

Experiment 6

Computer Networking: Concepts

PART 1 — FIXED-LENGTH SUBNETTING

Given Network: **172.16.0.0/24**

Required Subnets:

- Subnet A: 40 hosts
- Subnet B: 20 hosts
- Subnet C: 10 hosts
- Subnet D: 5 hosts

! Fixed-length subnetting means all subnets must be of equal size.

Step 1 — Determine Subnet Size

We need the largest host requirement → **40 hosts**.

Formula:

$$\text{Hosts} = 2^h - 2 \geq 40$$

$$2^6 - 2 = 62 \rightarrow \text{OK}$$

So we need **6 host bits**, leaving:

$$\text{Prefix} = 32 - 6 = /26$$

$$\text{Subnet mask} = 255.255.255.192$$

Each subnet size = $2^6 = \mathbf{64}$ addresses per subnet

Step 2 — Create Subnets of /26

Subnet	Network Address	First Host	Last Host	Broadcast
A	172.16.0.0/26	172.16.0.1	172.16.0.62	172.16.0.63
B	172.16.0.64/26	172.16.0.65	172.16.0.126	172.16.0.127
C	172.16.0.128/26	172.16.0.129	172.16.0.190	172.16.0.191
D	172.16.0.192/26	172.16.0.193	172.16.0.254	172.16.0.255

Step 3 — Packet Tracer Topology

Use:

- 1 Router (**PT-Empty Router** or **PT Router**)
- 4 Switches
- Multiple PCs in each subnet

To add new interfaces (Extra Ports)

Drag the Router to the Workspace

- *From **Devices** → **Routers***
- *Choose **Cisco PT-Empty Router***
- *Drag onto the workspace.*

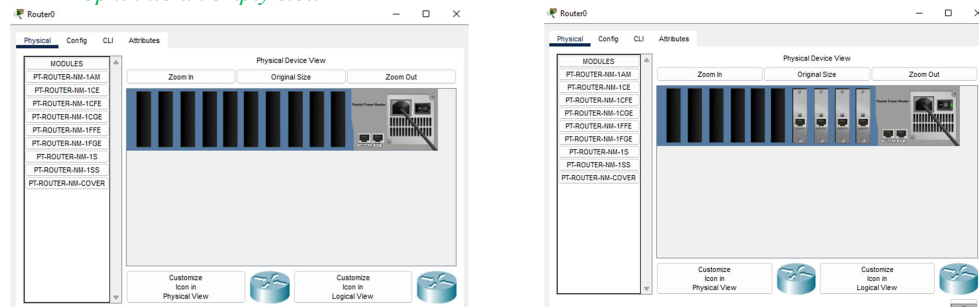
*Power **OFF** the Router*

You cannot insert modules while powered on.

- *Click the router*
- *Go to the **Physical** tab*
- *Find the **Power button** (left side → switch)*
- *Click it → It turns **red (OFF)***

Choose a Module to Add to the empty slot

- In the router's Physical tab, you'll see **empty slots**.
- Drag the module (**PT-ROUTER-NM-1CGE**) from the left panel
- Drop it into an empty slot.



You will see the module appear with new port.

Power ON the Router

- Click the same power switch
- It turns **green (ON)**

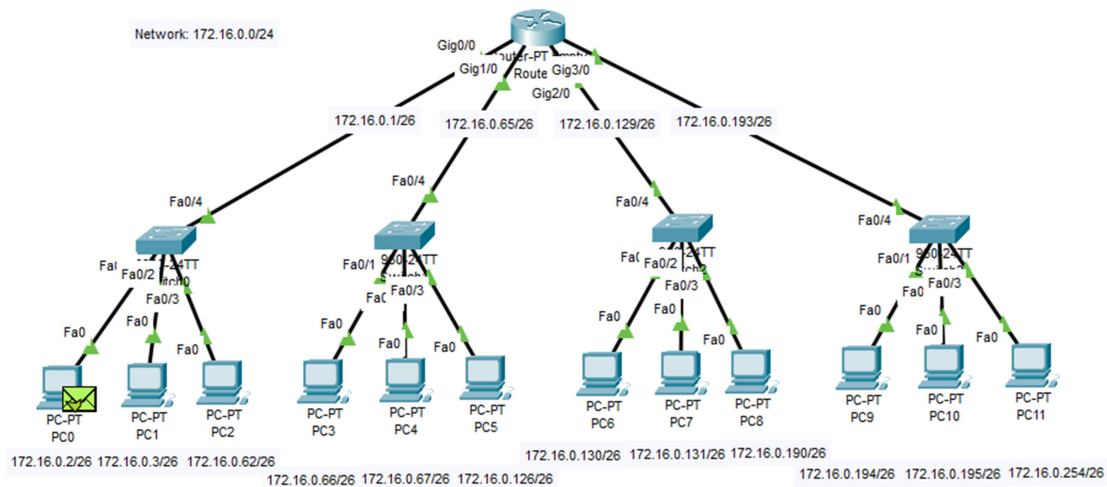
Go to CLI and Verify Ports

Open CLI → type:

`show ip interface brief`

You should now see the new interfaces.

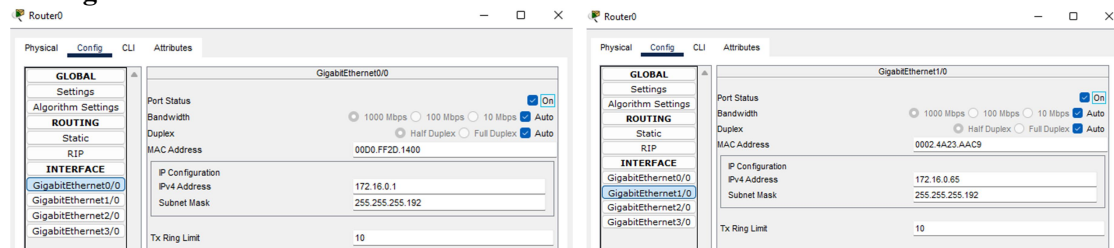
Connect:



Step 4 — Router Configuration

Example for Router:

Config:



CLI:

```
enable
configure terminal

interface g0/0
 ip address 172.16.0.1
 255.255.255.192
 no shutdown

interface g1/0
 ip address 172.16.0.65
 255.255.255.192
 no shutdown

interface g2/0
 ip address 172.16.0.129
 255.255.255.192
 no shutdown

interface g3/0
 ip address 172.16.0.193
 255.255.255.192
 no shutdown
```

Since a single router is used, **routing is automatic** (no static routes needed).

Step 5 — PC Configuration Example

PC in Subnet A:

IP: 172.16.0.2

Mask: 255.255.255.192

Gateway: 172.16.0.1

Repeat for all PCs.

Step 6 — Verification

Ping across subnets:

PC-A → PC-B

PC-A → PC-C

PC-A → PC-D

All pings should succeed.

PART 2 — VLSM

We use the same network **172.16.0.0/24**, but assign subnet sizes based on host counts.

Host requirements:

- A → 40
- B → 20
- C → 10
- D → 5

Step 1 — Sort by host size

1. A = 40 hosts → needs /26 (62 hosts)
2. B = 20 hosts → /27 (30 hosts)
3. C = 10 hosts → /28 (14 hosts)
4. D = 5 hosts → /29 (6 hosts)

Step 2 — Allocate Subnets (largest first)

✓ Subnet A (40 hosts) → /26

172.16.0.0/26

Range: 172.16.0.1 - 172.16.0.62

Broadcast: 172.16.0.63

✓ **Subnet B (20 hosts) → /27**

Next available block starts at 172.16.0.64

172.16.0.64/27

Range: 172.16.0.65 – 172.16.0.94

Broadcast: 172.16.0.95

✓ **Subnet C (10 hosts) → /28**

Next block starts at 172.16.0.96

172.16.0.96/28

Range: 172.16.0.97 – 172.16.0.110

Broadcast: 172.16.0.111

✓ **Subnet D (5 hosts) → /29**

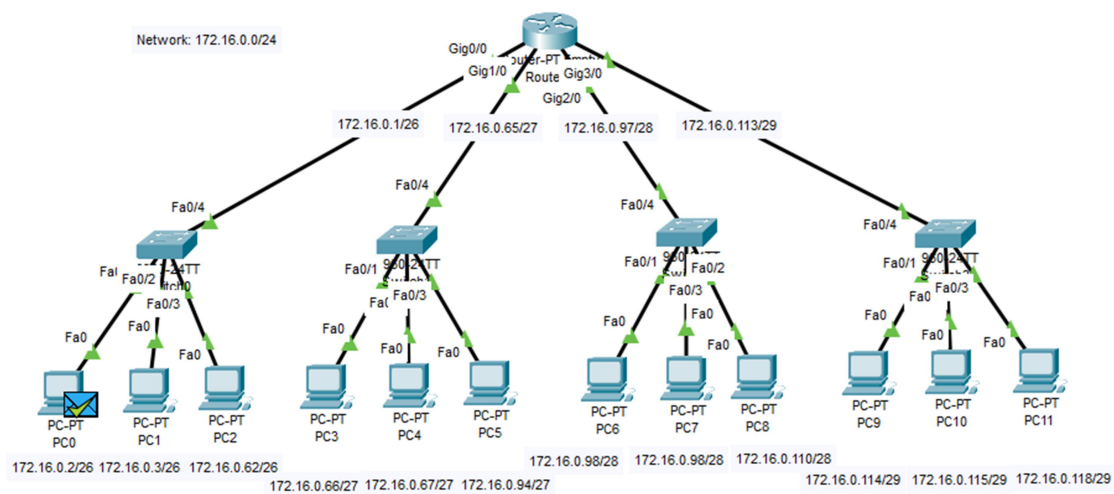
Next block starts at 172.16.0.112

172.16.0.112/29

Range: 172.16.0.113 – 172.16.0.118

Broadcast: 172.16.0.119

Step 3 — Topology



Step 4 — Configure PCs

Example for Subnet D:

IP: 172.16.0.118

Mask: 255.255.255.248

Gateway: 172.16.0.113

Step 5 — Verify With Ping

All hosts must successfully ping across all networks.