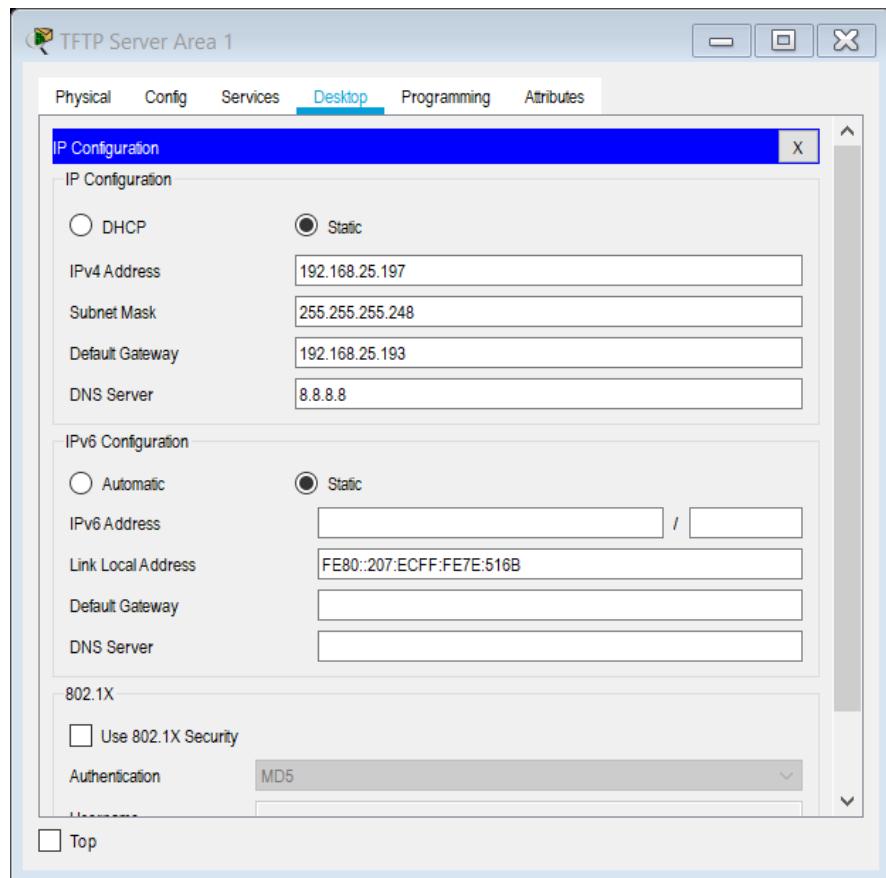












PC18

Physical Config Desktop Programming Attributes

IP Configuration

Interface: FastEthernet0

DHCP Static

IPv4 Address: 192.168.25.196

Subnet Mask: 255.255.255.248

Default Gateway: 192.168.25.193

DNS Server: 8.8.8.8

IPv6 Configuration

Automatic Static

IPv6 Address: [] / []

Link Local Address: FE80::290:21FF:FE54:19EE

Default Gateway: []

DNS Server: []

802.1X

Use 802.1X Security

Authentication: MD5

Top

PC14

Physical Config Desktop Programming Attributes

IP Configuration

Interface: FastEthernet0

DHCP Static

IPv4 Address: 192.168.25.195

Subnet Mask: 255.255.255.248

Default Gateway: 192.168.25.193

DNS Server: 8.8.8.8

IPv6 Configuration

Automatic Static

IPv6 Address: [] / []

Link Local Address: FE80::203:E4FF:FE0C:D75B

Default Gateway: []

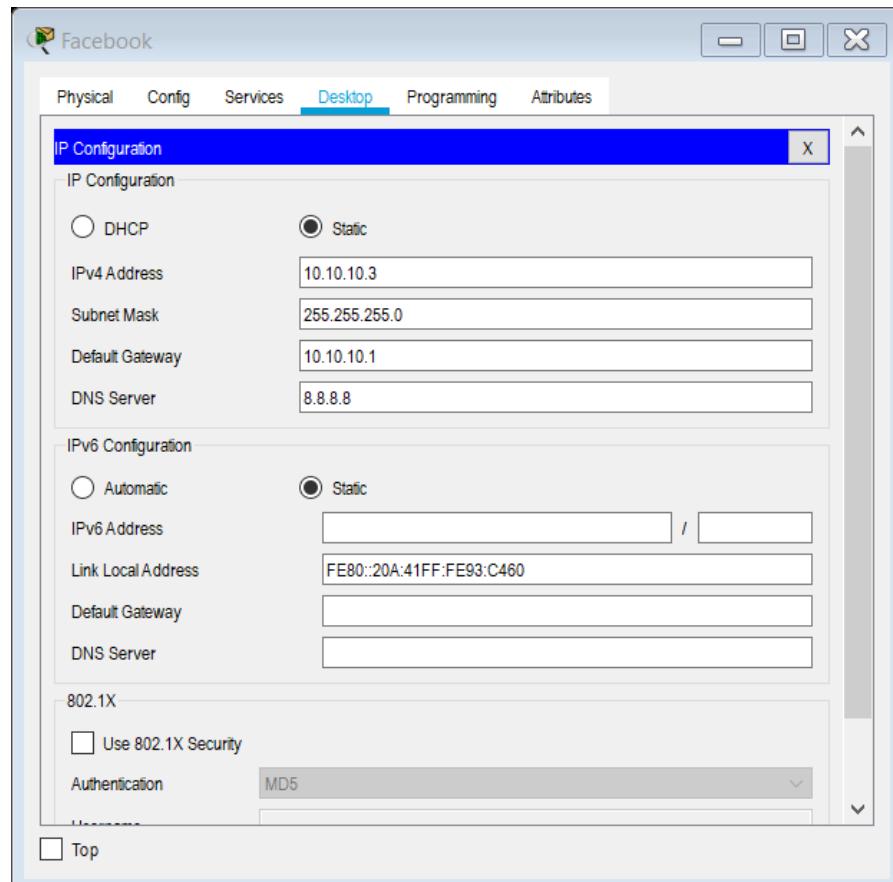
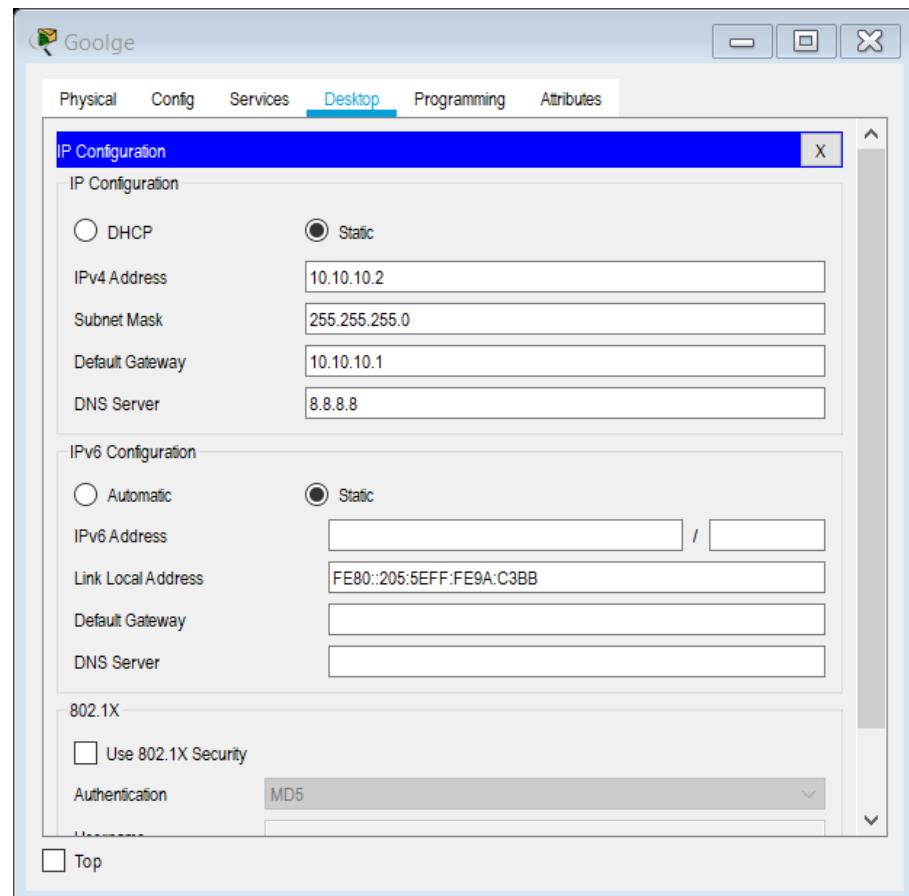
DNS Server: []

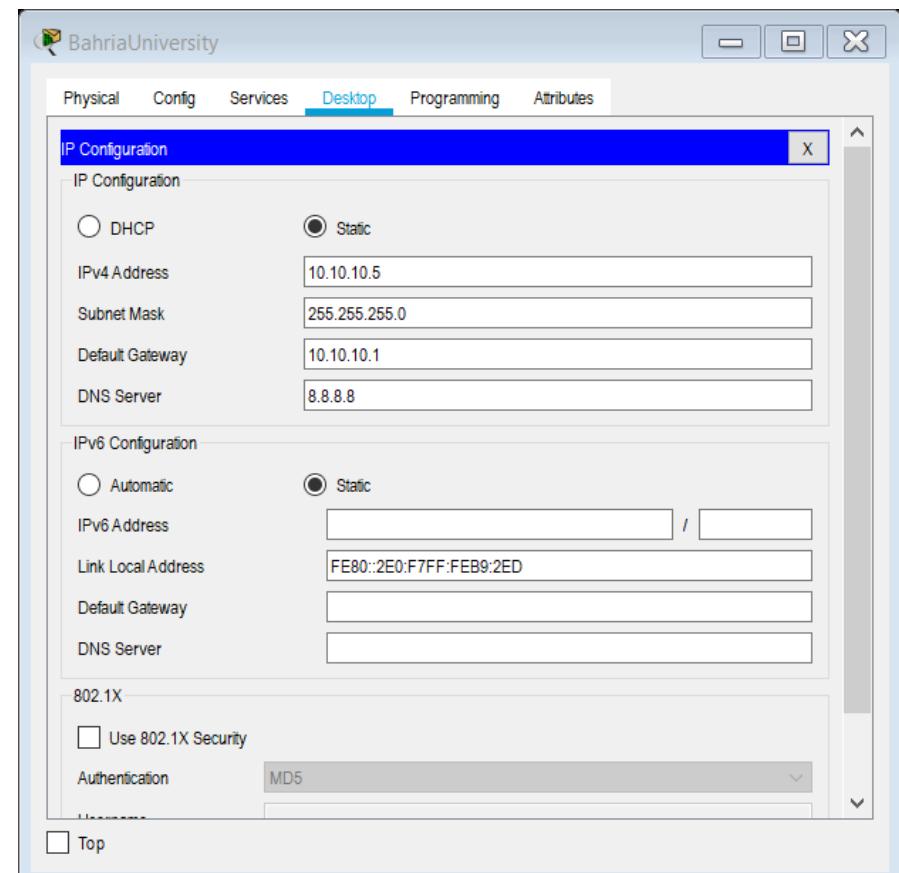
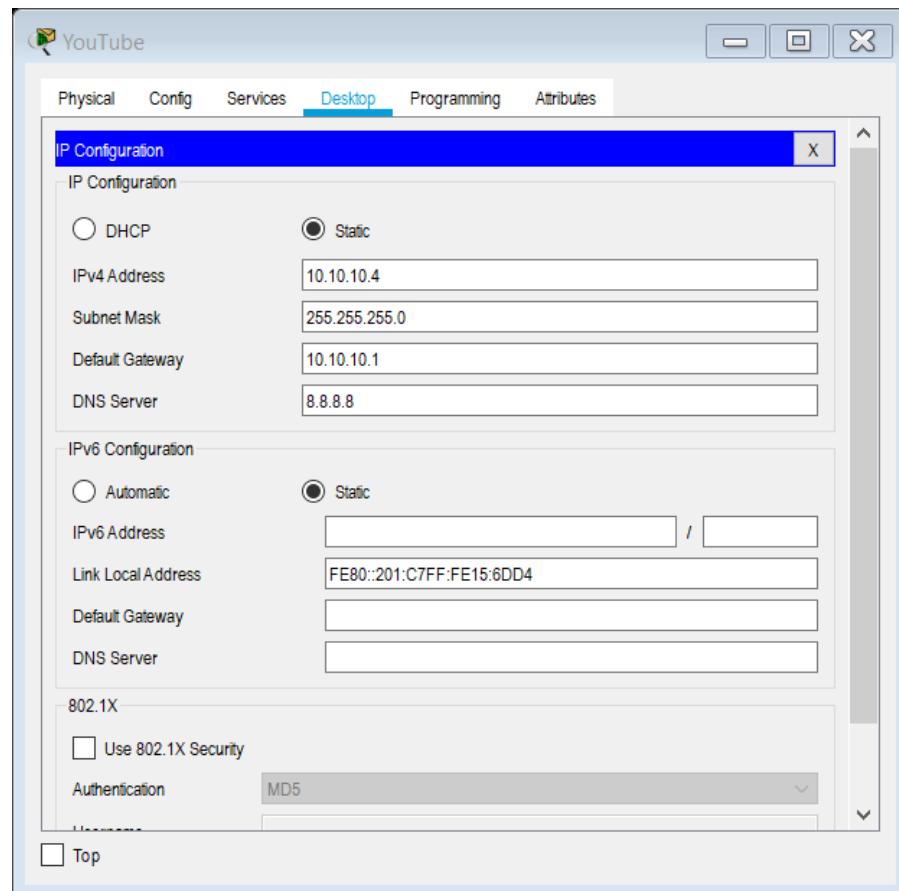
802.1X

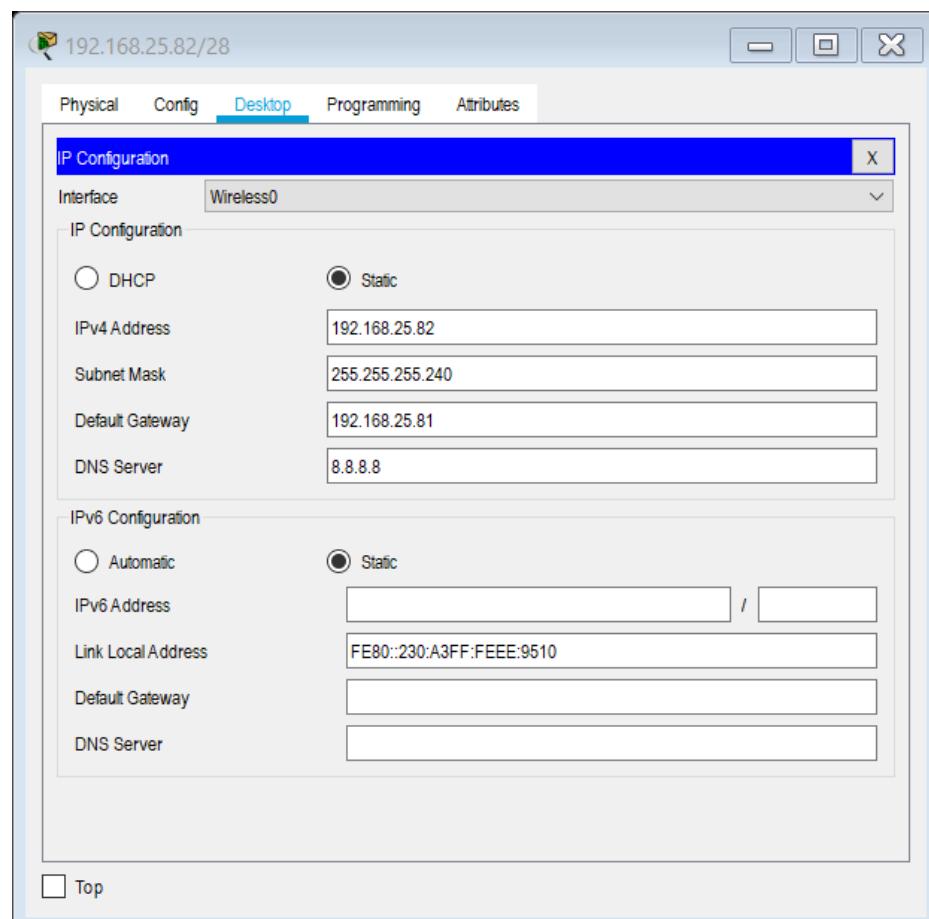
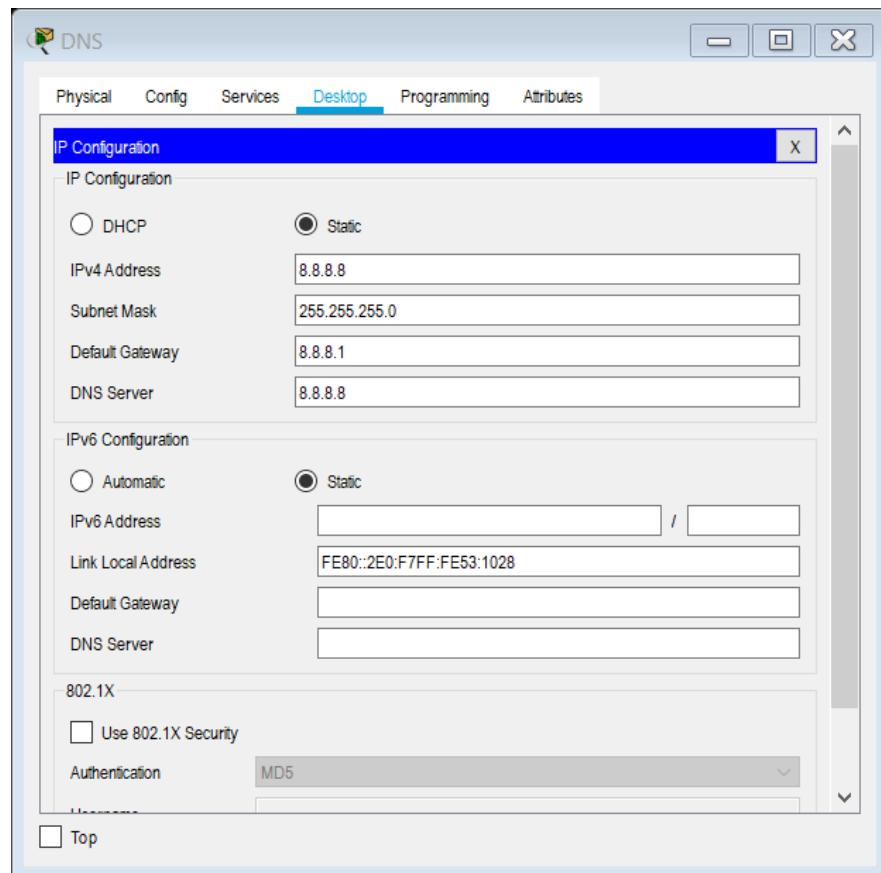
Use 802.1X Security

Authentication: MD5

Top







192.168.25.83/28

Physical Config Desktop Programming Attributes

IP Configuration

Interface: Wireless0

IP Configuration

DHCP Static

IPv4 Address: 192.168.25.83

Subnet Mask: 255.255.255.240

Default Gateway: 192.168.25.81

DNS Server: 8.8.8.8

IPv6 Configuration

Automatic Static

IPv6 Address: [] / []

Link Local Address: FE80::230:A3FF:FE02:6AE4

Default Gateway: []

DNS Server: []

Top

192.168.25.98/28

Physical Config Desktop Programming Attributes

IP Configuration

Interface: Wireless0

IP Configuration

DHCP Static

IPv4 Address: 192.168.25.98

Subnet Mask: 255.255.255.240

Default Gateway: 192.168.25.97

DNS Server: 8.8.8.8

IPv6 Configuration

Automatic Static

IPv6 Address: [] / []

Link Local Address: FE80::260:2FFF:FEB3:BA25

Default Gateway: []

DNS Server: []

Top

192.168.25.99/28

Physical Config Desktop Programming Attributes

IP Configuration

Interface: Wireless0

IP Configuration

DHCP Static

IPv4 Address: 192.168.25.99

Subnet Mask: 255.255.255.0

Default Gateway: 192.168.25.97

DNS Server: 8.8.8.8

IPv6 Configuration

Automatic Static

IPv6 Address: [] / []

Link Local Address: FE80::201:43FF:FEC5:8D3A

Default Gateway: []

DNS Server: []

Top

Smartphone1

Physical Config Desktop Programming Attributes

IP Configuration

Interface: Wireless0

IP Configuration

DHCP Static

IPv4 Address: 192.168.25.100

Subnet Mask: 255.255.255.240

Default Gateway: 192.168.25.97

DNS Server: 8.8.8.8

IPv6 Configuration

Automatic Static

IPv6 Address: [] / []

Link Local Address: FE80::209:7CFF:FECD:CB9D

Default Gateway: []

DNS Server: []

Top

192.168.25.114/28

Physical Config Desktop Programming Attributes

IP Configuration

Interface: Wireless0

IP Configuration

DHCP Static

IPv4 Address: 192.168.25.114

Subnet Mask: 255.255.255.240

Default Gateway: 192.168.25.113

DNS Server: 8.8.8.8

IPv6 Configuration

Automatic Static

IPv6 Address: /

Link Local Address: FE80::20A:F3FF:FE81:2351

Default Gateway:

DNS Server:

Top

192.168.25.115/28

Physical Config Desktop Programming Attributes

IP Configuration

Interface: Wireless0

IP Configuration

DHCP Static

IPv4 Address: 192.168.25.115

Subnet Mask: 255.255.255.240

Default Gateway: 192.168.25.113

DNS Server: 8.8.8.8

IPv6 Configuration

Automatic Static

IPv6 Address: /

Link Local Address: FE80::230:A3FF:FEAD:E3D7

Default Gateway:

DNS Server:

Top

192.168.25.130/28

Physical Config Desktop Programming Attributes

IP Configuration

Interface: Wireless0

IP Configuration

DHCP Static

IPv4 Address: 192.168.25.130

Subnet Mask: 255.255.255.240

Default Gateway: 192.168.25.129

DNS Server: 8.8.8.8

IPv6 Configuration

Automatic Static

IPv6 Address: /

Link Local Address: FE80::201:C7FF:FE6:31E8

Default Gateway:

DNS Server:

Top

192.168.25.131/28

Physical Config Desktop Programming Attributes

IP Configuration

Interface: Wireless0

IP Configuration

DHCP Static

IPv4 Address: 192.168.25.131

Subnet Mask: 255.255.255.240

Default Gateway: 192.168.25.129

DNS Server: 8.8.8.8

IPv6 Configuration

Automatic Static

IPv6 Address: /

Link Local Address: FE80::260:2FFF:FE67:BC57

Default Gateway:

DNS Server:

Top

Switch Configuration

VLAN

Switch 1:

```
S1>
S1>
S1>en
S1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
S1(config)#int f0/1
S1(config-if)#sw mode trunk

S1(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

S1(config-if)#exit
S1(config)#[/pre>
```

Switch 2:

```
S2>
S2>en
S2#conf t
Enter configuration commands, one per line. End with CNTL/Z.
S2(config)#int f0/1
S2(config-if)#sw mode trunk

S2(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

S2(config-if)#exit
S2(config)#[/pre>
```

Switch 3:

```
S3>en
S3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
S3(config)#int f0/1
S3(config-if)#sw mode trunk

S3(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

S3(config-if)#exit
S3(config)#[/pre>
```

Switch 4:

```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname S4
S4(config)#vlan 10
S4(config-vlan)#name AAA
S4(config-vlan)#exit
S4(config)#vlan 20
S4(config-vlan)#name BBB
S4(config-vlan)#exit
S4(config)#vlan 30
S4(config-vlan)#name CCC
S4(config-vlan)#exit
S4(config)#
S4#
%SYS-5-CONFIG_I: Configured from console by console

S4#show vlan br

VLAN Name          Status      Ports
---- -----
1    default        active     Fa0/1, Fa0/2, Fa0/3, Fa0/4
                           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

10   AAA            active
20   BBB            active
30   CCC            active
1002 fddi-default  active
1003 token-ring-default  active
1004 fddinet-default  active
1005 trnet-default   active
S4#config t
Enter configuration commands, one per line. End with CNTL/Z.
S4(config)#interface fa 0/2
S4(config-if)#switchport mode access
S4(config-if)#switchport access vlan 10
S4(config-if)#exit
S4(config)#interface fa 0/3
S4(config-if)#switchport access vlan 20
S4(config-if)#switchport mode access
S4(config-if)#switchport access vlan 20
S4(config-if)#exit
S4(config)#interface fa 0/4
S4(config-if)#switchport mode access
S4(config-if)#switchport access vlan 30
S4(config-if)#exit
S4(config)#

S4#
%SYS-5-CONFIG_I: Configured from console by console

S4#show vlan br

VLAN Name          Status      Ports
---- -----
1    default        active     Fa0/1, 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

10   AAA            active     Fa0/2
20   BBB            active     Fa0/3
30   CCC            active     Fa0/4
1002 fddi-default  active
1003 token-ring-default  active
1004 fddinet-default  active
1005 trnet-default   active
S4#
S4#
S4#config t
Enter configuration commands, one per line. End with CNTL/Z.
S4(config)#interface fa 0/1
S4(config-if)#switchport mode trunk

S4(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

S4(config-if)#
S4#
%SYS-5-CONFIG_I: Configured from console by console
...
```

Switch 6:

```
S6>
S6>en
S6#conf t
Enter configuration commands, one per line. End with CNTL/Z.
S6(config)#int f0/1
S6(config-if)#sw mode trunk

S6(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to down
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

S6(config-if)#exit
S6(config)#

```

Switch 9:

```
Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname S9
S9(config)#vlan 50
S9(config-vlan)#name DATA
S9(config-vlan)#exit
S9(config)#vlan 60
S9(config-vlan)#name VOICE
S9(config-vlan)#exit
S9(config)#vlan 70
S9(config-vlan)#name NATIVE
S9(config-vlan)#exit
S9(config)#interface fa 0/1
S9(config-if)#switchport mode trunk
S9(config-if)#switchport native vlan 70
^
* Invalid input detected at '^' marker.

S9(config-if)#switchport trunk native vlan 70
S9(config-if)#exit
S9(config)#interface range fa 0/2-4
S9(config-if-range)#switchport mode access
S9(config-if-range)#switchport access vlan 50
S9(config-if-range)#switchport voice vlan 60
S9(config-if-range)#exit
S9(config)#
S9#
%SYS-5-CONFIG_I: Configured from console by console

S9#show vlan brief

VLAN Name          Status    Ports
----- -----
1    default        active    Fa0/1, 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
50   DATA           active    Fa0/2, Fa0/3, Fa0/4
60   VOICE          active    Fa0/2, Fa0/3, Fa0/4
70   NATIVE         active
1002  fddi-default active
1003  token-ring-default active
1004  fddinet-default active
1005  trnet-default active

S9#show ip int brief
Interface      IP-Address      OK? Method Status      Protocol
FastEthernet0/1 unassigned      YES manual down      down
FastEthernet0/2 unassigned      YES manual up       up
FastEthernet0/3 unassigned      YES manual up       up

```

| VLAN Name | Status | Ports |
|--|------------|--|
| 1 default | active | Fa0/1, 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 |
| 50 DATA | active | Fa0/2, Fa0/3, Fa0/4 |
| 60 VOICE | active | Fa0/2, Fa0/3, Fa0/4 |
| 70 NATIVE | active | |
| 1002 fddi-default | active | |
| 1003 token-ring-default | active | |
| 1004 fddinet-default | active | |
| 1005 trnet-default | active | |
| S9#show ip int brief | | |
| Interface | IP-Address | OK? Method Status Protocol |
| FastEthernet0/1 | unassigned | YES manual down down |
| FastEthernet0/2 | unassigned | YES manual up up |
| FastEthernet0/3 | unassigned | YES manual up up |
| FastEthernet0/4 | unassigned | YES manual up up |
| FastEthernet0/5 | unassigned | YES manual down down |
| FastEthernet0/6 | unassigned | YES manual down down |
| FastEthernet0/7 | unassigned | YES manual down down |
| FastEthernet0/8 | unassigned | YES manual down down |
| FastEthernet0/9 | unassigned | YES manual down down |
| FastEthernet0/10 | unassigned | YES manual down down |
| FastEthernet0/11 | unassigned | YES manual down down |
| FastEthernet0/12 | unassigned | YES manual down down |
| FastEthernet0/13 | unassigned | YES manual down down |
| FastEthernet0/14 | unassigned | YES manual down down |
| FastEthernet0/15 | unassigned | YES manual down down |
| FastEthernet0/16 | unassigned | YES manual down down |
| FastEthernet0/17 | unassigned | YES manual down down |
| FastEthernet0/18 | unassigned | YES manual down down |
| FastEthernet0/19 | unassigned | YES manual down down |
| FastEthernet0/20 | unassigned | YES manual down down |
| FastEthernet0/21 | unassigned | YES manual down down |
| FastEthernet0/22 | unassigned | YES manual down down |
| FastEthernet0/23 | unassigned | YES manual down down |
| FastEthernet0/24 | unassigned | YES manual down down |
| GigabitEthernet0/1 | unassigned | YES manual down down |
| GigabitEthernet0/2 | unassigned | YES manual down down |
| Vlan1 | unassigned | YES manual administratively down down |
| S9# | | |
| S9# | | |
| S9# | | |
| S9#copy running-config startup-config | | |
| Destination filename [startup-config]? | | |
| Building configuration... | | |
| [OK] | | |
| S9# | | |
| S9# | | |

```

S9>
S9>en
S9#conf t
Enter configuration commands, one per line. End with CNTL/Z.
S9(config)#vlan 100
S9(config-vlan)#name MANAGER
S9(config-vlan)#exit
S9(config)#interface range fa 0/10-15
S9(config-if-range)#switchport mode access
S9(config-if-range)#switchport access vlan 100
S9(config-if-range)#exit
S9(config)#
S9#
%SYS-5-CONFIG_I: Configured from console by console

S9#show vlan brief
      ^
% Invalid input detected at '^' marker.

S9#show vlan brief



| VLAN Name               | Status | Ports                                                                                                                           |
|-------------------------|--------|---------------------------------------------------------------------------------------------------------------------------------|
| 1 default               | active | Fa0/5, Fa0/6, Fa0/7, Fa0/8<br>Fa0/9, Fa0/16, Fa0/17, Fa0/18<br>Fa0/19, Fa0/20, Fa0/21, Fa0/22<br>Fa0/23, Fa0/24, Gig0/1, Gig0/2 |
| 50 DATA                 | active | Fa0/2, Fa0/3, Fa0/4                                                                                                             |
| 60 VOICE                | active | Fa0/2, Fa0/3, Fa0/4                                                                                                             |
| 70 NATIVE               | active |                                                                                                                                 |
| 100 MANAGER             | active | Fa0/10, Fa0/11, Fa0/12, Fa0/13<br>Fa0/14, Fa0/15                                                                                |
| 1002 fddi-default       | active |                                                                                                                                 |
| 1003 token-ring-default | active |                                                                                                                                 |
| 1004 fddinet-default    | active |                                                                                                                                 |
| 1005 trnet-default      | active |                                                                                                                                 |


S9#

```

Switch 10:

```

Switch>enable
Switch#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Switch(config)#hostname S10
S10(config)#vlan 150
S10(config-vlan)#name DATA
S10(config-vlan)#exit
S10(config)#vlan 160
S10(config-vlan)#name VOICE
S10(config-vlan)#exit
S10(config)#vlan 170
S10(config-vlan)#name NATIVE
S10(config-vlan)#exit
S10(config)#interface fa 0/1
S10(config-if)#sw mode trunk

S10(config-if)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, char
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, char

S10(config-if)#sw trunk native vlan 170
S10(config-if)#exit
S10(config)#interface range fa 0/2-4
%LINK-3-UPDOWN: Interface FastEthernet0/3, changed state to down

```

```

S10(config-if-range)#sw mode access
S10(config-if-range)#switchport mode access
S10(config-if-range)#switchport access vlan 150
S10(config-if-range)#switchport voice vlan 160
S10(config-if-range)#exit
S10(config)#
S10#
%SYS-5-CONFIG_I: Configured from console by console

S10#show vlan br

VLAN Name          Status    Ports
---- -
1    default        active    Fa0/1, 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
150   DATA          active    Fa0/2, Fa0/3, Fa0/4
160   VOICE         active    Fa0/2, Fa0/3, Fa0/4
170   NATIVE        active
1002  fddi-default  active
1003  token-ring-default  active
1004  fddinet-default  active
1005  trnet-default   active
S10#show ip int br
Interface      IP-Address      OK? Method Status      Protocol
FastEthernet0/1  unassigned     YES manual down      down
FastEthernet0/2  unassigned     YES manual up       up
FastEthernet0/3  unassigned     YES manual up       up
FastEthernet0/4  unassigned     YES manual up       up
FastEthernet0/5  unassigned     YES manual down     down
FastEthernet0/6  unassigned     YES manual down     down
FastEthernet0/7  unassigned     YES manual down     down
FastEthernet0/8  unassigned     YES manual down     down
FastEthernet0/9  unassigned     YES manual down     down
FastEthernet0/10  unassigned    YES manual down     down
FastEthernet0/11  unassigned    YES manual down     down
FastEthernet0/12  unassigned    YES manual down     down
FastEthernet0/13  unassigned    YES manual down     down
FastEthernet0/14  unassigned    YES manual down     down
FastEthernet0/15  unassigned    YES manual down     down
FastEthernet0/16  unassigned    YES manual down     down
FastEthernet0/17  unassigned    YES manual down     down
FastEthernet0/18  unassigned    YES manual down     down
FastEthernet0/19  unassigned    YES manual down     down
FastEthernet0/20  unassigned    YES manual down     down
FastEthernet0/21  unassigned    YES manual down     down
FastEthernet0/22  unassigned    YES manual down     down
FastEthernet0/23  unassigned    YES manual down     down
FastEthernet0/24  unassigned    YES manual down     down
GigabitEthernet0/1 unassigned    YES manual down     down
GigabitEthernet0/2 unassigned    YES manual down     down
Vlan1           unassigned     YES manual administratively down down
S10#
S10#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
S10#

```

Router Configuration

Assigning IP to Fast Ethernet Interfaces

Sample Code:

```
Router>en
```

```
Router>conf t
```

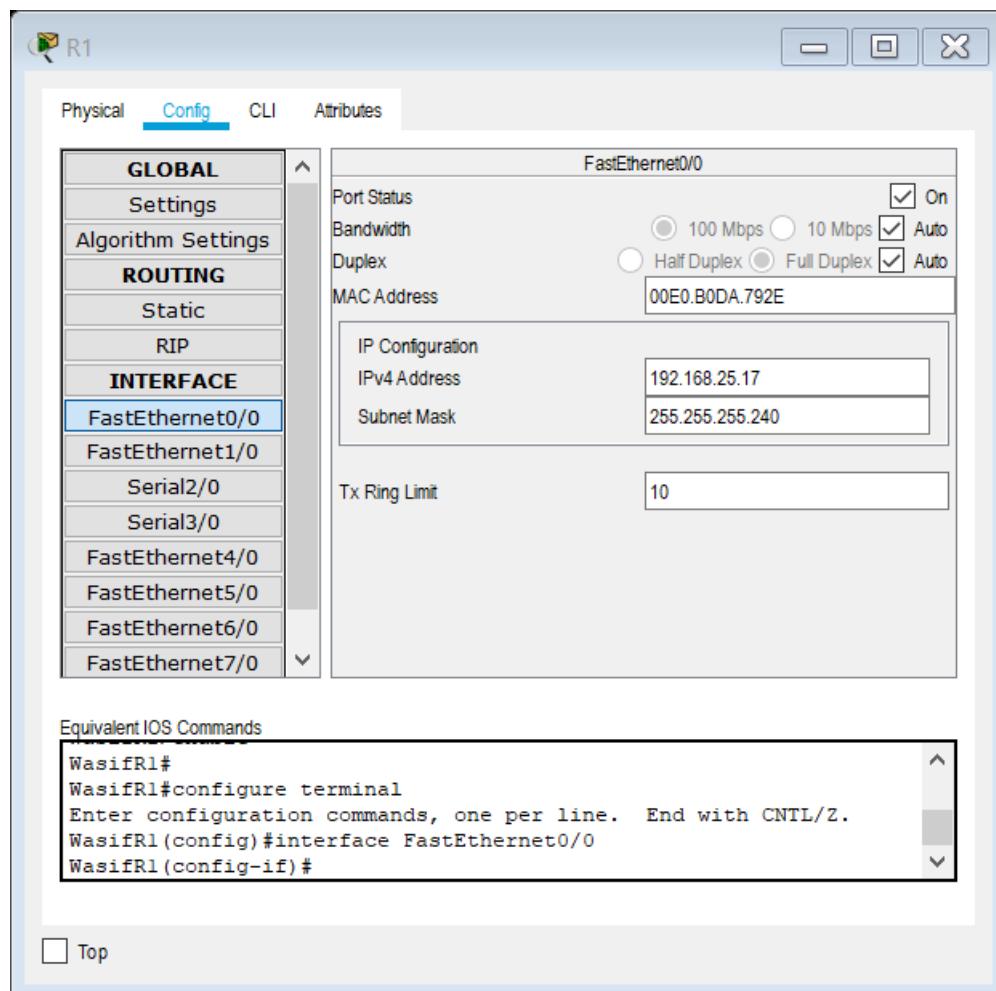
```
Router#int f0/0
```

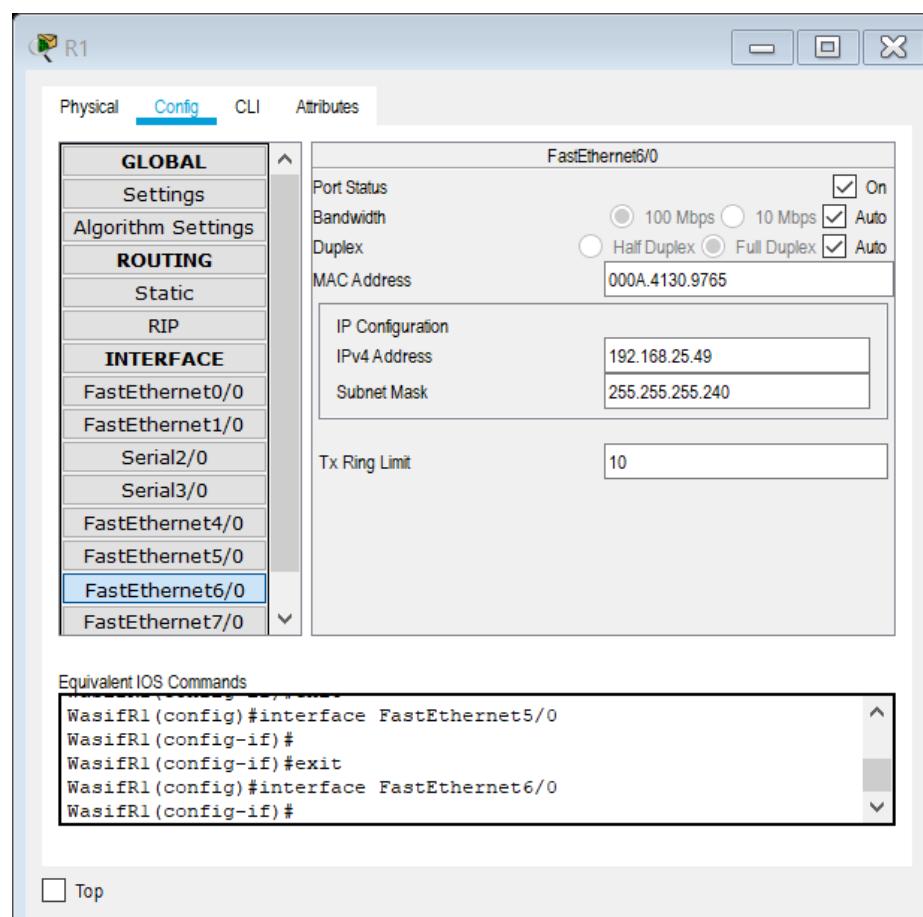
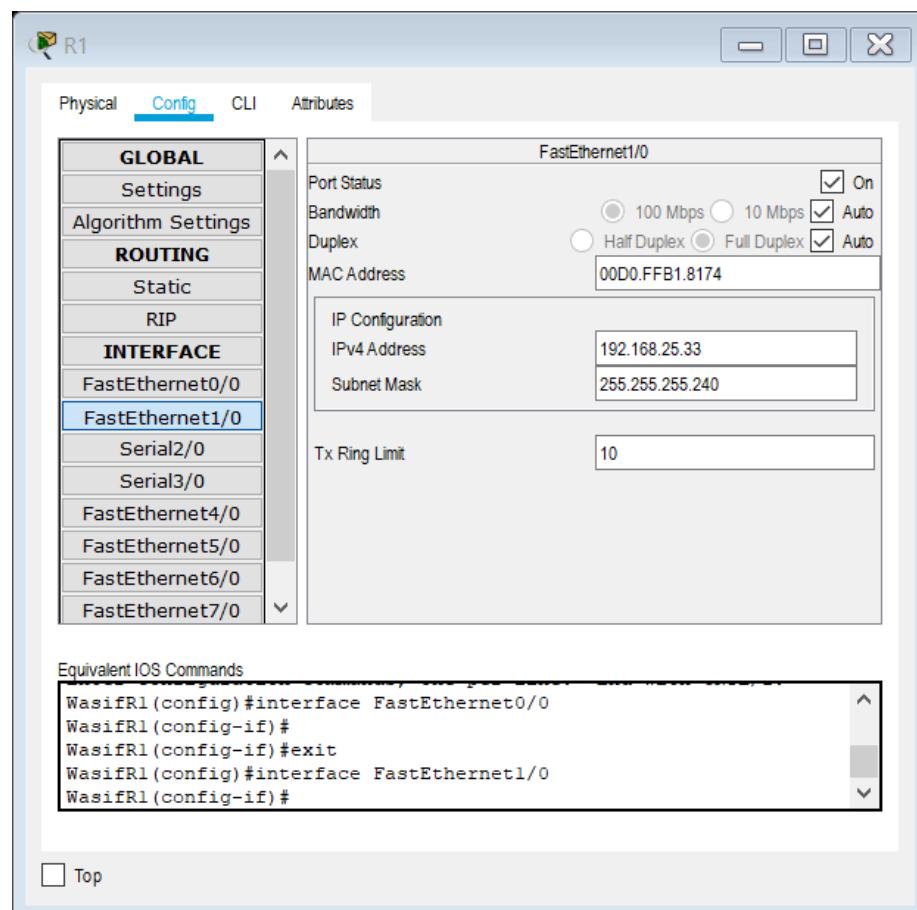
```
Router(config-if)#ip address 192.168.25.17 255.255.255.240
```

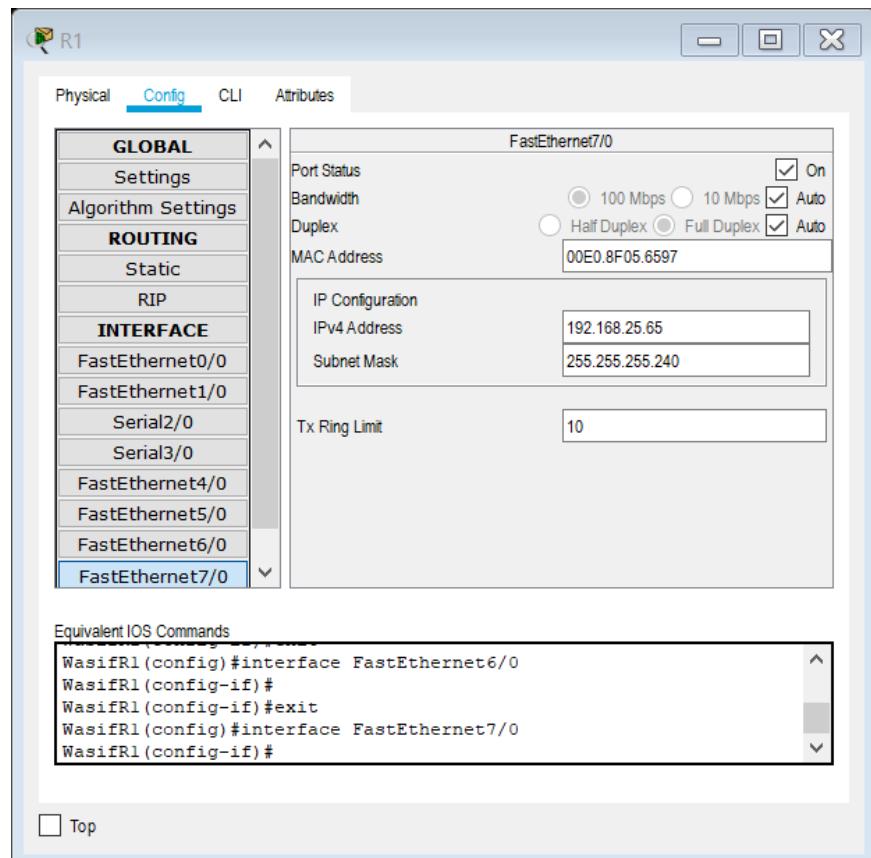
```
Router(config-if)#no shut
```

```
Router(config-if)#exit
```

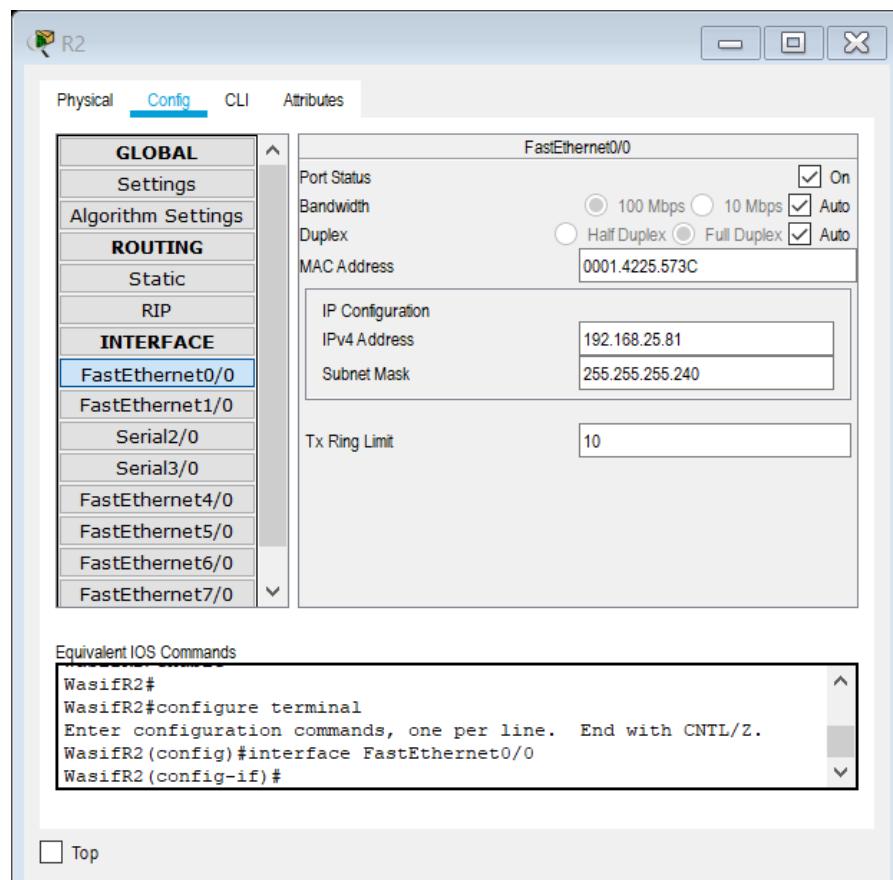
Router 1

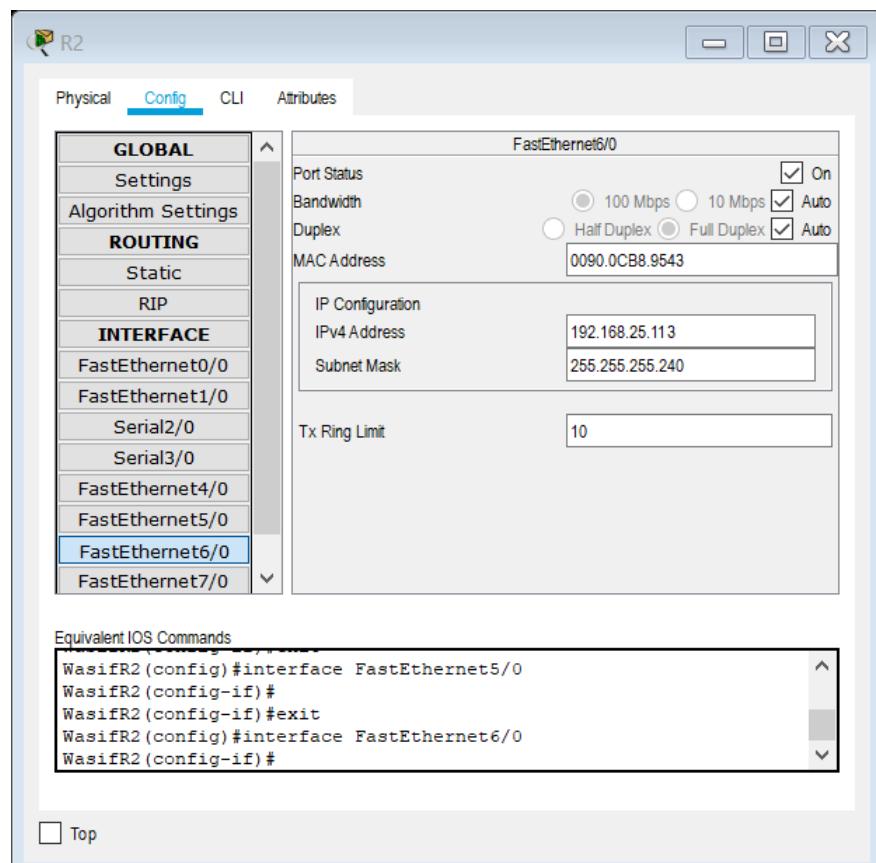
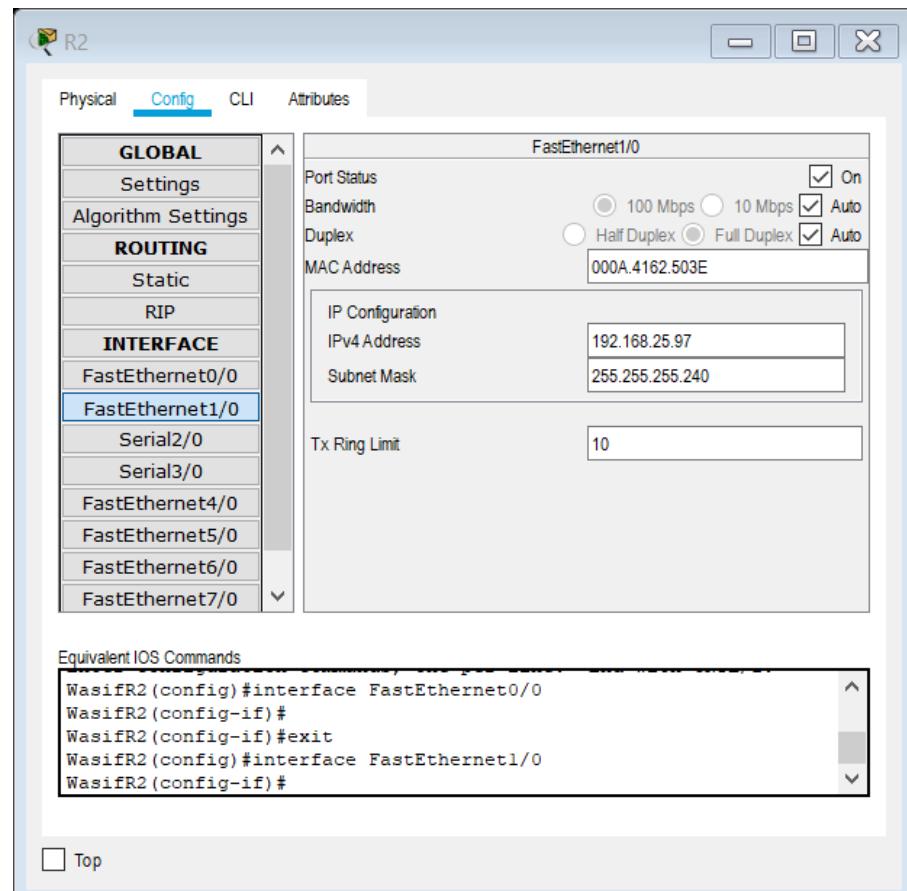


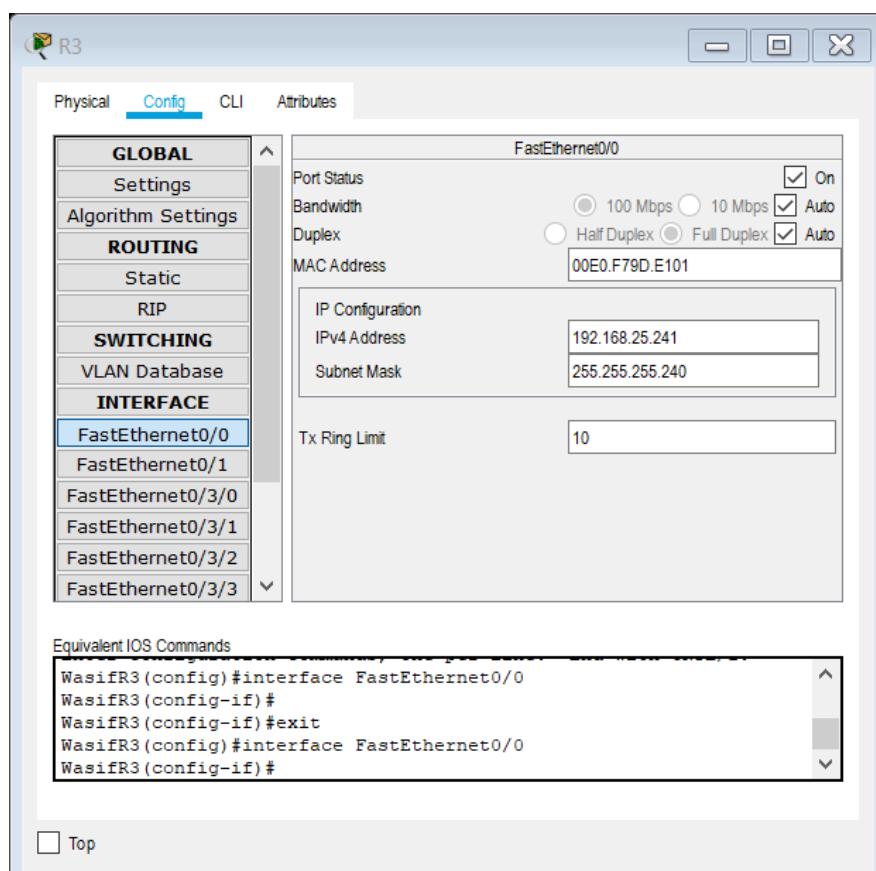
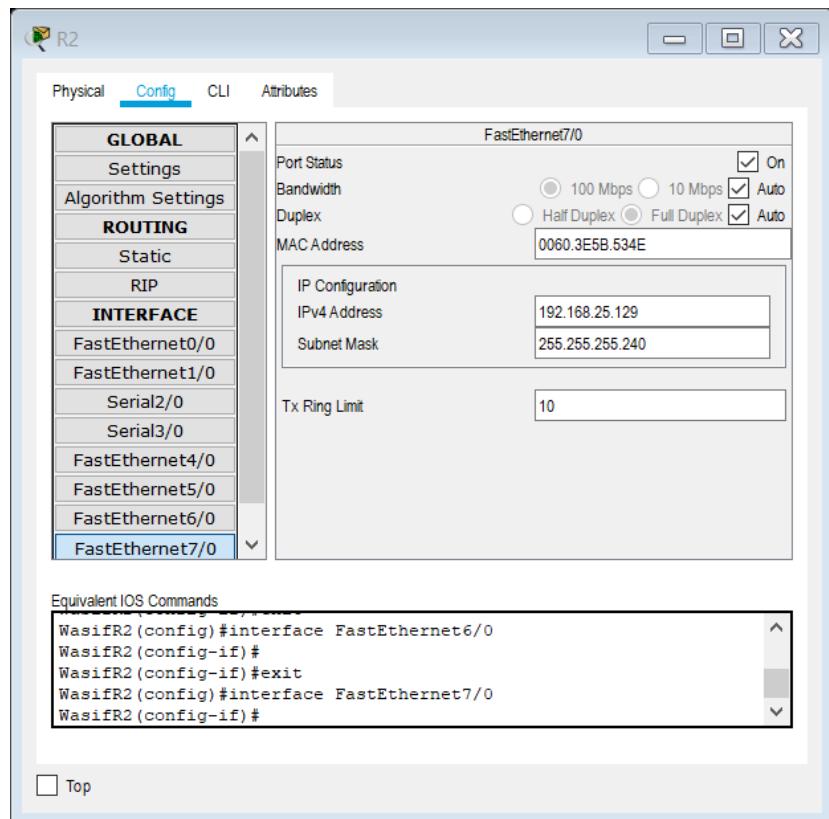




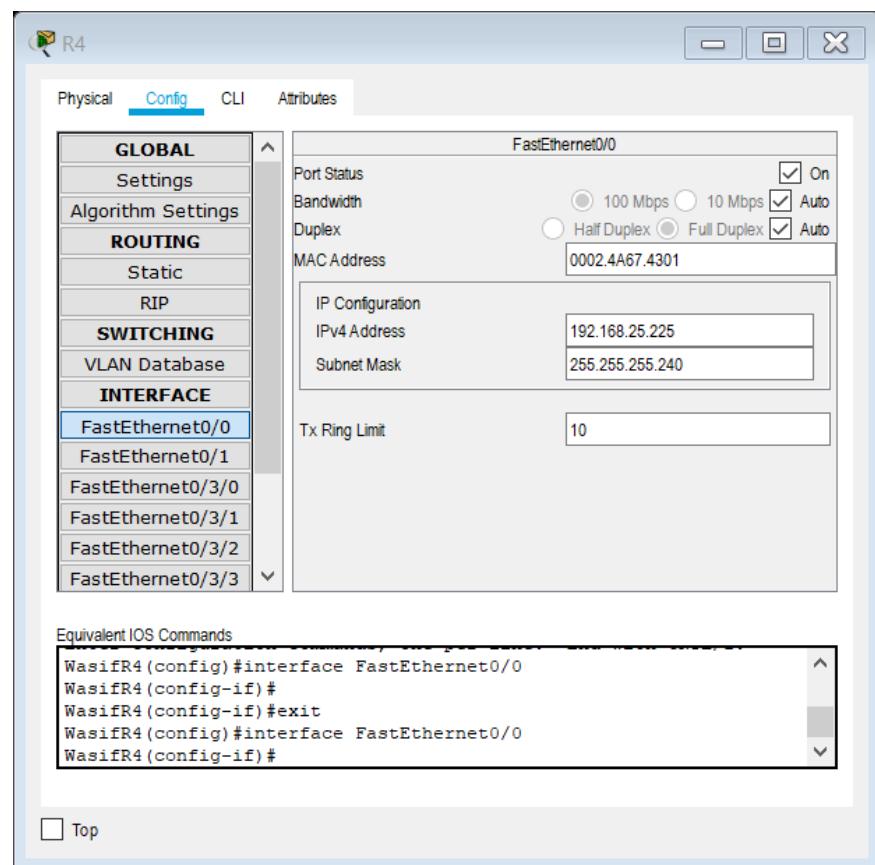
Router 2



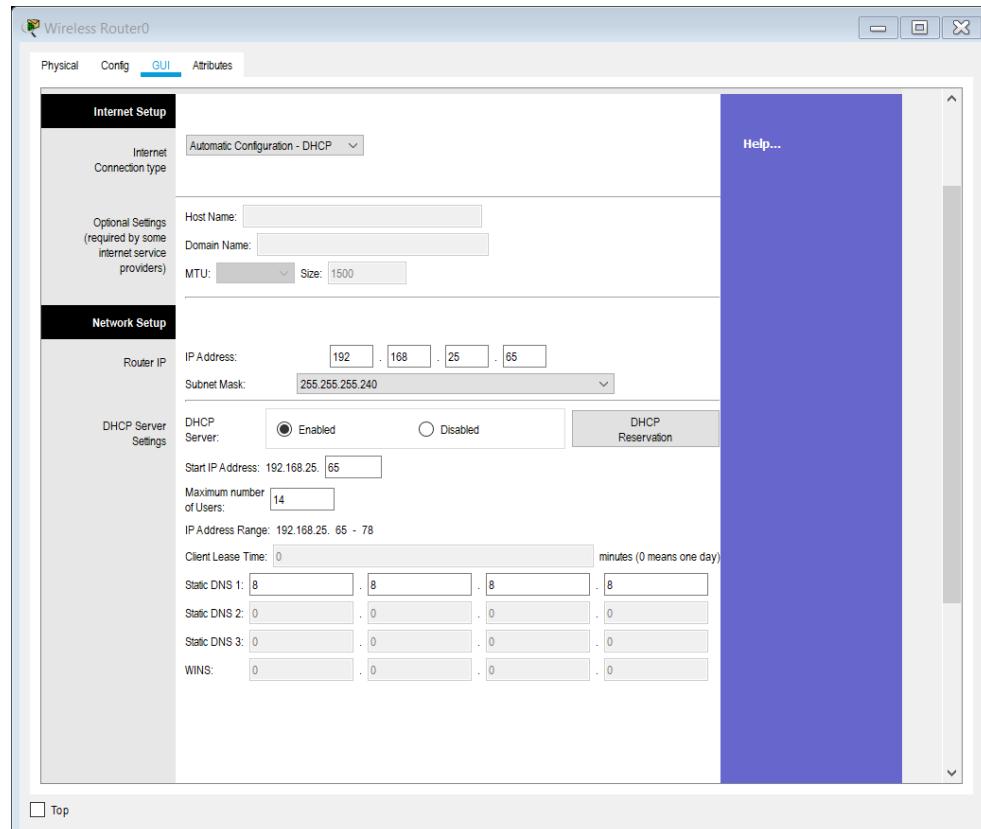




Router 4



Wifi Router



Assigning IP to Serial Port Interfaces

Sample Code:

```
Router>en
```

```
Router>conf t
```

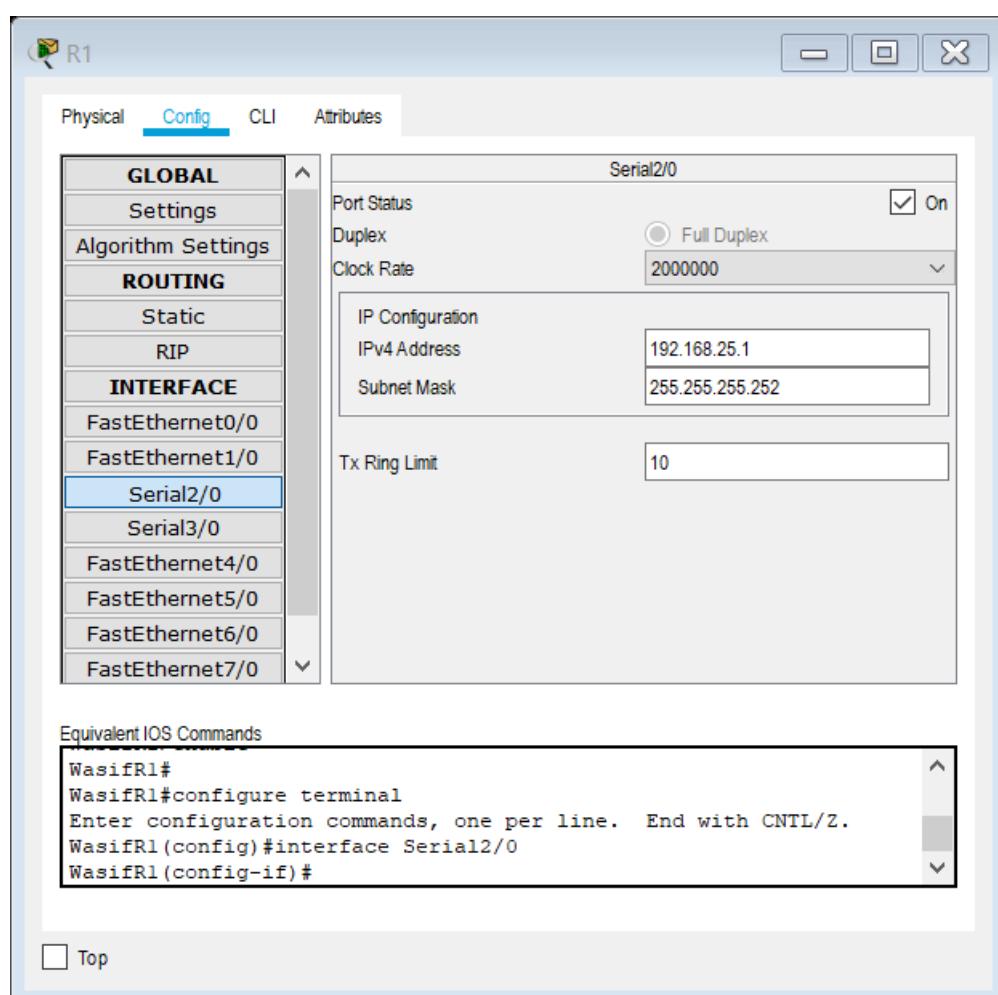
```
Router#int serial2/0
```

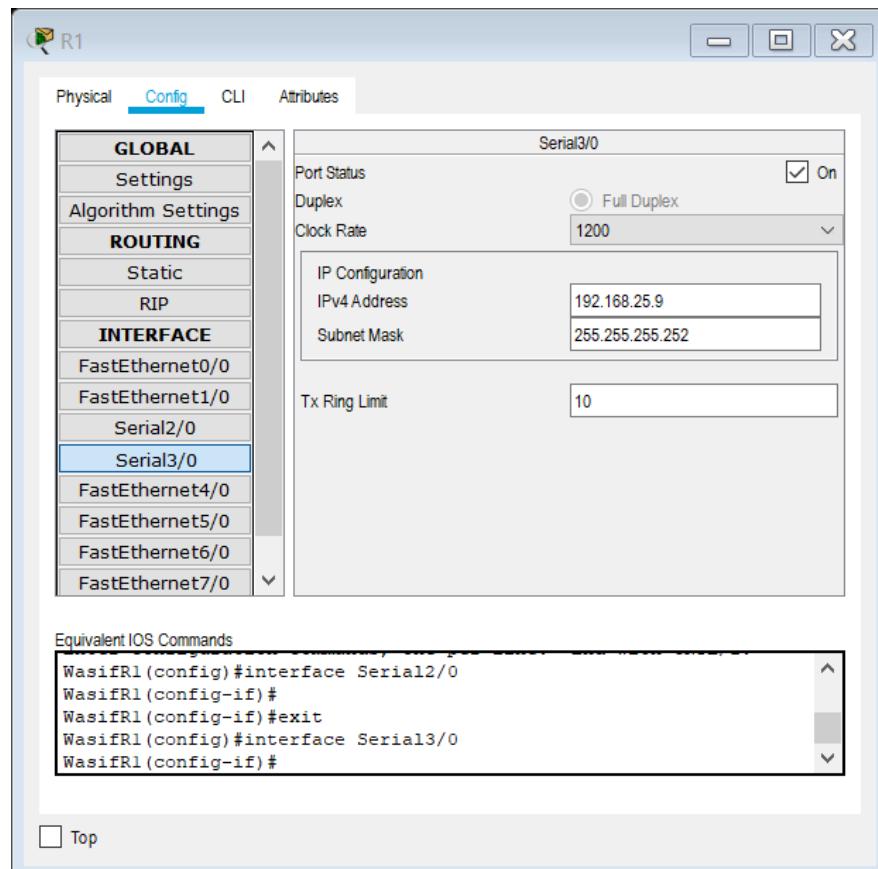
```
Router(config-if)#ip address 192.168.25.1 255.255.255.252
```

```
Router(config-if)#no shut
```

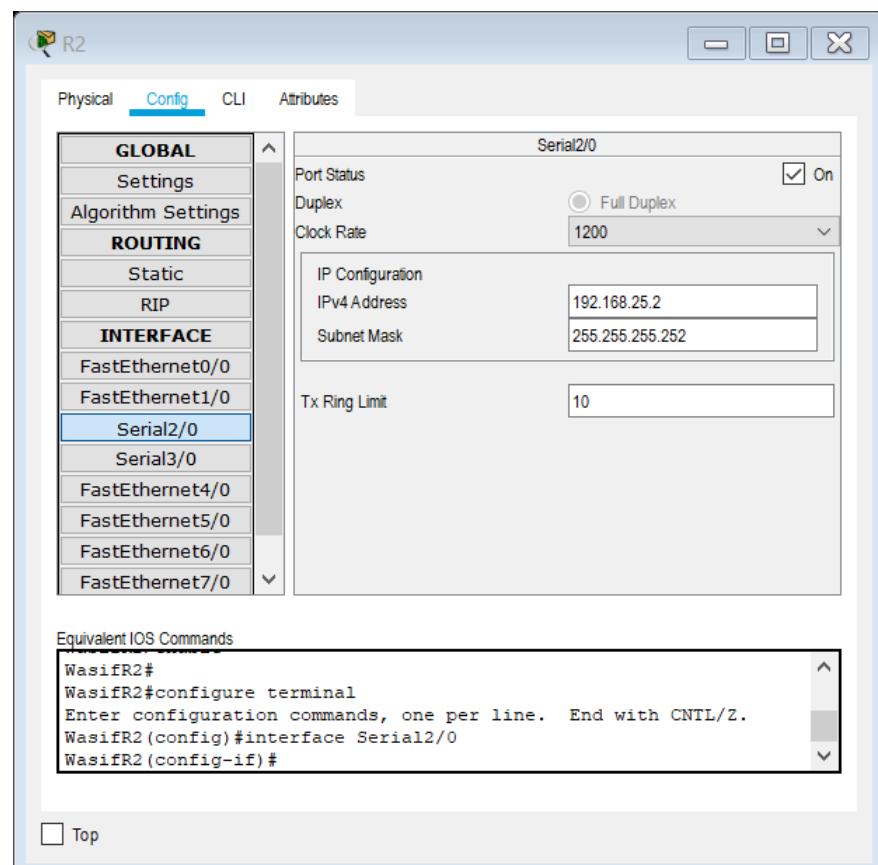
```
Router(config-if)#exit
```

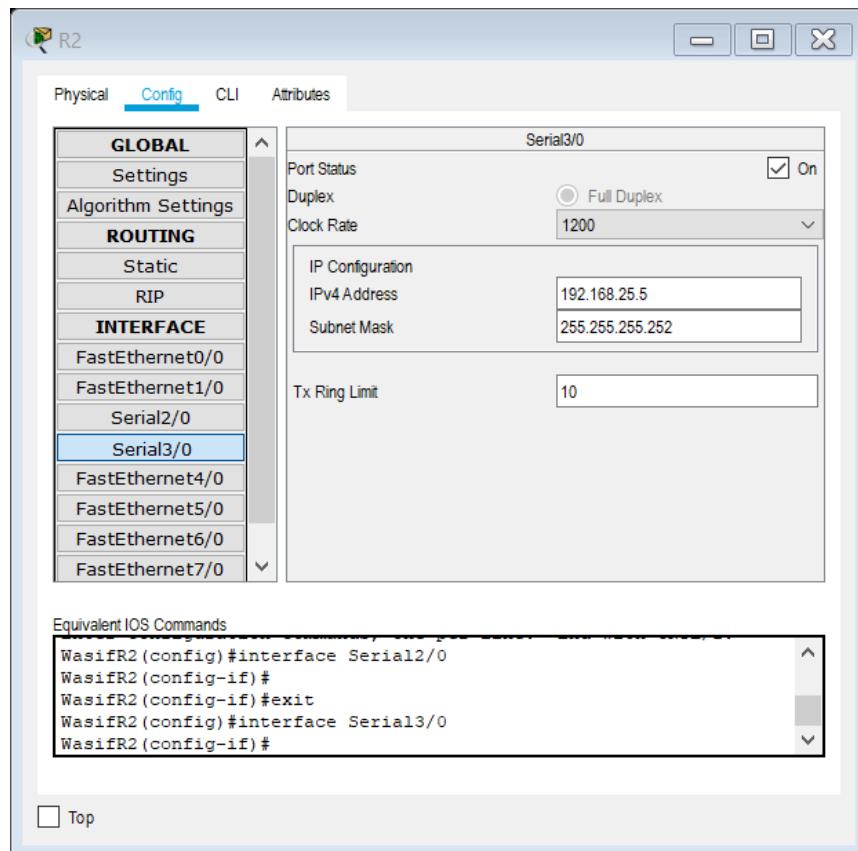
Router 1



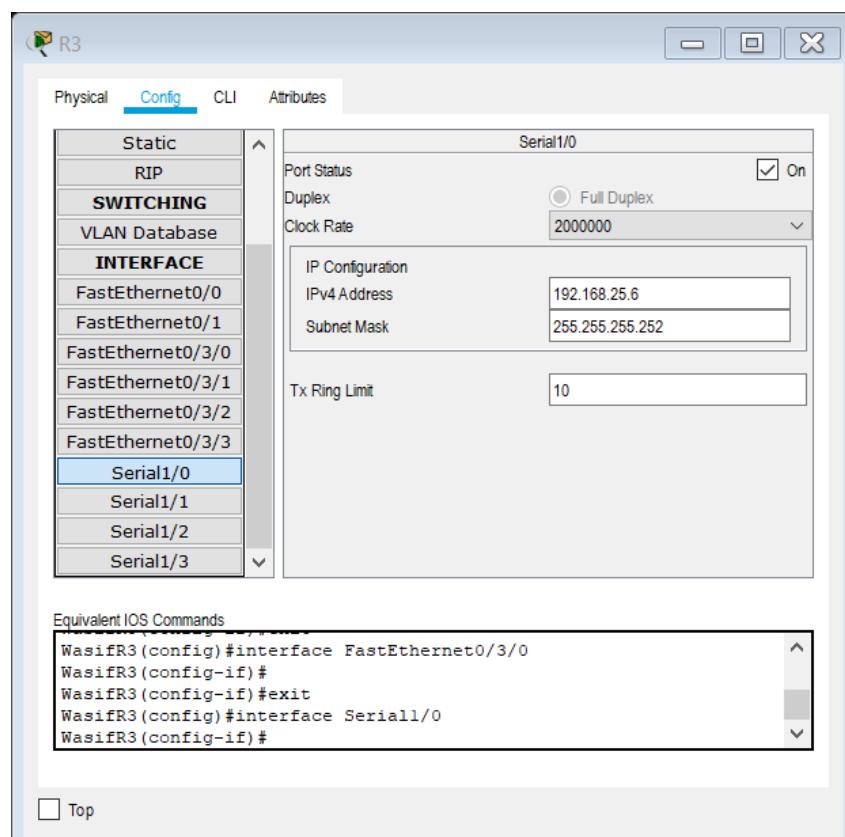


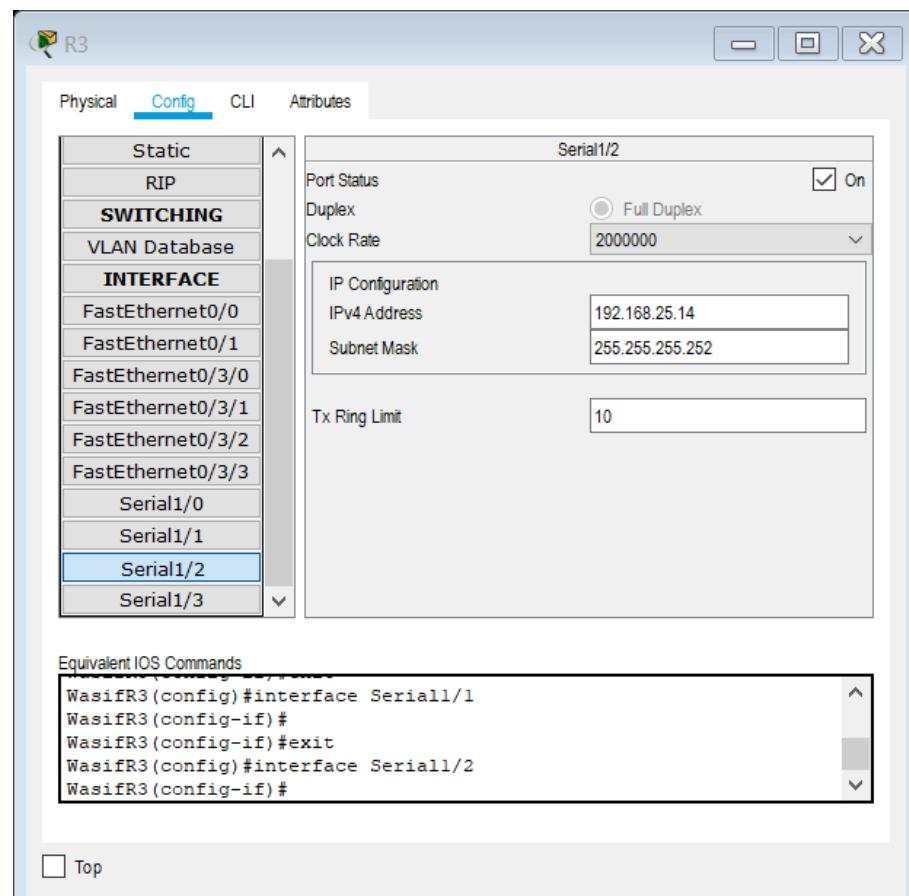
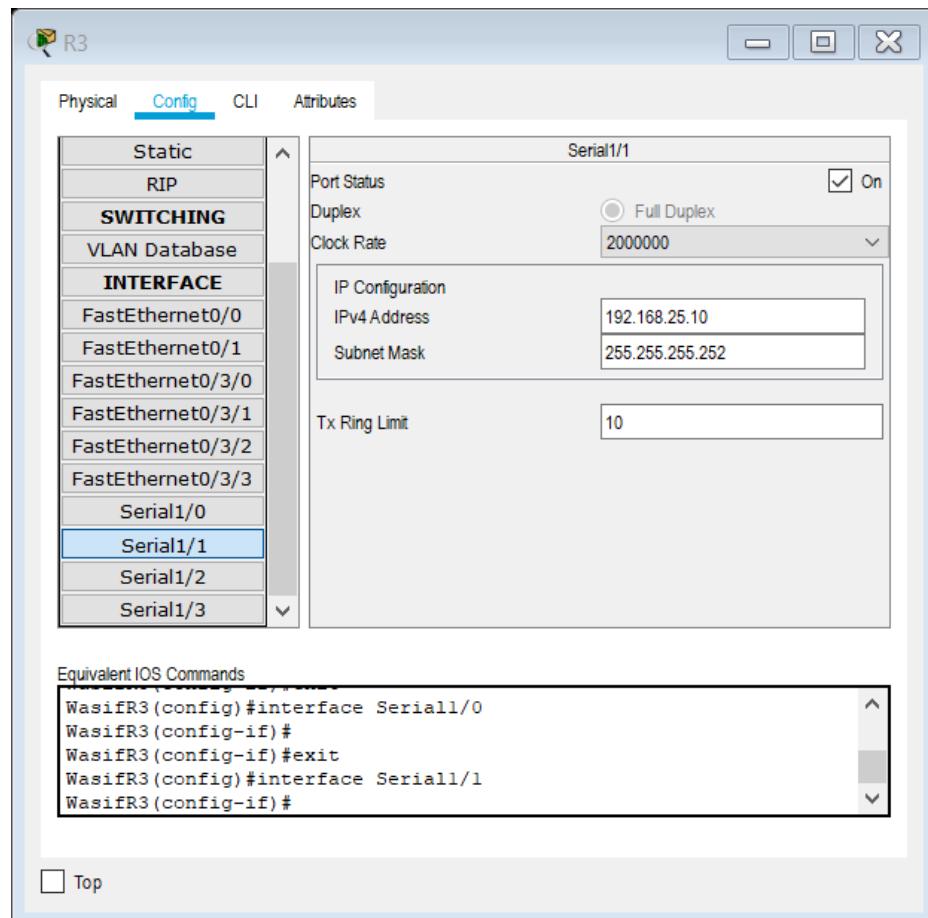
Router 2



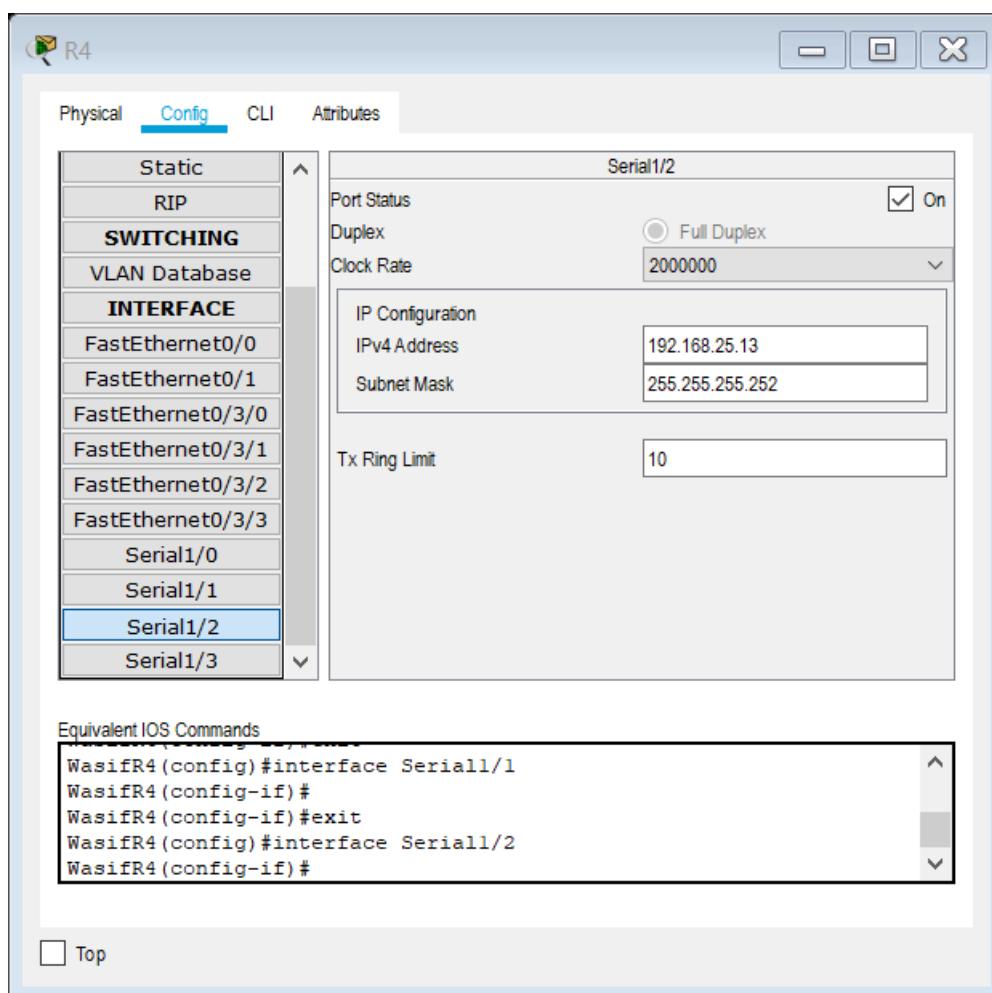


Router 3





Router 4



Inter VLAN Routing

```
WasifR1(config)#interface fa 0/0
WasifR1(config-if)#no shut
WasifR1(config-if)#no shutdown
WasifR1(config-if)#
WasifR1#
%SYS-5-CONFIG_I: Configured from console by console

WasifR1#config t
Enter configuration commands, one per line. End with CNTL/Z.
WasifR1(config)#interface fa0/0.1
WasifR1(config-subif)#
%LINK-5-CHANGED: Interface FastEthernet0/0.1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.1, changed state to up

WasifR1(config-subif)#encap
WasifR1(config-subif)#encapsulation dot1Q 10
^
% Invalid input detected at '^' marker.

WasifR1(config-subif)#dot1Q 10
^
% Invalid input detected at '^' marker.

WasifR1(config-subif)#encap
WasifR1(config-subif)#encapsulation dot1Q 10
WasifR1(config-subif)#ip address 192.168.25.145 255.255.255.248
WasifR1(config-subif)#no shut
WasifR1(config-subif)#exit
WasifR1(config)#interface fa 0/0.2
WasifR1(config-subif)#
%LINK-5-CHANGED: Interface FastEthernet0/0.2, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.2, changed state to up

WasifR1(config-subif)#encap
WasifR1(config-subif)#encapsulation dot1Q 20
WasifR1(config-subif)#ip address 192.168.25.153 255.255.255.248
WasifR1(config-subif)#no shut
WasifR1(config-subif)#exit
WasifR1(config)#interface fa 0/0.3
WasifR1(config-subif)#
%LINK-5-CHANGED: Interface FastEthernet0/0.3, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.3, changed state to up

WasifR1(config-subif)#encap
WasifR1(config-subif)#encapsulation dot1Q 30
WasifR1(config-subif)#ip address 192.168.25.161 255.255.255.248
```

```

WasifR1(config-subif)#encap
WasifR1(config-subif)#encapsulation dot1Q 30
WasifR1(config-subif)#ip address 192.168.25.161 255.255.255.248
WasifR1(config-subif)#no shut
WasifR1(config-subif)#exit
WasifR1(config)#
WasifR1#
%SYS-5-CONFIG_I: Configured from console by console

WasifR1#show ip br
WasifR1#show ip br
^
* Invalid input detected at '^' marker.

WasifR1#show ip interface brief
Interface          IP-Address      OK? Method Status        Protocol
FastEthernet0/0    192.168.25.17   YES manual up           up
FastEthernet0/0.1   192.168.25.145  YES manual up           up
FastEthernet0/0.2   192.168.25.153  YES manual up           up
FastEthernet0/0.3   192.168.25.161  YES manual up           up
FastEthernet1/0    192.168.25.33   YES manual up           up
Serial2/0          192.168.25.1    YES manual up           up
Serial3/0          unassigned      YES unset administratively down down
FastEthernet4/0    unassigned      YES unset administratively down down
FastEthernet5/0    unassigned      YES unset administratively down down
FastEthernet6/0    192.168.25.49   YES manual up           up
FastEthernet7/0    192.168.25.65   YES manual up           up
WasifR1#
WasifR1#

```

```

Router(config-subif)#encap
Router(config-subif)#encapsulation dot1Q 50
Router(config-subif)#ip address 192.168.25.169 255.255.255.248
Router(config-subif)#exit
Router(config)#interface fa0/0.20
Router(config-subif)#encapsulation dot1Q 60
Router(config-subif)#ip address 192.168.25.177 255.255.255.248
Router(config-subif)#exit
Router(config)#interface fa0/0.30
Router(config-subif)#encapsulation dot1Q 70
Router(config-subif)#encapsulation dot1Q 70 native
Router(config-subif)#exit
Router(config)#interface fa0/0
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

%LINK-5-CHANGED: Interface FastEthernet0/0.10, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.10, changed state to up

%LINK-5-CHANGED: Interface FastEthernet0/0.20, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.20, changed state to up

%LINK-5-CHANGED: Interface FastEthernet0/0.30, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.30, changed state to up

Router(config-if)#exit

```

```
interface when portfast is enabled, can cause temporary bridging loops.
Use with CAUTION

#Portfast has been configured on FastEthernet1/6 but will only
have effect when the interface is in a non-trunking mode.
ISP_Router(config-if-range)#no shut

ISP_Router(config-if-range)#
%LINK-5-CHANGED: Interface FastEthernet1/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan8, changed state to up

%LINK-5-CHANGED: Interface FastEthernet1/1, changed state to up

%LINK-5-CHANGED: Interface FastEthernet1/2, changed state to up

%LINK-5-CHANGED: Interface FastEthernet1/3, changed state to up

%LINK-5-CHANGED: Interface FastEthernet1/4, changed state to up

%LINK-5-CHANGED: Interface FastEthernet1/5, changed state to up

%LINK-5-CHANGED: Interface FastEthernet1/6, changed state to up

ISP_Router(config-if-range)#exit
ISP_Router(config)#int range f1/7-15
ISP_Router(config-if-range)#sw mode acc
ISP_Router(config-if-range)#sw acc vlan 10
# Access VLAN does not exist. Creating vlan 10
ISP_Router(config-if-range)#
%LINK-5-CHANGED: Interface Vlan10, changed state to up

ISP_Router(config-if-range)#spanning-tree portfast
%Warning: portfast should only be enabled on ports connected to a single
host. Connecting hubs, concentrators, switches, bridges, etc... to this
interface when portfast is enabled, can cause temporary bridging loops.
Use with CAUTION

#Portfast has been configured on FastEthernet1/7 but will only
have effect when the interface is in a non-trunking mode.
%Warning: portfast should only be enabled on ports connected to a single
host. Connecting hubs, concentrators, switches, bridges, etc... to this
interface when portfast is enabled, can cause temporary bridging loops.
Use with CAUTION

%Portfast has been configured on FastEthernet1/8 but will only
have effect when the interface is in a non-trunking mode.
```

```

Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface fa0/0.10
Router(config-subif)#encap
Router(config-subif)#encapsulation dot1Q 150
Router(config-subif)#ip address 192.168.25.209 255.255.255.248
Router(config-subif)#exit
Router(config)#interface fa0/0.20
Router(config-subif)#encap
Router(config-subif)#encapsulation dot1Q 160
Router(config-subif)#ip address 192.168.25.209 255.255.255.248
% 192.168.25.208 overlaps with FastEthernet0/0.10
Router(config-subif)#ip address 192.168.25.217 255.255.255.248
Router(config-subif)#exit
Router(config)#interface fa0/0.30
Router(config-subif)#encapsulation dot1Q 170
Router(config-subif)#encapsulation dot1Q 170 native
Router(config-subif)#exit
Router(config)#interface fa0/0
Router(config-if)#no shut

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

%LINK-5-CHANGED: Interface FastEthernet0/0.10, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.10, changed state to up

%LINK-5-CHANGED: Interface FastEthernet0/0.20, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.20, changed state to up

%LINK-5-CHANGED: Interface FastEthernet0/0.30, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0.30, changed state to up

Router(config-if)#exit

```

DHCP Configuration

```

Router(config)#ip dhcp e
Router(config)#ip dhcp excluded-address 192.168.25.169 192.168.25.170
Router(config)#ip dhcp excluded-address 192.168.25.177 192.168.25.178
Router(config)#ip dhcp pool DATA50
Router(dhcp-config)#network 192.168.25.168 255.255.255.248
Router(dhcp-config)#default-router 192.168.25.169
Router(dhcp-config)#exit
Router(config)#ip dhcp pool VOICE60
Router(dhcp-config)#network 192.168.25.176 255.255.255.248
Router(dhcp-config)#default-router 192.168.25.177
Router(dhcp-config)#option 150 192.168.25.177
^
% Invalid input detected at '^' marker.

Router(dhcp-config)#option 150 ip 192.168.25.177
Router(dhcp-config)#exit

```

```

ISP_Router>en
ISP_Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
ISP_Router(config)#ip dhcp pool CUSTOMERS
ISP_Router(dhcp-config)#default-router 20.110.25.1
ISP_Router(dhcp-config)#network 20.110.25.0 255.255.255.0
ISP_Router(dhcp-config)#dns-server 8.8.8.8
ISP_Router(dhcp-config)#exit
ISP_Router(config)#ip dhcp excluded-address 20.110.25.1
ISP_Router(config)#end
ISP_Router#
%SYS-5-CONFIG_I: Configured from console by console

ISP_Router#

```

```

Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#int f8/0
Router(config-if)#ip add dhcp
Router(config-if)#no
%DHCP-6-ADDRESS_ASSIGN: Interface FastEthernet8/0 assigned DHCP address 20.110.25.2, mask 255.255.255.0, hostname Router1

WasifR1>
WasifR1>en
WasifR1#show ip interface brief
Interface          IP-Address      OK? Method Status          Protocol
FastEthernet0/0    192.168.25.17  YES NVRAM up               up
FastEthernet0/0.1   192.168.25.145 YES NVRAM up               up
FastEthernet0/0.2   192.168.25.153 YES NVRAM up               up
FastEthernet0/0.3   192.168.25.161 YES NVRAM up               up
FastEthernet1/0    192.168.25.33  YES NVRAM up               up
Serial2/0          192.168.25.1   YES NVRAM up               up
Serial3/0          unassigned     YES NVRAM administratively down down
FastEthernet4/0    unassigned     YES NVRAM administratively down down
FastEthernet5/0    unassigned     YES NVRAM administratively down down
FastEthernet6/0    192.168.25.49  YES NVRAM up               up
FastEthernet7/0    192.168.25.65  YES NVRAM up               up
FastEthernet8/0    unassigned     YES unset up              up
WasifR1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
WasifR1(config)#int f8/0
WasifR1(config-if)#ip add dhcp
WasifR1(config-if)#no
%DHCP-6-ADDRESS_ASSIGN: Interface FastEthernet8/0 assigned DHCP address 20.110.25.3, mask 255.255.255.0, hostname Router4

shut
WasifR1(config-if)#no shut
WasifR1(config-if)#exit
WasifR1(config)#
WasifR1#
%SYS-5-CONFIG_I: Configured from console by console

WasifR1#
WasifR1#show ip interface brief
Interface          IP-Address      OK? Method Status          Protocol
FastEthernet0/0    192.168.25.17  YES NVRAM up               up
FastEthernet0/0.1   192.168.25.145 YES NVRAM up               up
FastEthernet0/0.2   192.168.25.153 YES NVRAM up               up
FastEthernet0/0.3   192.168.25.161 YES NVRAM up               up
FastEthernet1/0    192.168.25.33  YES NVRAM up               up
Serial2/0          192.168.25.1   YES NVRAM up               up
Serial3/0          unassigned     YES NVRAM administratively down down
FastEthernet4/0    unassigned     YES NVRAM administratively down down
FastEthernet5/0    unassigned     YES NVRAM administratively down down
FastEthernet6/0    192.168.25.49  YES NVRAM up               up
FastEthernet7/0    192.168.25.65  YES NVRAM up               up
FastEthernet8/0    20.110.25.3   YES DHCP up              up
WasifR1#
WasifR1#
WasifR1#conf t

```

```

Router(config)#ip dhcp excluded-address 192.168.25.193
Router(config)#ip dhcp pool MANAGER100
Router(dhcp-config)#network 192.168.25.192 255.255.255.248
Router(dhcp-config)#default-router 192.168.25.193
Router(dhcp-config)#option 150 ip 192.168.25.193
Router(dhcp-config)#exit

```

```

Router(config)#ip dhcp e
Router(config)#ip dhcp excluded-address 192.168.25.209
Router(config)#ip dhcp excluded-address 192.168.25.217
Router(config)#ip dhcp pool DATA150
Router(dhcp-config)#network 192.168.25.208 255.255.255.248
Router(dhcp-config)#default-router 192.168.25.209
Router(dhcp-config)#exit
Router(config)#ip dhcp pool VOICE160
Router(dhcp-config)#network 192.168.25.216 255.255.255.248
Router(dhcp-config)#default-router 192.168.25.217
Router(dhcp-config)#option 150 ip 192.168.25.217
Router(dhcp-config)#exit

```

```

Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#ip dhcp pool DATA
Router(dhcp-config)#dns-server 8.8.8.8
Router(dhcp-config)#exit
Router(config)#
Router(config)#end
Router#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
Router#
%SYS-5-CONFIG_I: Configured from console by console

```

Internet Configuration

```
interface when portfast is enabled, can cause temporary bridging loops.
Use with CAUTION

%Portfast has been configured on FastEthernet1/6 but will only
have effect when the interface is in a non-trunking mode.
ISP_Router(config-if-range)#no shut

ISP_Router(config-if-range)#
%LINK-5-CHANGED: Interface FastEthernet1/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan8, changed state to up

%LINK-5-CHANGED: Interface FastEthernet1/1, changed state to up

%LINK-5-CHANGED: Interface FastEthernet1/2, changed state to up

%LINK-5-CHANGED: Interface FastEthernet1/3, changed state to up

%LINK-5-CHANGED: Interface FastEthernet1/4, changed state to up

%LINK-5-CHANGED: Interface FastEthernet1/5, changed state to up

%LINK-5-CHANGED: Interface FastEthernet1/6, changed state to up

ISP_Router(config-if-range)#exit
ISP_Router(config)#int range f1/7-15
ISP_Router(config-if-range)#sw mode acc
ISP_Router(config-if-range)#sw acc vlan 10
% Access VLAN does not exist. Creating vlan 10
ISP_Router(config-if-range)#
%LINK-5-CHANGED: Interface Vlan10, changed state to up

ISP_Router(config-if-range)#spanning-tree portfast
%Warning: portfast should only be enabled on ports connected to a single
host. Connecting hubs, concentrators, switches, bridges, etc... to this
interface when portfast is enabled, can cause temporary bridging loops.
Use with CAUTION

%Portfast has been configured on FastEthernet1/7 but will only
have effect when the interface is in a non-trunking mode.

%Portfast has been configured on FastEthernet1/8 but will only
have effect when the interface is in a non-trunking mode.
```

```
ISP_Router(config-if-range)#
%LINK-5-CHANGED: Interface FastEthernet1/7, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/7, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Vlan10, changed state to up
%LINK-5-CHANGED: Interface FastEthernet1/8, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/8, changed state to up
%LINK-5-CHANGED: Interface FastEthernet1/9, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet1/9, changed state to up
%LINK-5-CHANGED: Interface FastEthernet1/10, changed state to up
%LINK-5-CHANGED: Interface FastEthernet1/11, changed state to up
%LINK-5-CHANGED: Interface FastEthernet1/12, changed state to up
%LINK-5-CHANGED: Interface FastEthernet1/13, changed state to up
%LINK-5-CHANGED: Interface FastEthernet1/14, changed state to up
%LINK-5-CHANGED: Interface FastEthernet1/15, changed state to up

ISP_Router(config-if-range)#exit
ISP_Router(config)#do wr
Building configuration...
[OK]
ISP_Router(config)#int f0/0
ISP_Router(config-if)#ip add 20.110.25.1 255.255.255.0
ISP_Router(config-if)#no cdp enable
ISP_Router(config-if)#no shut

ISP_Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
ISP_Router(config)#

```

```
ISP_Router(config-if)#ip add 20.110.25.1 255.255.255.0
ISP_Router(config-if)#no cdp enable
ISP_Router(config-if)#no shut

ISP_Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

ISP_Router(config-if)#exit
ISP_Router(config)#
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up

ISP_Router(config)#

```

ISP_Router con0 is now available

Press RETURN to get started.

```
ISP_Router>en
ISP_Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
ISP_Router(config)#ip dhcp pool CUSTOMERS
ISP_Router(dhcp-config)#default-router 20.110.25.1
ISP_Router(dhcp-config)#network 20.110.25.0 255.255.255.0
ISP_Router(dhcp-config)#dns-server 8.8.8.8
ISP_Router(dhcp-config)#exit
ISP_Router(config)#ip dhcp excluded-address 20.110.25.1
ISP_Router(config)#end
ISP_Router#
%SYS-5-CONFIG_I: Configured from console by console

ISP_Router#
```

```

Router(config)#int f8/0
Router(config-if)#ip add dhcp
Router(config-if)#no shut
Router(config-if)#exit
Router(config)#
Router(config)#
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#
Router#show interface ip brief
^
% Invalid input detected at '^' marker.

Router#
Router#show ip interface brief
Interface          IP-Address      OK? Method Status        Protocol
FastEthernet0/0    192.168.25.81  YES NVRAM  up           up
FastEthernet1/0    192.168.25.97  YES NVRAM  up           up
Serial2/0          192.168.25.2   YES NVRAM  up           up
Serial3/0          192.168.25.5   YES NVRAM  up           up
FastEthernet4/0    unassigned     YES NVRAM  administratively down down
FastEthernet5/0    unassigned     YES NVRAM  administratively down down
FastEthernet6/0    192.168.25.113  YES NVRAM  up           up
FastEthernet7/0    192.168.25.129  YES NVRAM  up           up
FastEthernet8/0    20.110.25.2    YES DHCP   up           up
Router#
Router#
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#access-list 1 permit 192.168.25.96 0.0.0.15
Router(config)#ip nat inside source list 1 interface f8/0
Router(config)#int f1/0
Router(config-if)#ip nat inside
Router(config-if)#exit
Router(config)#int f8/0
Router(config-if)#ip nat outside
Router(config-if)#exit
Router(config)#do wr
Building configuration...
[OK]
Router(config)#

```

```

Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#access-list 2 permit 192.168.25.80 0.0.0.15
Router(config)#access-list 3 permit 192.168.25.112 0.0.0.15
Router(config)#access-list 4 permit 192.168.25.128 0.0.0.15
Router(config)#
Router(config)#ip nat inside source list 2 interface f8/0
Router(config)#ip nat inside source list 3 interface f8/0
Router(config)#ip nat inside source list 4 interface f8/0
Router(config)#
Router(config)#int f0/0
Router(config-if)#ip nat inside
Router(config-if)#exit
Router(config)#int f6/0
Router(config-if)#ip nat inside
Router(config-if)#exit
Router(config)#int f7/0
Router(config-if)#ip nat inside
Router(config-if)#exit
Router(config)#
Router(config)#int f8/0
Router(config-if)#ip nat outside
Router(config-if)#exit
Router(config)#
Router(config)#do wr
Building configuration...
[OK]
Router(config)#

```

```
WasifR1#-----  
WasifR1#-----  
WasifR1#conf t  
Enter configuration commands, one per line. End with CNTL/Z.  
WasifR1(config)#access-list 1 permit 192.168.25.16 0.0.0.15  
WasifR1(config)#access-list 2 permit 192.168.25.144 0.0.0.7  
WasifR1(config)#access-list 3 permit 192.168.25.152 0.0.0.7  
WasifR1(config)#access-list 4 permit 192.168.25.160 0.0.0.7  
WasifR1(config)#access-list 5 permit 192.168.25.32 0.0.0.15  
WasifR1(config)#access-list 6 permit 192.168.25.48 0.0.0.15  
WasifR1(config)#access-list 7 permit 192.168.25.64 0.0.0.15  
WasifR1(config)#-----  
WasifR1(config)#ip nat inside source list 1 interface f8/0  
WasifR1(config)#ip nat inside source list 2 interface f8/0  
WasifR1(config)#ip nat inside source list 3 interface f8/0  
WasifR1(config)#ip nat inside source list 4 interface f8/0  
WasifR1(config)#ip nat inside source list 5 interface f8/0  
WasifR1(config)#ip nat inside source list 6 interface f8/0  
WasifR1(config)#ip nat inside source list 7 interface f8/0  
WasifR1(config)#-----  
WasifR1(config)#int f0/0  
WasifR1(config-if)#ip nat inside  
WasifR1(config-if)#exit  
WasifR1(config)#int f0/0.1  
WasifR1(config-subif)#ip nat inside  
WasifR1(config-subif)#exit  
WasifR1(config)#int f0/0.2  
WasifR1(config-subif)#ip nat inside  
WasifR1(config-subif)#exit  
WasifR1(config)#int f0/0.3  
WasifR1(config-subif)#ip nat inside  
WasifR1(config-subif)#exit  
WasifR1(config)#int f1/0  
WasifR1(config-if)#ip nat inside  
WasifR1(config-if)#exit  
WasifR1(config)#int f6/0  
WasifR1(config-if)#ip nat inside  
WasifR1(config-if)#exit  
WasifR1(config)#int f7/0  
WasifR1(config-if)#ip nat inside  
WasifR1(config-if)#exit  
WasifR1(config)#-----  
WasifR1(config)#int f8/0  
WasifR1(config-if)#ip nat outside  
WasifR1(config-if)#exit  
WasifR1(config)#-----  
WasifR1(config)#do wr  
Building configuration...  
[OK]
```

```
Router#conf t  
Enter configuration commands, one per line. End with CNTL/Z.  
Router(config)#int f0/1  
Router(config-if)#ip add dhcp  
Router(config-if)#no  
%DHCP-6-ADDRESS_ASSIGN: Interface FastEthernet0/1 assigned DHCP address 20.110.25.4, mask 255.255.255.0, hostname Router5  
shut  
Router(config-if)#exit  
Router(config)#-----  
Router(config)#-----  
Router(config)#access-list 1 permit 192.168.25.168 0.0.0.7  
Router(config)#access-list 2 permit 192.168.25.176 0.0.0.7  
Router(config)#ip nat inside source list 1 interface f0/1  
Router(config)#ip nat inside source list 2 interface f0/1  
Router(config)#int f0/0  
Router(config-if)#ip nat inside  
Router(config-if)#exit  
Router(config)#int f0/1  
Router(config-if)#ip nat outside  
Router(config-if)#exit  
Router(config)#do wr  
Building configuration...  
[OK]
```

Ctrl+F6 to exit CLI focus

```

Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#access-list 10 permit 192.168.25.168 0.0.0.7
Router(config)#ip nat inside source list 10 interface f0/1
Router(config)#int f0/0.10
Router(config-subif)#ip nat inside
Router(config-subif)#exit
Router(config)#int f0/1
Router(config-if)#ip nat outside
Router(config-if)#exit
Router(config)#do wr
Building configuration...
[OK]
Router(config)#

```



```

Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#access-list 10 permit 192.168.25.208 0.0.0.7
^
* Invalid input detected at '^' marker.

Router(config)#access-list 10 permit 192.168.25.208 0.0.0.7
Router(config)#ip nat inside source list 10 interface f0/1
Router(config)#int f0/0.10
Router(config-subif)#ip nat inside
Router(config-subif)#exit
Router(config)#int f0/1
Router(config-if)#ip nat outside
Router(config-if)#exit
Router(config)#do wr
Building configuration...
[OK]
Router(config)#int f0/1
Router(config-if)#ip add dhcp
Router(config-if)#no shut

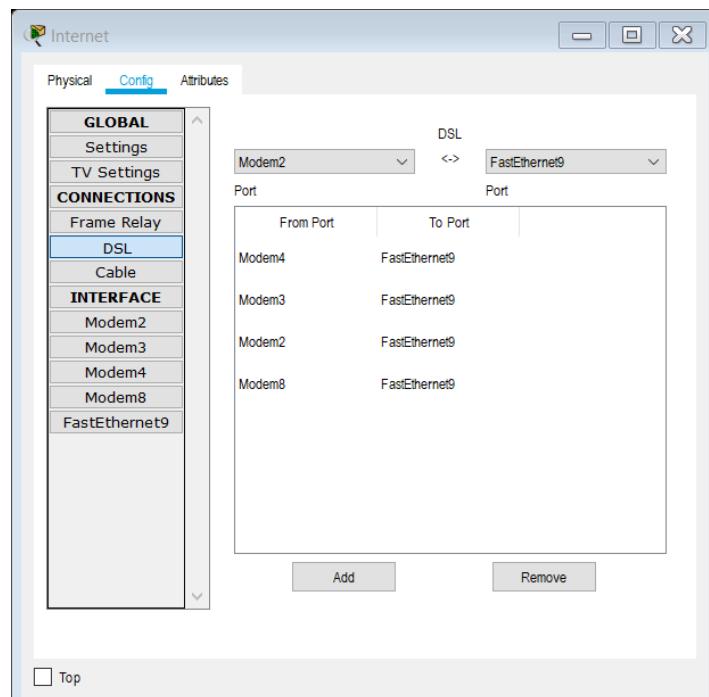
Router(config-if)#
*LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

*LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up

Router(config-if)#
Router#
*SYS-5-CONFIG_I: Configured from console by console

Router#
Router#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...
[OK]
Router#
*DHP-6-ADDRESS_ASSIGN: Interface FastEthernet0/1 assigned DHCP address 20.110.25.5, mask 255.255.255.0, hostname R4

```



OSPF Configuration

```
Router>
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router ospf 25
Router(config-router)#network 192.168.25.80 255.255.255.240 area 0
Router(config-router)#network 192.168.25.96 255.255.255.240 area 0
Router(config-router)#network 192.168.25.0 255.255.255.252 area 0
Router(config-router)#
01:46:15: %OSPF-5-ADJCHG: Process 25, Nbr 192.168.25.161 on Serial2/0 from LOADING to FULL, Loading Done

Router(config-router)#network 192.168.25.112 255.255.255.240 area 0
Router(config-router)#network 192.168.25.128 255.255.255.240 area 0
Router(config-router)#
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#

WasifR1>
WasifR1>
WasifR1>en
WasifR1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
WasifR1(config)#router ospf 25
WasifR1(config-router)#network 192.168.25.16 255.255.255.240 area 0
WasifR1(config-router)#network 192.168.25.144 255.255.255.248 area 0
WasifR1(config-router)#network 192.168.25.152 255.255.255.248 area 0
WasifR1(config-router)#network 192.168.25.160 255.255.255.248 area 0
WasifR1(config-router)#network 192.168.25.32 255.255.255.240 area 0
WasifR1(config-router)#network 192.168.25.0 255.255.255.252 area 0
WasifR1(config-router)#network 192.168.25.48 255.255.255.240 area 0
WasifR1(config-router)#network 192.168.25.64 255.255.255.240 area 0
WasifR1(config-router)#
WasifR1#
%SYS-5-CONFIG_I: Configured from console by console

WasifR1#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is 20.110.25.1 to network 0.0.0.0

      20.0.0.0/24 is subnetted, 1 subnets
C        20.110.25.0 is directly connected, FastEthernet8/0
      192.168.25.0/24 is variably subnetted, 9 subnets, 3 masks
C          192.168.25.0/30 is directly connected, Serial2/0
R          192.168.25.4/30 [120/1] via 192.168.25.2, 00:00:23, Serial2/0
C          192.168.25.16/28 is directly connected, FastEthernet0/0
C          192.168.25.32/28 is directly connected, FastEthernet1/0
C          192.168.25.48/28 is directly connected, FastEthernet6/0
C          192.168.25.64/28 is directly connected, FastEthernet7/0
C          192.168.25.144/29 is directly connected, FastEthernet0/0.1
C          192.168.25.152/29 is directly connected, FastEthernet0/0.2
C          192.168.25.160/29 is directly connected, FastEthernet0/0.3
S*    0.0.0.0/0 [254/0] via 20.110.25.1

WasifR1#
01:05:04: %OSPF-5-ADJCHG: Process 25, Nbr 192.168.25.129 on Serial2/0 from LOADING to FULL, Loading Done
```

```

Router#
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router ospf 26
Router(config-router)#network 192.168.25.208 255.255.255.252 area 1
Router(config-router)#network 192.168.25.216 255.255.255.252 area 1
Router(config-router)#network 192.168.25.216 255.255.255.248 area 1
Router(config-router)#network 192.168.25.208 255.255.255.248 area 1
Router(config-router)#network 192.168.25.12 255.255.255.252 area 1
Router(config-router)#
Router#
%SYS-5-CONFIG_I: Configured from console by console

Router#
00:07:13: %OSPF-5-ADJCHG: Process 26, Nbr 192.168.25.193 on Serial1/2 from LOADING to FULL, Loading Done

```

```

Router#
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#router ospf 26
Router(config-router)#network 192.168.25.12 255.255.255.252 area 1
Router(config-router)#network
05:47:05: %OSPF-5-ADJCHG: Process 26, Nbr 192.168.25.209 on Serial1/2 from LOADING to FULL, Loading Done

% Incomplete command.
Router(config-router)#network 192.168.25.168 255.255.255.248 area 1
Router(config-router)#network 192.168.25.176 255.255.255.248 area 1
Router(config-router)#network 192.168.25.192 255.255.255.248 area 1
Router(config-router)#

```

VoIP Configuration

```

Router(config)#tele
Router(config)#telephony-service
Router(config-telephony)#max-dn 3
Router(config-telephony)#max-ephones 3
Router(config-telephony)#ip source-address 192.168.25.177 port 2000
Router(config-telephony)#ephone-dn 1
Router(config-ephone-dn)##LINK-3-UPDOWN: Interface ephone_dsp DN 1.1, changed state to up

Router(config-ephone-dn)#number 241
Router(config-ephone-dn)#ephone-dn 2
Router(config-ephone-dn)##LINK-3-UPDOWN: Interface ephone_dsp DN 2.1, changed state to up

Router(config-ephone-dn)#number 242
Router(config-ephone-dn)#ephone-dn 3
Router(config-ephone-dn)##LINK-3-UPDOWN: Interface ephone_dsp DN 3.1, changed state to up

Router(config-ephone-dn)#number 243
Router(config-ephone-dn)#exit
Router(config)#ephone 1
Router(config-ephone)#type 7960
Router(config-ephone)#button 1:1
Need to configure ephone mac address or VM station-id
Router(config-ephone)#mac-address 0001.647C.5CC6
Router(config-ephone)#type 7960
Router(config-ephone)#button 1:1
Router(config-ephone)#exit
Router(config)#ephone 2
Router(config-ephone)#mac-address 00E0.A38D.9A59
Router(config-ephone)#type 7960
Router(config-ephone)#button 1:2
Router(config-ephone)#exit
Router(config)#ephone 3
Router(config-ephone)#mac-address 00D0.97D5.8924
Router(config-ephone)#type 7960
Router(config-ephone)#button 1:3
Router(config-ephone)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console

```

```

Router(config)#tele
Router(config)#telephony-service
Router(config-telephone)#max-dn 3
Router(config-telephone)#max-ephone 3
Router(config-telephone)#ip source-address 192.168.25.217 port 2000
Router(config-telephone)#auto assign 4 to 6
Router(config-telephone)#auto assign 1 to 5
Router(config-telephone)#exit
Router(config)#tele
Router(config)#telephony-service
Router(config-telephone)#ephone-dn 1
Router(config-ephone-dn)#{LINK-3-UPDOWN: Interface ephone_dsp DN 1.1, changed state to up

Router(config-ephone-dn)#number 541
Router(config-ephone-dn)#exit
Router(config)#tele
Router(config)#telephony-service
Router(config-telephone)#ephone-dn 2
Router(config-ephone-dn)#{LINK-3-UPDOWN: Interface ephone_dsp DN 2.1, changed state to up

Router(config-ephone-dn)#number 542
Router(config-ephone-dn)#exit
Router(config)#tele
Router(config)#telephony-service
Router(config-telephone)#ephone-dn 3
Router(config-ephone-dn)#{LINK-3-UPDOWN: Interface ephone_dsp DN 3.1, changed state to up

Router(config-ephone-dn)#number 543
Router(config-ephone-dn)#exit
Router(config)#
Router#
%SYS-5-CONFIG_I: Configured from console by console
Router#

```

```

WasifR3#conf t
Enter configuration commands, one per line. End with CNTL/Z.
WasifR3(config)#dial-peer voice 1 voip
WasifR3(config-dial-peer)#destination-pattern 5..
WasifR3(config-dial-peer)#session target ipv4:192.168.25.217
WasifR3(config-dial-peer)#exit
WasifR3(config)#
WasifR3(config)#end
WasifR3#copy running-config startup-config
Destination filename [startup-config]?
Building configuration...

```

TFTP Server

```

WasifR4>en
WasifR4#copy running-config tftp
Address or name of remote host []? 192.168.25.197
Destination filename [WasifR4-config]? WasifR4_Backup

Writing running-config...!!
[OK - 2492 bytes]

2492 bytes copied in 0.003 secs (830666 bytes/sec)
WasifR4#

```

```

WasifR3>
WasifR3>en
WasifR3#copy running-config tftp
Address or name of remote host []? 192.168.25.197
Destination filename [WasifR3-config]? WasifR3_Backup

Writing running-config...!!
[OK - 3015 bytes]

3015 bytes copied in 3.001 secs (1004 bytes/sec)
WasifR3#

```

```
WasifR2>en
WasifR2#copy running-config tftp
Address or name of remote host []? 192.168.25.18
Destination filename [WasifR2-config]? WasifR2_Backup

Writing running-config...!!!
[OK - 1794 bytes]

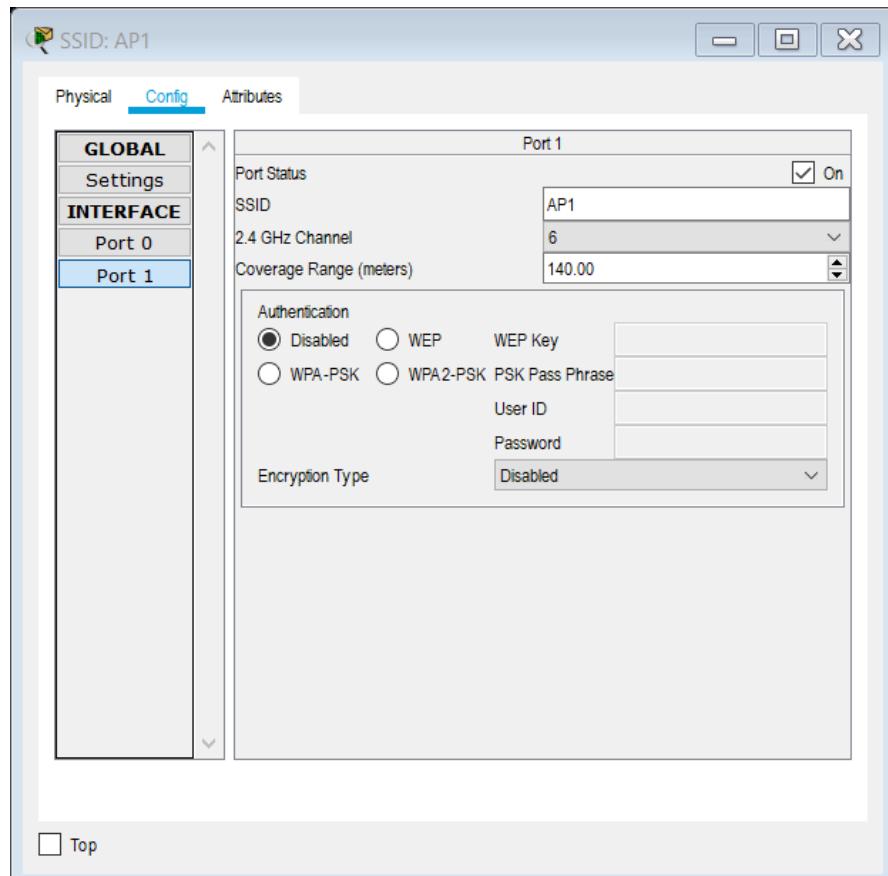
1794 bytes copied in 0.012 secs (149500 bytes/sec)
WasifR2#
```

```
WasifR1>
WasifR1>
WasifR1>en
WasifR1#copy running-config tftp
Address or name of remote host []? 192.168.25.18
Destination filename [WasifR1-config]? WasifR1_Backup

Writing running-config...!!!
[OK - 2582 bytes]

2582 bytes copied in 3.011 secs (857 bytes/sec)
WasifR1#
```

Access Points and Wifi Router SSID



SSID: AP2

Physical Config Attributes

GLOBAL

Settings

INTERFACE

Port 0

Port 1

Port Status On

SSID AP2

2.4 GHz Channel 6

Coverage Range (meters) 140.00

Authentication

Disabled WEP WEP Key
 WPA-PSK WPA2-PSK PSK Pass Phrase

User ID
Password

Encryption Type Disabled

Top

SSID: AP3

Physical Config Attributes

GLOBAL

Settings

INTERFACE

Port 0

Port 1

Port Status On

SSID AP3

2.4 GHz Channel 6

Coverage Range (meters) 140.00

Authentication

Disabled WEP WEP Key
 WPA-PSK WPA2-PSK PSK Pass Phrase

User ID
Password

Encryption Type Disabled

Top

SSID: AP4

Physical Config Attributes

GLOBAL

INTERFACE

Port 0 Port 1

Port 1

Port Status On

SSID AP4

2.4 GHz Channel 6

Coverage Range (meters) 140.00

Authentication

Disabled WEP WEP Key

WPA-PSK WPA2-PSK PSK Pass Phrase

User ID

Password

Encryption Type Disabled

Top

SSID: AP5

Physical Config Attributes

GLOBAL

INTERFACE

Port 0 Port 1

Port 1

Port Status On

SSID AP5

2.4 GHz Channel 6

Coverage Range (meters) 140.00

Authentication

Disabled WEP WEP Key

WPA-PSK WPA2-PSK PSK Pass Phrase

User ID

Password

Encryption Type Disabled

Top

SSID: AP6

Physical Config Attributes

GLOBAL

Settings

INTERFACE

Port 0

Port 1

Port Status On

SSID AP6

2.4 GHz Channel 6

Coverage Range (meters) 140.00

Authentication

Disabled WEP WEP Key
 WPA-PSK WPA2-PSK PSK Pass Phrase

User ID
Password

Encryption Type Disabled

Top

SSID: AP7

Physical Config Attributes

GLOBAL

Settings

INTERFACE

Port 0

Port 1

Port Status On

SSID AP7

2.4 GHz Channel 6

Coverage Range (meters) 140.00

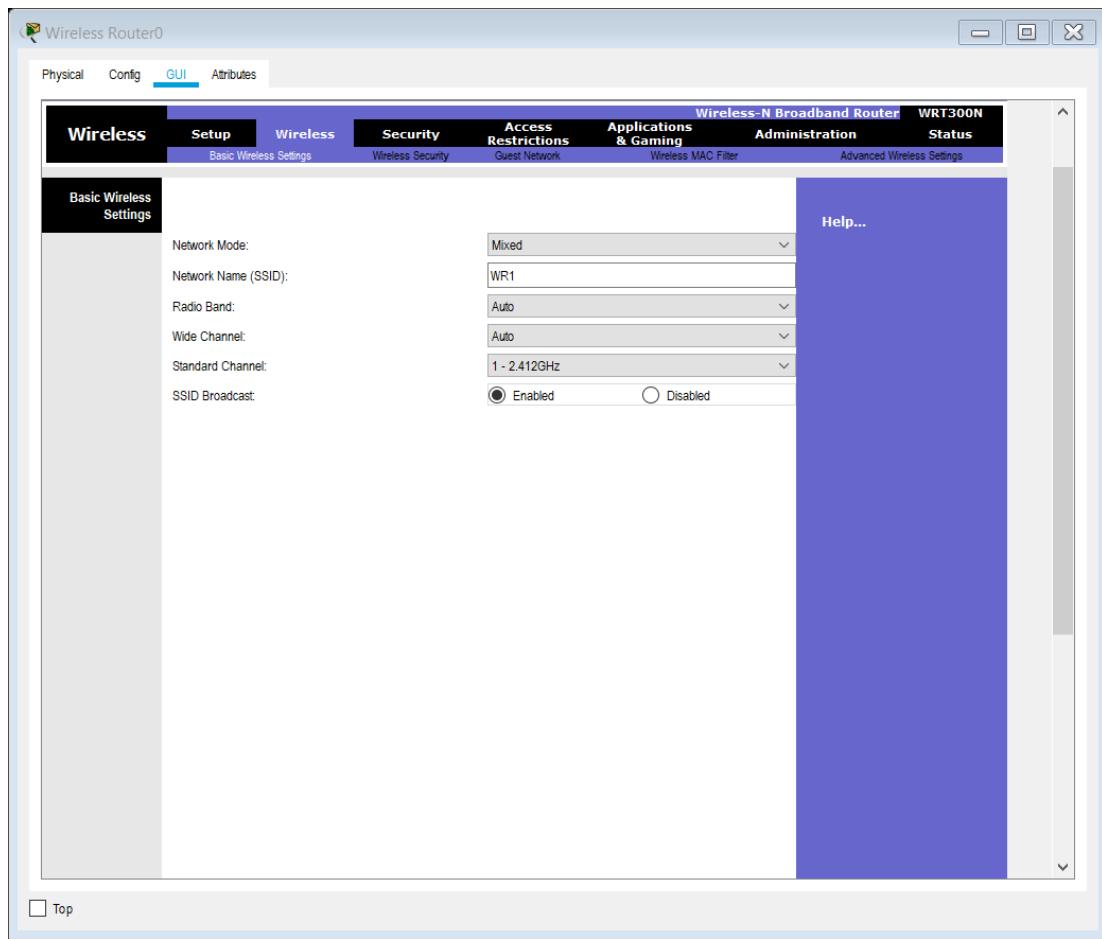
Authentication

Disabled WEP WEP Key
 WPA-PSK WPA2-PSK PSK Pass Phrase

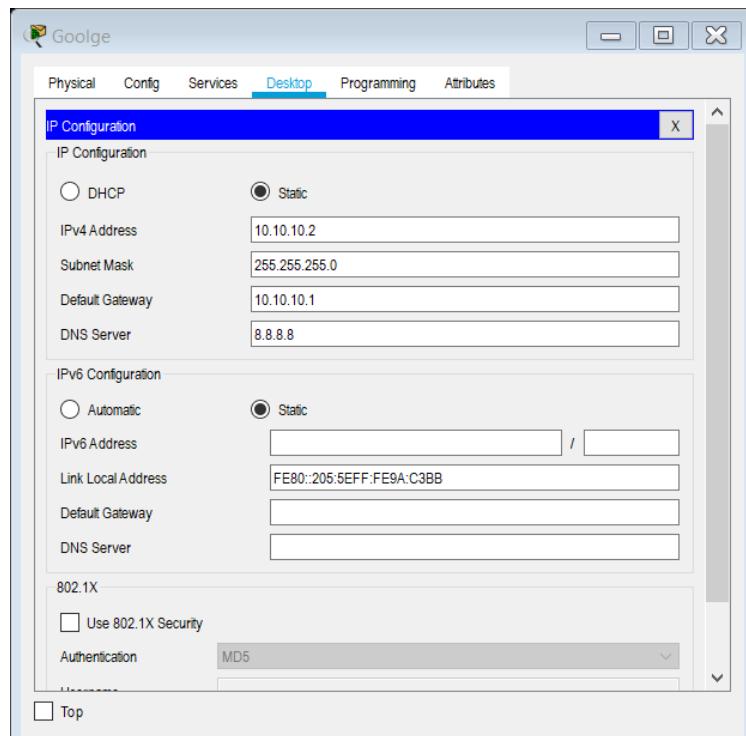
User ID
Password

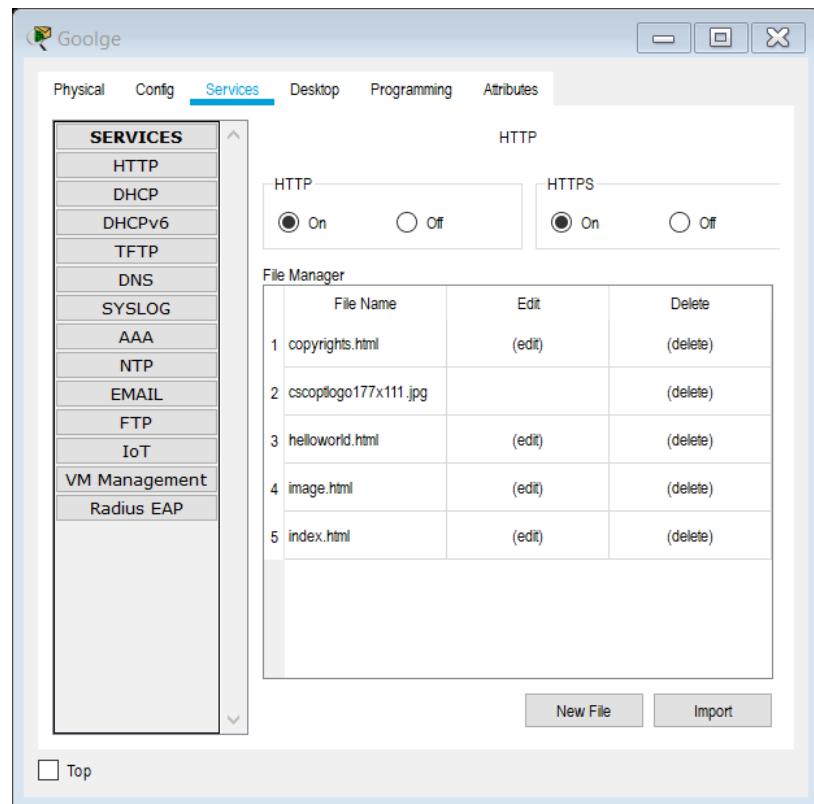
Encryption Type Disabled

Top

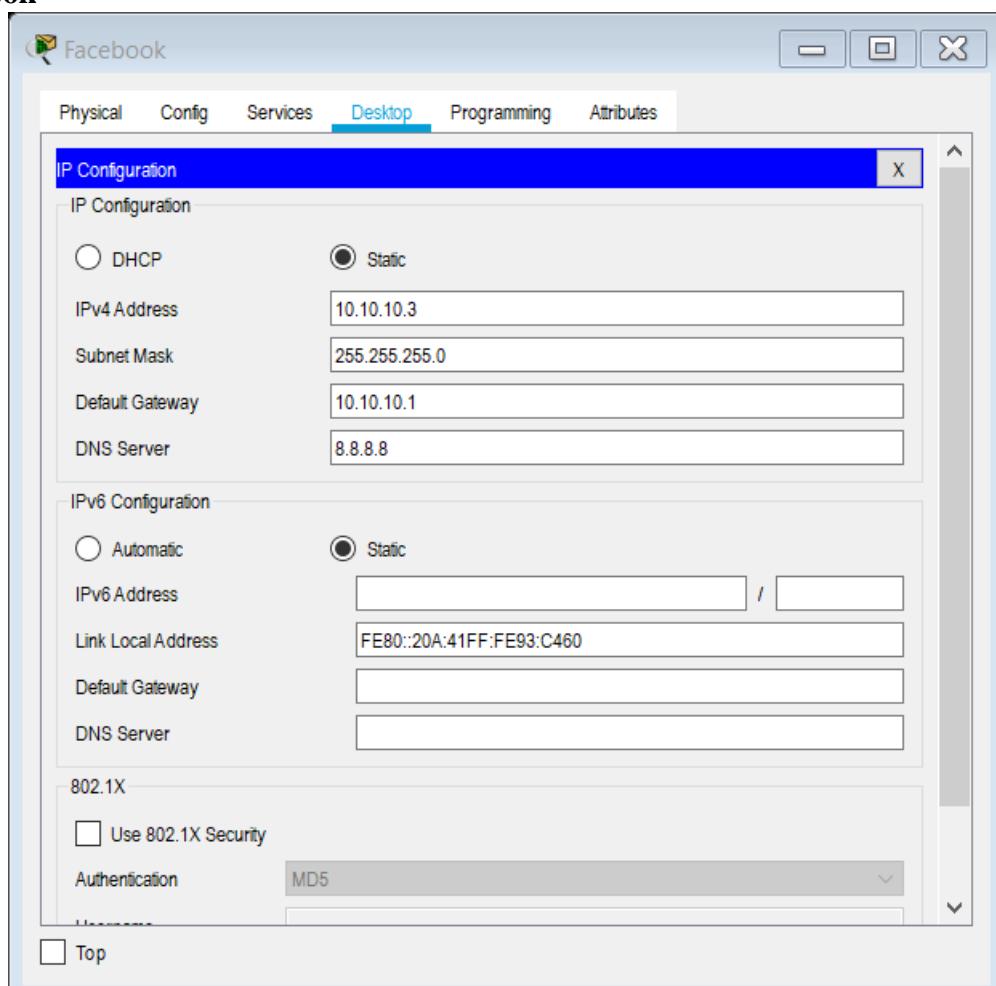


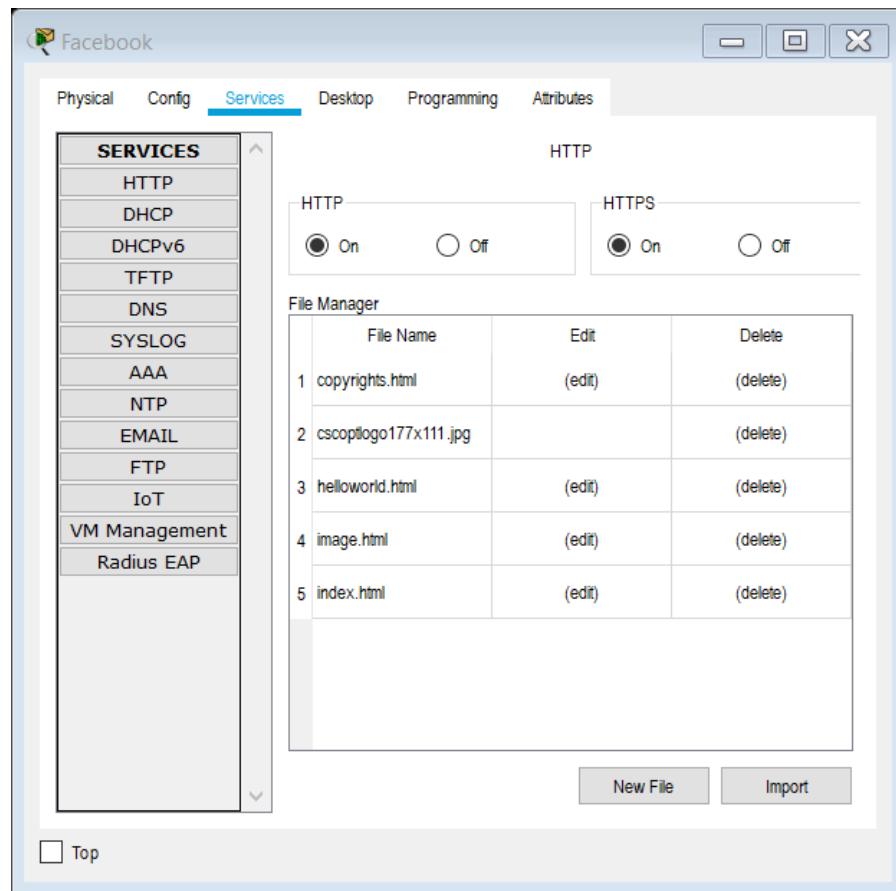
Web Servers Google



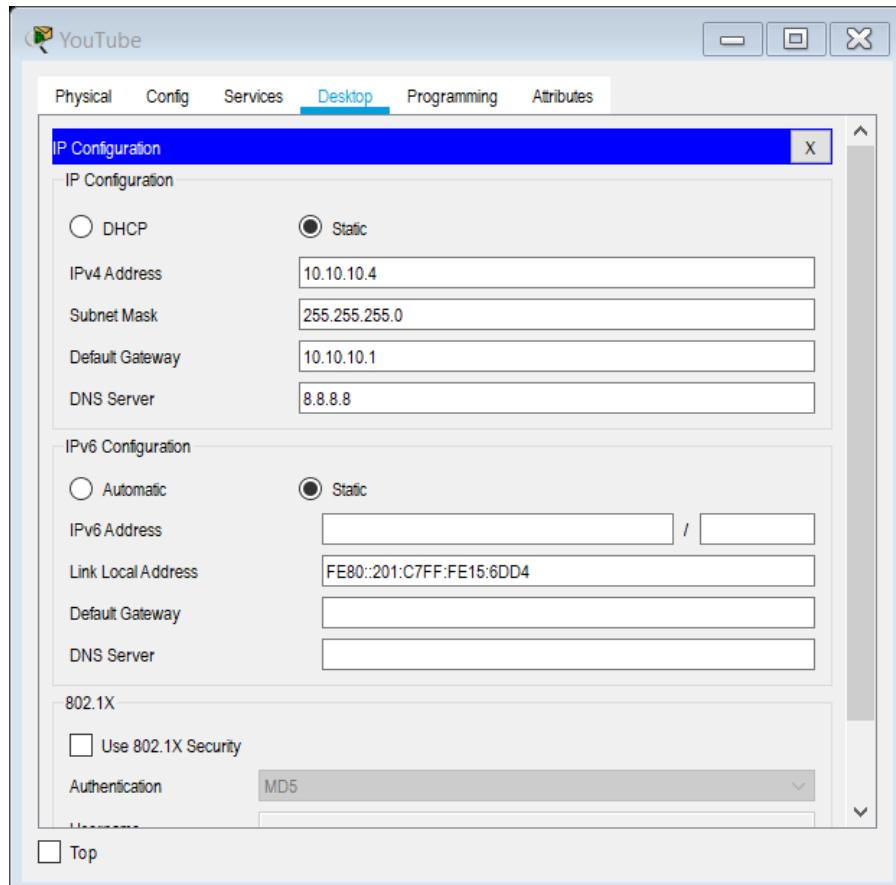


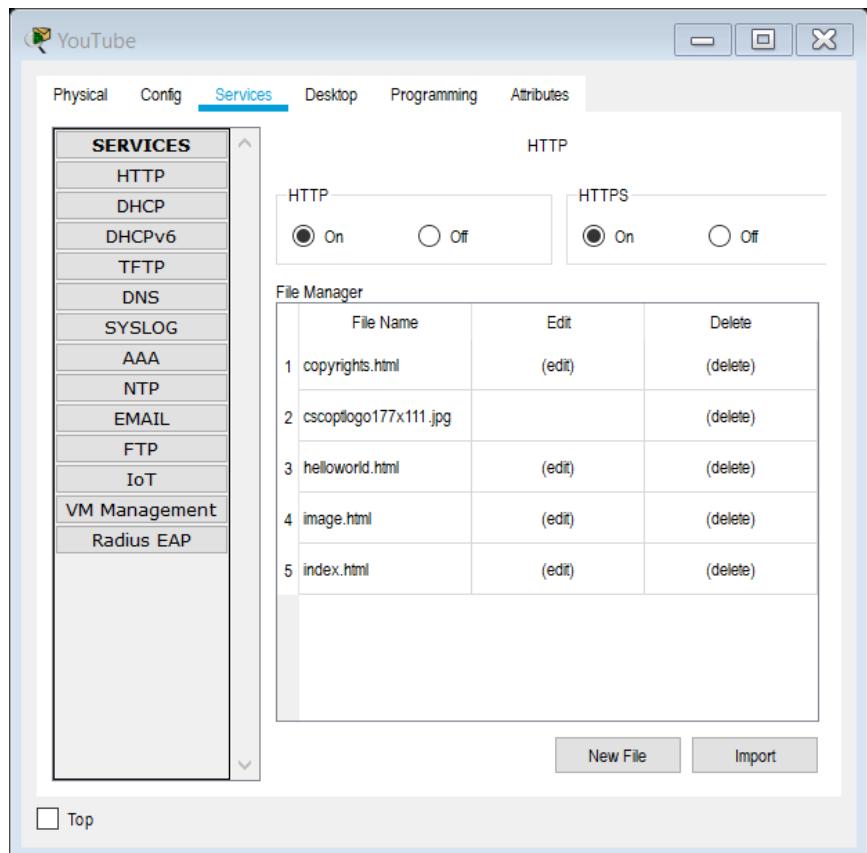
Facebook



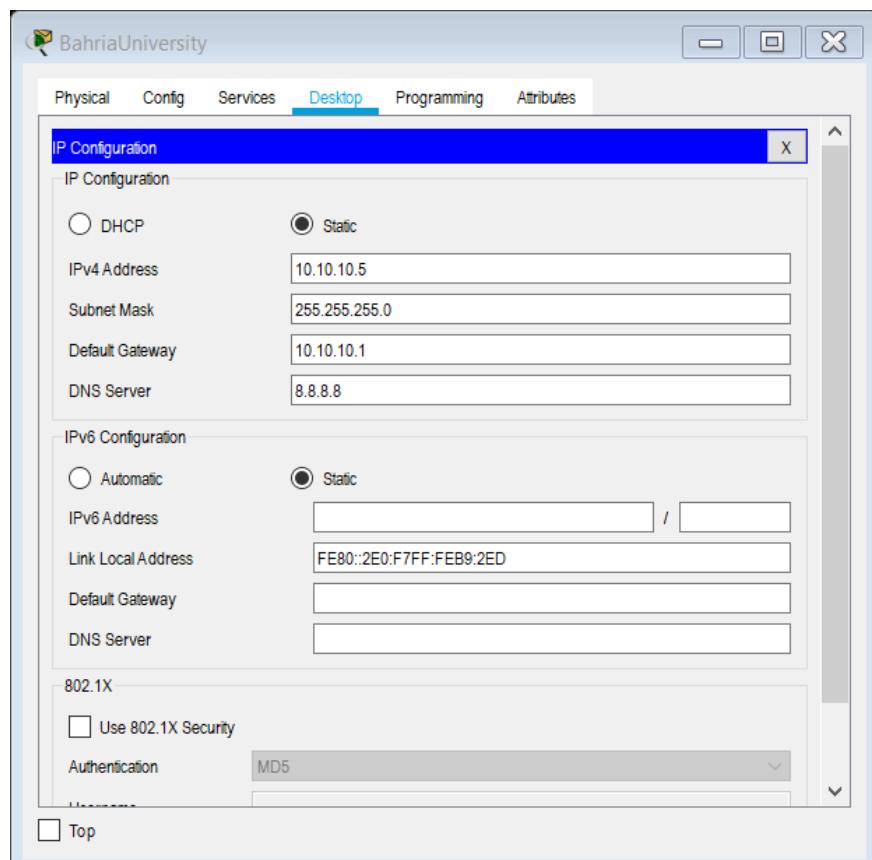


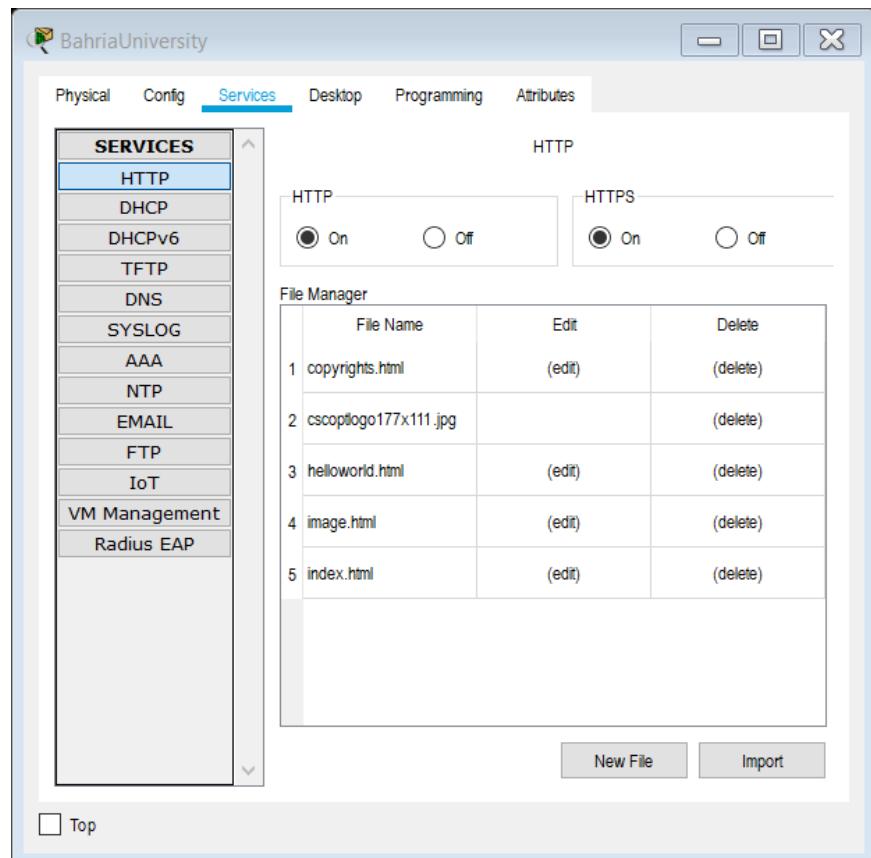
Youtube



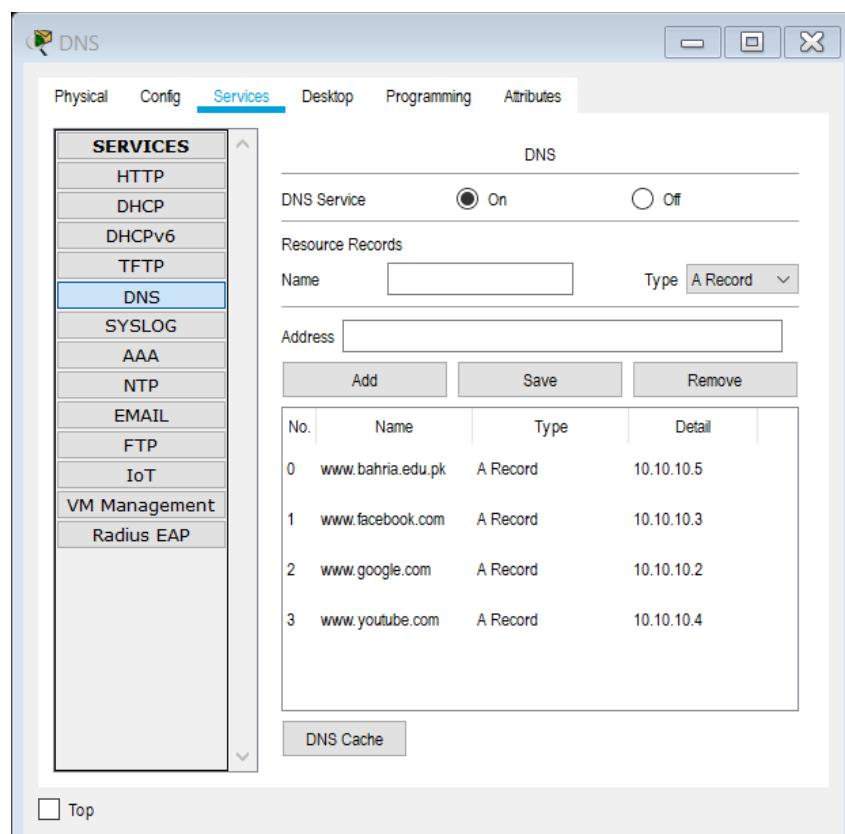


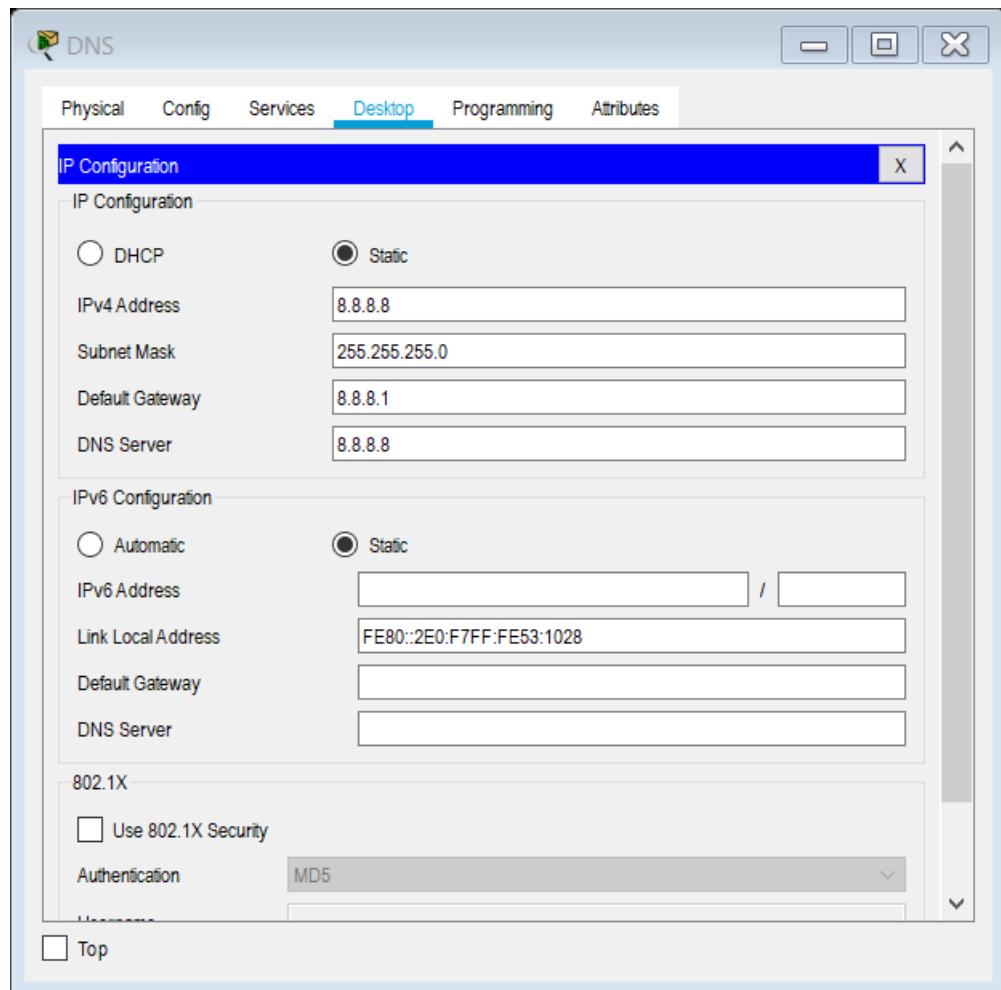
Bahria





DNS

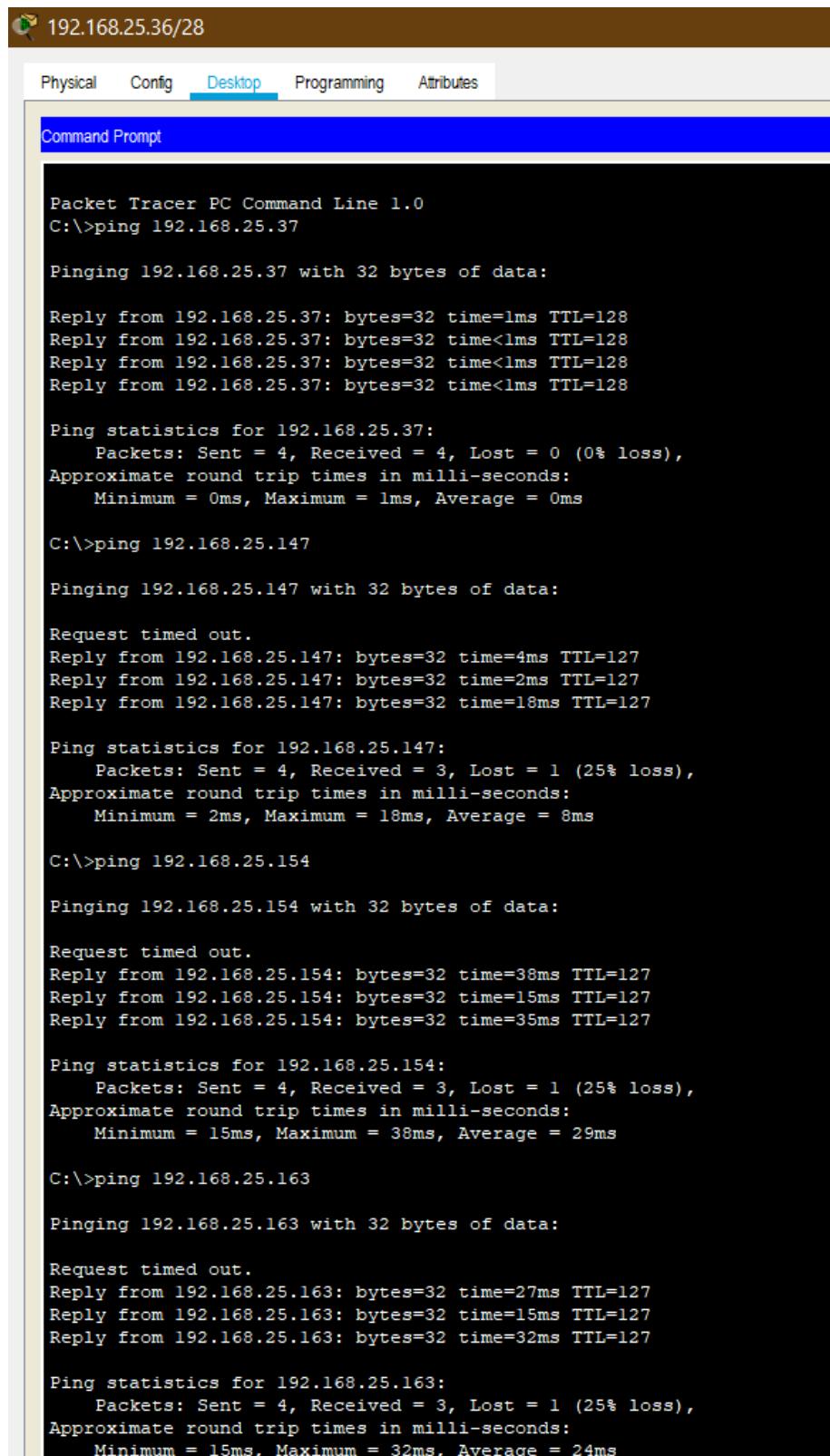




Output

Ping PC

PC is pinged with every single network to show communication between Networks and VLANs. Users can communicate within same area e.g. Area 0 user can communicate with Area 0 user but cannot communicate with Area 1 user.



The screenshot shows a 'Command Prompt' window within the 'Packet Tracer PC Command Line 1.0'. The window title is '192.168.25.36/28'. The tabs at the top are Physical, Config, Desktop (which is selected), Programming, and Attributes. The command prompt shows the results of multiple ping operations:

```
Packet Tracer PC Command Line 1.0
C:\>ping 192.168.25.37

Pinging 192.168.25.37 with 32 bytes of data:

Reply from 192.168.25.37: bytes=32 time=1ms TTL=128
Reply from 192.168.25.37: bytes=32 time<1ms TTL=128
Reply from 192.168.25.37: bytes=32 time<1ms TTL=128
Reply from 192.168.25.37: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.25.37:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 1ms, Average = 0ms

C:\>ping 192.168.25.147

Pinging 192.168.25.147 with 32 bytes of data:

Request timed out.
Reply from 192.168.25.147: bytes=32 time=4ms TTL=127
Reply from 192.168.25.147: bytes=32 time=2ms TTL=127
Reply from 192.168.25.147: bytes=32 time=18ms TTL=127

Ping statistics for 192.168.25.147:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 2ms, Maximum = 18ms, Average = 8ms

C:\>ping 192.168.25.154

Pinging 192.168.25.154 with 32 bytes of data:

Request timed out.
Reply from 192.168.25.154: bytes=32 time=38ms TTL=127
Reply from 192.168.25.154: bytes=32 time=15ms TTL=127
Reply from 192.168.25.154: bytes=32 time=35ms TTL=127

Ping statistics for 192.168.25.154:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 15ms, Maximum = 38ms, Average = 29ms

C:\>ping 192.168.25.163

Pinging 192.168.25.163 with 32 bytes of data:

Request timed out.
Reply from 192.168.25.163: bytes=32 time=27ms TTL=127
Reply from 192.168.25.163: bytes=32 time=15ms TTL=127
Reply from 192.168.25.163: bytes=32 time=32ms TTL=127

Ping statistics for 192.168.25.163:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 15ms, Maximum = 32ms, Average = 24ms
```

192.168.25.36/28

Physical Config Desktop Programming Attributes

Command Prompt

```
C:\>ping 192.168.25.51

Pinging 192.168.25.51 with 32 bytes of data:

Request timed out.
Reply from 192.168.25.51: bytes=32 time<1ms TTL=127
Reply from 192.168.25.51: bytes=32 time<1ms TTL=127
Reply from 192.168.25.51: bytes=32 time<1ms TTL=127

Ping statistics for 192.168.25.51:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>ping 192.168.25.66

Pinging 192.168.25.66 with 32 bytes of data:

Request timed out.
Request timed out.
Request timed out.
Request timed out.

Ping statistics for 192.168.25.66:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 192.168.25.210

Pinging 192.168.25.210 with 32 bytes of data:

Reply from 20.110.25.1: Destination host unreachable.

Ping statistics for 192.168.25.210:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),

C:\>ping 192.168.25.170

Pinging 192.168.25.170 with 32 bytes of data:

Reply from 20.110.25.1: Destination host unreachable.

Ping statistics for 192.168.25.170:
    Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
```

192.168.25.36/28

Physical Config Desktop Programming Attributes

Command Prompt

```
C:\>ping 192.168.25.82

Pinging 192.168.25.82 with 32 bytes of data:

Request timed out.
Reply from 192.168.25.82: bytes=32 time=23ms TTL=126
Reply from 192.168.25.82: bytes=32 time=34ms TTL=126
Reply from 192.168.25.82: bytes=32 time=3ms TTL=126

Ping statistics for 192.168.25.82:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 3ms, Maximum = 34ms, Average = 20ms

C:\>ping 192.168.25.99

Pinging 192.168.25.99 with 32 bytes of data:

Request timed out.
Reply from 192.168.25.99: bytes=32 time=55ms TTL=126
Reply from 192.168.25.99: bytes=32 time=1ms TTL=126
Reply from 192.168.25.99: bytes=32 time=1ms TTL=126

Ping statistics for 192.168.25.99:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 55ms, Average = 19ms

C:\>ping 192.168.25.114

Pinging 192.168.25.114 with 32 bytes of data:

Request timed out.
Reply from 192.168.25.114: bytes=32 time=30ms TTL=126
Reply from 192.168.25.114: bytes=32 time=49ms TTL=126
Reply from 192.168.25.114: bytes=32 time=35ms TTL=126

Ping statistics for 192.168.25.114:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 30ms, Maximum = 49ms, Average = 38ms

C:\>ping 192.168.25.131

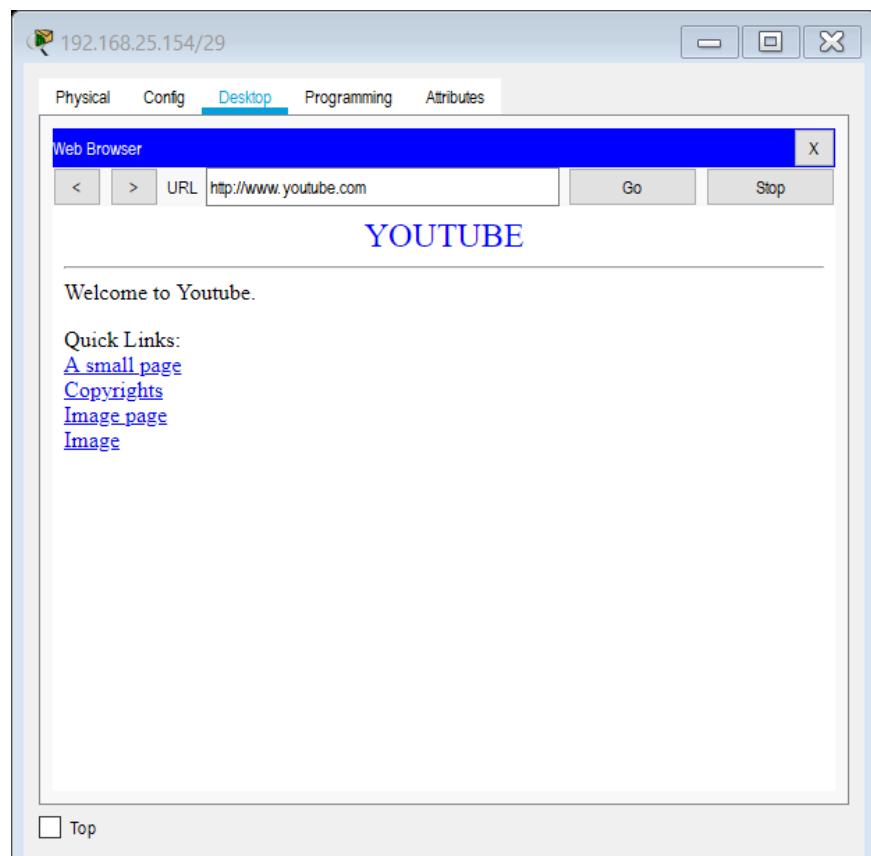
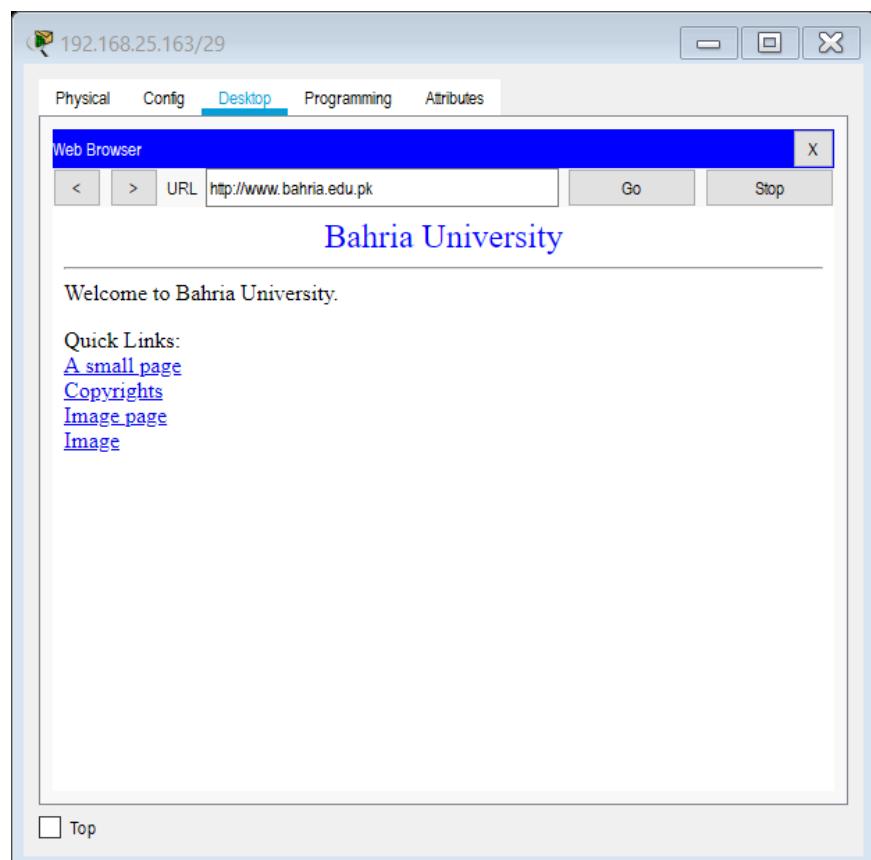
Pinging 192.168.25.131 with 32 bytes of data:

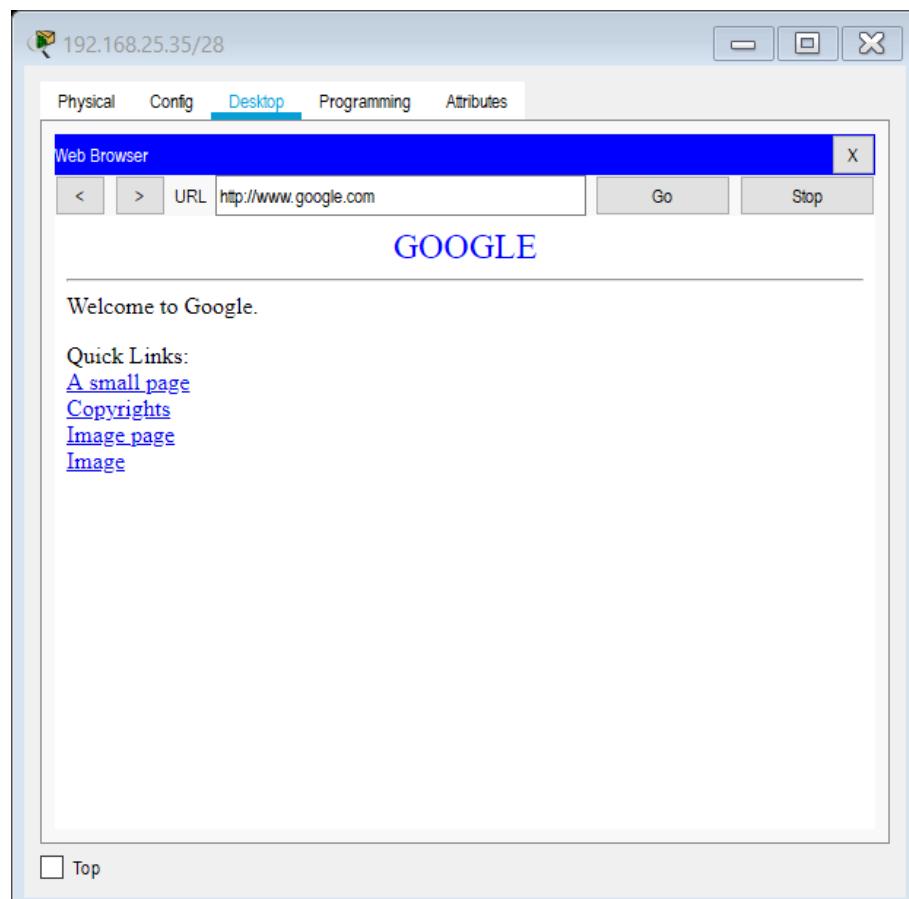
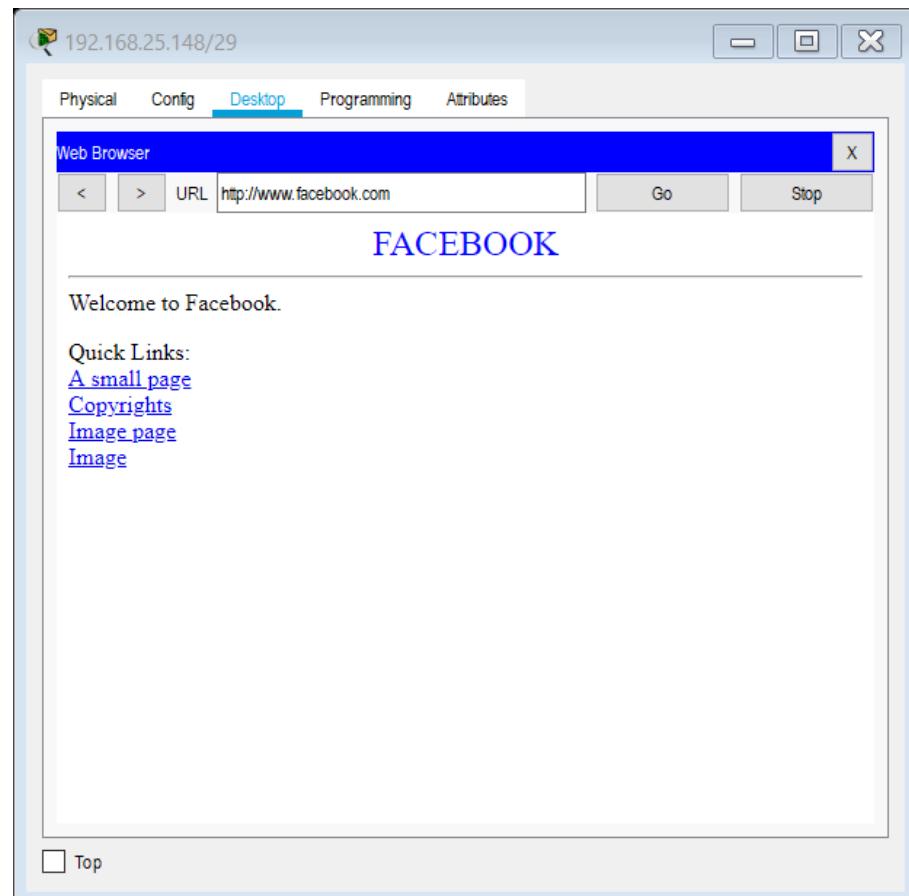
Request timed out.
Reply from 192.168.25.131: bytes=32 time=1ms TTL=126
Reply from 192.168.25.131: bytes=32 time=18ms TTL=126
Reply from 192.168.25.131: bytes=32 time=2ms TTL=126

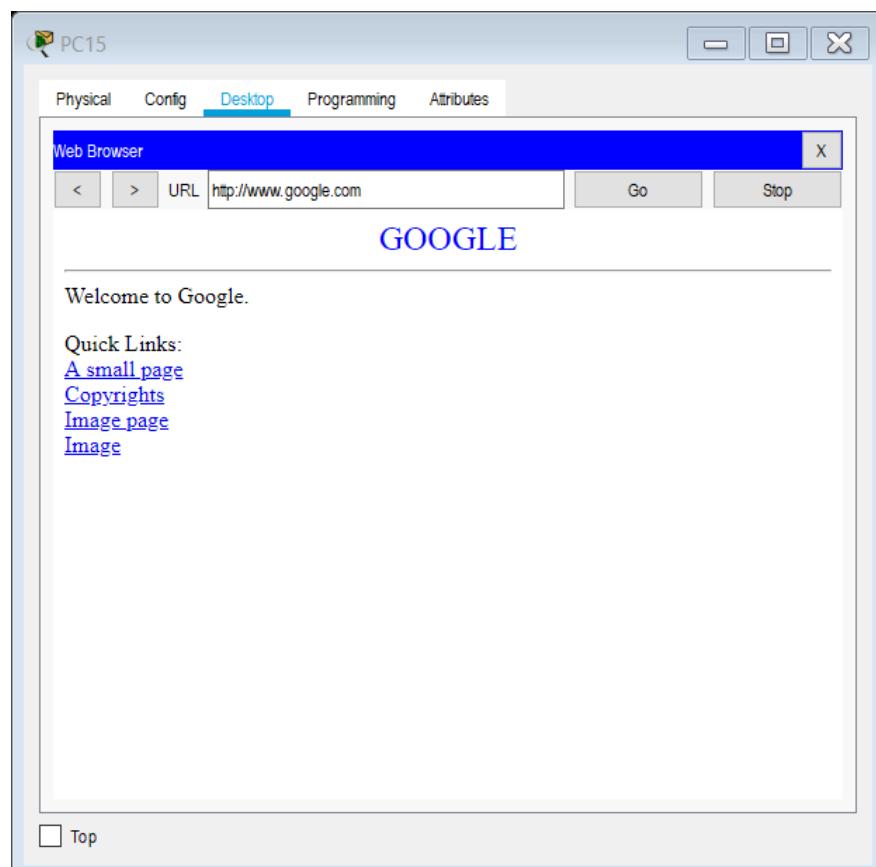
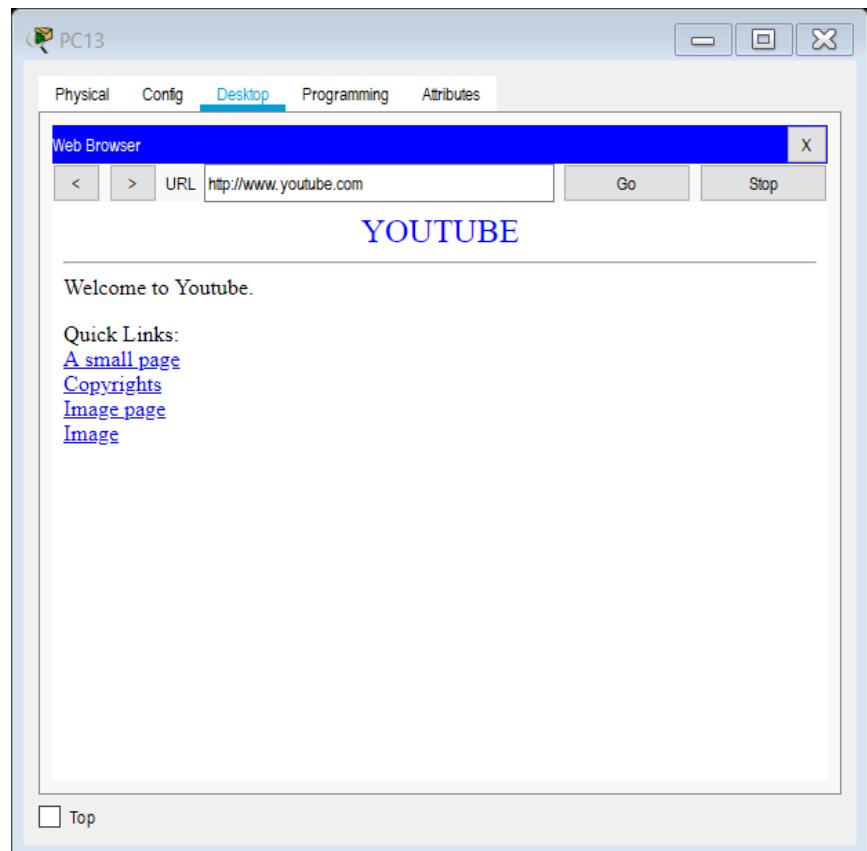
Ping statistics for 192.168.25.131:
    Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
    Minimum = 1ms, Maximum = 18ms, Average = 7ms
```

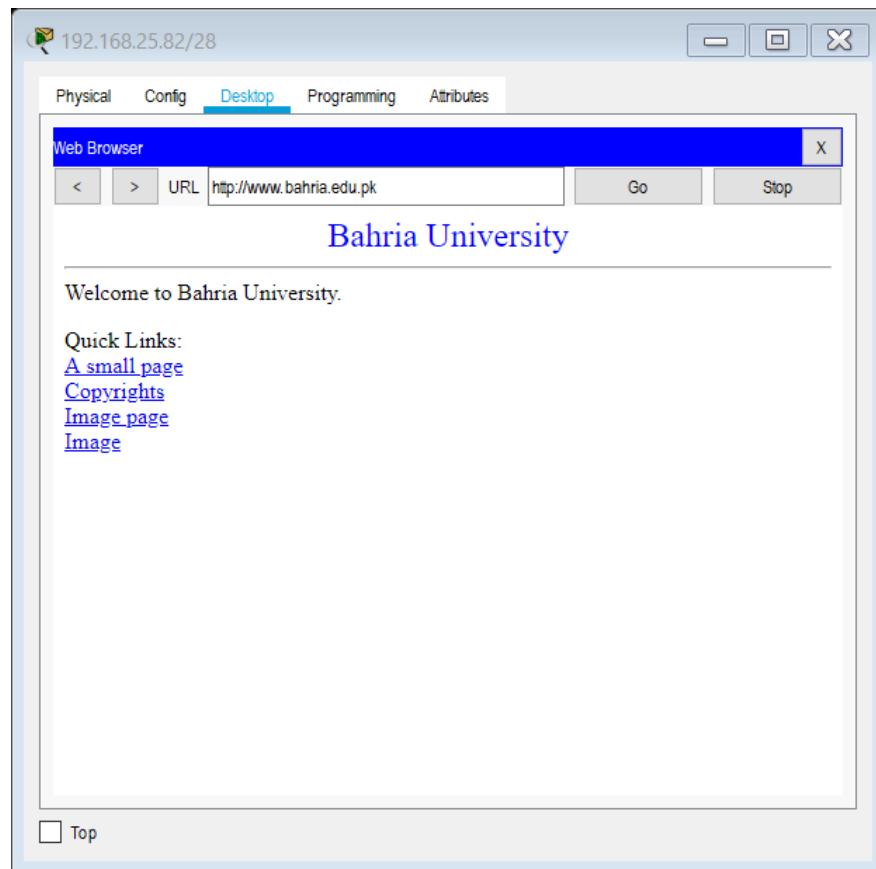
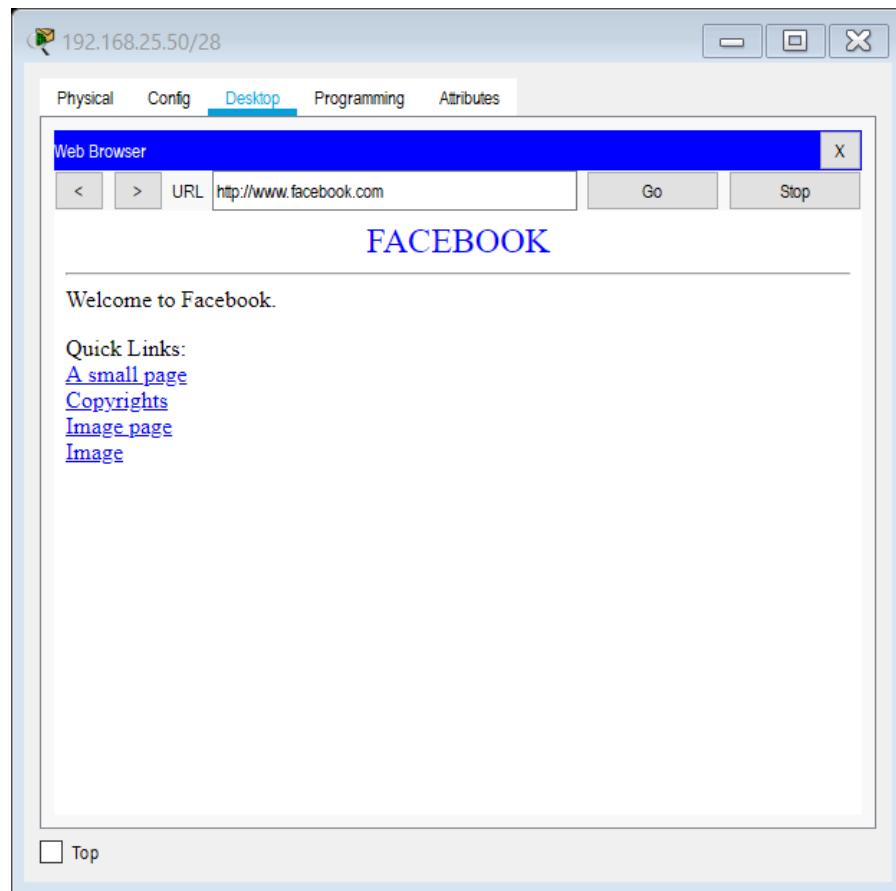
Internet Access

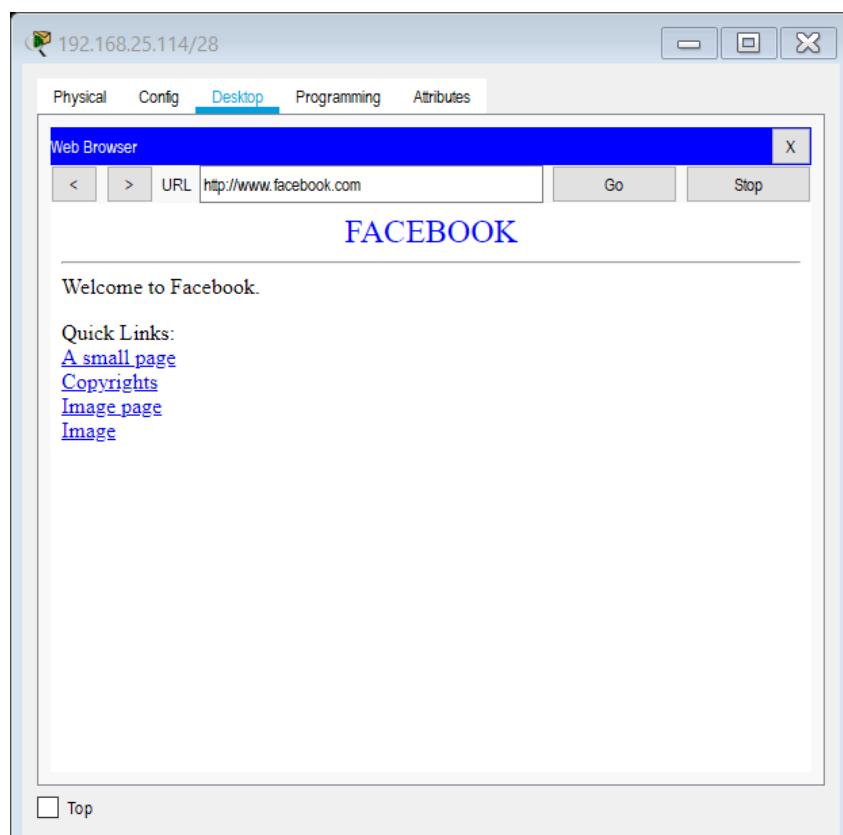
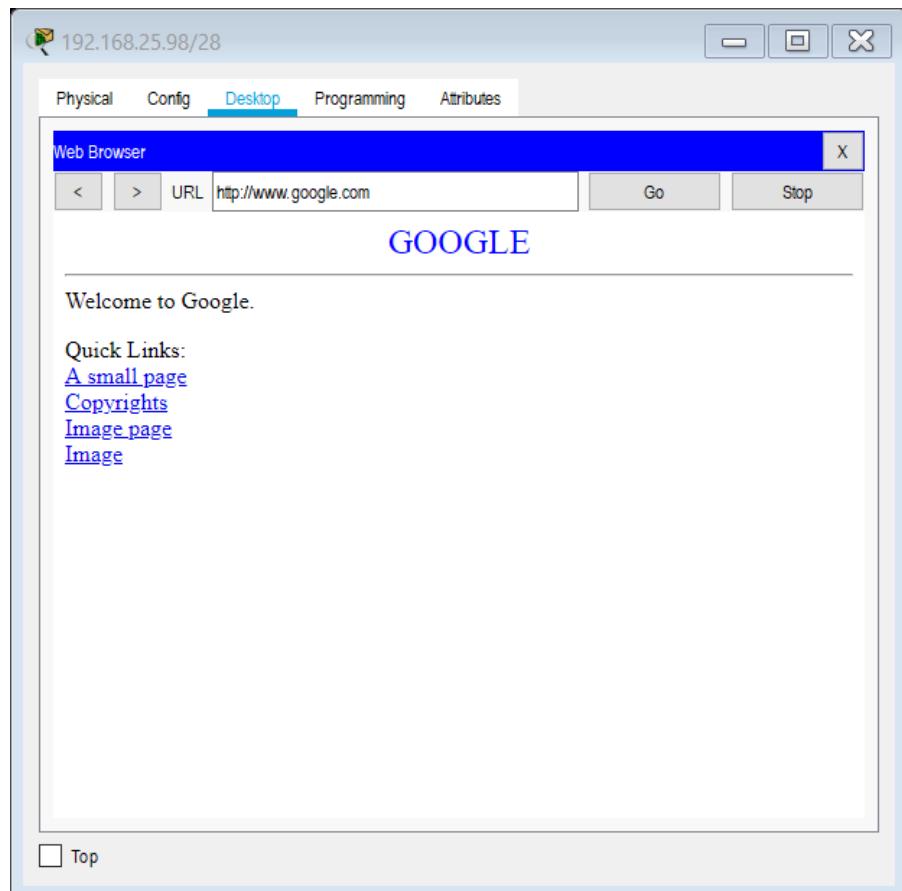
Below are the screen shots of 1 user from every network accessing internet.

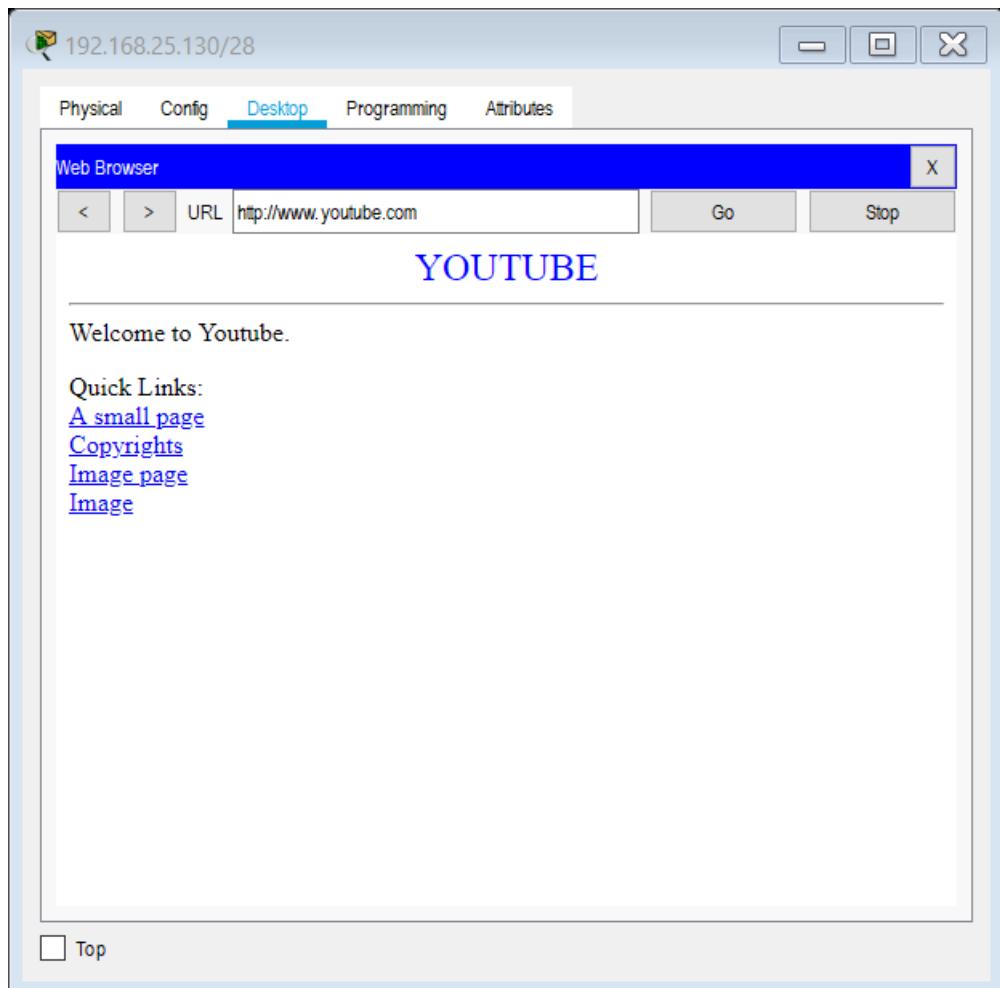




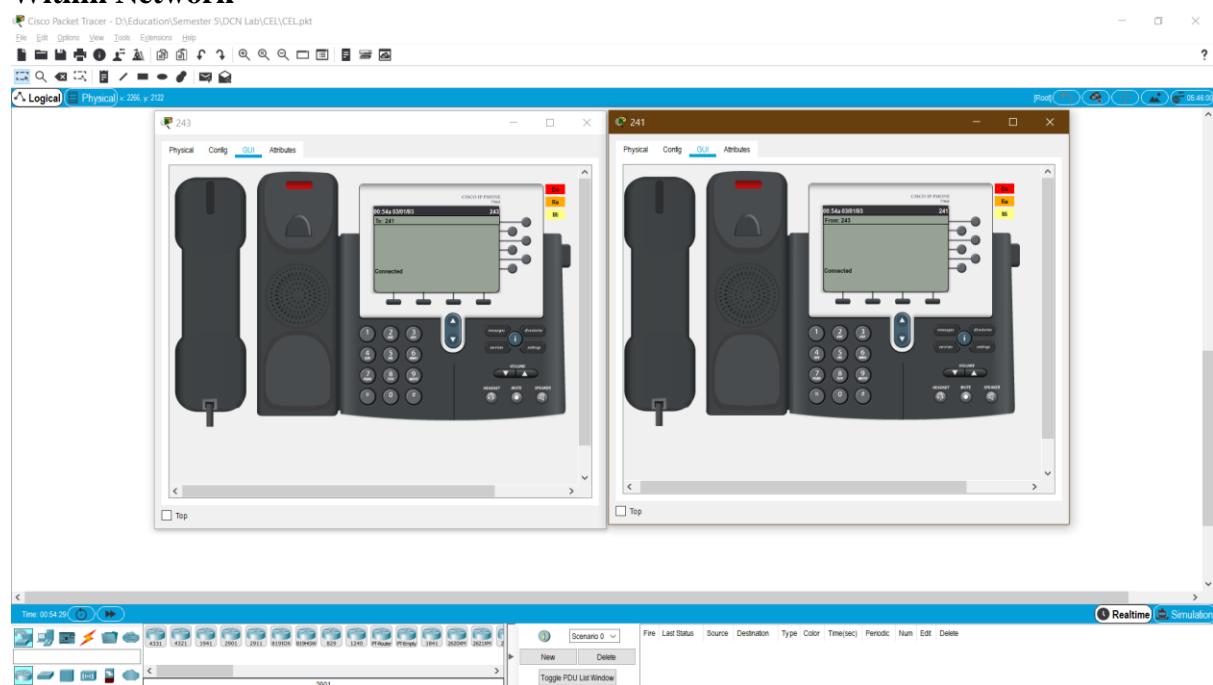


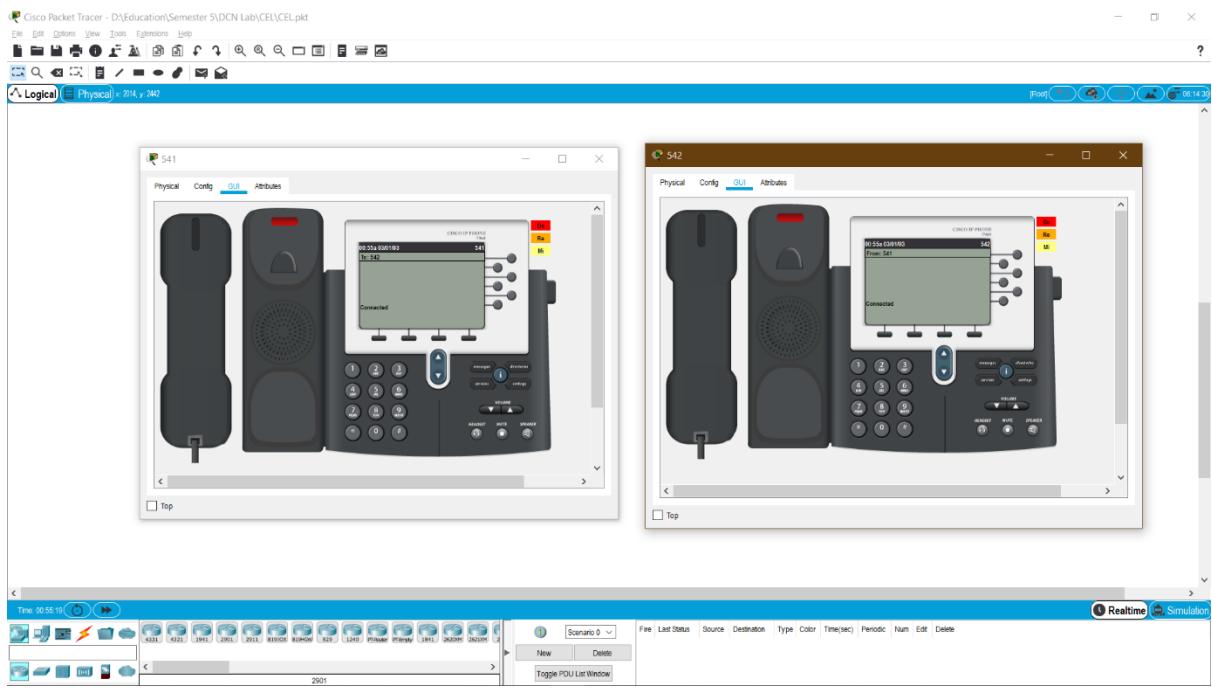




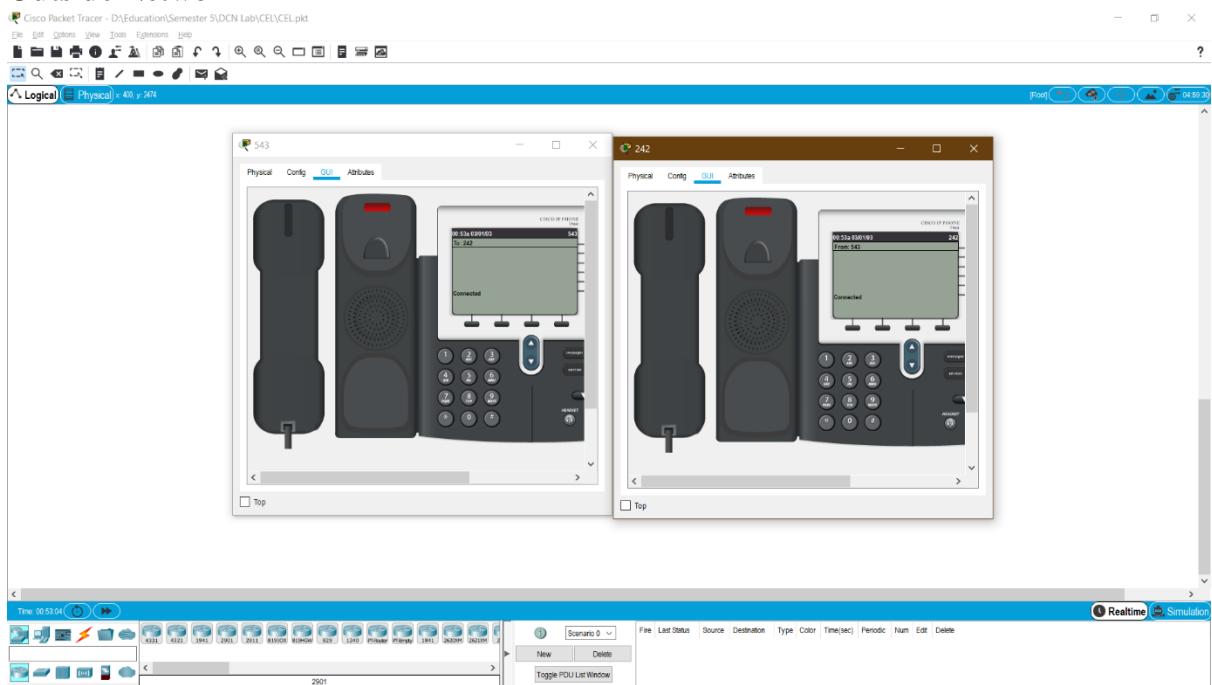


VoIP Communication Within Network





Outside Network



Detailed Results

R1

Physical Config **CLI** Attributes

```
WasifR1#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is 20.110.25.1 to network 0.0.0.0

  20.0.0.0/24 is subnetted, 1 subnets
C   20.110.25.0 is directly connected, FastEthernet8/0
  192.168.25.0/24 is variably subnetted, 14 subnets, 3 masks
C     192.168.25.0/30 is directly connected, Serial2/0
R     192.168.25.4/30 [120/1] via 192.168.25.2, 00:00:12, Serial2/0
C     192.168.25.8/30 is directly connected, Serial3/0
C     192.168.25.16/28 is directly connected, FastEthernet0/0
C     192.168.25.32/28 is directly connected, FastEthernet1/0
C     192.168.25.48/28 is directly connected, FastEthernet6/0
C     192.168.25.64/28 is directly connected, FastEthernet7/0
O     192.168.25.80/28 [110/65] via 192.168.25.2, 02:29:15, Serial2/0
O     192.168.25.96/28 [110/65] via 192.168.25.2, 02:29:15, Serial2/0
O     192.168.25.112/28 [110/65] via 192.168.25.2, 02:29:15, Serial2/0
O     192.168.25.128/28 [110/65] via 192.168.25.2, 02:29:15, Serial2/0
C     192.168.25.144/29 is directly connected, FastEthernet0/0.1
C     192.168.25.152/29 is directly connected, FastEthernet0/0.2
C     192.168.25.160/29 is directly connected, FastEthernet0/0.3
S*   0.0.0.0/0 [254/0] via 20.110.25.1

WasifR1#show ip interface br
Interface          IP-Address      OK? Method Status          Protocol
FastEthernet0/0    192.168.25.17  YES manual up           up
FastEthernet0/0.1  192.168.25.145 YES NVRAM up          up
FastEthernet0/0.2  192.168.25.153 YES NVRAM up          up
FastEthernet0/0.3  192.168.25.161 YES NVRAM up          up
FastEthernet1/0    192.168.25.33  YES NVRAM up          up
Serial2/0          192.168.25.1   YES NVRAM up          up
Serial3/0          192.168.25.9   YES manual up         up
FastEthernet4/0    unassigned     YES NVRAM administratively down down
FastEthernet5/0    unassigned     YES NVRAM administratively down down
FastEthernet6/0    192.168.25.49  YES NVRAM up           up
FastEthernet7/0    192.168.25.65  YES NVRAM up           up
FastEthernet8/0    20.110.25.3   YES DHCP up           up

WasifR1#show ip ospf br
^
% Invalid input detected at '^' marker.

WasifR1#show ip ospf
Routing Process "ospf 25" with ID 192.168.25.161
Supports only single TOS(TOS0) routes
Supports opaque LSA
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
Number of external LSA 0 Checksum Sum 0x00000000
```

R1

Physical Config **CLI** Attributes

```
FastEthernet0/0      unassigned      YES NVRAM  administratively down down
FastEthernet6/0      192.168.25.49   YES NVRAM  up        up
FastEthernet7/0      192.168.25.65   YES NVRAM  up        up
FastEthernet8/0      20.110.25.3    YES DHCP    up        up
WasifR1#show ip ospf br
^
% Invalid input detected at '^' marker.

WasifR1#show ip ospf
Routing Process "ospf 25" with ID 192.168.25.161
Supports only single TOS(TOS0) routes
Supports opaque LSA
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
Number of external LSA 0. Checksum Sum 0x000000
Number of opaque AS LSA 0. Checksum Sum 0x000000
Number of DCbitless external and opaque AS LSA 0
Number of DoNotAge external and opaque AS LSA 0
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
External flood list length 0
Area BACKBONE(0)
  Number of interfaces in this area is 8
  Area has no authentication
  SPF algorithm executed 25 times
  Area ranges are
  Number of LSA 2. Checksum Sum 0x00ff0d
  Number of opaque link LSA 0. Checksum Sum 0x000000
  Number of DCbitless LSA 0
  Number of indication LSA 0
  Number of DoNotAge LSA 0
  Flood list length 0

WasifR1#show ip dhcp
% Incomplete command.
WasifR1#show ip dhcp binding
IP address      Client-ID/          Lease expiration      Type
                  Hardware address

WasifR1#show access-list ipv4
WasifR1#show access-list
Standard IP access list 1
  10 permit 192.168.25.16 0.0.0.15
Standard IP access list 2
  10 permit 192.168.25.144 0.0.0.7
Standard IP access list 3
  10 permit 192.168.25.152 0.0.0.7 (4 match(es))
Standard IP access list 4
  10 permit 192.168.25.160 0.0.0.7
Standard IP access list 5
  10 permit 192.168.25.32 0.0.0.15 (20 match(es))
Standard IP access list 6
  10 permit 192.168.25.48 0.0.0.15 (8 match(es))
Standard IP access list 7
  10 permit 192.168.25.64 0.0.0.15

WasifR1#
```

Ctrl+F6 to exit CLI focus

S4

Physical Config **CLI** Attributes

```

WasifS4#
WasifS4#
WasifS4#
WasifS4#
WasifS4#
WasifS4#
WasifS4#
WasifS4#
WasifS4#
WasifS4#show vlan br

VLAN Name          Status      Ports
-----  -----
1     default       active     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, Gige0/2
10    AAA           active     Fa0/2
20    BBB           active     Fa0/3
30    CCC           active     Fa0/4
1002  fddi-default active
1003  token-ring-default active
1004  fddinet-default active
1005  trnet-default  active
WasifS4#show ip interface br
Interface        IP-Address      OK? Method Status      Protocol
FastEthernet0/1   unassigned      YES manual up        up
FastEthernet0/2   unassigned      YES manual up        up
FastEthernet0/3   unassigned      YES manual up        up
FastEthernet0/4   unassigned      YES manual up        up
FastEthernet0/5   unassigned      YES manual down    down
FastEthernet0/6   unassigned      YES manual down    down
FastEthernet0/7   unassigned      YES manual down    down
FastEthernet0/8   unassigned      YES manual down    down
FastEthernet0/9   unassigned      YES manual down    down
FastEthernet0/10  unassigned      YES manual down    down
FastEthernet0/11  unassigned      YES manual down    down
FastEthernet0/12  unassigned      YES manual down    down
FastEthernet0/13  unassigned      YES manual down    down
FastEthernet0/14  unassigned      YES manual down    down
FastEthernet0/15  unassigned      YES manual down    down
FastEthernet0/16  unassigned      YES manual down    down
FastEthernet0/17  unassigned      YES manual down    down
FastEthernet0/18  unassigned      YES manual down    down
FastEthernet0/19  unassigned      YES manual down    down
FastEthernet0/20  unassigned      YES manual down    down
FastEthernet0/21  unassigned      YES manual down    down
FastEthernet0/22  unassigned      YES manual down    down
FastEthernet0/23  unassigned      YES manual down    down
FastEthernet0/24  unassigned      YES manual down    down
GigabitEthernet0/1 unassigned      YES manual down    down
GigabitEthernet0/2 unassigned      YES manual down    down
Vlan1            unassigned      YES manual administratively down down
WasifS4#

```

Ctrl+F6 to exit CLI focus

 S1

Physical Config **CLI** Attributes

Press RETURN to get started.

```
S1>enable
S1#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
S1(config)#hostname WasifS1
WasifS1(config)#
WasifS1#
%SYS-5-CONFIG_I: Configured from console by console

WasifS1#show ip interface br
Interface          IP-Address      OK? Method Status          Protocol
FastEthernet0/1    unassigned      YES manual up           up
FastEthernet0/2    unassigned      YES manual up           up
FastEthernet0/3    unassigned      YES manual up           up
FastEthernet0/4    unassigned      YES manual up           up
FastEthernet0/5    unassigned      YES manual up           up
FastEthernet0/6    unassigned      YES manual up           up
FastEthernet0/7    unassigned      YES manual down        down
FastEthernet0/8    unassigned      YES manual down        down
FastEthernet0/9    unassigned      YES manual down        down
FastEthernet0/10   unassigned      YES manual down        down
FastEthernet0/11   unassigned      YES manual down        down
FastEthernet0/12   unassigned      YES manual down        down
FastEthernet0/13   unassigned      YES manual down        down
FastEthernet0/14   unassigned      YES manual down        down
FastEthernet0/15   unassigned      YES manual down        down
FastEthernet0/16   unassigned      YES manual down        down
FastEthernet0/17   unassigned      YES manual down        down
FastEthernet0/18   unassigned      YES manual down        down
FastEthernet0/19   unassigned      YES manual down        down
FastEthernet0/20   unassigned      YES manual down        down
FastEthernet0/21   unassigned      YES manual down        down
FastEthernet0/22   unassigned      YES manual down        down
FastEthernet0/23   unassigned      YES manual down        down
FastEthernet0/24   unassigned      YES manual down        down
GigabitEthernet0/1 unassigned      YES manual down        down
GigabitEthernet0/2 unassigned      YES manual down        down
Vlan1             unassigned      YES manual administratively down down
WasifS1#
```

Ctrl+F6 to exit CLI focus

S2

Physical Config **CLI** Attributes

Press RETURN to get started.

```
S2>enable
S2#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
S2(config)#hostname WasifS2
WasifS2(config)#
WasifS2#
%SYS-5-CONFIG_I: Configured from console by console

WasifS2#show ip int br
Interface      IP-Address      OK? Method Status      Protocol
FastEthernet0/1 unassigned      YES manual up       up
FastEthernet0/2 unassigned      YES manual up       up
FastEthernet0/3 unassigned      YES manual up       up
FastEthernet0/4 unassigned      YES manual up       up
FastEthernet0/5 unassigned      YES manual down    down
FastEthernet0/6 unassigned      YES manual down    down
FastEthernet0/7 unassigned      YES manual down    down
FastEthernet0/8 unassigned      YES manual down    down
FastEthernet0/9 unassigned      YES manual down    down
FastEthernet0/10 unassigned     YES manual down    down
FastEthernet0/11 unassigned     YES manual down    down
FastEthernet0/12 unassigned     YES manual down    down
FastEthernet0/13 unassigned     YES manual down    down
FastEthernet0/14 unassigned     YES manual down    down
FastEthernet0/15 unassigned     YES manual down    down
FastEthernet0/16 unassigned     YES manual down    down
FastEthernet0/17 unassigned     YES manual down    down
FastEthernet0/18 unassigned     YES manual down    down
FastEthernet0/19 unassigned     YES manual down    down
FastEthernet0/20 unassigned     YES manual down    down
FastEthernet0/21 unassigned     YES manual down    down
FastEthernet0/22 unassigned     YES manual down    down
FastEthernet0/23 unassigned     YES manual down    down
FastEthernet0/24 unassigned     YES manual down    down
GigabitEthernet0/1 unassigned   YES manual down    down
GigabitEthernet0/2 unassigned   YES manual down    down
Vlan1          unassigned      YES manual administratively down down
WasifS2#
```

S3

Physical Config **CLI** Attributes

Press RETURN to get started.

```
S3>enable
S3#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
S3(config)#hostname WasifS3
WasifS3(config)#
WasifS3#
%SYS-5-CONFIG_I: Configured from console by console

WasifS3#show ip int br
Interface          IP-Address      OK? Method Status        Protocol
FastEthernet0/1    unassigned      YES manual up           up
FastEthernet0/2    unassigned      YES manual up           up
FastEthernet0/3    unassigned      YES manual down        down
FastEthernet0/4    unassigned      YES manual down        down
FastEthernet0/5    unassigned      YES manual down        down
FastEthernet0/6    unassigned      YES manual down        down
FastEthernet0/7    unassigned      YES manual down        down
FastEthernet0/8    unassigned      YES manual down        down
FastEthernet0/9    unassigned      YES manual down        down
FastEthernet0/10   unassigned      YES manual down        down
FastEthernet0/11   unassigned      YES manual down        down
FastEthernet0/12   unassigned      YES manual down        down
FastEthernet0/13   unassigned      YES manual down        down
FastEthernet0/14   unassigned      YES manual down        down
FastEthernet0/15   unassigned      YES manual down        down
FastEthernet0/16   unassigned      YES manual down        down
FastEthernet0/17   unassigned      YES manual down        down
FastEthernet0/18   unassigned      YES manual down        down
FastEthernet0/19   unassigned      YES manual down        down
FastEthernet0/20   unassigned      YES manual down        down
FastEthernet0/21   unassigned      YES manual down        down
FastEthernet0/22   unassigned      YES manual down        down
FastEthernet0/23   unassigned      YES manual down        down
FastEthernet0/24   unassigned      YES manual down        down
GigabitEthernet0/1 unassigned      YES manual down        down
GigabitEthernet0/2 unassigned      YES manual down        down
Vlan1             unassigned      YES manual administratively down down
WasifS3#
```

Ctrl+F6 to exit CLI focus

R4

Physical Config **CLI** Attributes

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname WasifR4
WasifR4(config)#
WasifR4#
%SYS-5-CONFIG_I: Configured from console by console

WasifR4#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is 20.110.25.1 to network 0.0.0.0

  20.0.0/24 is subnetted, 1 subnets
C    20.110.25.0 is directly connected, FastEthernet0/1
  192.168.25.0/24 is variably subnetted, 6 subnets, 2 masks
C      192.168.25.12/30 is directly connected, Serial1/2
O      192.168.25.168/29 [110/65] via 192.168.25.14, 01:03:42, Serial1/2
O      192.168.25.176/29 [110/65] via 192.168.25.14, 01:03:42, Serial1/2
O      192.168.25.192/29 [110/65] via 192.168.25.14, 01:03:42, Serial1/2
C      192.168.25.208/29 is directly connected, FastEthernet0/0.10
C      192.168.25.216/29 is directly connected, FastEthernet0/0.20
S*   0.0.0.0/0 [254/0] via 20.110.25.1

WasifR4#show ip int br
Interface          IP-Address      OK? Method Status           Protocol
FastEthernet0/0    unassigned     YES NVRAM up                up
FastEthernet0/0.10 192.168.25.209 YES NVRAM up                up
FastEthernet0/0.20 192.168.25.217 YES NVRAM up                up
FastEthernet0/0.30 unassigned     YES NVRAM up                up
FastEthernet0/1    20.110.25.5   YES DHCP  up                up
FastEthernet0/3/0   unassigned     YES unset up               down
FastEthernet0/3/1   unassigned     YES unset up               down
FastEthernet0/3/2   unassigned     YES unset up               down
FastEthernet0/3/3   unassigned     YES unset up               down
Serial1/0          unassigned     YES NVRAM down              down
Serial1/1          unassigned     YES NVRAM down              down
Serial1/2          192.168.25.13  YES NVRAM up                up
Serial1/3          unassigned     YES NVRAM down              down
Vlan1             unassigned     YES NVRAM administratively down down

WasifR4#show ip ospf
  Routing Process "ospf 25" with ID 192.168.25.217
  Supports only single TOS(TOS0) routes
  Supports opaque LSA
  SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
  Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
  Number of external LSA 0. Checksum Sum 0x00000000
  Number of opaque AS LSA 0. Checksum Sum 0x00000000
  Number of DCbitless external and opaque AS LSA 0
```

Ctrl+F6 to exit CLI focus

R4

Physical Config **CLI** Attributes

```
Serial1/1          unassigned    YES NVRAM  down      down
Serial1/2          192.168.25.13 YES NVRAM  up       up
Serial1/3          unassigned    YES NVRAM  down      down
Vlan1             unassigned    YES NVRAM  administratively down down
WasifR4#show ip ospf
  Routing Process "ospf 25" with ID 192.168.25.217
  Supports only single TOS(TOS0) routes
  Supports opaque LSA
  SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
  Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
  Number of external LSA 0. Checksum Sum 0x000000
  Number of opaque AS LSA 0. Checksum Sum 0x000000
  Number of DCbitless external and opaque AS LSA 0
  Number of DoNotAge external and opaque AS LSA 0
  Number of areas in this router is 0. 0 normal 0 stub 0 nssa
  External flood list length 0

  Routing Process "ospf 26" with ID 192.168.25.209
  Supports only single TOS(TOS0) routes
  Supports opaque LSA
  SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
  Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
  Number of external LSA 0. Checksum Sum 0x000000
  Number of opaque AS LSA 0. Checksum Sum 0x000000
  Number of DCbitless external and opaque AS LSA 0
  Number of DoNotAge external and opaque AS LSA 0
  Number of areas in this router is 1. 1 normal 0 stub 0 nssa
  External flood list length 0

  Area 1
    Number of interfaces in this area is 3
    Area has no authentication
    SPF algorithm executed 7 times
    Area ranges are
    Number of LSA 2. Checksum Sum 0x01a453
    Number of opaque link LSA 0. Checksum Sum 0x000000
    Number of DCbitless LSA 0
    Number of indication LSA 0
    Number of DoNotAge LSA 0
    Flood list length 0

WasifR4#show ip dhcp
% Incomplete command.
WasifR4#show ip dhcp binding
IP address      Client-ID/           Lease expiration      Type
               Hardware address
192.168.25.212 0001.C905.5E19   --                  Automatic
192.168.25.210 0060.3EBE.764E   --                  Automatic
192.168.25.218 0004.9A98.DDC2   --                  Automatic
192.168.25.219 0001.63D3.20EA   --                  Automatic
192.168.25.220 0003.E4E8.2B07   --                  Automatic
WasifR4#show access-list
Standard IP access list 10
  10 permit 192.168.25.208 0.0.0.7 (8 match(es))

WasifR4#
```

Ctrl+F6 to exit CLI focus

S10

Physical Config **CLI** Attributes

```
S10>enable
S10#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
S10(config)#hostname WasifS10
WasifS10(config)#
WasifS10#
%SYS-5-CONFIG_I: Configured from console by console

WasifS10#show ip int br
Interface          IP-Address      OK? Method Status           Protocol
FastEthernet0/1    unassigned      YES manual up            up
FastEthernet0/2    unassigned      YES manual up            up
FastEthernet0/3    unassigned      YES manual up            up
FastEthernet0/4    unassigned      YES manual up            up
FastEthernet0/5    unassigned      YES manual down          down
FastEthernet0/6    unassigned      YES manual down          down
FastEthernet0/7    unassigned      YES manual down          down
FastEthernet0/8    unassigned      YES manual down          down
FastEthernet0/9    unassigned      YES manual down          down
FastEthernet0/10   unassigned      YES manual down          down
FastEthernet0/11   unassigned      YES manual down          down
FastEthernet0/12   unassigned      YES manual down          down
FastEthernet0/13   unassigned      YES manual down          down
FastEthernet0/14   unassigned      YES manual down          down
FastEthernet0/15   unassigned      YES manual down          down
FastEthernet0/16   unassigned      YES manual down          down
FastEthernet0/17   unassigned      YES manual down          down
FastEthernet0/18   unassigned      YES manual down          down
FastEthernet0/19   unassigned      YES manual down          down
FastEthernet0/20   unassigned      YES manual down          down
FastEthernet0/21   unassigned      YES manual down          down
FastEthernet0/22   unassigned      YES manual down          down
FastEthernet0/23   unassigned      YES manual down          down
FastEthernet0/24   unassigned      YES manual down          down
GigabitEthernet0/1 unassigned      YES manual down          down
GigabitEthernet0/2 unassigned      YES manual down          down
Vlan1             unassigned      YES manual administratively down down
WasifS10#show vlan br

VLAN Name          Status     Ports
--- 
1    default        active    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
150   DATA          active    Fa0/2, Fa0/3, Fa0/4
160   VOICE         active    Fa0/2, Fa0/3, Fa0/4
170   NATIVE        active
1002  fddi-default active
1003  token-ring-default active
1004  fddinet-default active
1005  trnet-default active
WasifS10#
```

Ctrl+F6 to exit CLI focus

S9

Physical Config **CLI** Attributes

```
S9>enable
S9#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
S9(config)#hostname WasifS9
WasifS9(config)#
WasifS9#
%SYS-5-CONFIG_I: Configured from console by console

WasifS9#show vlan br

VLAN Name          Status    Ports
-----  -----
1     default       active    Fa0/5, Fa0/6, Fa0/7, Fa0/8
                           Fa0/9, Fa0/16, Fa0/17, Fa0/18
                           Fa0/19, Fa0/20, Fa0/21, Fa0/22
                           Fa0/23, Fa0/24, Gig0/1, Gig0/2
50    DATA          active    Fa0/2, Fa0/3, Fa0/4
60    VOICE         active    Fa0/2, Fa0/3, Fa0/4
70    NATIVE        active
100   MANAGER       active    Fa0/10, Fa0/11, Fa0/12, Fa0/13
                           Fa0/14, Fa0/15
1002  fddi-default active
1003  token-ring-default active
1004  fddinet-default active
1005  trnet-default  active
WasifS9#show ip int br
Interface      IP-Address      OK? Method Status      Protocol
FastEthernet0/1 unassigned      YES manual up       up
FastEthernet0/2 unassigned      YES manual up       up
FastEthernet0/3 unassigned      YES manual up       up
FastEthernet0/4 unassigned      YES manual up       up
FastEthernet0/5 unassigned      YES manual down    down
FastEthernet0/6 unassigned      YES manual down    down
FastEthernet0/7 unassigned      YES manual down    down
FastEthernet0/8 unassigned      YES manual down    down
FastEthernet0/9 unassigned      YES manual down    down
FastEthernet0/10 unassigned     YES manual down    down
FastEthernet0/11 unassigned     YES manual up       up
FastEthernet0/12 unassigned     YES manual up       up
FastEthernet0/13 unassigned     YES manual down    down
FastEthernet0/14 unassigned     YES manual down    down
FastEthernet0/15 unassigned     YES manual down    down
FastEthernet0/16 unassigned     YES manual down    down
FastEthernet0/17 unassigned     YES manual down    down
FastEthernet0/18 unassigned     YES manual down    down
FastEthernet0/19 unassigned     YES manual down    down
FastEthernet0/20 unassigned     YES manual down    down
FastEthernet0/21 unassigned     YES manual down    down
FastEthernet0/22 unassigned     YES manual down    down
FastEthernet0/23 unassigned     YES manual down    down
FastEthernet0/24 unassigned     YES manual down    down
GigabitEthernet0/1 unassigned   YES manual down    down
GigabitEthernet0/2 unassigned   YES manual down    down
Vlan1           unassigned     YES manual administratively down down
WasifS9#
```

Ctrl+F6 to exit CLI focus

S5

Physical Config **CLI** Attributes

Press RETURN to get started.

```
S5>enable
S5#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
S5(config)#hostname WasifS5
WasifS5(config)#
WasifS5#
%SYS-5-CONFIG_I: Configured from console by console

WasifS5#show ip int br
Interface          IP-Address      OK? Method Status          Protocol
FastEthernet0/1    unassigned      YES manual up           up
FastEthernet0/2    unassigned      YES manual up           up
FastEthernet0/3    unassigned      YES manual down        down
FastEthernet0/4    unassigned      YES manual down        down
FastEthernet0/5    unassigned      YES manual down        down
FastEthernet0/6    unassigned      YES manual down        down
FastEthernet0/7    unassigned      YES manual down        down
FastEthernet0/8    unassigned      YES manual down        down
FastEthernet0/9    unassigned      YES manual down        down
FastEthernet0/10   unassigned      YES manual down        down
FastEthernet0/11   unassigned      YES manual down        down
FastEthernet0/12   unassigned      YES manual down        down
FastEthernet0/13   unassigned      YES manual down        down
FastEthernet0/14   unassigned      YES manual down        down
FastEthernet0/15   unassigned      YES manual down        down
FastEthernet0/16   unassigned      YES manual down        down
FastEthernet0/17   unassigned      YES manual down        down
FastEthernet0/18   unassigned      YES manual down        down
FastEthernet0/19   unassigned      YES manual down        down
FastEthernet0/20   unassigned      YES manual down        down
FastEthernet0/21   unassigned      YES manual down        down
FastEthernet0/22   unassigned      YES manual down        down
FastEthernet0/23   unassigned      YES manual down        down
FastEthernet0/24   unassigned      YES manual down        down
GigabitEthernet0/1  unassigned      YES manual down        down
GigabitEthernet0/2  unassigned      YES manual down        down
Vlan1              unassigned      YES manual administratively down down
WasifS5#
```

Ctrl+F6 to exit CLI focus

S6

Physical Config **CLI** Attributes

Press RETURN to get started.

```
S6>enable
S6#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
S6(config)#hostname WasifS6
WasifS6(config)#
WasifS6#
*SYS-5-CONFIG_I: Configured from console by console

WasifS6#show ip int br
Interface          IP-Address      OK? Method Status        Protocol
FastEthernet0/1    unassigned      YES manual up           up
FastEthernet0/2    unassigned      YES manual up           up
FastEthernet0/3    unassigned      YES manual down        down
FastEthernet0/4    unassigned      YES manual down        down
FastEthernet0/5    unassigned      YES manual down        down
FastEthernet0/6    unassigned      YES manual down        down
FastEthernet0/7    unassigned      YES manual down        down
FastEthernet0/8    unassigned      YES manual down        down
FastEthernet0/9    unassigned      YES manual down        down
FastEthernet0/10   unassigned      YES manual down        down
FastEthernet0/11   unassigned      YES manual down        down
FastEthernet0/12   unassigned      YES manual down        down
FastEthernet0/13   unassigned      YES manual down        down
FastEthernet0/14   unassigned      YES manual down        down
FastEthernet0/15   unassigned      YES manual down        down
FastEthernet0/16   unassigned      YES manual down        down
FastEthernet0/17   unassigned      YES manual down        down
FastEthernet0/18   unassigned      YES manual down        down
FastEthernet0/19   unassigned      YES manual down        down
FastEthernet0/20   unassigned      YES manual down        down
FastEthernet0/21   unassigned      YES manual down        down
FastEthernet0/22   unassigned      YES manual down        down
FastEthernet0/23   unassigned      YES manual down        down
FastEthernet0/24   unassigned      YES manual down        down
GigabitEthernet0/1 unassigned      YES manual down        down
GigabitEthernet0/2 unassigned      YES manual down        down
Vlan1             unassigned      YES manual administratively down down
WasifS6#
```

Ctrl+F6 to exit CLI focus

 S7

Physical Config **CLI** Attributes

Press RETURN to get started.

```
S7>enable
S7#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
S7(config)#hostname WasifS7
WasifS7(config)#
WasifS7#
%SYS-5-CONFIG_I: Configured from console by console

WasifS7#show ip int br
Interface          IP-Address      OK? Method Status      Protocol
FastEthernet0/1    unassigned     YES manual up       up
FastEthernet0/2    unassigned     YES manual up       up
FastEthernet0/3    unassigned     YES manual down    down
FastEthernet0/4    unassigned     YES manual down    down
FastEthernet0/5    unassigned     YES manual down    down
FastEthernet0/6    unassigned     YES manual down    down
FastEthernet0/7    unassigned     YES manual down    down
FastEthernet0/8    unassigned     YES manual down    down
FastEthernet0/9    unassigned     YES manual down    down
FastEthernet0/10   unassigned     YES manual down    down
FastEthernet0/11   unassigned     YES manual down    down
FastEthernet0/12   unassigned     YES manual down    down
FastEthernet0/13   unassigned     YES manual down    down
FastEthernet0/14   unassigned     YES manual down    down
FastEthernet0/15   unassigned     YES manual down    down
FastEthernet0/16   unassigned     YES manual down    down
FastEthernet0/17   unassigned     YES manual down    down
FastEthernet0/18   unassigned     YES manual down    down
FastEthernet0/19   unassigned     YES manual down    down
FastEthernet0/20   unassigned     YES manual down    down
FastEthernet0/21   unassigned     YES manual down    down
FastEthernet0/22   unassigned     YES manual down    down
FastEthernet0/23   unassigned     YES manual down    down
FastEthernet0/24   unassigned     YES manual down    down
GigabitEthernet0/1 unassigned     YES manual down    down
GigabitEthernet0/2 unassigned     YES manual down    down
Vlan1             unassigned     YES manual administratively down down
WasifS7#
```

Ctrl+F6 to exit CLI focus

S8

Physical Config **CLI** Attributes

Press RETURN to get started.

```
S8>enable
S8#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
S8(config)#hostname WasifS8
WasifS8(config)#
WasifS8#
%SYS-5-CONFIG_I: Configured from console by console

WasifS8#show ip int br
Interface          IP-Address      OK? Method Status      Protocol
FastEthernet0/1    unassigned      YES manual up       up
FastEthernet0/2    unassigned      YES manual up       up
FastEthernet0/3    unassigned      YES manual down    down
FastEthernet0/4    unassigned      YES manual down    down
FastEthernet0/5    unassigned      YES manual down    down
FastEthernet0/6    unassigned      YES manual down    down
FastEthernet0/7    unassigned      YES manual down    down
FastEthernet0/8    unassigned      YES manual down    down
FastEthernet0/9    unassigned      YES manual down    down
FastEthernet0/10   unassigned      YES manual down    down
FastEthernet0/11   unassigned      YES manual down    down
FastEthernet0/12   unassigned      YES manual down    down
FastEthernet0/13   unassigned      YES manual down    down
FastEthernet0/14   unassigned      YES manual down    down
FastEthernet0/15   unassigned      YES manual down    down
FastEthernet0/16   unassigned      YES manual down    down
FastEthernet0/17   unassigned      YES manual down    down
FastEthernet0/18   unassigned      YES manual down    down
FastEthernet0/19   unassigned      YES manual down    down
FastEthernet0/20   unassigned      YES manual down    down
FastEthernet0/21   unassigned      YES manual down    down
FastEthernet0/22   unassigned      YES manual down    down
FastEthernet0/23   unassigned      YES manual down    down
FastEthernet0/24   unassigned      YES manual down    down
GigabitEthernet0/1 unassigned     YES manual down    down
GigabitEthernet0/2 unassigned     YES manual down    down
Vlan1             unassigned     YES manual administratively down down
WasifS8#
```

Ctrl+F6 to exit CLI focus

R3

Physical Config **CLI** Attributes

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#hostname WasifR3
WasifR3(config)#
WasifR3#
*SYS-5-CONFIG_I: Configured from console by console

WasifR3#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is 20.110.25.1 to network 0.0.0.0

  20.0.0.0/24 is subnetted, 1 subnets
C    20.110.25.0 is directly connected, FastEthernet0/1
  192.168.25.0/24 is variably subnetted, 8 subnets, 2 masks
C      192.168.25.4/30 is directly connected, Serial1/0
C      192.168.25.8/30 is directly connected, Serial1/1
C      192.168.25.12/30 is directly connected, Serial1/2
C      192.168.25.168/29 is directly connected, FastEthernet0/0.10
C      192.168.25.176/29 is directly connected, FastEthernet0/0.20
C      192.168.25.192/29 is directly connected, FastEthernet0/0.100
O      192.168.25.208/29 [110/65] via 192.168.25.13, 01:09:05, Serial1/2
O      192.168.25.216/29 [110/65] via 192.168.25.13, 01:09:05, Serial1/2
S*   0.0.0.0/0 [254/0] via 20.110.25.1

WasifR3#show ip int br
Interface          IP-Address      OK? Method Status        Protocol
FastEthernet0/0     unassigned      YES NVRAM up           up
FastEthernet0/0.10  192.168.25.169 YES NVRAM up           up
FastEthernet0/0.20  192.168.25.177 YES NVRAM up           up
FastEthernet0/0.30  unassigned      YES NVRAM up           up
FastEthernet0/0.100 192.168.25.193 YES NVRAM up           up
FastEthernet0/1     20.110.25.4   YES DHCP up           up
FastEthernet0/3/0   unassigned      YES unset up          down
FastEthernet0/3/1   unassigned      YES unset up          down
FastEthernet0/3/2   unassigned      YES unset up          down
FastEthernet0/3/3   unassigned      YES unset up          down
Serial1/0           192.168.25.6   YES NVRAM up           up
Serial1/1           192.168.25.10  YES NVRAM up           up
Serial1/2           192.168.25.14  YES NVRAM up           up
Serial1/3           unassigned      YES NVRAM administratively down down
Vlan1              unassigned      YES NVRAM administratively down down

WasifR3#show ip ospf
Routing Process "ospf 26" with ID 192.168.25.193
Supports only single TOS(TOS0) routes
Supports opaque LSA
SPF schedule delay 5 secs, Hold time between two SPF's 10 secs
```

Ctrl+F6 to exit CLI focus

R3

Physical Config **CLI** Attributes

```
FastEthernet0/0.10      192.168.25.169  YES NVRAM  up          up
FastEthernet0/0.20      192.168.25.177  YES NVRAM  up          up
FastEthernet0/0.30      unassigned       YES NVRAM  up          up
FastEthernet0/0.100     192.168.25.193  YES NVRAM  up          up
FastEthernet0/1         20.110.25.4    YES DHCP   up          up
FastEthernet0/3/0       unassigned       YES unset  up          down
FastEthernet0/3/1       unassigned       YES unset  up          down
FastEthernet0/3/2       unassigned       YES unset  up          down
FastEthernet0/3/3       unassigned       YES unset  up          down
Serial1/0               192.168.25.6    YES NVRAM  up          up
Serial1/1               192.168.25.10   YES NVRAM  up          up
Serial1/2               192.168.25.14   YES NVRAM  up          up
Serial1/3               unassigned       YES NVRAM  administratively down down
Vlan1                 unassigned       YES NVRAM  administratively down down

WasifR3#show ip ospf
Routing Process "ospf 26" with ID 192.168.25.193
Supports only single TOS(TOS0) routes
Supports opaque LSA
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
Number of external LSA 0. Checksum Sum 0x000000
Number of opaque AS LSA 0. Checksum Sum 0x000000
Number of DCbitless external and opaque AS LSA 0
Number of DoNotAge external and opaque AS LSA 0
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
External flood list length 0
  Area 1
    Number of interfaces in this area is 4
    Area has no authentication
    SPF algorithm executed 7 times
    Area ranges are
    Number of LSA 2. Checksum Sum 0x01a453
    Number of opaque link LSA 0. Checksum Sum 0x000000
    Number of DCbitless LSA 0
    Number of indication LSA 0
    Number of DoNotAge LSA 0
    Flood list length 0

WasifR3#show ip dhcp binding
IP address           Client-ID/          Lease expiration      Type
                           Hardware address
192.168.25.172        0090.0C3C.28B1    --
192.168.25.173        0007.ECD0.7170    --
192.168.25.179        00D0.97D5.8924    --
192.168.25.180        00E0.A38D.9A59    --
192.168.25.181        0001.647C.5CC6    --
WasifR3#show access-list
Standard IP access list 1
  10 permit 192.168.25.168 0.0.0.7
Standard IP access list 2
  10 permit 192.168.25.176 0.0.0.7
Standard IP access list 10
  10 permit 192.168.25.168 0.0.0.7

WasifR3#
```

Ctrl+F6 to exit CLI focus



ISP ROUTER

Physical Config **CLI** Attributes

```
ISP_Router>en
ISP_Router#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is not set

  8.0.0.0/24 is subnetted, 1 subnets
C       8.8.8.0 is directly connected, Vlan8
  10.0.0.0/24 is subnetted, 1 subnets
C       10.10.10.0 is directly connected, Vlan10
  20.0.0.0/24 is subnetted, 1 subnets
C       20.110.25.0 is directly connected, FastEthernet0/0

ISP_Router#show ip int br
Interface          IP-Address      OK? Method Status           Protocol
FastEthernet0/0    20.110.25.1    YES manual up            up
FastEthernet0/1    unassigned      YES unset administratively down down
FastEthernet1/0    unassigned      YES unset up             up
FastEthernet1/1    unassigned      YES unset up             down
FastEthernet1/2    unassigned      YES unset up             down
FastEthernet1/3    unassigned      YES unset up             down
FastEthernet1/4    unassigned      YES unset up             down
FastEthernet1/5    unassigned      YES unset up             down
FastEthernet1/6    unassigned      YES unset up             down
FastEthernet1/7    unassigned      YES unset up             up
FastEthernet1/8    unassigned      YES unset up             up
FastEthernet1/9    unassigned      YES unset up             up
FastEthernet1/10   unassigned      YES unset up             up
FastEthernet1/11   unassigned      YES unset up             down
FastEthernet1/12   unassigned      YES unset up             down
FastEthernet1/13   unassigned      YES unset up             down
FastEthernet1/14   unassigned      YES unset up             down
FastEthernet1/15   unassigned      YES unset up             down
Vlan1              unassigned      YES unset administratively down down
Vlan8              8.8.8.1        YES manual up            up
Vlan10             10.10.10.1   YES manual up            up

ISP_Router#show ip ospf
ISP_Router#show ip dhcp binding
IP address          Client-ID/          Lease expiration      Type
                  Hardware address
20.110.25.2        0001.64A4.45E3    --
20.110.25.3        00D0.589C.D159    --
20.110.25.4        00E0.F79D.E102    --
20.110.25.5        0002.4A67.4302    --
ISP_Router#show access-list
ISP_Router#show vlan br

VLAN Name          Status     Ports
```

Ctrl+F6 to exit CLI focus



ISP ROUTER

Physical Config **CLI** Attributes

```
20.110.25.3      0000.589C.D159      --          Automatic
20.110.25.4      00E0.F79D.E102      --          Automatic
20.110.25.5      0002.4A67.4302      --          Automatic
ISP_Router#show access-list
ISP_Router#show vlan br

VLAN Name           Status    Ports
-----  
1     default        active    Fal/0, Fal/1, Fal/2, Fal/3
8     VLAN0008        active    Fal/4, Fal/5, Fal/6
10    VLAN0010        active    Fal/7, Fal/8, Fal/9, Fal/10
                           Fal/11, Fal/12, Fal/13, Fal/14
                           Fal/15
1002 fddi-default   active
1003 token-ring-default active
1004 fddinet-default active
1005 trnet-default   active
ISP_Router#show spanning-tree
VLAN0008
  Spanning tree enabled protocol ieee
  Root ID    Priority    32776
              Address     0001.437E.856B
              This bridge is the root
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32776 (priority 32768 sys-id-ext 8)
              Address     0001.437E.856B
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
              Aging Time   20

Interface      Role Sts Cost      Prio.Nbr Type
-----  
Fal/0          Desg FWD 19       128.3    P2p

VLAN0010
  Spanning tree enabled protocol ieee
  Root ID    Priority    32778
              Address     0001.437E.856B
              This bridge is the root
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec

  Bridge ID  Priority    32778 (priority 32768 sys-id-ext 10)
              Address     0001.437E.856B
              Hello Time   2 sec  Max Age 20 sec  Forward Delay 15 sec
              Aging Time   20

Interface      Role Sts Cost      Prio.Nbr Type
-----  
Fal/7          Desg FWD 19       128.10   P2p
Fal/9          Desg FWD 19       128.12   P2p
Fal/8          Desg FWD 19       128.11   P2p
Fal/10         Desg FWD 19       128.13   P2p

ISP_Router#|
```

Ctrl+F6 to exit CLI focus

R2

Physical Config **CLI** Attributes

```
Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#
Router(config)#hostname WasifR2
WasifR2(config)#
WasifR2#
*SYS-5-CONFIG_I: Configured from console by console

WasifR2#show ip br
^
% Invalid input detected at '^' marker.

WasifR2#show ip route
Codes: C - connected, S - static, I - IGRP, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2, E - EGP
      i - IS-IS, L1 - IS-IS level-1, L2 - IS-IS level-2, ia - IS-IS inter area
      * - candidate default, U - per-user static route, o - ODR
      P - periodic downloaded static route

Gateway of last resort is 20.110.25.1 to network 0.0.0.0

  20.0.0.0/24 is subnetted, 1 subnets
C    20.110.25.0 is directly connected, FastEthernet0/0
  192.168.25.0/24 is variably subnetted, 14 subnets, 3 masks
C      192.168.25.0/30 is directly connected, Serial2/0
C      192.168.25.4/30 is directly connected, Serial3/0
R      192.168.25.8/30 [120/1] via 192.168.25.1, 00:00:01, Serial2/0
O      192.168.25.16/28 [110/65] via 192.168.25.1, 02:51:50, Serial2/0
O      192.168.25.32/28 [110/65] via 192.168.25.1, 02:51:50, Serial2/0
O      192.168.25.48/28 [110/65] via 192.168.25.1, 02:51:50, Serial2/0
O      192.168.25.64/28 [110/65] via 192.168.25.1, 02:51:50, Serial2/0
C      192.168.25.80/28 is directly connected, FastEthernet0/0
C      192.168.25.96/28 is directly connected, FastEthernet1/0
C      192.168.25.112/28 is directly connected, FastEthernet6/0
C      192.168.25.128/28 is directly connected, FastEthernet7/0
O      192.168.25.144/29 [110/65] via 192.168.25.1, 02:51:50, Serial2/0
O      192.168.25.152/29 [110/65] via 192.168.25.1, 02:51:50, Serial2/0
O      192.168.25.160/29 [110/65] via 192.168.25.1, 02:51:50, Serial2/0
S*    0.0.0.0/0 [254/0] via 20.110.25.1

WasifR2#show ip int br
Interface          IP-Address      OK? Method Status          Protocol
FastEthernet0/0    192.168.25.81   YES NVRAM up           up
FastEthernet1/0    192.168.25.97   YES NVRAM up           up
Serial2/0          192.168.25.2    YES NVRAM up           up
Serial3/0          192.168.25.5    YES NVRAM up           up
FastEthernet4/0    unassigned     YES NVRAM administratively down down
FastEthernet5/0    unassigned     YES NVRAM administratively down down
FastEthernet6/0    192.168.25.113   YES NVRAM up           up
FastEthernet7/0    192.168.25.129   YES NVRAM up           up
FastEthernet8/0    20.110.25.2    YES DHCP  up           up
```

Ctrl+F6 to exit CLI focus

 R2

Physical Config **CLI** Attributes

```
C 192.168.25.128/28 is directly connected, FastEthernet7/0
O 192.168.25.144/29 [110/65] via 192.168.25.1, 02:51:50, Serial2/0
O 192.168.25.152/29 [110/65] via 192.168.25.1, 02:51:50, Serial2/0
O 192.168.25.160/29 [110/65] via 192.168.25.1, 02:51:50, Serial2/0
S* 0.0.0.0/0 [254/0] via 20.110.25.1

WasifR2#show ip int br
Interface          IP-Address      OK? Method Status      Protocol
FastEthernet0/0    192.168.25.81  YES NVRAM up           up
FastEthernet1/0    192.168.25.97  YES NVRAM up           up
Serial2/0          192.168.25.2   YES NVRAM up           up
Serial3/0          192.168.25.5   YES NVRAM up           up
FastEthernet4/0    unassigned     YES NVRAM administratively down down
FastEthernet5/0    unassigned     YES NVRAM administratively down down
FastEthernet6/0    192.168.25.113  YES NVRAM up           up
FastEthernet7/0    192.168.25.129  YES NVRAM up           up
FastEthernet8/0    20.110.25.2   YES DHCP  up           up

WasifR2#show ip ospf
Routing Process "ospf 25" with ID 192.168.25.129
Supports only single TOS(TOS0) routes
Supports opaque LSA
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
Number of external LSA 0. Checksum Sum 0x000000
Number of opaque AS LSA 0. Checksum Sum 0x000000
Number of DCbitless external and opaque AS LSA 0
Number of DoNotAge external and opaque AS LSA 0
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
External flood list length 0
  Area BACKBONE(0)
    Number of interfaces in this area is 5
    Area has no authentication
    SPF algorithm executed 21 times
    Area ranges are
      Number of LSA 2. Checksum Sum 0x00fb0f
      Number of opaque link LSA 0. Checksum Sum 0x000000
      Number of DCbitless LSA 0
      Number of indication LSA 0
      Number of DoNotAge LSA 0
    Flood list length 0

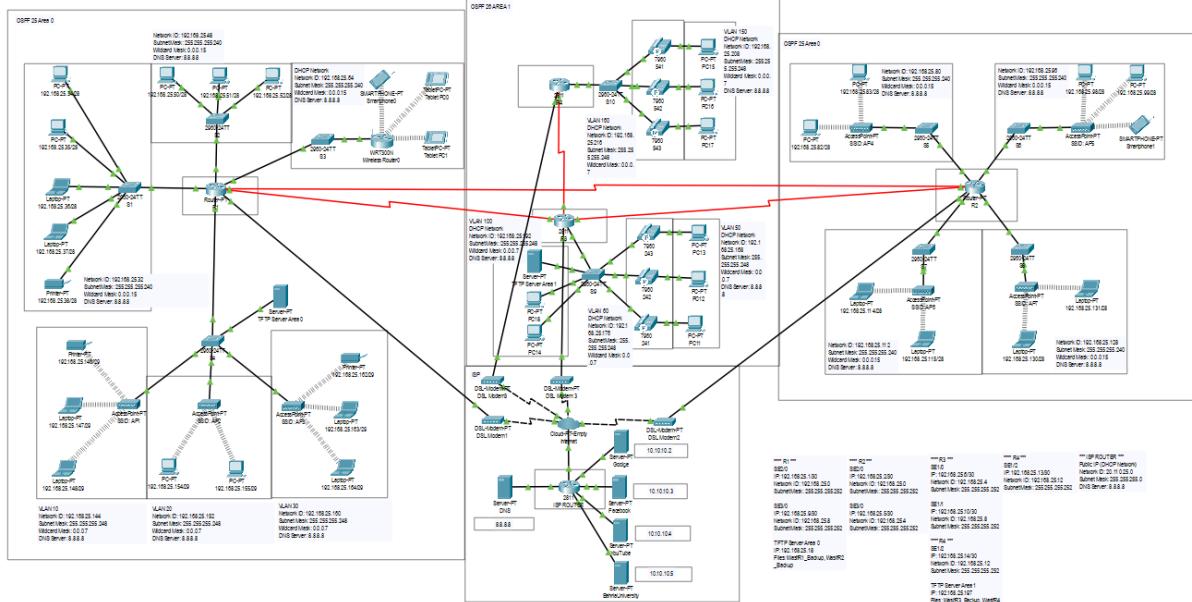
WasifR2#show ip dhcp binding
IP address          Client-ID/          Lease expiration      Type
                  Hardware address

WasifR2#show access-list
Standard IP access list 1
  10 permit 192.168.25.96 0.0.0.15 (52 match(es))
Standard IP access list 2
  10 permit 192.168.25.80 0.0.0.15 (18 match(es))
Standard IP access list 3
  10 permit 192.168.25.112 0.0.0.15 (12 match(es))
Standard IP access list 4
  10 permit 192.168.25.128 0.0.0.15 (4 match(es))

WasifR2#
```

Ctrl+F6 to exit CLI focus

Output Network Diagram



Conclusion

CEP has been completed using various of concepts learned in Data Communication and Networking course and lab. Setting up VoIP and Internet was a difficult task yet completed with the knowledge gained from web search. OSPF configuration was done so, users can communicate between different networks and users have access to internet as well. Inter-VLAN routing was also performed to allow other networks to communicate with VLANs. TFTP server is used to create backup files of the configuration. DCHP pool was created to dynamically assign IPs to users in some networks. NAT concept is used to set up Internet connect. Wireless connections are also used in this network to communicate with users. This project helped me polish my DCN skills learned in lab and course. CISCO is a powerful tool for the simulation of networks. All relevant screen shots are attached in this report, showing configuration of ever single components and details of the network. After successful completion of this project, I feel confident that I can perform any task related to DCN and CISCO.

References

- https://www.youtube.com/watch?v=MXNM7_Kykaw
- <https://www.calculator.net/ip-subnet-calculator.html>
- <https://tinkering-tots.blogspot.com/2015/05/cisco-voip-phone-setup-in-packet-tracer.html>