IP Subnetting and Routing Simulation – Project Report

1. Introduction

This project demonstrates the design and implementation of an IP addressing scheme using subnetting in a simulated multi-router network environment using Cisco Packet Tracer. The objective is to divide a given /24 IPv4 network into multiple subnets, assign IPs to various devices (routers, switches, and PCs), and configure router interfaces accordingly to ensure proper communication between subnets.

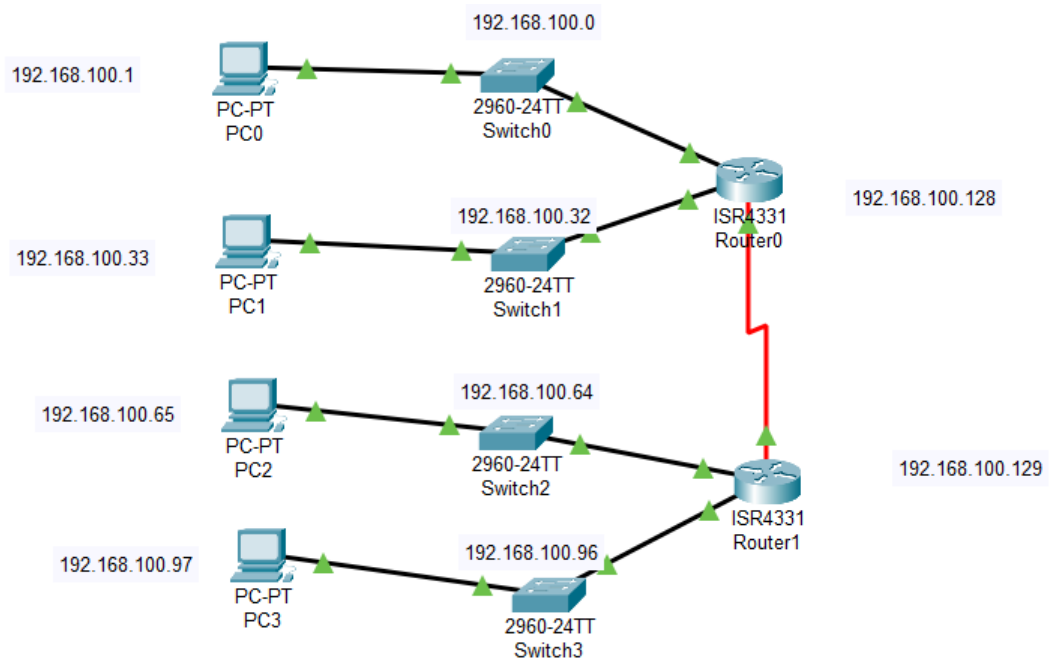
2. Tools Used

- **Cisco Packet Tracer** (for network simulation)
- **Binary Subnetting** (for IP planning)
- **Router CLI Configuration** (for assigning and activating interfaces)
- **Manual IP Configuration** (for PCs and switches)

3. Network Topology Overview

The simulated network consists of:

- **2 Routers** (Router0 and Router1)
- **4 LAN segments** (each with a switch and a PC)
- **A WAN link** between the two routers
- **Subnetting applied** to divide 192.168.100.0/24 into 5 subnets



4. Key Tasks Performed

4.1. Subnetting Design

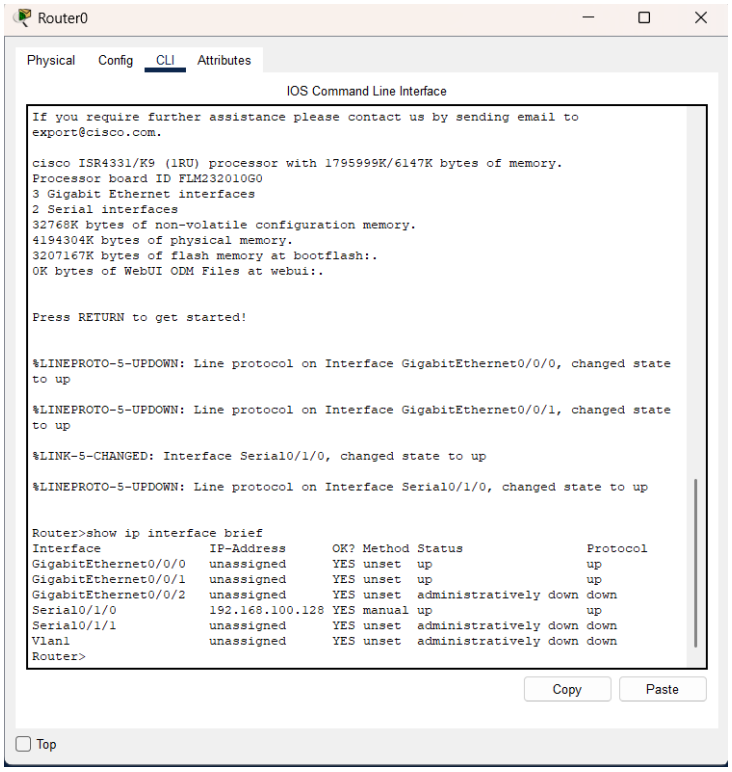
- The given block 192.168.100.0/24 was divided into **5 subnets**:
  - 4 LAN subnets for local segments
  - 1 WAN subnet for the router-to-router link
- Choose a subnet mask of /27 (i.e., 255.255.255.224) to allow 30 usable hosts per LAN.

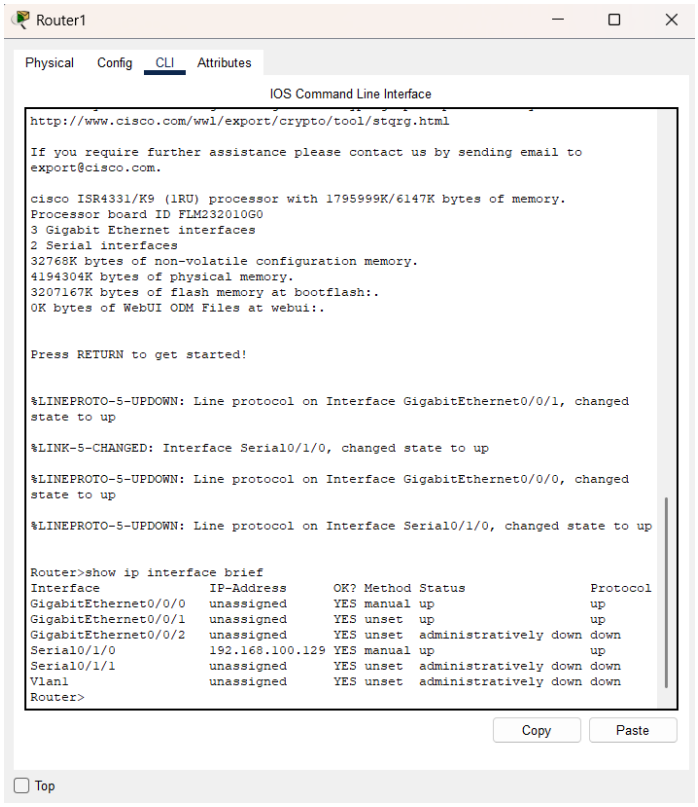
Subnet #	Subnet Address	Usable Range	Broadcast
0	192.168.100.0/27	192.168.100.1 – .30	192.168.100.31
1	192.168.100.32/27	192.168.100.33 – .62	192.168.100.63
2	192.168.100.64/27	192.168.100.65 – .94	192.168.100.95
3	192.168.100.96/27	192.168.100.97 – .126	192.168.100.127
4 (WAN)	192.168.100.128/30	192.168.100.129 – .130	192.168.100.131

4.2. Router and Device Configuration

- Assigned IP addresses to **Router0** and **Router1** interfaces based on subnet planning.

- Used no shutdown to activate interfaces.
- Assigned first usable IPs to routers, second to switches, and last to PCs





4.3. Addressing Summary

Device	Interface	IP Address	Subnet
Router0	G0/0	192.168.100.1	0
Router0	G0/1 (WAN)	192.168.100.129	4
Router1	G0/0	192.168.100.33	1
Router1	G0/1 (WAN)	192.168.100.130	4
Switches	VLAN1 IPs	(e.g., .2, .34...)	LANs
PCs	Last usable IPs (e.g., .30, .62...)	LANs	

5. Explanation: How Subnetting Helps Organize a Network

Subnetting allows network administrators to divide a larger network into logical segments, isolating traffic and improving manageability. In this simulation, subnetting ensured:

- Efficient IP allocation
- Easier troubleshooting
- Organized device grouping
- Clear routing table entries on each router

A router determines if a destination IP belongs to a particular subnet by applying a bitwise AND operation between the destination IP and the subnet mask, then comparing the result with the subnet's network address. If there's a match, it forwards the packet via the appropriate interface.

6. Learning Outcomes

- Learned to subnet a /24 IPv4 network into smaller subnets.
- Gained experience with IP planning and binary calculations.
- Practiced configuring router interfaces in CLI.
- Developed logical understanding of interface assignments and address roles in network design.

7. Conclusion

This simulation successfully demonstrated the use of subnetting for structured network design and the configuration of router interfaces to ensure subnet communication. The result was a fully structured and subnetted network capable of clean IP allocation, ready for routing and scalability.

8. Attachments

- IP-Subnetting-Simulation.pkt
- topology.png
- r1-config.png
- r2-config.png