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DEPLOYING A CAMPUS NETWORK USING IPv6 WITH ACL SECURITY

Das, Puja

Independent University, Bangladesh

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Submitted by
Puja Das
Student ID: **2111363**

Summer, 2023

Supervised By
Dr. Tarem Ahmed
Associate Professor

Department of Computer Science & Engineering
Independent University, Bangladesh

August 23, 2023

This Project Report Presented in partial fulfillment of the Requirements for the degree of Master of Science in Computer Science

Department of Computer Science & Engineering

Independent University, Bangladesh

Attestation

I'm Puja Das, hereby certify that none of the work that has been done in this report is plagiarized or copied from anywhere. Any resources used are mentioned in the reference section of the report. No help was asked for during the completion of the report from a third-party organization except the one that I have worked for in the last 6 months implement these network.

23 August, 2023

Signature Date

Puja Das

Name

ACKNOWLEDGEMENT

First I express our heartiest thanks and gratefulness to almighty God for His divine blessing makes us possible to complete the final year project successfully.

I'm really grateful and wish my deep debt to **Supervisor Dr. Tarem Ahmed**, **Associate Professor**, Department of CSE Independent University, Bangladesh. Deep Knowledge & keen interest of my supervisor in the field of "*Field name*" to carry out this project. His endless patience, scholarly guidance, continual encouragement, constant and energetic supervision, constructive criticism, valuable advice, reading many inferior draft and correcting them at all stage have made it possible to complete this project.

Finally, I must acknowledge with due respect the constant support and patients of my parents.

Letter of Transmittal

23 August, 2023

Dr. Tarem Ahmed

Associate Professor

Department of Computer Science and Engineering

Independent University, Bangladesh

Subject: Project Report submission Summer,2023

With due honor and respect, I'm Puja Das, Summer, 2023, Section 01, would like to submit my project report. This report is written to kindly inform you that I have completed my project and its report. My project was conducted from 2nd March 2023 to date. I completed my project at Networking based project.

In this Project firstly gain a lot of experience in all the Networking related fields of the ISP Company, Corporate sector Network diagram how implements their network. Also including research and development, documentation paper make me a good ideas in this project implement.

In this period I found out that I learned and applied a lot of new skills and technologies.

I would like to thank you immensely for all your guidance and support. I hope and pray that this report fulfills all the requirements and is up to your expectations.

Sincerely,

Puja Das

2111363

Evaluation Committee

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Signature

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Name

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Supervisor

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Internal Examiner

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External Examiner

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Name

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Convener

ABSTRACT

This report write on a networking based project named “Deploying Dual Stack in a corporate network with ACL security". Here I configure both IPv4 & IPv6 in a same corporate network. Gradually I go ahead to IPv6 for some major limitation of IPv4. So I deploy “Dual stack” in a same network as both IPv4 and IPv6 accessing devices can use it. For deploying this project, I designed a corporate network then we implement it cisco packet tracer simulator, for configuring we use different IP address & routing protocol after that I test the whole network. The main part of my project is security issue. Now I can see day by day newly cybercrime will happen so it is major challenge for us to make more secure this network. Finally, this project will be helpful any kind of ISP, campus and corporate network. It is also can use as a proper guideline.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

IPv6 full meaning Internet Protocol version 6. IPv6 is the latest version of Internet Protocol (IP), a communication protocol that provides an identification and location system for computers on a network and routes traffic over the Internet. To eventually replace IPv4, the protocol for many Internet services. Every computer, mobile phone, and any other device connected to the Internet needs a digital IP address to communicate with other devices. As ipv4 address is limited, ipv6 is gaining popularity day by day.

1.2 Motivation

IPv4 address are running out day by day for its small address space and we moving towards IPv6 gradually. IPv6 will be the next generation protocol for internet communication. So, IPv6 address important goals bellow:

- **Larger address List:** This is what we discussed earlier. IPv6 is to provide more addresses for the growing Internet.
- **Better address space management:** It is desirable that IPv6 includes not only more addresses, but also a more efficient way to divide the address space and utilize the bits of each address.
- **Eliminate "addressing problems":** Technologies like NAT are actually "problems" that make up for the lack of address space in IPv4. IPv6 removes the need for NAT and similar alternatives, allowing any TCP/IP device to have a public address. Simplify TCP/IP Administration: The designers of IPv6 hoped to address some of IPv4's current labor-intensive requirements, such as the need to configure IP addresses. While tools like DHCP eliminate the need to manually configure multiple servers, this only partially solves the problem.

- **Modern Routing Design:** Unlike IPv4, which was designed before we all had an idea what the modern Internet would look like, IPv6 was created specifically to route efficiently in our current Internet and there is flexibility to 'coming.
- **Better multicast support:** Multicast was an option in IPv4 from the beginning, but support for it has been slow going forward.
- **Better security support:** IPv4 was designed at a time when security wasn't really an issue, as there were a relatively small number of networks on the Internet and their administrators generally knew each other. Today, security on the public Internet is a big deal, and the future success of the Internet requires security issues to be addressed.
- **Better support for mobility:** When IPv4 was created, there was really no concept of a portable IP device. Problems related to computers moving between networks have led to the need for Mobile IP. IPv6 builds on Mobile IP and provides support for mobility within IP itself.

This project also helpful for any ISP, IT Sectors, banking sector etc. to stabilize their network diagram.

1.3 Objectives

- Study in basic networking.
- Study in IPv6.
- Studying Campus network structure & its components.
- Study in ACL Security.
- Diagram Design.
- IP planning for the designed network.
- Suitable protocol chooses.
- Implement this network diagram.
- Testing the network.

1.4 Expected Outcome

After completing our project while all devices are linked up, they can share information easily each other. The system will more secure and data packet will be sent without any traffic. Every user communication & data transfer each other. Another important outcome is the ISP & IT Sectors can be benefit from my project; they can use my project as a proper guideline.

CHAPTER 2

BACKGROUND

2.1 Preliminaries

As web innovation begins to infiltrate the field, the internet and our shared lives are increasingly inextricably linked. Thus, the network is a very interactive and professional LAN. ISPs have chosen a method of IP address conversion. With the solution, all network devices, servers, switches, routers and firewalls in the ISP network will be configured to connect to IPv4 and IPv6. More importantly, technology allows ISPs to handle IPv4 and IPv6 traffic simultaneously. If an IT field, FAI includes many professional branches, we may create several local area networks and also through the connections and wired services of these branches.

2.2 Related Works

I can see many projects around us which was implemented by IPv4 or Ipv6. These projects work with a single IP address. But I'm deploying a campus network which supports ipv6. This type of project did not implement yet but there are many resources from where I can take a good knowledge about my projects Wikipedia, research paper, and journal, how it works, which protocol being used etc.

The main concept about my project is to study IPv6 and using those implement my project by selecting a campus network.

Though I use IPv4 present now but in near future we must have switch to IPv6 as IPv4 uses 32 bit only and IP address accessing increased phenomenally.

Therefore, I choose this project which has scope to evolution in near future. When I discuss about this project. We face some question:

- Why choose "Dual stack" networks?
- What resources are available for the proposed system? Is the problem worth solving?

- What will happen after the project?
- What filled used it?

2.3 Competitive Analysis

I have many websites and resources from which I can learn many features related to IPv4 or IPv6. But the question is: are they easy to use? If we think about the current situation of internet communication, our answer is yes because we are currently using IPv4. But if we think about the near future of internet communication, better performance and better security, IPv6 is suitable. We can therefore say that these functions only apply to a single implementation. However, my project was implemented by IPv6 addresses. This theme is very user-friendly as it allows you to use both IP devices on the same network without syncing. Most of it is due to the inactivity of the IT sectors as the IPv6 convergence.

CHAPTER 3

REQUIREMENT SPECIFICATION

3.1 Business Process Modeling

I can use my project as business purpose. ISP can use our project idea to implement their network and they can provide service in house, office building, Banking sectors, Shopping mall through pppoe, static or DHCP service.

3.2 Requirement Collection and Analysis

I visited the server center under an ISP to know the requirements of my project and talked to the IT controller and server controller of ISP. I have learned about the configuration of real life switch and have configured it by studying. I have also seen and gained knowledge of all the devices, routers, cables, switch, printers, servers, computers to do our project.

3.2.1 IP Protocols

IPv6

Internet protocol version 6 is the six version of the Internet protocol. IPv4 128-bit address & Hexadecimal format. Every portion separate (:).

2001: ABCD: 0000: 0000: 1234: 0001: 0110: 000F

Three classes of IPv6 address.

- Unicast.
- Multicast.
- Anycast.

Unicast are three types.

- Global Unicast.
- Unique Local.
- Link Local.

Global Unicast: Any addresses that is started in 2000 & first 3 bits are constant like that 001 that's called Global Unicast.

For example: 2001: ABCD:: 1234 : 1 : 110: F

Unique Local: Any addresses that is started in FC00 & first 7 bits are constant like that that's called Unique Local.

For example: FC00: 0 : 0 : 1 :: AAAA

Link Local: Any addresses that is started in FE80 & first 10 bits are constant like that's called Unique Local.

For example: FC00: 0: 0: 1:: AAAA

I learned a gather knowledge of IPv6 Subnetting.

3.2.2 Switch Basic Configuration

The topics we cover:

- Hostname Setup.
- Console Password Setup.
- Enable Password Setup.
- Enable Secret Password Setup.
- Telnet Configuration.
- VLAN Configuration
- Port assign to single interface.

8. Port assign using “range” command.

To configure a switch, we have to know three basic modes. These modes also are the same for

Router. Total five modes are given below.

S/N Mode Explanation:

1. User Execution Switch>

2. Privilege Switch#

3. Global configuration Switch(config)#

4. Interface Switch(config-if)#

5. Sub-interface Switch(config-subif)#

**For a fresh switch we have to take access the switch using console.

Press RETURN to get started!

Switch>en

Switch>enable

Switch#conf

Switch#configure t

Switch#configure terminal

Enter configuration commands, one per line. End with CNTL/Z.

Switch(config)#

1. Hostname Setup:

Switch(config)#hostname Switch1

2. Console Password Setup:

Switch1(config)#line console 0

Switch1(config-line)#password cisco

Switch1(config-line)#login

Switch1(config-line)#exit

Switch1(config)#

Switch1#end

Translating "end"...domain server (255.255.255.255)

Switch1(config)#no ip domain-lookup

3. Enable Password Setup:

Switch1(config)#enable password 12345

4. Enable Secret Password Setup:

Switch1(config)#enable secret cisco123

**This password is recommended than ‘enable password’ because it is encrypted by default.

**To Encrypt system passwords we have to execute this command:

Switch1(config)#service password-encryption

**Actually telnet/vty is for remote access, so we must need to configure IP Address and

default-gateway. (Public/Real IP). But in layer 2 switch IP address cannot be configured in its interfaces that's why we have to configure IP address in its default vlan "Vlan 1" or by creating another vlan as per our requirement. Here we configured the IP address to the default vlan

Switch1(config)#interface vlan 1

Switch1(config-if)#ip address 192.168.10.10 255.255.255.0

Switch1(config-if)#no shutdown

Switch1(config-if)#exit

Switch1(config)#ip default-gateway 192.168.10.1**By default the telnet client of windows is disabled. So we have to enable the telnet client service.

3.3 Design Requirement

For my project design, I can use Cisco Packet Tracer, Draw.Io and GNS3 Simulator. I build a prototype using their simulator. I want to download the personal websites of their simulators. Cisco Packet Tracer was powered by a Cisco where we can use and play all Cisco devices.

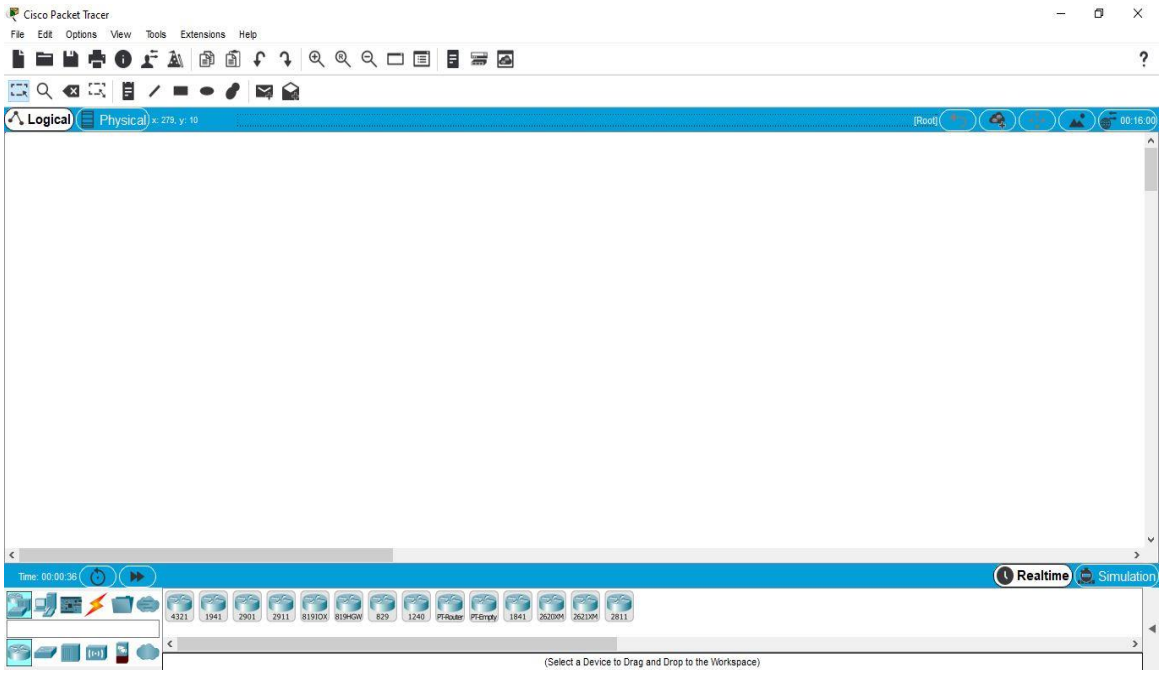


Figure 3.2: Cisco Packet Tracer Simulator

This figure 3.2, is the direction of Cisco Packet Tracer where I'm going to build my network prototype.

CHAPTER 4

DESIGN SPECIFICATION

4.1 Front-end Design

I use router, switch, server, pc, laptop & printer for designing the campus network. The appliances are shown below:

Figure 4.1: Instrument for design

This figure 4.1, is components of my project.

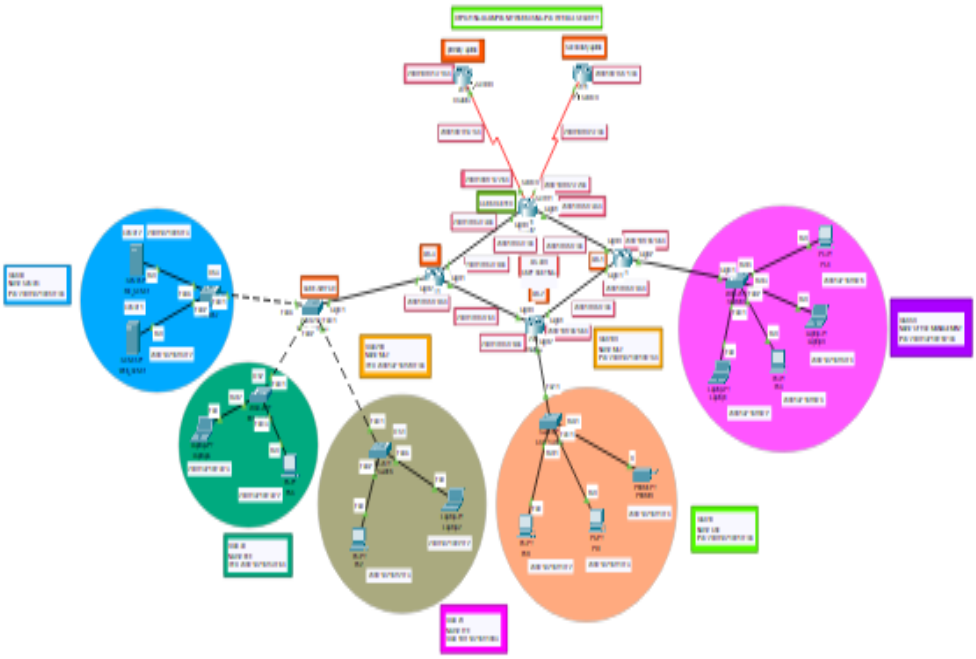


Figure 4.2: Network that Design in Packet Tracer

This figure 4.2, is complete design of my campus network that I designed at Cisco Packet Tracer Simulator using IPv4 and IPv6 addresses.

4.2 Implementation Requirements

To implement the Corporate Network, I use packet tracer simulator. I need network protocols for designing the campus network such as, router, switch, pc, laptop, printer and connecting wires. I also need routing protocol to enable the network. I will use Ospf routing, BGP routing, NAT, Vlan, Inter-Vlan. For implementing “Dual Stack” we have to give command in all protocol that we use.

CHAPTER 5

IMPLEMENTATION AND TESTING

5.1 Implementation of Front-end Design

Figure 5.1: Enable password of all router

In this figure5.1, I setup router enable password in Cisco Packet Tracer for its better security & also configure hostname to identify specific router.

UpLink Router Configuration:

```
=================R1/PRIMARY_UPLINK======================

Router>enable
Router#configure terminal
Router(config)#hostname PRIMARY-UPLINK


PRIMARY-UPLINK(config)#ipv6 unicast-routing
PRIMARY-UPLINK(config)#interface serial0/0/0
PRIMARY-UPLINK(config-if)#description "To_Core_Router"
PRIMARY-UPLINK(config-if)#ipv6 address 2000:100:0:13::1/64
PRIMARY-UPLINK(config-if)#exit
PRIMARY-UPLINK(config)#do wr
Building configuration...
[OK]
PRIMARY-UPLINK(config)#


<<<<<<<<<<<<<<<<<<<<<<BGP For IPv6>>>>>>>>>>>>>>>>>>

PRIMARY-UPLINK(config)#router bgp 100
PRIMARY-UPLINK(config-router)#bgp router-id 1.1.1.1
PRIMARY-UPLINK(config-router)#neighbor 2000:100:0:13::3 remote-as 300

PRIMARY-UPLINK(config-router)#address-family ipv6 unicast
PRIMARY-UPLINK(config-router-af)#neighbor 2000:100:0:13::3 activate
PRIMARY-UPLINK(config-router-af)#neighbor 2000:100:0:13::3 next-hop-self
PRIMARY-UPLINK(config-router-af)#neighbor 2000:100:0:13::3 default-originate
PRIMARY-UPLINK(config-router-af)#exit-address-family
PRIMARY-UPLINK(config-router)#
PRIMARY-UPLINK(config-router)#exit
PRIMARY-UPLINK(config)#do wr
Building configuration...
[OK]
PRIMARY-UPLINK(config)#exit
```

Figure 5.2:Primary_Uplink router configuration

Figure 5.2, PRIMARY_UPLINK is primary linkup of our project network diagram. In this figure, I want to show which command used in backend of PRIMARY_UPLINK router in Cisco Packet Tracer.

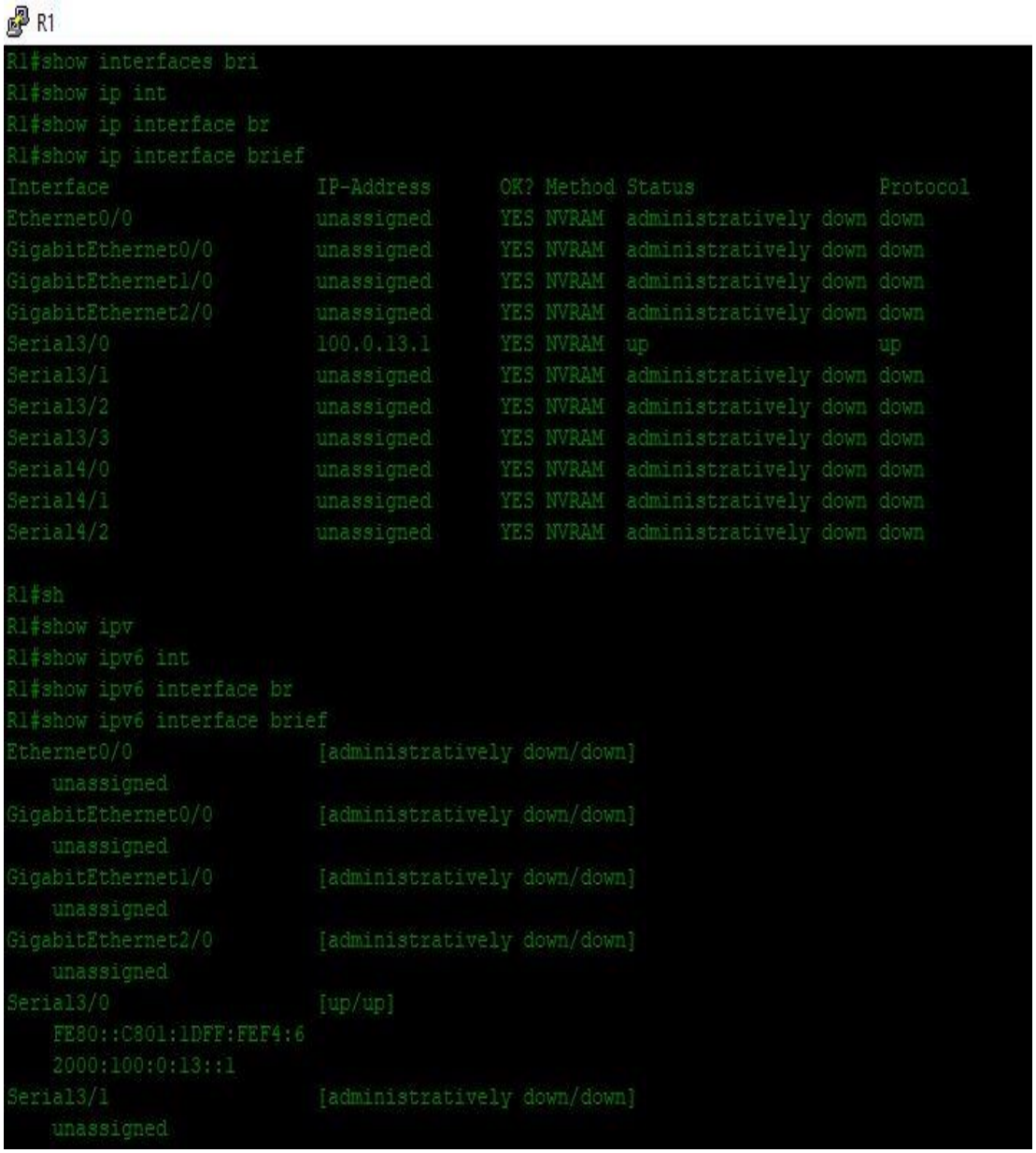


Figure 5.3: Primary_Uplink all Interface Linkup

In this figure 5.3, I show that how primary link attach with core router using “ipv6 interface brief” command for IPv6 addresses in Cisco Packet Tracer.

SECONDARY-UPLINK Router Configuration

```
==================R2/SECONDARY-UPLINK=================
Router>enable
Router#configure terminal
Router(config)#hostname SECONDARY-UPLINK
```

Figure 5.4: ISP_2 router configuration

```
SECONDARY-UPLINK(config)#ipv6 unicast-routing
SECONDARY-UPLINK(config)#interface serial0/0/0
SECONDARY-UPLINK(config-if)#description "To_Core_Router"
SECONDARY-UPLINK(config-if)#ipv6 address 2000:100:0:23::2/64
SECONDARY-UPLINK(config-if)#exit
SECONDARY-UPLINK(config)#do wr
Building configuration...
[OK]
SECONDARY-UPLINK(config)#do ping 2000:100:0:23::2

Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 100.0.23.3, timeout is 2 seconds:
!!!!!
Success rate is 100 percent (5/5), round-trip min/avg/max = 0/1/5 ms

<<<<<<<<<<<<<<<<<<<<<BGP For IPv6>>>>>>>>>>>>>>>>>>

SECONDARY-UPLINK(config)#router bgp 200
SECONDARY-UPLINK(config-router)#bgp router-id 2.2.2.2
SECONDARY-UPLINK(config-router)#neighbor 2000:100:0:23::3 remote-as 300

SECONDARY-UPLINK(config-router)#address-family ipv6 unicast
SECONDARY-UPLINK(config-router-af)#neighbor 2000:100:0:23::3 activate
SECONDARY-UPLINK(config-router-af)#neighbor 2000:100:0:23::3 next-hop-self
SECONDARY-UPLINK(config-router-af)#neighbor 2000:100:0:23::3 default-originate
SECONDARY-UPLINK(config-router-af)#exit-address-family
SECONDARY-UPLINK(config-router)#
SECONDARY-UPLINK(config-router)#exit
SECONDARY-UPLINK(config)#do wr
Building configuration...
[OK]
```

Figure 5.4, SECONDARY_UPLINK is secondary linkup of my project network diagram. In this figure, I want to show which command we used in backend of SECONDARY_UPLINK router in Cisco Packet Tracer.

Figure 5.5: Secondary_Uplink all Interface Linkup

In this figure 5.5, I show that how secondary link attach with core router using “ip interface brief” command for IPv4 & “ipv6 interface brief” command for IPv6 addresses in Cisco Packet Tracer.

Core Router Configuration:

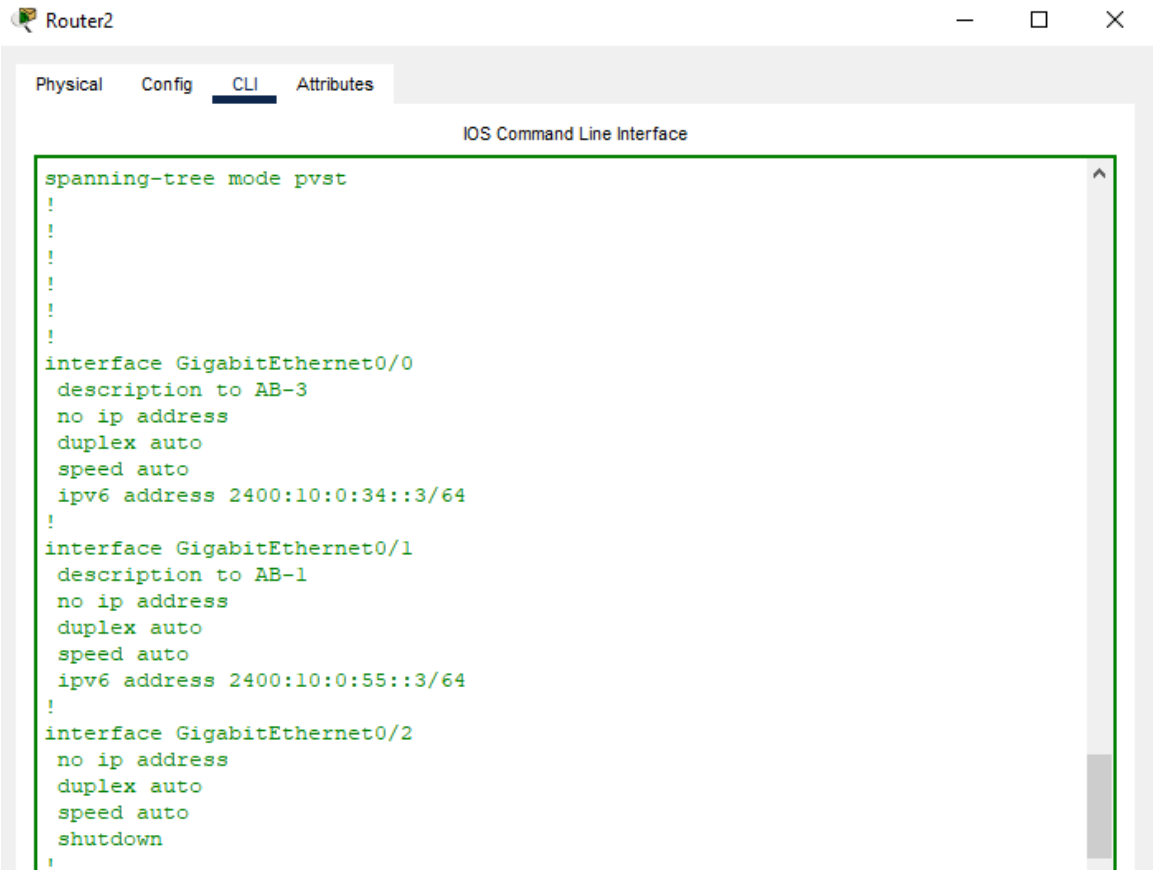


Figure 5.6: Core Router configuration

In this figure 5.6, I show the core router configuration which handle the whole protocols of my project. AB-3 & AB-1 are point to point connected this router and Primary_uplink, Secondary_uplink are connected outside with this router. Here I configure Ospf routing for reachability. I also configure NAT and BGP routing for getting access from ISP respectively IPv6.

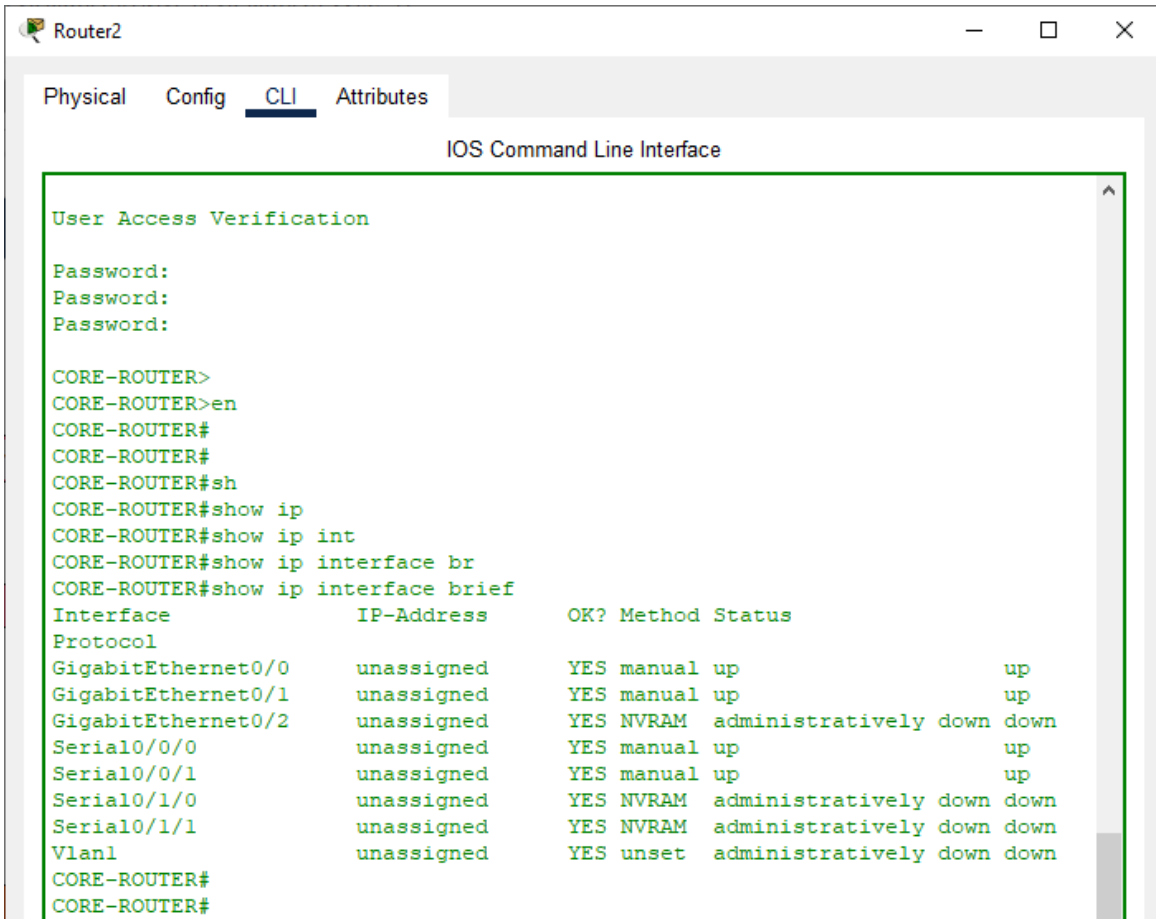


Figure 5.7: Core Router all Interface Linkup

Here figure 5.7 I show how all routers linked with core router using “show ipv6 interface brief” command for IPv6 in Cisco Packet Tracer.

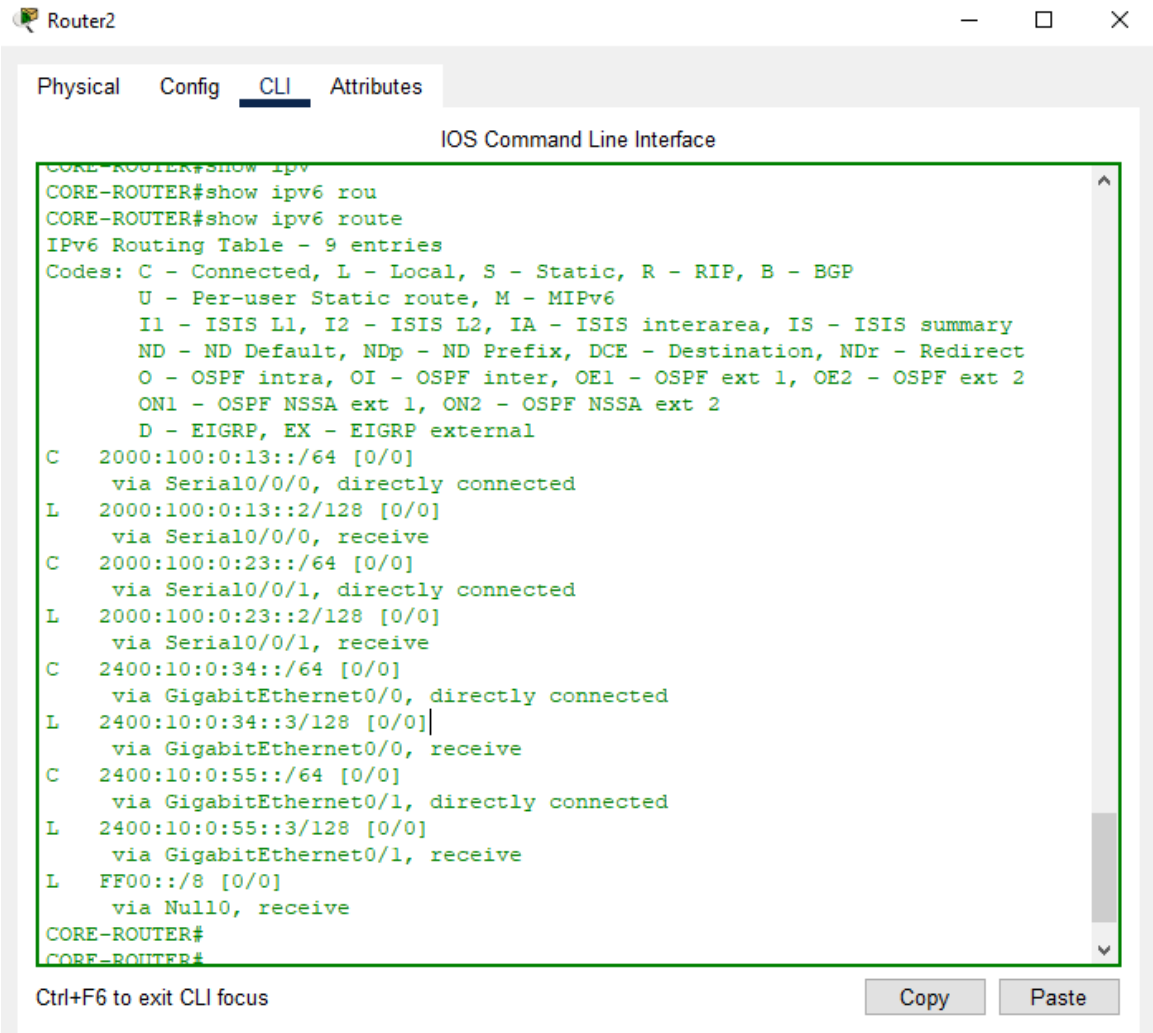


Figure 5.8: Core Router all Interface Linkup

Here figure 5.8, I show how all routers linked with core router using “show ipv6 route” command for IPv6.

AB-1 Router Configuration

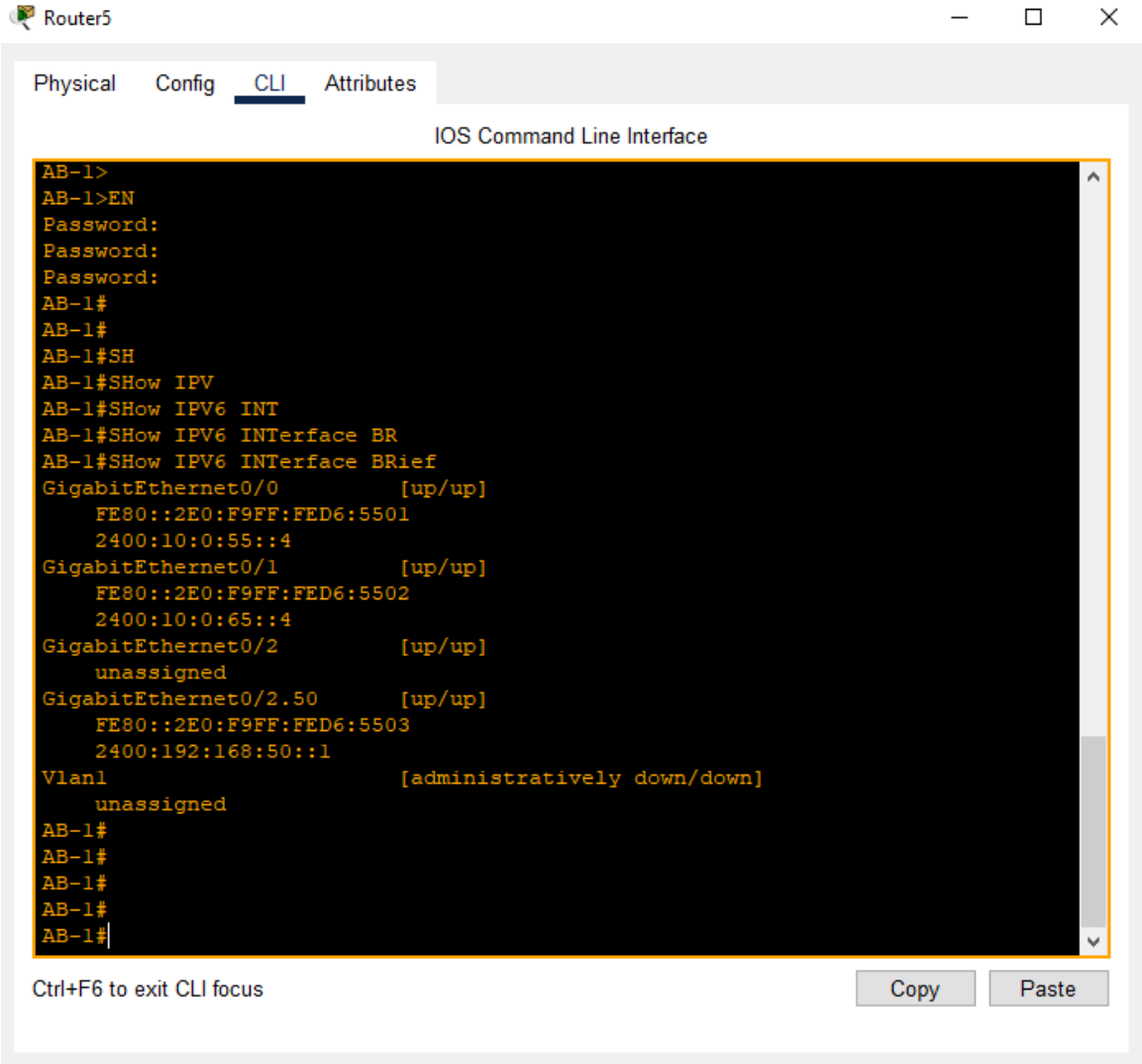


Figure 5.9: AB_1 Configuration

Figure 5.9 AB-1 are point to point connected with core router, Management_switch & AB-3 in the network diagram. Here, I configure Ospf routing.

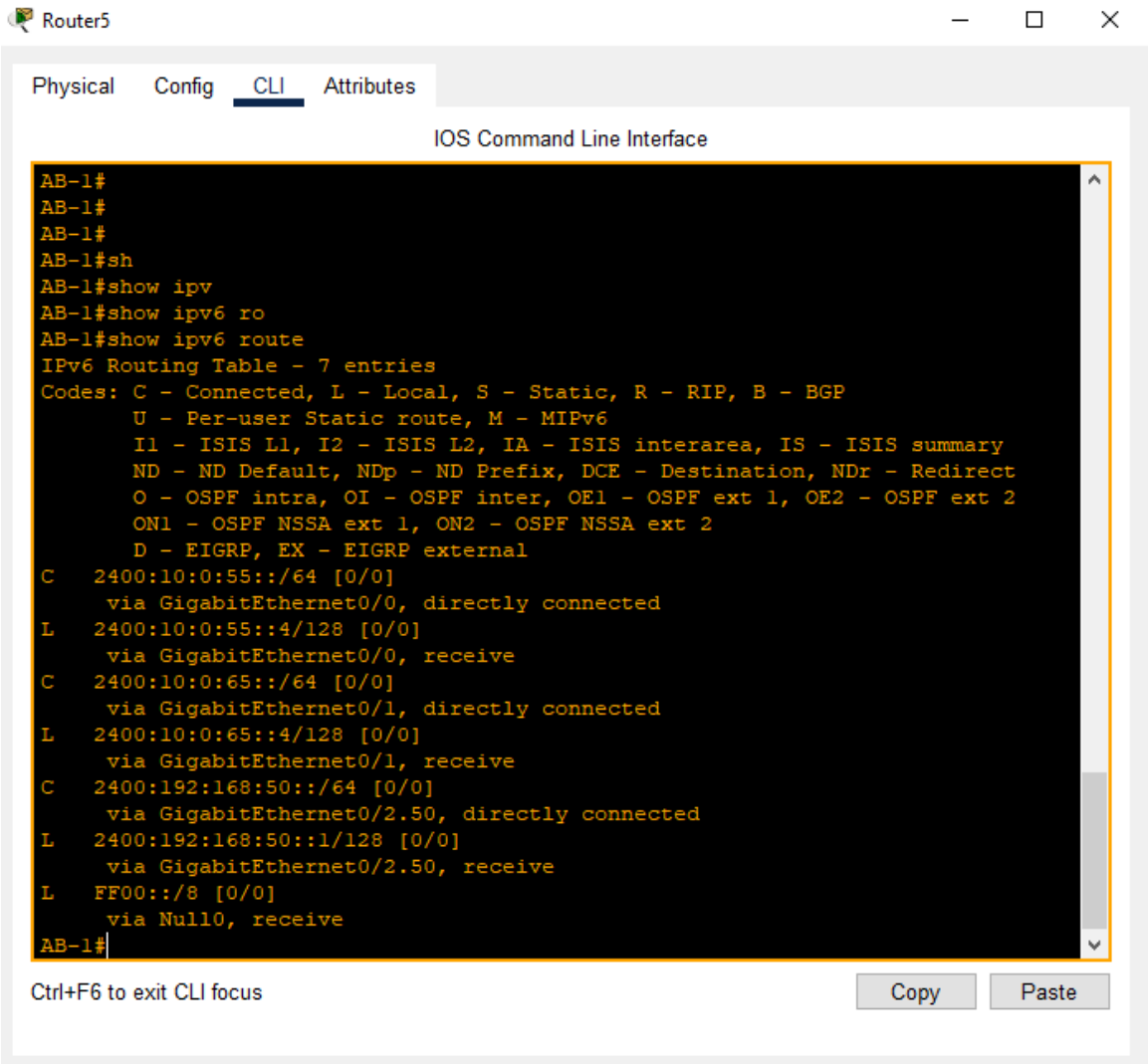


Figure 5.10: AB-1 Router all Interface Linkup

Here figure 5.10, I show how all routers linked with AB-1 router using “show ipv6 route” command for IPv6.

MANAGEMENT_SWITCH Configuration:

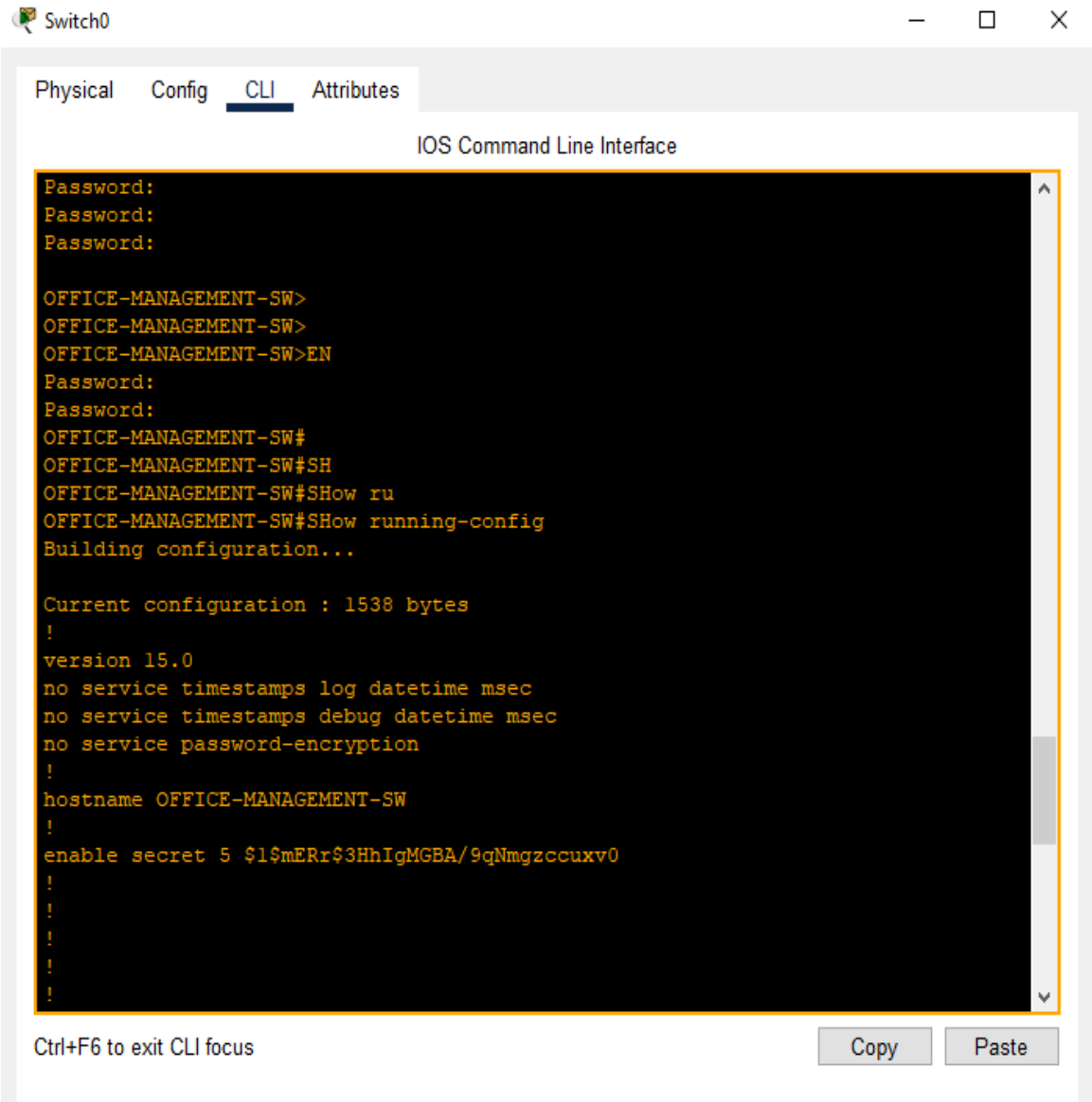


Figure 5.11: Management Switch all Interface Linkup

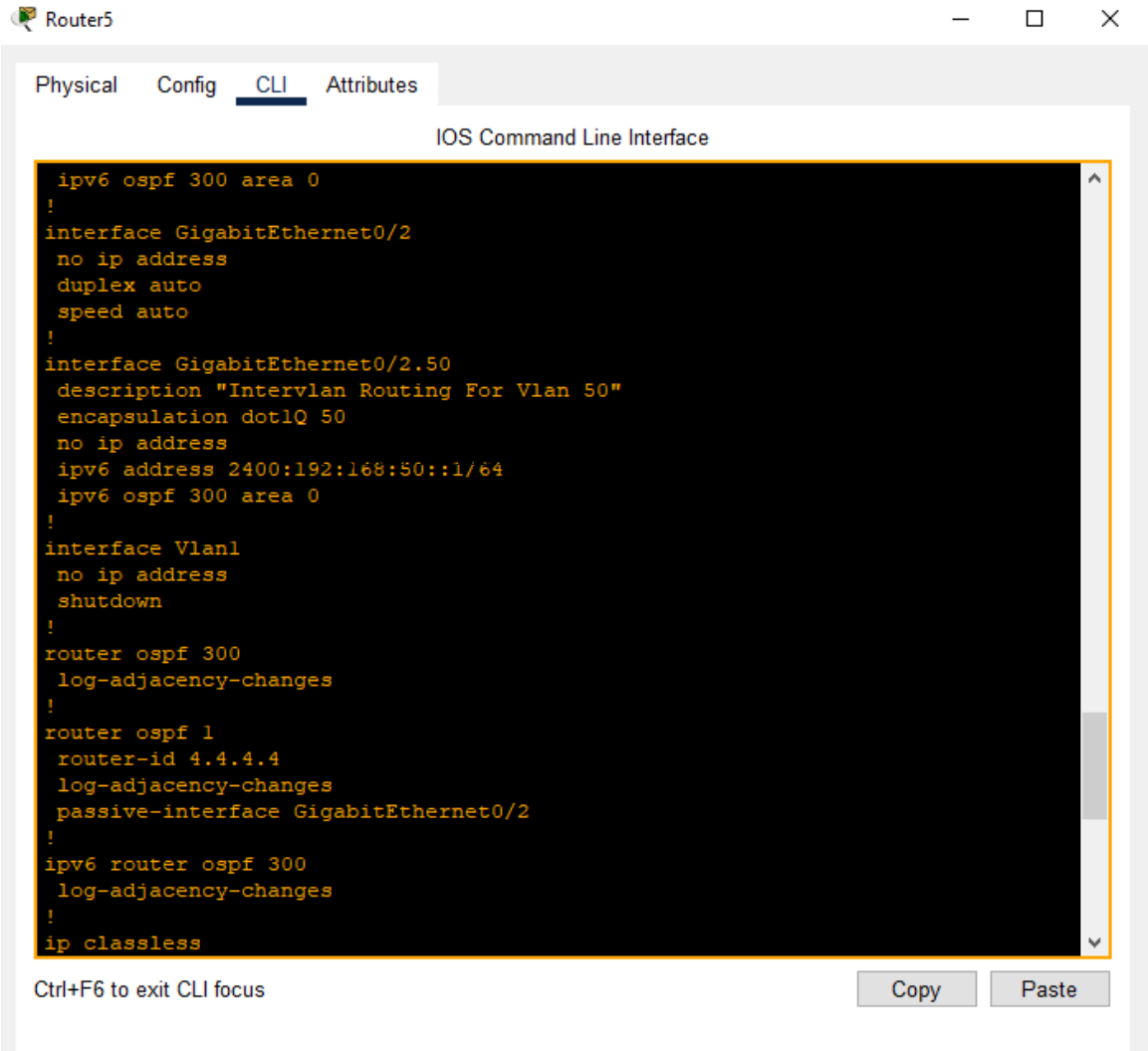


Figure 5.12: vlan configuration

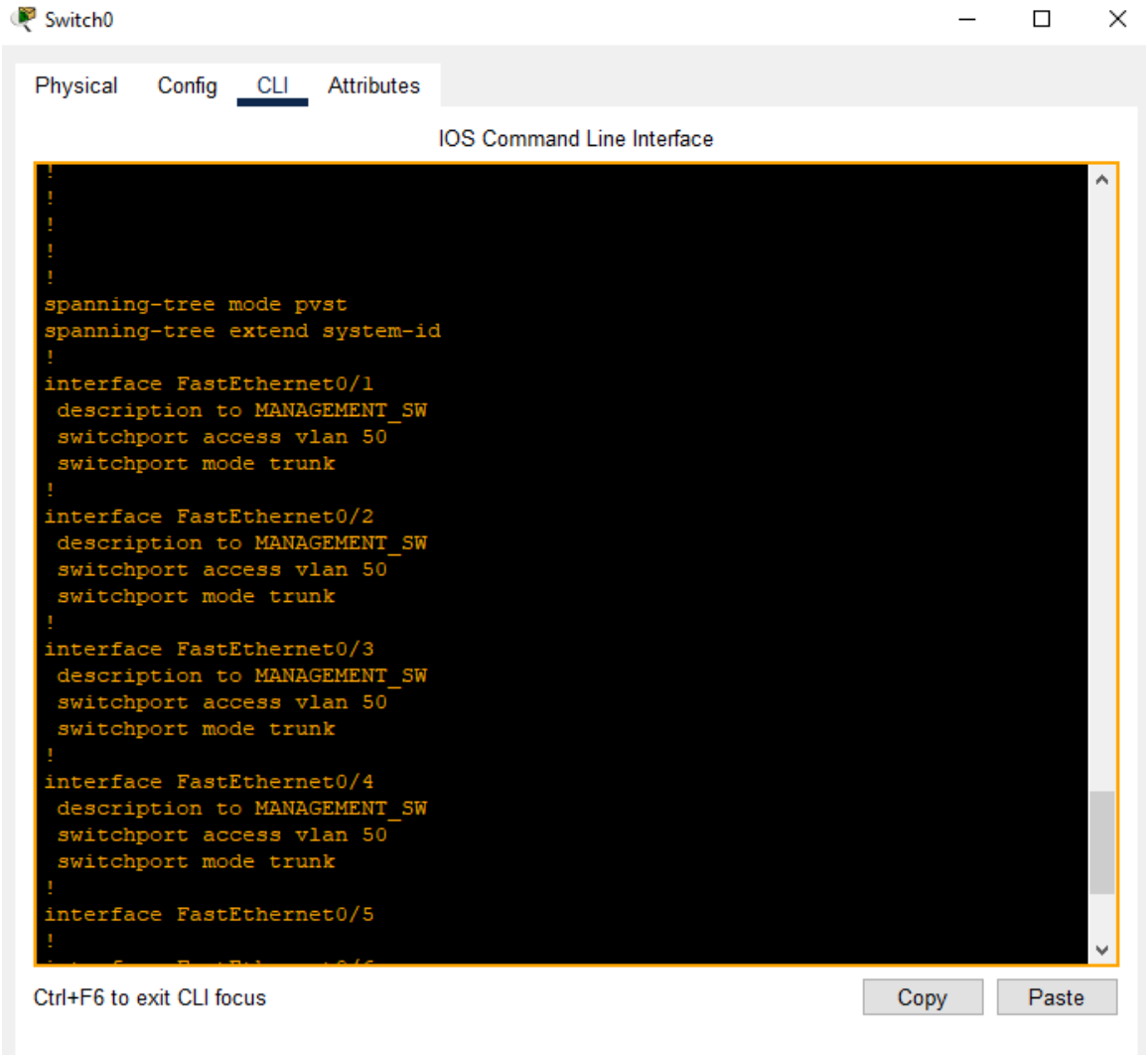


Figure 5.13: Inter-vlan configuration

Figure 5.13, AB-1 also connected with the Management_switch. In my project diagram Controller room & Service Provider room sector are connected with Management_switch. Here I configure Inter-Vlan (vlan50) for getting access smoothly.

AB-2 Router Configuration

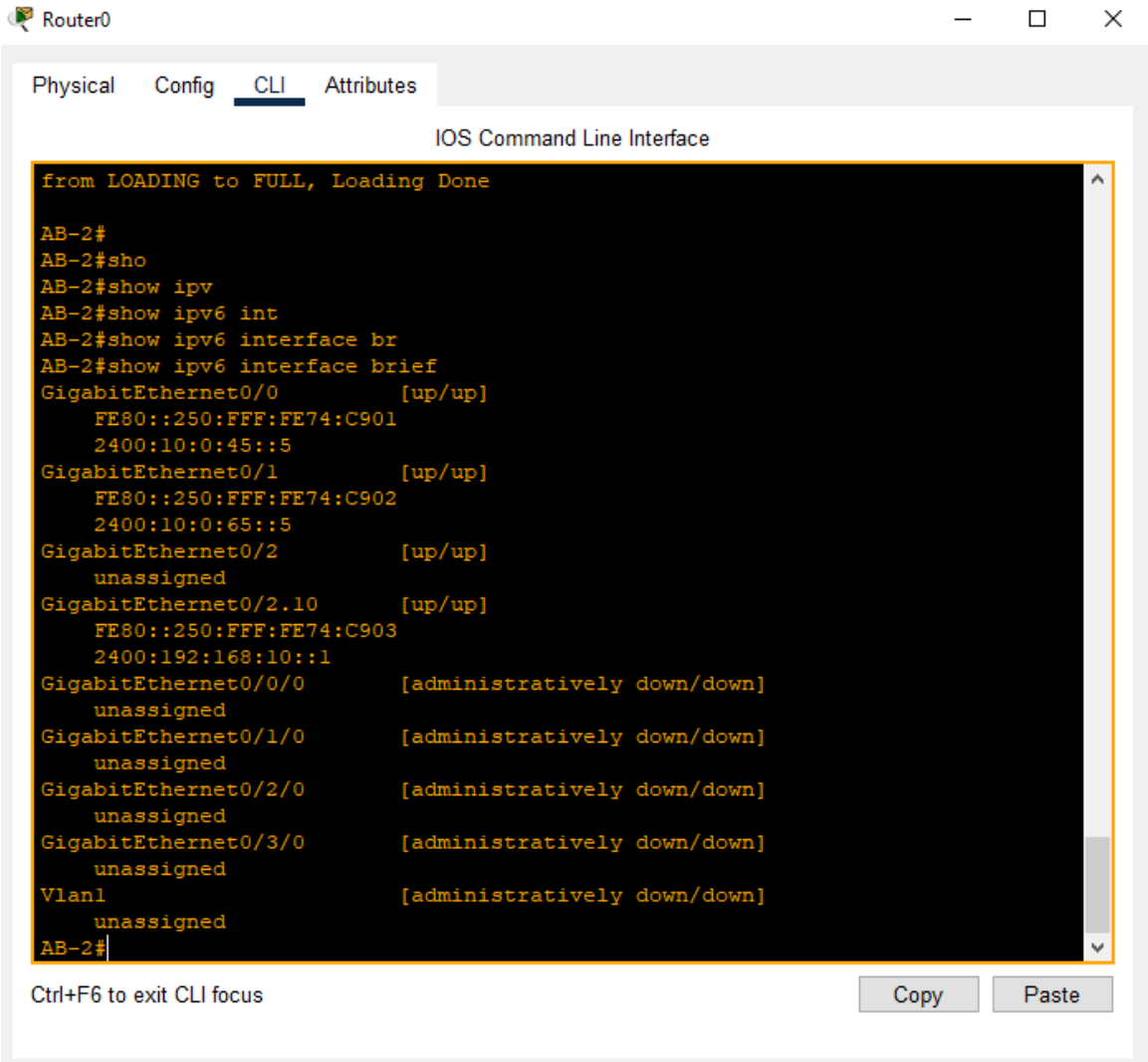
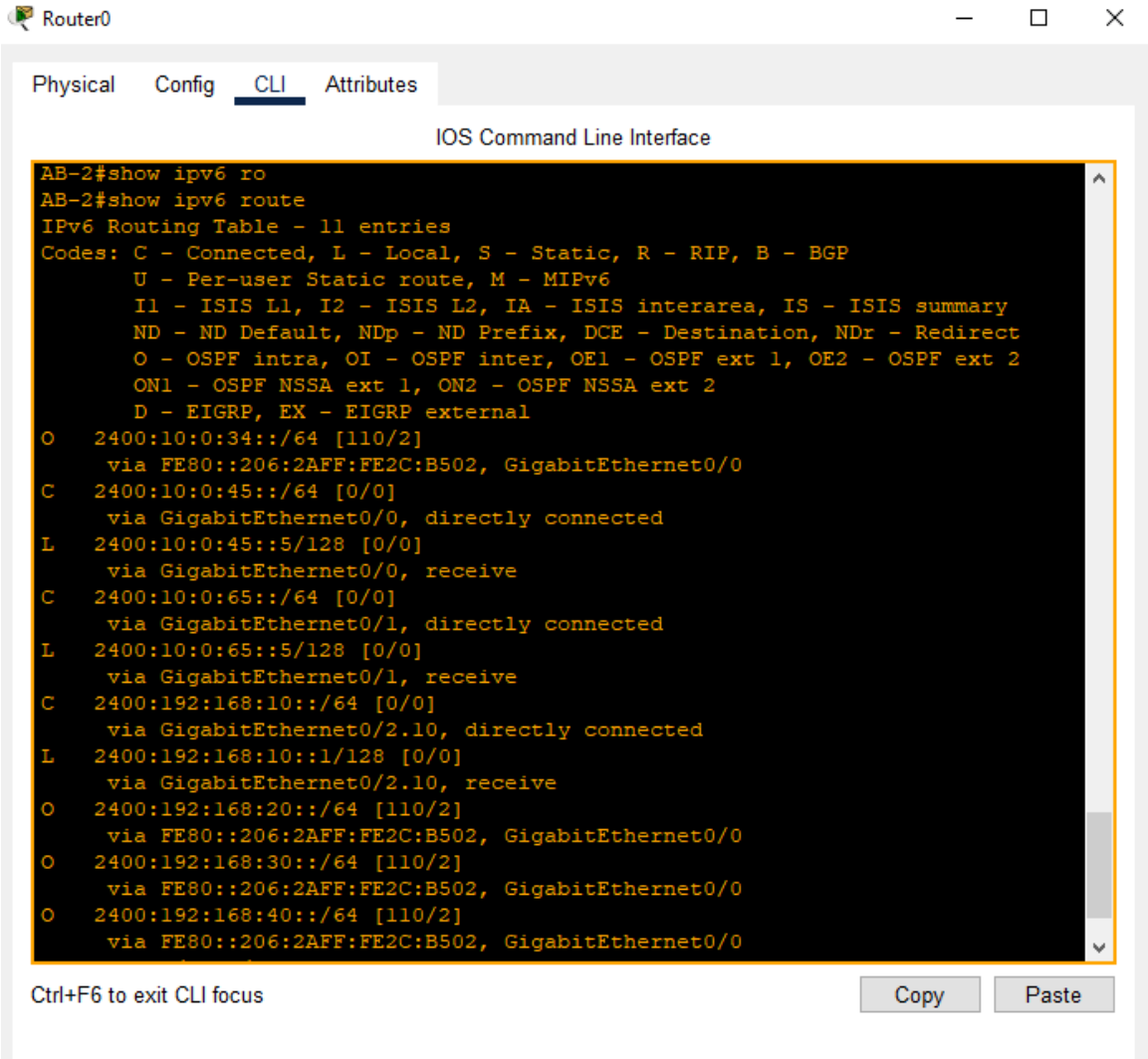
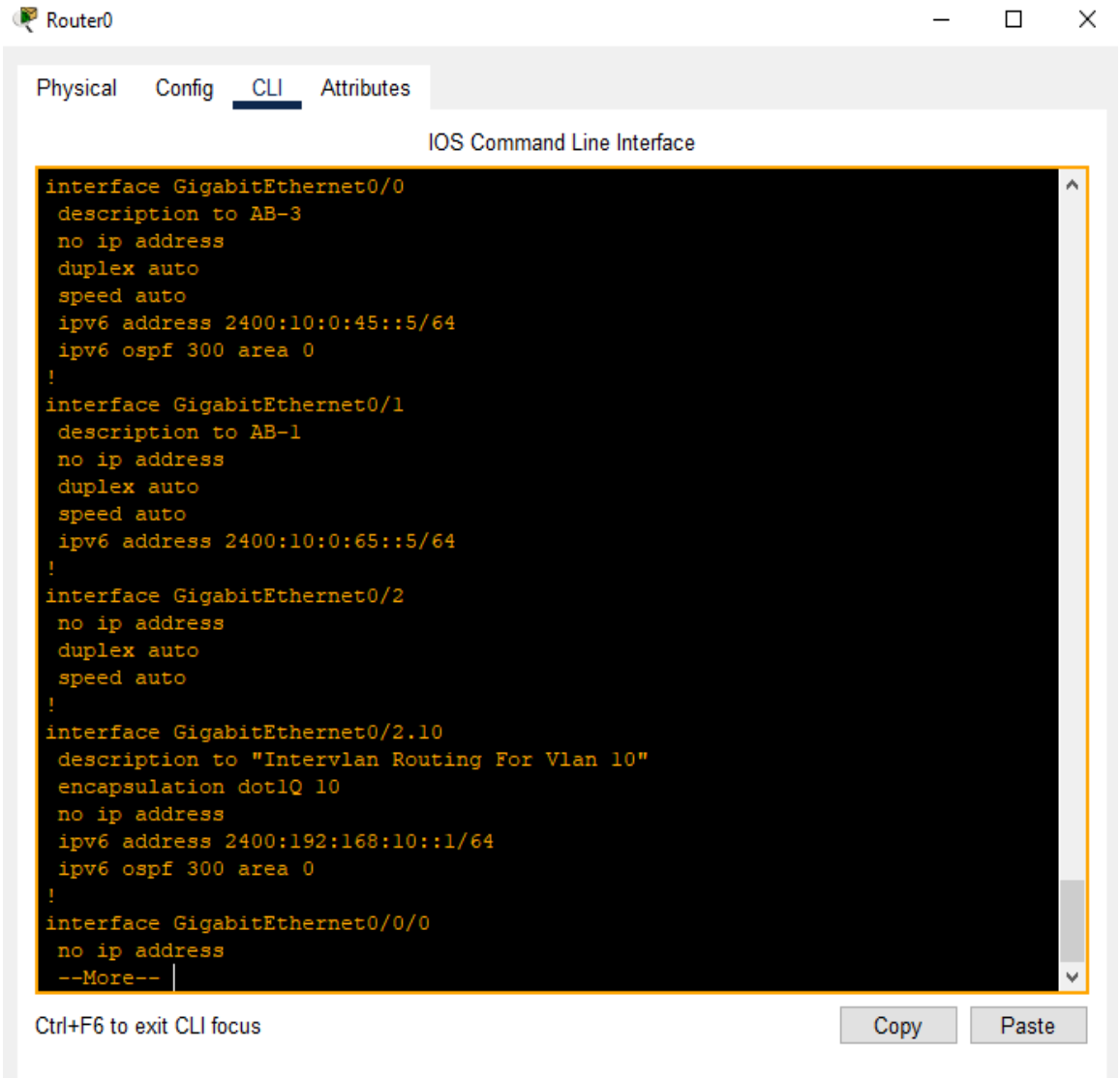


Figure 5.14: AB-2 Point to Point Link up

Here figure 5.14, I show how all routers linked with AB-1 router using “show ipv6 interface brief” command for IPv6.



Here figure 5.15, I show how all routers linked with AB-1 router using “show ipv6 route” command for IPv6.



Here figure 5.16, I show how all routers linked with AB-2 router using “show running-config” command for IPv6.

CSE_SWITCH Configuration:

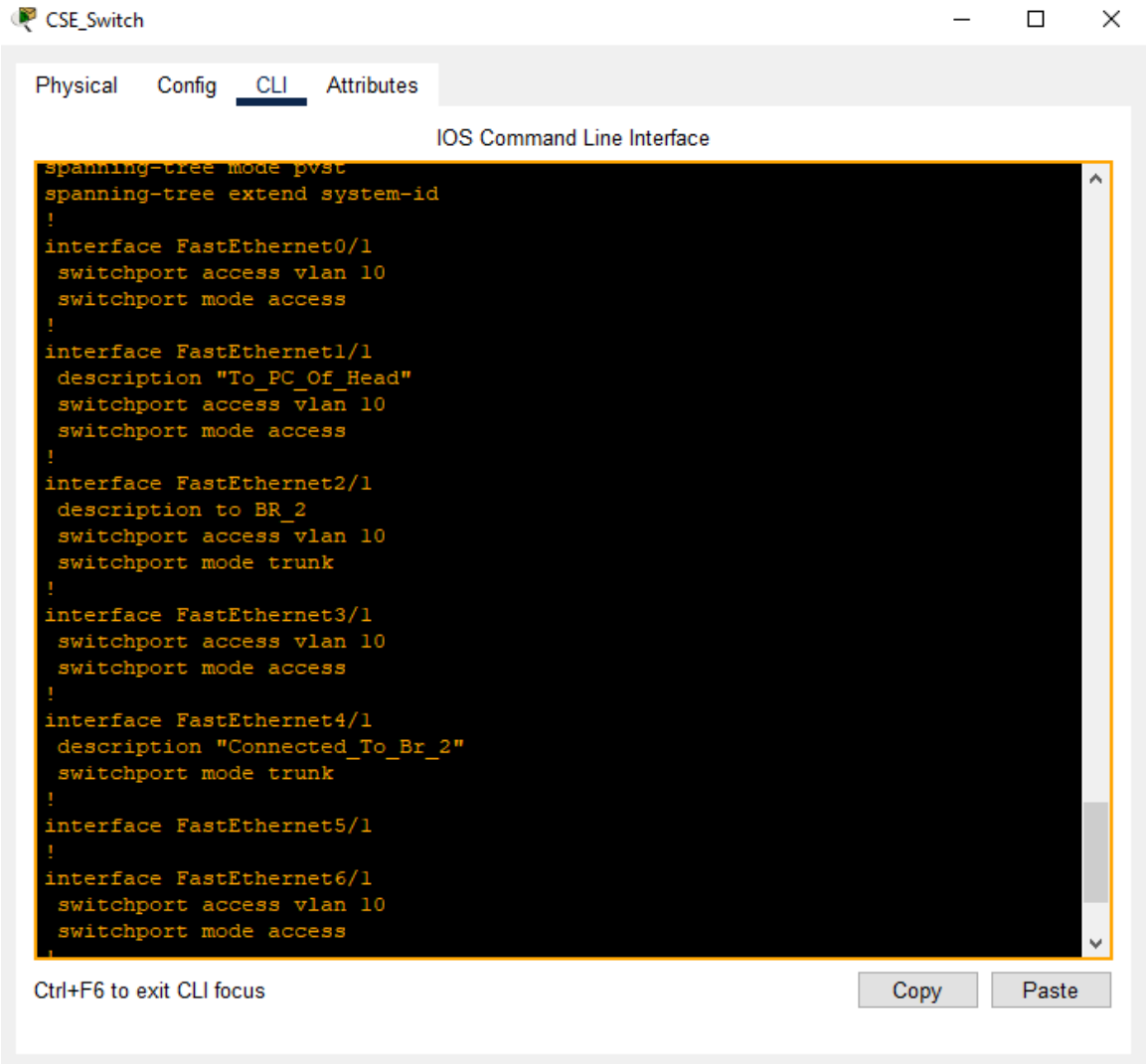
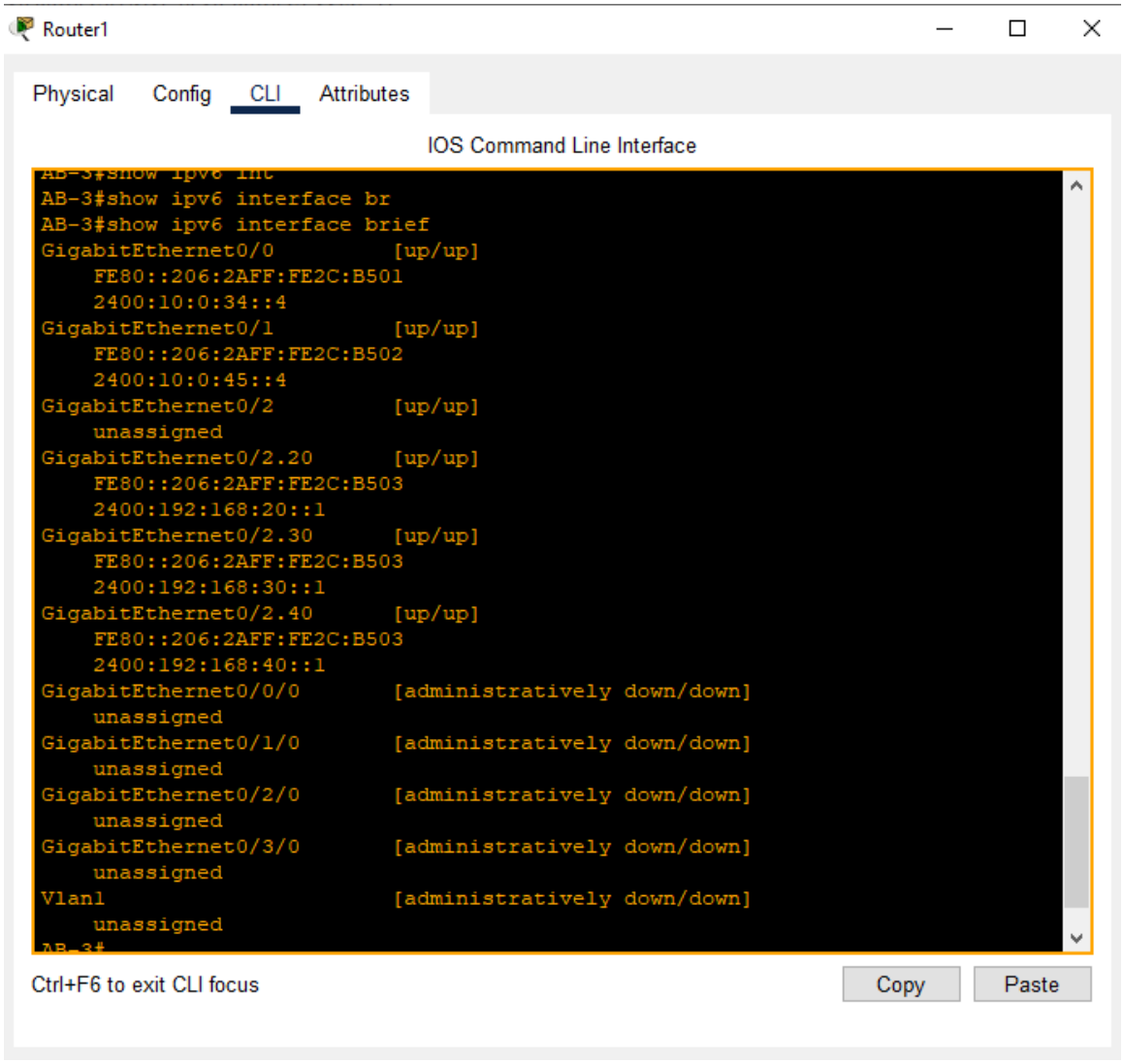
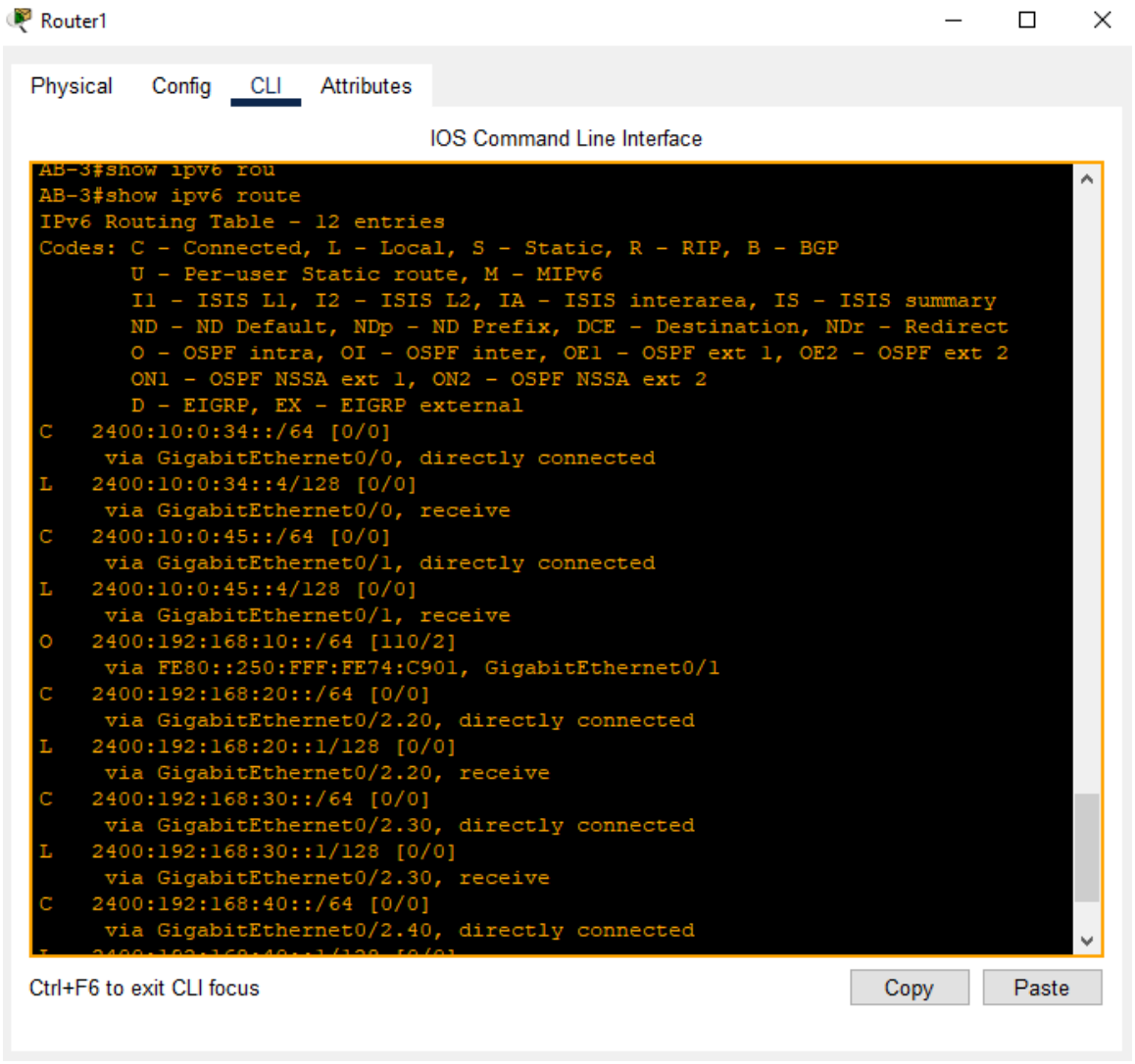


Figure 5.17, AB-2 also connected with the CSE_switch. In my project diagram Controller room & Service Provider room sector are connected with CSE_switch. Here I configure Inter-Vlan (vlan10) for getting access smoothly.

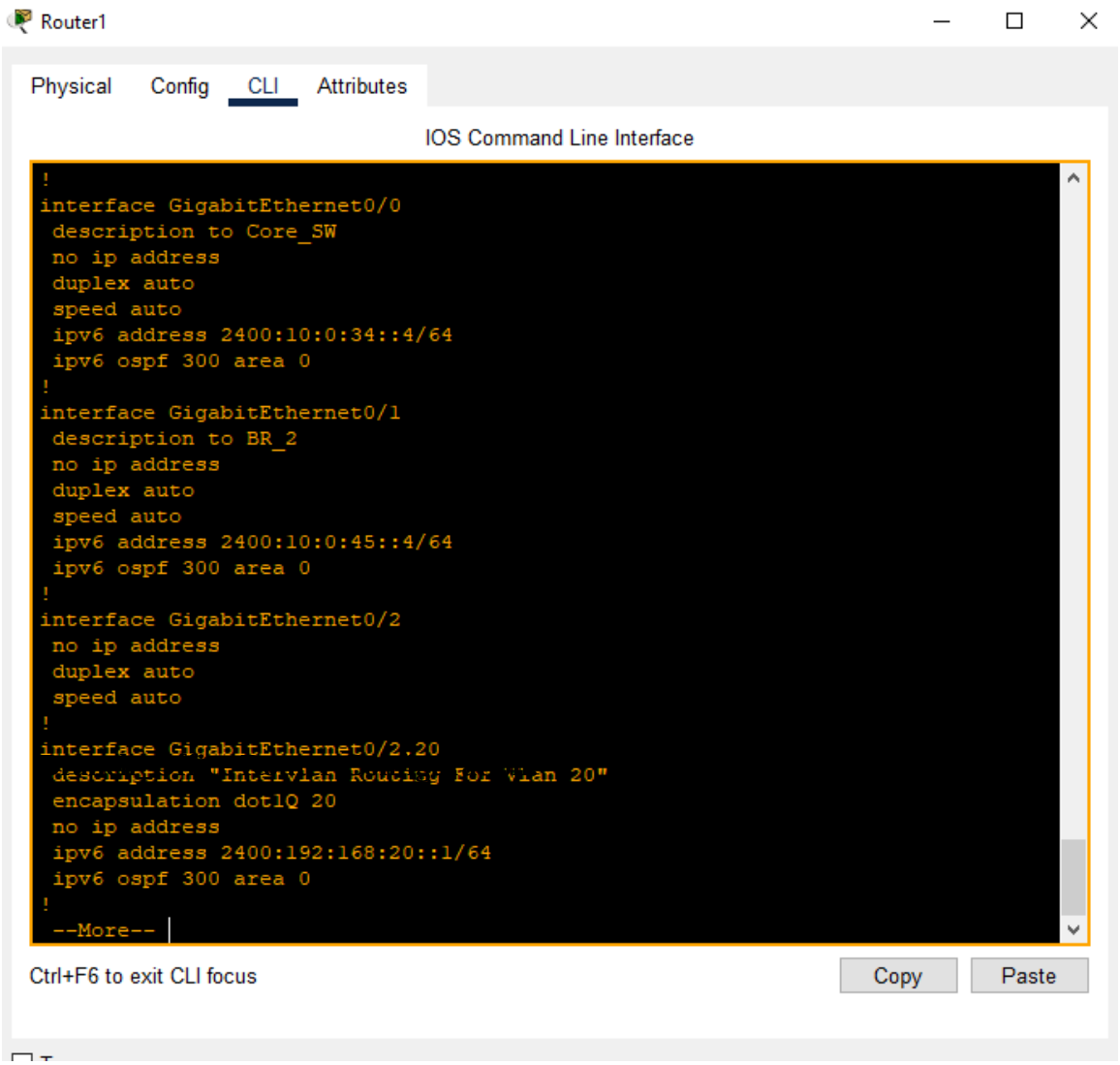
AB-3 Router Configuration:



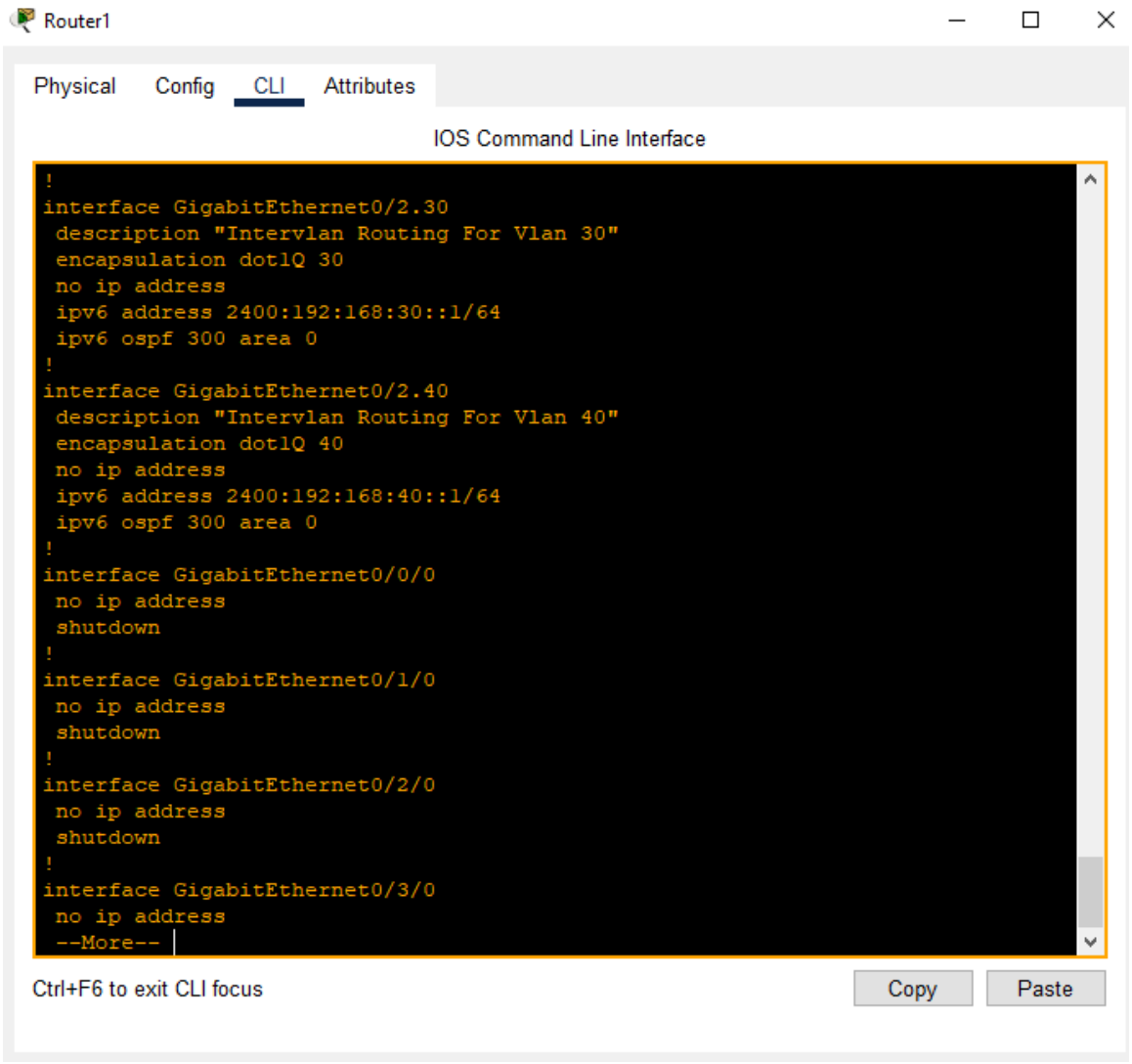
Here figure 5.17 I show how all routers linked with core router using “show ipv6 interface brief” command for IPv6 in Cisco Packet Tracer.



Here figure 5.18, I show how all routers linked with AB-3 router using “show ipv6 route” command for IPv6.



Here figure 5.19, show how all routers linked with AB-3 router Vlan



Here figure 5.20, I show how all link up with Main Office using “ip interface brief” for IPv4 & “ipv6 interface brief” command for IPv6.

Core_Switch Configuration:

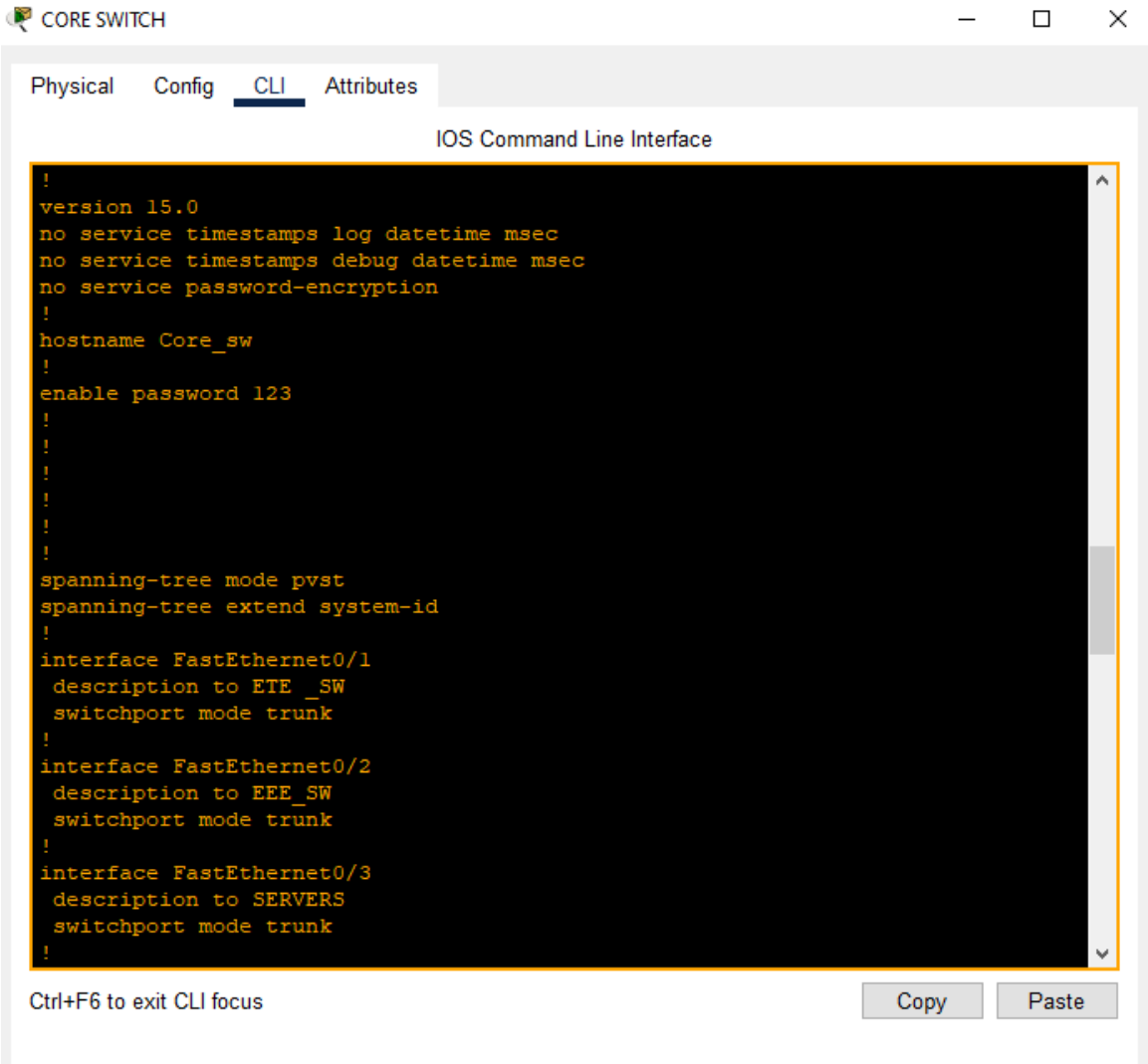


Figure 5.19: Core Switch Trunk Configuration

Figure 5.21, I configure Inter-vlan under vlan 20, 30, 40 for EEE, ETE & SERVER Department of this campus network. I use Inter-vlan as all devices can get access. I show core switch where 3 Distribution switch are directly connected and configure vlan 20 for Manager Department, vlan 30 for service department & vlan 40 for web server & file server. I use as all devices under the core switch can get access to each other. Here I use "show vlan interface" command to show all vlan that are connected with core switch.

Web Server Configuration

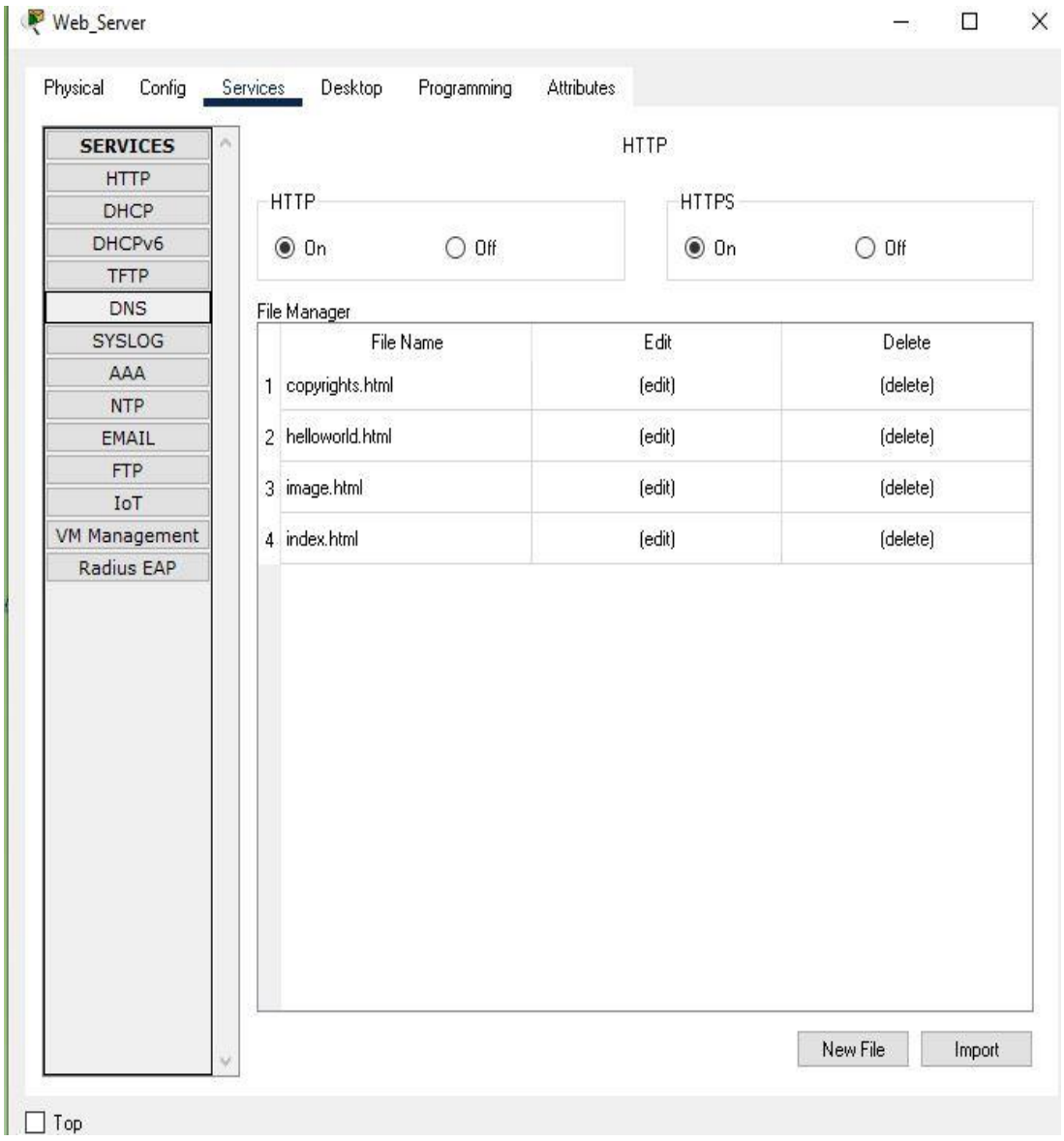


Figure 5.22: Web Server Configuration

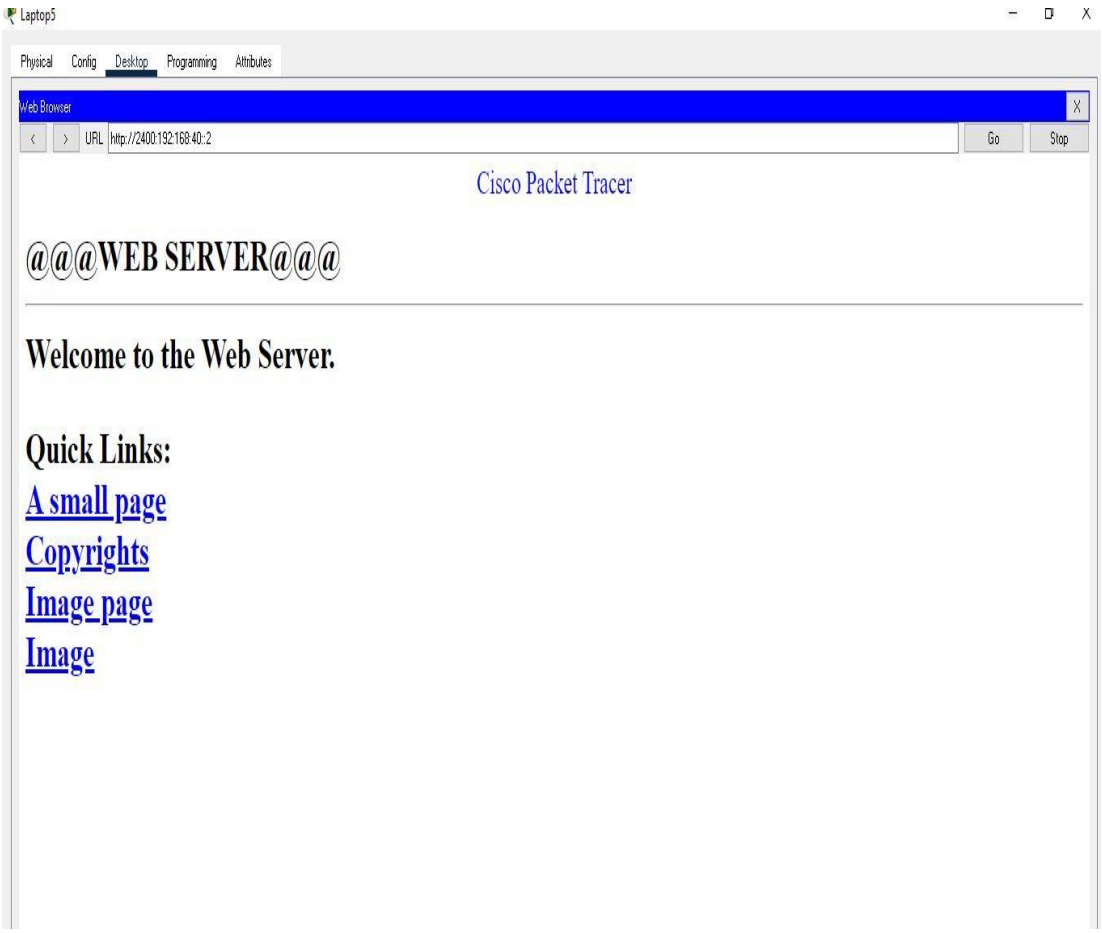
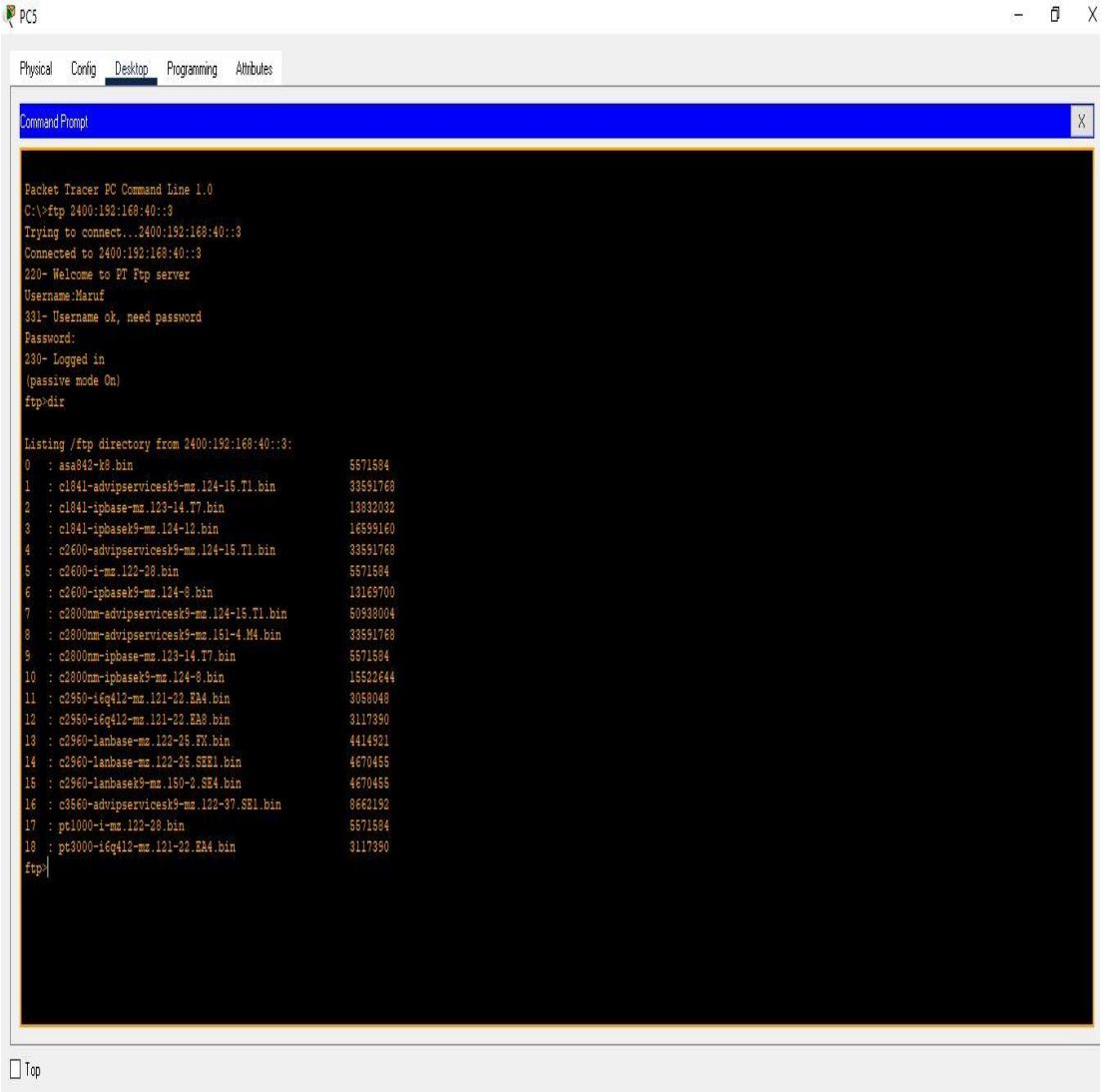


Figure 5.23: Web Server Setup Configuration

FTP Server Configuration



In figure 5.24, I configuire FTP server in our project. I create user name and password to secure our FTP server.we give access where the user can write, read, delete, rename, access or list the FTP files.

5.2 Testing Implementation

Testing Implementation also major part of every project. After Implementing whole campus network, we test all routers, switches & whole network protocols in this network. I check all access reachability whole network. I use ping test and tracert for testing.

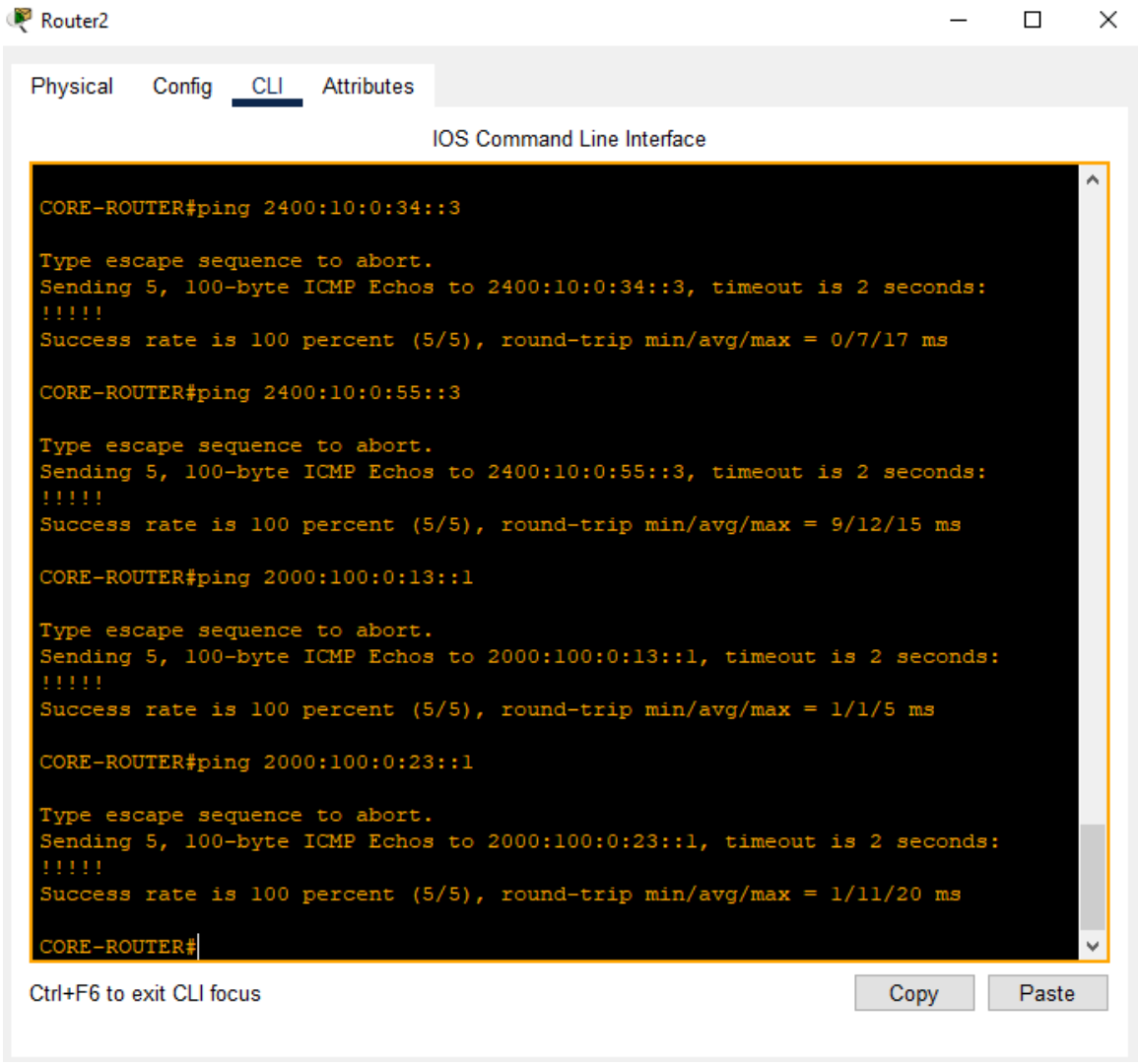


Figure 5.24: Ping test 1

In figure 5.25, I test ping of core router to check the access reachability ISP_1, Main Office & Branch Office routers.

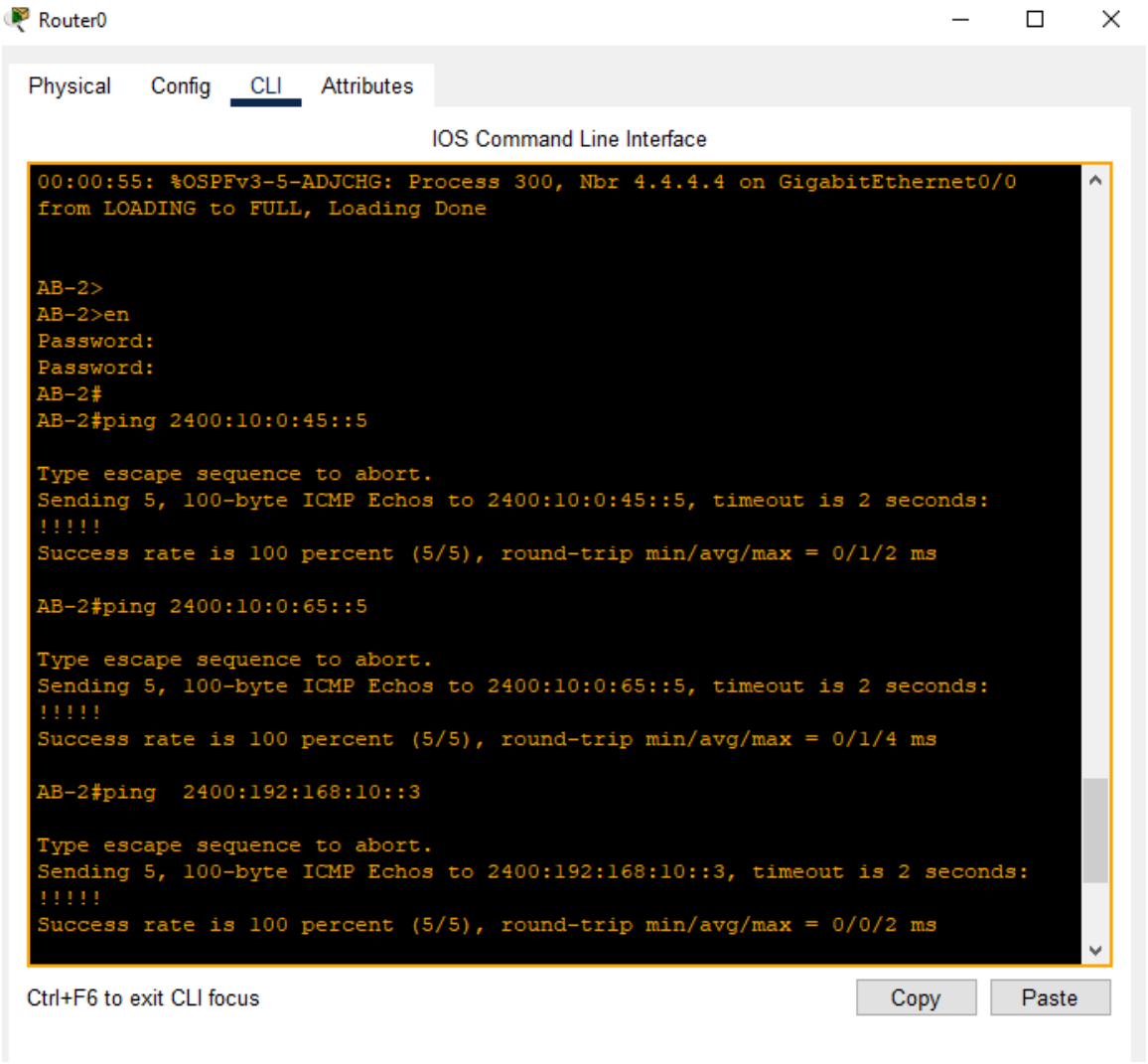


Figure 5.25: Ping test 2

In figure 5.26, I test ping of Branch to check the access reachability ISP_1, & core routers.

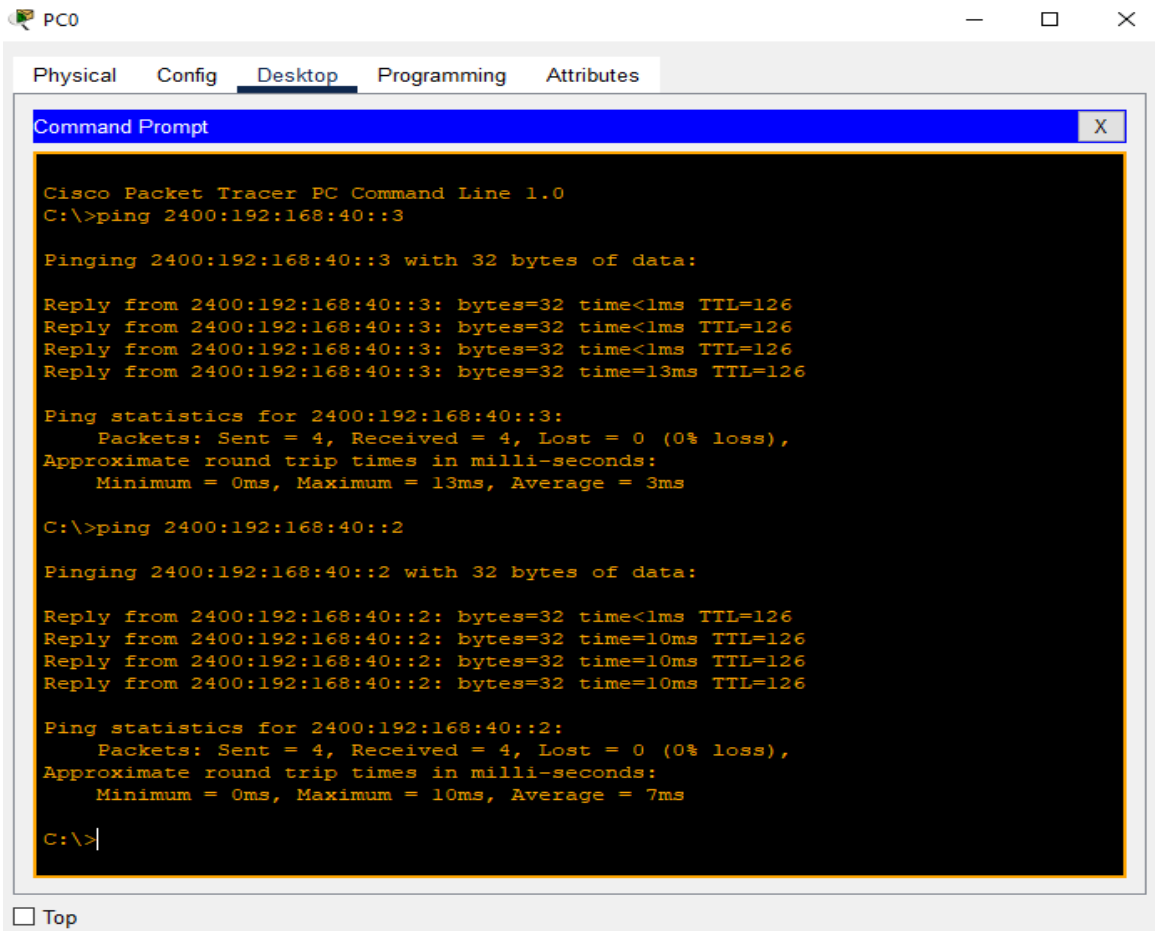


Figure 5.26: Ping test 3

This figure 5.27, shows ping test from branch to other network

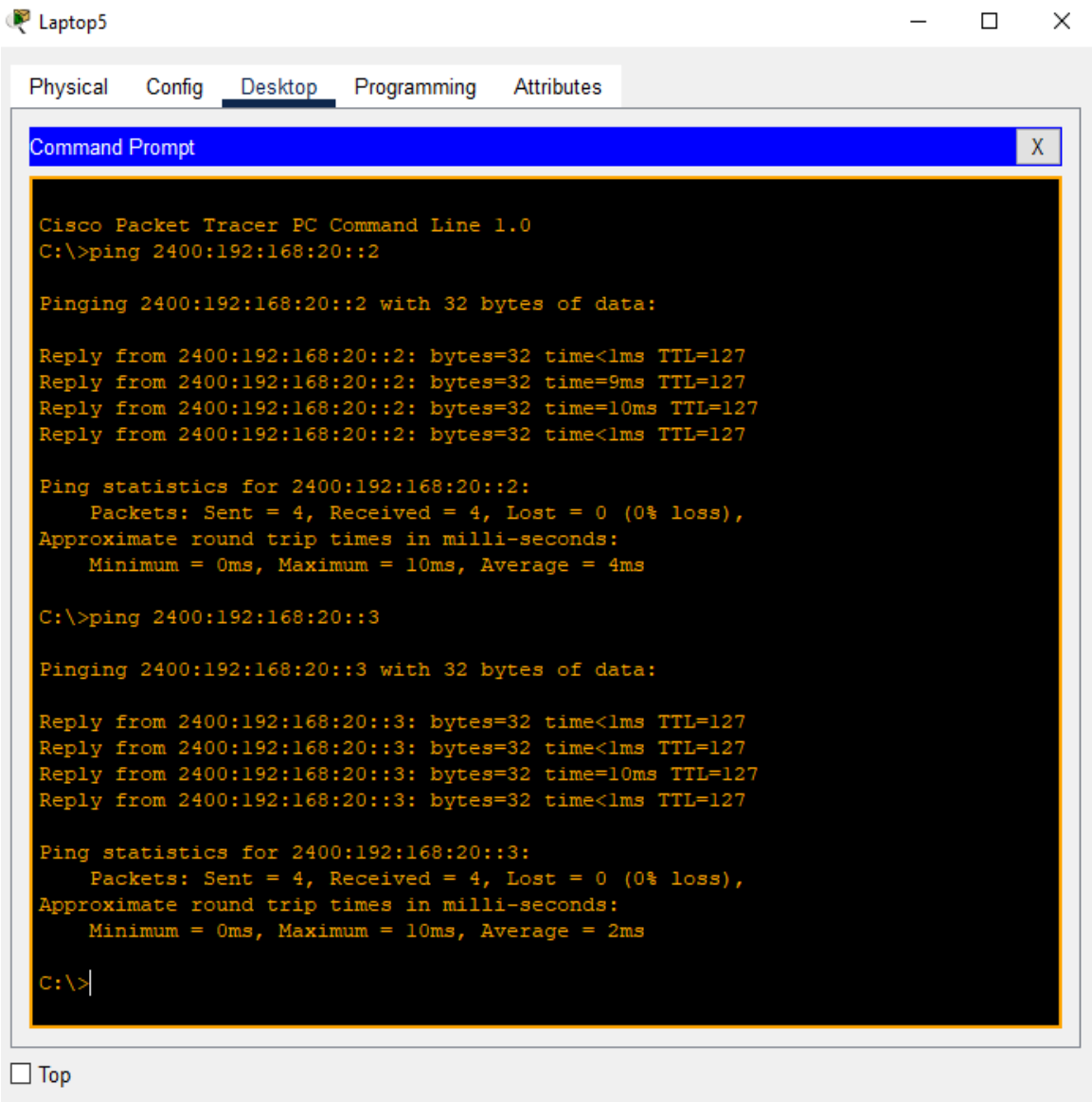


Figure 5.27: Ping test 4

This figure 5.28, shows ping test from Manager Department host to other networks.

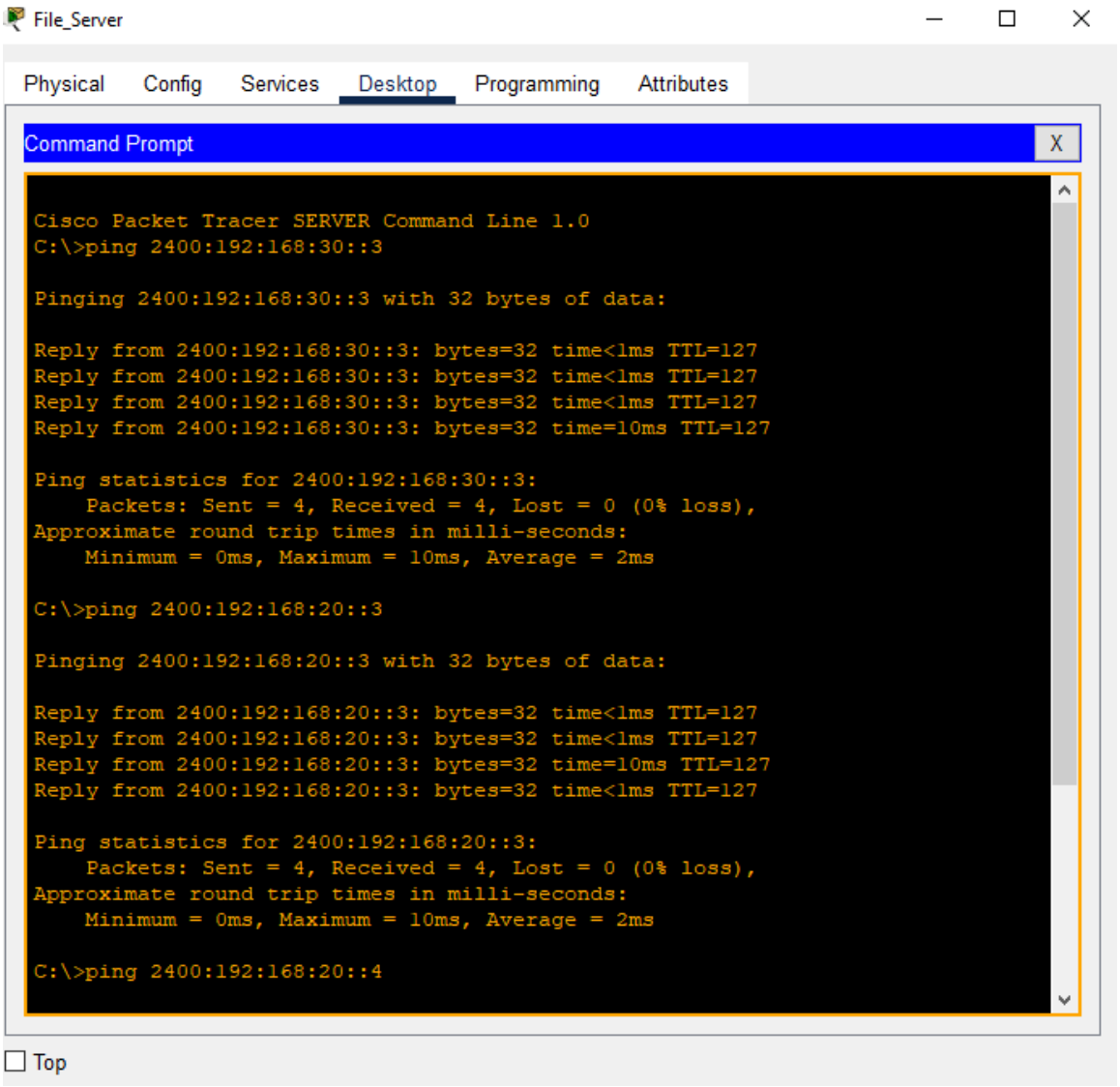


Figure 5.28: Ping test 5

This figure 5.29, shows ping test from Service Sector department host to other networks.

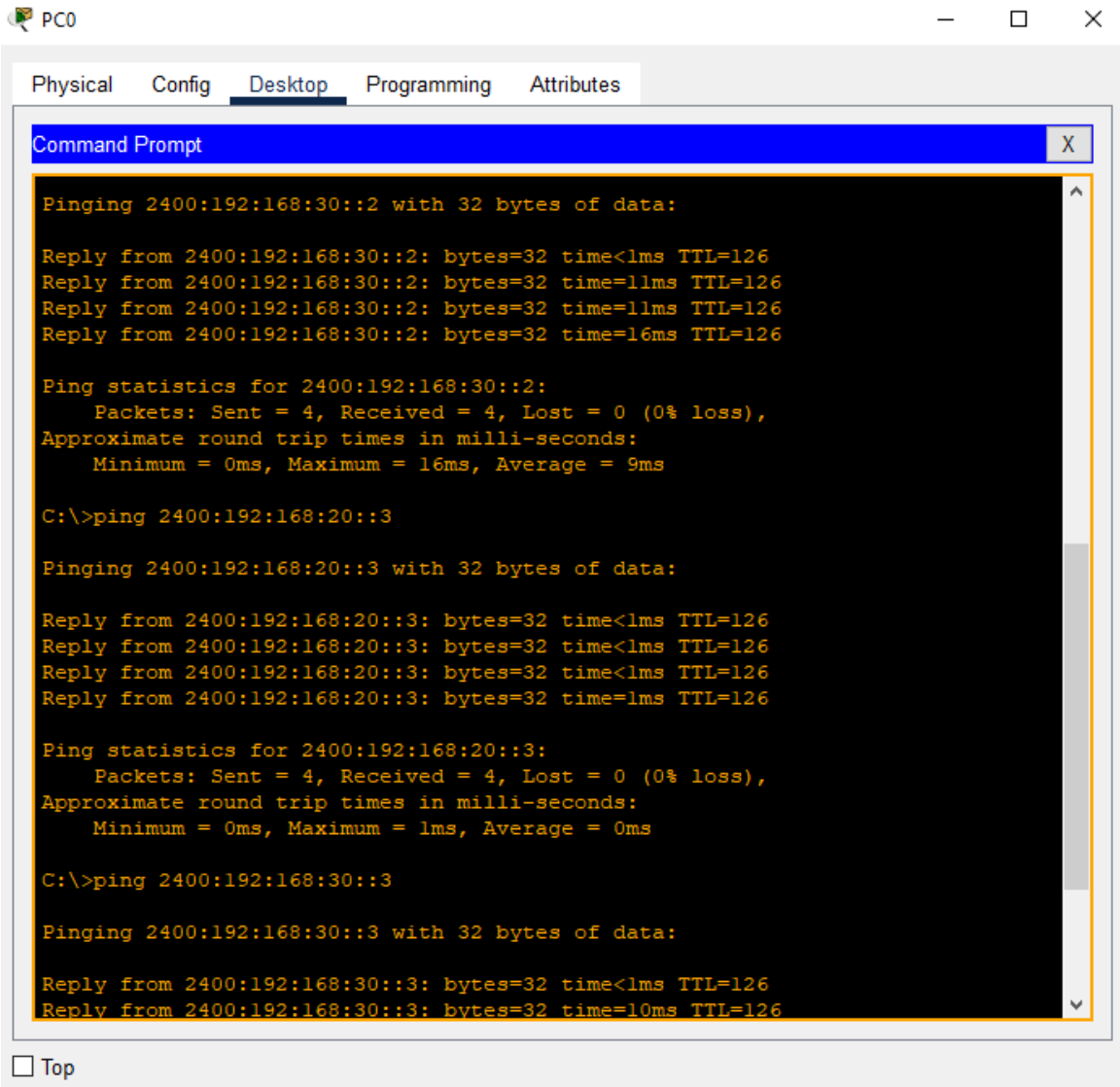


Figure 5.29: Ping test 6

This figure 5.30, shows ping test from Manager Department host to other networks.

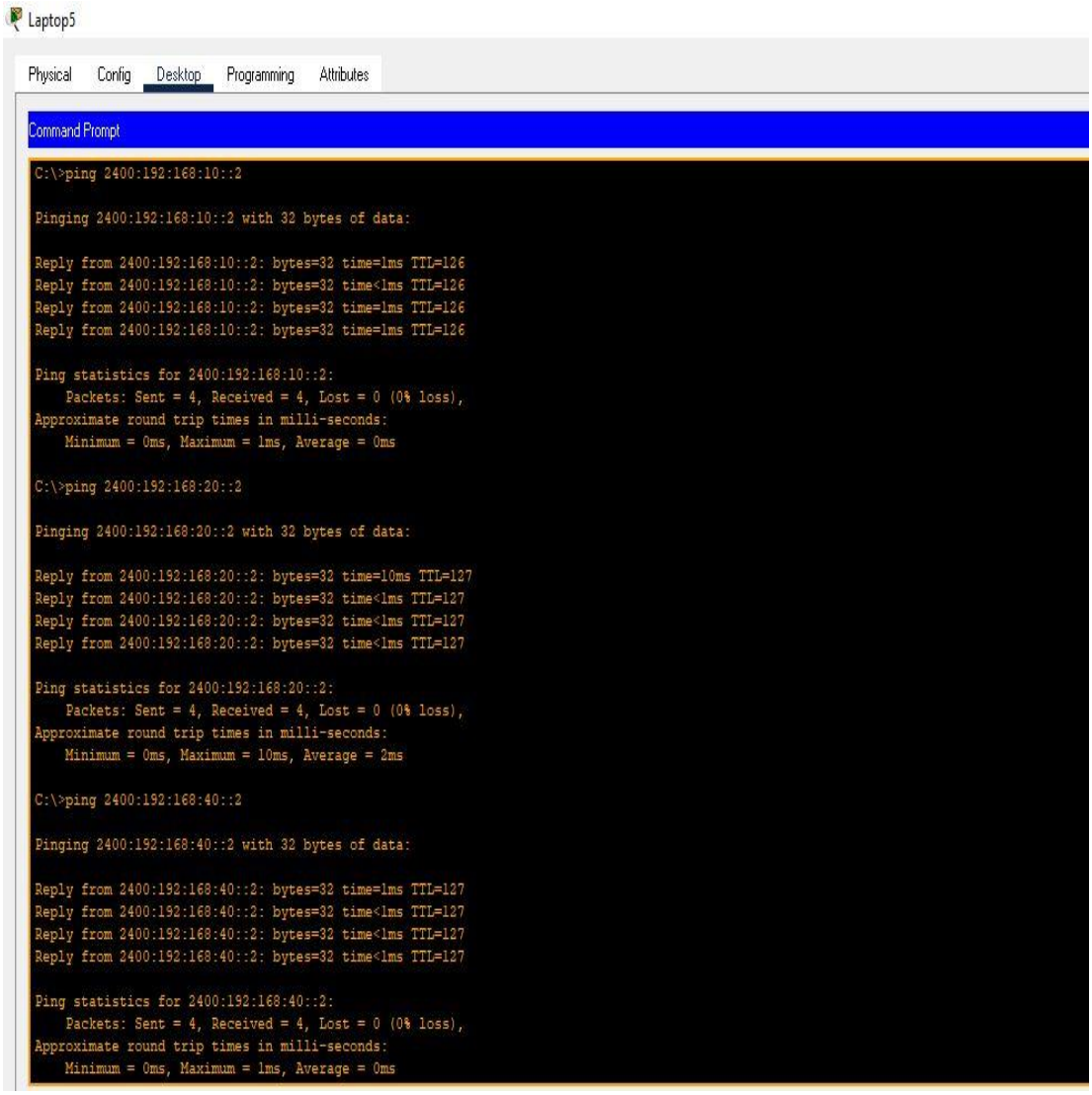


Figure 5.30: Ping test 7

This figure 5.31, shows ping test from Service Sector host to other networks.

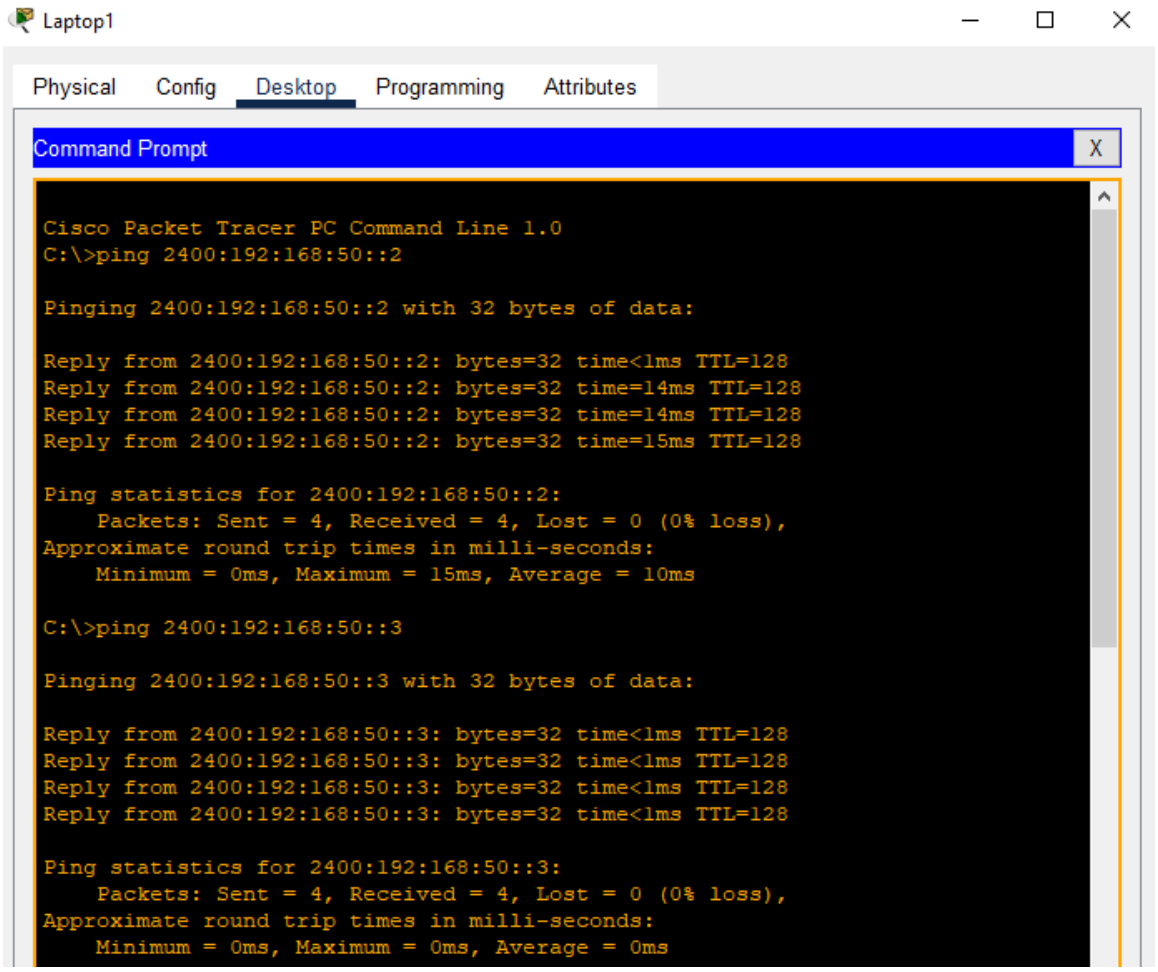


Figure 5.31: Ping test 8

This figure 5.32, shows ping test from web Server to access reachability check all department.

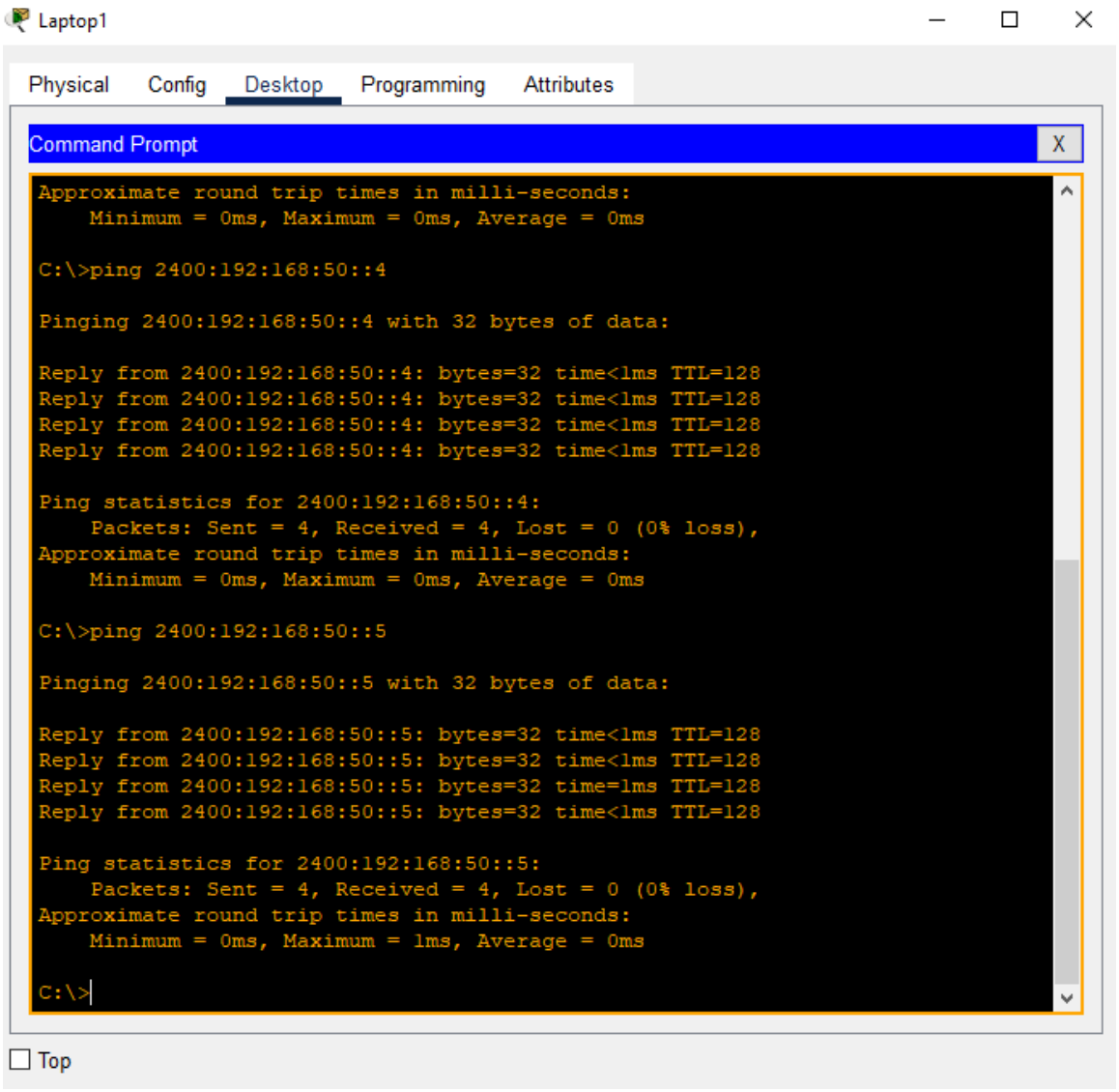


Figure 5.32: Ping test 9

This figure 5.33, shows ping test from web Server to access reachability check all department.

5.3 Access Control List (ACL)

- ACL is a set of rules which will allow or deny the specific traffic moving through the router
- It is a Layer 3 security which controls the flow of traffic from one router to another
- These lists tell the router OS what types of packets to accept or deny
- It is also called packet filtering firewall

5.3.1 ACL Benefits

- Limit network traffic and increase network performance.
- Provide traffic flow control.
- Provide a basic level of security for network access.
- Traffic decision (forwarded or blocked) at the router interfaces.
- To permit or deny screen hosts to access a network segment.

5.3.2 Types of ACL

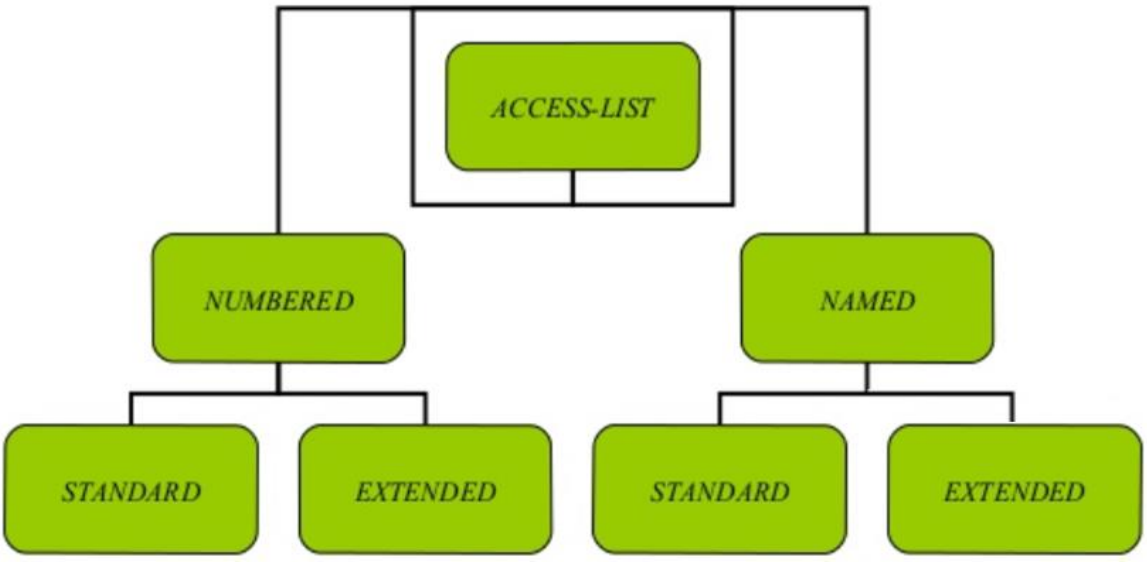


Figure 5.3.2: Types of ACL

5.3.3 Standard ACL

- The ACL number range is 1-99 or 1300-1999
- Can block/allow a network, host and subnet
- Two way communication is stopped
- All services are blocked by default
- Implemented closest to the destination
- Filtering is done based on source address only

Standard ACL Configuration

- Standard ACL creation
- (config)#access-list <acl no> <permit/deny> <source address> <source WCM>
- Implementation of Standard ACL
- (config)#interface <interface name
- (config-if)#ip access-group <acl no> <in/out>
- Verify ACL
- #show access-list
- #show access-list <acl no>

5.3.4 Rules of ACL

- All deny statements have to be given first
- There should be at least one permit statement
- An implicit deny blocks all traffic by default when there is no match (an invisible statement)
- Can have one access list per interface per direction, i.e. two ACL per interface, one in inbound direction and one in outbound direction
- Works in sequential order
- Editing of ACL is not possible, i.e. selectively adding or removing ACL statements is not possible

5.3.5 Flowchart of ACL

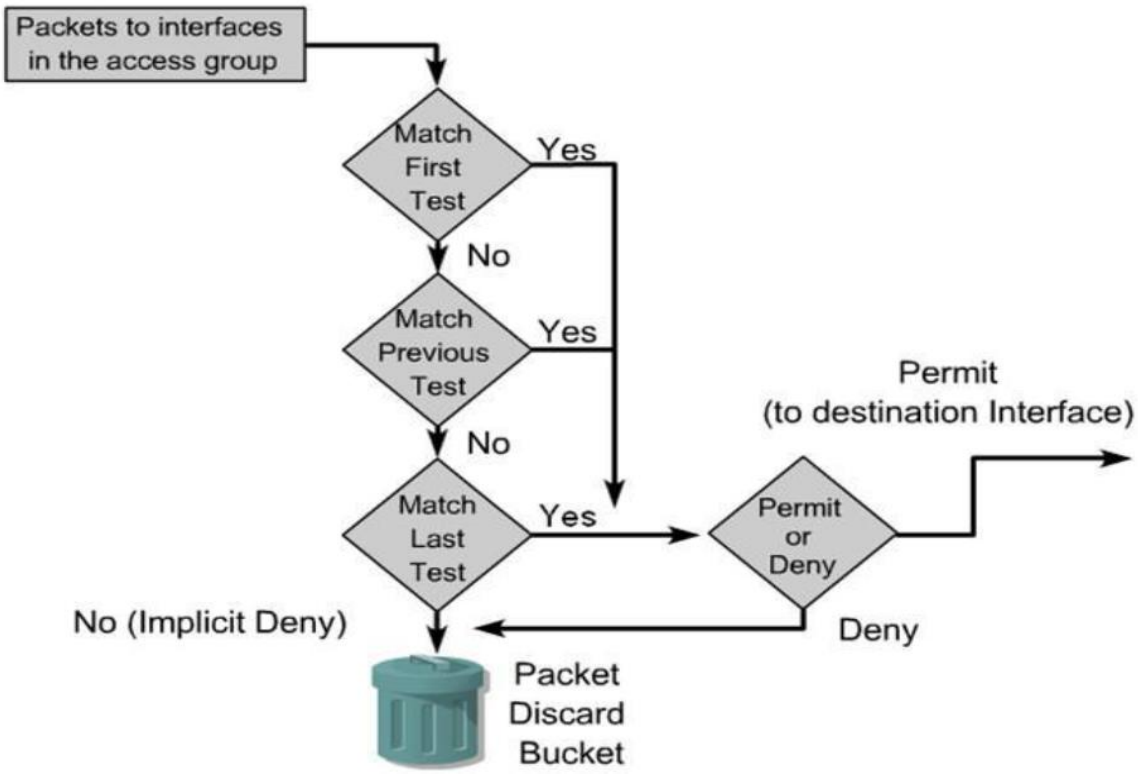


Figure 5.3.5: Flowchart of ACL

5.3.6 ACL Security Configuration to Branch Router

```
AB-1(config)# ipv6 access-list ipv6_acl
AB-1(config-ipv6-acl)# permit tcp any any
AB-1(config-ipv6-acl)# permit udp any any
AB-1(config-ipv6-acl)# hardware statistics
AB-1(config-ipv6-acl)# exit
******Assign an IP address and add the ACL on the interface.*******
AB-1(config)# interface GigabitEthernet0/2
AB-1(config-if)# no ip address
AB-1 (config-if)# negotiation auto
AB-1(config-if)# ipv6 address 2400:192:168:50::/64
AB-1(config-if)# ipv6 enable
AB-1(config-if)# ipv6 traffic-filter ipv6_acl in
AB-1(config-if)# exit
AB-1(config)# exit
AB-1# clear counters
Clear "show interface" counters on all interfaces [confirm]

**********Verify the configurations.************
AB-1(config)# show running-config interface GigabitEthernet0/2
Building configuration...
Current configuration : 114 bytes
!
AB-1(config)#interface GigabitEthernet0/2
no ip address
negotiation auto
AB-1(config-if)#ipv6 address 2400:192:168:50::/64
AB-1(config-if)#ipv6 traffic-filter ipv6_acl in
end
```

Figure 5.3.6: ACL Configuration

5.4 Test Results and Report

Test report should be created formally because from I can get the proper result of daily use. For getting the test result I have to test our network and from the outcome of the network I can give the test result. Measuring the outcome, I test the whole campus network. The components that I use ping test. The ping test that I use will give bellow:

- Uplink to core router
- core router to AB Router
- router to Distribution Switch
- Router to Core Switch
- core-switch to distributed-switch
- router to inter vlan different department
- server to server
- Pc to Pc in same vlan
- Pc to Pc in different vlan
- Pc to whole network.

After ping test I can see the packets will easily send inside the whole network without tariffing. I can easily access in different vlan, server, switch in the corporate network. For these reasons I believe that my project will easily accepted by clients.

CHAPTER 6

PROJECT AS ENGINEERING PROBLEM ANALYSIS

6.1 Sustainability of the Project/Work

First, I carefully design the entire network diagram, then I implement it using various routing commands and protocols. Once deployed, I test the entire network and it works successfully. Since I have no user experience of the network and to ensure sustainability, I have to launch the project. While I'm doing this, users can use the network and can give feedback and if necessary I have to add new features of the program. I also aim to convince the organization or ISP using the campus network around us to modify their network using my project as a guide. Then the network will use more and I can find errors and upgrade the network. This will help increase durability.

6.2 Social and Environmental Effects and Analysis

It is essential to keep our environment clean and safe. While I'm working or working on a project, sometimes it will be harmful or dangerous to our environment. There are issues of pollution, safety, natural resource damage, crime, etc., but my project is a software based implementation. Therefore, there will be no risk of environmental pollution, personal safety and damage of any kind to natural resources. My project is a blessing to the environment. I can easily browse the net, here we provide higher security, and better routing efficiency for this reason, and users can be blessed.

Since the risk of cyber-attack here is low, I believe this project will be more effective in protecting and calming our surroundings.

6.3 Impact on society

Before implementing a project, it is imperative to analyze the project cases. The impact on society is one of the main aspects of this analysis. Here I mainly discuss why the project is necessary to society, why I allow it to be used in society, whether it was valuable to us, whether it is harmful or dangerous to society, etc. I implement the dual -Project Stack. This will be very useful for the public as people can use both IPv4 and IPv6 addresses on the same network. There is no risk in sending a data packet, without data traffic you can enjoy it. Although I don't have UX, I'm dedicated. I hope that will play an important role in building a strong and stable network around our company. It will be a blessing for all of us because we and various IT industries can benefit from this network and are an important part of our society. This network is stable and safe to use, so the user can be happy that their data is safe. On the other hand, it is a software-based design. In this case, the main challenge is to protect the network from a cyber-attack on the company. Hopefully I can accept the challenge.

CHAPTER 7

LESSON LEARNED

7.1 Problems Faced During this Period

Failure to set appropriate goals and objectives can lead to a whole host of issues, including poor resource and stakeholder management. In fact, a recent survey revealed that 29% of project professionals cited an inadequate vision or goal for their project as a primary cause of failure. Learning from the working environment is also very difficult because I have to absorb and understand my work with more effort. IPv4 address are running out day by day for its small address space and we moving towards IPv6 gradually. IPv6 will be the next generation protocol for internet communication. So, we have to learn how IPv6 works in a network diagram. It's so much difficult gain to learn. In many faces problem to learn IPv6 address. Not good resources to learn this address. One faces problem to selected network diagram. I will visit corporate office & campus to a lot of ideas to their campus network related.

7.2 Solution of those Problems

Network projects often involve complex and interrelated tasks, resources, and stakeholders. To successfully plan and execute a network project, you need to identify and mitigate the potential dependencies and constraints that may affect your scope, schedule, budget, and quality. In this article, you will learn what network project dependencies and constraints are, and how to analyze and manage them effectively. Network project dependencies and constraints can offer a variety of benefits and opportunities for your project, such as helping to define and clarify the project scope, goals, and deliverables. These dependencies can motivate you to be more creative and innovative in finding solutions and alternatives. IPv6 is designed to solve many of the problems of the current version of the Internet Protocol suite (known as IPv4) about address depletion, security, auto-configuration, extensibility, and so on. In this problem I will solved online tutorial, google & Wikipedia help me to gain a clear concept to implement this project.

CHAPTER 8

FUTURE WORK AND CONCLUSION

8.1 Future Work

Ipv4 running out gradually and IPv6 will be next generation protocol for internet communication. Though ipv6 is more secure but it is not wildly used. Thus it is new protocol so it has to faces many difficulties in future such as security issues, newly cyber-attack etc.

While ipv6 will use everywhere I will use some protocol to make our corporate network more secure and stable. Those,

- Will increase network area.
- Will add more protocol.
- Will increase more security.

8.2 CONCLUTION

Internet Protocol version 6(IPv6) overcomes many of the limitations of IPv4 and introduces new features and functions that make the network administrator's job easier. As IPv6 differs significantly from IPv4, the changes aim to improve the administrative experience. While there are still similarities with IPv4, the IPv6 protocol seems "familiar". By overcoming the weaknesses of IPv4, IPv6 has made great strides. The most obvious is that IPv6 has a 128-bit address space (compared to 32-bit in IPv4), allowing more machines to be connected to the network. Additionally, IPv6 improves router performance issues through the use of more concise network packet headers, maintaining multicast membership, reducing network broadcasts, and delegating control. Packet fragmentation control.

The reality is that this new technology poses great challenges for the implementers. However, many of the challenges are superficial as the underlying architecture and network design principles remain unchanged. So many of the changes in IPv6 are superficial. For example, IPv6 no longer uses "private addresses [RFC 1918]" but instead uses two types of network addresses known as "site-local" and "link-local" addresses. "Address Resolution Protocol" and "Router Discovery Protocol" have been replaced by Neighbor Discovery Protocol. DHCP (Dynamic Host Configuration Protocol) is not needed as servers can negotiate their addresses at startup. Finally, the textbook implementation techniques used for many IPv4 networks are very similar to IPv6 networks. This allows IPv6 implementers to leverage their existing expertise in deploying next-generation networks using the IPv6 framework. The way to develop my project is a great experience. I'm developing a Networking-based project titled "Deploying a Campus network using IPv4 with ACL Security". In order to develop this project, I have to face many problems and challenges, such as making a campus network diagram. I'm familiar with IPv4, but IPv6 was a new topic for us, so I still have a lot to learn about it. I also face the challenge of choosing an IP address and routing protocol. I believe that my project will be more effective for IT industry.

REFERENCES

[1] Deploying a Campus Networks, available at <<https://www.cisco.com/ >>, last accessed on 29th December 2022 at 10:25am.

[2] Learn about IPv6 Wikipedia, available at << https://en.wikipedia.org/wiki/IPv6 >>, last accessed on 31th December 2022 at 12:11am.

[3] Studying about networking knowledge, available at << www.cisco.com >>, last accessed on 10th January 2023 at 9:11am.

[4] Studying about ACL Security, available at<< https://community.cisco.com/t5/networking-knowledge-base/access-control-lists-acl-explained/>>, >>, last accessed on 10th January 2023 at 9:11am.

[5] CCNA Routing and switching, available at << https://www.cisco.com >>, last accessed on 12th January 2023 at 12:11am.

[6] Mir, N.F, "Enabling IPv6 within a campus network "Prentice Hall, pp. 630–651, March 24, 2003.

[7] Studying IP Subnetting, available at << https://www.udemy.com/course/subnetting-secrets-learn-the-easy-way-to-subnet/ >>last accessed on 20th January 2023 at 5:11pm.

[8] Cisco Packet Tracer, available at << https://www.netacad.com/courses/packet-tracer/introduction-packet-tracer >>, last accessed on 18th February 2023 at 10:11pm.

[9] Studying IOS Command, available at <<https://community.cisco.com/t5/switching/cisco-ios-xe-command/td-p/4154070?dtid=osscdc000283 >>, last accessed on 10th March 2023 at 2:11pm.

[10] Studying Routing & Switching, available at << https://ptgmedia.pearsoncmg.com/ >>, last accessed on 10th November 2023 at 2:11pm.

[11] Studying NAT Routing, available at <<https://www.geeksforgeeks.org/network-address-translation-nat/ >>, last accessed on 16th January 2023 at 8:11pm.

[12] Studying Ping Test, available at <<https://www.howtogeek.com/355664/how-to-use-ping-to-test-your-network/ >>, last accessed on 19th March 2023 at 9:10pm.