Computer Networks Project Report

Simple LAN Communication

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Submission Date: 12-05-25

1. Abstract

This project focuses on the design, implementation, and verification of a simple Local Area Network (LAN) using the Cisco Packet Tracer simulation tool. The primary purpose was to establish communication between end devices within a single broadcast domain. We utilized a Star Topology connecting multiple End Devices (PCs) and laptops to a central Switch. The methodology involved assigning static IP addresses to all PCs and laptops. The results, confirmed by successful ping commands, demonstrated functional LAN communication and the importance of correct IP addressing and connectivity in network setup.

2. Introduction

A Local Area Network (LAN) is a computer network that interconnects computers within a limited area such as a school, laboratory, or office building. The project's idea is to model and implement the most basic form of a wired LAN. Networking is fundamentally important as it allows for the sharing of resources (like printers and files) and efficient communication between users. A real-world application of this simple LAN is the network found in a small office or home, where multiple computers connect to a central device (like a switch) to communicate with each other and share a single connection to the internet.

3. Objectives

The project aims to achieve the following objectives:

- Understand LAN/Wi-Fi communication principles by implementing a wired LAN.
- Assign and configure IP addresses and subnet masks to end devices.
- Perform testing using the ping command to verify end-to-end connectivity.
- Gain hands-on experience with the Cisco Packet Tracer simulation software.

4. Tools & Software Used

The primary software and key devices used for this simulation are detailed below:
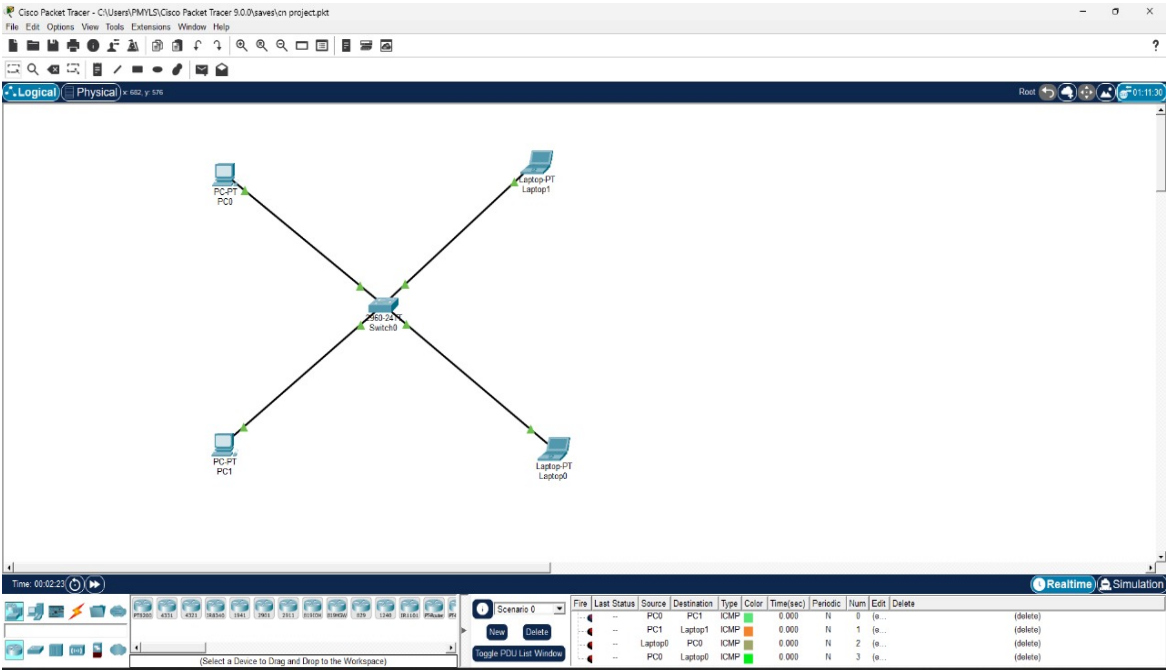
Table 1: Tools and Devices Used

Tool/Device Name	Version (or Model)	Purpose
Cisco Packet Tracer	8.2 or newer	Network simulation and configuration
Switch	2960 Series	Central device to connect all PCs and laptops in the LAN

PC (End Devices)	Generic PC	Nodes to test communication
Copper Straight-Through Cable	N/A	Connect PCs to the Switch

5. Network Topology

5.1.Topology Type: Star Topology

In this topology, every end device is individually connected to a central device, in this case, a Switch. This design is widely used in modern LANs due to its ease of setup, straightforward troubleshooting, and resilience (if one cable fails, only that single PC or laptop loses connection).

Star Topology for Simple LAN

5.2. Device List

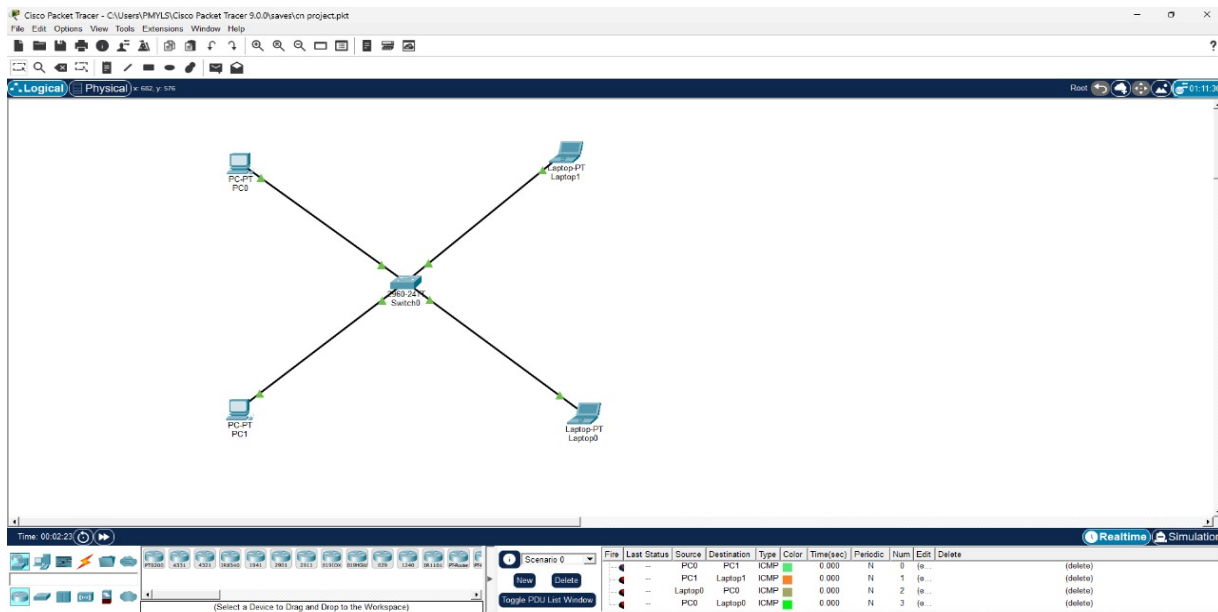Table 2: Device Addressing and Configuration

Device Name	Device Purpose	IP Address	Subnet Mask
PC-0	End Device	192.168.1.10	255.255.255.0
PC-1	End Device	192.168.1.11	255.255.255.0
Laptop-0	End Device	192.168.1.13	255.255.255.0
Laptop-1	End Device	192.168.1.12	255.255.255.0
Switch-1	Central Connection	N/A (Layer 2 device)	N/A

6. Implementation Steps

The following steps were performed in Cisco Packet Tracer to implement the simple LAN:

6.1. Topology Setup

- One Switch (2960-24TT) was added to the workspace.
- Four End Devices (PCs and Laptops) were added to the workspace.
- Copper Straight-Through Cables were used to connect each PC's FastEthernet0 port to an available port on Switch-1.
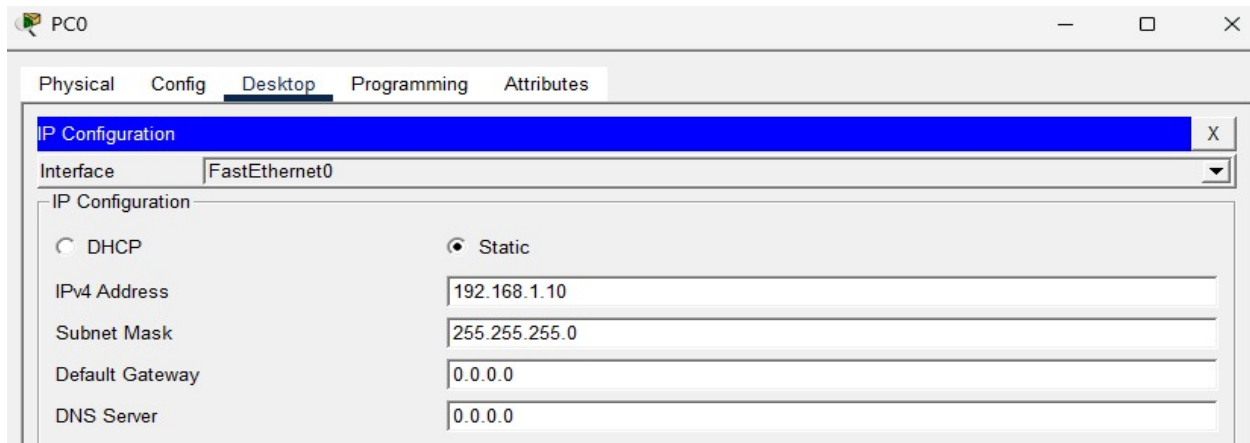

6.2. IP Address Configuration

Configuration for all PCs followed the pattern:
Click on **PC → Desktop tab → IP Configuration → Select Static**.

6.2.1 IP Address Configuration for PC-0

- Set IPv4 Address to **192.168.1.10**

- Set Subnet Mask to **255.255.255.0**
- Insert screenshot of PC-0 IP Configuration window

6.2.2 IP Address Configuration for PC-1

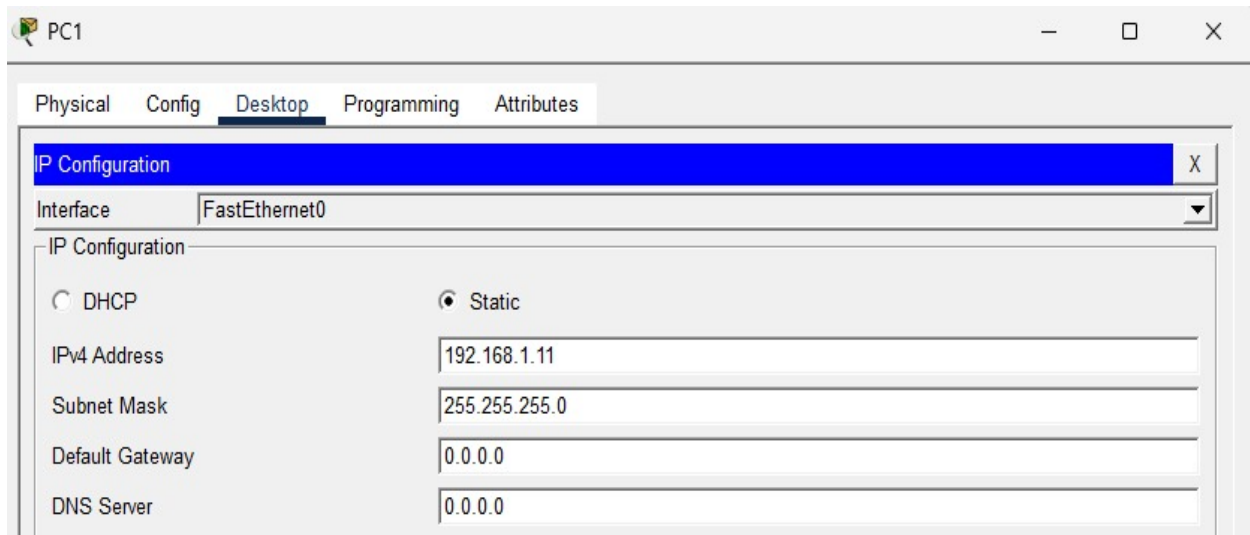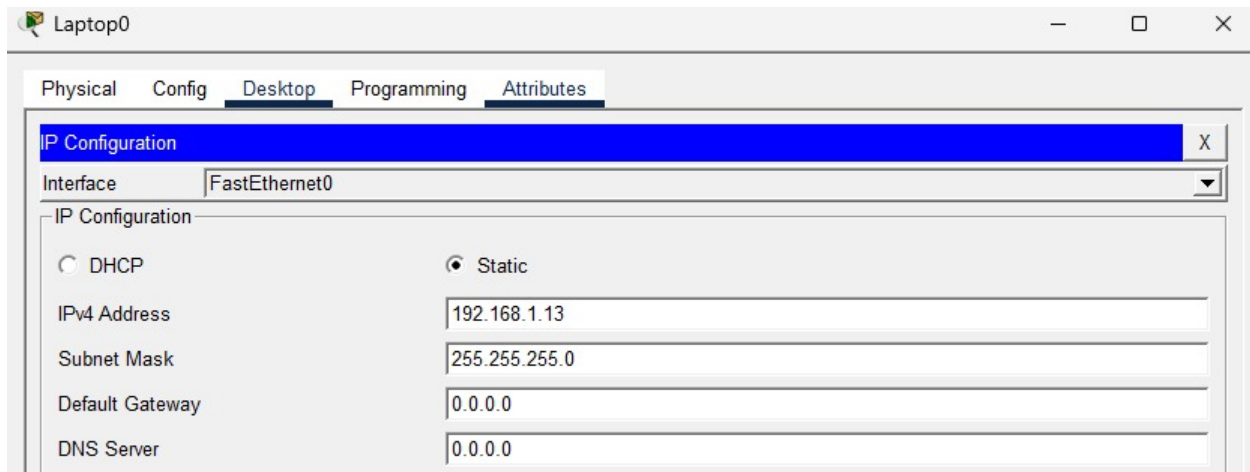- Set IPv4 Address to **192.168.1.11**
- Set Subnet Mask to **255.255.255.0**
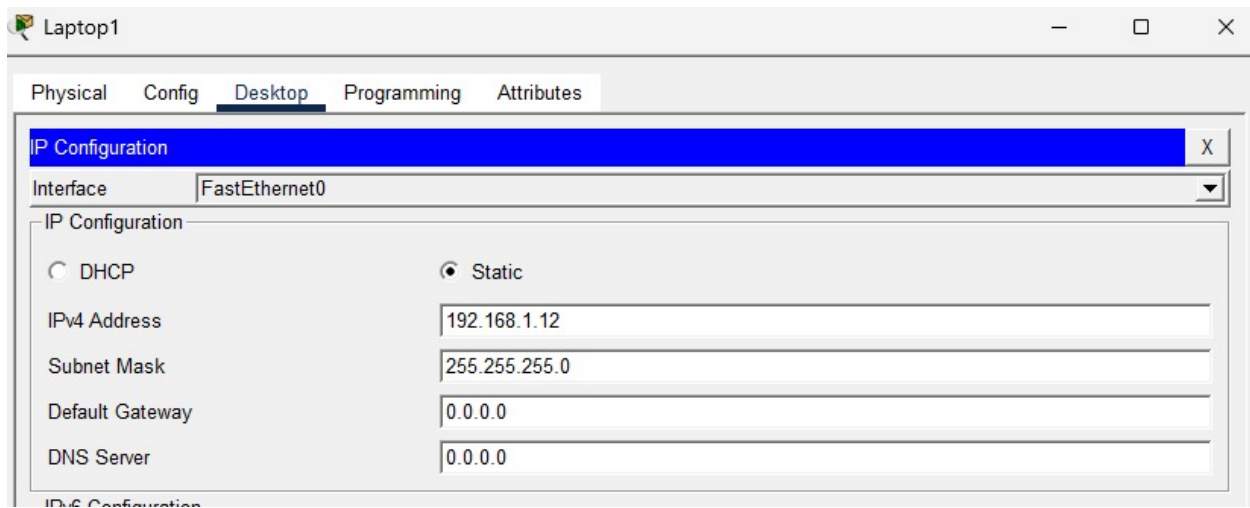- Insert screenshot of PC-1 IP Configuration window

6.2.3. IP Address Configuration for Laptop-0

- Set IPv4 Address to **192.168.1.13**
- Set Subnet Mask to **255.255.255.0**
- Insert screenshot of laptop-0 IP Configuration window

6.2.4. IP Address Configuration for Laptop-1

- Set IPv4 Address to **192.168.1.12**
- Set Subnet Mask to **255.255.255.0**
- Insert screenshot of Laptop-1 IP Configuration window

7. Simulation & Testing

Network connectivity was tested using the **ping** command from the Command Prompt of one PC to the IP address of another PC.

7.1.Ping Command Execution

- Click on PC-0 → Desktop tab → Command Prompt

- Execute the command:
- `ping 192.168.1.10`

7.2. Ping Results

```
PC0                                                      —    □

Physical   Config   Desktop   Programming   Attributes

Command Prompt

Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.10

Pinging 192.168.1.10 with 32 bytes of data:

Reply from 192.168.1.10: bytes=32 time=10ms TTL=128
Reply from 192.168.1.10: bytes=32 time<1ms TTL=128
Reply from 192.168.1.10: bytes=32 time=4ms TTL=128
Reply from 192.168.1.10: bytes=32 time=1ms TTL=128

Ping statistics for 192.168.1.10:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 10ms, Average = 3ms

C:\>
```

Table 3: Ping Test Results

Ping Test	Result (Expected)	Observations
PC-0 (192.168.1.10) to PC-1 (192.168.1.11)	Success (4/4 packets received)	The devices successfully communicated within the LAN; reply time was minimal.
Laptop-0 (192.168.1.13) to PC-0 (192.168.1.10)	Success (4/4 packets received)	Confirms bidirectional communication between PC-2 and PC-1.

8. Results & Discussion

The simulation successfully established a fully functional simple LAN. The ping tests returned 100% success rates, confirming that all end devices (PC-0, PC-1, Laptop-0 and laptop-1) could communicate with each other through the central Switch-1.

8.1. Successes

- Correct application of the Star Topology

- Successful static IP addressing within the same subnet (192.168.1.0/24)
- Verified communication using the ping command

8.2. Challenges and Solutions

Challenge: Initial testing resulted in a "Destination Host Unreachable."

Solution: This was traced back to an incorrectly typed IP address (192.168.1.110 instead of 192.168.1.10). Correcting the IP address resolved the issue immediately.

9. Conclusion

The project successfully met all objectives, demonstrating a practical understanding of basic LAN communication and IP address configuration using Cisco Packet Tracer. The simple Star Topology proved to be an effective architecture for connecting a small number of devices. The success of the ping tests validated the design and implementation.

9.1. What Was Learned

- The function of a Switch as a Layer 2 device in a LAN
- The necessity of end devices being on the same IP subnet
- The use of the ping command as a basic troubleshooting tool

9.2. Future Improvements

- Implementing a DHCP Server for automatic IP address assignment
- Adding a Router for inter-LAN communication
- Integrating a Wireless Access Point for Wi-Fi support

10 References

- Classroom materials/Lecture notes on Computer Networks.

- Cisco Networking Academy documentation.

- Books: [COMPUTER NETWORKS]

- Websites: https://stackoverflow.com/questions/33502851/simple-communication-in-a-lan

    https://www.geeksforgeeks.org/computer-networks/how-to-set-up-a-lan-network/