Semester 451

COE351 Project

Local Area Network (LAN)

in College Of Computer

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Prepared for

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INTRODUCTION

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In today's technology-driven world, computer networks have become an essential part of daily life. Local Area Networks (LANs) are the foundation of these networks, providing connectivity for computers, devices, and resources within a limited area, such as a home, office, or school. This project aims to apply the fundamentals of computer networking to design, implement, and manage a basic LAN infrastructure.

What is Local Area Networks (LANs)?

Local Area Networks (LANs) provide seamless communication and resource sharing within a limited geographic area, and are the backbone of modern connectivity. There are several factors that need to be considered before establishing a functional LAN, including the topology of the network, the IP addressing scheme, and the configuration of the devices.

THE LAN TOPOLOGY

is the network's blueprint. It is defined by how devices are arranged and how they are interconnected. In addition to influencing the performance and scalability of the network, it determines how data flows across it. Common topologies include Bus Topology, Ring Topology and Star Topology, which we chose for our project.

THE STAR TOPOLOGY

consists of a central hub or switch that serves as the focal point, with devices connected individually. It offers flexibility and fault tolerance.

IP addressing scheme

An IP address is a unique identifier that allows each device on a LAN to communicate effectively. There are four sets of numbers separated by periods in an IP address, which is typically represented in decimal form.

Serve two primary functions:

- Network Interface: IP addresses enable data packets to be routed to the intended destination on the network by uniquely identifying each device.
- Location Addressing: IP addresses provide a hierarchical representation of the network structure, allowing devices to be grouped into subnetworks.

Device Configurations

Optimizing Network Performance in Network devices, such as routers and switches, play an important role in directing data traffic and maintaining the smooth operation of networks. Their configurations govern how they work within a LAN.

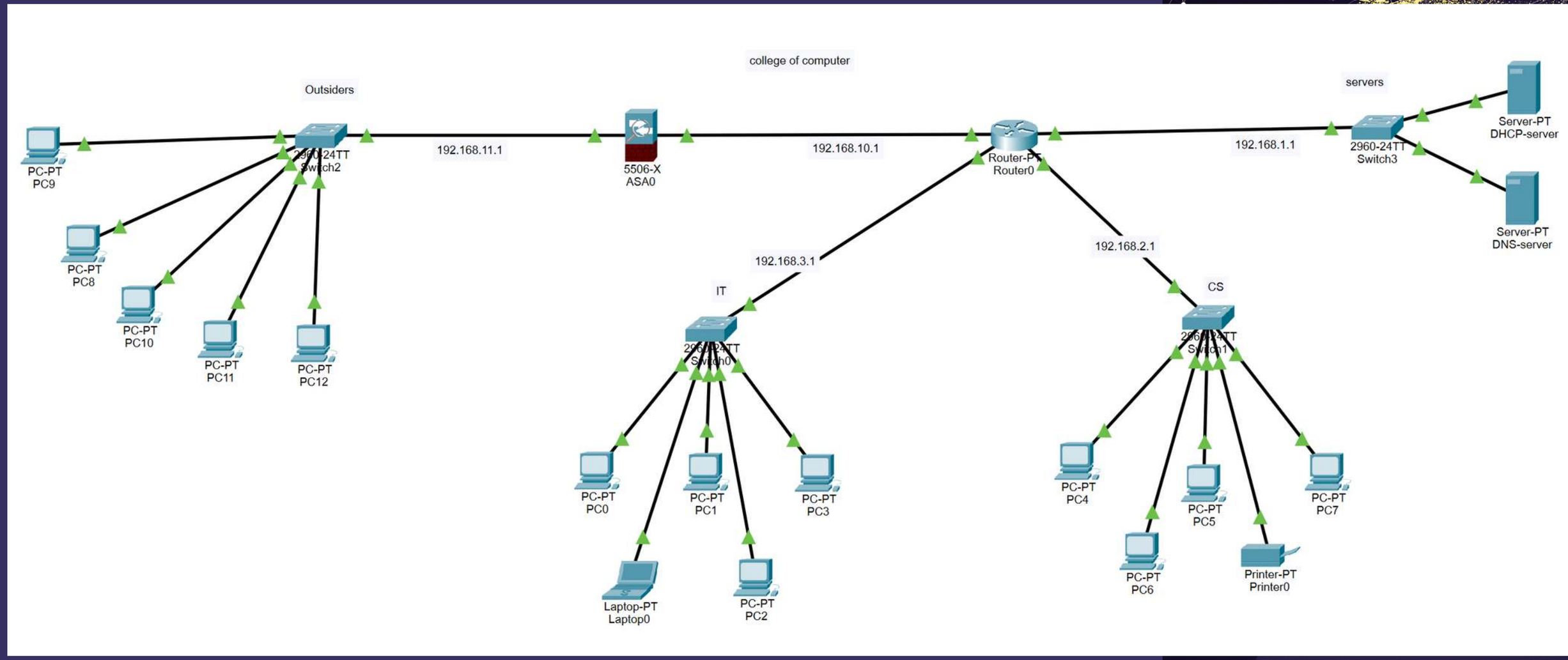
ROUTERS

Routers connect various LANs or subnets, passing data packets to their destinations. Routing tables, which define packet pathways, are part of their settings.

SWITCHES

Switches connect LAN devices by passing data packets to the relevant ports. MAC address tables, which map MAC addresses to specific ports, are included in their settings.

Our LAN in college of computer



The Configuration Files

Router

interface GigabitEthernet0/0

```
Router(config)#interface GigabitEthernet0/0
Router(config-if)#ip address 192.168.3.1 255.255.255.0
```

interface GigabitEthernet1/0

```
Router(config)#interface GigabitEthernet1/0
Router(config-if)#ip address 192.168.2.1 255.255.255.0
```

interface GigabitEthernet2/0

```
Router(config)#interface GigabitEthernet2/0
Router(config-if)#ip address 192.168.1.1 255.255.255.0
```

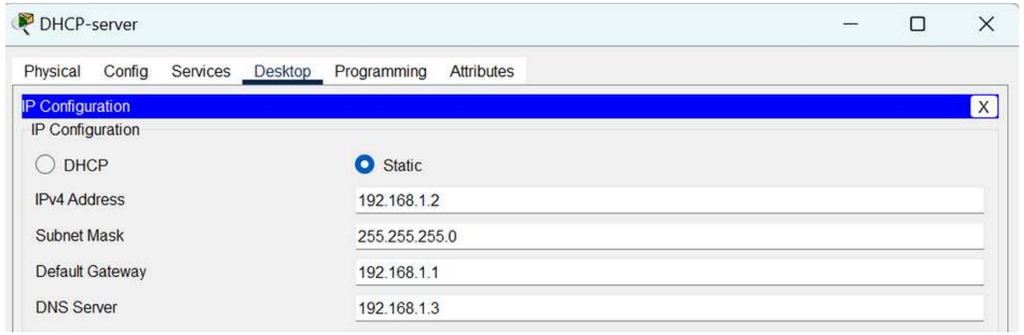
interface GigabitEthernet3/0

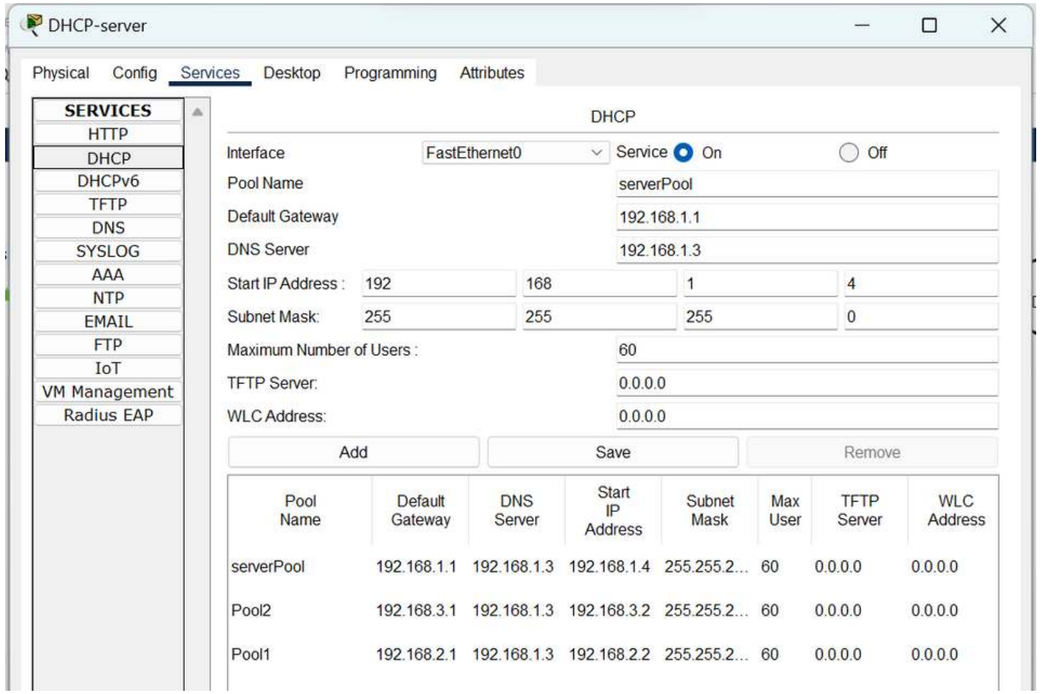
```
Router(config)#interface GigabitEthernet3/0
Router(config-if)#ip address 192.168.10.1 255.255.255.0
```

The Configuration Files

03

DHCP server

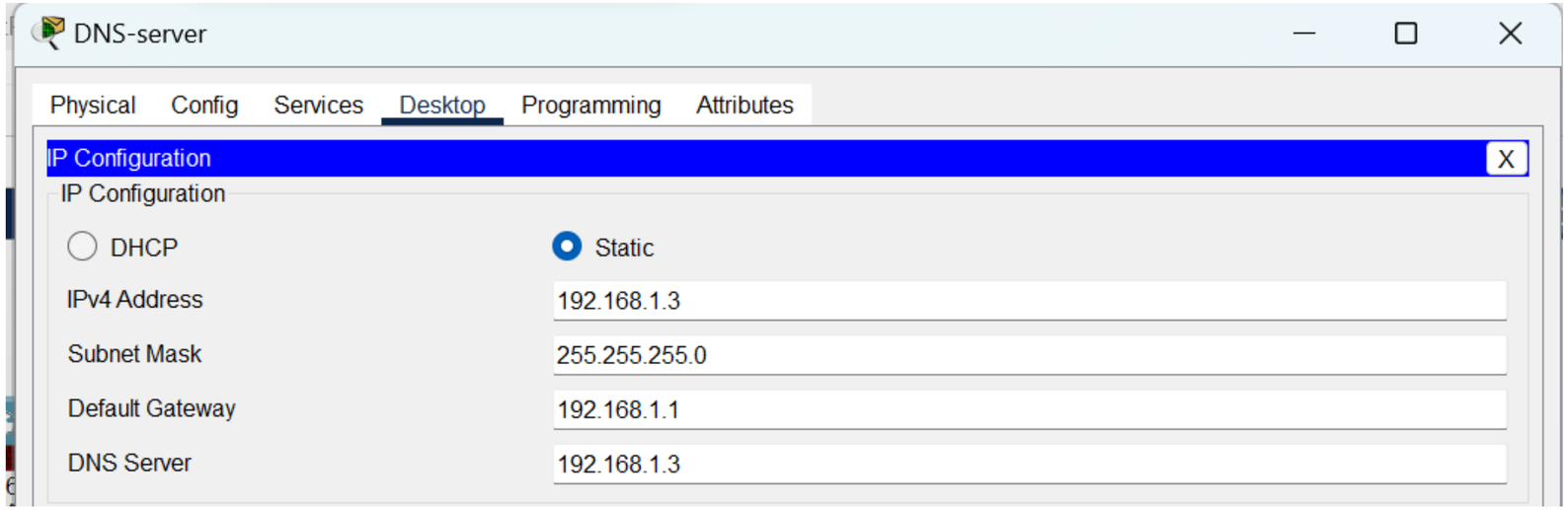




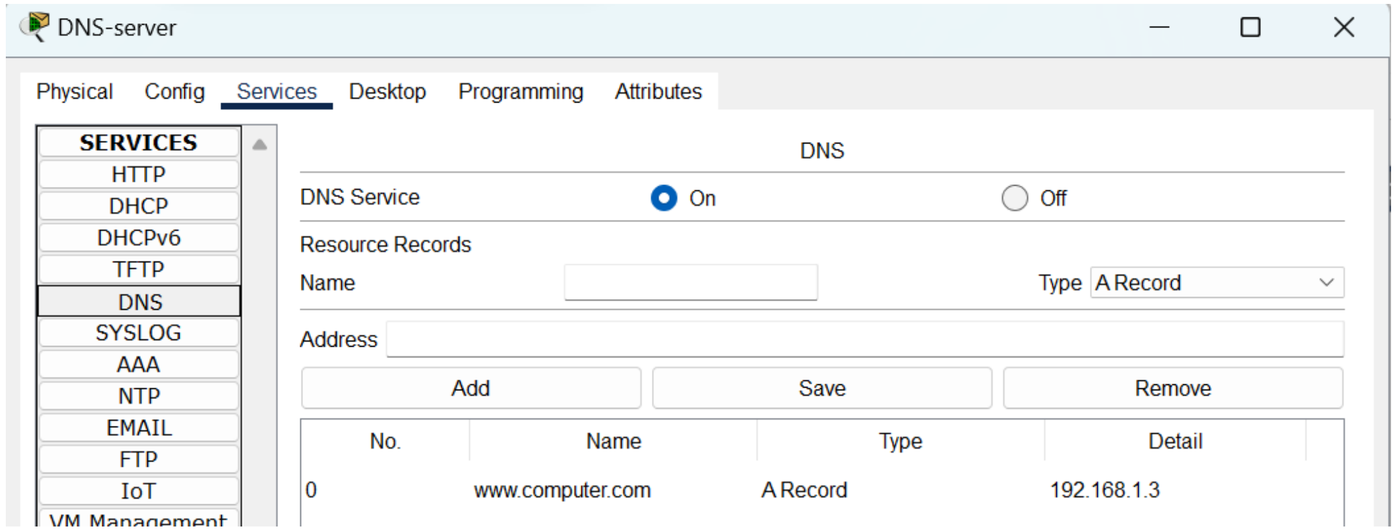
The Configuration Files

03

DNS server



DNS services



The Configuration Files

03

Firewall config :

```
firewall(config)#interface GigabitEthernet1/1
firewall(config-if)#ip address 192.168.11.1 255.255.255.0
firewall(config-if)#
firewall(config-if)#exit
firewall(config)#interface GigabitEthernet1/2
firewall(config-if)#ip address 192.168.10.2 255.255.255.0
```

The Network Security implementation

We add an authentication password to be sure just who is in charge can access the configuration file for the firewall

```
firewall(config)#enable password Coe351Net
firewall(config)#username Admin password Coe3510Net
firewall(config)#Invalid password
firewall(config)#
firewall(config)#interface GigabitEthernet1/1
firewall(config-if)#
firewall(config-if)#exit
firewall(config)#interface GigabitEthernet1/2
firewall(config-if)#nameif inside
INFO: Security level for "inside" set to 100 by default.
firewall(config-if)#Invalid password
firewall(config-if)#
firewall(config-if)#exit
firewall(config)#interface GigabitEthernet1/2
firewall(config-if)#
firewall(config-if)#exit
firewall(config)#interface GigabitEthernet1/1
firewall(config-if)#nameif outside
INFO: Security level for "outside" set to 0 by default.
```

Access Control policies:

```
firewall(config)#access-list ACL1 extended permit ip any any
firewall(config)#access-group ACL1 out interface inside
firewall(config)#
firewall(config)#access-list ACL2 extended deny ip any any
firewall(config)#access-group ACL2 in interface outside
```

The Testing Results

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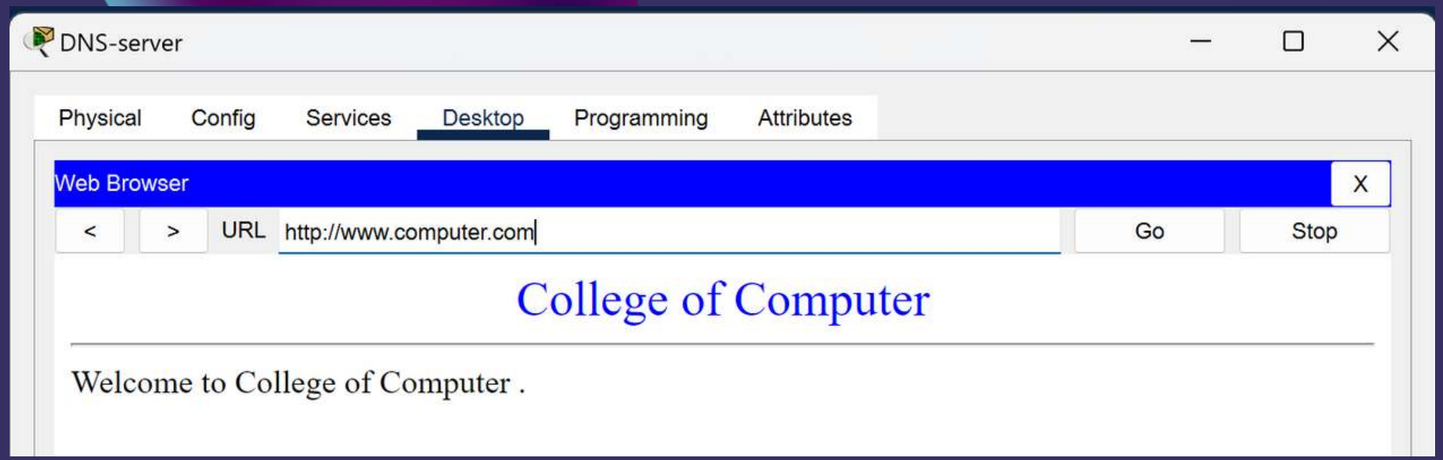
Inside and Outside testing:

PDU List Window

Fire	Last Status	Source	Destination	Type	Color	Time(sec)	Periodic	Num	Edit
	Successful	PC0	PC4	ICMP		0.000	N	0	(edit)
	Successful	PC6	Laptop0	ICMP		0.000	N	1	(edit)
	Failed	PC9	PC1	ICMP		0.000	N	2	(edit)
	Failed	PC8	PC5	ICMP		0.000	N	3	(edit)

The DNS testing:



The Testing Results

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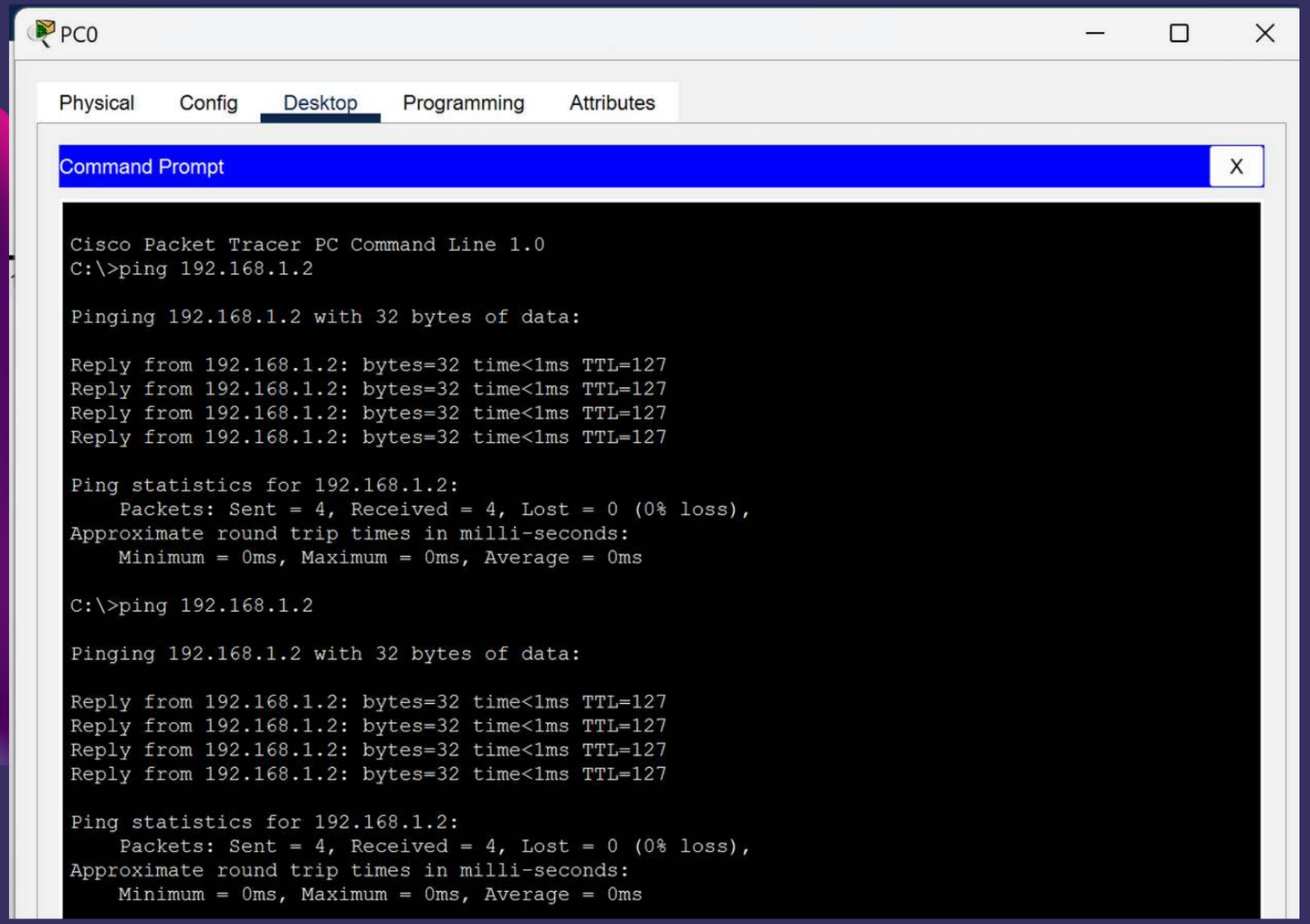
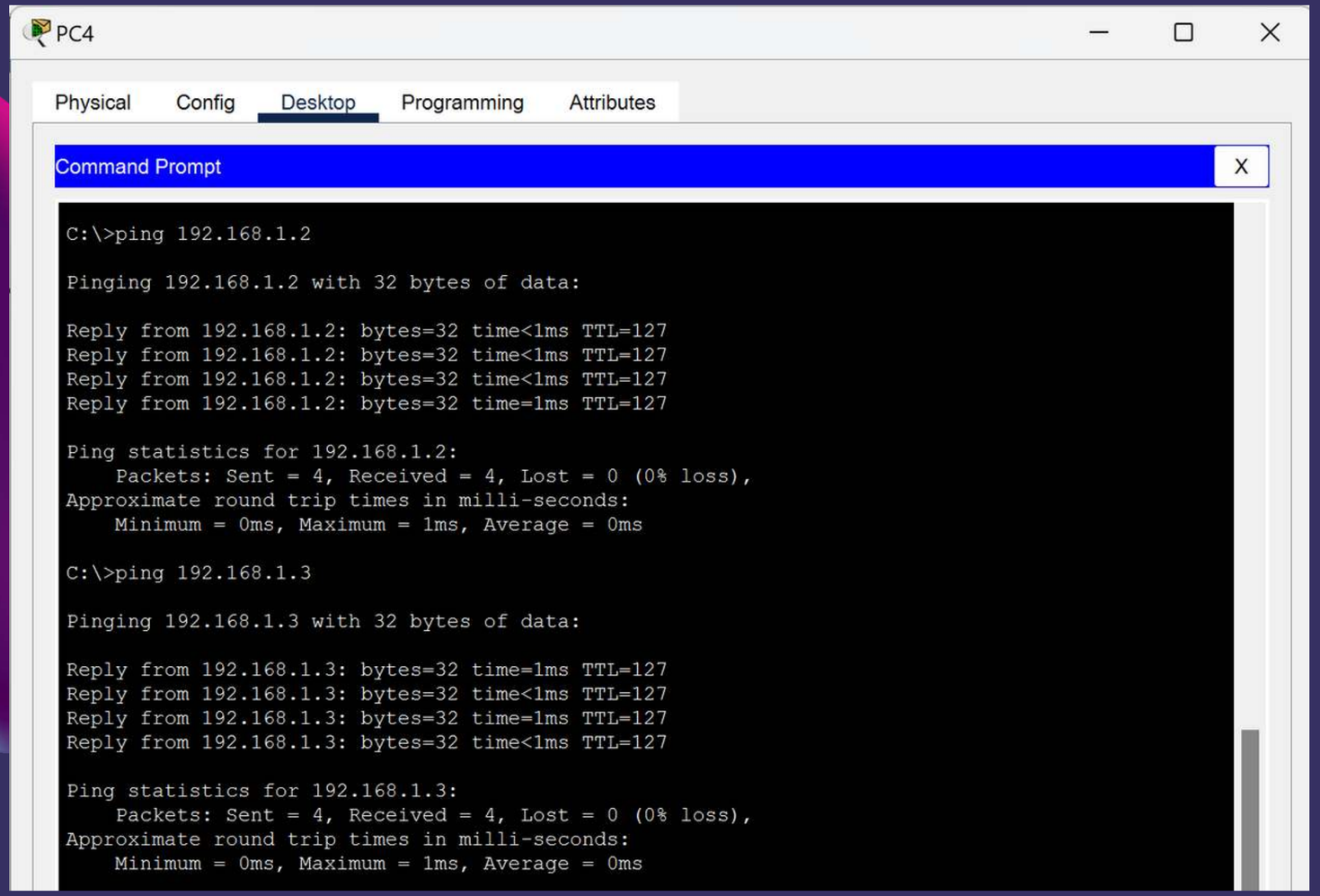
Test form the IT Department:



The Testing Results

05

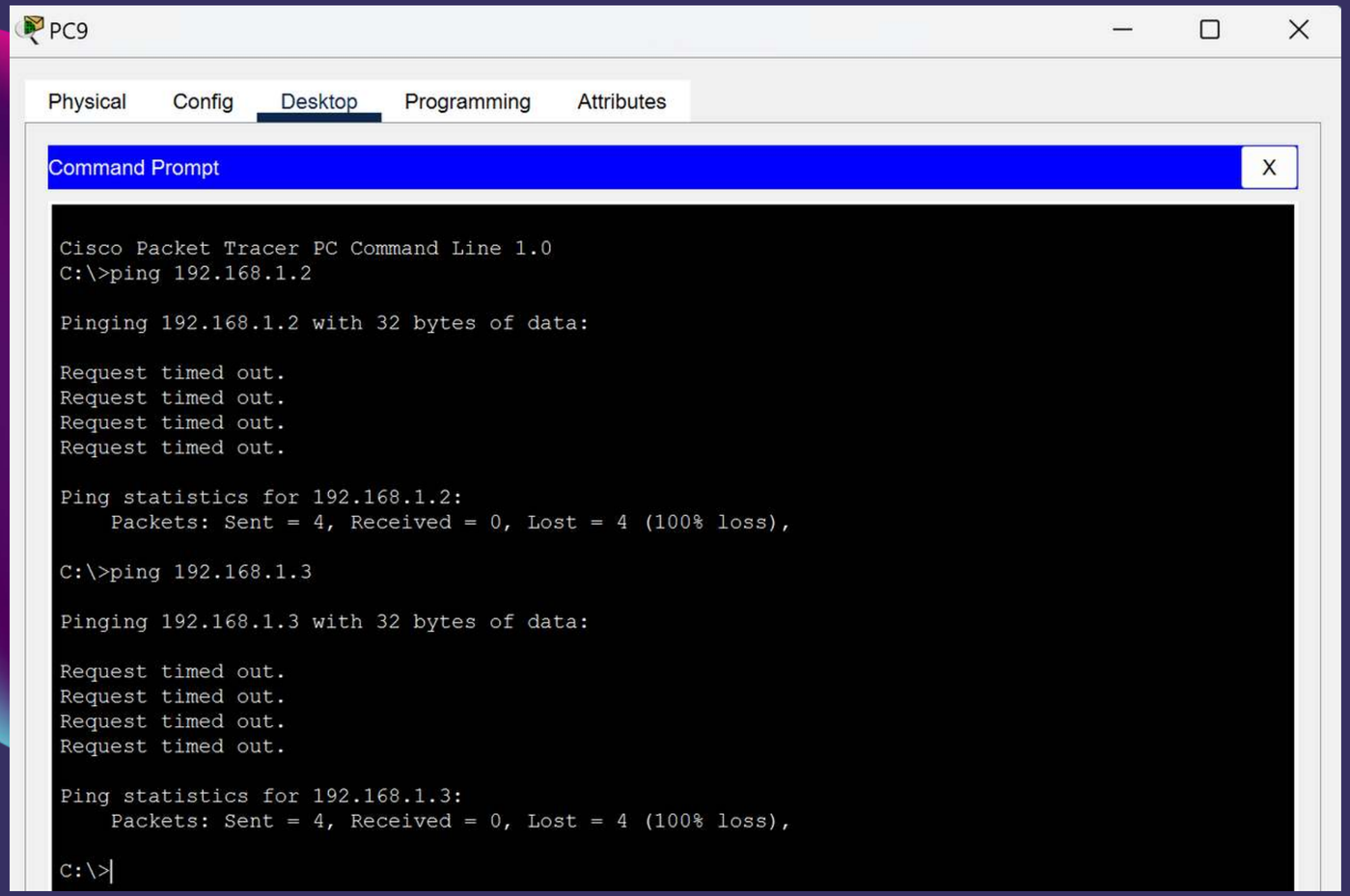
Test form the CS Department:



The Testing Results

05

Test form the Outsiders:



The Testing Results

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Test form the Firewall:

Summary

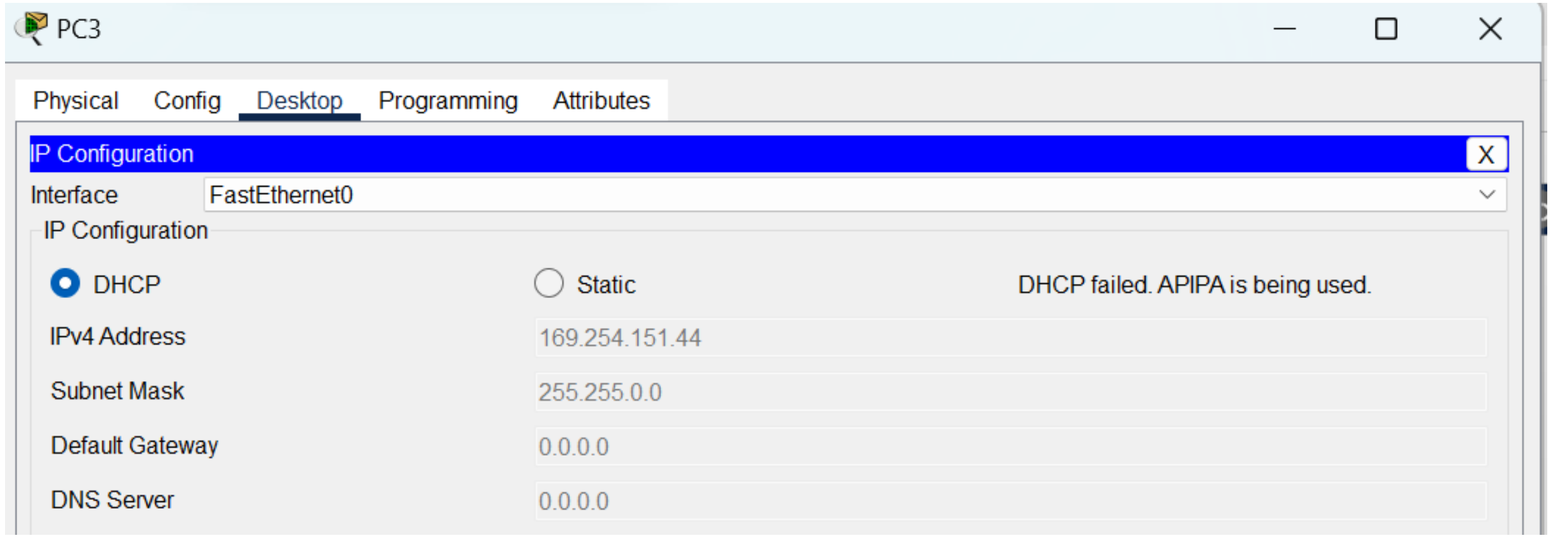
As part of the project, a basic infrastructure for Local Area Networks (LANs) was designed and implemented as part of the design and implementation process. It included a topology of a hierarchical star, IP addressing, the configuring of network devices, implementing network services, as well as basic security measures as a part of the process.

Challenges Faced

The most challenging aspects of implementation were understanding routing and subnetting, configuring network devices, and testing and troubleshooting.

Summary

We had a problem with the DHCP server it shows its failed each time we tried to implemented it as occurred in here:



So we used The ip helper-address CMD that's provides a solution to forward broadcast traffic between network subnets for DHCP.

```
Router(config)#interface GigabitEthernet1/0
Router(config-if)#ip helper-address 192.168.1.2
```

Summary

Project Implementation

The project commenced with configuring the router as the central device, assigning it a unique IP address, enabling DHCP server functionality, and configuring routing protocols. Next, each workstation and the central server were configured with appropriate IP addresses, subnet masks, and default gateways. Network services, including DHCP and DNS, were implemented to facilitate automatic IP address allocation and domain name resolution, respectively. Finally, a basic firewall was configured to restrict unauthorized access to the LAN.

Summary

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Lessons Learned

Overall, the project was a rewarding learning experience that provided practical application of computer networks concepts and enhanced my understanding of network operations. The challenges encountered served as valuable learning opportunities, allowing us to develop problem-solving and troubleshooting skills. The project reinforced the importance of thorough planning, careful configuration, and meticulous testing to ensure a functioning and secure LAN infrastructure.

THANK YOU

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