Computer Networks
VLSM

Introduction:

VLSM is a Variable Length Subnet Mask in which the subnet design uses more than one mask in the same network which means more than one mask is used for different subnets of a single class A, B, C, or a network. It is used to improve the usability of subnets as they can be of variable size. It is also defined as the process of subnetting a subnet.

How to do Subnetting with VLSM?

Step 1: Determine Host Requirements

Identify the number of hosts needed in each LAN and WAN:

- **HQ LAN** – 50 hosts
- **BRANCH 1** – 30 hosts
- **BRANCH 2** – 20 hosts
- **WAN 1 (HQ to BRANCH 1)** – 2 hosts
- **WAN 2 (HQ to BRANCH 2)** – 2 hosts
- **WAN 3 (BRANCH 1 to BRANCH 2)** – 2 hosts

Total: 106 hosts

Step 2: Choose IP Subnet Class

Based on the host count, a Class C subnet (192.168.10.0) will suffice.

Step 3: Host Bits per Subnet

For the HQ LAN (50 hosts), 6 host bits will fulfill the requirement.

Step 4: Calculate Subnet Mask

The subnet mask for HQ LAN is /26 or 255.255.255.192.

Step 5: Determine Increment

With 6 host bits, the increment is 64.

Step 6: Network, Broadcast, and Usable IP Range

- **Network Address:** 192.168.10.0
- **Broadcast Address:** 192.168.10.63
- **Usable IP Addresses:** 192.168.10.1 to 192.168.10.62

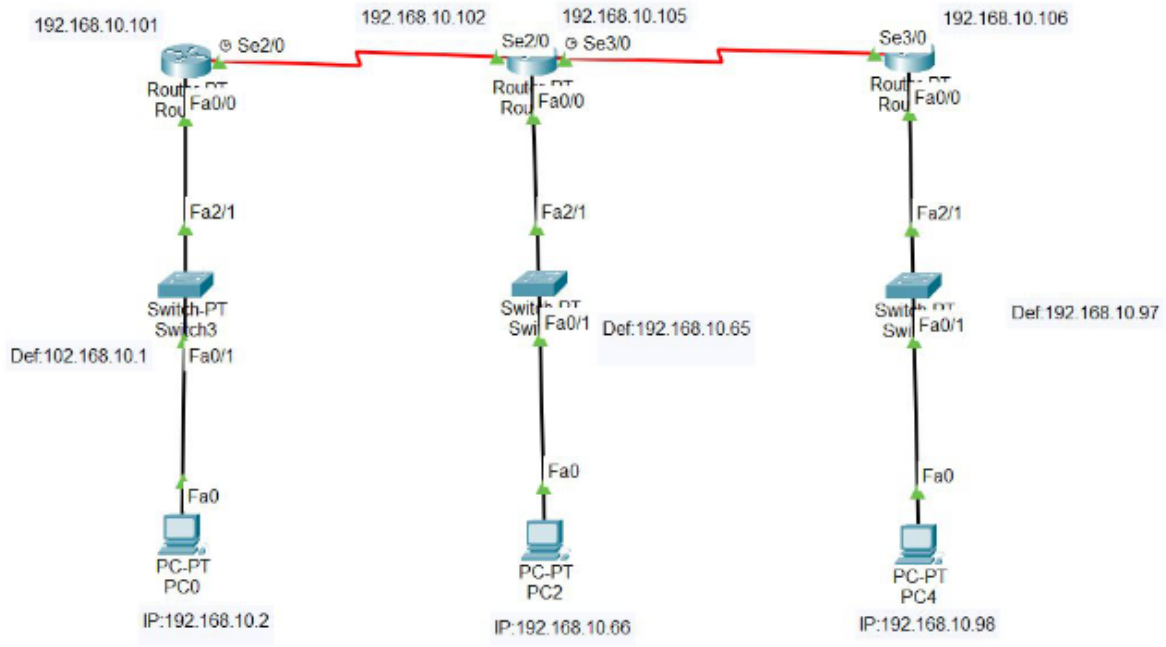
Implementing VLSM

Subnetting:

- **BRANCH 1 LAN**
    - **Hosts:** 30
    - **Subnet Mask:** /27
    - **Network Address:** 192.168.10.64
    - **Usable IP Range:** 192.168.10.65 to 192.168.10.94
- **BRANCH 2 LAN**
    - **Hosts:** 20
    - **Subnet Mask:** /27
    - **Network Address:** 192.168.10.96
    - **Usable IP Range:** 192.168.10.97 to 192.168.10.126
- **WAN 1, WAN 2, WAN 3**
    - **Hosts:** 2 each
    - **Subnet Mask:** /30
    - **Usable IP Range:** Address ranges for each WAN

By following these steps, you can efficiently allocate IP addresses across various subnets within your network.

VLSM in CISCO PACKET TRACER



Steps to create VLSM in CISCO Packet Tracer

Step 1: First, open the cisco packet tracer desktop and select the devices given below:

S.NO	Device	Model-Name	Qty.
1.	pc	pc	3

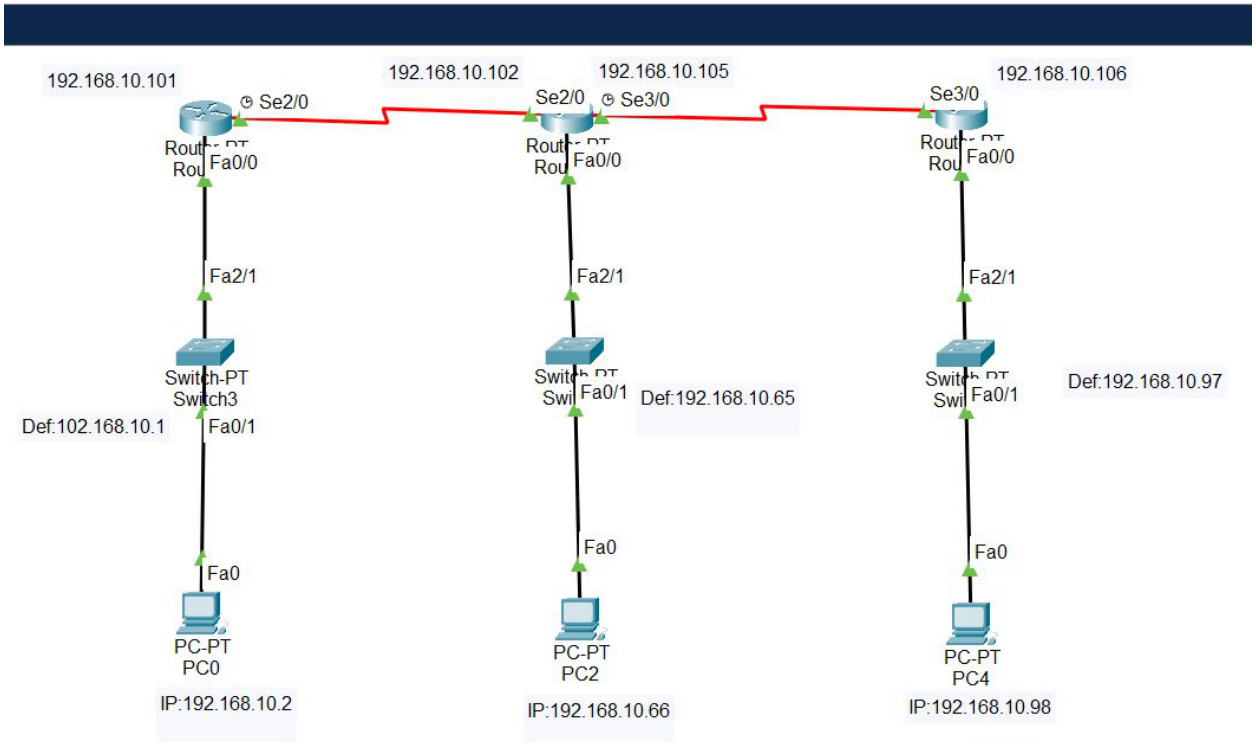
2.	switch	PT-Switch	3
3.	router	PT-Router	3

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

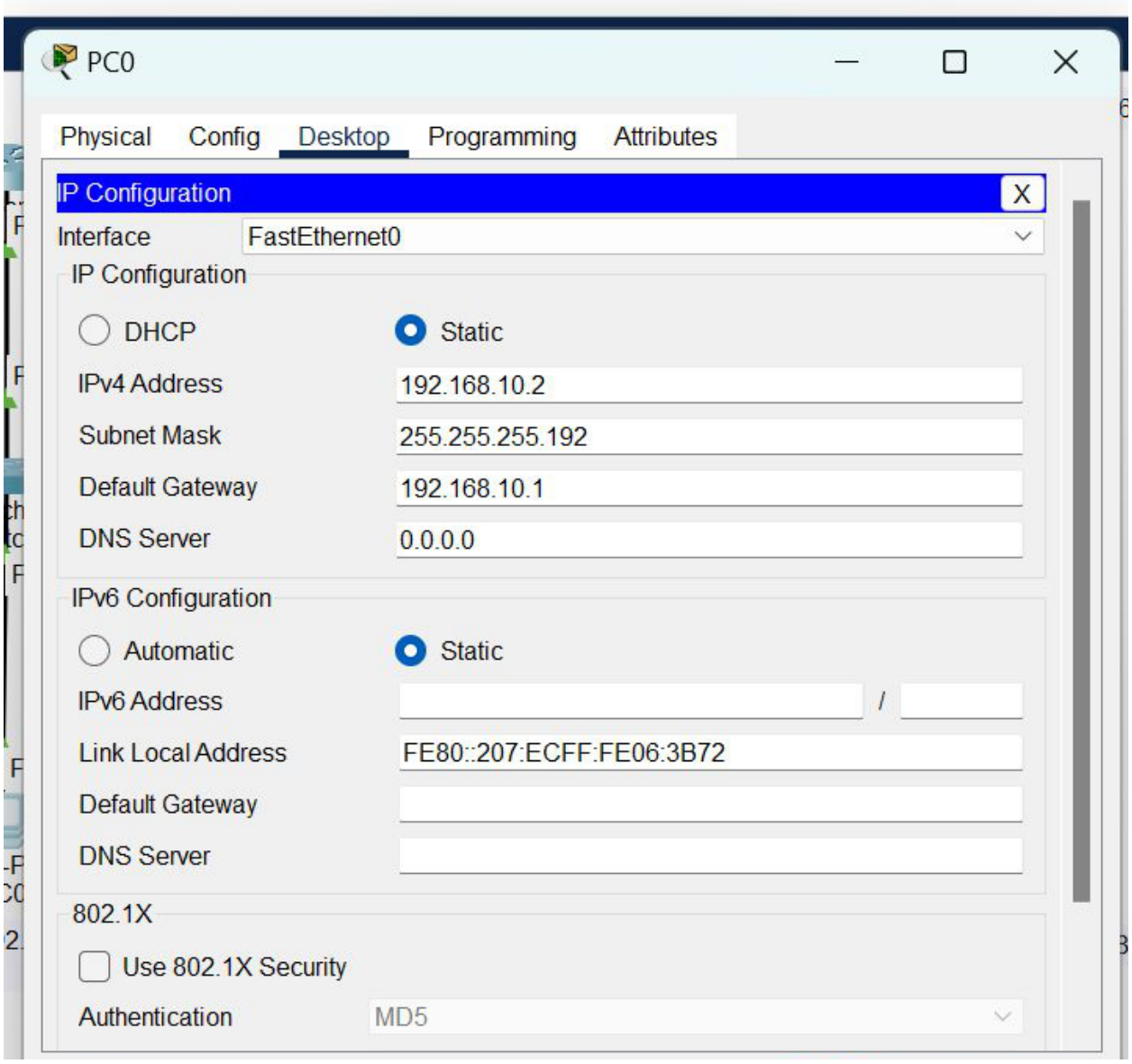
- Then, create a network topology as shown below the image.

- Use an automatic connecting cable to connect the devices with others.



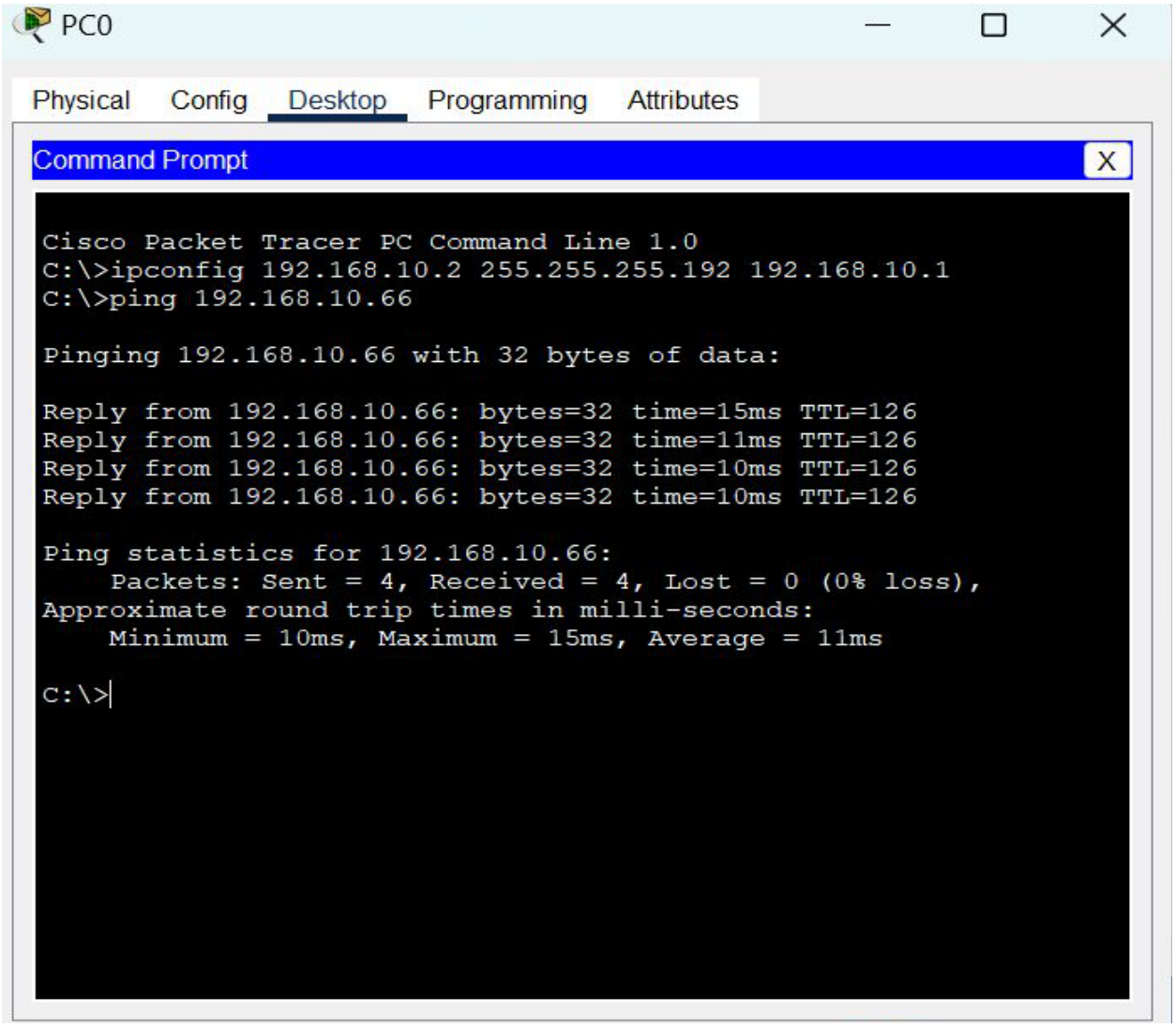
Step 2: Configure the PCs (hosts) with IPv4 address and Subnet Mask according to the IP addressing table given above.

- To assign an IP address in PC0, click on PC0.
- Then, go to desktop and then IP configuration and there you will IPv4 configuration.
- Fill IPv4 address and subnet mask.



- **Assigning an IP address using the ipconfig command, or we can also assign an IP address with the help of a command.**
- **Go to the command terminal of the PC.**
- **Then, type ipconfig <IPv4 address><subnet mask><default gateway>(if needed)**

Example: ipconfig 192.168.10.2 255.255.255.192 192.168.10.1



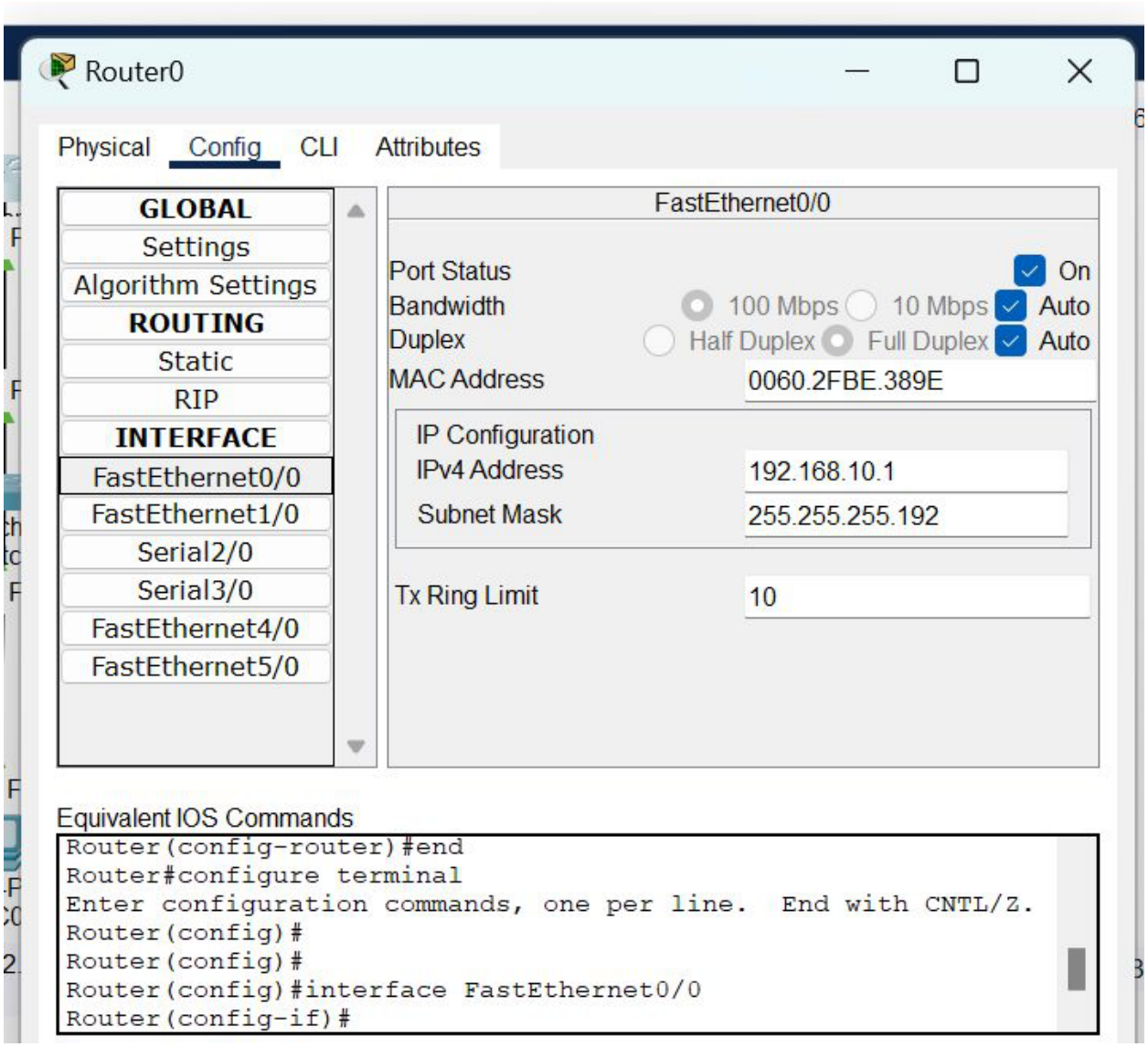
- **Repeat the same procedure with other PCs to configure them thoroughly.**

Step 3: Configure router with IP address and subnet mask.

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
		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

- To assign an IP address in router0, click on router0.
- Then, go to config and then Interfaces.
- Now, configure the IP address in FastEthernet and serial ports according to IP addressing Table.
- Fill IPv4 address and subnet mask.



- **Repeat the same procedure with other routers to configure them thoroughly.**

Step 4: After configuring all of the devices we need to assign the routes to the routers.

To assign static routes to the particular router:

- **First, click on router0 then Go to CLI.**

- then type the commands and IP information given below.

```
CLI command : ip route <network id> <subnet mask><next hop>
```

Static Routes for Router0 are given below:

```
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
```

Static Routes for Router1 are given below:

```
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
```

Static Routes for Router2 are given below:

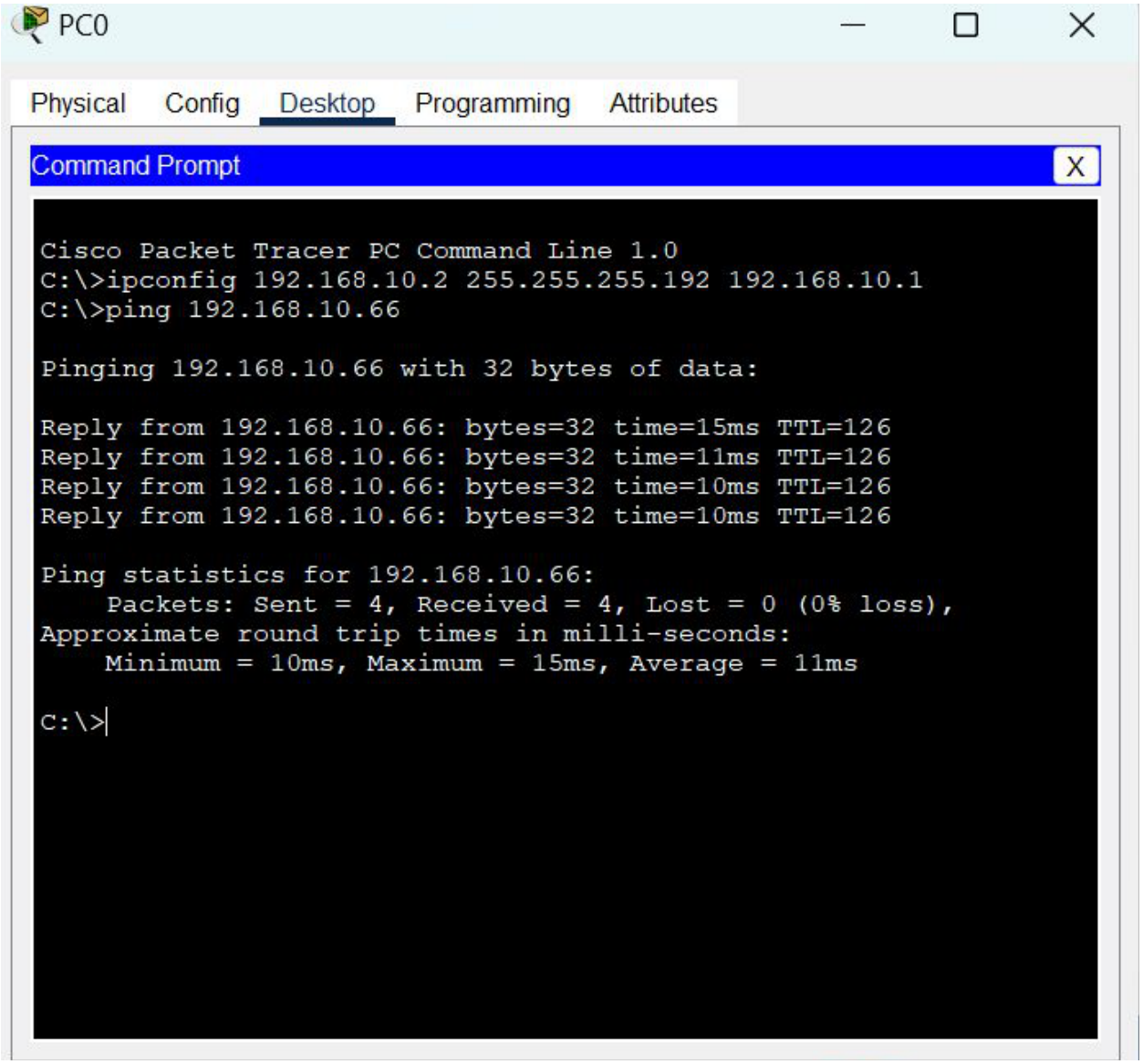
```
Router(config)#ip route 192.168.10.64 255.255.255.224
192.168.10.105
Router(config)#ip route 192.168.10.100 255.255.255.252
192.168.10.105
Router(config)#ip route 192.168.10.0 255.255.255.192
192.168.10.105
```

Step 5: Verifying the network by pinging the IP address of any PC.

we will use the ping command to do so.

- First, click on PC0 then Go to the command prompt.
- Then type ping <IP address of targeted node>.
- As we can see in the below image we are getting replies which means the connection is working.

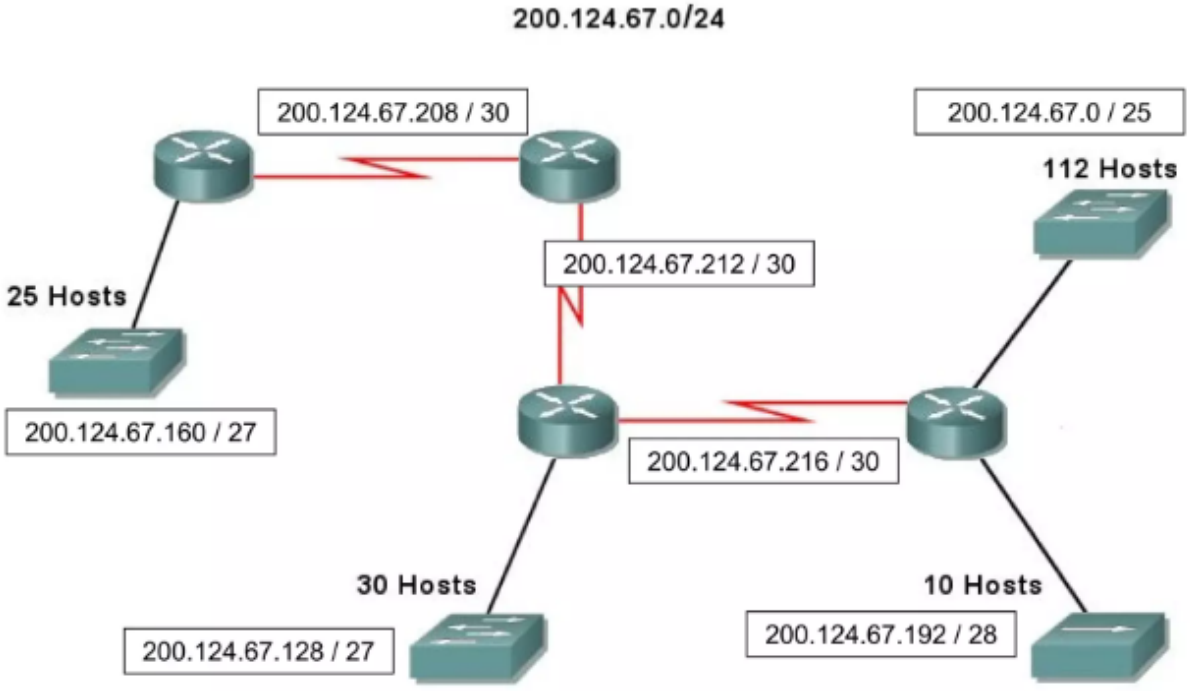
```
Example : ping 192.168.10.66
```



- **A simulation of the experiment is given below we are sending PDU from PC0 to PC2 and PC2 to PC4:**

Lab Task.

Design the below VLSM architecture in cisco packet tracer.


200.124.67.0/24
200.124.67.208 / 30
200.124.67.0 / 25
112 Hosts
200.124.67.212 / 30
25 Hosts
200.124.67.160 / 27
200.124.67.216 / 30
30 Hosts
10 Hosts
200.124.67.128 / 27
200.124.67.192 / 28