IT INFRASTRUCTURE LAB PROJECT

NEW BRANCH OFFICE SETUP

Local Area Network (LAN) Configuration

Scenario:

The IT team must connect three PCs to share files in a new office

Lab Environment: Cisco Packet Tracer

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1. Executive Summary

This project documents the setup and configuration of a Local Area Network (LAN) for a new branch office. The primary objective is to enable three workstations (PCs) to communicate and share files through a centralized network infrastructure. Using Cisco Packet Tracer as the simulation environment, this lab demonstrates fundamental networking concepts including physical connectivity, IP addressing, subnet configuration, and connectivity verification.

The project also includes an analysis of a common configuration error, subnet mismatch which prevents devices from communicating despite being physically connected to the same switch. This error analysis serves as a practical learning experience for understanding Layer 3 networking principles.

2. Project Objectives

1. Design and implement a functional LAN topology for a small branch office
2. Configure static IP addresses on all network devices
3. Establish network connectivity between three PCs using a switch
4. Verify communication using ping commands
5. Document and analyze common configuration errors that may arise
6. Develop troubleshooting skills for network connectivity issues

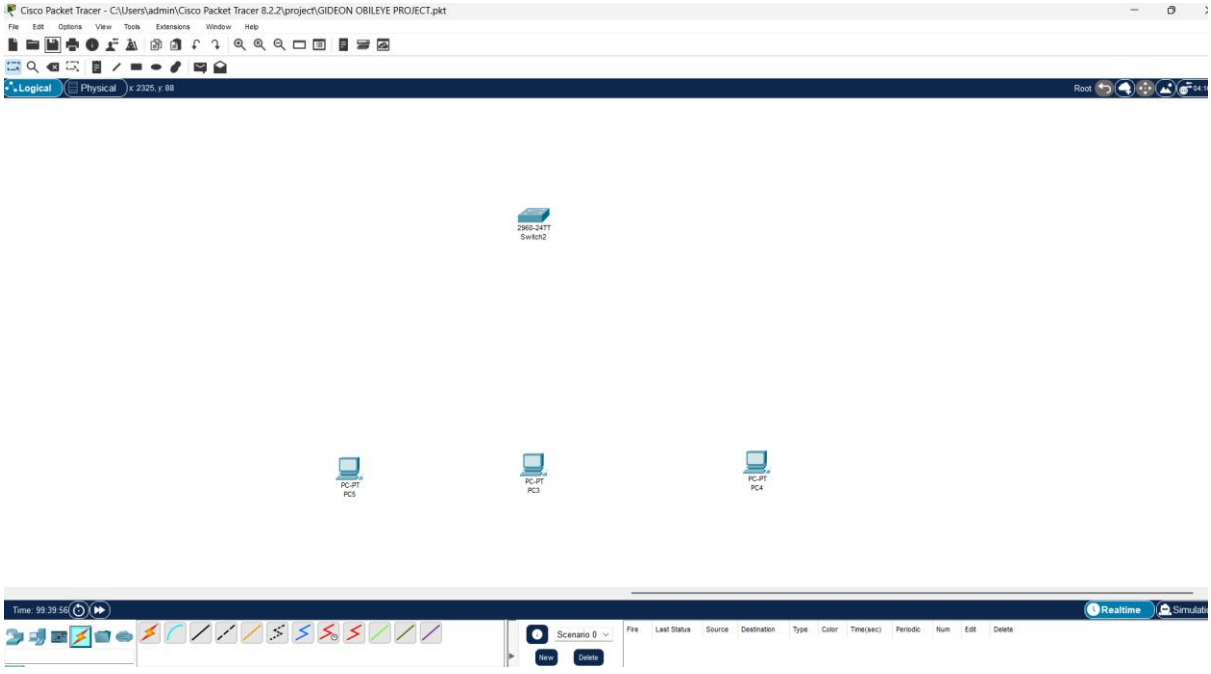
3. Equipment and Requirements

3.1 Software Requirements

- Cisco Packet Tracer

3.2 Virtual Hardware Components

Device	Quantity	Description
Cisco 2960-24TT Switch	1	24-port Layer 2 managed switch
PC-PT (End Device)	3	PC (Alpha, Beta, Gama)
Straight-Through Cable	3	FastEthernet connections



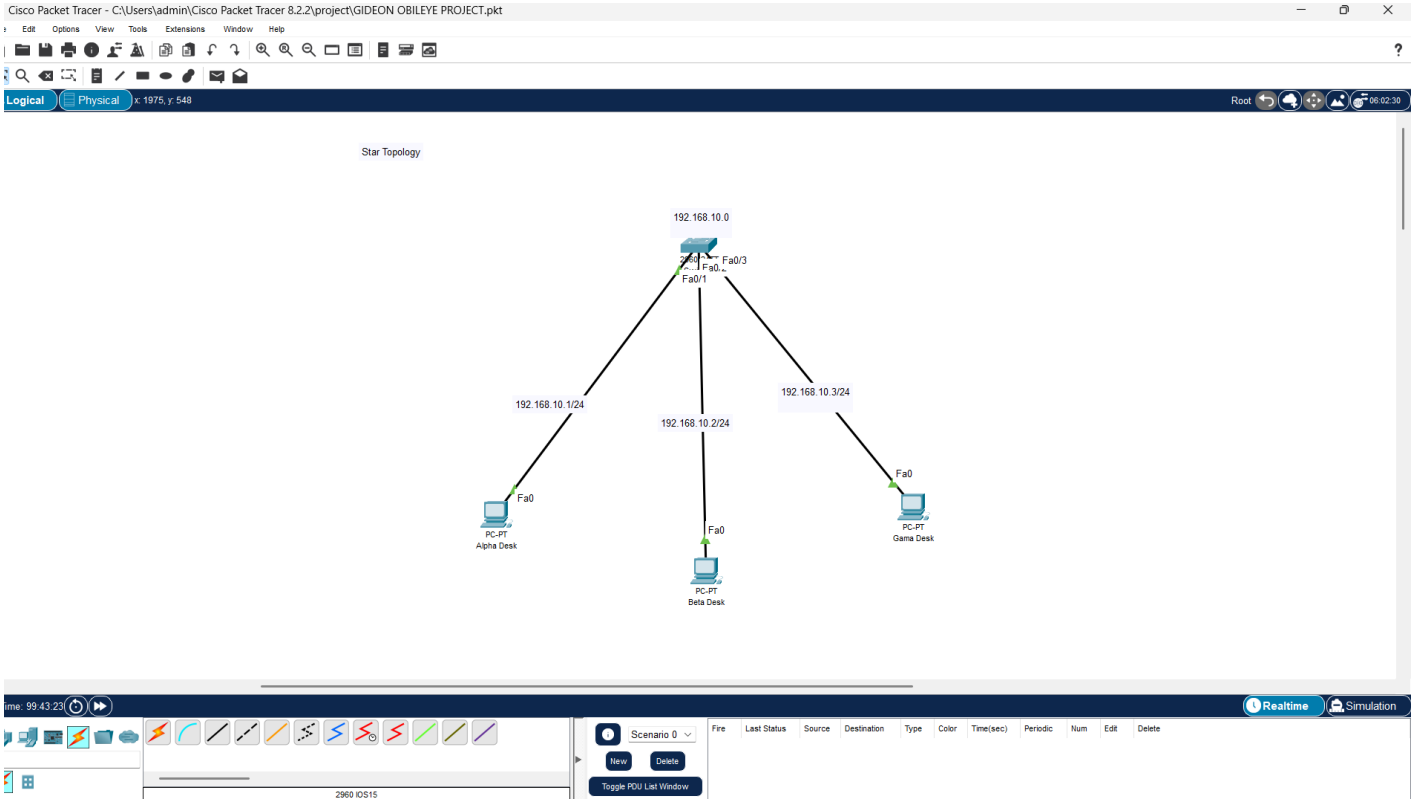
4. Network Design and Topology

4.1 Topology Type

This implementation uses a **Star Topology**, where all PCs connect to a central switch. This topology offers several advantages for small office environments including centralized management, easy troubleshooting, fault isolation (one failed connection doesn't affect others), and simple scalability.

4.2 Physical Connection Map

Device	Interface	Connects To	Switch Port
PC Alpha	Fa0	Switch0	Fa0/1
PC Beta	Fa0	Switch0	Fa0/2
PC Gama	Fa0	Switch0	Fa0/3



5. Implementation Procedure

5.1 Step-by-Step Setup

Step 1: Launch Cisco Packet Tracer

Open Cisco Packet Tracer and create a new project workspace.

Step 2: Add Network Devices

From the device panel, add the following devices to the workspace:

- Navigate to Network Devices => Switches => 2960 and drag a 2960-24TT switch
- Navigate to End Devices => PC-PT and add three PCs

Step 3: Connect Devices

Use Straight-Through cables to connect each PC to the switch:

- Click Connections => Straight-Through
- Click PC0 (FastEthernet0) => Click Switch0 (FastEthernet0/1)
- Repeat for PC1 (to Fa0/2) and PC2 (to Fa0/3)
- I will name PC0 Alpha. PC1 Beta and PC2 Gama Respectively for the cause of this project

Step 4: Configure IP Addresses

Configure static IP addresses on each PC as detailed in Section 6.

6. IP Address Configuration

6.1 Correct Configuration (All devices on same subnet)

Device	IP Address	Subnet Mask	Network
Alpha	192.168.10.1	255.255.255.0	192.168.10.0/24
Beta	192.168.10.2	255.255.255.0	192.168.10.0/24
Gama	192.168.10.3	255.255.255.0	192.168.10.0/24

6.2 Configuration Steps for Each PC

1. Click on the PC to open its configuration window
2. Navigate to Desktop => IP Configuration
3. Select "Static" for IP configuration
4. Enter the IP Address and Subnet Mask as per the table above
5. Close the configuration window

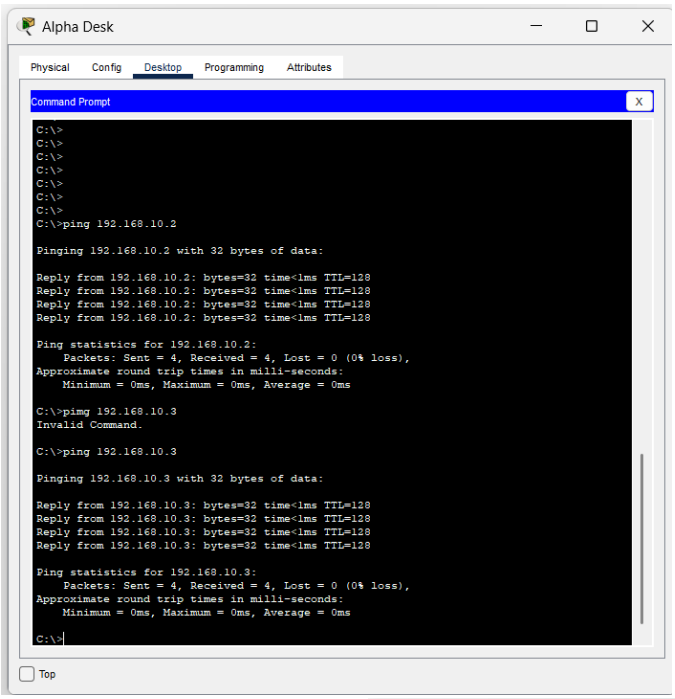
7. Connectivity Testing and Verification

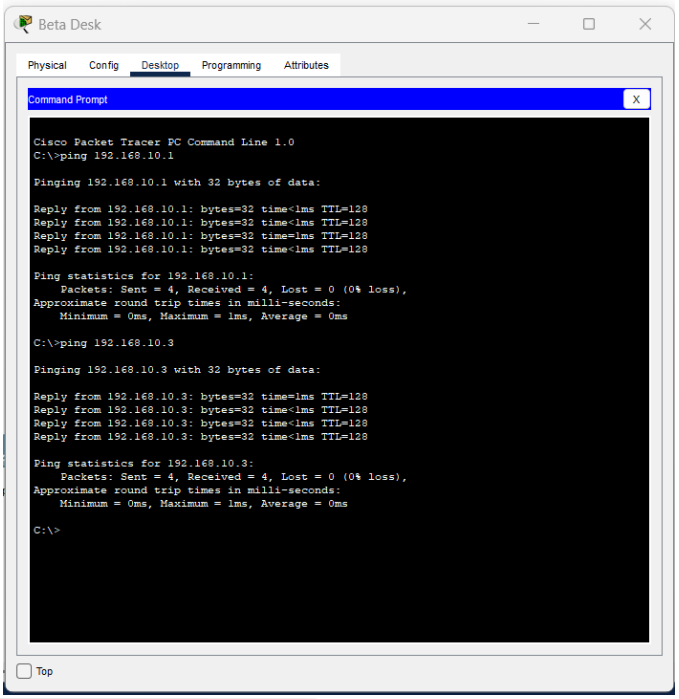
7.1 Testing Procedure

To verify connectivity, use the ping command from the Command Prompt on each PC:

6. Click on PC(Alpha) => Desktop => Command Prompt
7. Type: ping 192.168.10.2 (to test connectivity to “PC Beta”)
8. Type: ping 192.168.10.3 (to test connectivity to “PC Gama”)
9. Repeat from other PCs to ensure full mesh connectivity

7.2 Expected Results (Successful Configuration)





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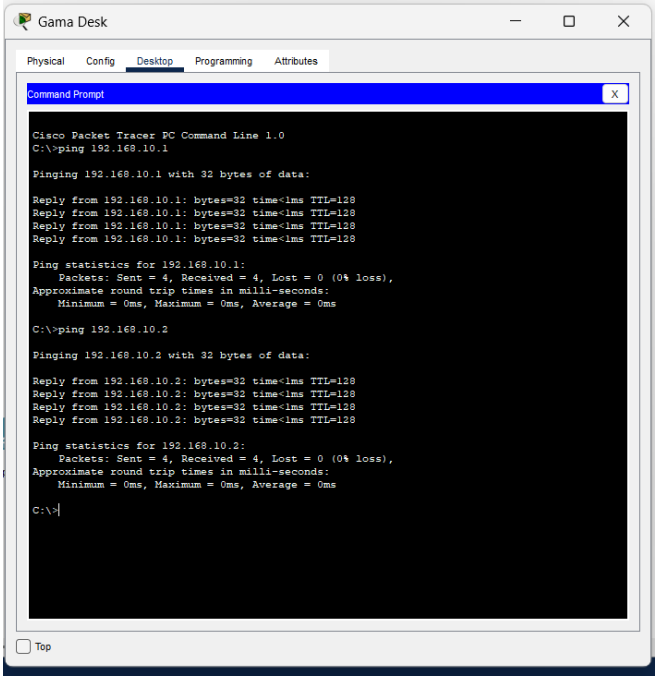
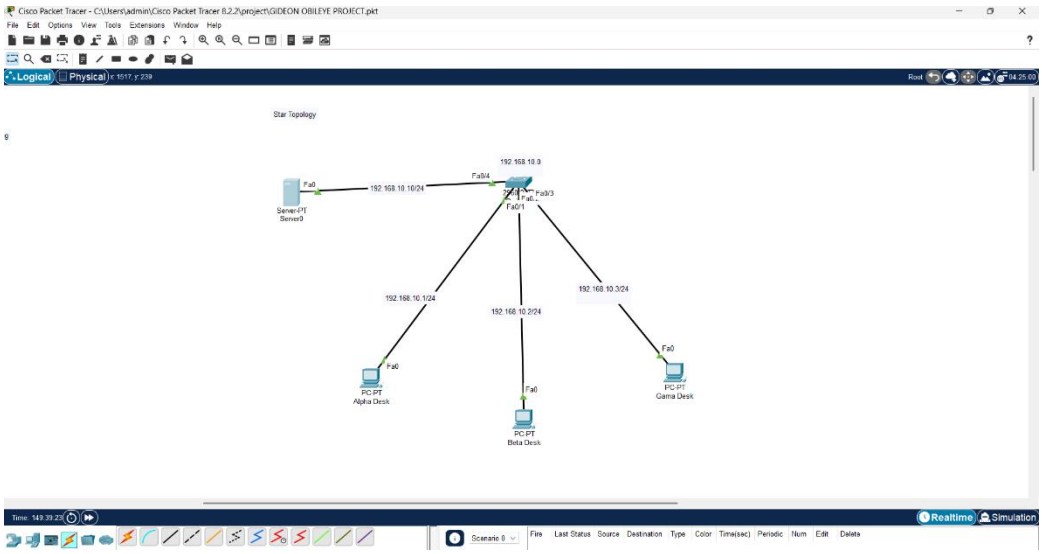


8. Basic File Sharing Setup

In the cause of this project, I will be adding a Server0 to the switch with its IP *within the same network using a straight-through cable to enable file sharing for the PCs in the network. Our new connection will look like this:

Device		Switch Interface		IP/Subnet Mask
Alpha	=>	Switch Fa0/1	=>	192.168.10.1/255.255.255.0
Beta	=>	Switch Fa0/2	=>	192.168.10.2/255.255.255.0
Gama	=>	Switch Fa0/3	=>	192.168.10.3/255.255.255.0
Server0	=>	Switch Fa0/4	=>	192.168.10.10/255.255.255.0

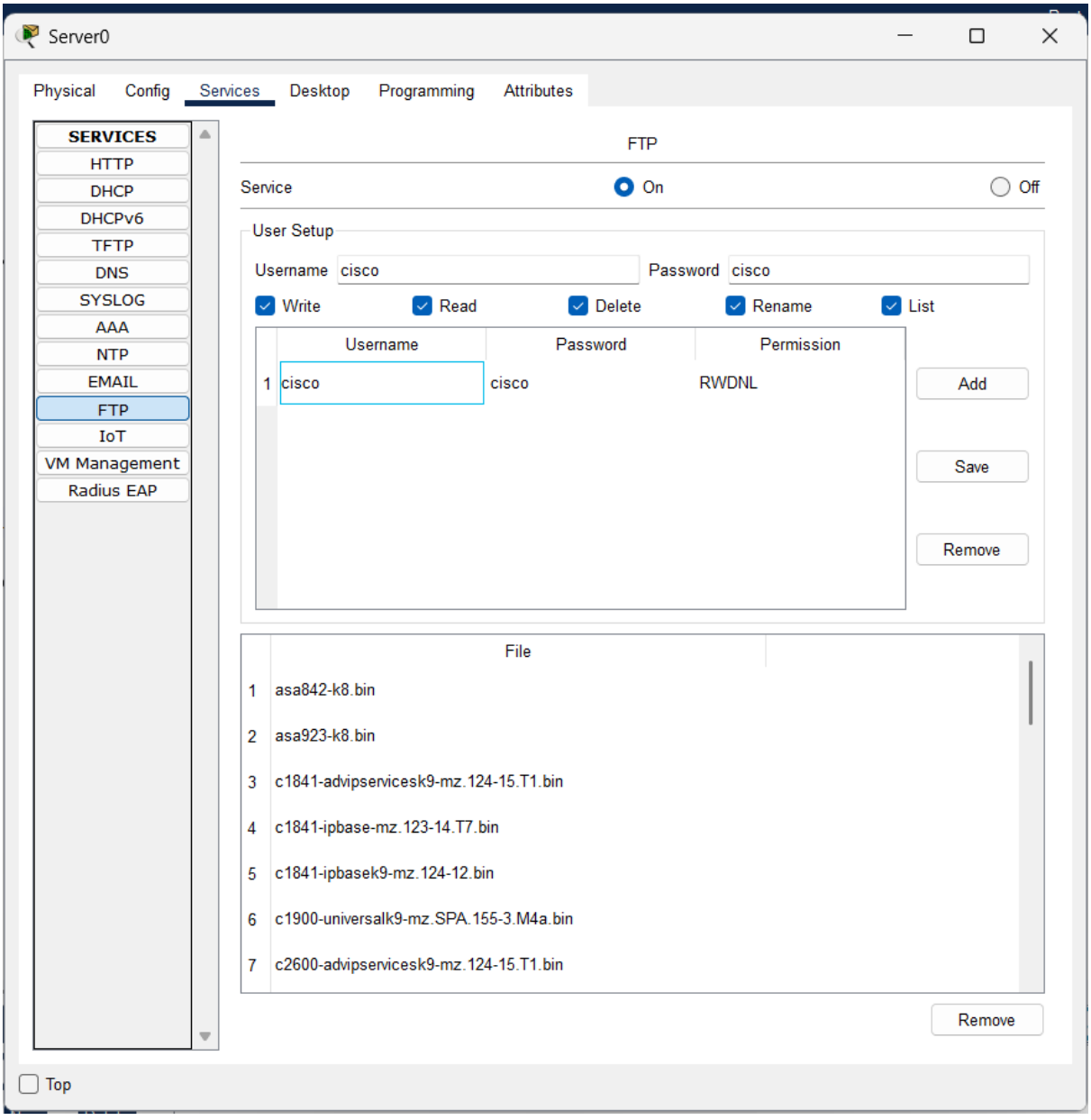


The Packet Tracer supports three main file-sharing services:

- **FTP (File Transfer Protocol):** Used to uploading and downloading files

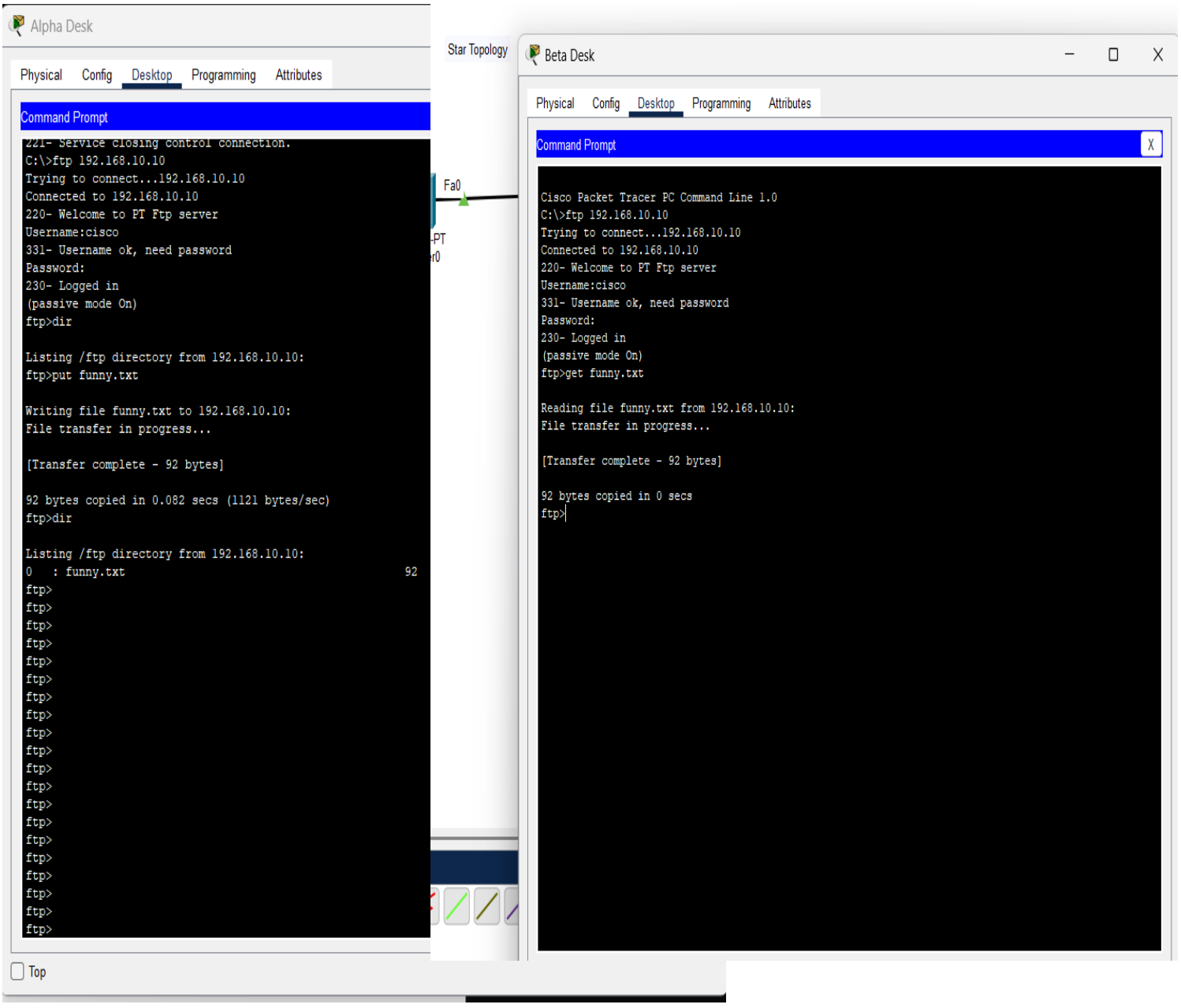
To enable FTP for file sharing we use these 5 steps

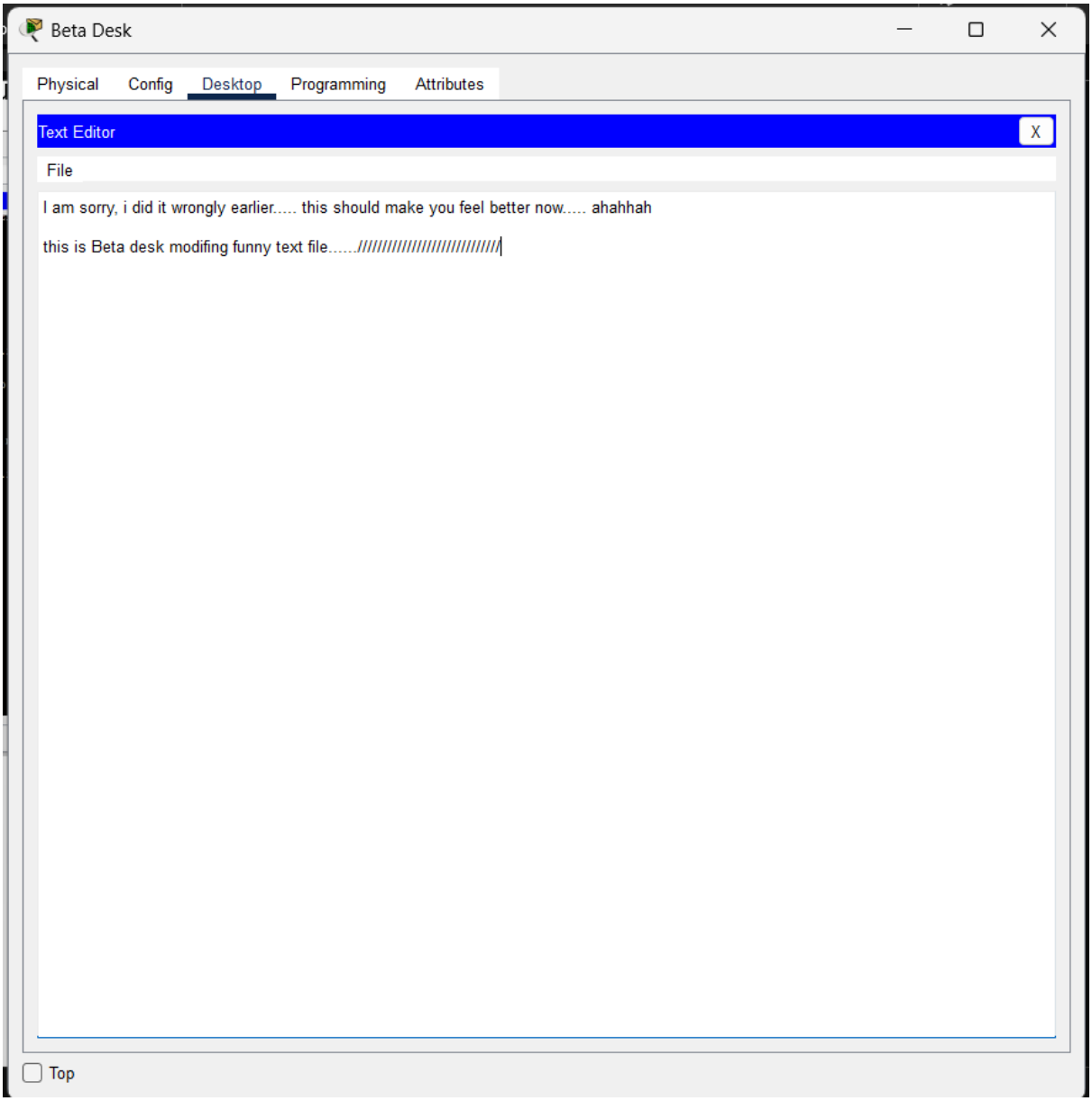
1. Click on the Server
2. Go to Services tab
3. Select FTP from the left menu
4. Toggle FTP Service ON
5. Add files to share: Click Add File, Browse/Create a File (e.g “notes.txt”), Save.
   Note: Username and Password can also be added to make it secured to prevent file from unauthorized access



Accessing files via FTP, we need to do the following: On PC => Desktop tab => Open Command Prompt (Type ftp 192.168.10.10) input username/password if set => Use FTP commands.

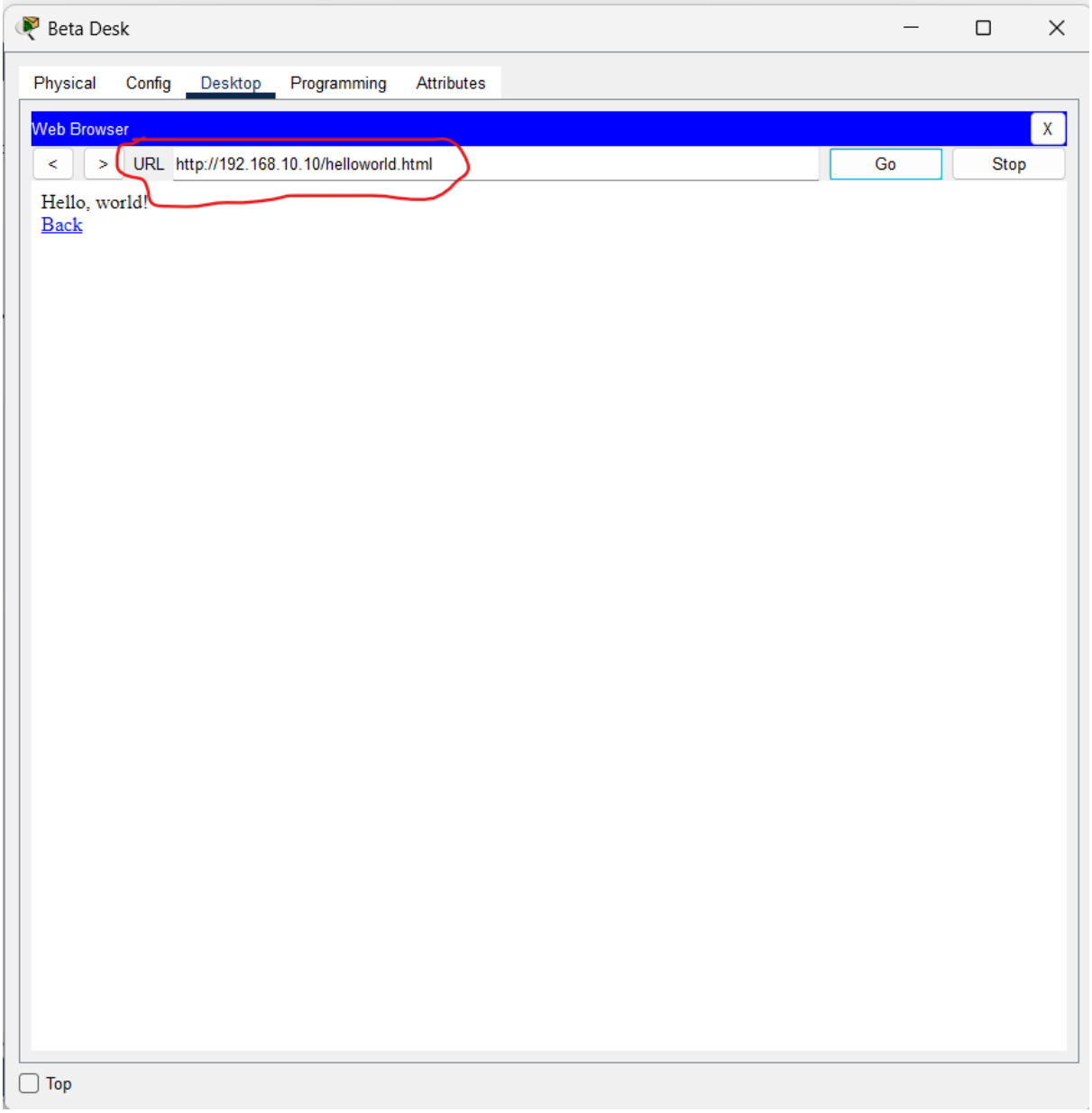
Command		**Function**
dir	=>	View shared files
get filename	=>	Download file
put filename	=>	Upload file
lcd	=>	Change local Directory
delete filename	=>	Delete file on server
quit	=>	exit ftp





This show BetaDesk PC accessing and modifying the shared file from AlphaDesk Pc with the ftp method through the server on the same network 192.168.10.0

- **Http:** Basically for file access via browser
  Using this method to access a shared file from the browser, we need to do the following: Go to any PC(Within a network) => Desktop tab => Web Browser(Type Server IP in url) http://192.168.10.10 => Download file from the page if HTTP is enabled



After creating a new file on the server, we were able to access it from BetaDesk PC which happens to be on the same Network with the server.

- **TFTP:** For lightweight file transfers. When accessing files via TFTP we use the following: PC => Desktop tab => Open Command Prompt => Use the command to download files into the pc (tftp 192.168.10.10)

9. Common Configuration Error Analysis

During network setup, various configuration errors can prevent devices from communicating. This section documents a critical error that is commonly encountered: **Subnet Mismatch Error**.

9.1 Error Description: Subnet Mismatch

In this error scenario, all three PCs are physically connected to the same switch, but they are configured on different subnets, making communication impossible without a switch.

A Wrong Type of Configuration

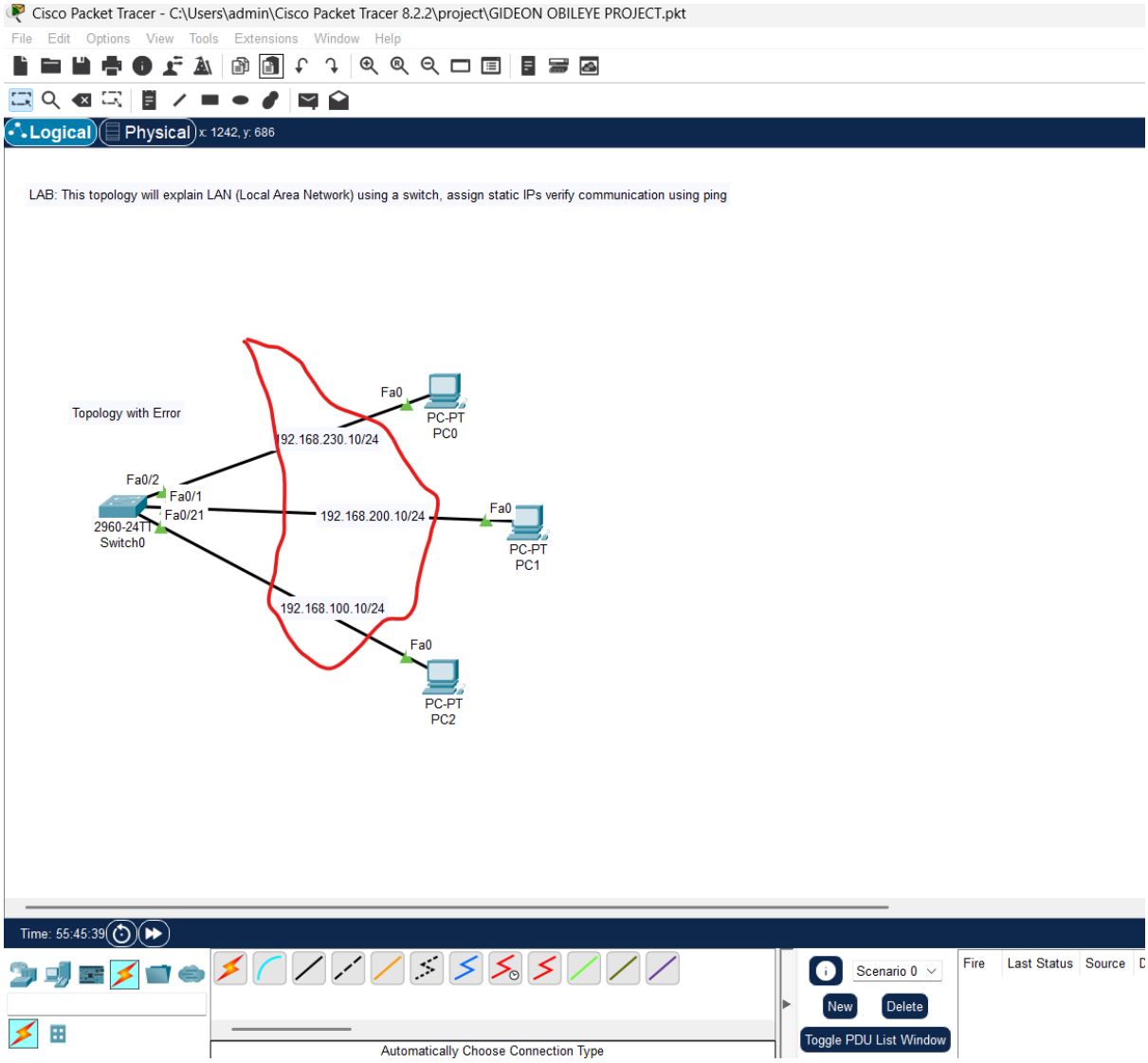
Device	IP Address	Subnet Mask	Network
Alpha	192.168.230.1	255.255.255.0	192.168.230.0/24
Beta	192.168.200.1	255.255.255.0	192.168.200.0/24
Gama	192.168.100.1	255.255.255.0	192.168.100.0/24

9.2 Why This Error Occurs

Understanding the technical reason behind this error:

- A /24 subnet mask (255.255.255.0) means only devices with matching first three octets can communicate directly
- Each PC is on a different network by their IP configurations: 192.168.230.0, 192.168.200.0, and 192.168.100.0
- A Layer 2 switch only forwards frames within the same broadcast domain and cannot route between subnets
- Without a Layer 3 device (router), inter-subnet communication is impossible

Hence, files can’t be shared between PCs because there is no communication between them



9.3 Solutions

Solution: Reconfigure All PCs to Same Subnet

Change all IP addresses to be within the same network range (e.g., 192.168.10.0/24). This is the simplest and most appropriate solution for a small office LAN where all devices need to communicate.

10. Troubleshooting Guide

When network connectivity fails, follow this systematic troubleshooting approach:

1. **Verify Physical Connections** – Check that all cables show green indicators (both lights should be green, not amber)
2. **Check IP Configuration** – Use 'ipconfig' command on each PC to verify IP address and subnet mask
3. **Verify Subnet Consistency** – Ensure all devices are on the same subnet (first three octets match for /24)
4. **Test Local Interface** – Ping 127.0.0.1 (localhost) to verify TCP/IP stack is working
5. **Ping Own IP** – Ping the device's own IP address to verify NIC configuration
6. **Ping Target Device** – Attempt to ping other devices on the network
7. **Check for Duplicate IPs** – Ensure no two devices share the same IP address

11. Conclusion and Key Learnings

This project successfully demonstrated the setup of a Local Area Network for a new branch office environment. Through the implementation and analysis of both correct and incorrect configurations, I have been able to highlighted several key networking principles.

Key Learnings

- Physical connectivity alone is insufficient for network communication rather proper Layer 3 (IP) configuration is essential
- All devices on the same LAN segment must be on the same subnet to communicate directly
- Switches operate at Layer 2 and cannot route traffic between different subnets
- Systematic troubleshooting from physical layer upward is the most efficient approach to diagnosing connectivity issues
- Documentation and planning before implementation help prevent configuration errors

The subnet mismatch error analyzed in this project represents one of the most common mistakes made during network setup. Understanding why this error occurs and how to resolve it is essential for any IT professional working with network infrastructure.

End of Project Report