Princess Sumaya University for Technology

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Computer Engineering Department

Computer Networks Lab Report

22449

Project

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Abstract

This network project is all about designing and setting up a complex network with routers, switches, and PCs. We're making sure everything is arranged just right, both in how it's logically organized and physically set up. The main aim is to create a network that works well, separates into different parts when needed, hands out IP addresses automatically, figures out the best routes for data, controls who can access what, and keeps everything secure. We're using different ways of making devices talk to each other, sorting out how to give them addresses, and making sure no one can sneak in where they shouldn't be.

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Introduction

In today's world, a well-structured and efficient network is vital. Without it, smooth communication and data exchange become challenging. This project is essential as it focuses on creating such a network using Cisco devices, ensuring it's organized both physically and logically. We aim to establish connections, segment the network, set up routing with RIP, provide DHCP services, control access, and enforce security measures. Without this project, navigating modern networking demands would be much more difficult. This project involves both physical connections between devices and the setup needed for them to communicate effectively. It includes dividing the network into segments, assigning IP addresses, setting up how data moves around, handling IP address distribution, controlling who can access what, and managing everything remotely. These components are essential for a smooth and secure network operation.

Objectives

- Establish a network with routers, switches, and devices, ensuring physical and logical connectivity.
- Implement VLAN segmentation and assign IP addresses as per the addressing table.
- Apply access control and security measures, including passwords, ACLs, and remote configuration.
- Optimization of Network Services

Theory

This project covers a range of important networking ideas needed to design, set up, and manage computer networks. First, we need to understand different network setups and how they're used in real life. Then, we'll dive into Virtual Local Area Networks (VLANs), which help split networks for better performance, security, and control. We'll also learn about IPv4 addresses, subnetting, and how to divide networks effectively. Knowing routing protocols like EIGRP is key for devices to talk to each other efficiently. We'll also explore DHCP, which automatically gives devices their IP addresses. To keep things secure, we'll look at access control with VLAN access control lists and port security. And we'll learn about remote management using protocols like Telnet and SSH. Lastly, we'll understand Network Address Translation (NAT) and how it helps devices communicate over the internet. By practicing these concepts, we'll get hands-on experience and a deeper understanding of how networks work.

Commands Guidelines

Commands and guidelines for the project:

- Topology Configuration.
- Logical Configuration.
- Routing Protocol Configuration.
- Switch Configuration.
- VLAN Configuration.
- DHCP Server Configuration.
- Access Control List Configuration (ACL).
- NAT and PAT Configuration.

Procedure and Discussions

2.1 Configurations

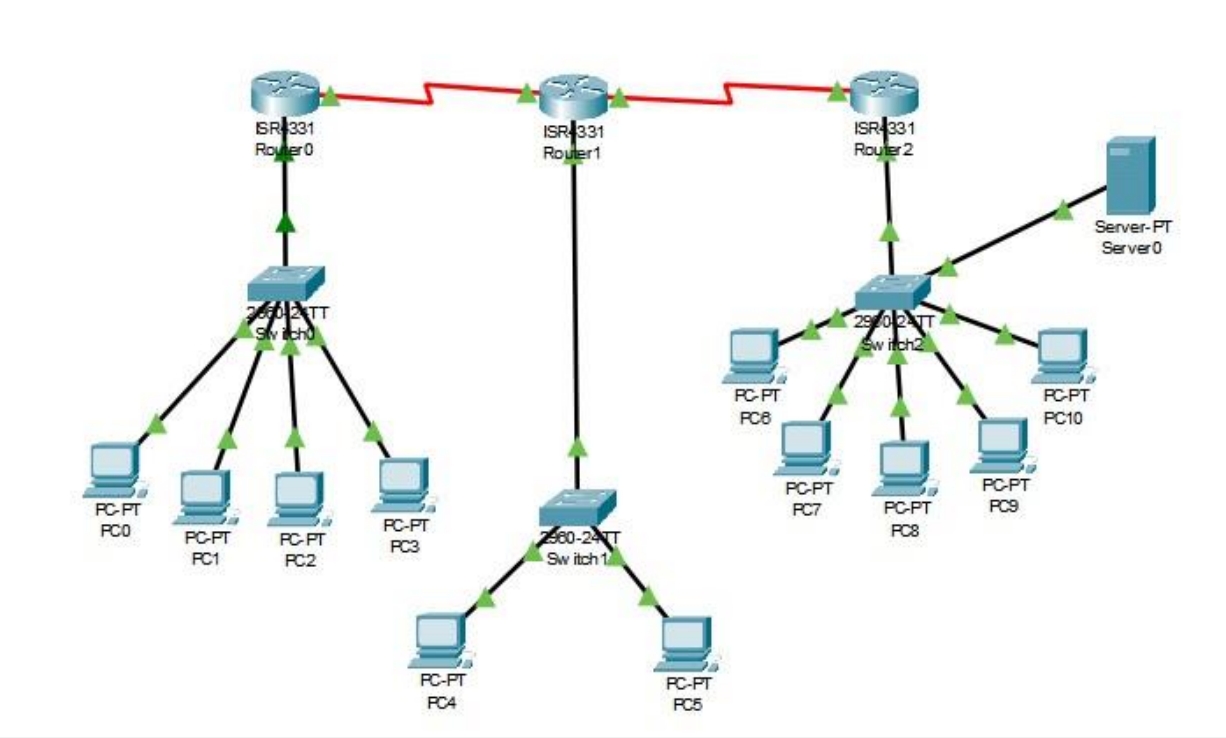

Figure 1: physical connection.

1. PC0 and PC1 should be in the same VLAN with ID 90 and name of Sales.
2. PC2 and PC3 should be in the same VLAN with ID 80 and name of HR.

```
mourad#show vlan

VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/6, Fa0/7, Fa0/8, Fa0/9
                                                 Fa0/10, Fa0/11, Fa0/12, Fa0/13
                                                 Fa0/14, Fa0/15, Fa0/16, Fa0/17
                                                 Fa0/18, Fa0/19, Fa0/20, Fa0/21
                                                 Fa0/22, Fa0/23, Fa0/24, Gig0/1
                                                 Gig0/2
80   HR                                active    Fa0/4, Fa0/5
90   Sales                             active    Fa0/2, Fa0/3
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                   active
1005 trnet-default                     active
```

Figure 2 VLAN 80 and 90.

3. PC4 and PC5 should be in the same VLAN with ID 60 and name of Accountant.

```
darwish#show vlan

VLAN Name                              Status    Ports
---- --------------------------------- --------- -------------------------------
1    default                           active    Fa0/4, Fa0/5, Fa0/6, Fa0/7
                                                 Fa0/8, Fa0/9, Fa0/10, Fa0/11
                                                 Fa0/12, Fa0/13, Fa0/14, Fa0/15
                                                 Fa0/16, Fa0/17, Fa0/18, Fa0/19
                                                 Fa0/20, Fa0/21, Fa0/22, Fa0/23
                                                 Fa0/24, Gig0/1, Gig0/2
60   Accountant                        active    Fa0/1, Fa0/2
1002 fddi-default                      active
1003 token-ring-default                active
1004 fddinet-default                   active
1005 trnet-default                     active
```

Figure 3 VLAN 60.

4. PCs 6-10 in VLAN 3.
5. Server SRV0 in VLAN 2

```
allaham#show vlan

VLAN Name                             Status    Ports
---- -------------------------------- --------- -------------------------------
1    default                          active    Fa0/8, Fa0/9, Fa0/10, Fa0/11
                                                Fa0/12, Fa0/13, Fa0/14, Fa0/15
                                                Fa0/16, Fa0/17, Fa0/18, Fa0/19
                                                Fa0/20, Fa0/21, Fa0/22, Fa0/23
                                                Fa0/24, Gig0/1, Gig0/2
2    VLAN0002                         active    Fa0/7
3    VLAN0003                         active    Fa0/2, Fa0/3, Fa0/4, Fa0/5
                                                Fa0/6
1002 fddi-default                     active
1003 token-ring-default               active
1004 fddinet-default                  active
1005 trnet-default                    active
```

Figure 4 connect VLNAS to devices.

6. Configure the IP addresses for the routers, PCs and server as shown in the addressing table below.

```
mariam#show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0/0   unassigned      YES manual administratively down down
GigabitEthernet0/0/1   unassigned      YES manual up                    up
GigabitEthernet0/0/1.8080.0.0.1        YES manual up                    up
GigabitEthernet0/0/1.9090.0.0.1        YES manual up                    up
GigabitEthernet0/0/2   unassigned      YES unset  administratively down down
Serial0/1/0            202.0.0.1       YES manual up                    up
Serial0/1/1            unassigned      YES unset  administratively down down
Vlan1                  unassigned      YES unset  administratively down down
```

Figure 5 Router 0 IP's.

```
tima#show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0/0   20.0.0.1        YES manual up                    up
GigabitEthernet0/0/0.6060.0.0.1        YES manual up                    up
GigabitEthernet0/0/1   unassigned      YES unset  administratively down down
GigabitEthernet0/0/2   unassigned      YES unset  administratively down down
Serial0/1/0            202.0.0.2       YES manual up                    up
Serial0/1/1            206.0.0.1       YES manual up                    up
Vlan1                  unassigned      YES unset  administratively down down
```

Figure 6 Router 1 IP's.

```
mais#show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0/0   unassigned      YES manual up                    up
GigabitEthernet0/0/0.2 192.168.20.1    YES manual up                    up
GigabitEthernet0/0/0.3 192.168.3.1     YES manual up                    up
GigabitEthernet0/0/1   unassigned      YES unset  administratively down down
GigabitEthernet0/0/2   unassigned      YES unset  administratively down down
Serial0/1/0            206.0.0.2       YES manual up                    up
Serial0/1/1            unassigned      YES unset  administratively down down
Vlan1                  unassigned      YES unset  administratively down down
```

Figure 6 Router 2 IP's.

7. Configure the required Vlans, access and trunk ports on the switches.

```
interface FastEthernet0/1
 switchport mode trunk
!
interface FastEthernet0/2
 switchport access vlan 90
 switchport mode access
!
interface FastEthernet0/3
 switchport access vlan 90
 switchport mode access
!
interface FastEthernet0/4
 switchport access vlan 80
 switchport mode access
!
interface FastEthernet0/5
 switchport access vlan 80
 switchport mode access
```

Figure 7 R0 Tunck.

```
interface FastEthernet0/1
 switchport access vlan 60
 switchport mode access
!
interface FastEthernet0/2
 switchport access vlan 60
 switchport mode access
!
interface FastEthernet0/3
 switchport mode trunk
```

Figure 9 R1 Tunck.

```
interface FastEthernet0/1
 switchport mode trunk
!
interface FastEthernet0/2
 switchport access vlan 3
 switchport mode access
!
interface FastEthernet0/3
 switchport access vlan 3
 switchport mode access
!
interface FastEthernet0/4
 switchport access vlan 3
 switchport mode access
!
interface FastEthernet0/5
 switchport access vlan 3
 switchport mode access
!
interface FastEthernet0/6
 switchport access vlan 3
 switchport mode access
!
interface FastEthernet0/7
 switchport access vlan 2
 switchport mode access
```

Figure 10 R2 Tunck.

8. Configure Router 0 as DHCP server for Vlan 80 and 90.

```
ip dhcp excluded-address 90.0.0.1
ip dhcp excluded-address 80.0.0.1
!
ip dhcp pool vlan80
 network 80.0.0.0 255.0.0.0
 default-router 80.0.0.1
 dns-server 8.8.8.8
ip dhcp pool vlan90
 network 90.0.0.0 255.0.0.0
 default-router 90.0.0.1
 dns-server 8.8.8.8
```

Figure 11 R0 DHCP.

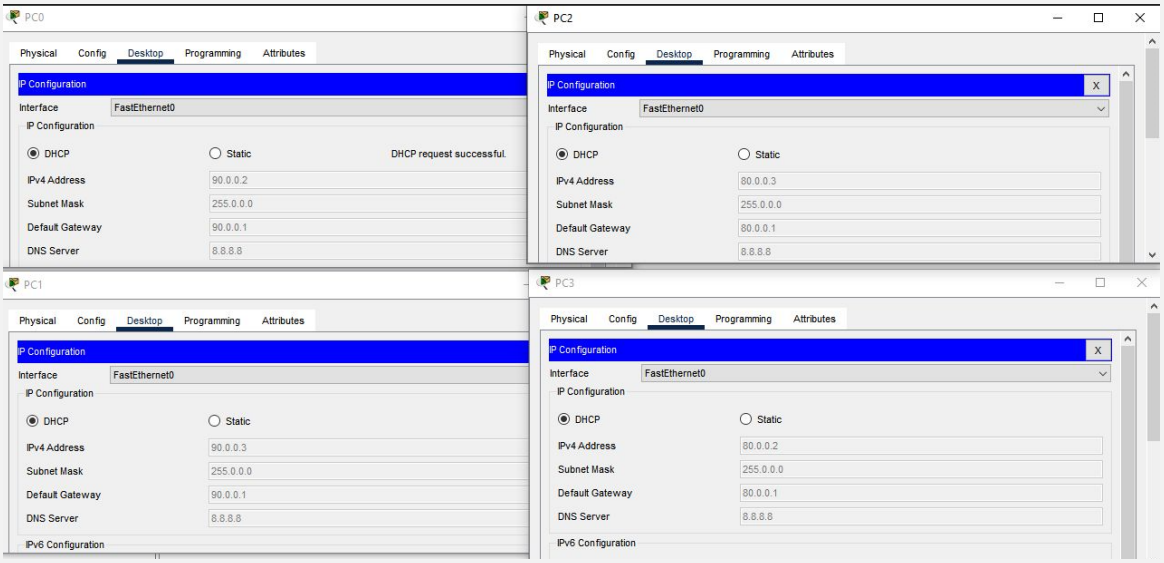

Figure 12 IP addressed by the DHCP.

9. Configure the EIGRP routing protocol so all Pcs can reach each other's (except the two private LANs)

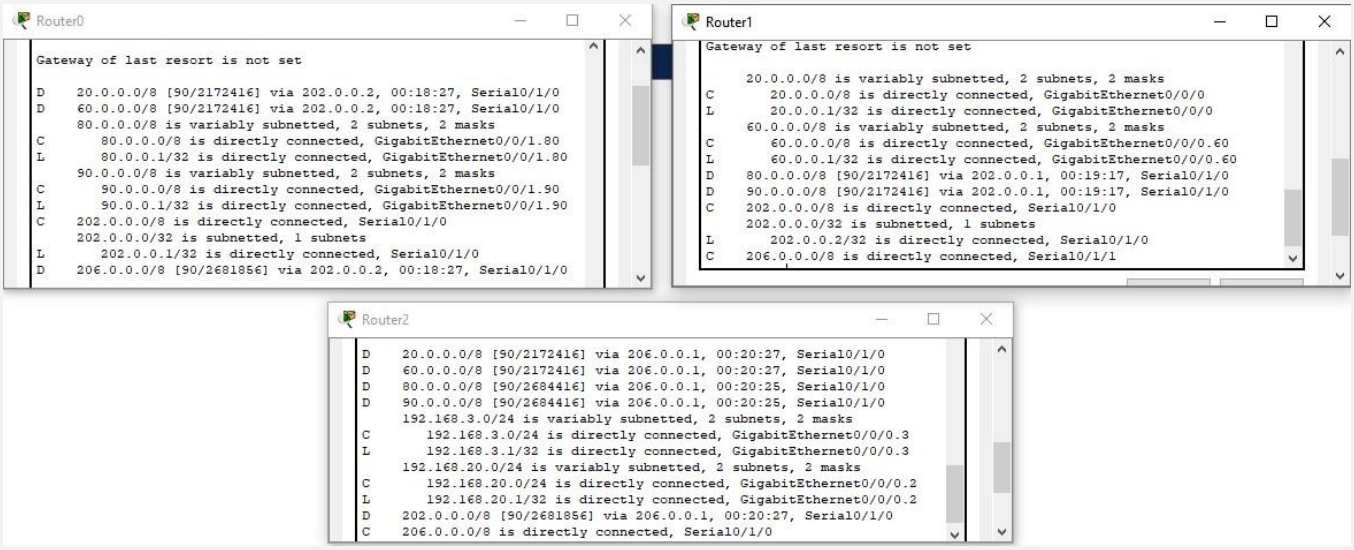

Figure 13 EIGRP Routing Protocol for all routers.

Figure 14 EIGRP Routing Protocol for all routers.

10. Configure hostnames for all the routers and switches with your names.

Figure 15.

Figure 16

Figure 17

11. Configure psut as enable, console, VTY password on all devices.

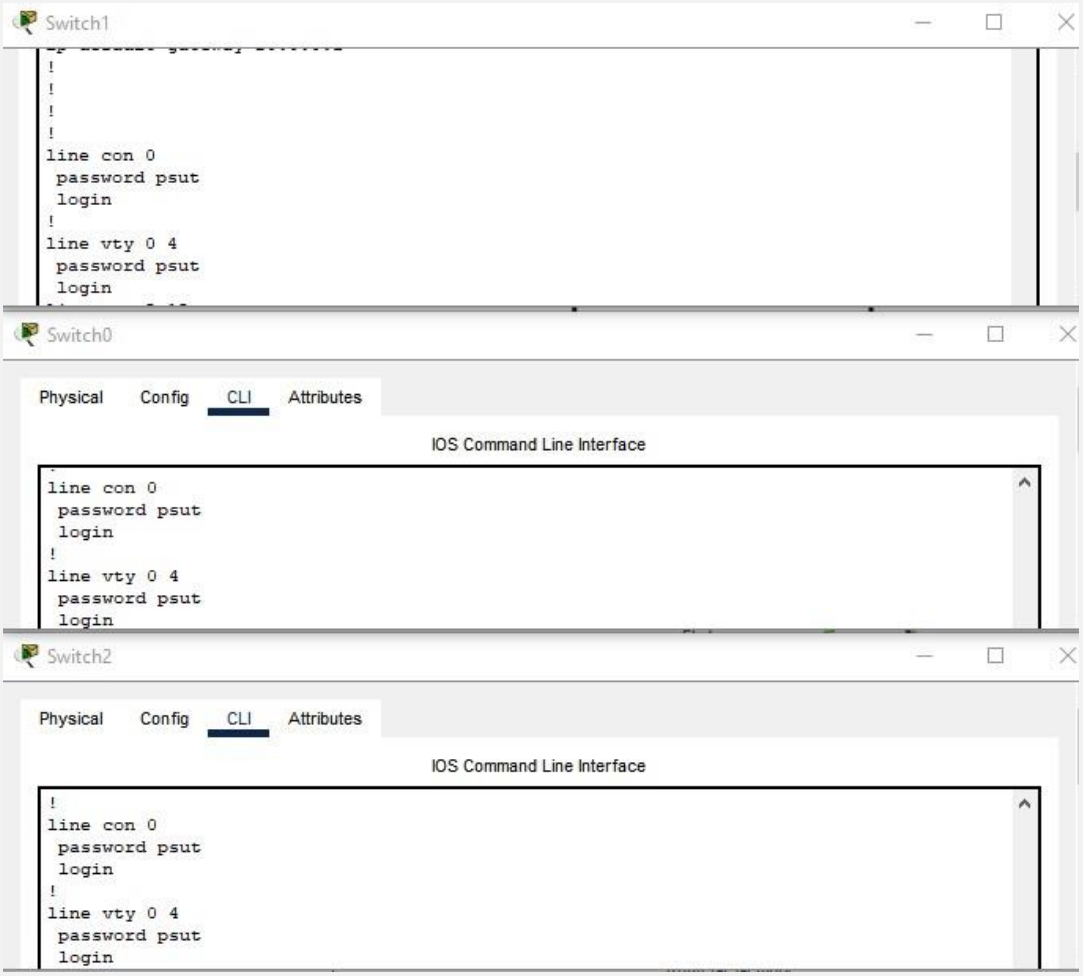

Figure 18 Passwords on switches.

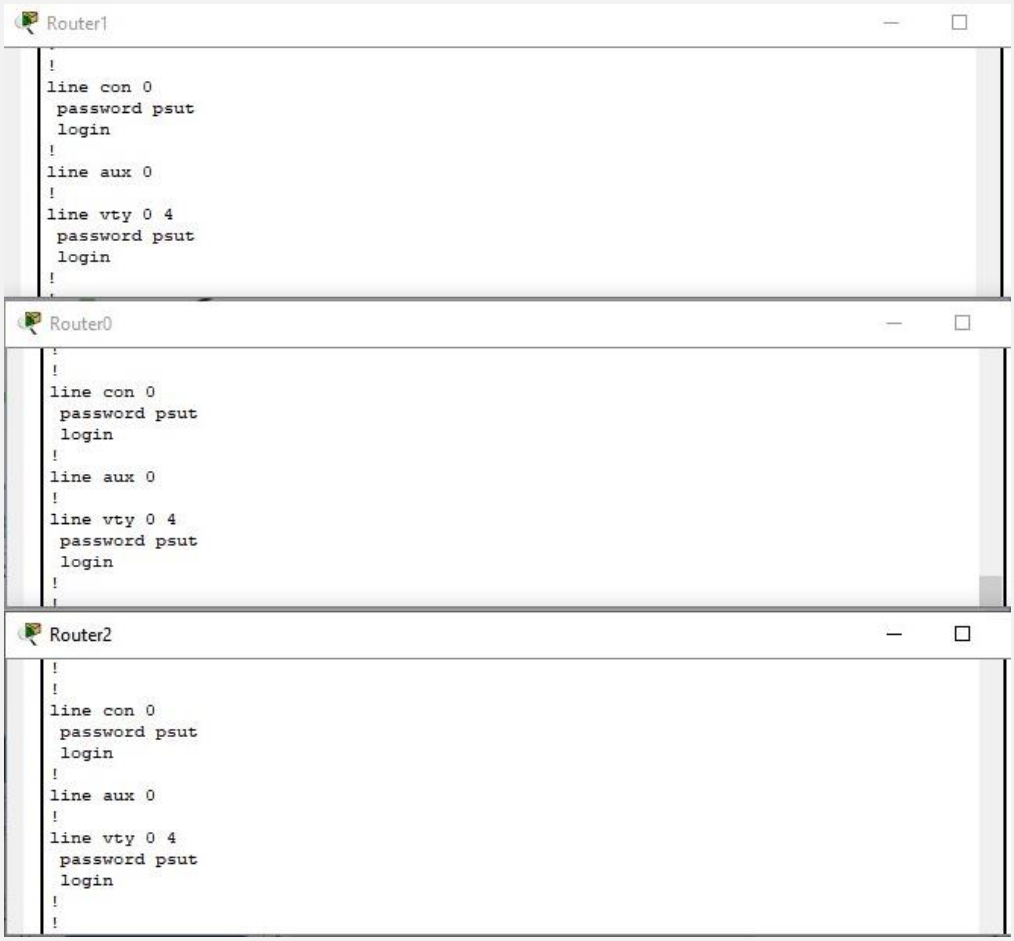

Figure 19 Passwords on Routers.

12. Switch 1 should be accessible for remote configuration from any other VLANs (using Telnet or SSH)

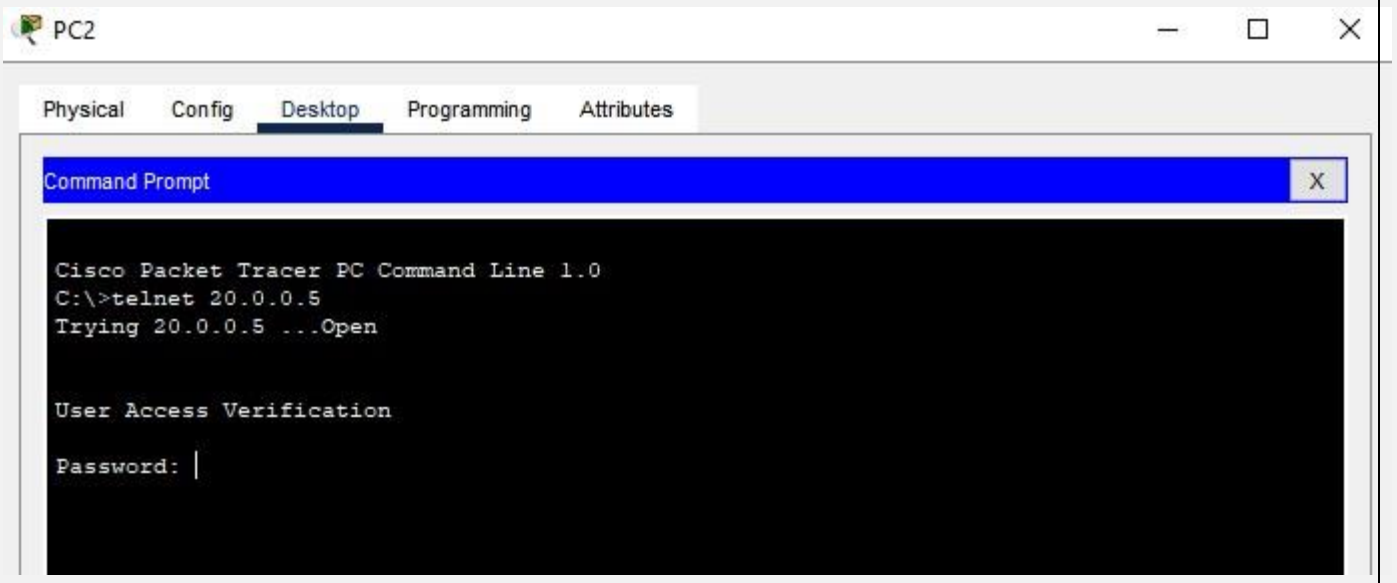

Figure 20 PC connects telnet on switch1.

13. Server's network (192.168.20.0) should be private (not advertised in EIGRP) and Static Nat should be used to reach the server using the public IP of S0/1/1 of R2.

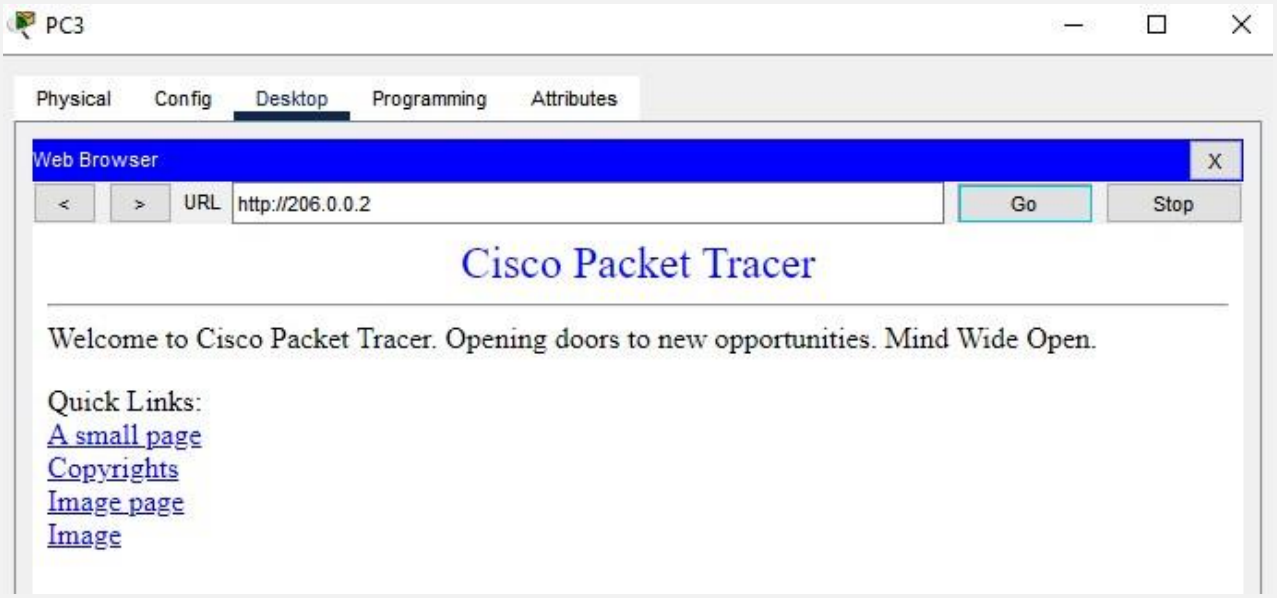

Figure 21 Accessing SRV0 through S1 serial IP address.

```
mais#show ip nat translations
Pro  Inside global     Inside local       Outside local      Outside global
icmp 206.0.0.2:3       192.168.20.10:3    90.0.0.2:3         90.0.0.2:3
icmp 206.0.0.2:4       192.168.20.10:4    90.0.0.2:4         90.0.0.2:4
icmp 206.0.0.2:5       192.168.20.10:5    90.0.0.2:5         90.0.0.2:5
icmp 206.0.0.2:6       192.168.20.10:6    90.0.0.2:6         90.0.0.2:6
---  206.0.0.2         192.168.20.10      ---                ---
tcp 206.0.0.2:80       192.168.20.10:80   80.0.0.3:1026      80.0.0.3:1026
```

Figure 22 Accessing SRV0 through S1 serial IP address.

14. PC6 to PC10 are using PAT to communicate simultaneously with other networks with the public IP 172.40.0.3.

Router2

```
interface Vlan1
 no ip address
 shutdown
!
router eigrp 1
 network 206.0.0.0
!
ip nat pool nnaatt 172.40.0.3 172.40.0.7 netmask 255.255.255.0
ip nat inside source list 20 pool nnaatt
ip classless
!
```

Figure 23 Public IP for PC6-10

15. Configure a numbered access control list to deny PC5 to access Vlan 90.

Router0

```
!
router eigrp 1
 network 90.0.0.0
 network 80.0.0.0
 network 202.0.0.0
!
ip classless
!
ip flow-export version 9
!
!
access-list 90 deny host 60.0.0.11
access-list 90 permit any
```

Figure 24 Number ACL deny PC5 to vlan90

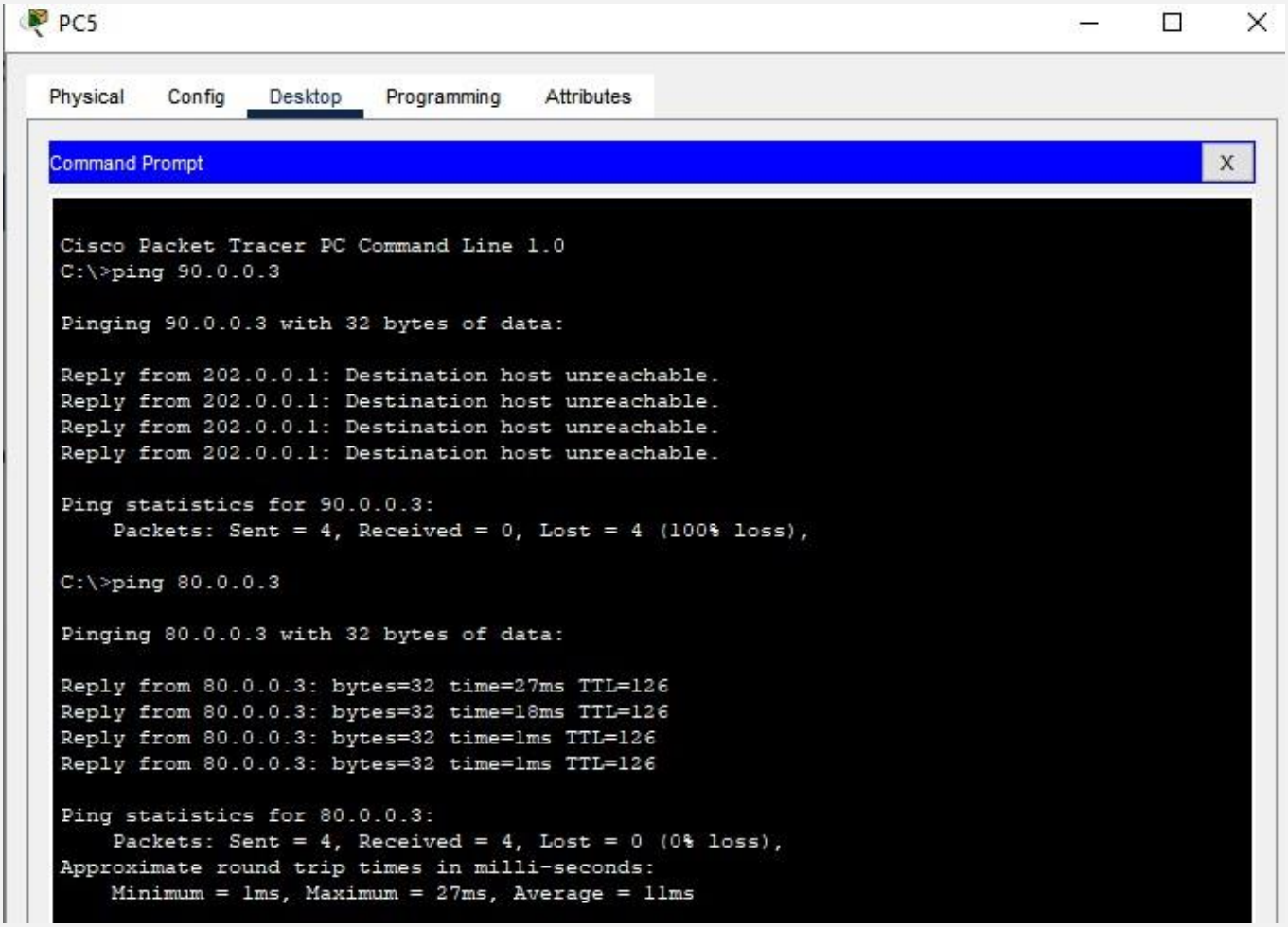

Figure 25 Number ACL deny PC5 to vlan90

16. Configure a named access control list (CCCHTTP) to deny PC4 from accessing HTTP/HTTPs service from the server. (note that PC4 can ping the server).

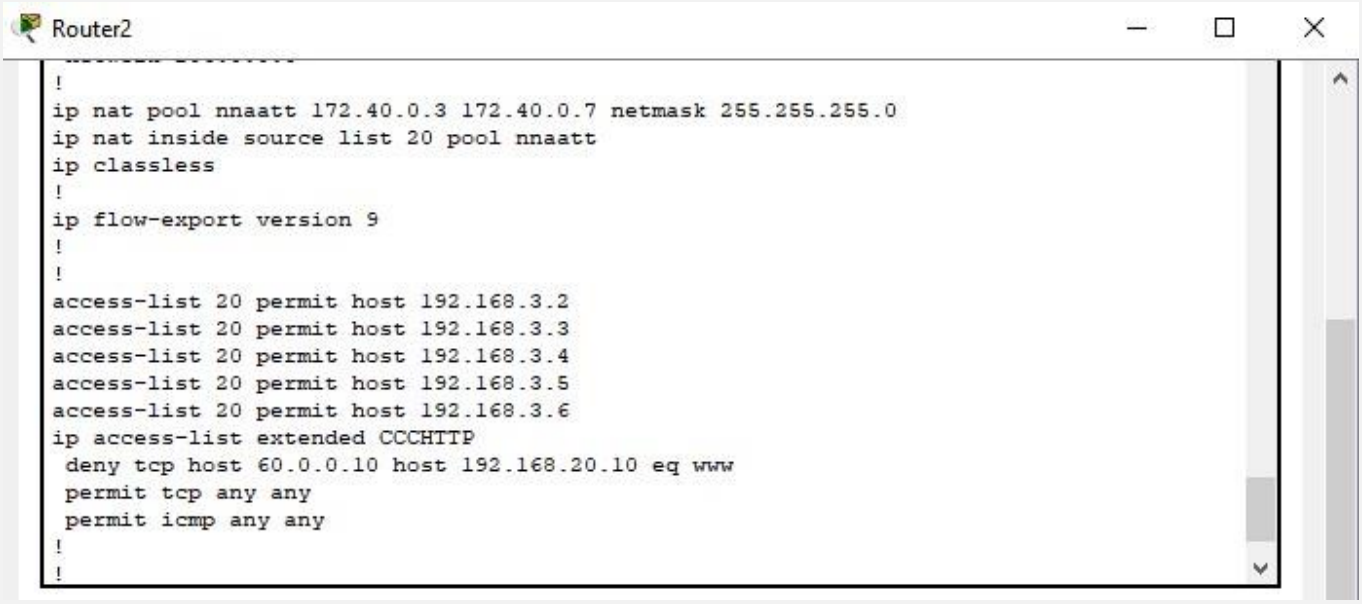

Figure 26

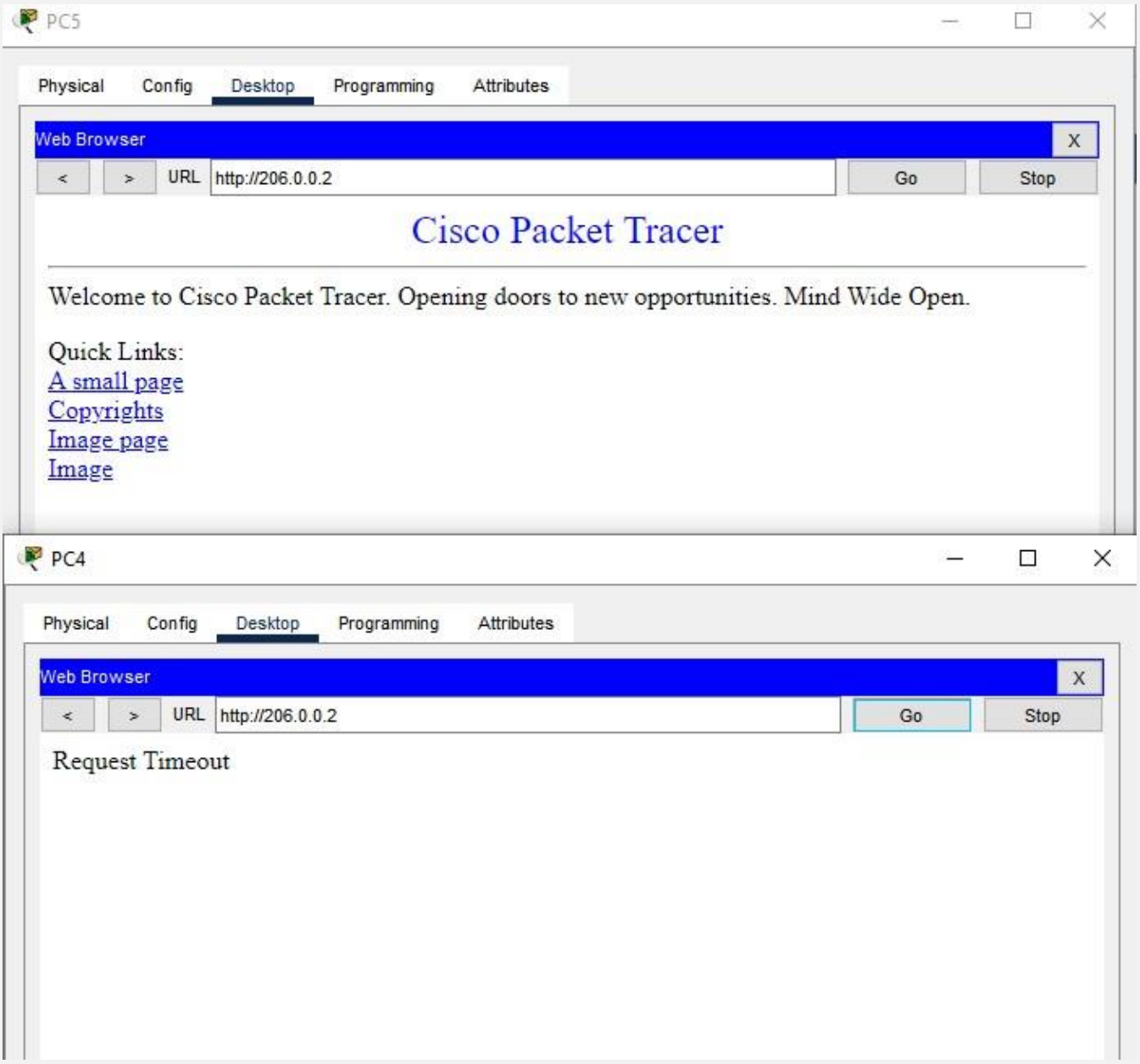

Figure 27 PC4 is not allowed to connect to SRV0 but another PCs can.

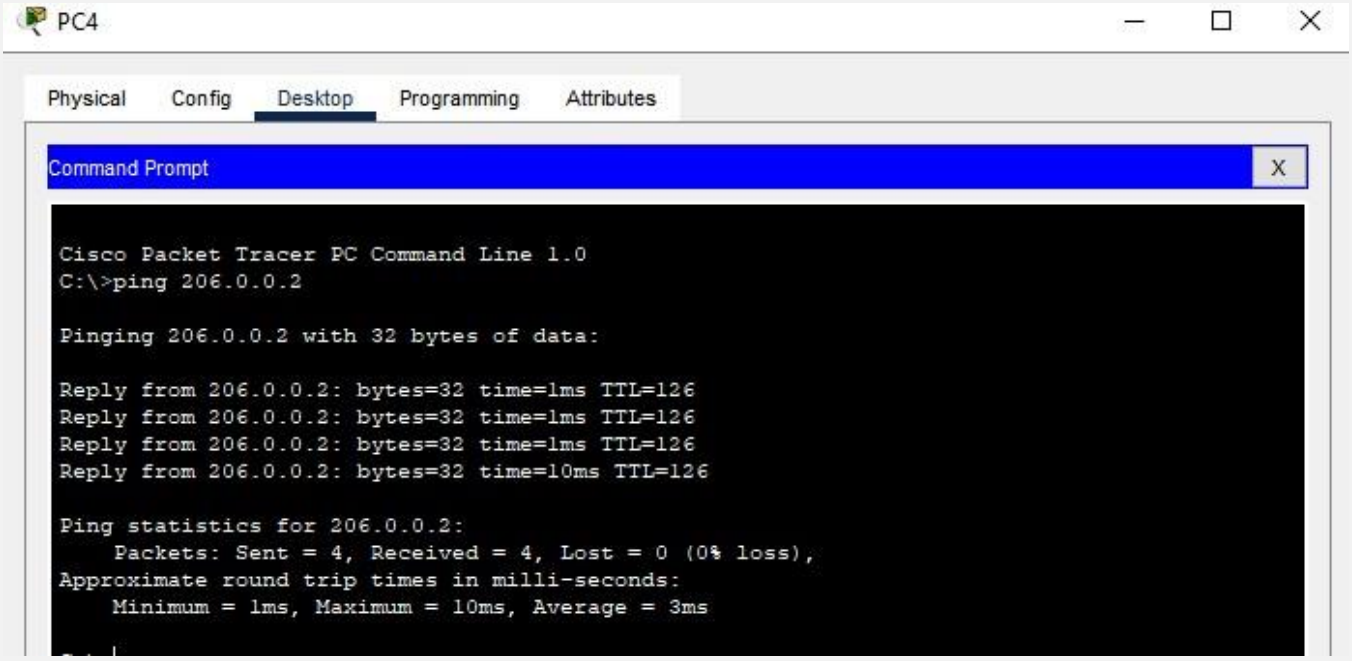

Figure 28 PC4 is allowed to ping SRV0 like other PCs but not allowed to connect to it.

Conclusions

In summary, this project has been a great chance to put what we've learned about networking into practice. By following specific instructions and using Cisco Packet Tracer to set up networks, we've gained valuable hands-on experience in designing, configuring, and managing networks. We've worked with VLANs, routing protocols, DHCP, access controls, and network address translation, showing our understanding of key networking concepts and protocols. Plus, the documentation and presentations have helped us explain our design choices, how we set things up, and how we'd fix any issues, improving our communication skills. Overall, this project has deepened our understanding of networking and given us important skills for handling real-world networking tasks.

References

https://drive.google.com/file/d/1T5-n5c9r-uL1-eoQfGog6Hs8FqmgB-xd/view?usp=sharing

The information presented in this report is sourced from the documents posted on the Elearning platform.