Proposed By :
- **M.Muzzamal**
- **Imran Ali**

Date :
31 Dec, 2024

Group:
Group#09

Computer Networking

Remote Access with Telnet

(Configure Telnet for Remote Access to Network Devices)

Submitted to:
Mam Shehrish

Semester Project Report: Remote Access with Telnet

Table of Contents

1. **Introduction**
   - Objectives of the project
   - Project overview
2. **Scope of Object**
3. **Requirements**
   - Hardware requirement
     - router specification
     - switch specification
   - Software requirement
     - Operator system
     - Network configuration tool
   - Basic Knowledge
4. **Network Design and Topology**
   - Logical Topology
   - Physical Topology
5. **Arrangement of Devices and Connections**
   - selection of devices
   - Arrangement of devices
   - Connections
   - Connection Media
6. **Configuration Step**
   - Configure Routers
     - Assign IP Addresses to Router Interfaces
     - Configure Serial Interfaces
     - Enable Routing
   - Configure Switches
     - Basic IP configuration
   - Configure Telnet on Routers
     - Enable Telnet Access
   - Test Network Connectivity
     - Ping Across Subnets
     - Test Telnet Access
7. **Network and analysis**
   - **Network performance evolution**
     - Latency and Response Time:
     - Throughput:
     - Connectivity:
     - Reliability:
     - Reliability:
   - **Achievements**
     - Telnet Access:
     - Effect on Routing:

        - Device Integration:
        - Enhanced Security:
        - Testing:
    - **Problems**
        - Initial Misconfigurations:
        - Telnet Security Issues:
        - Cable Management:
        - Troubleshooting Time:
        - Scalability

8. Conclusion

- Summary of the project
- Key learnings
    - Network Design and Topology:
    - Routing Configuration:
    - Remote Access Management:
    - Troubleshooting Skills:
    - Security Awareness:
    - Teamwork and Planning:

Remote Access of Telnet

Introduction

Objective:

This network is aimed at showing how to configure and use remote access using Telnet in a multi-subnet environment. With three routers, three switches, and nine PCs, the network is capable of communication between
subnets, and the management and monitoring of routers are possible over the internet. This network setup brings out some key concepts in networking, including IP addressing, routing, and Telnet configuration to provide centralized control and troubleshooting capabilities. The project puts forward the significance of remote management in modern networks and provides a scalable and practical solution for real-world applications.

Overview:

The reason for the design of such a network is to make exploration and configuration of Telnet in addition to knowledge about Digital Logic Circuits, so the configuration setting up remote connections for this purpose would communicate over this network securely and efficiently while accessing the resources. Courses covered by the Digital Circuit Course are very basic aspects such as gates, combining, additive, subtractive circuits plus small and medium-scale integrations. These areas combine to provide a comprehensive understanding of both networking protocols and digital circuit design.

Scope of this network

- **Telnet Setup and Configuration:** Focus on establishing and configuring Telnet for remote network access, enabling secure and efficient communication with network devices.
- **Design of Digital Logic Circuits:** Involves creating and analysing digital logic circuits using basic gates and combinational logic to form functional units within the system.
- **Combinational Circuit Optimization:** Focus on optimizing circuits like adders, subtractors, multiplexers, and decoders for efficient performance in digital systems.
- **Network Security Implementation**: Implement measures to secure Telnet connections and the overall network, including encryption, authentication, and access controls.

- **Integration of Network and Digital Systems:** Ensure the seamless integration of digital logic systems with the network, enabling reliable communication and data processing across the network infrastructure.

Requirement

Hardware requirement:

- **Client-side devices:** PC, Laptop, or any device for running telnet client application.
- **Server-**side devices: A server that supports telnet services.

Software requirement:

- **Network Configuration Tool**: Cisco Packet Tracer or GNS3 for network simulation (or a real network device for hands-on implementation).
- **Operating System**: Windows/Linux for PC.

Basic Knowledge:

- Understanding of basic networking concepts such as IP addressing, sub-netting, routing, and switch configuration.
- Familiarity with **Cisco's IOS command-line interface.**

Network Design and Topology

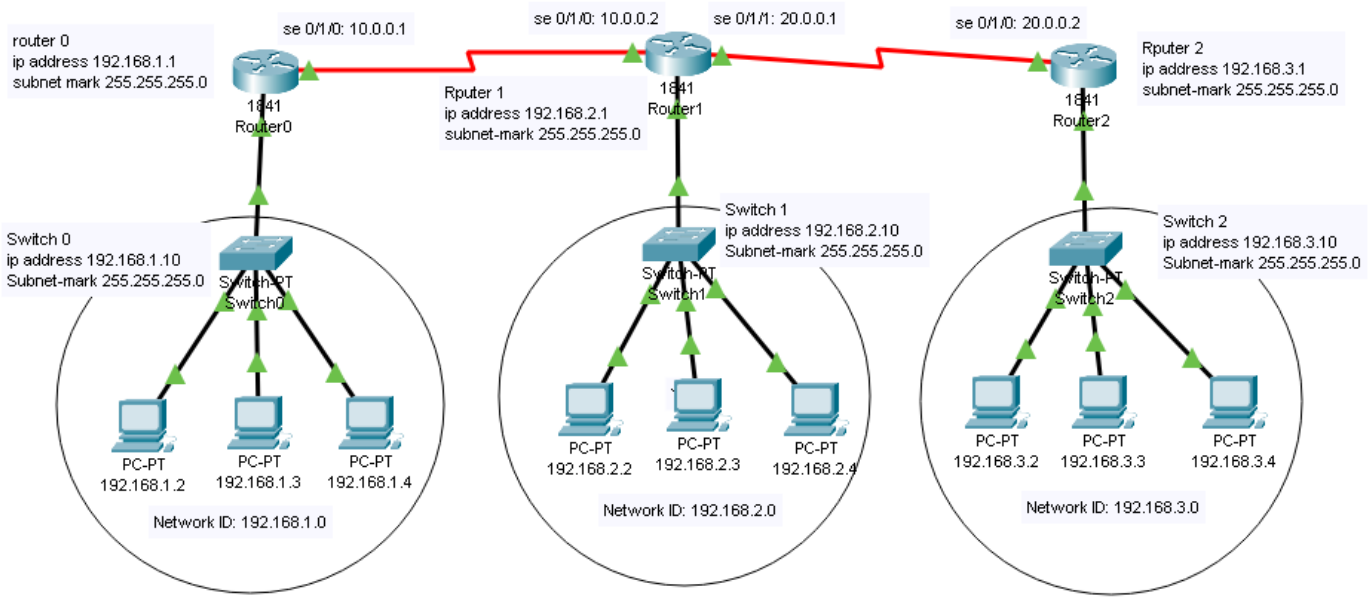
Logic Topology:

The network consists of three subnets connected via routers, forming a hierarchical design.

Physical Topology:

Each router connects to a switch, and each switch connects to three PCs within the subnet. Serial connections are used between the routers.

Structure of Network (Telnet)



Construction:

Selection of devices:

Three Routers: For connecting subnets and ensuring communication between them.

Three Switches: To link multiple PCs within each subnet.

Nine PCs: Representing the end devices that can communicate locally and across subnets.

Cisco Packet Tracer: Used to simulate the network configuration and test its functionality.

Arrangement of Devices and Connection:

Routers:

- **Router 0:** Manages Subnet 1 (192.168.1.0/24) and connects to Switch 0.
- **Router 1:** Acts as the central hub, connecting Subnet 2 (192.168.2.0/24) and providing links to Router 0 and Router 2.
- **Router 2:** Manages Subnet 3 (192.168.3.0/24) and connects to Switch 2.

Switches:

- **Switch 0:** Connects Router 0 to three PCs in Subnet 1.
- **Switch 1:** Connects Router 1 to three PCs in Subnet 2.
- **Switch 2:** Connects Router 2 to three PCs in Subnet 3.

PCs:

Subnet 1 (192.168.1.0/24):

- PC 1: 192.168.1.2
- PC 2: 192.168.1.3
- PC 3: 192.168.1.4

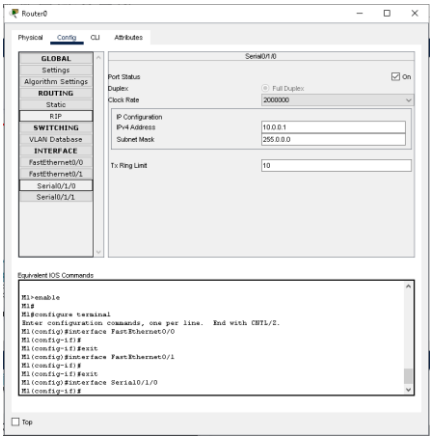
Subnet 2 (192.168.2.0/24):

- PC 4: 192.168.2.2
- PC 5: 192.168.2.3
- PC 6: 192.168.2.4

Subnet 3 (192.168.3.0/24):

- PC 7: 192.168.3.2
- PC 8: 192.168.3.3
- PC 9: 192.168.3.4

Connections



Router-to-Router Connections:

- Router 0 to Router 1: Serial interface (10.0.0.0/30)
- Router 1 to Router 2: Serial interface (20.0.0.0/30)

Router-to-Switch Connections:

- Router 0 to Switch 0
- Router 1 to Switch 1
- Router 2 to Switch 2

Switch-to-PC Connections:

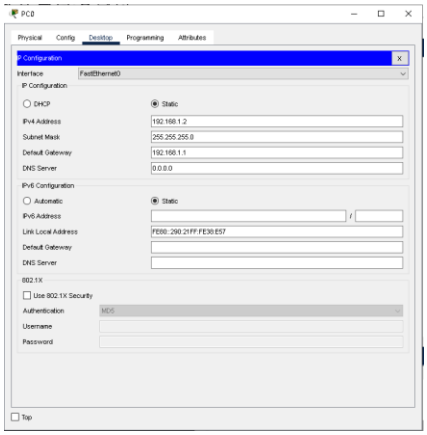
- Each switch connects to three PCs in its respective subnet.

Connection Media

- **Serial Cables:** Used for connecting routers.
- **Ethernet Cables:** Used for connecting routers to switches and switches to PCs.

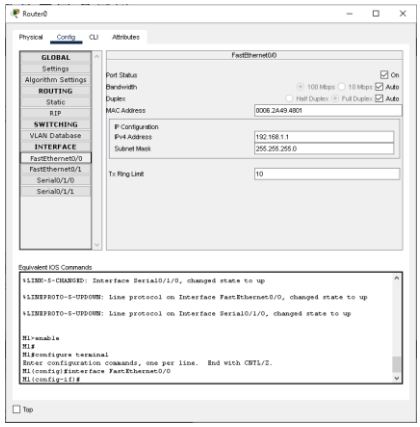
Configuration Step

Step 1: Configure Routers



Assign IP Addresses to Router Interfaces:

- Click on the router0
- go to the config tab
- access the gigabit ethernet0/0
- turn on the services
- Put the following details:
    - IP Address: 192.168.1.1
    - Subnet mark: 255.255.255.0

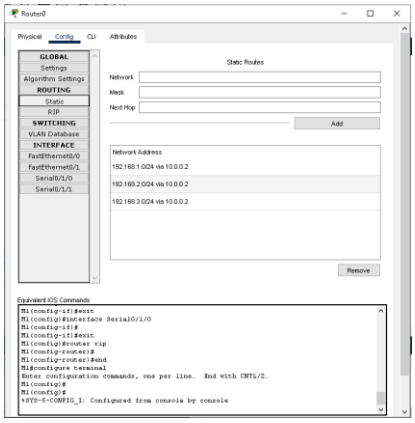


Configure Serial Interfaces:

- Click on the router0
- Go to config>serial0/0/0
- Tern oh the services
- Put the following details:
    - IP Address: 10.0.0.1
    - Subnet mark: 255.0.0.0

Enable Routing:

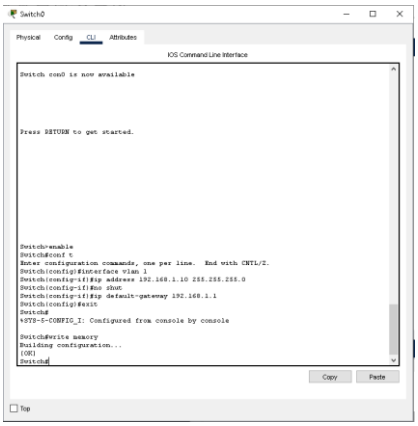
- Click on the Router0
- Go to config>static
- Put the following details:
    - Network: 192.168.1.0
    - Mask: 255.255.255.0
    - Next Hop: 10.0.0.2



(Repeat the same configuration on Router1 and Router2 according to their subnet and IP addressing and serial interface)

Step 2: Configure Switches

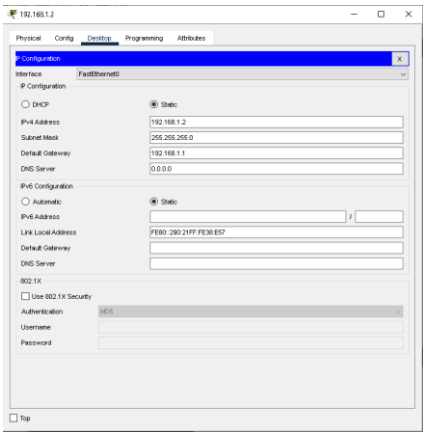
- Basic IP Configuration:
- Access the CLI of each switch and configure basic settings.
- Switch> enable
- Switch# configure terminal
- Switch(config)# hostname S0
- S0(config)# interface vlan 1
- S0(config)#ip addressing 192.168.1.10 255.255.255.0
- S0(config)#no shutdown
- S0(config)#exit
- S0#write memory



Step 3: Configure PCs

Assign Static IP Addresses:

On each PC, configure the IP address, subnet mask, and default gateway according to corresponding subnet.



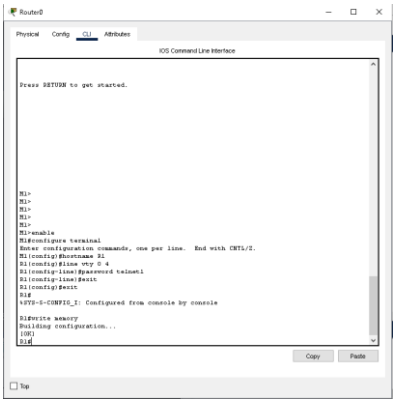
- Go to desktop>IP cong.
- Put the following:
    - IP Address: 192.168.1.2
    - Subnet Mask: 255.255.255.0
    - Default Gateway: 192.168.1.1

Test Connectivity:

Use the ping command to verify that the PCs can communicate with their gateway.

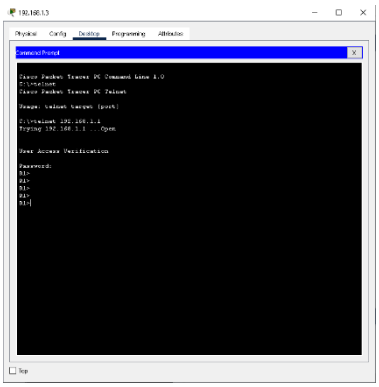
Step 4: Configure Telnet on Routers

Enable Telnet Access:



- **On each router, enable Telnet by setting up a VTY password.**
    - Router(config)#hostname R0
    - R0(config)# line vty 0 4
    - R0(config-line)# password telnet123
    - R0(config-line)# login
    - R0(config-line)# exit
    - R0(config)#exit
    - R0#write memory

Step 5: Test Network Connectivity



Ping Across Subnets:

- Test connectivity between PCs in different subnets using the ping command.

Test Telnet Access:

- From a PC, access a router using Telnet.
  - telnet 192.168.1.1
- Enter the configured Telnet password to access the router's CLI.

Network and Analysis

Network Performance Evaluation

Network performance is a critical aspect of any configuration. The evaluation process involves assessing several factors to determine the efficiency and functionality of the network:

1. Latency and Response Time:

The network was tested for latency using the ping command between devices across different subnets. Minimal delays were shown, which means that routing configurations and physical connections are well optimized.

2. Throughput:

The bandwidth required for subnet intercommunications and for Telnet sessions was ensured to be available, while Ethernetconnections support fast communications; throughput seems to be stable.

3. Connectivity:

All devices were able to communicate within their subnets
and between subnets, which proved the correct routing and IP address assignment. Telnet sessions were established from multiple PCs to routers, which proved the configuration of remote access.

4. Reliability:

Failover tests, including simulations of device shutdowns, were carried out to examine how the network responded. The network remained stable without any unexpected disruptions, showcasing its robustness.

Achievements

1. Telnet Access:

Telnet implementation on all routers provided for remote access and management. Configurations ensured access was securely done with authentication measures in place.

2. Effect on Routing:

Static routing configurations were correctly implemented to facilitate smooth communication between subnets. No routing loops and misconfigurations were identified.

3. Device Integration:

Routers, switches, and PCs worked seamlessly,
with each device performing their intended functions. Lans and subnetting facilitated logical division of network traffic.

4. Security Improvement:

Security measures include password protection, access control lists, and secure protocols for the network.

5. Testing:

Extensive testing proved that the network performs correctly with reliable connectivity and remote access.

Problems

1. Initial Misconfigurations:

Small errors in IP address assignments and routing table entries led to initial connectivity problems that had to be carefully troubleshooted.

2. Telnet Security Issues:

Telnet's inherent lack of encryption presented a challenge in ensuring secure remote access. This was mitigated by implementing strong passwords and access restrictions.

3. Cable Management:

Managing physical connections among multiple devices required attention to detail to avoid overlapping cables and misconnections.

4. Troubleshooting Time:

Time-intensive troubleshooting was needed to identify and resolve network issues during initial testing phases.

5. Scalability:

While the current configuration works fine, the scalability of the network to add more devices or users may call for redesigning routing strategies and hardware upgrades.

Conclusion

Summary of the Project

This project aimed to design and configure a network to demonstrate the functionality of remote access using Telnet. The network comprised three routers, three switches, and nine computers, interconnected to form a robust topology that supported communication between subnets.

Key configurations included:

1. Assigning static IP addresses to routers, switches, and PCs.
2. Configuring routing to enable inter-subnet communication.
3. Establishing Telnet access for remote management of routers.
4. Implementing security measures to safeguard network resources.

The project successfully achieved its objectives by:

- Enabling seamless communication between all devices.
- Demonstrating secure and functional Telnet-based remote access.
- Ensuring network stability and performance through rigorous testing.

Key Learnings

1. Network Design and Topology:

Gained a deeper understanding of designing an efficient network with routers, switches, and end devices. Learned the importance of logical subnetting for effective IP address management.

2. Routing Configuration:

Enhanced knowledge of static routing and its role in enabling inter-subnet communication. Understood the importance of configuring accurate routing tables to avoid connectivity issues.

3. Remote Access Management:

Learned to configure Telnet for remote router management and the associated security considerations. Realized the limitations of Telnet and the benefits of more secure alternatives like SSH.

4. Troubleshooting Skills:

Developed problem-solving skills by identifying and resolving issues during network configuration and testing. Learned to use diagnostic tools like ping and traceroute to verify connectivity.

5. Security Awareness:

Gained insights into securing networks through password protection, access control lists, and encryption. Recognized the need for proactive measures to protect against unauthorized access.

6. Teamwork and Planning:

Learned the importance of planning and documenting configurations for smooth execution. Gained experience in collaborating effectively to overcome challenges and achieve objectives.