Practical 6 : Design and Create an internetwork using VLSM Classless IP Address Router and Hub or Switch
Solutions :

Designing and creating an internetwork using Variable Length Subnet Masking (VLSM) and implementing classless IP addressing with routers, hubs, or switches involves multiple steps. Below is a detailed step-by-step:

Step 1: Gather Network Requirements
Determine the total number of subnets required.
Estimate the number of hosts per subnet.
Identify critical devices (routers, switches, hubs) and their placement.
Step 2: Choose an IP Addressing Scheme
Select a private IP range: For example, 192.168.0.0/24.

Use VLSM to allocate subnets based on host requirements.

Example:

Subnet A: 50 hosts
Subnet B: 25 hosts
Subnet C: 10 hosts
Subnet D: 5 hosts

Step 3: Calculate Subnet Masks

Step 4: Design the Network Topology
Routers: Connect each subnet to a router. Use routers for subnet isolation and routing.
Switches/Hubs:
Place switches in each subnet to connect devices within the subnet.
Avoid hubs in modern networks due to limitations; switches are recommended.
IP Addressing: Assign IPs to router interfaces and configure each device.
Step 5: Configure Router and Switch Interfaces
Router Configuration:

Assign an IP from the subnet to each router interface.
Example for Subnet A:
arduino
Copy code
Router(config)# interface FastEthernet0/0
Router(config-if)# ip address 192.168.0.1 255.255.255.192
Router(config-if)# no shutdown
Switch Configuration:

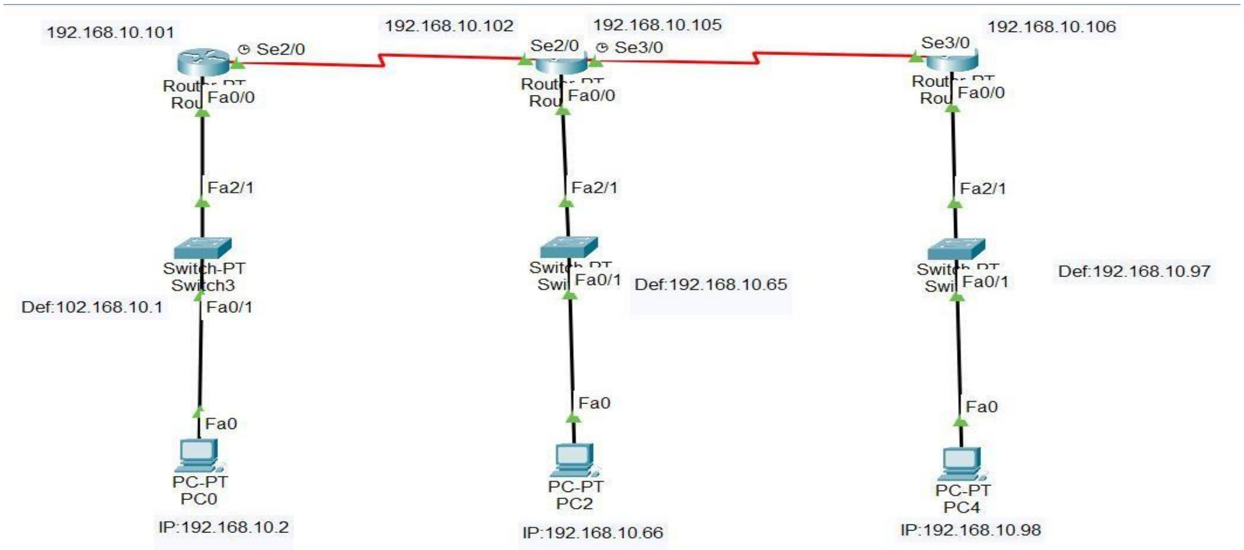
Assign VLANs if required.
Connect devices to switch ports.
Step 6: Enable Routing
Use a dynamic routing protocol (e.g., RIP, OSPF) or configure static routes.

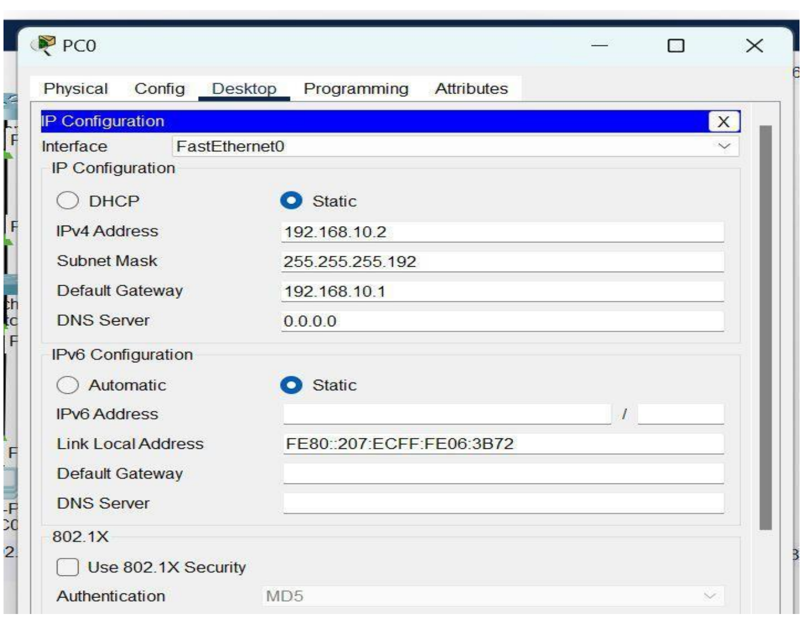
Step 7: Test Connectivity
Use the ping command to check connectivity between subnets.
Verify end-to-end communication with all devices.
Step 8: Document the Network
Prepare a detailed network diagram.
Include:
Subnet details
Device IPs
Interface configurations

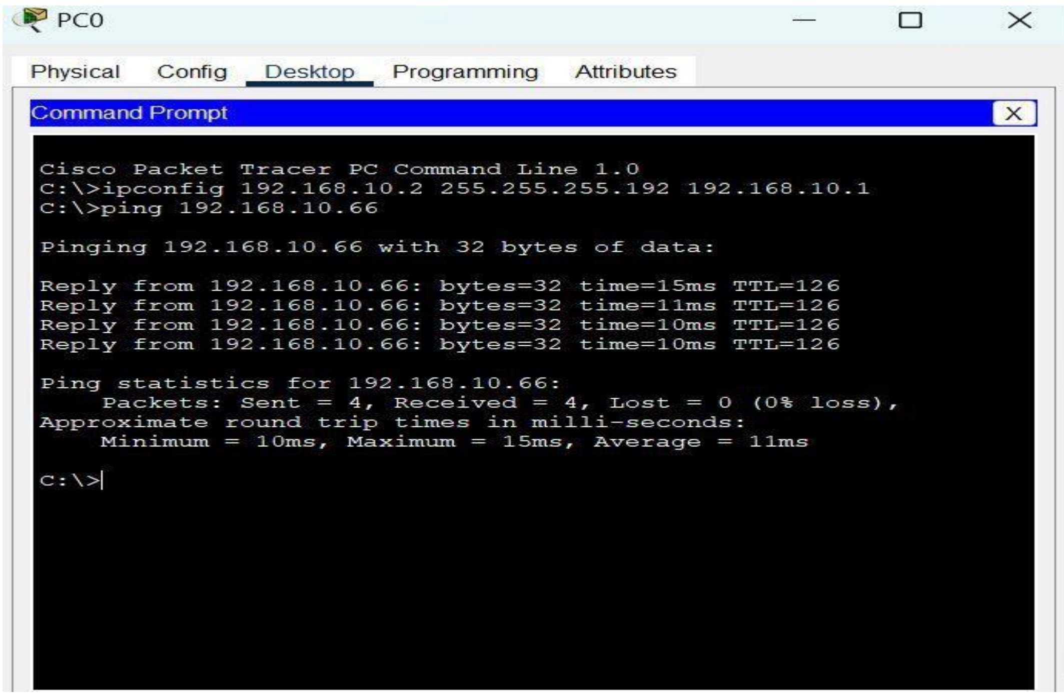
S.NO	Device	Model-Name	Qty.
1.	pc	pc	3
2.	switch	PT-Switch	3
3.	router	PT-Router	3

IP Addressing Table for PCs

S.NO	Device	IPv4 Address	Subnet-Mask	Default-Gateway
1.	pc0	192.168.10.2	255.255.255.192	192.168.10.1
2.	pc2	192.168.10.66	255.255.255.224	192.168.10.65
3.	pc4	192.168.10.98	255.255.255.252	192.168.10.97

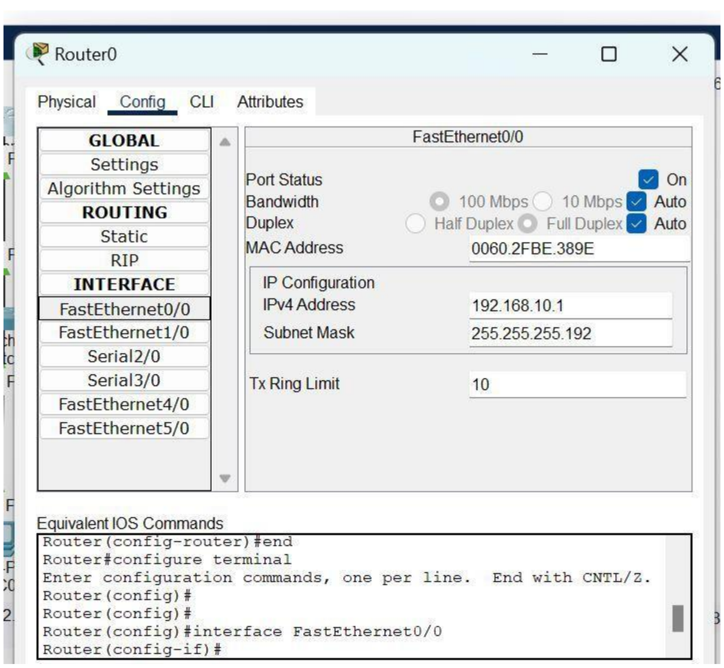

192.168.10.101
Se2/0
192.168.10.102
Se2/0
192.168.10.105
Se3/0
Se3/0
192.168.10.106
Fa0/0
Fa0/0
Fa0/0
Fa2/1
Fa2/1
Fa2/1
Switch-PT
Switch3
Def:102.168.10.1
Fa0/1
Fa0/1
Def:192.168.10.65
Fa0/1
Def:192.168.10.97
Fa0
Fa0
Fa0
PC-PT
PC0
IP:192.168.10.2
PC-PT
PC2
IP:192.168.10.66
PC-PT
PC4
IP:192.168.10.98


PC0
Physical
Config
Desktop
Programming
Attributes
IP Configuration
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
192.168.10.2
Subnet Mask
255.255.255.192
Default Gateway
192.168.10.1
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
Link Local Address
FE80::207:ECFF:FE06:3B72
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5



S.NO	**Device**	**Interface**	**IPv4 Address**	**Subnet mask**
1.	router0	FastEthernet0/0	192.168.10.1	255.255.255.192
		Serial2/0	192.168.10.101	255.255.255.252
2.	router2	FastEthernet0/0	192.168.10.65	255.255.255.224

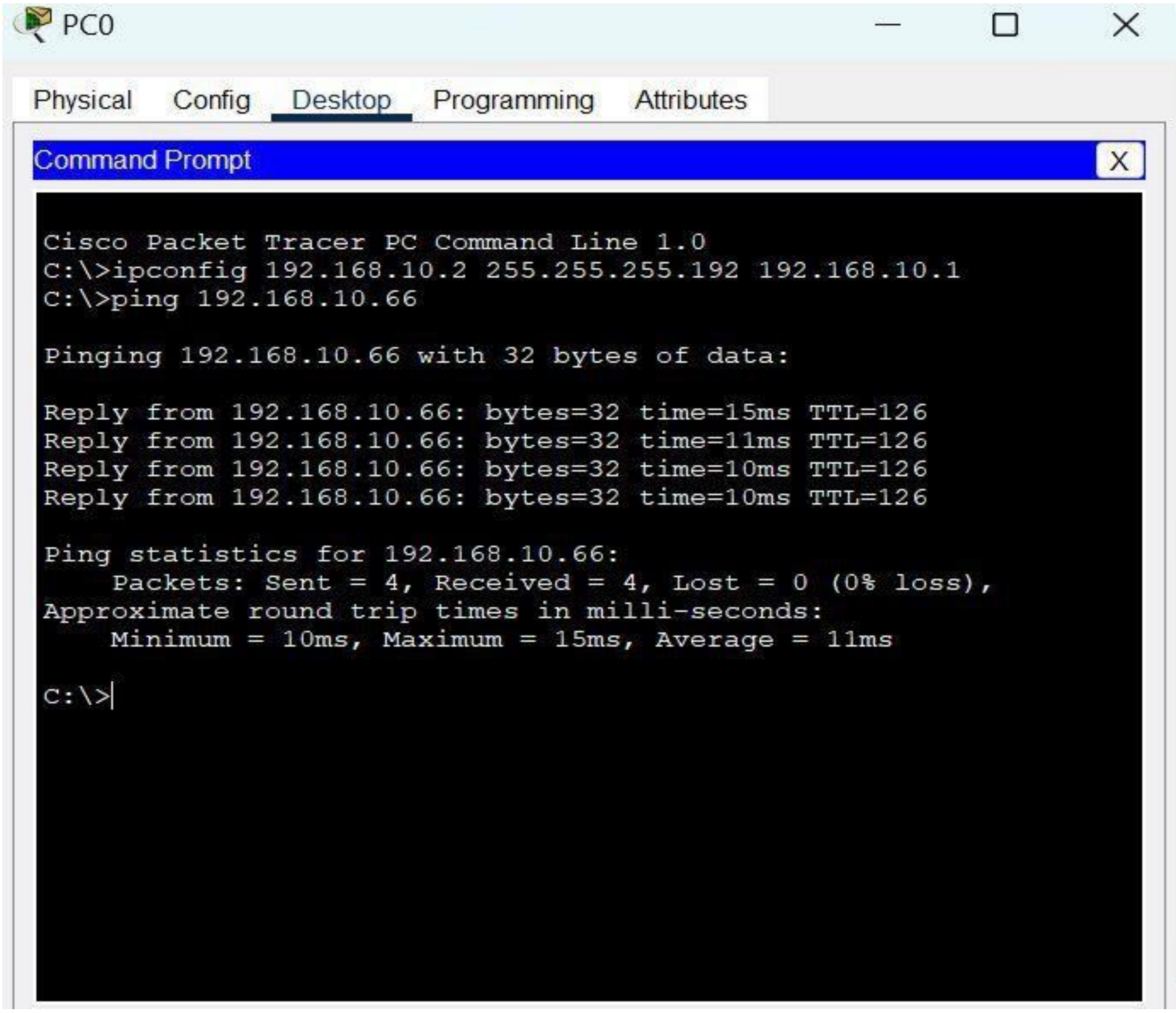
S.NO	Device	Interface	IPv4 Address	Subnet mask
		Serial2/0	192.168.10.102	255.255.255.252
		Serial3/0	192.168.10.105	255.255.255.252
3.	router3	FastEthernet0/0	192.168.10.97	255.255.255.252
		Serial2/0	192.168.10.106	255.255.255.252



```
Router(config)#ip route 192.168.10.64 255.255.255.224 192.168.10.102
Router(config)#ip route 192.168.10.104 255.255.255.252 192.168.10.102
Router(config)#ip route 192.168.10.96 255.255.255.252 192.168.10.102
```

```
Router(config)#ip route 192.168.10.0 255.255.255.192 192.168.10.101
Router(config)#ip route 192.168.10.96 255.255.255.252 192.168.10.106
```

```
Router(config)#ip route 192.168.10.64 255.255.255.224 192.168.10.105
Router(config)#ip route 192.168.10.100 255.255.255.252 192.168.10.105
Router(config)#ip route 192.168.10.0 255.255.255.192 192.168.10.105
```



Conclusion :

The practical implementation of an internetwork using VLSM and classless IP addressing highlights the significance of efficient and scalable network design. By employing VLSM, IP addresses were allocated based on the exact requirements of each subnet, ensuring minimal wastage and optimized utilization of the available address space. The integration of routers and switches facilitated seamless communication between subnets while maintaining logical isolation, thereby enhancing the overall network's performance and scalability. The division of the network into smaller subnets effectively reduced broadcast domains, contributing to improved efficiency and better control over network traffic. Additionally, the use of routing protocols, whether static or dynamic, enabled proper packet delivery across the network, underscoring the fundamental principles of routing. This practical not only demonstrated the technical aspects of network configuration and interconnectivity but also provided invaluable experience in planning and implementing robust and structured network solutions for real-world applications.

Practical 7 Design and Create an internetwork using Dynamic Routing with RIPv2 using hub and Switch.
Solutions : -

Steps to Design and Create an Internetwork with RIPv2, Hubs, and Switches
Identify Network Requirements:

Determine the number of subnets and host requirements.
Choose IP Addressing:

Select a private IP range (e.g., 192.168.1.0/24) and divide it into subnets.
Setup the Network Topology:

Use routers to connect subnets.
Connect devices within each subnet to switches or hubs.
Assign IP Addresses:

Assign IPs to router interfaces and devices.
Example:
Subnet A: 192.168.1.0/26
Subnet B: 192.168.1.64/26
Subnet C: 192.168.1.128/28.
Configure RIPv2 on Routers:

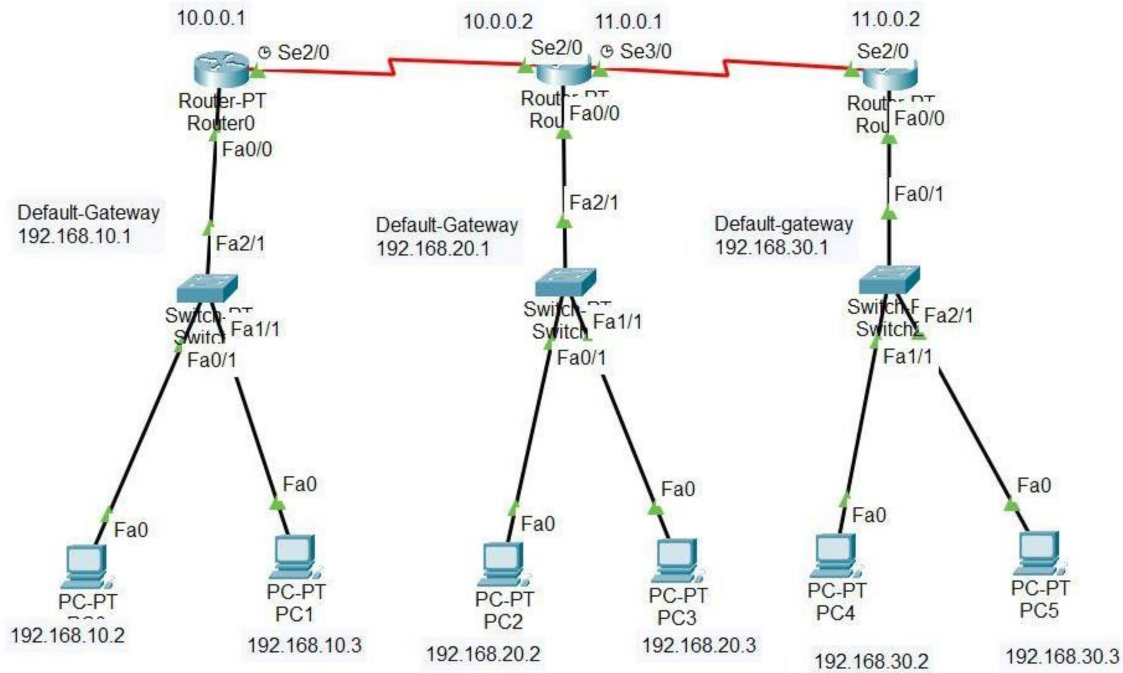
Enable RIPv2 and add connected networks.
Example for Router 1:
arduino
Copy code
Router(config)# router rip
Router(config-router)# version 2
Router(config-router)# network 192.168.1.0
Test Routing:

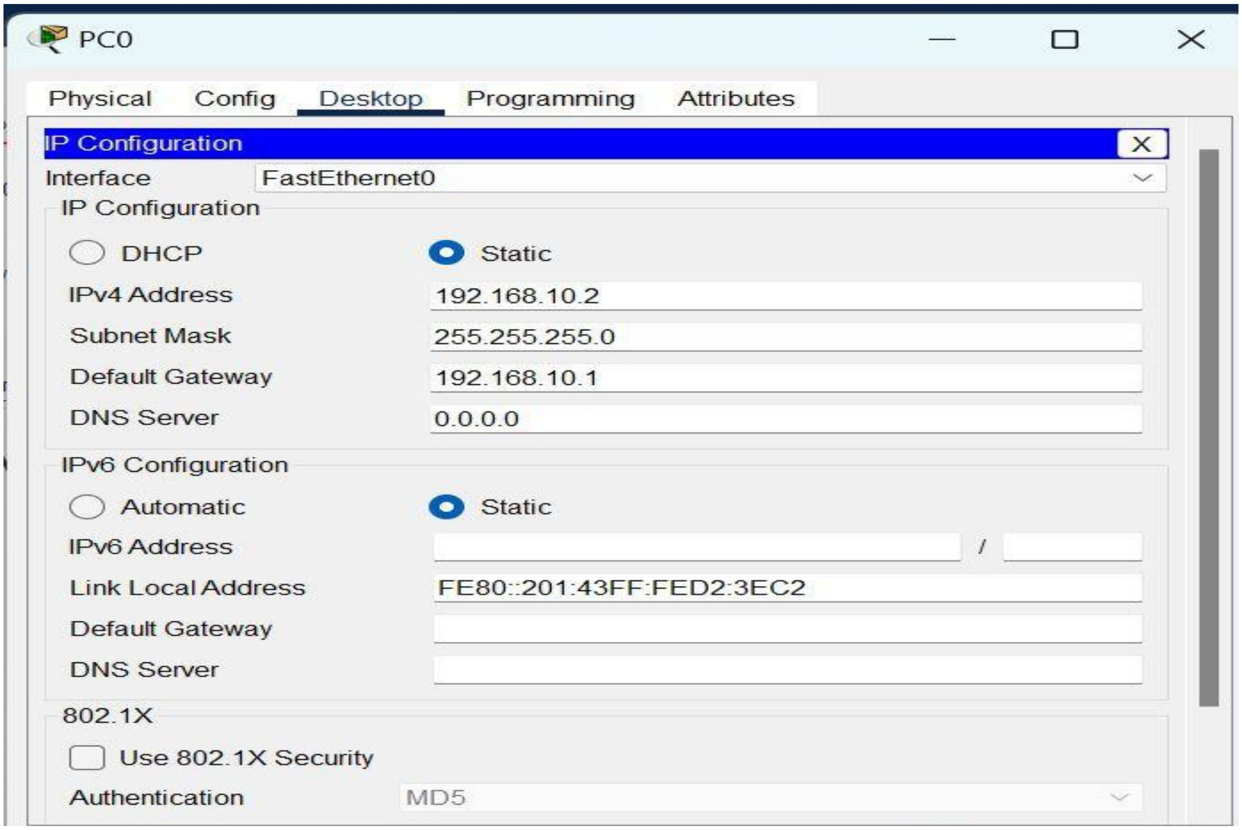
Use show ip route to verify route propagation.
Ping between devices in different subnets.
Document and Verify

S.NO	Device	Model Name	Qty.
1.	PC	PC	6
2.	Switch	PT-Switch	3

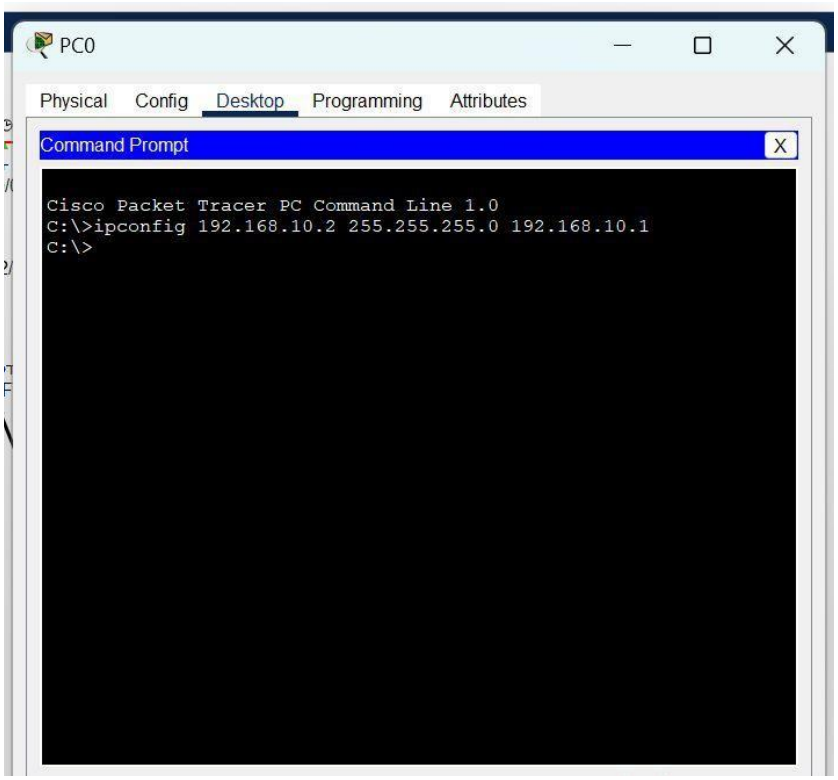
3.	**Router**	**PT-router**	**3**

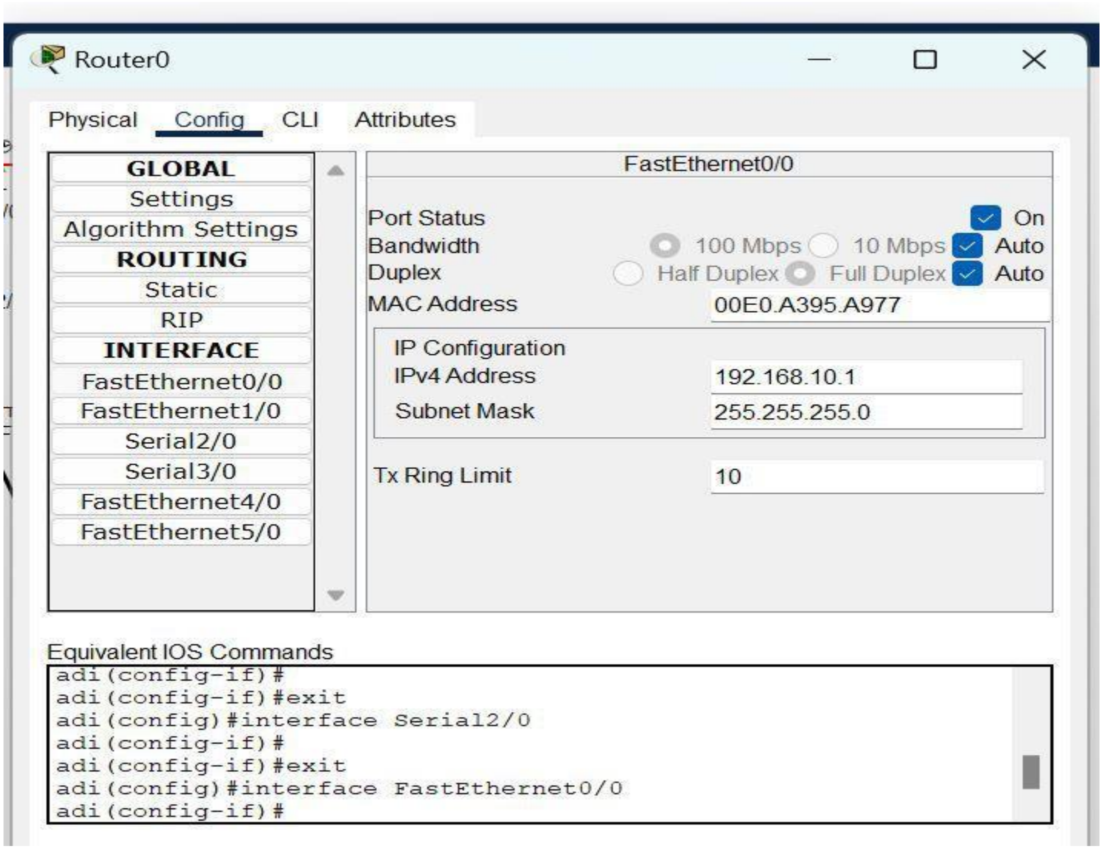
S.NO	Device	IPv4 Address	Subnet mask	Default Gateway
1.	**PC0**	**192.168.10.2**	**255.255.255.0**	**192.168.10.1**
2.	**PC1**	**192.168.10.3**	**255.255.255.0**	**192.168.10.1**
3.	**PC2**	**192.168.20.2**	**255.255.255.0**	**192.168.20.1**
4.	**PC3**	**192.168.20.3**	**255.255.255.0**	**192.168.20.1**
5.	**PC4**	**192.168.30.2**	**255.255.255.0**	**192.168.30.1**
6.	**PC5**	**192.168.30.3**	**255.255.255.0**	**192.168.30.1**


10.0.0.1
Se2/0
10.0.0.2
Se2/0
11.0.0.1
Se3/0
11.0.0.2
Se2/0
Router-PT
Router0
Fa0/0
Fa0/0
Fa0/0
Default-Gateway
192.168.10.1
Fa2/1
Default-Gateway
192.168.20.1
Fa2/1
Default-gateway
192.168.30.1
Fa0/1
Fa1/1
Fa0/1
Fa1/1
Fa0/1
Fa2/1
Fa1/1
Fa0
Fa0
Fa0
Fa0
Fa0
Fa0
PC-PT
192.168.10.2
PC-PT
PC1
192.168.10.3
PC-PT
PC2
192.168.20.2
PC-PT
PC3
192.168.20.3
PC-PT
PC4
192.168.30.2
PC-PT
PC5
192.168.30.3


PC0
Physical
Config
Desktop
Programming
Attributes
IP Configuration
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
192.168.10.2
Subnet Mask
255.255.255.0
Default Gateway
192.168.10.1
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
/
Link Local Address
FE80::201:43FF:FED2:3EC2
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5

S.NO	Device	Interface	IPv4 Address	Subnet mask
1.	router0	FastEthernet0/0	192.168.10.1	255.255.255.0
		Serial2/0	10.0.0.1	255.0.0.0
2.	router1	FastEthernet0/0	192.168.20.1	255.255.255.0
		Serial2/0	10.0.0.2	255.0.0.0
		Serial3/0	11.0.0.1	255.0.0.0
3.	router2	FastEthernet0/0	192.168.30.1	255.255.255.0
		Serial2/0	11.0.0.2	255.0.0.0


PC0
Physical
Config
Desktop
Programming
Attributes
Command Prompt
X
Cisco Packet Tracer PC Command Line 1.0
C:\>ipconfig 192.168.10.2 255.255.255.0 192.168.10.1
C:\>



CLI command : router rip
CLI command : network <network id>

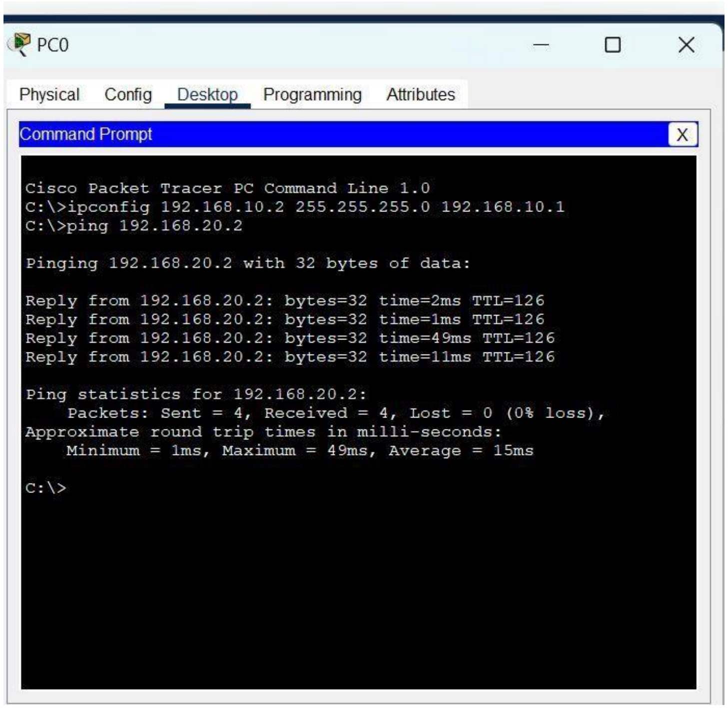
RIP Routes for Router0 are given below:

Router(config)#router rip
Router(config-router)#network 192.168.10.0
Router(config-router)#network 10.0.0.0

RIP Routes for Router1 are given below:

Router(config)#router rip
Router(config-router)#network 192.168.20.0
Router(config-router)#network 10.0.0.0
Router(config-router)#network 11.0.0.0

RIP Routes for Router2 are given below:
Router(config)#router rip
Router(config-router)#network 192.168.30.0
Router(config-router)#network 11.0.0.0



Conclusion :

The practical implementation of an internetwork using RIPv2 for dynamic routing highlights the importance of efficient and automated route management in a multi-subnet environment. By configuring RIPv2 on routers, the network demonstrated the ability to dynamically learn and propagate routes without requiring manual updates, ensuring seamless communication across subnets. The use of switches and hubs allowed for effective connection of devices within each subnet, maintaining logical separation while providing reliable intra-subnet communication. This setup showcased how dynamic routing simplifies network scalability and reduces administrative overhead by automatically adjusting to changes in the network topology. Overall, the practical emphasized the benefits of RIPv2 and dynamic routing in creating a robust, scalable, and interconnected network infrastructure.

Practical 8 Design and Create an internetwork using Dynamic Routing with EIGRP uand switch ? .

Solutions :

Steps to Design and Create an Internetwork with EIGRP and Switches
Determine Network Requirements:

Identify the number of subnets and host requirements for each subnet.
Choose IP Addressing Scheme:

Select a private IP range (e.g., 10.0.0.0/24) and divide it into subnets as needed.
Setup the Network Topology:

Use routers to interconnect subnets.
Connect end devices within subnets using switches.
Example:
Subnet A connected to Router 1 via Switch 1.
Subnet B connected to Router 2 via Switch 2.
Assign IP Addresses:

Assign IPs to router interfaces and devices within subnets.
Example:
Subnet A: 10.0.0.0/24 -> Router 1 Interface: 10.0.0.1.
Subnet B: 10.0.1.0/24 -> Router 2 Interface: 10.0.1.1.
Configure EIGRP on Routers:

Enable EIGRP and define the autonomous system (AS) number.
Advertise the connected networks.
Example for Router 1:
scss
Copy code

```
Router(config)# router eigrp 100
Router(config-router)# network 10.0.0.0 0.0.0.255
Router(config-router)# no auto-summary
```

Test Routing:

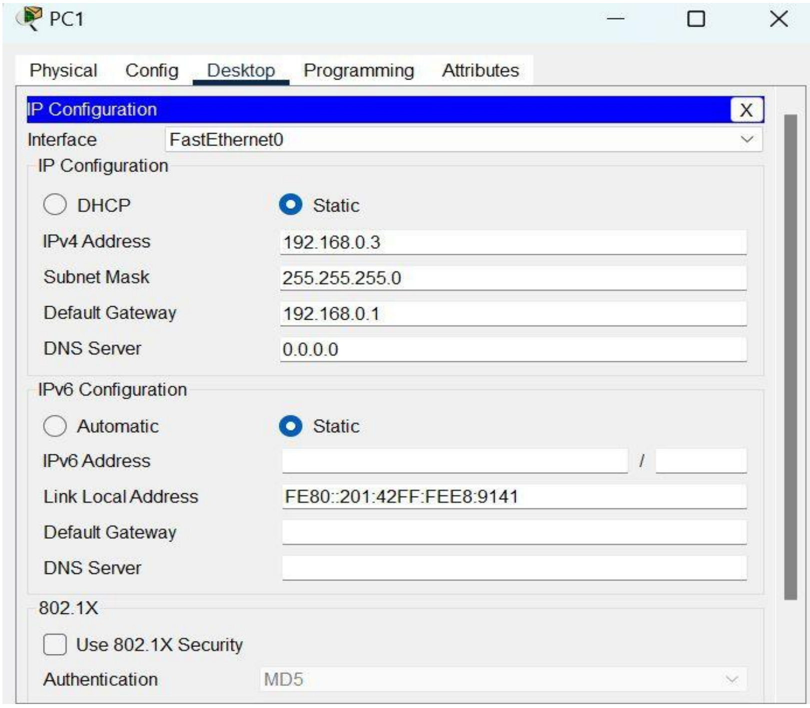
Verify EIGRP neighbor relationships using show ip eigrp neighbors.
Check the routing table with show ip route.
Test Connectivity:

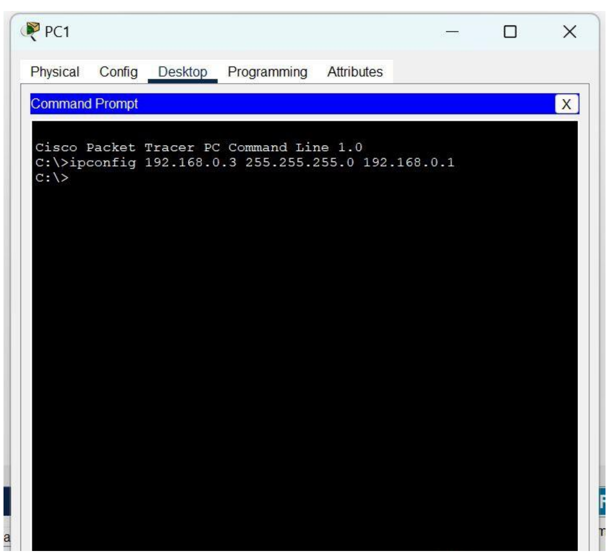
Use the ping and traceroute commands to confirm communication between devices in different subnets.

S.NO	Device	Model Name	Qty.

1.	**pc**	**pc**	**4**
2.	**switch**	**PT-Switch**	**2**
3.	**router**	**PT-Router**	**2**

S.NO	**Device**	**IPv4 Address**	**Subnet Mask**	**Default Gateway**
1.	**pc0**	**192.168.0.2**	**255.255.255.0**	**192.168.0.1**
2.	**pc1**	**192.168.0.3**	**255.255.255.0**	**192.168.0.1**
3.	**pc2**	**172.168.0.2**	**255.255.255.0**	**172.168.0.1**
4.	**pc3**	**172.168.0.3**	**255.255.255.0**	**172.168.0.1**

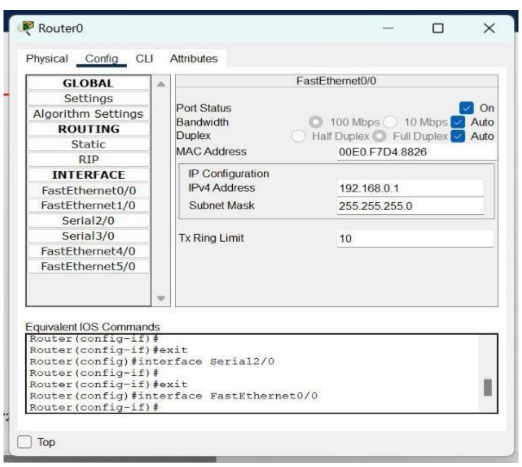

PC1
Physical
Config
Desktop
Programming
Attributes
IP Configuration
Interface
FastEthernet0
IP Configuration
DHCP
Static
IPv4 Address
192.168.0.3
Subnet Mask
255.255.255.0
Default Gateway
192.168.0.1
DNS Server
0.0.0.0
IPv6 Configuration
Automatic
Static
IPv6 Address
/
Link Local Address
FE80::201:42FF:FEE8:9141
Default Gateway
DNS Server
802.1X
Use 802.1X Security
Authentication
MD5


PC1
Physical
Config
Desktop
Programming
Attributes
Command Prompt
Cisco Packet Tracer PC Command Line 1.0
C:\>ipconfig 192.168.0.3 255.255.255.0 192.168.0.1
C:\>

S.NO	Device	Interface	IPv4 Address	Subnet Mask
1.	router0	FastEthernet0/0	192.168.0.1	255.255.255.0
		Serial2/0	10.0.0.1	255.0.0.0
2.	router1	FastEthernet0/0	172.168.0.1	255.255.0.0
		Serial2/0	10.0.0.2	255.0.0.0

CLI command : router eigrp 10
network <network id>

Protocols for router0



Router(config)#router eigrp 10
Router(config-router)#network 192.168.0.0
Router(config-router)#network 10.0.0.0

Protocols for router1
Router(config)#router eigrp 10
Router(config-router)#network 172.168.0.0
Router(config-router)#network 10.0.0.0

Conclusion :

The practical implementation of an internetwork using EIGRP for dynamic routing demonstrates the efficiency and scalability of modern network management. By configuring EIGRP on routers, the network successfully established neighbor relationships and dynamically shared routing information, ensuring seamless connectivity between multiple subnets. The integration of switches within each subnet facilitated robust intra-subnet communication and efficient device management. The use of EIGRP's advanced features, such as rapid convergence and reduced bandwidth utilization, showcased its superiority in dynamic routing scenarios. Overall, the practical highlighted how EIGRP simplifies complex network topologies, enhances scalability, and provides a reliable solution for interconnecting diverse network segments.