1 Project Overview

This project focuses on practicing IP addressing and subnetting in a simulated network environment. Subnetting is a crucial skill in networking as it allows a large network to be divided into smaller, manageable segments called subnets**.** This helps improve network performance, enhances security, and ensures efficient utilization of IP addresses.

Through this project, learners will understand how to calculate subnet ranges, assign IP addresses to devices, and verify connectivity within and between subnets.

2 Objectives

- **Calculate subnet ranges:** Learn to divide a given network (e.g., 192.168.10.0/28) into smaller subnets (e.g., /28) and determine the valid host ranges for each subnet.
- **Assign IP addresses:** Properly assign IP addresses to PCs and router interfaces according to the subnetting plan.
- **Test connectivity:** Use tools like ping to verify communication between devices in the same subnet and across different subnets.
- **Understand routing basics:** Learn when and how routing is necessary for inter-subnet communication.

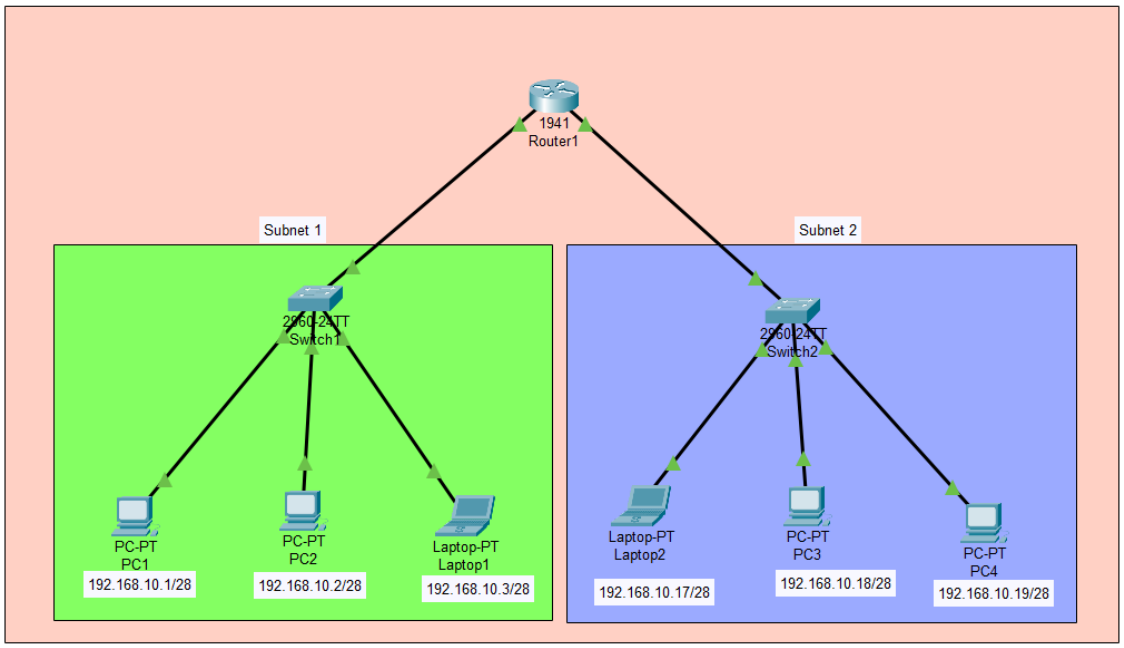
3 Network Topology

This project utilizes a simple network topology consisting of:

- **Devices:**
  - 2 Cisco switches
  - 1 Router
  - 2 PCs and 1 laptop connected to each switch
- **Network Addressing:**
  - Base network: 192.168.10.0/24
  - Subnet mask: /28
  - This results in 16 subnets with 14 usable hosts each.
- **Connections:**
  - PCs are connected to switches.
  - Switches are connected to router interfaces.
  - Router interfaces are configured for each subnet to enable inter-subnet communication if required.
- **Subnet Details Example:**

Subnet	Network Address	First Address	Last Address	Broadcast Address
Subnet 1	192.168.10.0/28	192.168.10.1	192.168.10.14	192.168.10.15
Subnet 2	192.168.10.16/28	192.168.10.17	192.168.10.30	192.168.10.31

3.1 Topology Diagram:



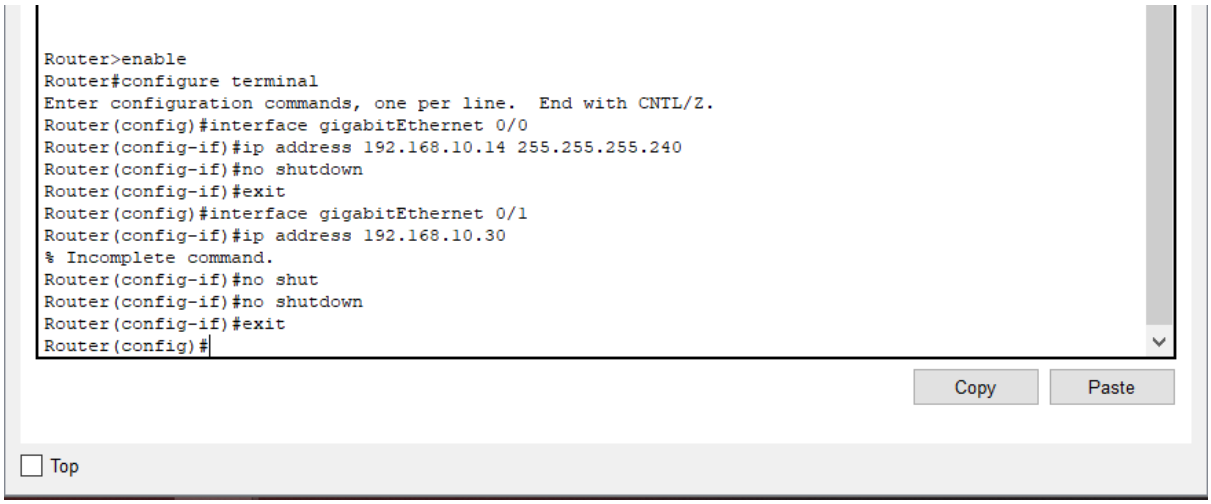
4 Step by Step Configuration

4.1 Subnet Planning:

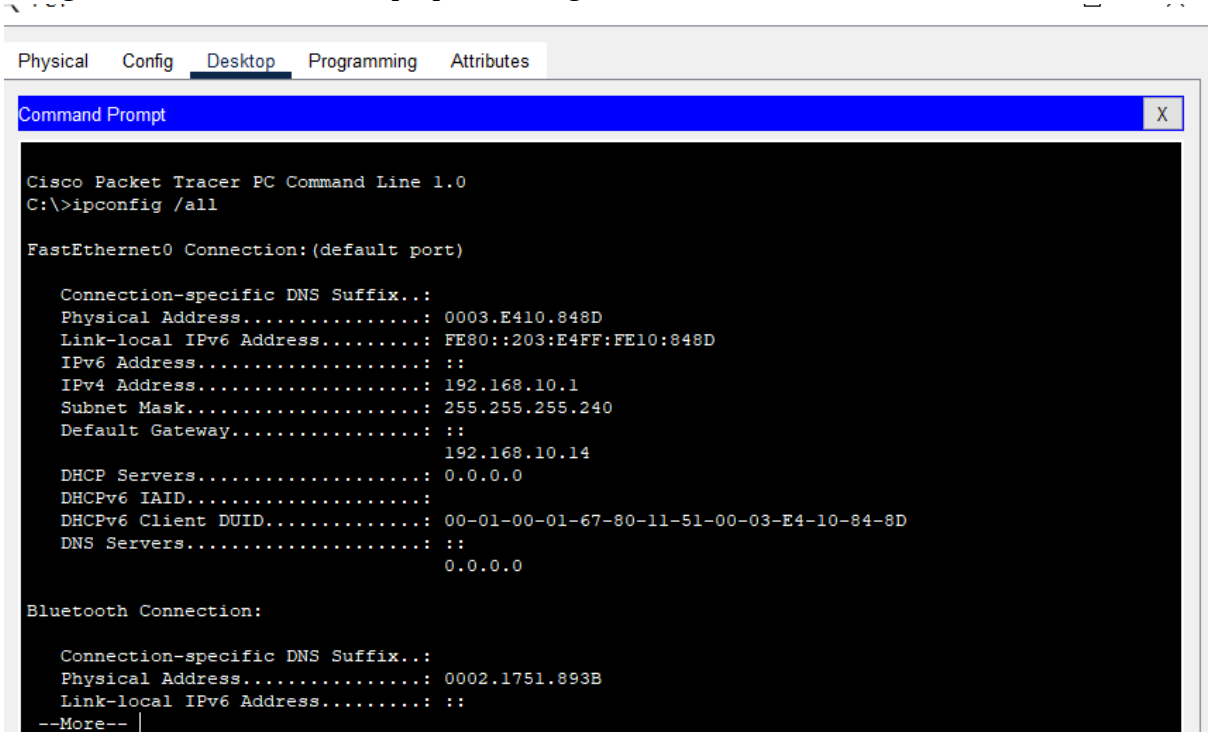
- Determine the number of subnets required.
- Calculate subnet addresses, host ranges, and broadcast addresses.
- Document the IP plan to avoid conflicts.

4.2 Device Configuration:

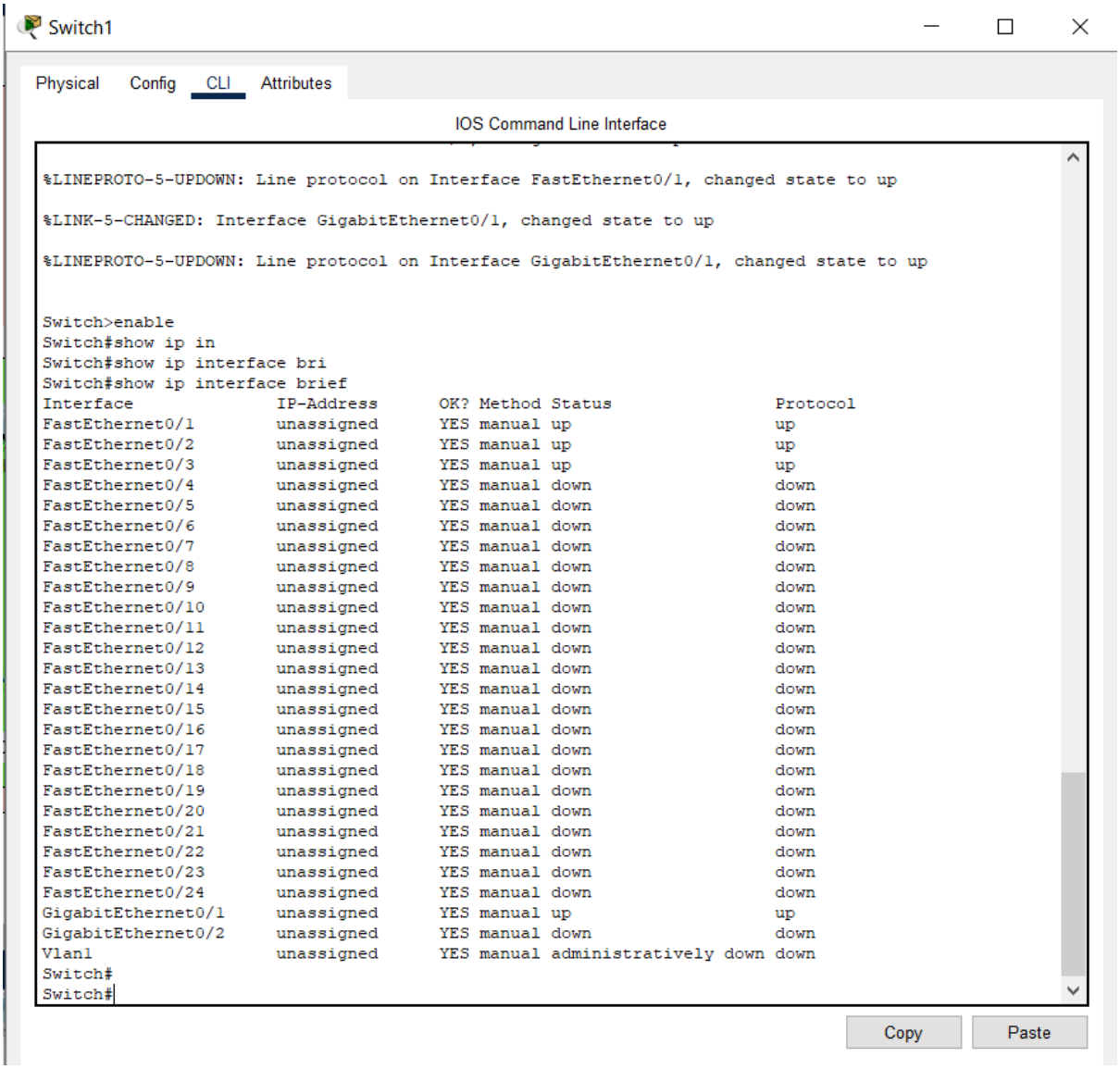
- Assign IP addresses to router interfaces based on subnet plan:



- Assign IP addresses to PCs, laptop according to their subnet



- Enable Interfaces:



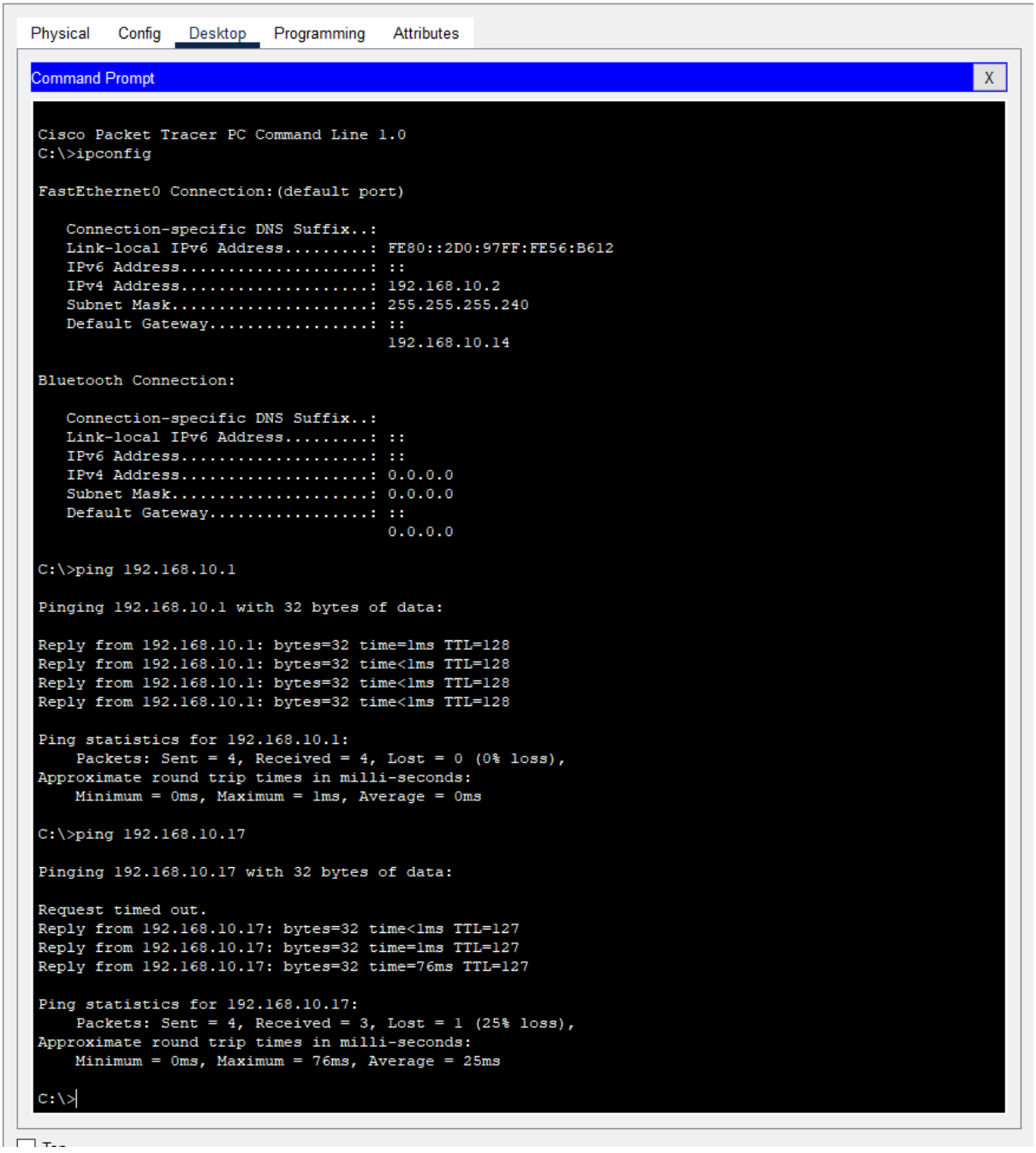
Explanation:

- Make sure router and switch interfaces are activated using no shutdown.
- Verify interface status with show ip interface brief.

5 Testing

5.1 Connectivity Testing:

- Use `ping` to test communication between devices within the same subnet and across different subnets.
- Examples:



5.2 IP Verification:

- On PCs: `ipconfig /all`
- On Router: `show ip interface brief`

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ipconfig /all

FastEthernet0 Connection:(default port)

   Connection-specific DNS Suffix..:
   Physical Address................: 0001.432D.7053
   Link-local IPv6 Address.........: FE80::201:43FF:FE2D:7053
   IPv6 Address....................: ::
   IPv4 Address....................: 192.168.10.17
   Subnet Mask.....................: 255.255.255.240
   Default Gateway.................: ::
                                     192.168.10.30
   DHCP Servers....................: 0.0.0.0
   DHCPv6 IAID.....................:
   DHCPv6 Client DUID..............: 00-01-00-01-AD-45-10-A8-00-01-43-2D-70-53
   DNS Servers.....................: ::
                                     0.0.0.0
```

```
Router>enable
Router#show ip interface brief
Interface              IP-Address      OK? Method Status                Protocol
GigabitEthernet0/0     192.168.10.14   YES manual up                    up
GigabitEthernet0/1     192.168.10.30   YES manual up                    up
Vlan1                  unassigned      YES unset  administratively down down
Router#
```

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6 Conclusion

Subnetting is a fundamental networking technique that improves network management, reduces broadcast traffic and ensures efficient IP usage. By completing this project, learners gain hands-on experience in planning subnets, assigning IP addresses, and verifying network connectivity, laying a solid foundation for designing scalable and efficient networks.