

INTERNSHIP ON COMPUTER NETWORKING

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This Report Presented in Limited Fulfilment of the Requirements for
the Degree of Bachelor of Science in Computer Science and
Engineering

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APPROVAL

This Project/internship titled **Internship On Networking**, submitted by Abu Raihan, ID No: 181-15-11083 to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 06/01/2022.

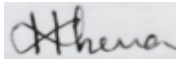
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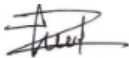
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DECLARATION

I hereby make a declaration that this internship has been finished by me under the supervision of **Refath Ara Hossain, Lecturer, Department of CSE Daffodil International University**. I also make a declaration that neither this internship nor any fragment of this internship has been submitted somewhere else for an award of any degree or diploma.

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Ms. Refath Ara Hossain

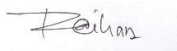
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I would like to express my heartiest gratitude to **Prof. Dr. Touhid Bhuiyan, Head, Department of CSE**, for his kind help to finish my Internship and also to other faculty members and the staff of the CSE department of Daffodil International University.

I would like to thank our entire course-mate in Daffodil International University, who took part in this discussion while completing the course work.

Finally, I must acknowledge with due respect the constant support and patients of my parents, teachers, parents, friends, and well-wishers.

ABSTRACT

In this report, I am trying to highlight what I have done and what I have learned from doing an internship. In my internship as a Network engineer, my main focus was to develop my skill in networking and knowing about switching, Routing IP addresses, and different kind of routing and there are protocols. Now a day, there are lots of network engineers working on new technology. I want to learn the difference between routing and switching protocols also internet protocol version 4 (ipv4) and upcoming internet protocol version 6 (ipv6) and why internet protocol version 6 (ipv6) and also know how to work internet protocol version 4 (ipv4) and upcoming internet protocol version 6 (ipv6). I would need to learn about real-life projects. I need to learn how an actual project will manage. I am very much interested to start my carrier as a network engineer. That is why I choose the internship as s "**Network engineer**". Working in **Technology Palli** added huge experiences in my future or upcoming careers. Working with the actual problems of the client, was another key point to gain experience This report takes us through all the details of an actual project and experience gathered during this internship at 4 months' time.

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CHAPTER 1

Introduction

1.1 Introduction of Internship

An internship is a project in which one can learn some practical work under a company. Its duration time at 4 months of training. At the time of these four months, a student gets an opportunity to a practical project and how the work is done and if there is a problem it is able to solve. Through this project, we can develop ourselves as skilled people keeping pace with the outside world. And can snatch success

Objective of Internship

1.2 Objective of internship

This report highlights the need for internships. This internship changes our student life to career and helps us to achieve success.

1.3 Inspiration of Internship

Traditionally, towards the end of B.Sc., each student has to take a four-month internship thesis or project on any subject in order to be fit for the job. That's why I chose an internship in networking because networking is the last step in the IT sector. and I have chosen Technology Limited as my training

There I learned how to manage and control a company's network system The company has helped me to become a skilled network engineer and has encouraged me to work with colleagues from all over to give me a better idea of networking.

1.4 Report Layout of Internship

In this report, I have given representation the basic idea of my work which I learned and worked on it continuously for 4 months. In "Chapter 1" I have tried to describe the role of internship, the aim of internship, and the inspiration of internship. In "Chapter Two" I tried to describe the company I completed my internship with. In "Chapter 3" I tried to describe my working procedure during the internship. I wrote about the work there and gave examples of that work. In "Chapter 4 and chapter 5" I tried to describe the reference and conclusion. I wrote about the work there and gave examples of that work.

CHAPTER 2

Company Profile

2.1 About Technology Palli Limited

First of all, Technology Palli believes that a student who is made as a worthy person is what the industry wants. We have to prepare a student in such a way through a device because a student is not limited to just studying in academies, our main objective is Bangladesh. The rest is up to Allah to take him to a worthy place in the network industry.

2.2 Technology Palli limited services

1: Corporate Office & Full-Building Network Structure design and implementation: What Technology Palli will give you is that you will be able to gift a job to the fullest, because the skills team that has worked in the technology industry will play a role in designing and completing your work throughout the project, far ahead of other companies in the real field. Every engineer who works and we will be able to explain the job to you at the right time because we have a lot of experience working in the network industry before. That is why you can choose Technology Palli for this project. 1. There is no discount on quality at all times Handed Percent Quality Insure. 2. You will be able to understand the work liketime within the time given in the Vedas. 3. Don't hesitate to provide you with one hundred percent support even after the project is over.

2: CCTV Surveillance System, Fire & Security Alarm System, Time attendance & Access Control System, Business, Agriculture Firm, Fish Frim, All Security Solutions CCTV Surveillance System, Fire & Security Alarm System, Time attendance & Access Control System, Business, Agriculture Firm, Fish Frim, All Security Solutions. What Technology Palli will give you is that you will be able to gift a job to the fullest, because the skills team that has worked in the technology industry will play a role in designing and completing

your work throughout the project, far ahead of other companies in the real field. Every engineer who works and we will be able to explain the job to you at the right time because we have a lot of experience working in the network industry before. That is why you can choose Technology Palli for this project. 1. There is no discount on quality at all times Handed Percent Quality Insure. 2. You will be able to understand the work like time within the time given in the Vedas. 3. Don't hesitate to provide you with one hundred percent support even after the project is over.

3: Complete ISP solution

For example, if you want to create an ISP, our team will give you a complete calculation of how much the entire budget will cost and how much money your company will run in a year, how many engineers, and how many fiber people it will take. We will keep you informed through our service for months, our team will provide you with the complete configuration of what configuration you need, InshaAllah. What Technology Palli will give you is that you will be able to gift a job to the fullest, because the skills team that has worked in the technology industry will play a role in designing and completing your work throughout the project, far ahead of other companies in the real field. Every engineer who works and we will be able to explain the job to you at the right time because we have a lot of experience working in the network industry before. That is why you can choose Technology Palli for this project. 1. There is no discount on quality at all times Handed Percent Quality Insure. 2. You will be able to understand the work like time within the time given in the Vedas. 3. Don't hesitate to provide you with one hundred percent support even after the project is over.[1]

CHAPTER 3

Basic Networking

I have been working on hardware and networks since my diploma and I have spent four months studying at your university and designing network topologies for some small and large organizations on the internet. I have implemented various demands and protocols for routing and switching. In this report, I have presented the complete syllabus of the Cisco Certified Network Associate (CCNA) network.

3.1 Basic networking concept

Is a process in which two or more Node are connected together. In another word, When multiple computers are connected to each other via a cable or wireless, it is called a network.

The necessity of Network:

Networking allows us to easily transfer data from one computer to another

3.2 Type of Networking:

There are three types of networking

- i) Unicast (One to One Communications)

The following figure 3.2.1 Shows Unicast Model

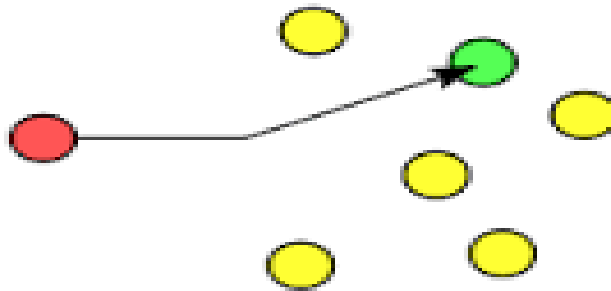


Figure:3.2.1 Unicast

- ii) Broadcast (One to all communications)

The following figure 3.2.2 Shows Broadcast Model.

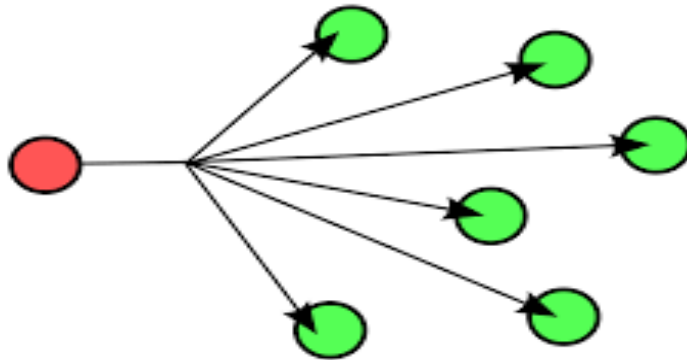


Figure:3.2.2 Board Cast

iii) Multi Cast (One to multi)

The following figure 3.2.3 Shows Multicast Model[2]

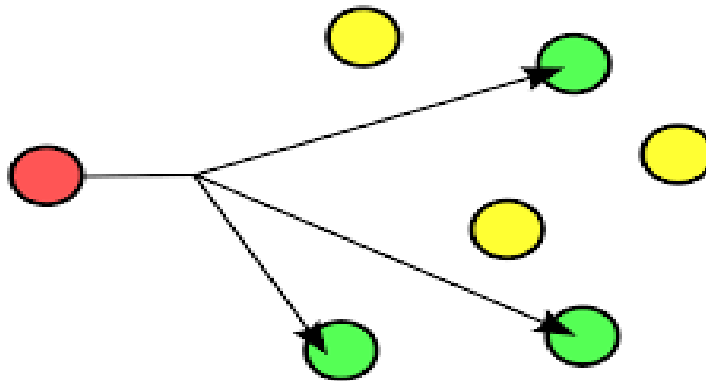


Figure: 3.2.3: Multicast

3.3 : Network Tool

- 1) Hub(broadcast incoming traffic on all ports)
- 2) **Task Switch:** In the case of networking, a switch is a device that can perform filtering and packet forwarding when exchanging information packets between different parts of the local area network. The switch works on one of the data link layers of the OSI layer. on one of the data link layers of the OSI layer.

The following figure 3. 3.1 Shows CISCO Switch)



Fig:3.3.1: Switch

- 3) **Task of Router:** A router is a network device that sends a data package to its specific destination.

The following figure 3. 3.2(CISCO ROUTER)



Fig:3.3.2: CISCO ROUTER

- 4) **Function of Repeater:** when the Long the distance between the computers in the network, the weaker the wave flowing through the cable. This is why repeaters are used to re-energize the flowing wave and to transfer it over Long distances.

The following figure 3. 3.3 Shows Repeater



Fig:3.3.3: Repeater

5) And Last one NIC Card/LAN Port:

The following figure 3. 3.4 Shows LAN

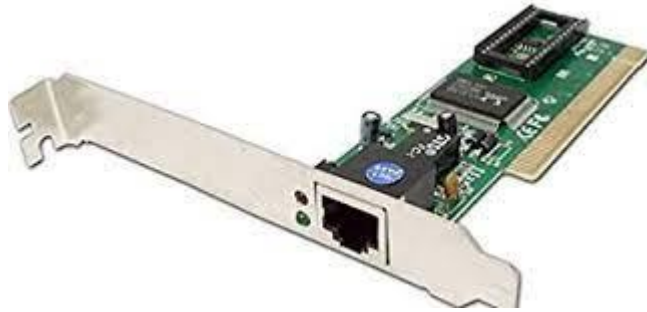


Fig:3.3.4(LAN)

OSI Model

7 types of OSI model:

7. Application Layer (human-computer relation layer, where request whither can access the network service)
6. Presentations Layer (Ensures that data is Workable and where data encryption occurs)
5. Session Layer (Keep in touch and is organized for controlling ports and Locations)
4. transport Layer (Transfer data using TCP & UDP)
3. Network Layer (Fix Which physical path the data will take in)
2. Data Link Layer (Explain the format of data on the network)
1. Physical Layer (Directly connect the Ethernet cable)

3.5:OSI VS TCP/IP:

The following figure 3.5.1 OSI VS TCP/IP

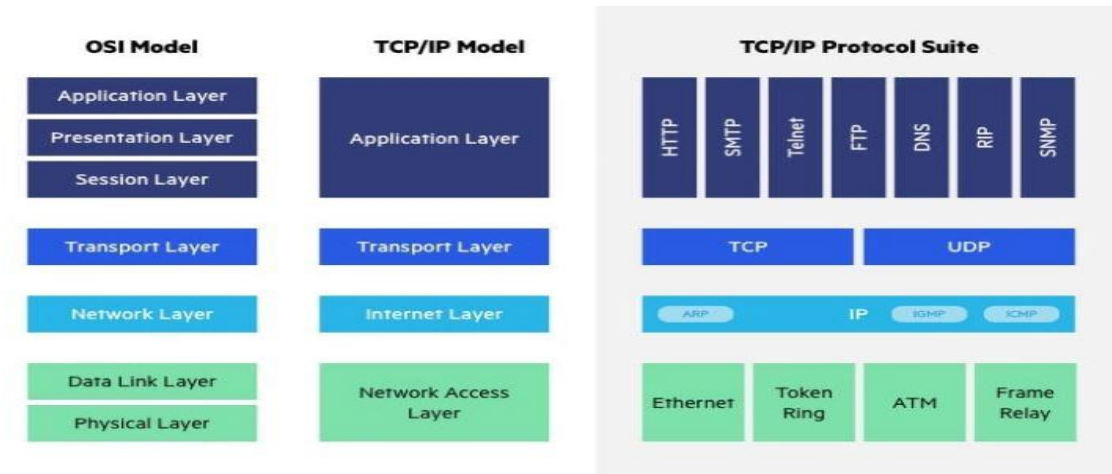


Fig:3.5.1 OSI VS TCP/IP

3.6 Cabling Part :

There are three types of cables to be used for cabling

1. Coaxial Cable
2. Two-State pair cable /Ethernet Cable
3. Fiber Optical Cable

Of these, Ethernet cable is the most widely used.2 types of Ethernet cable

1. STP(Shielded twisted pair cable)
2. UTP (Unshielded twisted pair cable)

568 B standard is required for networking cable:

| PIN NO | COLOR |
|--------|--------------|
| 1. | White orange |
| 2. | Orange |
| 3. | White green |
| 4. | Blue |
| 5. | White blue |
| 6. | Green |
| 7. | White brown |
| 8. | Brown |

Types of Ethernet Cable Configurations:

3 types of Ethernet cable.

1. State Cable (State cables are used to provide connections between different devices)
2. Crosse Cable (Cross cable is used in the same device)
3. Roll Over Cable (The only cable used to configure the router from the PC is the rollover cable)

3.7: Types Of Network Topologies:

✚ Bus Topology (One long cable that links all nodes tap, drop line, cable end)

The following figure 3.7.1 Bus Topology[5]

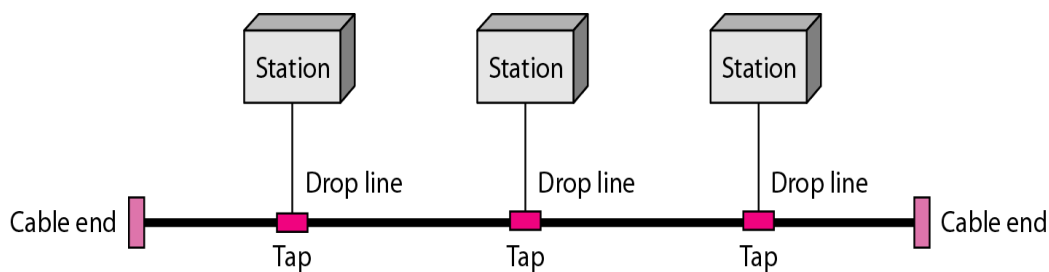


Fig: 3.7.1 Bus Topology

✚ Star Topology (Dedicated point-to-point link only to a central controller, called a hub)

The following figure 3.7.2 Shows Star Topology

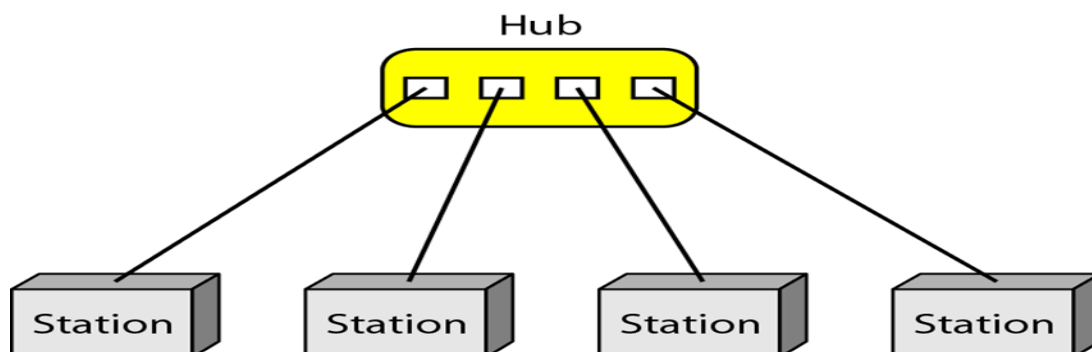


Fig: 3.7.2 Star Topology

✚ Ring Topology (Easy reconfiguration, fault isolation)

The following figure 3.7.3 Shows Ring Topology

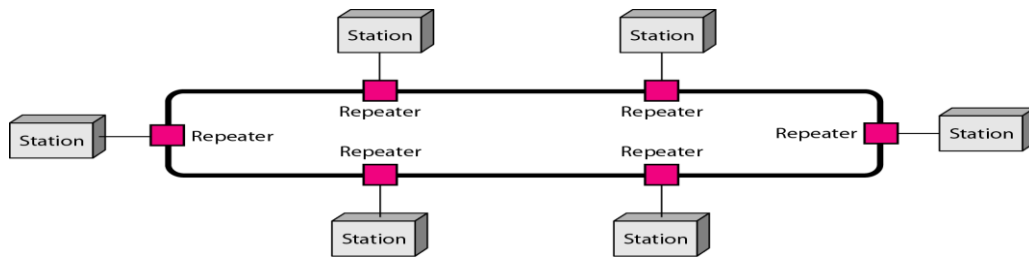


Fig: 3.7.3 Ring Topology

✚ Mesh Topology (No traffic problems, robust, security, easy fault identification & isolation)

The following figure 3.7.4 Shows Mesh Topology

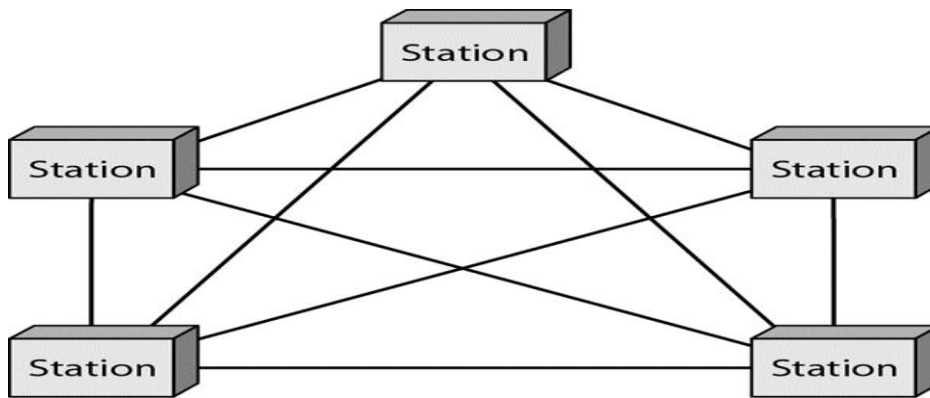


Fig: 3.7.4 Mesh Topology

✚ Hybrid Topology (Main star topology with each branch connecting several sections in a bus topology)

The following figure 3.7.5 Shows Hybrid Topology

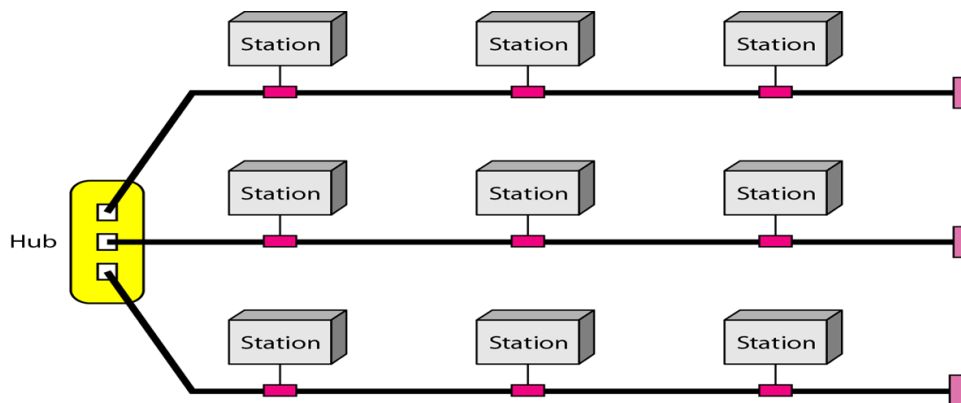


Fig: 3.7.5 Hybrid Topology

3.8: Categories of Networks :

The following figure 3.8.1 Network Type

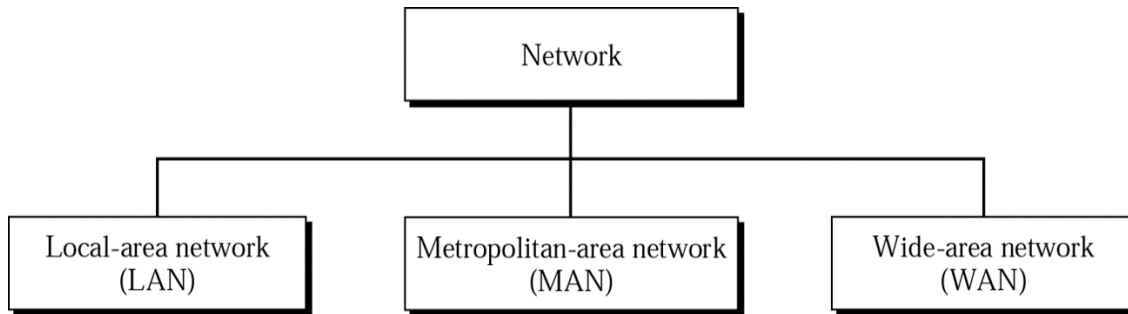


Fig:3.8.1: Network type

Chapter 4

Fundamentals of IP Address

An IP address (Internet Protocol address) is a unique number that devices use in order to identify and communicate with each other on a computer network utilizing the Internet Protocol standard (IP). Any participating network device including routers, computers, time-servers, printers, Internet fax machines, and some telephones must have its own unique address.[4]

Regional Internet Registry :

- i. African Network Information Center
- ii. American Registry for Internet Numbers
- iii. RIPE Network Coordination Centre
- iv. Asia-Pacific Network Information Centre
- v. Latin American and Caribbean Internet Addresses Registry

4.1: Introduce of TCP/IP network

Transmission Control Protocol/Internet Protocol is a set of protocols self-reliant o the physical Way used to transmit data, but most data transmission for Internet communication Starts and ends with Ethernet frames. The Ethernet can use either as bus or star topology.

Inside TCP/IP

Hiding inside the TCP/IP standard there are a number of protocols for handling data communication:

1. TCP (Transmission Control Protocol) communication between applications
2. UDP (User Datagram Protocol) simple communication between applications
3. IP (Internet Protocol) communication between computers
4. ICMP (Internet Control Message Protocol) for errors and statistics
5. DHCP (Dynamic Host Configuration Protocol) for dynamic addressing

4.2: IPv4 Details

The IPv4 network is divided into five parts:

- 1) Class A (Addresses are for large networks with many devices)
- 2) Class B (Addresses are for medium-sized networks.)
- 3) Class C (Addresses are for small networks (fewer than 256 devices))
- 4) Class D (Addresses are multicast addresses)
- 5) Class E (Used **Research.**)

Three out of five classes are used for LAN and WAN. and one is used for multicast the other for Research.

For **CLASS A, B, C** Used **LAN** and **WAN**.

Class D Used **Multicast**.

Class E Used **Research**.

Rang of Classes

Class A: 1 to 126 decimals.

Class B: 128 to 191 decimals.

Class C: 192 to 223 decimals.

Class D: 224 to 239 decimals.

Class E: 240 to 255 decimals.

Addresses beginning with 01111111, or 127 decimal, are reserved for loopback and for internal testing on a local machine. Class D addresses are reserved for multicasting. Class E addresses are reserved for future use. They should not be used for host addresses

Summary of Class full Addressing

| Class | Range | MSB | Number of bit in Network ID | Number of bit in Host ID | Number of Network | Number of Host for every network |
|-------|-----------|------|--|--------------------------|-------------------|----------------------------------|
| A | 1 - 127 | 0 | 8 | 24 | 126 | 16777214 |
| B | 128 - 191 | 10 | 16 | 16 | 16384 | 65534 |
| C | 192 - 223 | 110 | 24 | 8 | 2097152 | 254 |
| D | 224 - 239 | 1110 | <i>Reserved for multicast addressing</i> | | Not Applicable | |
| E | 240 - 255 | 1111 | <i>Reserved for experimental use</i> | | Not Applicable | |

Classification of IP Address

1. Private / Fake / Dummy IP Address

| IP Class | IP From | IP To | CIDR Notation | Subnet Mask |
|----------|-------------|-----------------|----------------|---------------|
| Class A | 10.0.0.0 | 10.255.255.255 | 10.0.0.0/8 | 255.0.0.0 |
| Class B | 172.16.0.0 | 172.31.255.255 | 172.16.0.0/16 | 255.255.0.0 |
| Class C | 192.168.0.0 | 192.168.255.255 | 192.168.0.0/24 | 255.255.255.0 |

2. Public /Real Address

Rest of the IP Address Called Public Address except Look back address.

3. Loopback Address: Diagnostic test that returns the transmitted signal to the sending device after it has passed through a device or across a link. Address is 127.0.0.1 to 127.255.255.255

4.3: IPv4 and IPv6:

IPv4: Currently IPv4 is the most widely used IP address. IPv4 requires a total of four octets (8 bit binary) or 32 bits to express each IP address.

Example: 11111111.1111 1111.1111 1111.1111 1111 total 32 bits[4]

IPv6: IPv6 has a total of eight parts for each IP address to be expressed and each bit requires 16 bits or a total of 128 bits.

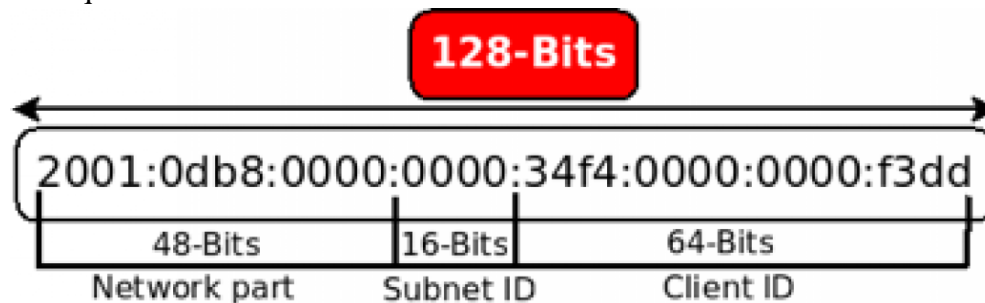


Fig :4.3.1 IPv6

4.4: Subnet mask:

You have to use 32 bit to make subnet mask. Subnet mask

The network bits are one and the host bits are zero.

For example: Class -C

| Network Bit | Network Bit | Network Bit | Host Bit |
|-------------|-------------|-------------|-----------|
| 1111 1111 | 1111 1111 | 1111 1111 | 0000 0000 |
| 255 | 255 | 255 | 0 |

Default Subnet Mask

By default, all type of Classes (A, B and C) have a subnet mask, we call it the "Default Subnet mask".

Class A - 255.0.0.0

Class B - 255.255.0.0

Class C - 255.255.255.0

Binary Count /25 /26 /27 /28 /29 /30 / 31 /32

| | | | | | | | | |
|---------------------------------------|------------|------------|------------|------------|------------|------------|------------|------------|
| Number of Subnetst | 2 | 4 | 8 | 16 | 32 | 64 | 128 | 256 |
| Binary position form Left Right | 2^1 | 2^2 | 2^3 | 2^4 | 2^5 | 2^6 | 2^7 | 2^8 |
| Bit | | | | | | | | |
| Binary position form Right to Left | 2^7 | 2^6 | 2^5 | 2^4 | 2^3 | 2^2 | 2^1 | 2^0 |
| Position Value | 128 | 64 | 32 | 16 | 8 | 4 | 2 | 1 |
| Subnet Mask | 128 | 192 | 224 | 240 | 248 | 252 | 254 | 255 |

Subnet Mask:

| | | |
|-----------|------------------------|-------|
| For 1 bit | : 128 | = 128 |
| For 2 bit | : 128+64 | = 192 |
| For 3 bit | : 128+64+32 | = 224 |
| For 4 bit | : 128+64+32+16 | = 240 |
| For 5 bit | : 128+64+32+16+8 | = 248 |
| For 6 bit | : 128+64+32+16+8+4 | = 252 |
| For 7 bit | : 128+64+32+16+8+4+2 | = 254 |
| For 8 bit | : 128+64+32+16+8+4+2+1 | = 255 |

4.5: Port Number:

A port number is a way to identify a specific process to which an Internet or other network message is to be forwarded when it arrives at a server

Some Known Service and PORT:

| TCP port number | Description |
|------------------------------|-------------|
| FTP server (data channel) | 20 |
| FTP server (control channel) | 21 |
| Telnet server | 23 |
| Web server (HTTP) | 80 |
| SMTP | 25 |
| HTTP | 80 |
| DNS | 53 |
| POP | 110 |
| NNTP | 119 |
| Squid | 3128 |
| Proxy | 8080 |
| NTP | 123 |

Chapter 5

Router

Modes On Cisco Router:

1. Setup Mode:

If NVRAM is blank

2. User Mode:

Only Some basic monitoring

3. Privileged Mode:

Monitoring and Troubleshooting

4. Global Configurations mode:

All Configuration that affects the router globally

5. interface mode:

Configurations are done on the specific interface

6. Rommon mode:

Reverting Password

5.1 Routing protocol Classification:

| IGP | EGP |
|--|--|
| Interior gateway protocol | Exterior Gateway protocol |
| Used to communicate within same dependent system | used to via between two or more Dependent system |
| RIP,IGRP,OSPF,IS-IS | Border gateway protocol (BGP) |

5.2 Basic IP routing types:

Transferring packets from one network to another network.

Types:

- Static routing
- Default routing
- Dynamic routing

5.3: Static routing

Selected best path by administrator Advantages:

- Administrator set the best path manually
- Must need destination network id
- Secure and fast
- Disadvantage:
- Everything configures manually
- It only uses a small network
- If any network change effect on hole Network

Static router model :

The following figure5.3.1 shows static routing:

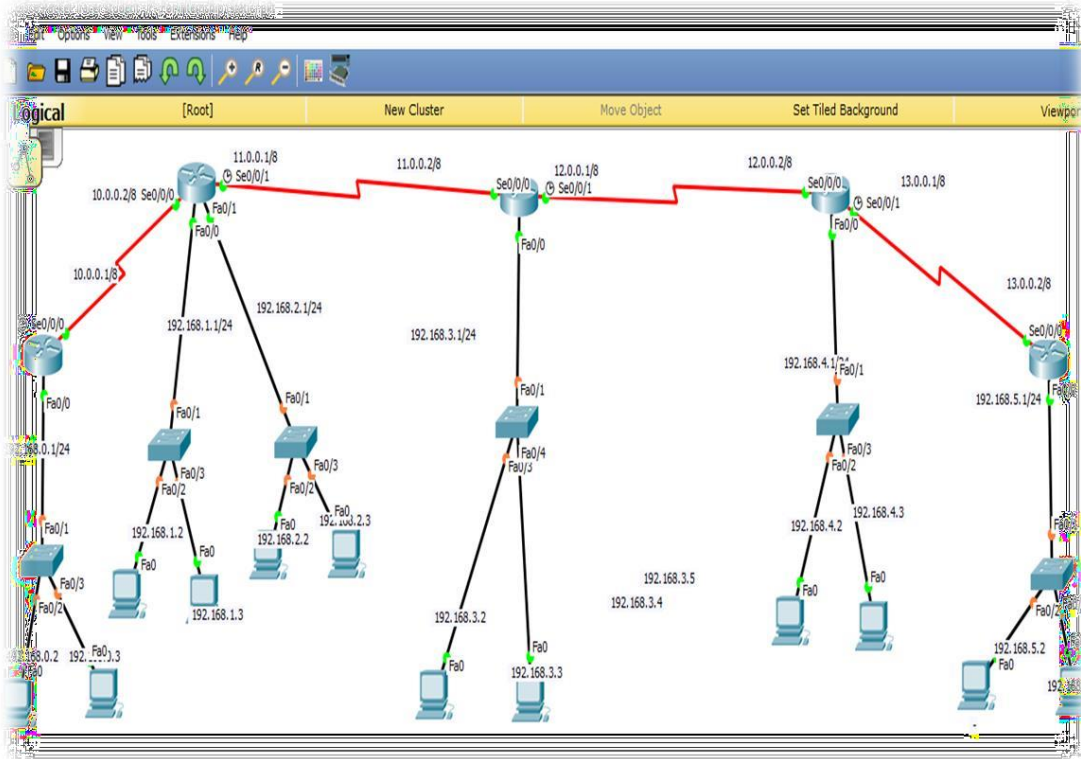
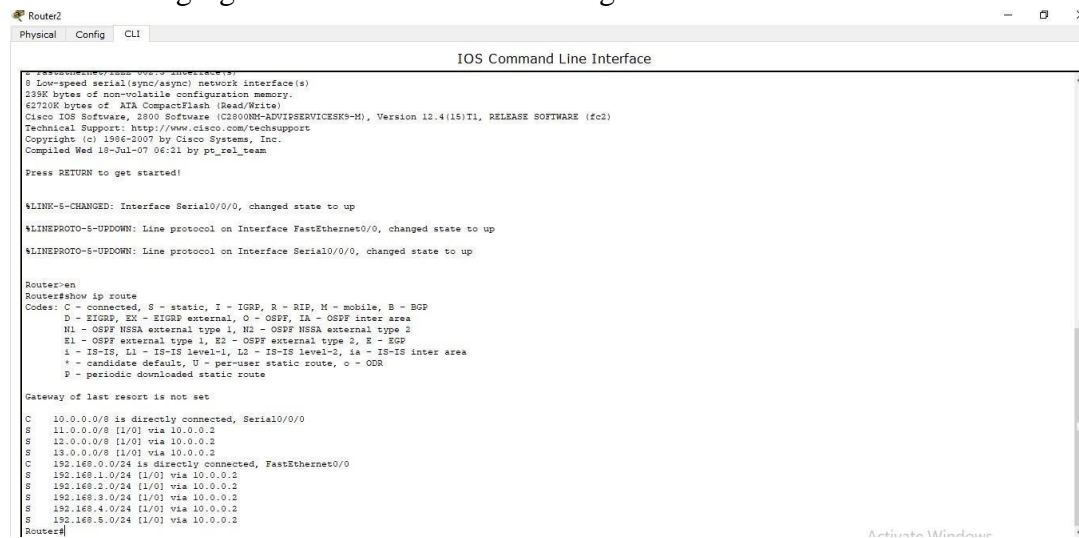


Figure 5.3.1 : Static routing Model

5.3.2: Static routing Table

The following figure 5.3.2 Shows Static routing



```
Router2
Physical Config CLI
IOS Command Line Interface

Router#show ip route
Router#show ip route
Codes: C - connected, S - static, I - IGMP, 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

C 10.0.0.0/8 is directly connected, Serial0/0/0
S 11.0.0.0/8 [1/0] via 10.0.0.2
S 12.0.0.0/8 [1/0] via 10.0.0.2
S 13.0.0.0/8 [1/0] via 10.0.0.2
C 152.169.0.0/24 is directly connected, FastEthernet0/0
S 152.169.1.0/24 [1/0] via 10.0.0.2
S 152.169.2.0/24 [1/0] via 10.0.0.2
S 152.169.3.0/24 [1/0] via 10.0.0.2
S 152.169.4.0/24 [1/0] via 10.0.0.2
S 152.169.5.0/24 [1/0] via 10.0.0.2
Router#
```

Figure 5.3.2: Static routing table and path selection

5.4: Default routing

- Used to route Traffic for unknown destination
- It's also use is end of the router
- It's helps to reduce routing table

Configure routing table :

- First and last router configure default but, in the middle must configure static
- First and last router. IP route 0.0.0.0 0.0.0.0 <Gateway>
- Middle on static, IP route<destination network id><Subnet mask><Gateway>

The following figure shows default routing

Default routing Config :

The following figure 5.4.1 Shows on default routing Model

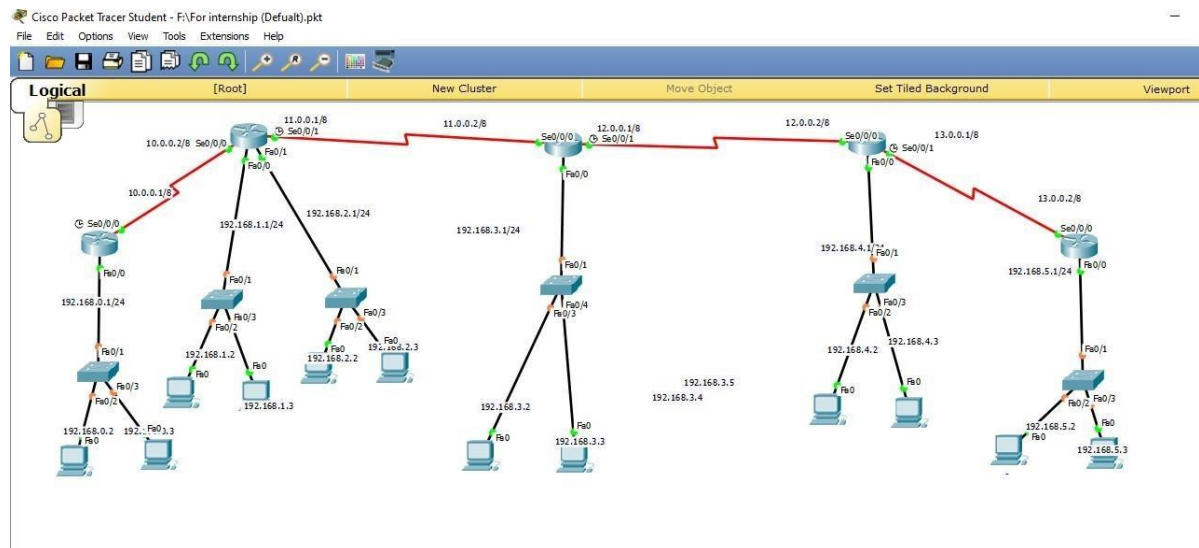
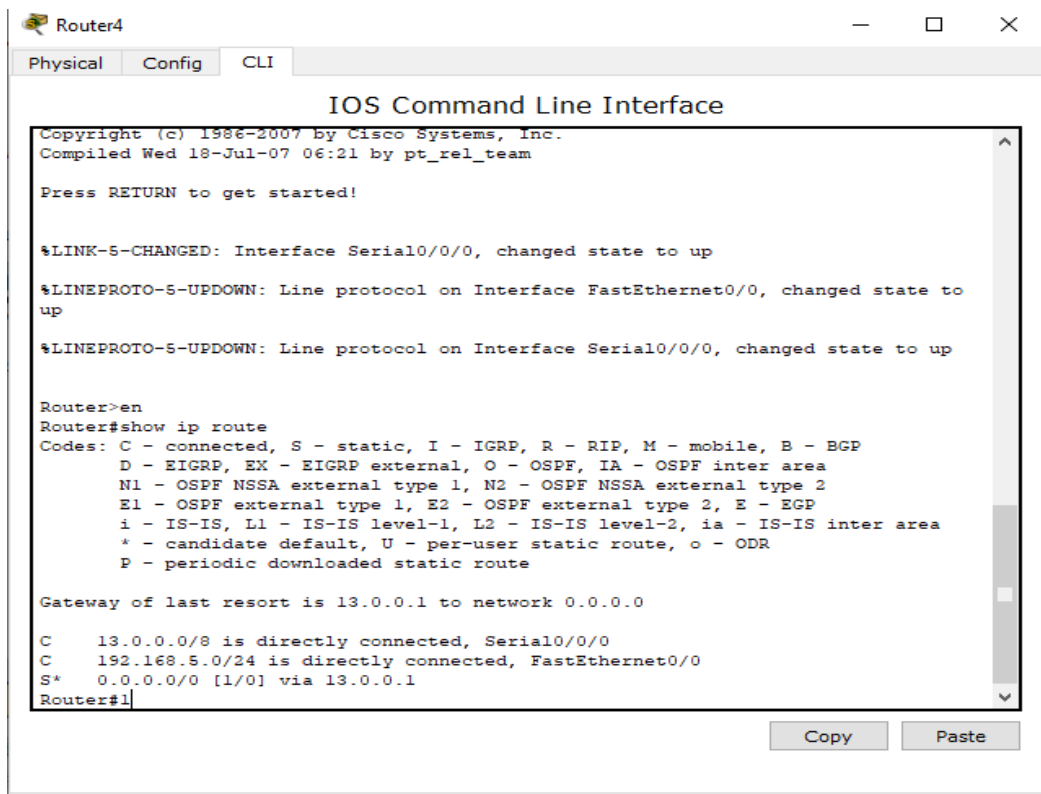


Figure 5.4.1: Model on default routing

Default routing Table

The following figure 5.4.2 Shows default routing



```
Router4
Physical Config CLI
IOS Command Line Interface

Copyright (c) 1986-2007 by Cisco Systems, Inc.
Compiled Wed 18-Jul-07 06:21 by pt_rel_team

Press RETURN to get started!

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up

Router>en
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 13.0.0.1 to network 0.0.0.0

C      13.0.0.0/8 is directly connected, Serial0/0/0
C      192.168.5.0/24 is directly connected, FastEthernet0/0
S*    0.0.0.0/0 [1/0] via 13.0.0.1
Router#
```

Figure 5.4.2: routing table and path selection default routing

5.5: Dynamic routing

3 Types of dynamic routing

- RIP routing
- EIGRP routing
- OSPF routing

Advantage of dynamic routing:

- No need to manual configuration
- Learn about other network via advertisement
- Necessary select best path
- No need to select destination network
- Administrative work reduces
- Upgrade the topology dynamically
- Applicable for large organization
- Dynamic routing protocols
- Distance vector protocol
- Link state protocols
- Hybrid protocols

5.6: Rip routing protocol (Router information protocols)

- It's open standard protocol (Use cisco and without CISCO)
- Class full routing protocols (Not carry subnet mask)
- It's used broadcast for updating table
- Maximum hope count 14
- Metrix: hope count
- Max routers 15
- Load balancing equal 4 path
- Administrative distance 120
- Exchange routing table every 30 seconds (Periodically update)

Advantage rip routing:

- Easy to configure
- No design constraint
- Less overhead

Disadvantage rip routing:

- Bandwidth utilization very high for broadcast
- Maximum hop count 15
- Use for small organization
- Slow convergence

Two types of rip routing:

- Firstly, Rip version 1 and Rip version 2
- Now days we use rip version 2
- Its last version

5.7: Configure rip version 2 for little Company's Configure:

```
Router(Config)#Router  rip  Router(Config-if)#network  Router(Config-  
if)#version 2
```

5.7.1: Model rip version2:

The following figure 5.7.1 Shows on rip routing Model

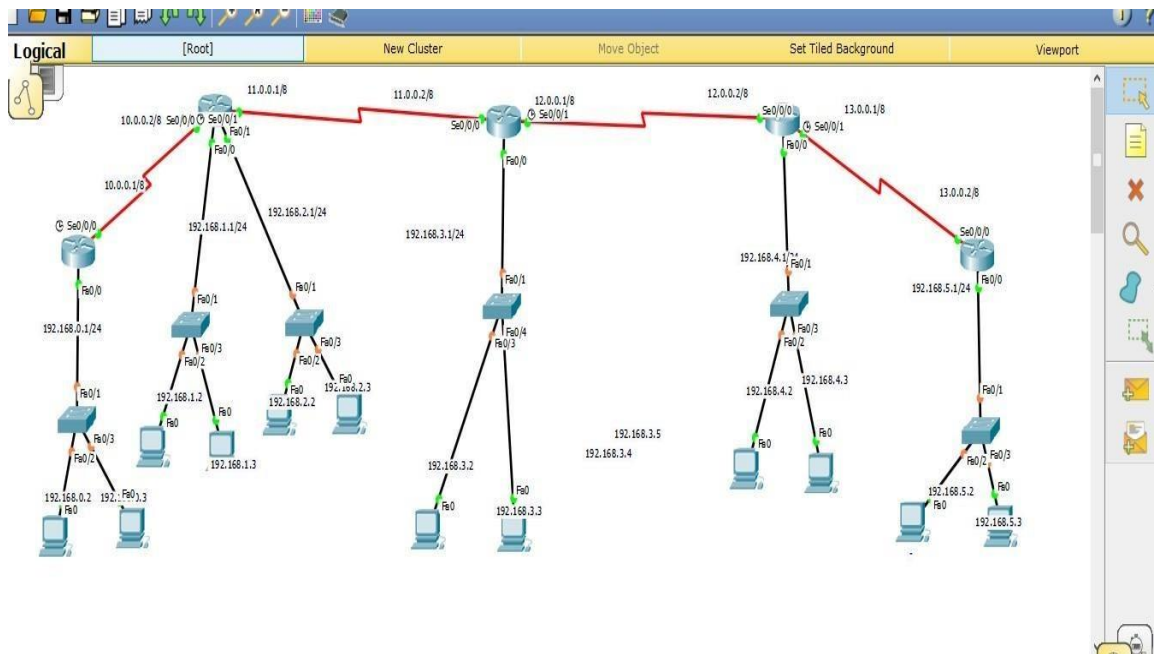
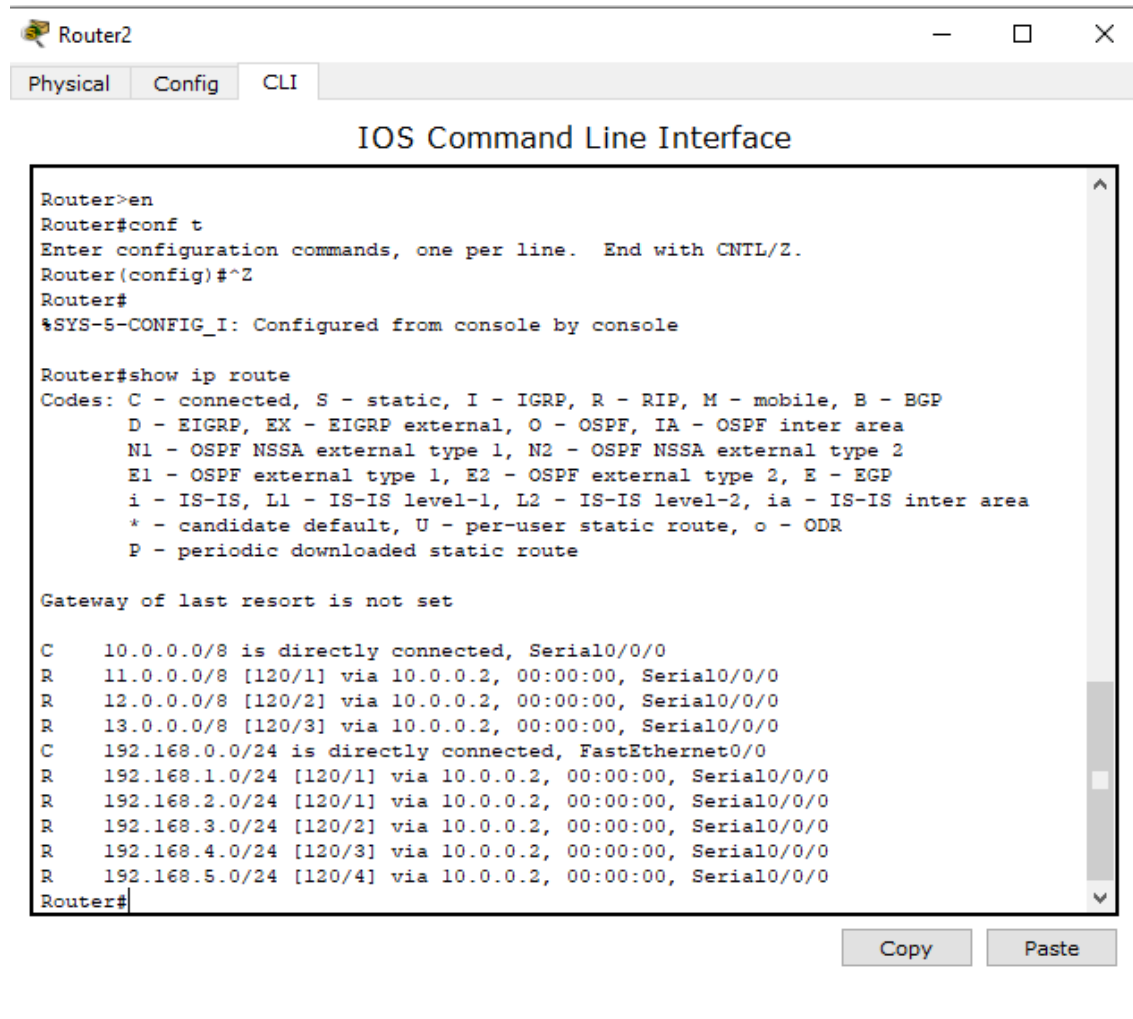


Figure 5.7.1 : Model on rip routing

RIP v2 routing table

The following figure 5.7.2: Shows rip routing table



The screenshot shows a Cisco Router CLI window titled "Router2". The window has tabs for "Physical", "Config", and "CLI". The "CLI" tab is active, and the title bar indicates "IOS Command Line Interface". The command prompt is "Router>". The user has entered "en" to enter enable mode, then "conf t" to enter configuration mode. The prompt changes to "Router(config)#". The user enters "^Z" to exit configuration mode, and the prompt returns to "Router#". The user then enters "show ip route" to display the routing table. The output shows the routing table for the router, including directly connected networks and routes learned via RIP. The routing table is as follows:

```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#^Z
Router#
%SYS-5-CONFIG_I: Configured from console by console

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

C    10.0.0.0/8 is directly connected, Serial0/0/0
R    11.0.0.0/8 [120/1] via 10.0.0.2, 00:00:00, Serial0/0/0
R    12.0.0.0/8 [120/2] via 10.0.0.2, 00:00:00, Serial0/0/0
R    13.0.0.0/8 [120/3] via 10.0.0.2, 00:00:00, Serial0/0/0
C    192.168.0.0/24 is directly connected, FastEthernet0/0
R    192.168.1.0/24 [120/1] via 10.0.0.2, 00:00:00, Serial0/0/0
R    192.168.2.0/24 [120/1] via 10.0.0.2, 00:00:00, Serial0/0/0
R    192.168.3.0/24 [120/2] via 10.0.0.2, 00:00:00, Serial0/0/0
R    192.168.4.0/24 [120/3] via 10.0.0.2, 00:00:00, Serial0/0/0
R    192.168.5.0/24 [120/4] via 10.0.0.2, 00:00:00, Serial0/0/0
Router#
```

Figure 5.7.2 : routing table and path selection rip routing

5.8: EIGRP (Enhanced interior gateway routing protocol)

- Advance Distance vector
- Its Hybrid protocol
- Standard protocol (Only for use cisco)
- Classless routing protocols (unique host)
- Maximum LAN port valid 255(Default 100)
- Administrative distance 90
- Easy and flexible network design in user
- Using multicast (224.0.0.10) and unicast for initial neighbor discovery process.

EIGRP Converge:

- Incremental updates
- Periodically Sending hello packet every 5 seconds (Dead 15 sec)
- Data up to fast (5 sec)
- Also advised second-best route
- Best route config = successor
- Second best route=Feasible successor

EIGRP metric calculation:

- Bandwidth K1=1
- Delay k3 =1
- Load k2=0
- Reliability k4=0
- MTU k5=0 [3]

Configure EIGRP

router(config)#Router EIGRP (AS Number) router(config-if)#network

5.8.1: Model on EIGRP:

The following figure 5.8.1 : Model on EIGRP

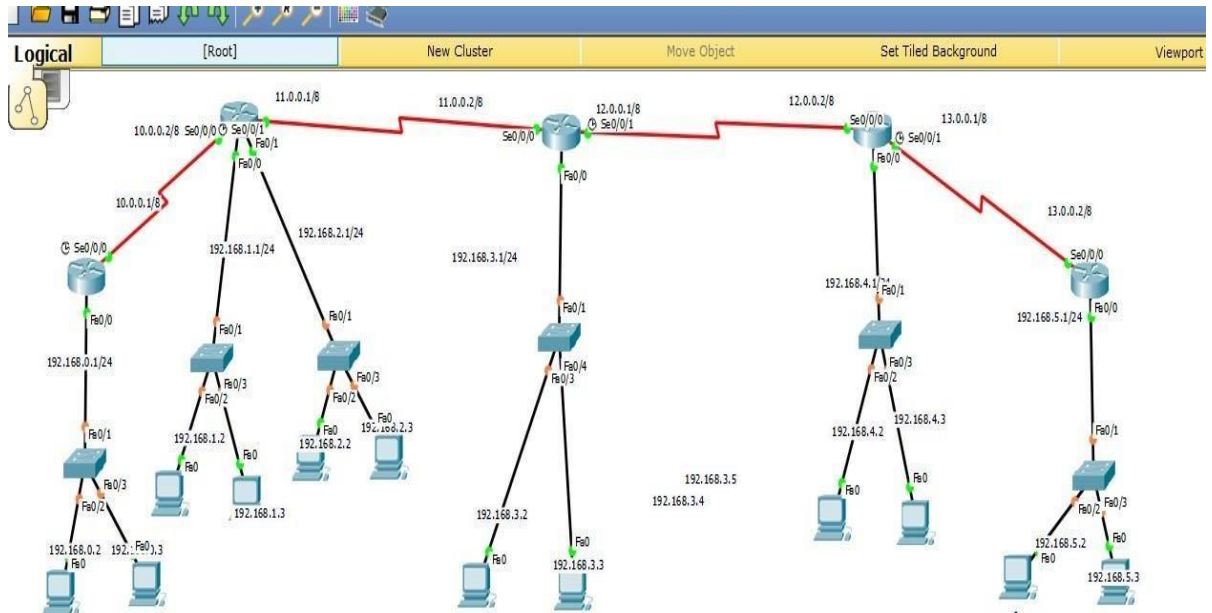
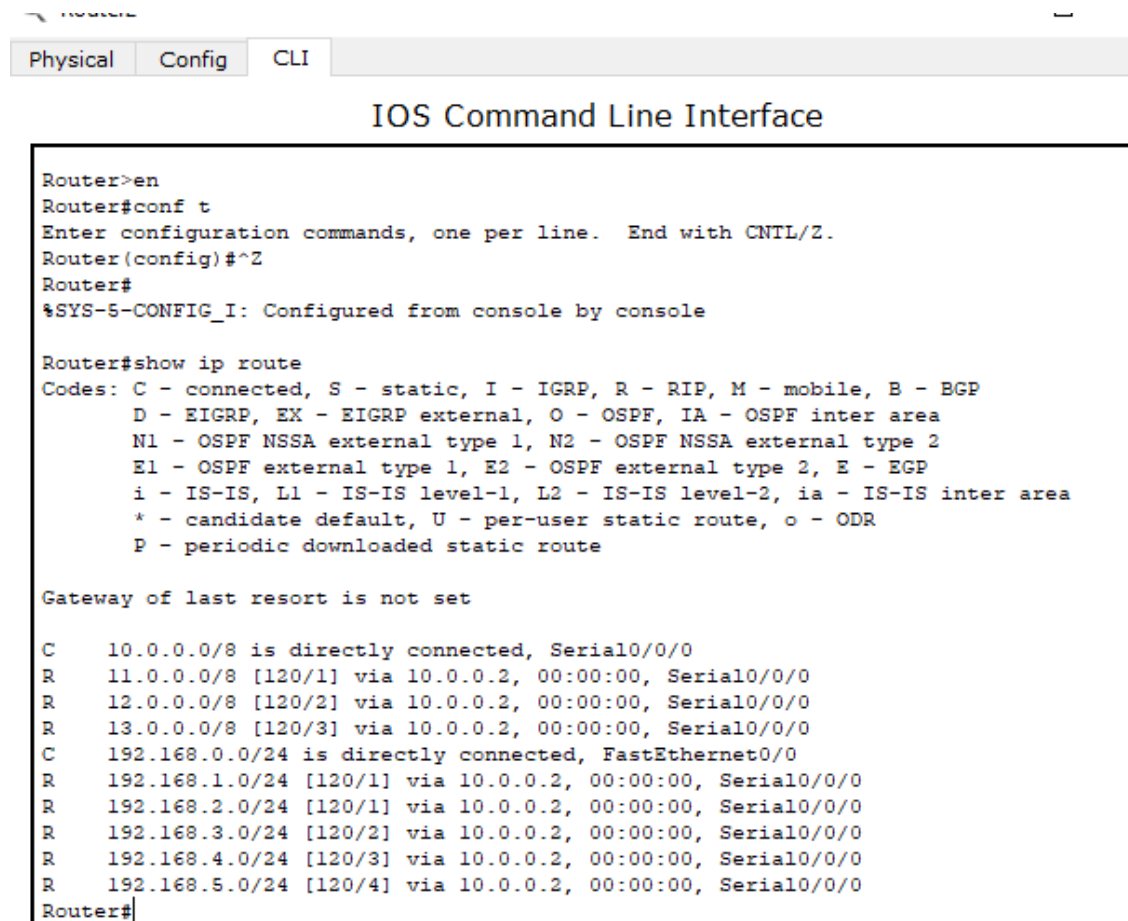


Figure 5.8.1 : Model on EIGRP routing

5.8.2: EIGRP Routing table

The following figure 5.8.2 Shows EIGRP routing table



```
Router>en
Router#conf t
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#^Z
Router#
%SYS-5-CONFIG_I: Configured from console by console

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

C    10.0.0.0/8 is directly connected, Serial0/0/0
R    11.0.0.0/8 [120/1] via 10.0.0.2, 00:00:00, Serial0/0/0
R    12.0.0.0/8 [120/2] via 10.0.0.2, 00:00:00, Serial0/0/0
R    13.0.0.0/8 [120/3] via 10.0.0.2, 00:00:00, Serial0/0/0
C    192.168.0.0/24 is directly connected, FastEthernet0/0
R    192.168.1.0/24 [120/1] via 10.0.0.2, 00:00:00, Serial0/0/0
R    192.168.2.0/24 [120/1] via 10.0.0.2, 00:00:00, Serial0/0/0
R    192.168.3.0/24 [120/2] via 10.0.0.2, 00:00:00, Serial0/0/0
R    192.168.4.0/24 [120/3] via 10.0.0.2, 00:00:00, Serial0/0/0
R    192.168.5.0/24 [120/4] via 10.0.0.2, 00:00:00, Serial0/0/0
Router#
```

Figure 5.8.2 : routing table and path selection routing

5.9: OSPF (Open shortest path first)

- It's link-state protocols
- Standard protocols
- Max hop count unlimited
- It uses shortest path first algorithm or Dijkstra algorithm
- Metric is cost($10^8/B.W.$)
- It's non-class routing protocols
- Supported VLSM
- Administrative distance 110
- Support one and the same cost full balancing

Basic OSPF process

- Down
- Initial
- Way
- Extract
- Exchange
- Loading

Full OSPF converge:

- Incremental updates
- Periodically Sending hello packet every 10sec (Dead 40 sec)
- Converge fast (10 sec) OSPF area :
- Area is a logical group of router
- All the router maintain same database in the same area
- Any change all the routers impact the same area
- Minimize the size of the database
- OSPF area rules:
- One area must call area 0 (It's the backbone area)
- All the non, backbone areas must connect area 0 Advantage OSPF:
- Open standard
- No hop count limitation

First convergence Disadvantage OSPF:

- Consume more CPU resources
- Complex design rules

```
Config# router OSPF (Process id)
```

```
Config-router# <network > <wild card mask> area <area id>
```

MODEL OF OSPF:

The following figure 5.9.1 Model on OSPF Routing

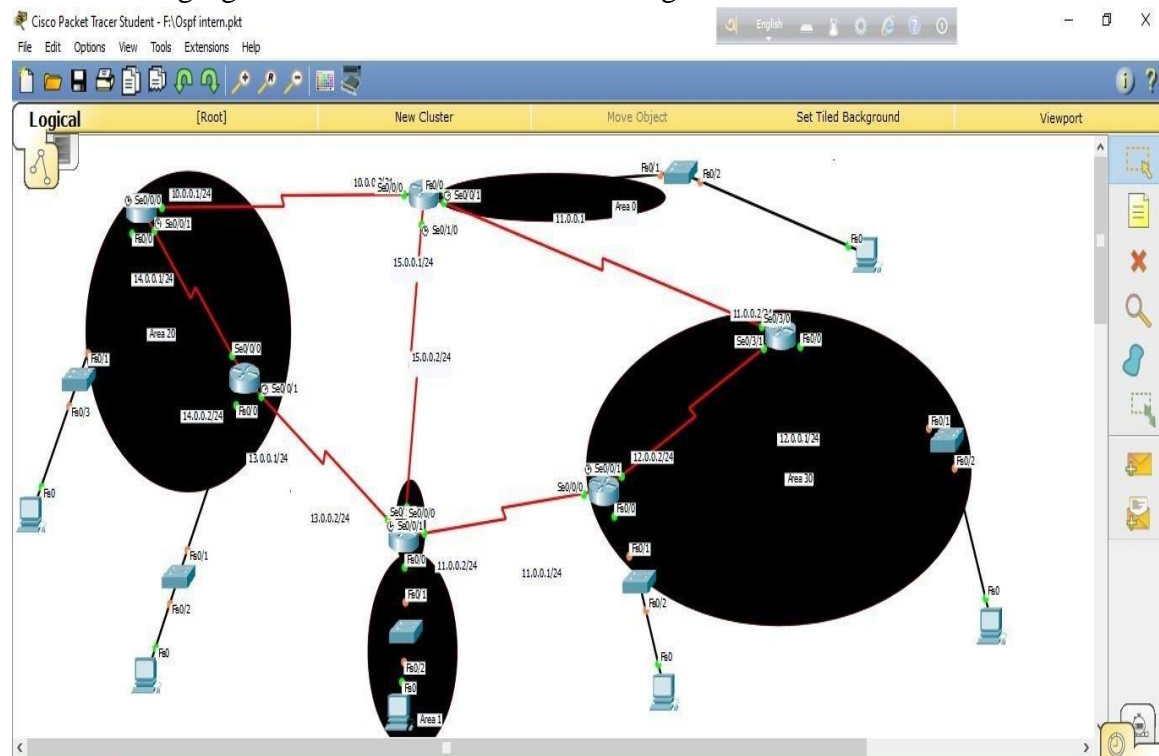
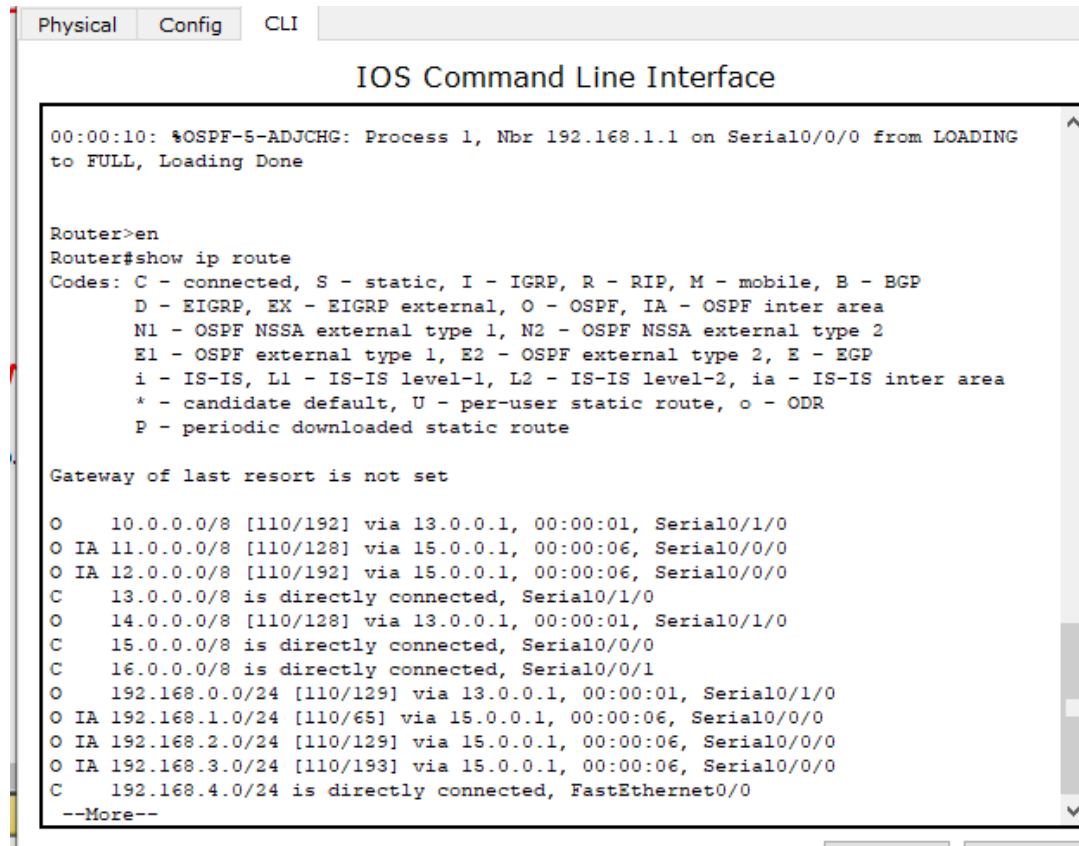


Figure 5.9.1 : Model on OSPF routing

5.9.2: OSPF Routing table and path selection :

The following figure 5.8.2 Shows OSPF routing



The screenshot shows a Cisco IOS Command Line Interface (CLI) window with tabs for Physical, Config, and CLI. The title bar reads "IOS Command Line Interface". The main window displays the following text:

```
00:00:10: %OSPF-5-ADJCHG: Process 1, Nbr 192.168.1.1 on Serial0/0/0 from LOADING
to FULL, Loading Done

Router>en
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

O    10.0.0.0/8 [110/192] via 13.0.0.1, 00:00:01, Serial0/1/0
O IA 11.0.0.0/8 [110/128] via 15.0.0.1, 00:00:06, Serial0/0/0
O IA 12.0.0.0/8 [110/192] via 15.0.0.1, 00:00:06, Serial0/0/0
C    13.0.0.0/8 is directly connected, Serial0/1/0
O    14.0.0.0/8 [110/128] via 13.0.0.1, 00:00:01, Serial0/1/0
C    15.0.0.0/8 is directly connected, Serial0/0/0
C    16.0.0.0/8 is directly connected, Serial0/0/1
O    192.168.0.0/24 [110/129] via 13.0.0.1, 00:00:01, Serial0/1/0
O IA 192.168.1.0/24 [110/65] via 15.0.0.1, 00:00:06, Serial0/0/0
O IA 192.168.2.0/24 [110/129] via 15.0.0.1, 00:00:06, Serial0/0/0
O IA 192.168.3.0/24 [110/193] via 15.0.0.1, 00:00:06, Serial0/0/0
C    192.168.4.0/24 is directly connected, FastEthernet0/0
--More--
```

Figure 5.9.2: routing table and path selection OSPF routing

5.10: BGP Protocols (Border Gateway Protocol)

- In BGP protocols we must need an as (autonomous system number) AS:

AS is a collection of network under a single administration

- It's range 1-65535 Two types of as:
- Private as (Used with in the same service provider)
- Unique with the service provider

The following figure 5.10.1 Shows Private AS service provider

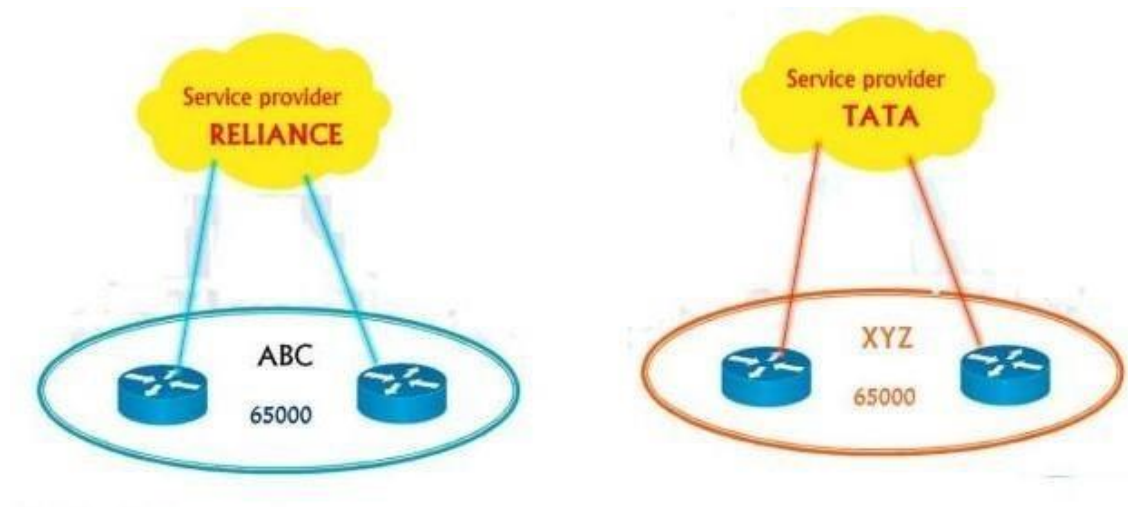


Figure 5.10.1 Private AS service provider

3) Range 64513-65535

Public as:

- Used with in multiple service provider
- Its globally unique
- Range 1-64512

The following figure 5.10.2 Shows Public AS service provider

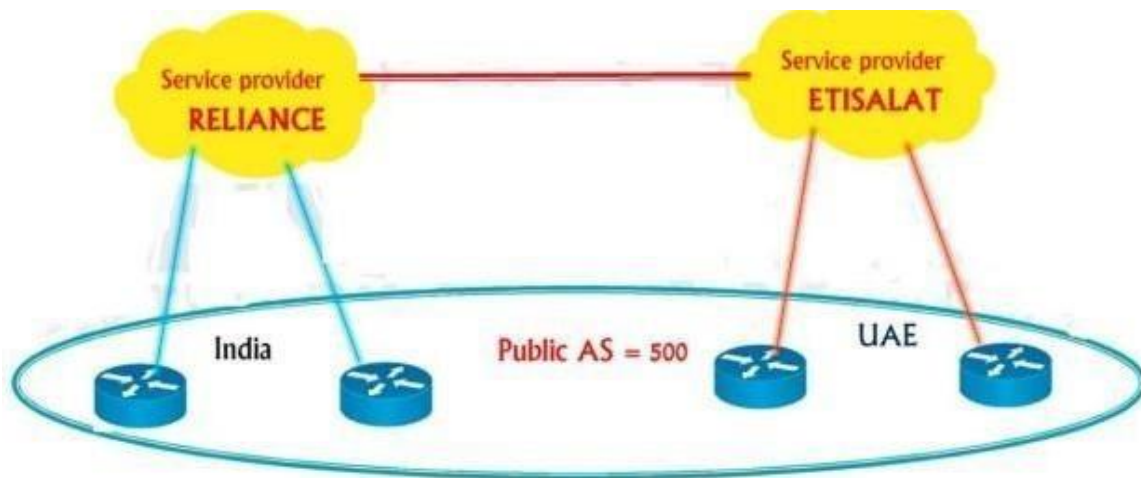


Figure 5.10.2 : Public AS service provider

BGP feature:

- Open standard model
- Exterior gateway protocols in a router
- Design for inter-AS domain routing
- Design to scale huge inter-network (Like internet)
- Classless Routing protocols (Support FLSM VLSM CIDR)
- Update incremental and trigger.
- Path vector protocols

BGP is used application layer protocol uses TCP for reliability

- Administrative distance routing
- External 20 update (EBGP)
- Internal 200 update (IBGP)

BGP is basically used for multi-home. Where a host can get two or more links in a single ISP or multiple ISP

BGP configure:

```
config# router BGP <AS number>
```

```
config-router# neighbor < IP address> remote AS<As number> config-router#
```

```
network <Network id> mask<subnet mask>
```

BGP MODEL:

The following figure 5.10.3 Shows of BGP with OSPF Model

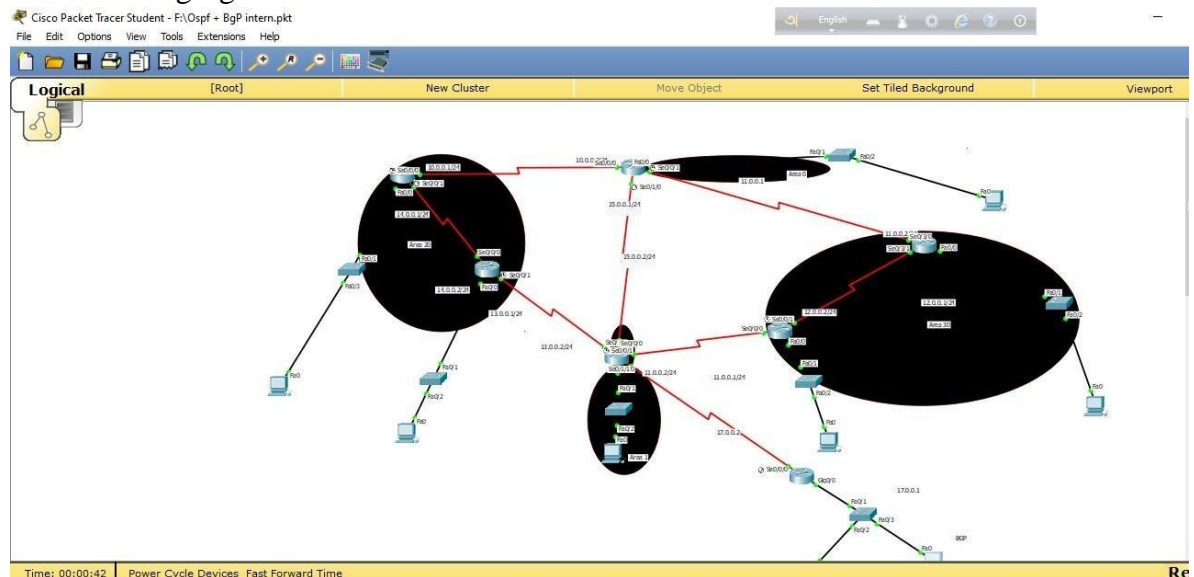
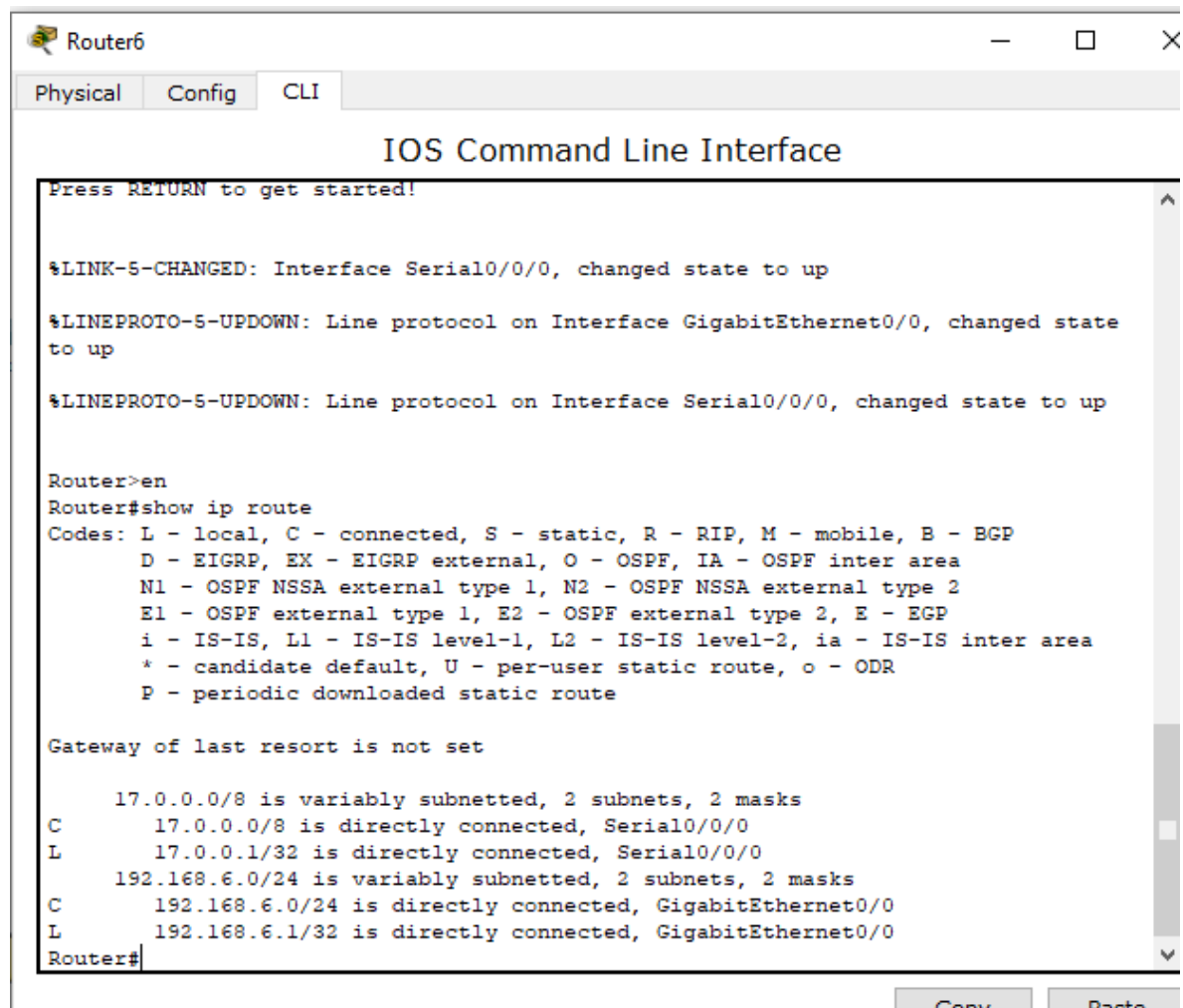


Figure 5.10.3 : Model on BGP protocols with OSPF routing

5.10.4: BGP Protocol with OSPF Path selections

The following figure 5.10.4 Shows BGP protocols with OSPF



The screenshot shows a Cisco Router CLI window titled "Router6" with tabs for "Physical", "Config", and "CLI". The main window displays the "IOS Command Line Interface". The output of the "show ip route" command is as follows:

```
Press RETURN to get started!

%LINK-5-CHANGED: Interface Serial0/0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface GigabitEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface Serial0/0/0, changed state to up

Router>en
Router#show ip route
Codes: L - local, C - connected, S - static, 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

    17.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
C       17.0.0.0/8 is directly connected, Serial0/0/0
L       17.0.0.1/32 is directly connected, Serial0/0/0
    192.168.6.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.6.0/24 is directly connected, GigabitEthernet0/0
L       192.168.6.1/32 is directly connected, GigabitEthernet0/0
Router#
```

Figure 5.10.4 : Path selection and routing table for BGP protocols with OSPF

5.11: Switching:

Switching is providing centralized location and connect with the LAN.

ARP: (Address resolution protocols) ARP works on Mac address. Switch identifies device based on mac address.

5.11.1: Switching Port interface:

The following figure 5.11.1 shows switching port interface

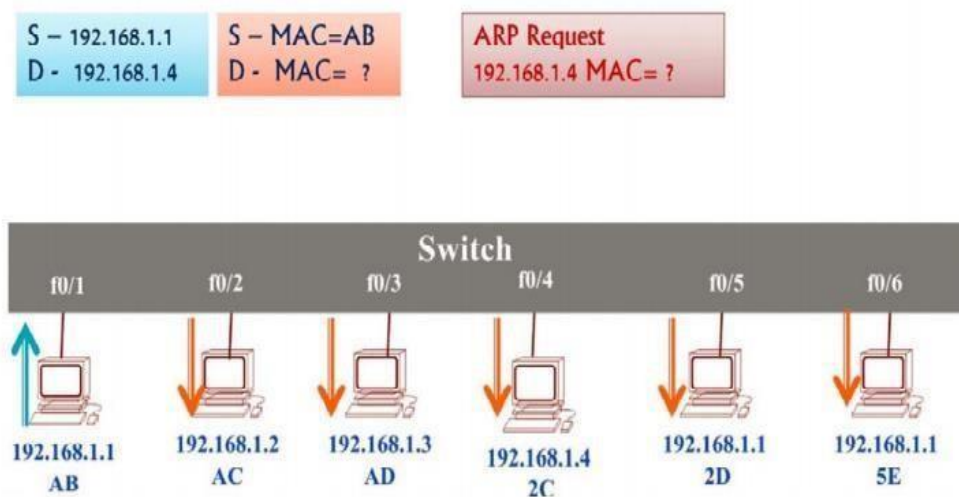


Figure 5.11.1 Switching port interface.

Generally, the mac address is 48 bit, the first 24 bit is a serial number for the company and the last 24 bit is the device number. Switch basic function: If destination address present in mac table switch does unicast otherwise it does broadcast. Max-age time for mac-entries is 300 seconds of inactivity

Type of switch:

1) Unmanageable switch

- Plug and play
- Ready start
- No configuration and verification can be done
- It has no console port

2) Manageable switch

- Also plug and play
- Its manageable unci port
- Configuration and verification can be done
- It has console port and cli classes

5.12: VLAN (Virtual LAN):

Divides individual single broadcast Addresses into multiple broadcast Address

- VLAN layer 2 security
- VLAN 1 is the default VLAN
- We can make VLAN from 2-1001
- It's totally work based on port number

Trunk or inter VLAN: If we configure general VLAN then we can't connect another department so we need to configure inter VLAN.

Basically, if we work time physically one wire to connecting the router to switch but logically it has multiple connection systems.

Inter VLAN work layer 3 security

5.12.1: Model VLAN:

The following figure 5.12.1 Shows on VLAN Model

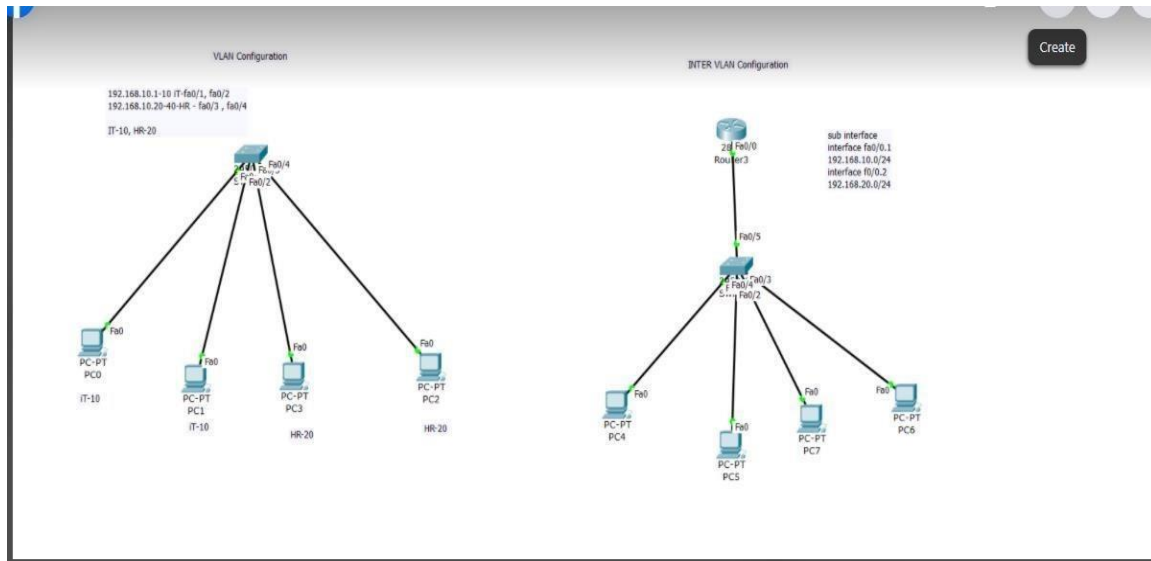


Figure 5.12.1: Model on VLAN

Step 01 :

VLAN Configuration :

```
switch>enable
switch# configure terminal switch(config)# VLAN10 switch(config-VLAN)#
name IT Switch(config)# VLAN 20 switch(config-VLAN) #name HR Switch#
configure terminal
switch(config)#interface fast Ethernet 0/1
switch(config-if)# switchport access VLAN 10
switch(config)#interface fast Ethernet 0/2
switch(config-if)# switchport access VLAN10
Switch(config)#interface fast Ethernet 0/3
switch(config-if)#switchport access VLAN 20
switch(config)#interface fast Ethernet 0/4
switch(config-if)# switchport access VLAN20
(Then Verification both are same department pc IT to IT, pc HR to HR)
```

Step 02 :

Inter VLAN Configuration:

```
router ena :
router>enable
router# configure terminal
router(config)#interface fast Ethernet 0/0
router(config-if)#no shutdown
router# configure terminal
router(config)#interface fast Ethernet 0/0/1
router (config-sub if) # encapsulation dot1Q 20
router (config-sub if) # IP address 192.168.20.1 255.255.255.0
router(config)#interface fast Ethernet 0/0/2
router (config-sub if) # encapsulation dot1Q 30
router (config-sub if) # IP address 192.168.30.1 255.255.255.0 Then switch:
```

Trunk port Configuration:

```
Switch1# configure terminal Switch(config)#interface fast Ethernet 0/5  
Switch1(config-if)#switchport mode trunk
```

5.13: ACL (Access control list)

ACL is a set of rules which will allow or deny the specific traffic moving through the router. Its full security based

Control the flow of traffic from one network to and other via a router. Basically two types of ACL

- 1) Standard ACL
- 2) Extend ACL

Standard ACL:

Can be name or number

- The access-list number range is (1-99) & (1300-1699)
- Can block a network, Host, and subnet (Not a selected service)
- All services are blocked
- Filter totally done only depend on IP source address.

The following figure 5.12.1 Shows on Standard ACL model

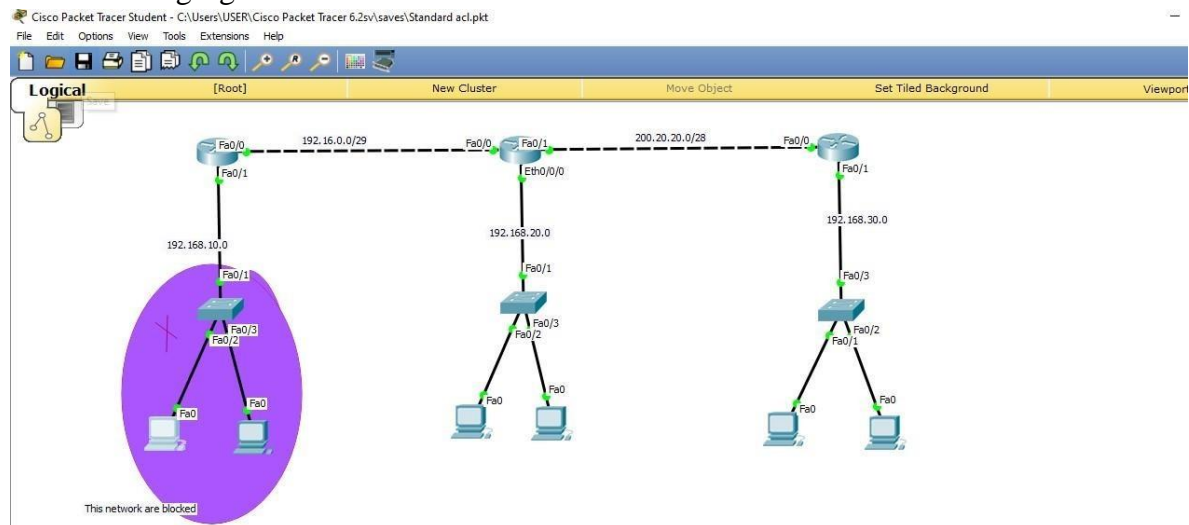


Figure 5.13.1 : Model on Standard ACL

5.13.2: Standard ACL Ping on Network

The following figure 5.13.2 Shows ping on Standard ACL

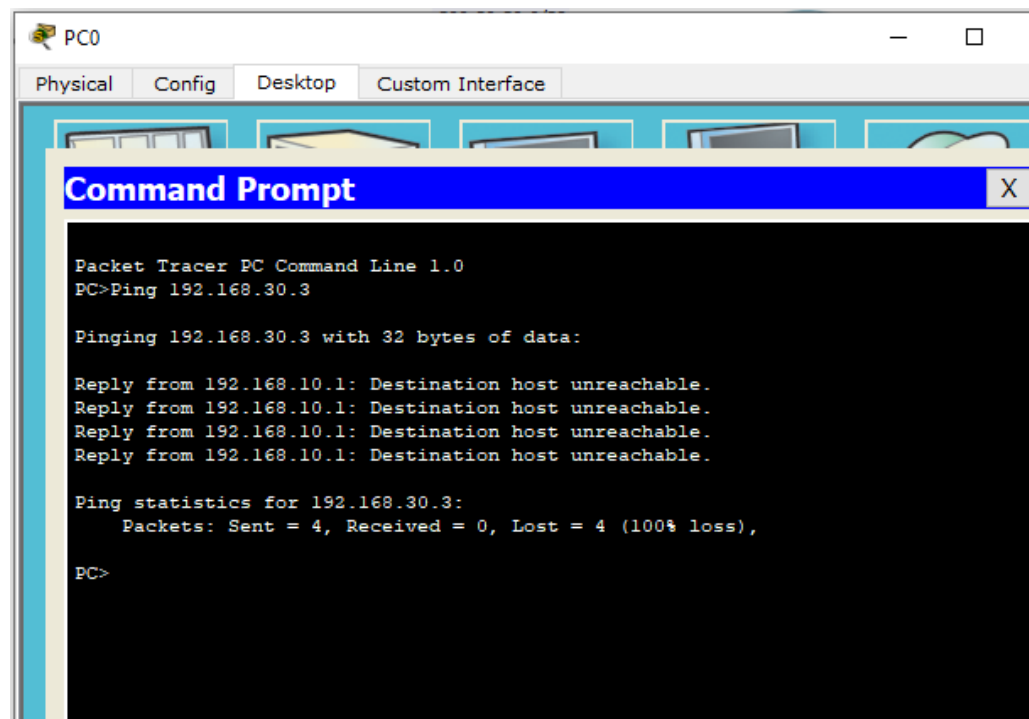


Figure 5.13.2: Ping one network to another on Standard ACL

Extended ACL:

Can be a name or number list

- The access-list number range is (100-199) and (2000-2699)
- Allow and deny a network, host, Subnet, and service
- Identify service can be blocked
- Filtering is done by IP, destination IP a Protocols and port number

5.13.3: Model On extend ACL:

The following figure 5.13.3 Shows on Extended ACL Model

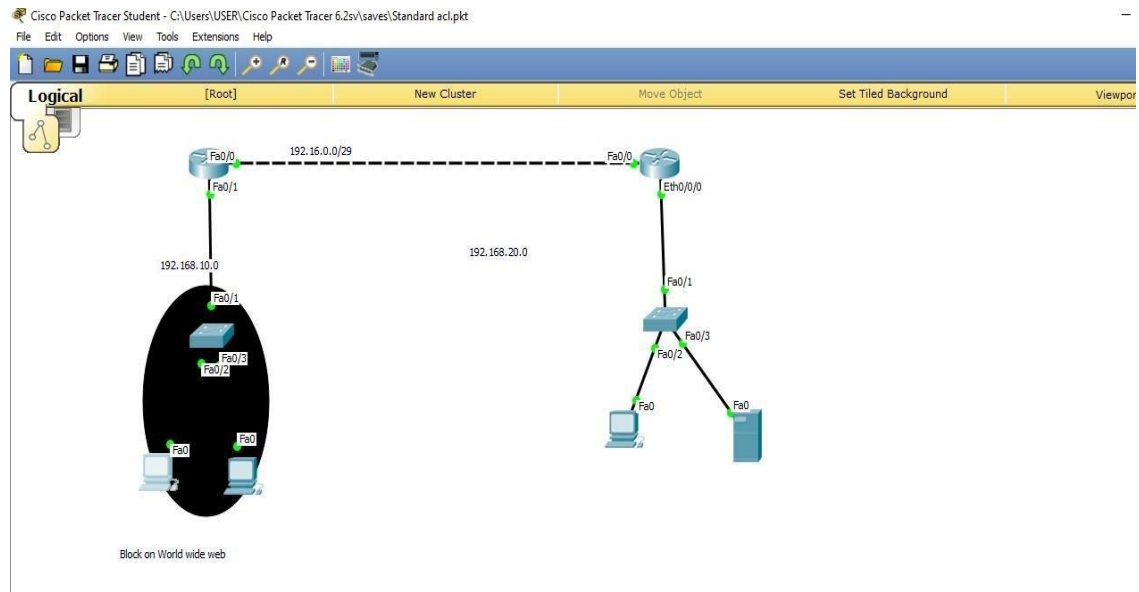


Figure 5.13.3: Model on Extended ACL

5.13.4: Extended ACL Ping on Netwrk :

The following figure 5.13.4 Shows ping on Extended ACL

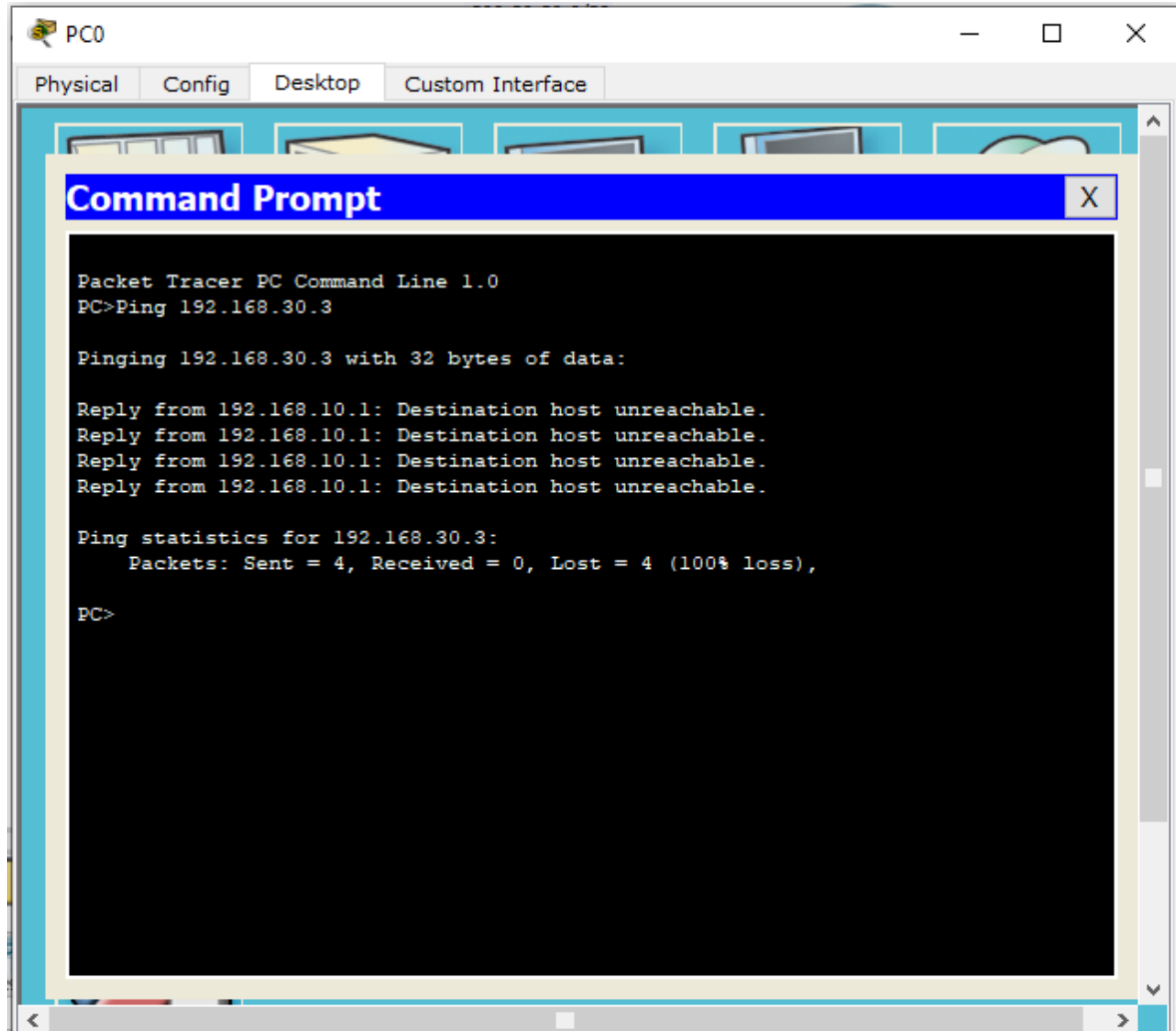


Figure 5.13.4: Ping one network to another on Extended ACL

5.14: DHCP (Dynamic host routing protocols)

DHCP works in dynamically on the protocols site. Its has very easy to configure. We work to configure only the router. For configure, we work layer 3 switch and router. The end device gets IP automatically. Dynamically assign an IP address to the host. Also, provide DNS and gateway if needed.

5.14.1: Model on DHCP:

The following figure 5.14.1Shows on DHCP Model

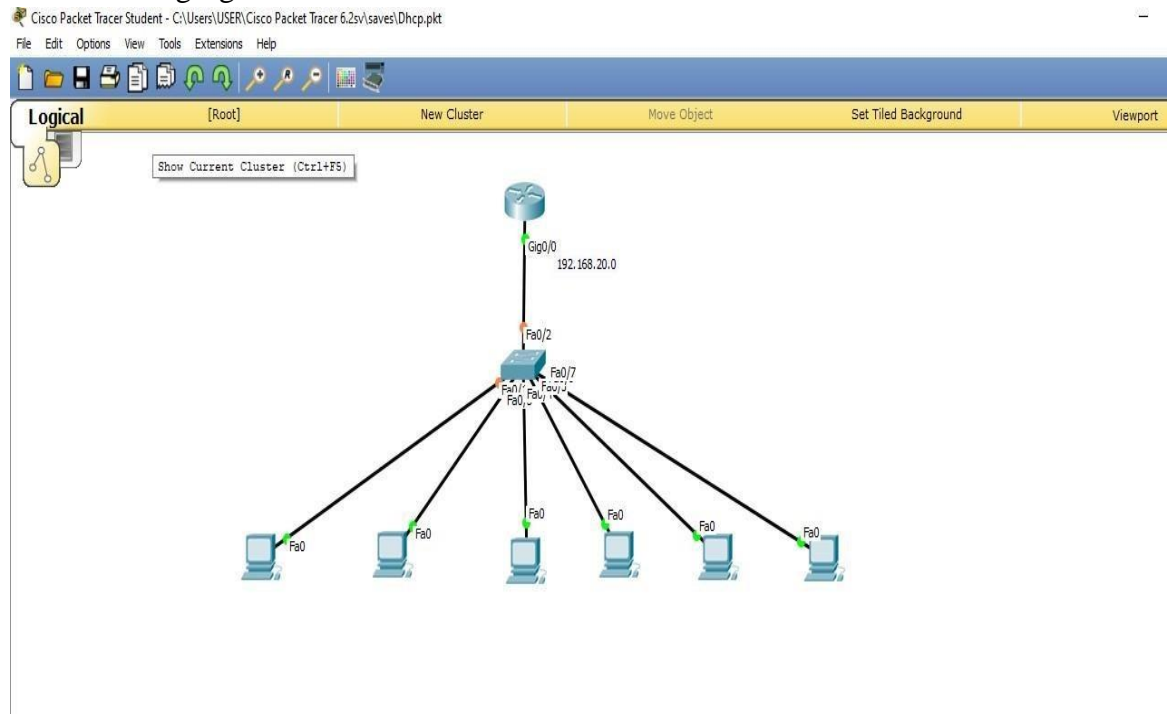
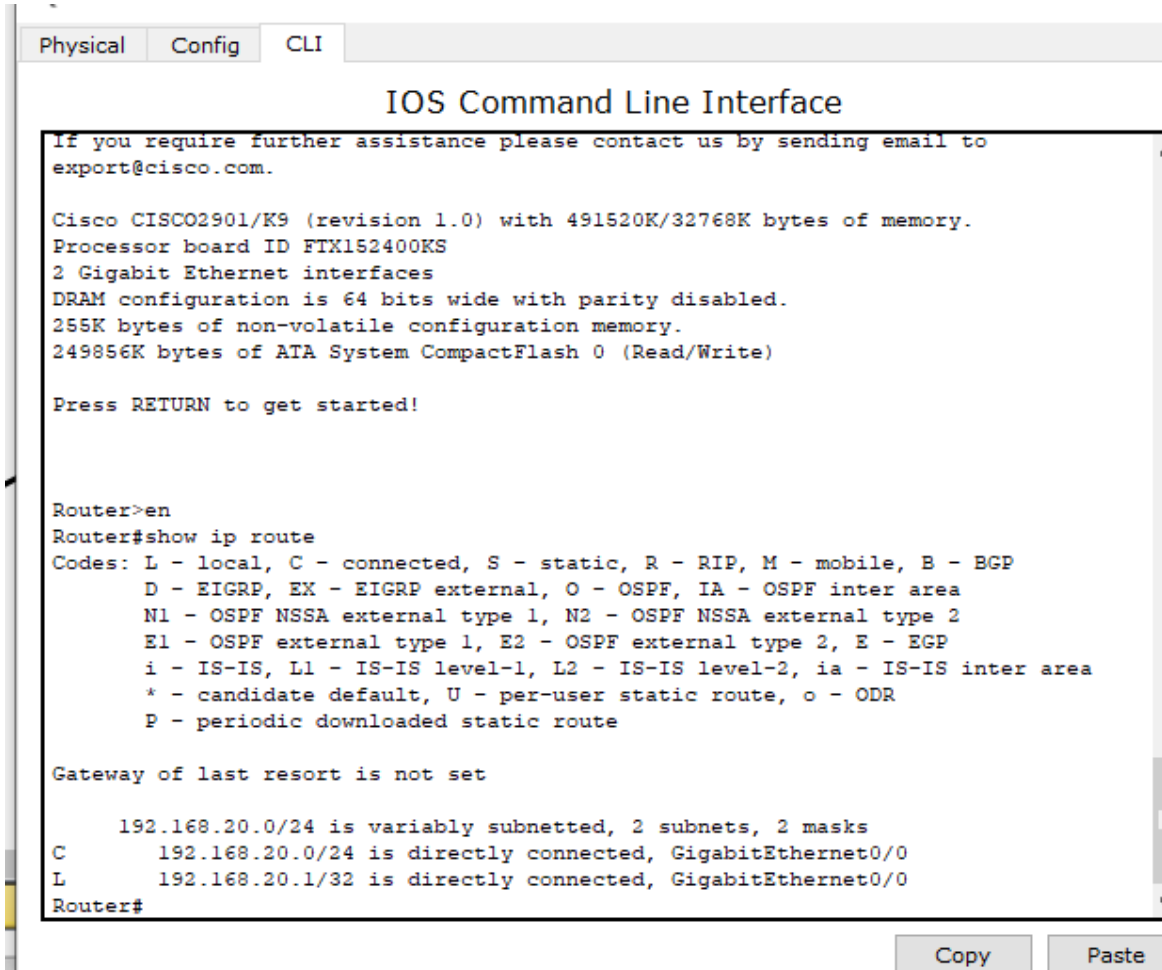


Figure 5.14.1: Model on DHCP

5.14.2: DHCP Routing Table

The following figure 5.14.2 Shows Routing table on DHCP



```
Physical Config CLI
IOS Command Line Interface
If you require further assistance please contact us by sending email to
export@cisco.com.

Cisco CISC02901/K9 (revision 1.0) with 491520K/32768K bytes of memory.
Processor board ID FTX152400KS
2 Gigabit Ethernet interfaces
DRAM configuration is 64 bits wide with parity disabled.
255K bytes of non-volatile configuration memory.
249856K bytes of ATA System CompactFlash 0 (Read/Write)

Press RETURN to get started!

Router>en
Router#show ip route
Codes: L - local, C - connected, S - static, 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

    192.168.20.0/24 is variably subnetted, 2 subnets, 2 masks
C       192.168.20.0/24 is directly connected, GigabitEthernet0/0
L       192.168.20.1/32 is directly connected, GigabitEthernet0/0
Router#
```

Figure 5.14.2: Routing table on DHCP

5.15: Ether channel (aggregation redundant link)

Ether channel allows converting multiple links to a single link. If one link is down then data or packet can pass another link. This is the Ether channel.

Here we use Two Negotiation Protocol

1) (PAGP) Port Aggregation Protocol

- Cisco Proprietary
- Port Mode: Auto, Desirable, On

2(LACP) Link Aggregation Control Protocol

- It's used for connected non-cisco property routers.
- Port mode: Passive

5.15.1: Model on Ether channel:

The following figure 5.15.1 Shows on Ether channel Model

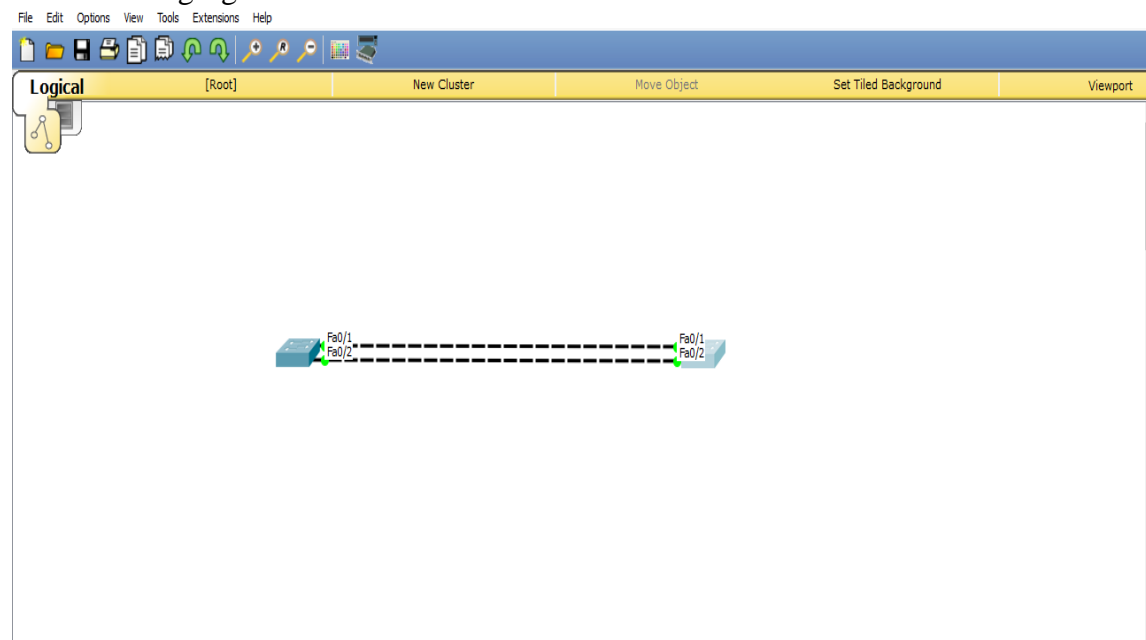
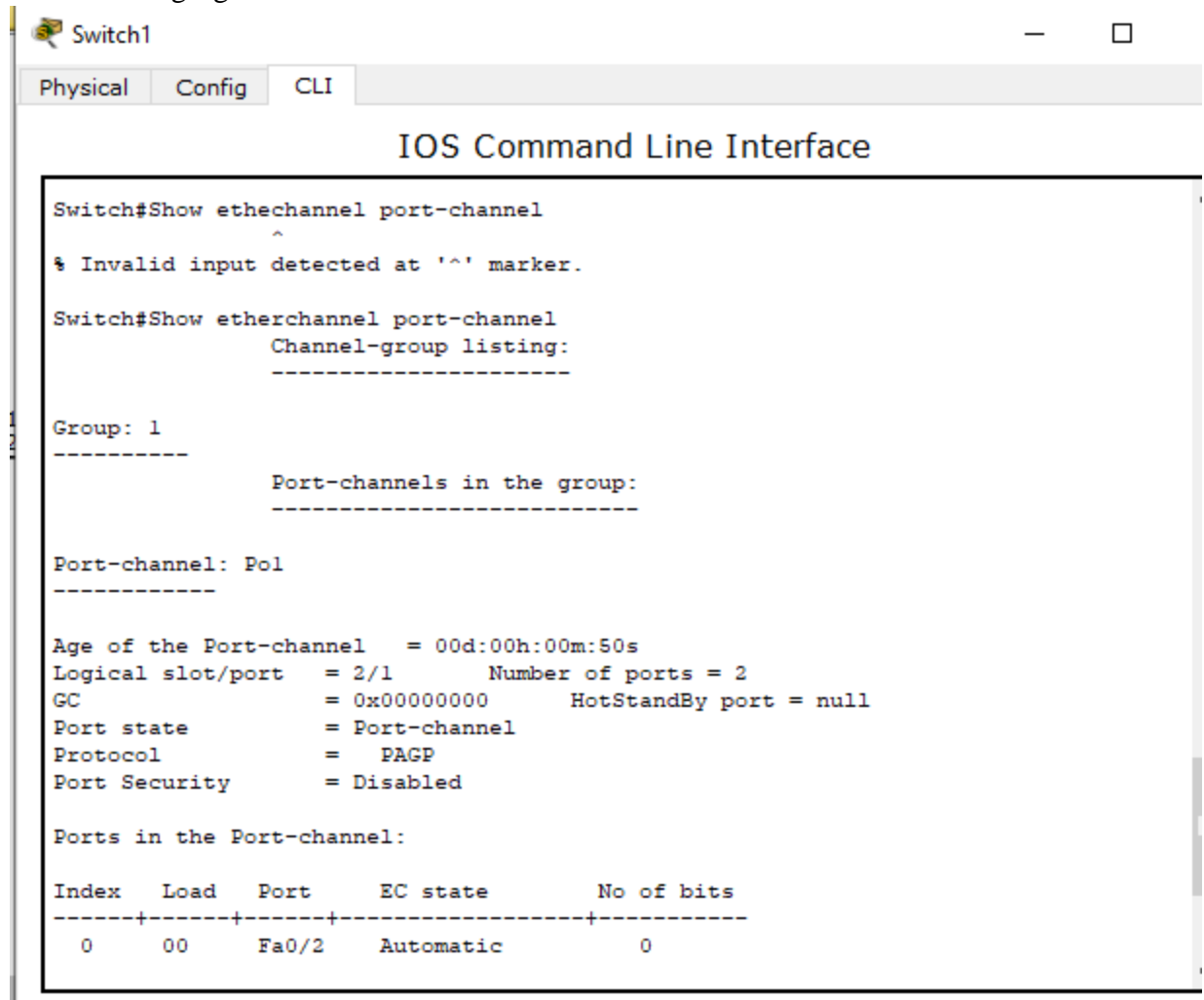


Figure 5.15.1: Model on Ether channel

5.15.2: Port-Channel on Ethernet Channel

The following figure 5.15.2 Shows Port-channel on Ether channel



The screenshot shows a network switch interface with tabs for Physical, Config, and CLI. The CLI tab is active, displaying the 'IOS Command Line Interface'. The user has entered the command 'Switch#Show ethechannel port-channel', which resulted in an error: '% Invalid input detected at '^' marker.' The user then entered 'Switch#Show etherchannel port-channel', which displayed the 'Channel-group listing:' for Group 1. The output shows that the port-channel is named 'Po1' and is in the 'Port-channel' state. The 'Port state' is 'Port-channel', the 'Protocol' is 'PAGP', and 'Port Security' is 'Disabled'. The 'Ports in the Port-channel:' section shows a table with one port, Fa0/2, in the 'Automatic' state.

```
Switch#Show ethechannel port-channel
^
% Invalid input detected at '^' marker.

Switch#Show etherchannel port-channel
Channel-group listing:
-----

Group: 1
-----

Port-channels in the group:
-----

Port-channel: Po1
-----

Age of the Port-channel   = 00d:00h:00m:50s
Logical slot/port        = 2/1          Number of ports = 2
GC                        = 0x00000000    HotStandBy port = null
Port state                = Port-channel
Protocol                  = PAGP
Port Security             = Disabled

Ports in the Port-channel:

Index  Load  Port    EC state    No of bits
-----+-----+-----+-----+-----
0      00     Fa0/2    Automatic    0
```

Figure 5.15.2 Port-channel on Ether channel

5.16: NAT (Network address translation)

It's the method of translating private IP to public IP address. Types of NAT :

- Static NAT
- Dynamic NAT
- Port address
- Translation (PAT)

5.16.1: Model on PAT:

The following figure 5.15.1Shows on PAT Model

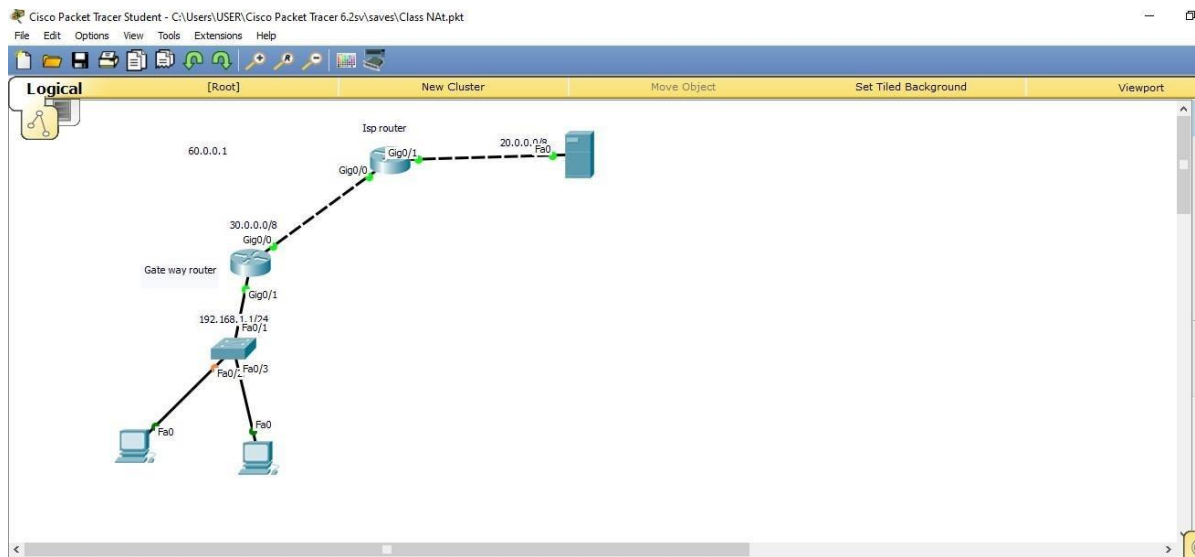
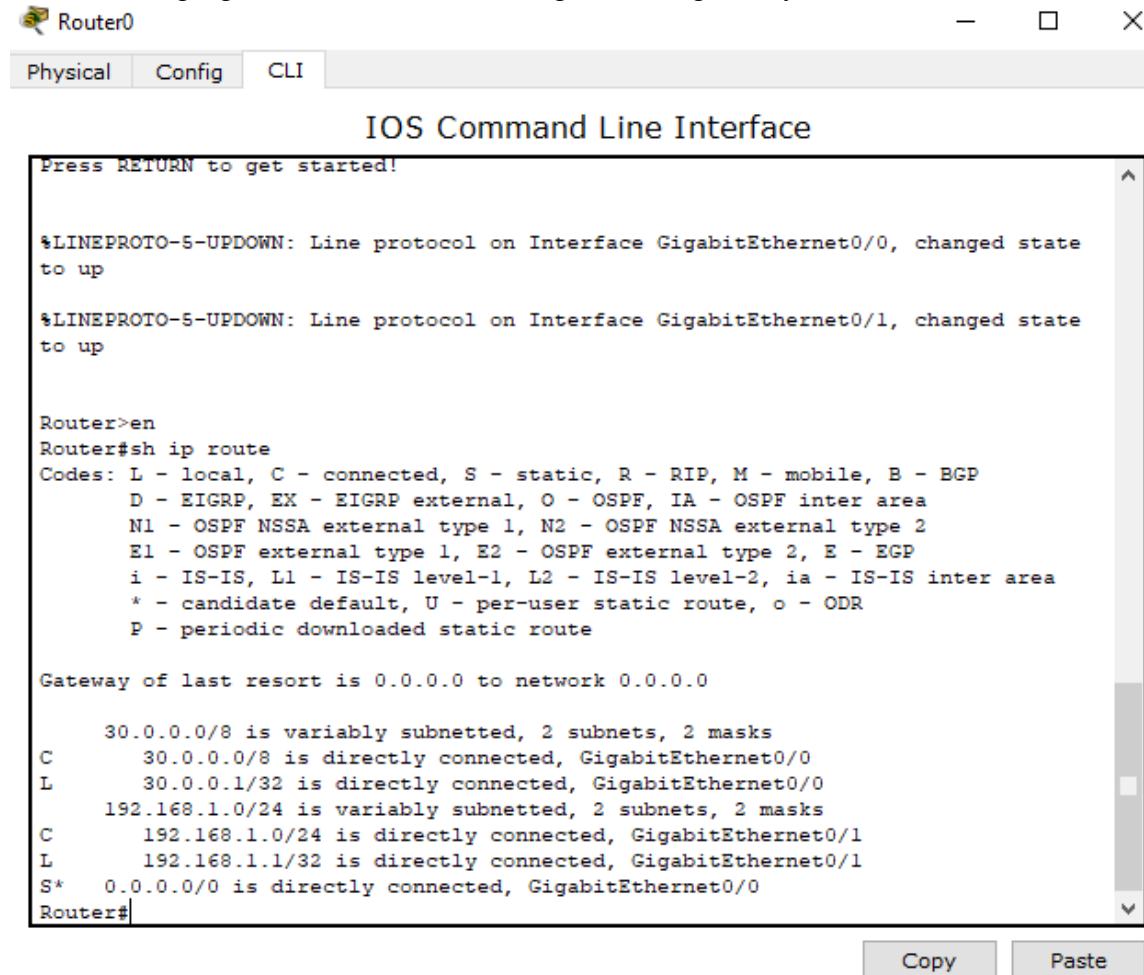


Figure 5.16.1: Model on PAT

5.16.2: PAT Routing table:

The following figure 5.16.2 Shows Routing table for gateway router on PAT



The screenshot shows a Cisco Router CLI window titled "Router0" with tabs for "Physical", "Config", and "CLI". The main window is titled "IOS Command Line Interface". The prompt is "Press RETURN to get started!". The user has entered the command "Router>en" and then "Router#sh ip route". The output shows the routing table for the gateway router on PAT. The table lists the following routes:

- 30.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
- C 30.0.0.0/8 is directly connected, GigabitEthernet0/0
- L 30.0.0.1/32 is directly connected, GigabitEthernet0/0
- 192.168.1.0/24 is variably subnetted, 2 subnets, 2 masks
- C 192.168.1.0/24 is directly connected, GigabitEthernet0/1
- L 192.168.1.1/32 is directly connected, GigabitEthernet0/1
- S* 0.0.0.0/0 is directly connected, GigabitEthernet0/0

The prompt "Router#" is visible at the bottom of the CLI window. Below the window, there are "Copy" and "Paste" buttons.

Figure 5.16.2: Routing table for gateway router on PAT

CHAPTER 6

Professional growth

6.1 : Networking and tools that I learn

I was assigned to an Organization where we worked on a networking platform. All I learned was other networking protocols, switching, design, hardware problem, And troubleshoot. Networking is very popular in Bangladesh. Most of us have to use the internet in our daily lives. This is unimaginable.

6.2 : Tools:

In my internship at Technology Palli Limited role model in the networking sector, I have used the backing tools in my regular tasks.

- i) Cisco packet tracer
- ii) Router
- iii) Switch
- iv) Cabling
- v) Computer

6.3 : Networking technologies:

I have gained knowledge of the following networking technologies in my internship time.

- i) Static routing
- ii) Dynamic routing
- iii) Default routing
- iv) Rip routing
- v) EIGRP
- vi) OSPF
- (vii) BGP

CHAPTER 7

Conclusion

7.1 Conclusion

I have gained a good knowledge of networking companies, their working methods, and networking through this internship program. Working as a group with group members and solving various problems, always thinking well and gaining knowledge about how to prioritize work. By success, this internship, and working as a team, my team-based work skills have improved and I have learned to respect the planning and advice of teammates. In general, doing this internship program has increased my networking understanding and I am becoming self-reliant and optimistic that I can work in the field of networking. After learning the basic ideas of this course, it will help me to establish myself in the field of employment. The things I learned earlier will help me a lot when I learn more about networking in the future. The Cause I chose networking is because it is in a large market all over the world including Bangladesh. In the future, I will develop myself as a networking engineer. I've seen everyone work in tandem with team leaders. To my mind, I have made a lot of mistakes in the last four months. But my instructor never misconducts oneself with me.

Future Development:

The Future of MTCNA & CCNA Certifications in the Computer Networking Sector This is Starting and best option. If I have Interested in networking. It is the starting way in the networking world. Finally, I Say that one day I have a big dream in the networking sector.

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