# VISVESVARAYA TECHNOLOGICAL UNIVERSITY

**"JnanaSangama", Belgaum -590014, Karnataka.**

**LAB RECORD**

# Computer Network Lab (23CS5PCCON)

***Submitted by***

**Bhoomi Udedh(1BM23CS066)**

***in partial fulfillment for the award of the degree of***

**BACHELOR OF ENGINEERING**

***in***

**COMPUTER SCIENCE AND ENGINEERING**

**B.M.S. COLLEGE OF ENGINEERING**

**(Autonomous Institution under VTU)**

**BENGALURU-560019**

**September 2025 – January 2026**

# B. M. S. College of Engineering,

**Bull Temple Road, Bangalore 560019**

(Affiliated To Visvesvaraya Technological University, Belgaum)

## Department of Computer Science and Engineering

# CERTIFICATE

This is to certify that the Lab work entitled "Computer Network (23CS5PCCON)" carried out by **Bhoomi Udedh(1BM23CS066),** who is bonafide student of **B.M.S. College of Engineering.** It is in partial fulfilment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum. The Lab report has been approved as it satisfies the academic requirements of the above-mentioned subject and the work prescribed for the said degree.

| | |
|---|---|
| **Spoorthi D M** | **Dr.Kavitha Sooda** |
| **Assistant Professor** | **Professor & HOD** |
| **Department of CSE,BMSCE** | **Department of CSE** |

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## Part - A

# Part - B



Github Link:

https://github.com/bhoomiudedh/CN-LAB-

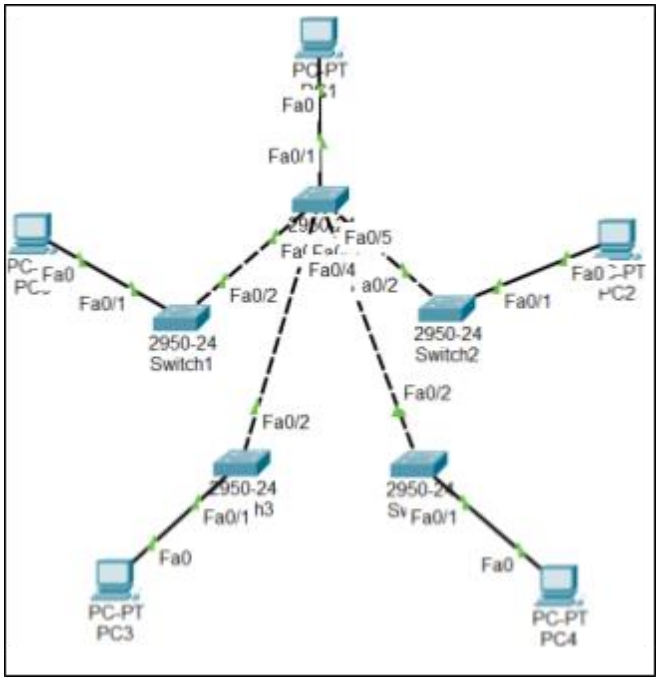
# PART - A

## Program 1:

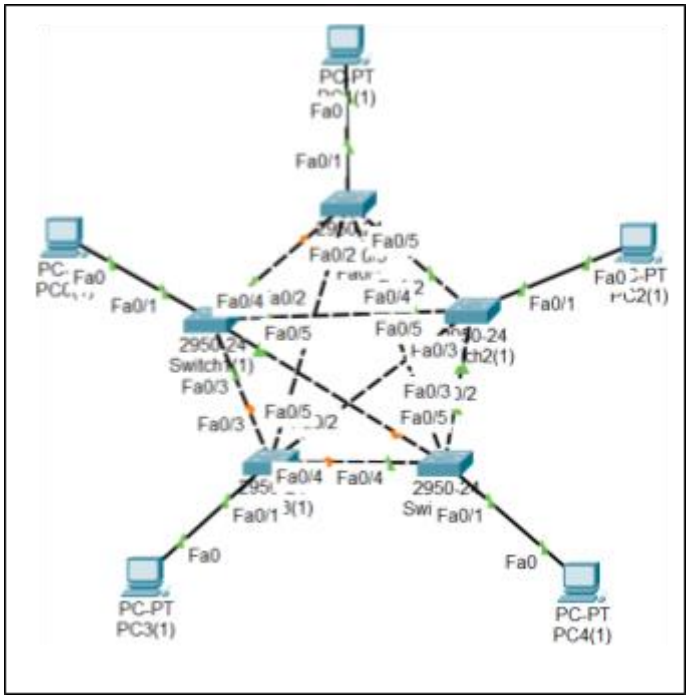
**Aim:** Create a topology and simulate sending a simple PDU from source to destination using hub and switch as connecting devices and demonstrate ping message.

**Topology:**

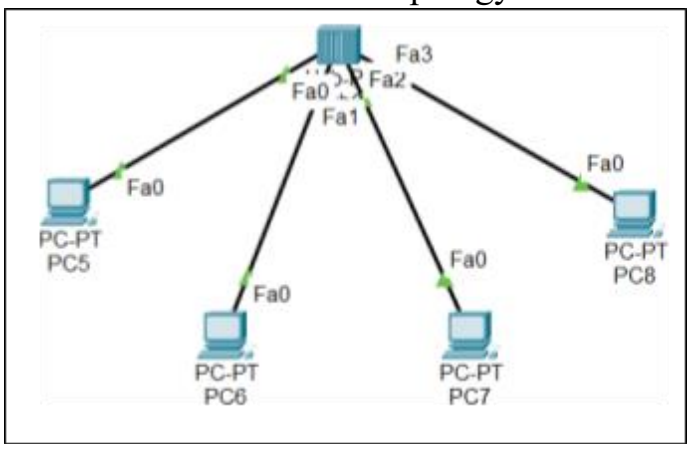
1. STAR Topology with Switch:




2. MESH Topology with Switch:




3. HUB-Based Network Topology:



## Procedure:

### 1. Create STAR Topology Using a Switch

1. Open Cisco Packet Tracer and go to the End Devices section.
2. Drag and drop PCs (PC0, PC1, PC2, PC3, PC4) into the workspace.
3. From Switches, drag a 2950-24 switch to the center.
4. Connect each PC to the switch using Copper Straight-Through cables:
    - PC0 → Switch (Fa0/1)
    - PC1 → Switch (Fa0/2)
    - PC2 → Switch (Fa0/5)
    - PC3 → Switch (Fa0/3)
    - PC4 → Switch (Fa0/4)
5. Assign IP addresses to PCs:
    - Go to PC → Desktop → IP Configuration
    - Enter the IP address/subnet for each PC (any address in same network).
6. Test connectivity:
    - Use Add Simple PDU tool to send a ping from one PC to another.

### 2. Create MESH Topology Using Switches

1. Drag and drop PCs (PC0, PC1, PC2, PC3, PC4).
2. Add two 2950-24 switches to the workspace.
3. Create mesh-style interconnections:
    - Connect each PC to the nearest switch.
    - Connect Switch1 ↔ Switch2 with multiple redundant links (e.g., Fa0/1 ↔ Fa0/3, Fa0/2 ↔ Fa0/4).
4. Assign IP addresses to all PCs within the same network.
5. Verify STP operation automatically blocks redundant paths.
6. Use Simple PDU (ICMP) to test ping between:
    - PC0 → PC3
    - PC1 → PC4
    - PC2 → any node
7. View packet movement under Simulation Mode.

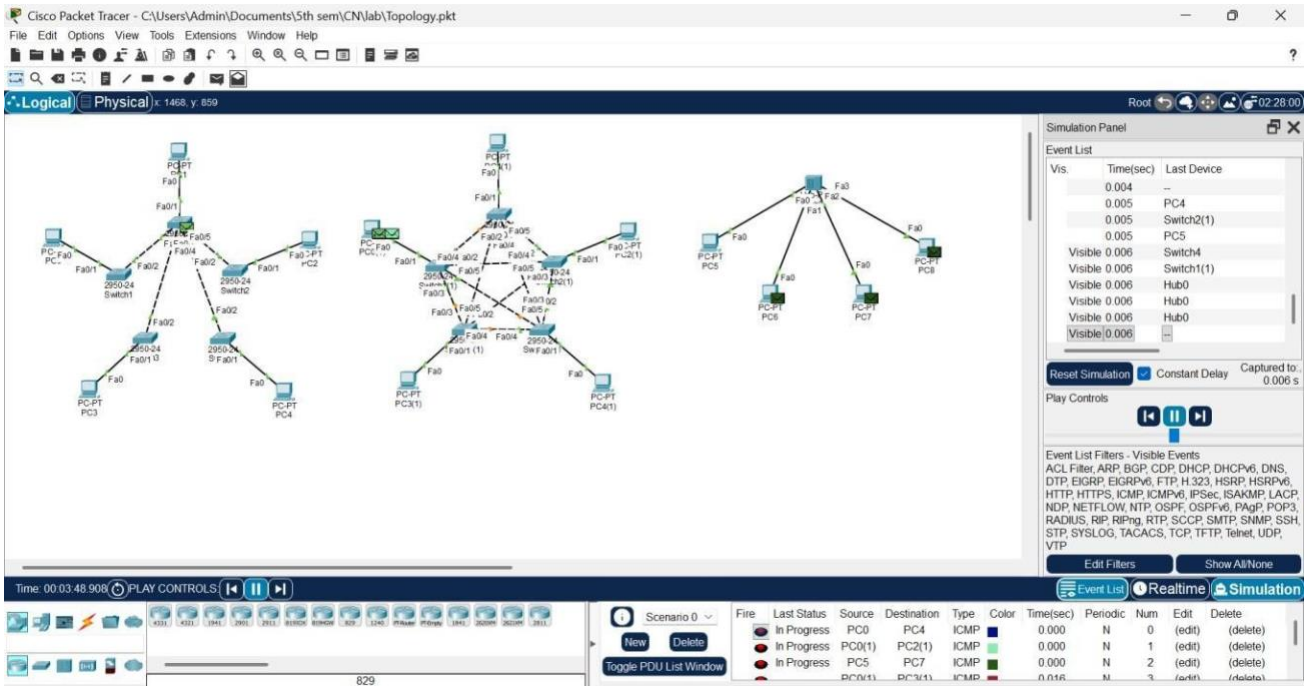
### 3. Create HUB-Based Topology

1. Drag and drop PCs (PC5, PC6, PC7, PC8, PC9).
2. From Hubs section, drag a Generic Hub (Hub0).
3. Connect each PC to the hub using Copper Straight-Through cable:
    - PC5 → Hub Fa0
    - PC6 → Hub Fa1
    - PC7 → Hub Fa2
    - PC8 → Hub Fa3
    - PC9 → Hub Fa4
4. Assign IP addresses within the same network for all PCs.
5. Use Simulation mode to send Simple PDU.
6. Observe broadcast behavior:
    - Hub sends the packet to all devices.

**4. Demonstrate Ping Message (ICMP)**

1. Switch to Simulation Mode from bottom-right corner.
2. Select the Simple PDU Tool (envelope icon).
3. Click on Source PC, then Destination PC.
4. Playback controls:
    - Play to observe step-by-step
    - Fast Forward for quick simulation
5. Watch the ICMP request and reply in the Event List window

## Output:



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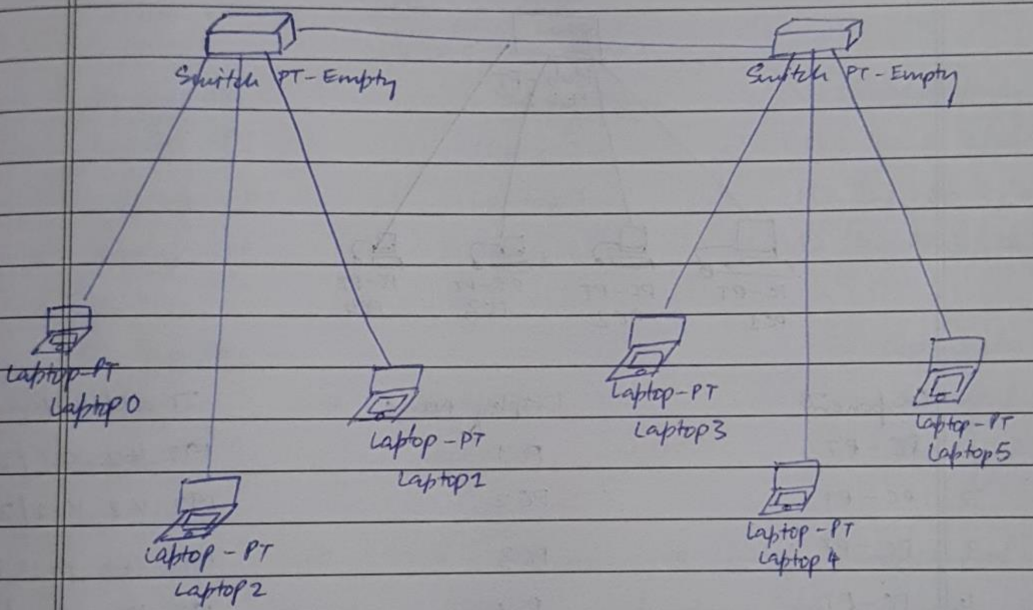
LAB-01.

AIM :- INTRODUCTION TO CISCO PACKET TRACER AND SIMPLE SYSTEM CONNECTIONS




| | Components | Display Name | IP address / config. |
|---|---|---|---|
| 1. | Laptop-PT | Laptop 0 | 192.162.10.1/24 |
| 2. | Laptop-PT | Laptop 1 | 192.162.10.2/24 |
| 3. | Laptop-PT | Laptop 2 | 192.162.10.3/24 |
| 4. | Laptop-PT | Laptop 3 | 192.162.20.1/24 |
| 5. | Laptop-PT | Laptop 4 | 192.162.20.2/24 |
| 6. | Laptop-PT | Laptop 5 | 192.162.20.3/24 |

| Observations :- | | | Last Status |
|---|---|---|---|
| Laptop 0 | → | Laptop 1 | Successful |
| Laptop 2 | → | Laptop 1 | Successful |
| Laptop 3 | → | Laptop 4 | Successful |
| Laptop 0 | → | Laptop 5 | Failed |

why it failed? → because they belong to different networks

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**Observation:**

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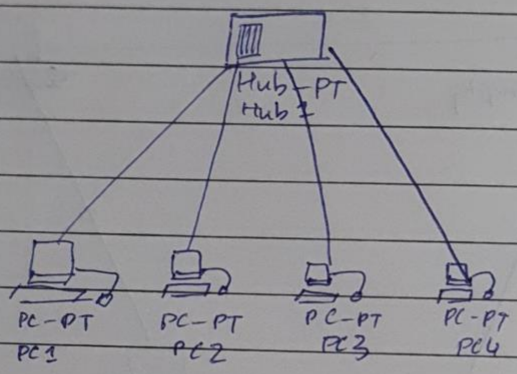
Q. Create a topology and simulate sending a simple PDU from source to destination using hub and switch as connecting devices and demonstrate a ping message.




| | Components | Display Name | IP address / config |
|---|---|---|---|
| 1. | PC-PT | PC1 | 192.162.10.1/24 |
| 2. | PC-PT | PC2 | 192.162.10.2/24 |
| 3. | PC-PT | PC3 | 192.162.10.3/24 |
| 4. | PC-PT | PC4 | 192.162.10.4/24 |

Observations:-

1. ~~Successful~~ Last status

1. PC1 → PC4 Successful
2. PC2 → PC3 Successful

PC1 to PC4 connection and message transfered successfully using a Hub. when a hub is used, H will send signal to all end-devices including receiver, but only concerned end-device will accept & send back receiver signal to hub.

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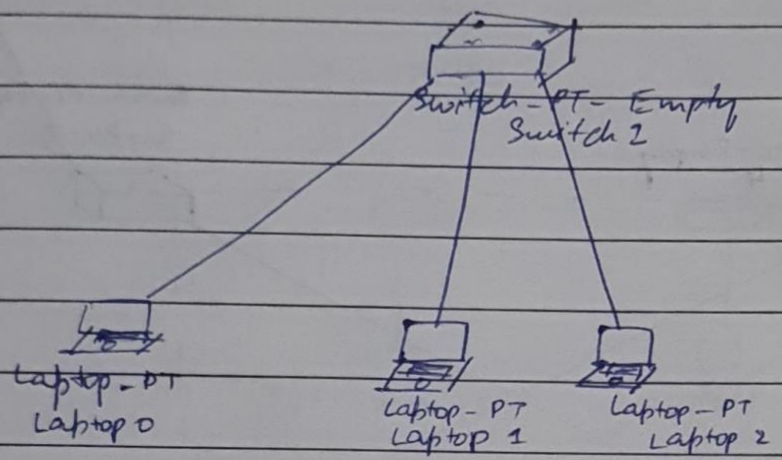
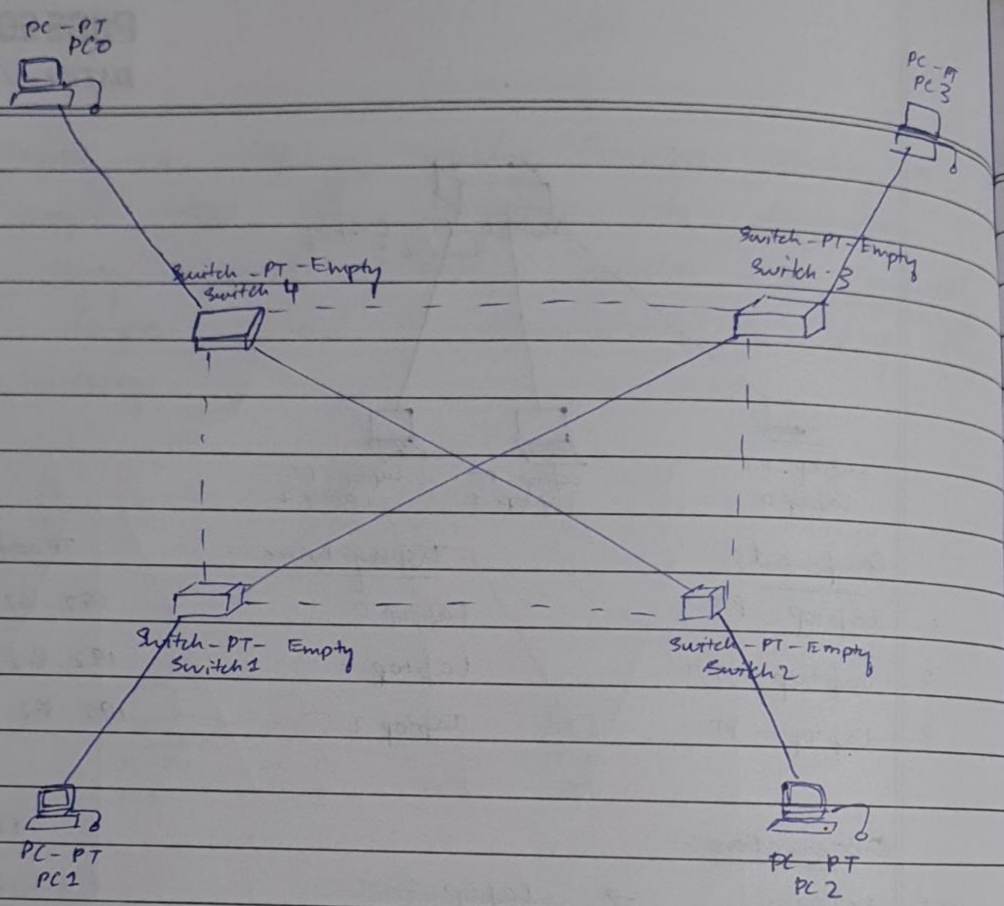



| | Components | Display Name | IP address Config |
|---|---|---|---|
| 1. | Laptop - PT | Laptop 0 | 192.162.20.1/24 |
| 2. | Laptop - PT | Laptop 1 | 192.162.20.2/24 |
| 3. | Laptop - PT | Laptop 2 | 192.162.20.3/24 |

Observations :-

| | | | | Last Status |
|---|---|---|---|---|
| 1. | Laptop 0 | → | Laptop 1 | Successful |
| 2. | Laptop 1 | → | Laptop 2 | Successful |

Switch will send signal to only concerned end-device instead of sending to every device.




| | Components | Display name | IP address/config |
|---|---|---|---|
| 1. | PC-PT | PC0 | 192.162.30.1/24 |
| 2. | PC-PT | PC1 | 192.162.30.2/24 |
| 3. | PC-PT | PC2 | 192.162.30.3/24 |
| 4. | PC-PT | PC3 | 192.162.30.4/24 |

Observations:-

| | | | Last status |
|---|---|---|---|
| 1. | PC3 | → PC2 | successful |
| 2. | PC0 | → PC1 | successful |
| 3. | PC0 | → PC2 | successful |

- Connections and message transfer were made successfully.
- Different switches are used to create mesh network

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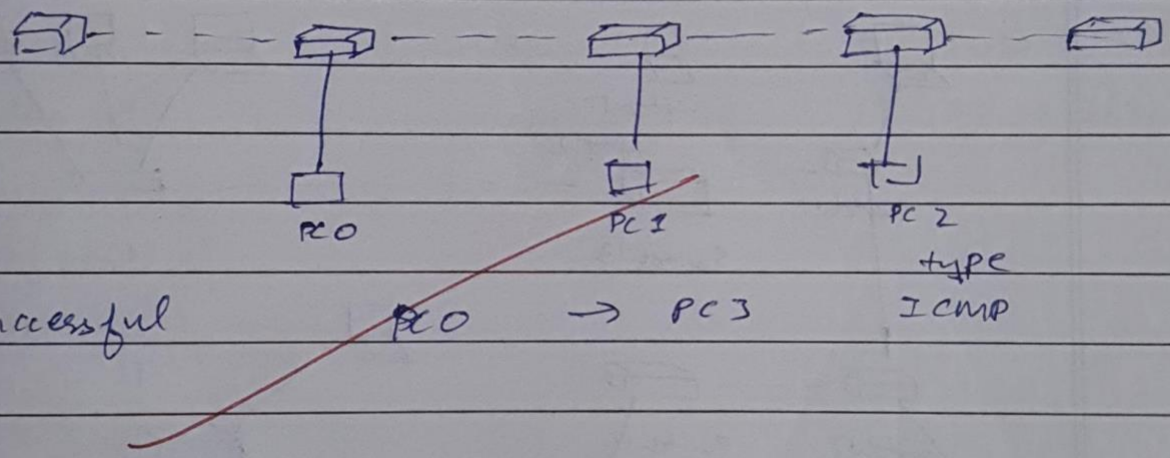
Different switches are used to create mesh networks.




Successful PC0 → PC3 type ICMP

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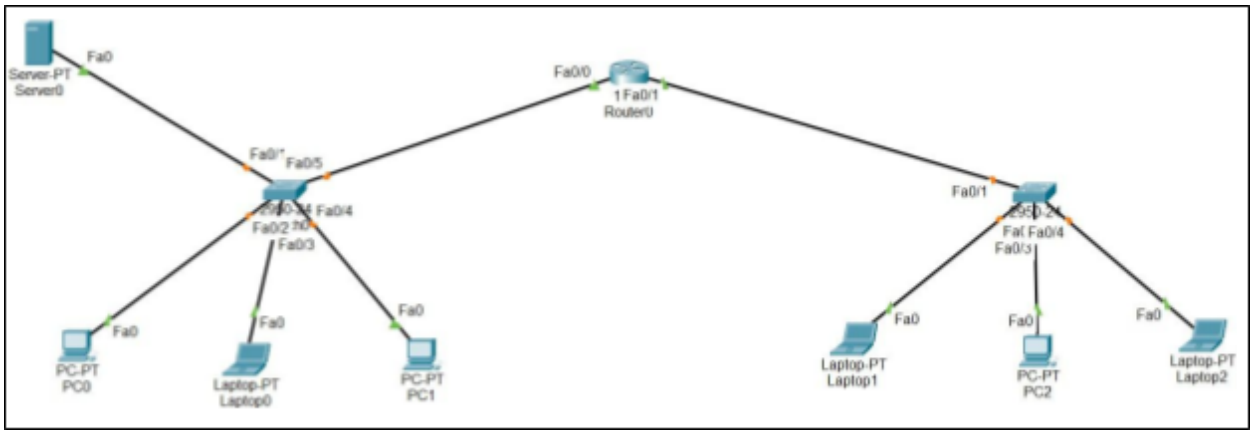
20/08

## Program 2:

**Aim:** Configure DHCP within a LAN and outside LAN.

**Topology:**



## Procedure:

1. **Configure DHCP Server:**
   in DHCP server go to Desktop>IP-Config, assign static IP – 192.168.10.2 and gateway 192.168.10.1

2. **Open Services>DHCP and add following two dhcp pool:**

   (a) Pool Name: switch1

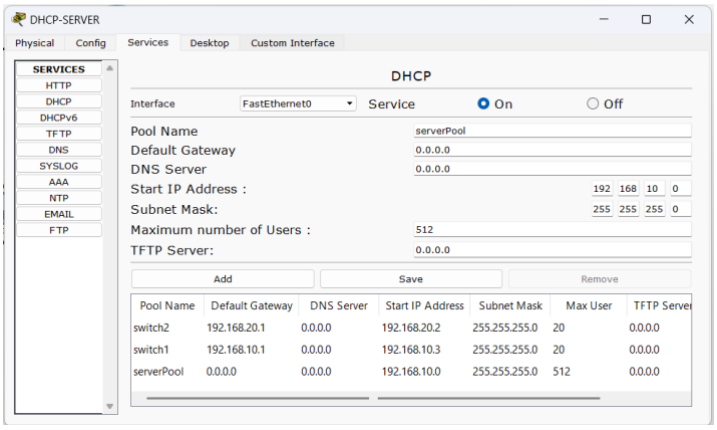
   Gateway: 192.168.10.1

   Start Ip: 192.168.10.3
   Subnet Mask: 255.255.255.0
   Max Users: 20

   (b) Pool Name: switch2

   Gateway: 192.168.20.1

   Start Ip: 192.168.10.2
   Subnet Mask: 255.255.255.0
   Max Users: 20




3. **Configure Router**

i. Router>enable

ii. Router#configure terminal

(Within Lan)

iii. Router(config)# int fa0/0

iv. Router(config-if)# ip address 192.168.10.1 255.255.255.0

v. Router(config-if)# ip helper-address 192.168.10.2

vi. Router(config-if)# no shutdown

vii. Router(config-if)# exit

(Outside Lan)

viii. Router(config)# int fa0/1

ix. Router(config-if)# ip address 192.168.20.1 255.255.255.0

x. Router(config-if)# ip helper-address 192.168.10.2

xi. Router(config-if)# no shutdown

xii. Router(config-if)# exit

xiii. Router(config)# exit

xiv. Router# write memory

## Observation:

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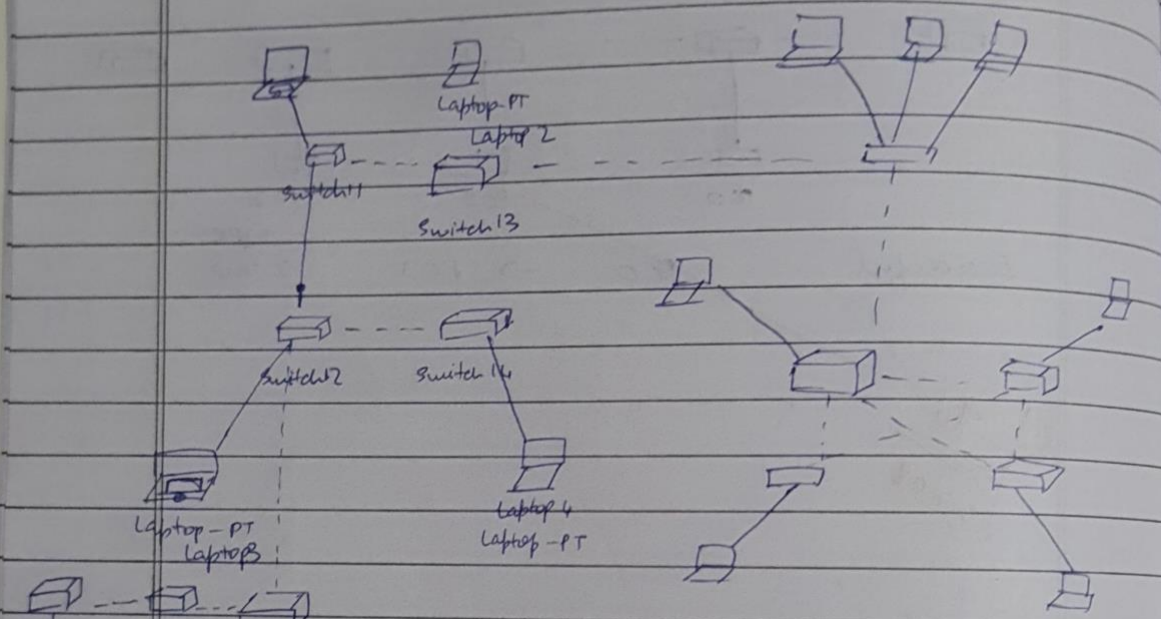
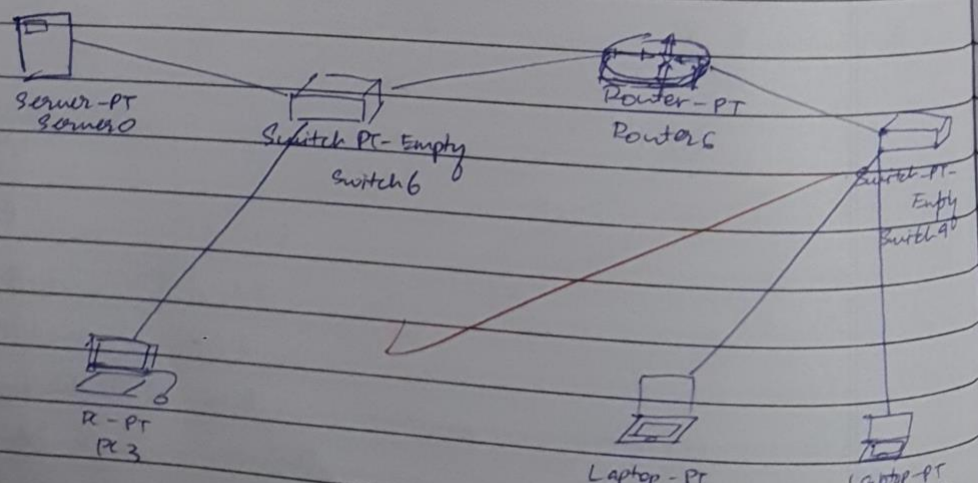



Dynamic Source Control Protocol

Configure DSCP within a land & outside land.



Observations :-

| Components | Display Name | Ip address / config |
|---|---|---|
| 1. PC - PT | PC 3 | 192.167.10.1/24 |
| 2. Laptop - PT | Laptop 0 | 192.167.10.2/24 |
| 3. Laptop - PT | Laptop 1 | 192.167.10.3/24 |

~~Observations~~ :-

Server

① DHCP
↳ Desktop IP config
↳ ~~static~~
↳ 192.168.10.2
Gateway 192.168.10.1

② Services
↳ DHCP

| | Switch one | Switch 2 |
|---|---|---|
| ↳ Pool Name | 192.168.10.1 | 192.168.20.1 |
| Start IP address | 192.168.10.3 | 192.168.20.2 |
| Subnet Mask | 255.255.255.0 | 255.255.255.0 |
| Max no. of users | 20 | 20 |

in Router
↳ CLI
↳ no
~~Router > enable~~

Observations :-

Address is fetched successfully within LAN & outside LAN

| | DHCP | DHCP req successful |
|---|---|---|
| IP address | | 192.168.10.1/24 |
| Subnet mask | | 255.255.255.0 |
| Default gateway | | 0.0.0.0 |

## Output:

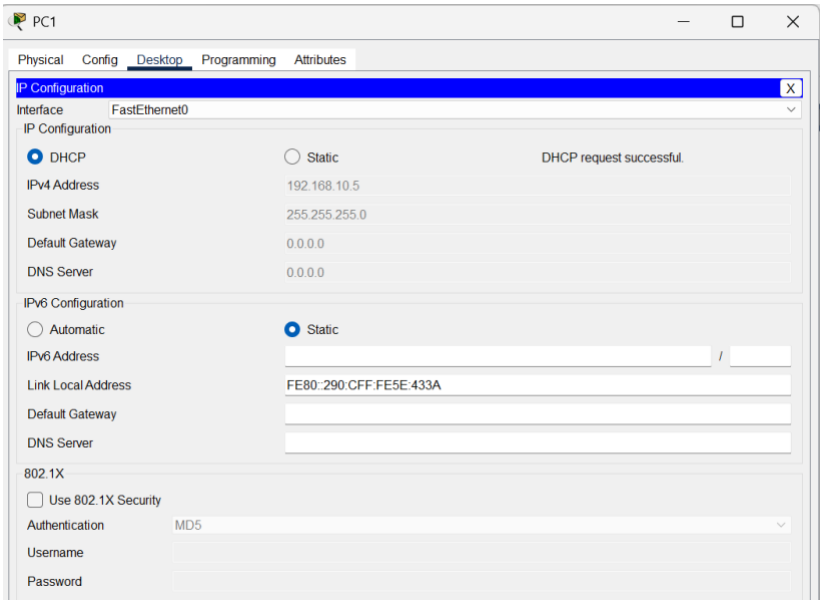



Fig 1. Ip address assigned by DHCP server within Lan (PC1)

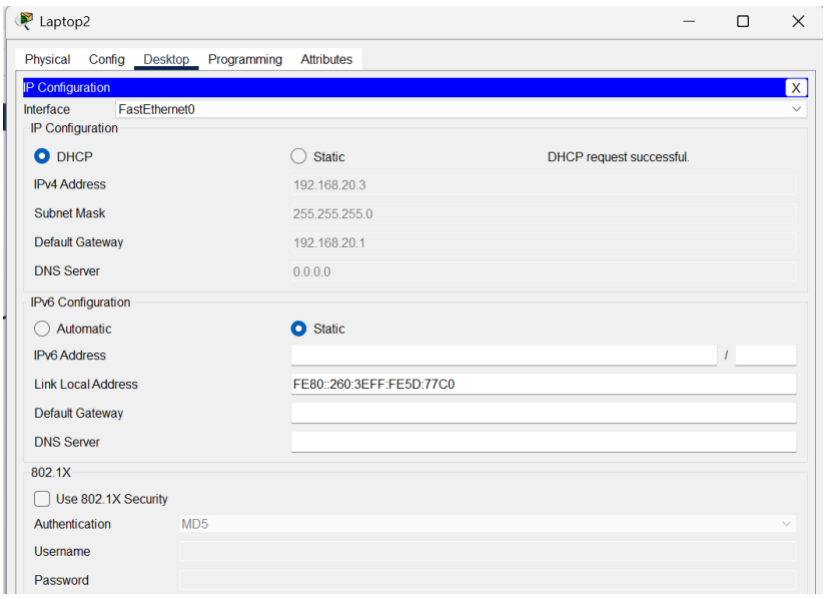
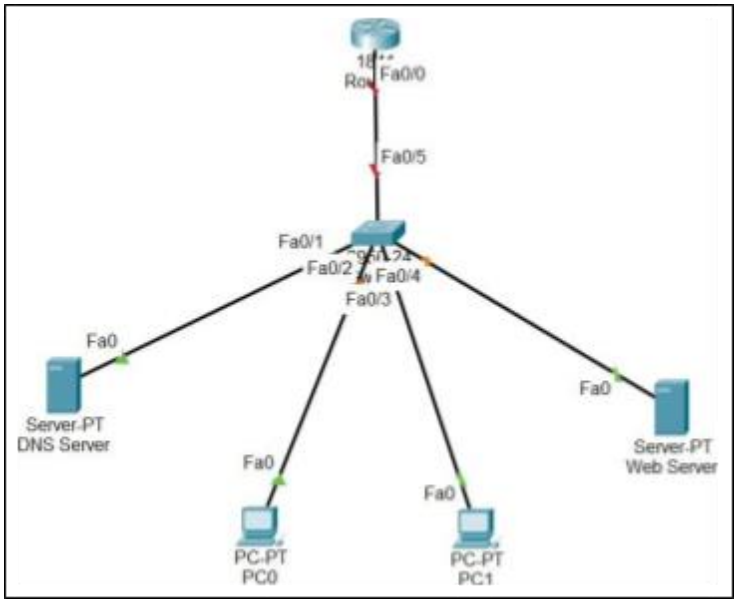



Fig 2. Ip address assigned by DHCP server outside Lan (laptop2)

## Program 3:

**Aim:** Configure Web Server, DNS within a LAN.

## Topology:




## Procedure:

### 1. Create the Network

1. Place 1 Router, 1 Switch, 1 DNS Server, 1 Web Server, and two PCs.
2. Connect all devices using Copper Straight-Through cables.

### 2. Assign IP Addresses

1. On each device: Desktop → IP Configuration
    - Assign IPs in same network (e.g., 192.168.1.x).
    - Set Gateway = Router's interface IP.

### 3. Configure DNS Server

1. Open DNS Server → Services → DNS.
2. Turn DNS Service = On.
3. Add A-Record:
    - Name: letslearn.com
    - Address: IP of Web Server

4. Click Add → Save.

**4. Configure Web Server**

1. Open Web Server → Services → HTTP.
2. Turn HTTP = On (HTTPS optional).
3. Ensure index.html exists (default file is fine).
4. Edit HTML if needed.

**5. Test from PC**

1. Open PC → Desktop → Web Browser.
2. Enter URL:
3. http://www.letslearn.com/index.html
4. The webpage should load, confirming DNS + Web Server working.

## Observation:

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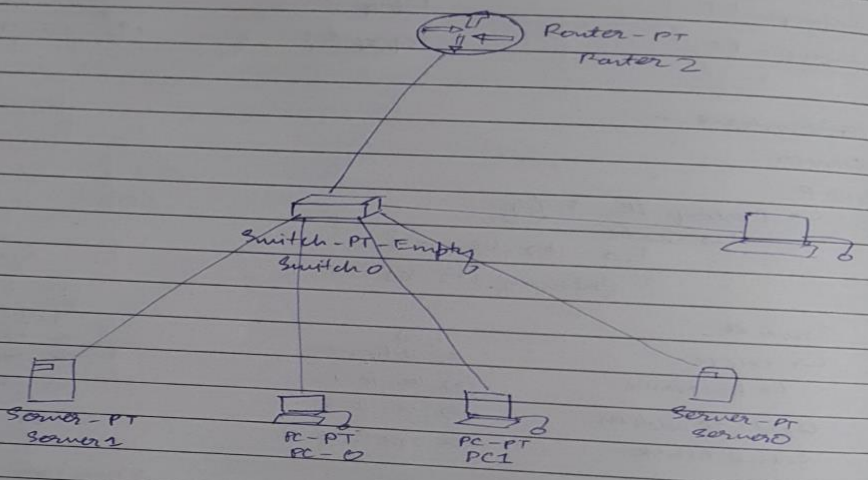
29) Configure web server, DNS within a local LAN




| | Components | Display Name | IP address/Config |
|---|---|---|---|
| 1. | Switch-PT-Empty | Switch0 | - |
| 2. | PC-PT | PC0 | 192.168.1.100/24 |
| 3. | PC-PT | PC1 | 192.168.1.101/24 |
| 4. | PC-PT | PC2 | 192.168.1.102/24 |
| 5. | Router-PT | Router2 | - |
| 6. | Server-PT | Server0 | 192.168.1.6/24 |
| 7. | Server-PT | Server1 | 192.168.1.5/24 |

Default Gateway - used to extend to different network

## Output:

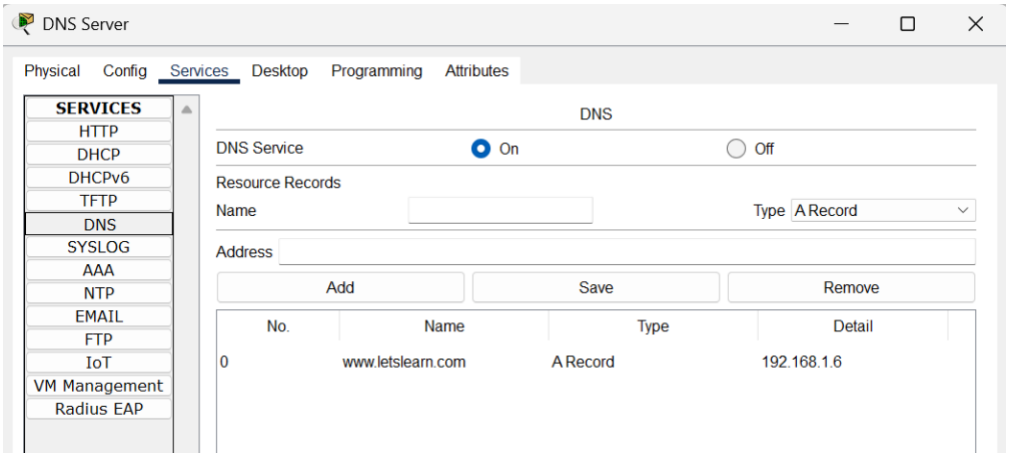



Fig 1. DNS server – DNS Services

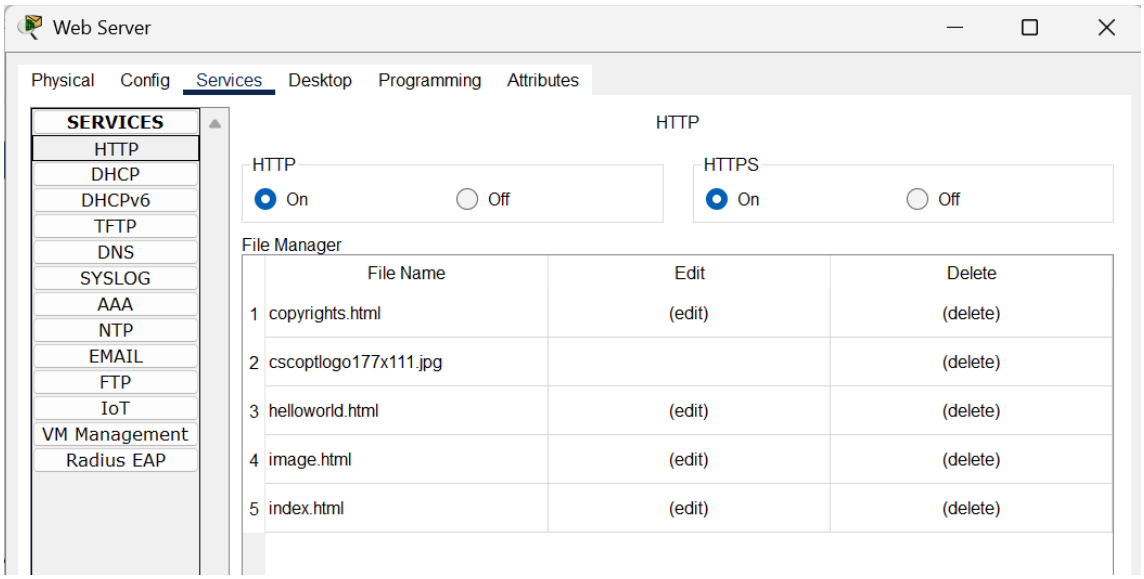


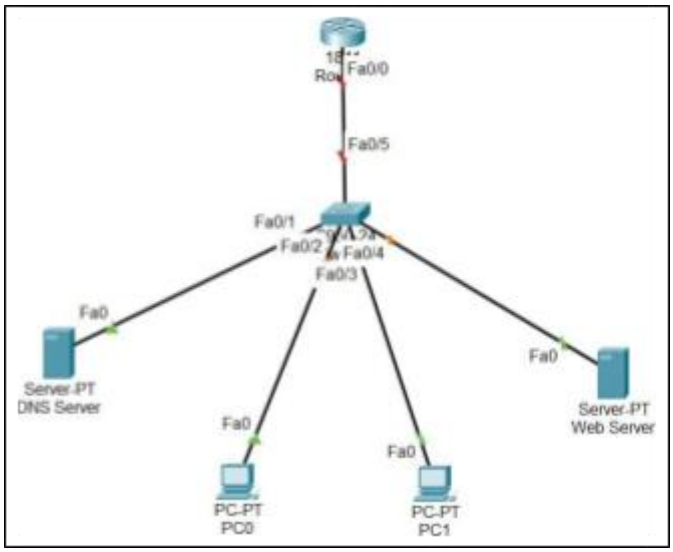

Fig 2. WEB server – HTTP Services


Fig 3. PC0 – accessing data from web browser

## Program 4:

**Aim:** Configure IP address to routers in packet tracer. Explore the following messages: ping responses, destination unreachable, request timed out, reply.

## Topology:




## Procedure:

**1. Assign IP Addresses to Router Interfaces**

1. Click the Router → Config → Interfaces.
2. **Configure and enable:**
    - Fa0/0 → IP: 192.168.1.1 /24
    - Fa0/5 → IP: 192.168.2.1 /24
3. **Turn Port Status = On for each interface**.

2. Assign IP Addresses to PCs and Servers

1. On each device → Desktop → IP Configuration.
2. Use matching networks:
    - Devices connected to Fa0/0 → IP: 192.168.1.x, Gateway: 192.168.1.1
    - Devices connected to Fa0/5 → IP: 192.168.2.x, Gateway: 192.168.2.1

3. Verify Connectivity with Ping

1. Open PC → Desktop → Command Prompt.
2. Test different responses:

- Ping reply → reachable IP
- Request timed out → device powered off / link down
- Destination unreachable → wrong gateway or missing route

3. Observe the output for each case.

   Example commands:

   ping 192.168.1.2

   ping 192.168.1.101

   ping 192.168.2.200

## Observation:

Ping configure IP address

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3) Configure IP addresses to router in Packet Tracer Explore the following messages :-

1. ping response
2. Destination unreachable
3. Request timeout
4. Reply

— x —

ii) go to web browser, in port status "off" & in PC1 type www.endoftheworld.com
"Request timed out"
or
switch off PC1 & Ping PC1 from PC0
"Request timed out".

iii) go to PC1 - in URL type www.endoftheworld.com
iv) go to PC0 & in CLI, do ping 192.168.1.5 → DNS server
ping 192.168.1.6 → Web server

DNS Server

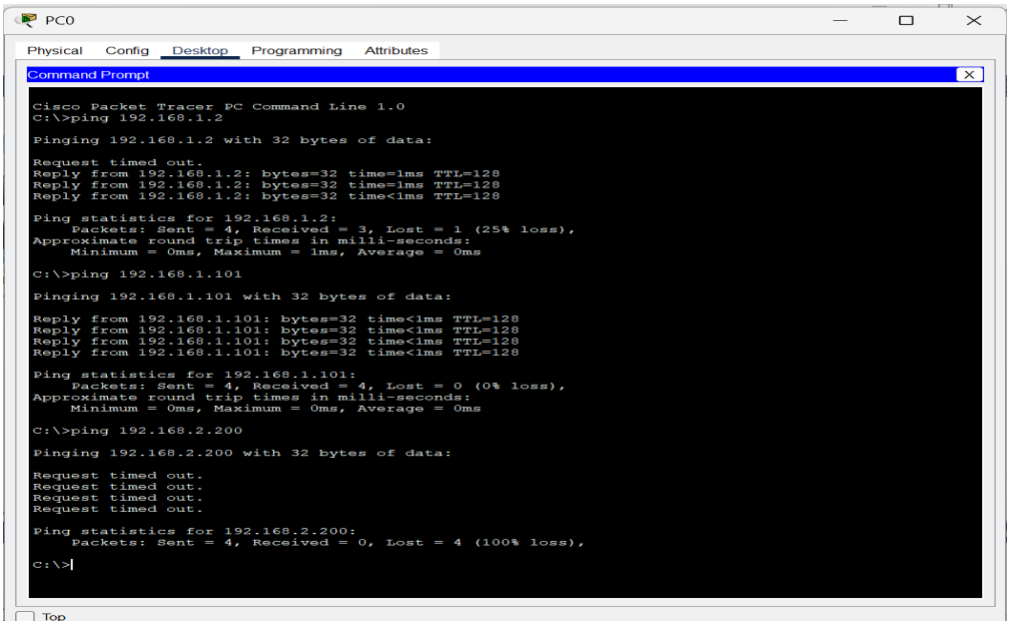
192.168.1.5

"

192.168.1.5 (Web Server [Config - HTTP (on on)])
IPv4 [A record] - [Config - DNS (on)] [Name - www.endoftheworld.com add]

PC0
Desktop - Command Prompt
ping 192.168.1.5 - - - - Reply messages
ping 192.168.1.6 - - - -
web browser
URL - www.endoftheworld.com
Ping :) response

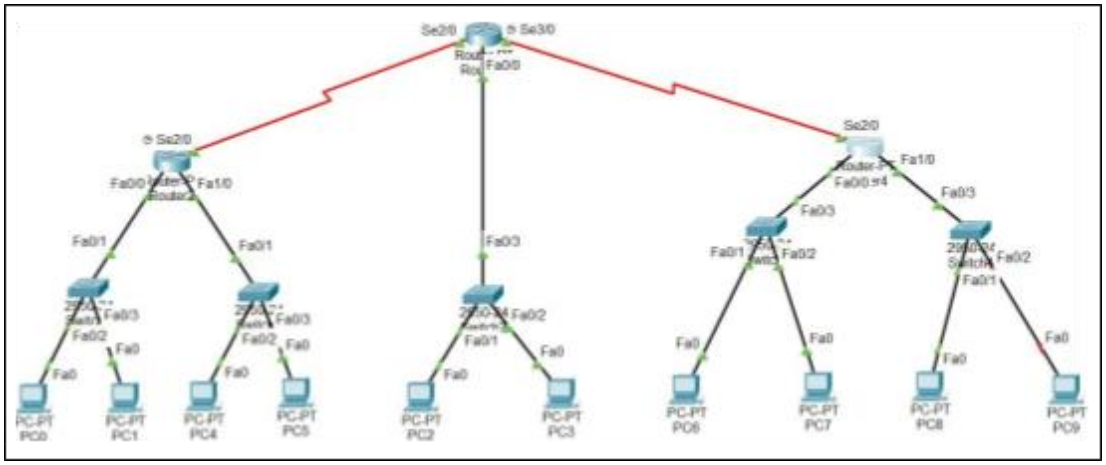
# Output:


PC0
Physical
Config
Desktop
Programming
Attributes
Command Prompt
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 192.168.1.2
Pinging 192.168.1.2 with 32 bytes of data:
Request timed out.
Reply from 192.168.1.2: bytes=32 time=1ms TTL=128
Reply from 192.168.1.2: bytes=32 time=1ms TTL=128
Reply from 192.168.1.2: bytes=32 time<1ms TTL=128
Ping statistics for 192.168.1.2:
Packets: Sent = 4, Received = 3, Lost = 1 (25% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 1ms, Average = 0ms
C:\>ping 192.168.1.101
Pinging 192.168.1.101 with 32 bytes of data:
Reply from 192.168.1.101: bytes=32 time<1ms TTL=128
Reply from 192.168.1.101: bytes=32 time<1ms TTL=128
Reply from 192.168.1.101: bytes=32 time<1ms TTL=128
Reply from 192.168.1.101: bytes=32 time<1ms TTL=128
Ping statistics for 192.168.1.101:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 0ms, Maximum = 0ms, Average = 0ms
C:\>ping 192.168.2.200
Pinging 192.168.2.200 with 32 bytes of data:
Request timed out.
Request timed out.
Request timed out.
Request timed out.
Ping statistics for 192.168.2.200:
Packets: Sent = 4, Received = 0, Lost = 4 (100% loss),
C:\>
Top

## Program 5:

**Aim:** Configure default route, static route to the Router.

## Topology:




## Procedure:

**1. Assign IP Addresses**

1. On each router → Config → Interfaces
2. Set IP addresses for all FastEthernet and Serial interfaces according to the network diagram.
3. Turn Port Status = On for each interface.

**2. Configure Static Routes**

Perform on each router:

Router 2

1. Go to Config → Routing → Static
2. Add routes for networks behind Router 3 and Router 4:
    - Network: 192.168.3.0 /24 → Next Hop: 192.168.4.2
    - Network: 192.168.5.0 /24 → Next Hop: 192.168.4.2
    - Network: 192.168.6.0 /24 → Next Hop: 192.168.4.2
    - Network: 192.168.7.0 /24 → Next Hop: 192.168.4.2

Router 3

1. Go to Config → Routing → Static
2. Add routes toward Router 2 and Router 4:
    - 192.168.1.0 /24 → via 192.168.4.1
    - 192.168.2.0 /24 → via 192.168.4.1
    - 192.168.5.0 /24 → via 192.168.7.2
    - 192.168.6.0 /24 → via 192.168.7.2

Router 4

1. Go to Config → Routing → Static
2. Add routes toward Router 2 and Router 3:
    - 192.168.1.0 /24 → via 192.168.7.1

- 192.168.2.0 /24 → via 192.168.7.1
- 192.168.3.0 /24 → via 192.168.7.1
- 192.168.4.0 /24 → via 192.168.7.1

**3. Configure Default Route (Optional)**
If needed, add:
0.0.0.0 /0 → next-hop IP
(from each router toward the main/central router)

**4. Test Connectivity**
1. On any PC → Command Prompt
2. Use ping to reach devices in other networks.
3. Successful reply = routing configured correctly.

## Observation

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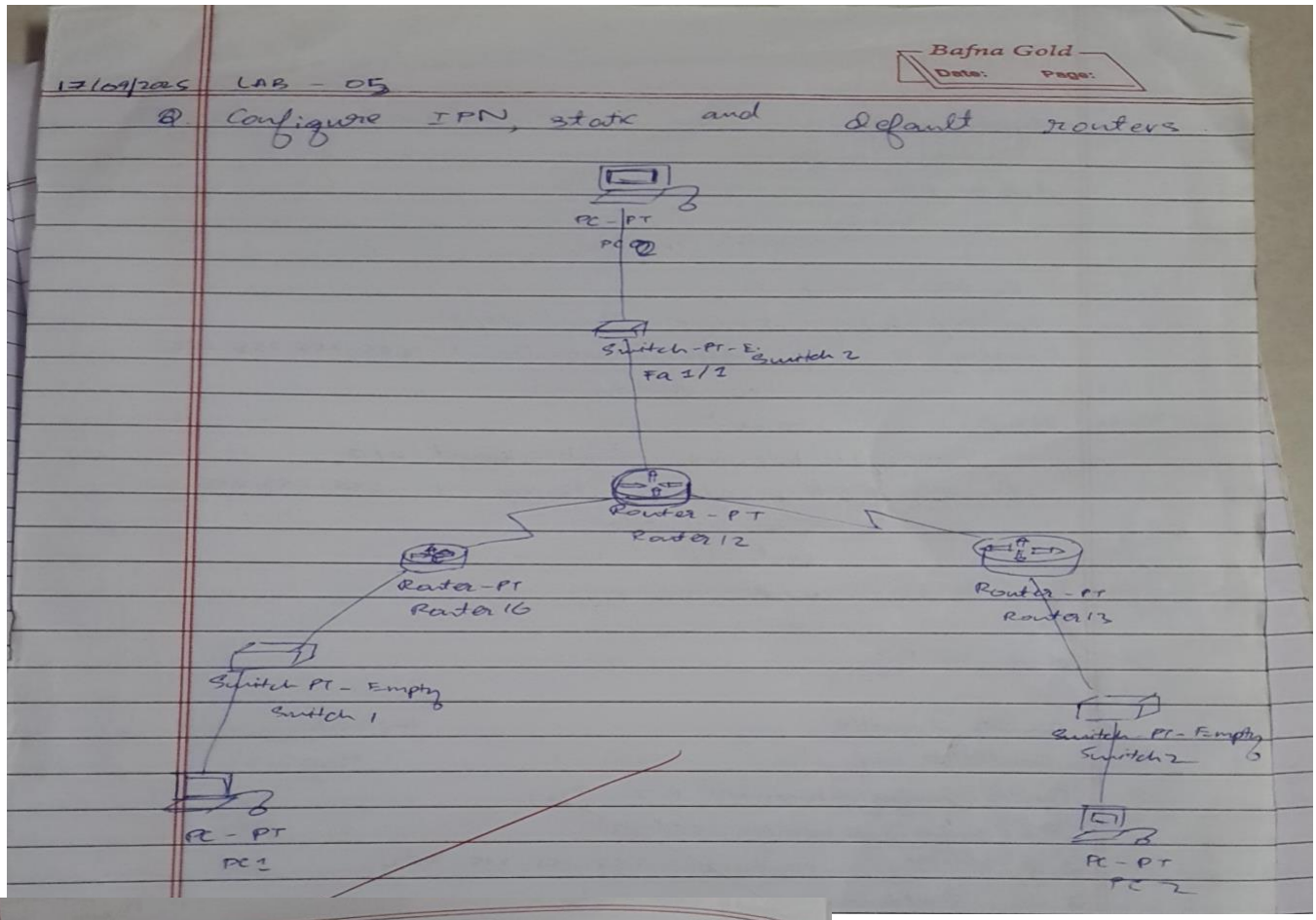
Bafna Gold
Date: Page:

Q. Configure IPN, static and default routers.




System name
Router config:-

click on R1
↳ CLI
↳ Router > enable

Router > conf t
Router (config) interface Serial 0/0/0
(config-if) # ip address 172.16.1.1 255.255.255.252
# no shutdown
# exit
(config) # interface GigabitEthernet 0/0
(config-if) # ip address 192.168.10.1 255.255.255.0
# no shutdown
exit
write memory

click on R2
↳ CLI

Router > enable
Router # conf t
Router (config) # hostname R2
R2 (config) # interface S0/0/0
# ip address 172.16.1.2 255.255.255.252
# no shutdown
# exit
R2 (config) # int fa0/0
# ip address 192.168.20.1 255.255.255.0
# no shutdown
exit

→ int Se0/1/1
ip address 172.16.2.1 255.255.255.252

Bafna Gold
Date: Page:

no shutdown
do write memory

Router 3

↳ no
→ enable
conf t
Hostname R3
int s0/1/1
ip address 192.16.2.2 255.255.255.252
no shutdown
exit

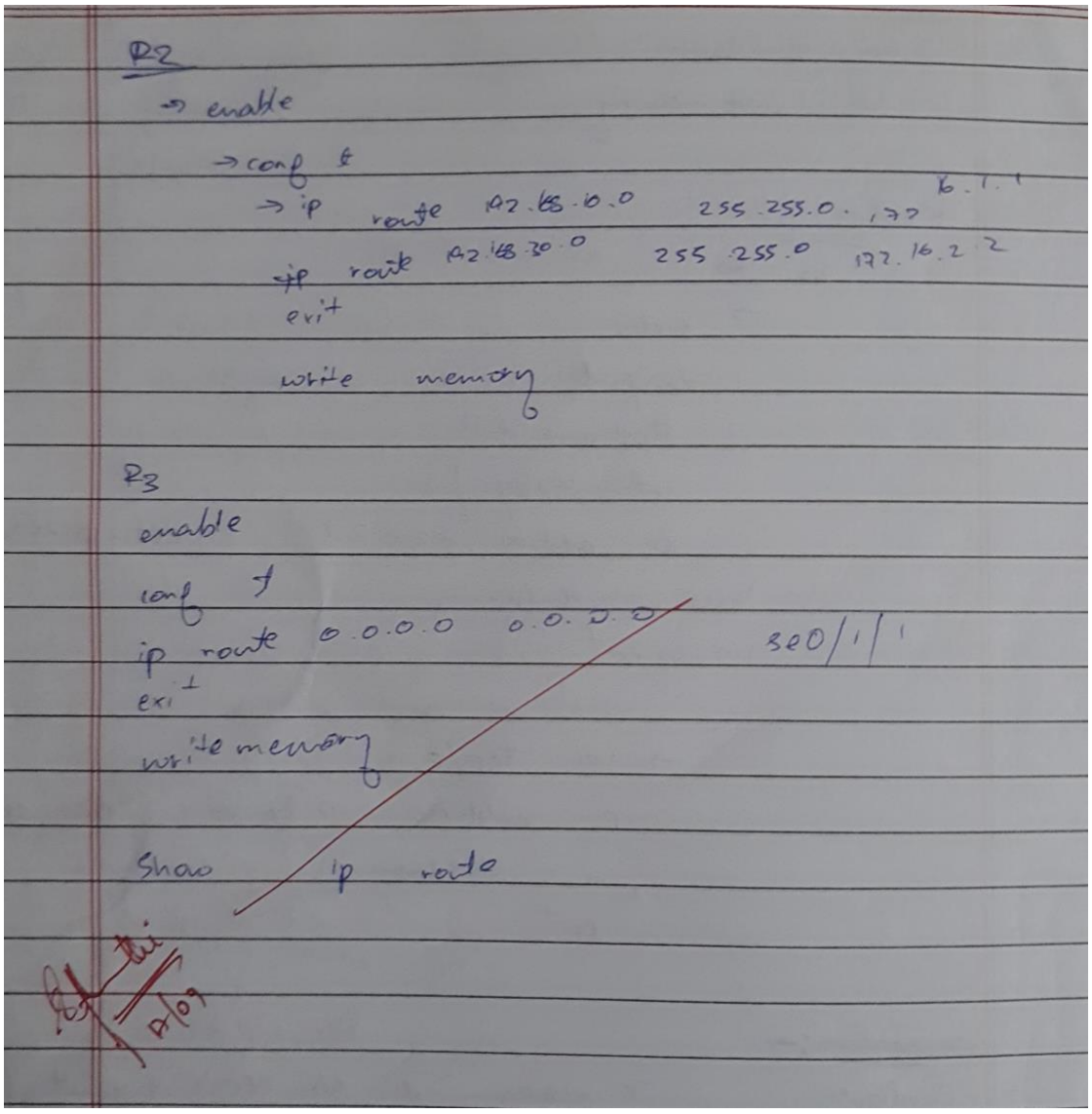
→ int fa0/0
ip address 192.168.30.1 255.255.255.0
no shutdown
exit

Observations :-

| Configure | IP address of all PC | Default |
|---|---|---|
| PC1 | 192.168.10.10 | 192.168.10.1 |
| PC2 | 192.168.20.10 | 192.168.20.1 |
| PC3 | 192.168.30.10 | 192.168.30.1 |

R1

→ enable
conf t
ip route 192.168.20.0 255.255.255.0 192.16.1.2
ip route 192.168.30.0 255.255.255.0 192.168.2.0
exit
write memory


R2
enable
conf t
ip route 192.168.10.0 255.255.0.
ip route 192.168.30.0 255.255.0
exit
write memory
R3
enable
conf t
ip route 0.0.0.0 0.0.0.0
exit
write memory
Show ip route

## Output:

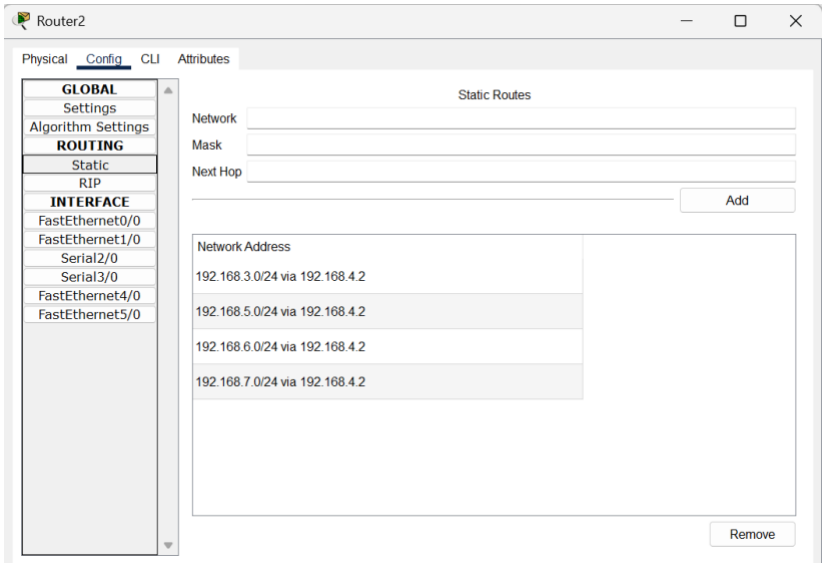

Router2
Physical
Config
CLI
Attributes
GLOBAL
Settings
Algorithm Settings
ROUTING
Static
RIP
INTERFACE
FastEthernet0/0
FastEthernet1/0
Serial2/0
Serial3/0
FastEthernet4/0
FastEthernet5/0
Static Routes
Network
Mask
Next Hop
Add
Network Address
192.168.3.0/24 via 192.168.4.2
192.168.5.0/24 via 192.168.4.2
192.168.6.0/24 via 192.168.4.2
192.168.7.0/24 via 192.168.4.2
Remove

Fig 1. Router 2 – Static routing

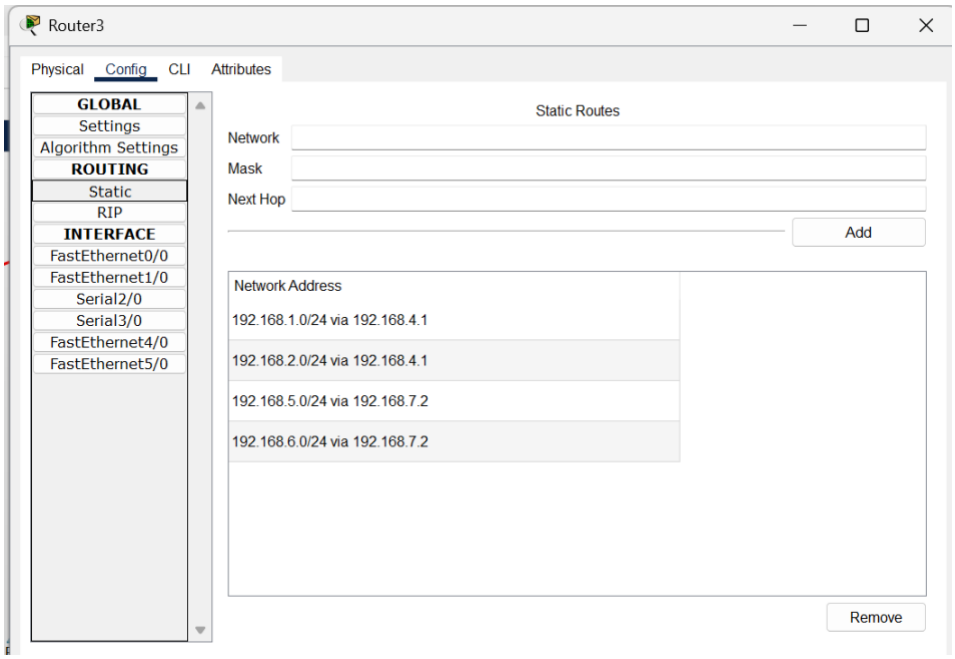



Fig 2. Router 3 – Static routing

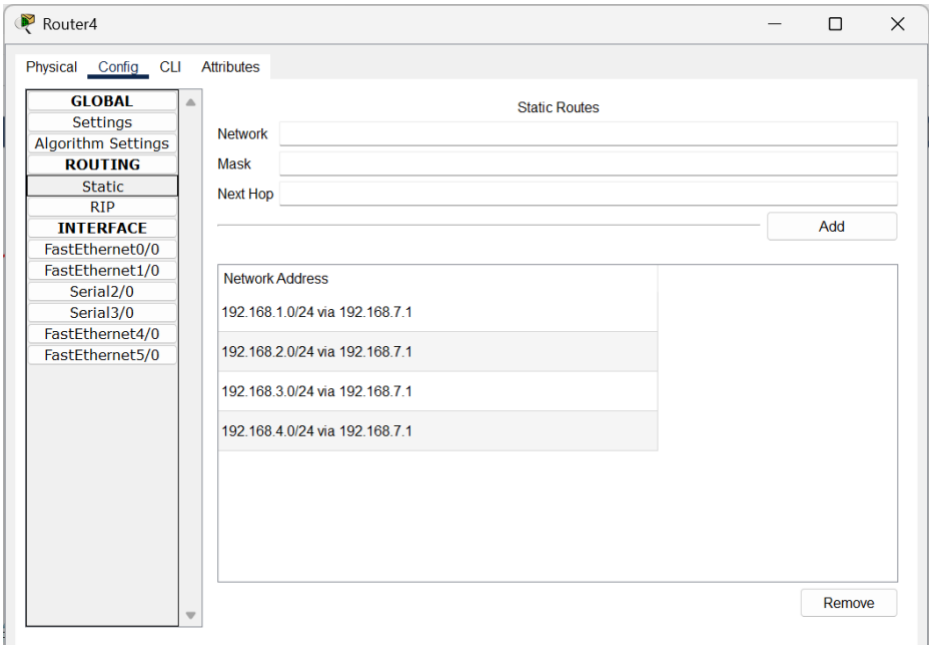
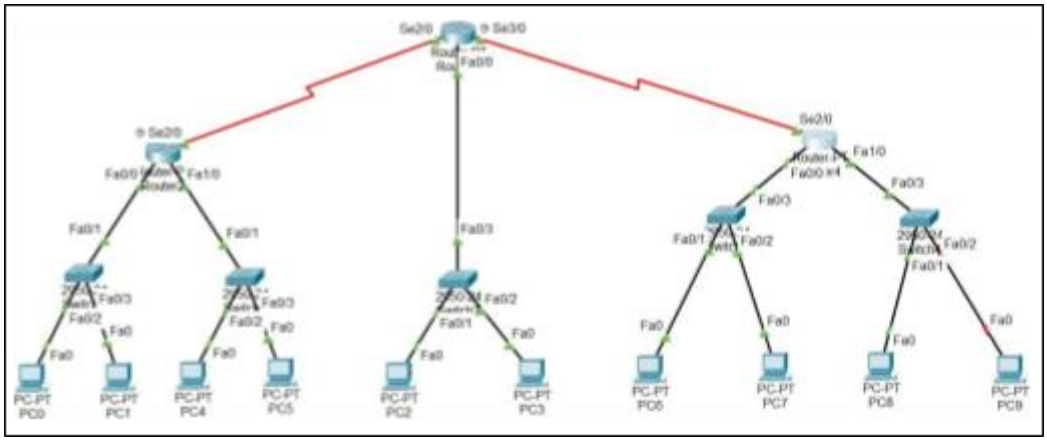



Fig 3. Router 4 – Static routing

## Program 6:

**Aim:** Configure RIP routing Protocol in Routers.

## Topology:



## Procedure

**1. Assign IP Addresses**

1. On each router → Config → Interfaces
2. Configure IPs for all FastEthernet and Serial interfaces as per the network diagram.
3. Turn Port Status = On.

**2. Enable RIP on Each Router**

Router 2

1. Go to Config → Routing → RIP
2. Add directly connected networks:
    - 192.168.1.0
    - 192.168.2.0
    - 192.168.4.0

Router 3

1. Go to Config → Routing → RIP
2. Add networks:
    - 192.168.3.0
    - 192.168.4.0
    - 192.168.7.0

Router 4

1. Go to Config → Routing → RIP
2. Add networks:
    - 192.168.5.0
    - 192.168.6.0
    - 192.168.7.0

**3. Verify Routing**

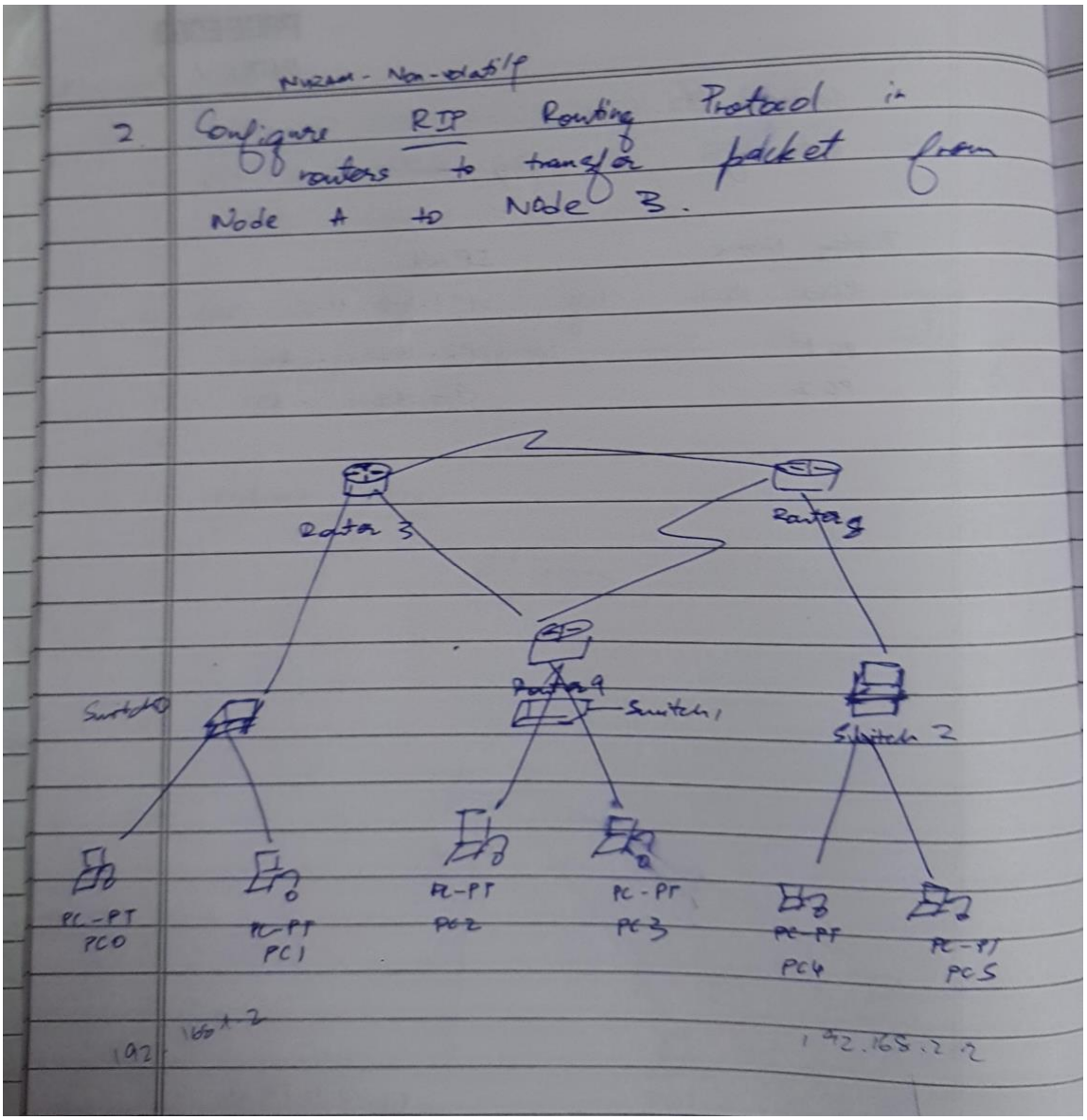
1. On any router → CLI
2. Use:
3. show ip route

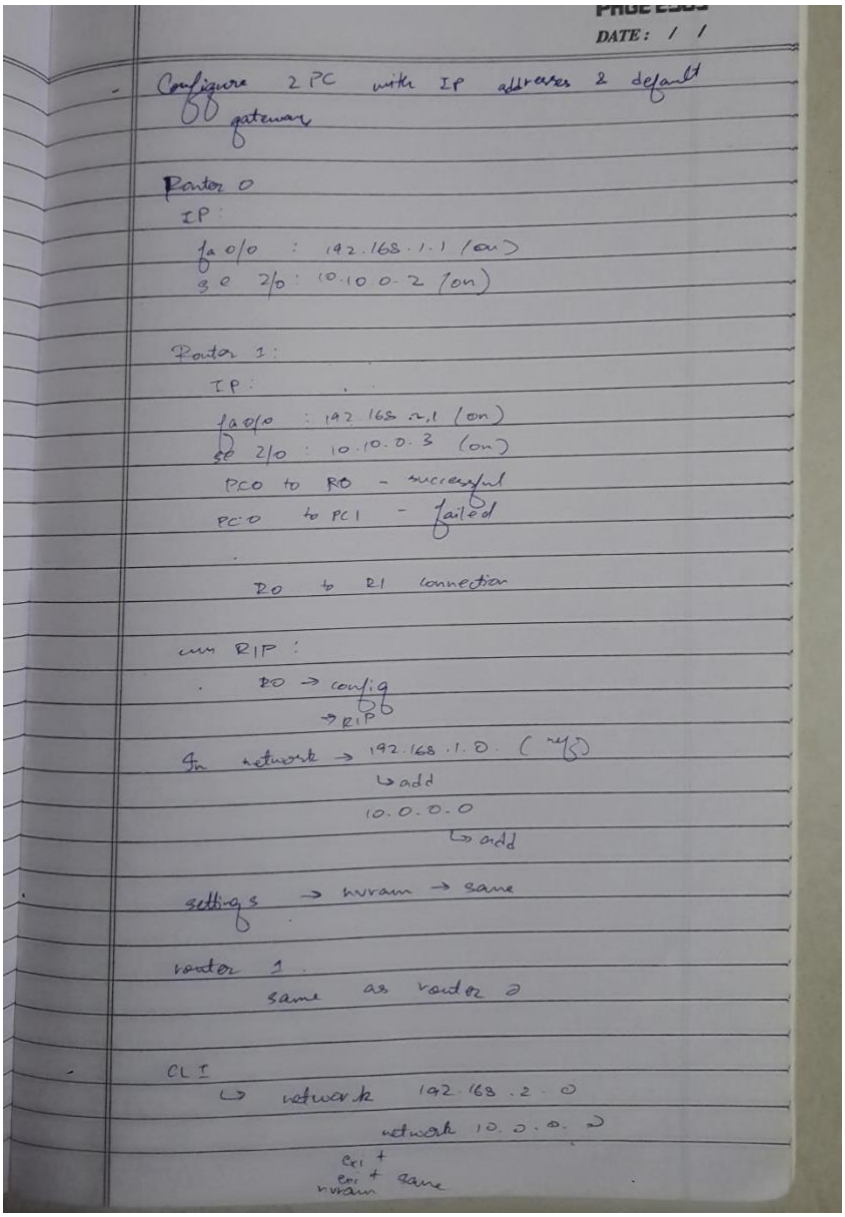
→ RIP routes should appear with the letter R.

4. Test Connectivity

1. From PCs across different networks, use:
2. ping <destination IP>
3. Successful replies confirm RIP routing is working.

## Observation





DATE : / /

Configure 2 PC with IP address & default gateway

Router 0

IP :

fa 0/0 : 192.168.1.1 (on)

se 2/0 : 10.10.0.2 (on)

Router 1 :

IP :

fa 0/0 : 192.168.2.1 (on)

se 2/0 : 10.10.0.3 (on)

PC0 to R0 - successful

PC0 to PC1 - failed

R0 to R1 connection

on RIP :

R0 → config → RIP

network → 192.168.1.0 ( my IP ) → add

10.0.0.0 → add

settings → nvram → save

router 1 :

same as router 0

CLI

↳ network 192.168.2.0

network 10.0.0.0

exit + exit + nvram save

# Output:

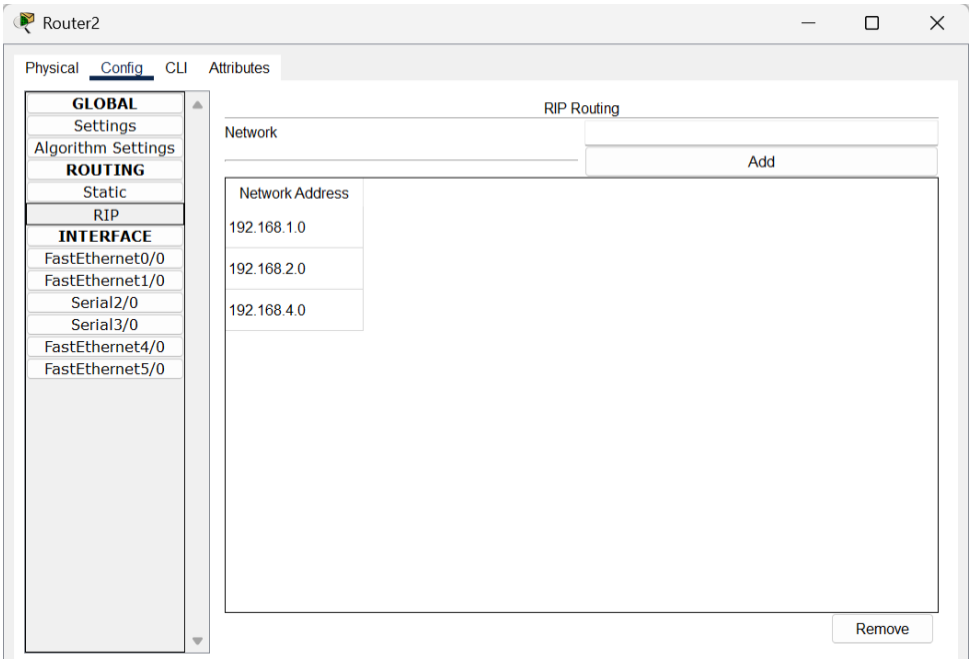


Fig 1. Router 2 – RIP routing

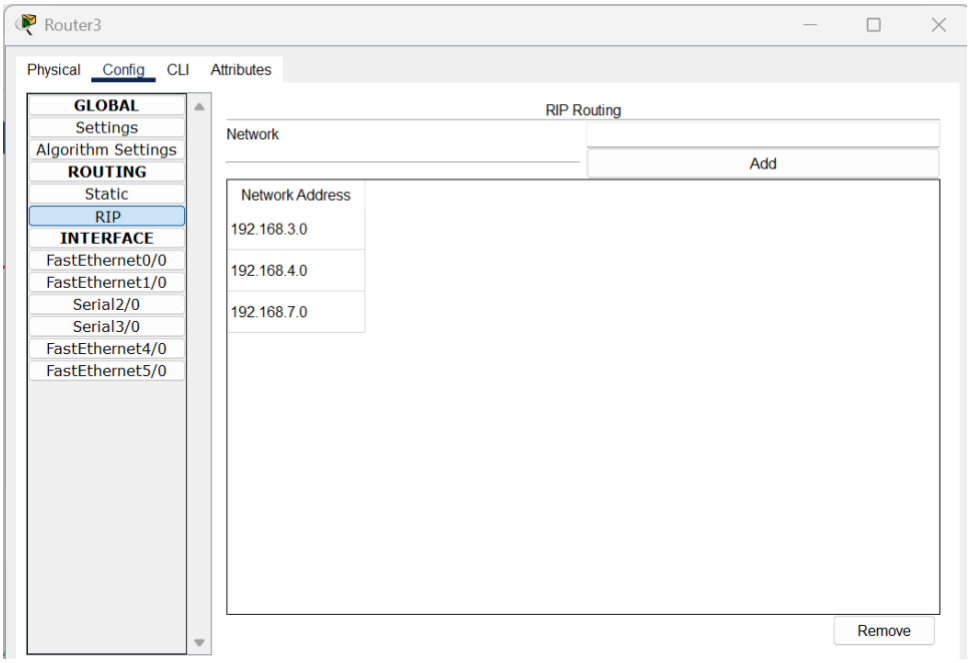



Fig 2. Router 3 – RIP routing

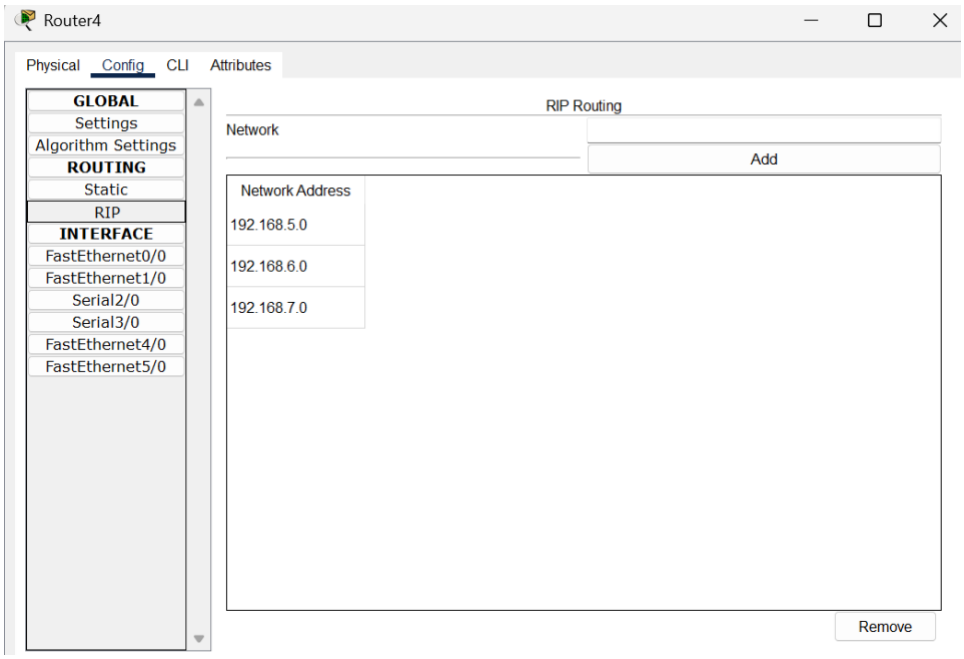
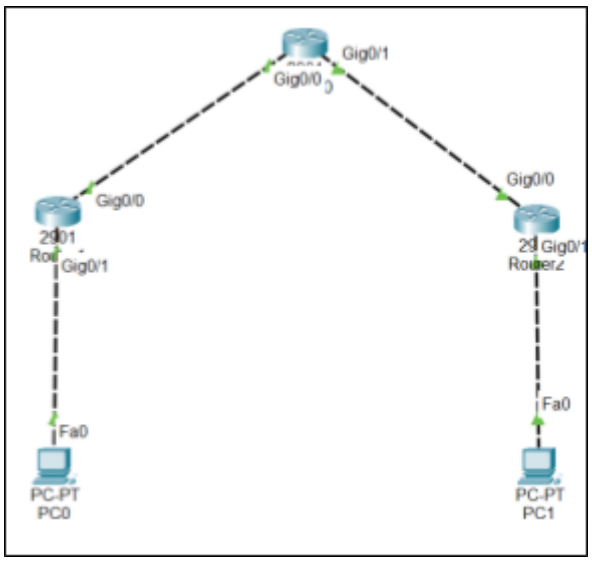



Fig 3. Router 4 – RIP routing

## Program 7:

**Aim:** Configure OSPF routing protocol.

**Topology:**




## Procedure:

**1. Assign IP Addresses**

1. On each router → Config → Interfaces
2. Assign IPs to Gig0/0, Gig0/1, and PC-facing interfaces as per the diagram.
3. Enable all interfaces (Port Status = On).

**2. Configure OSPF on All Routers**

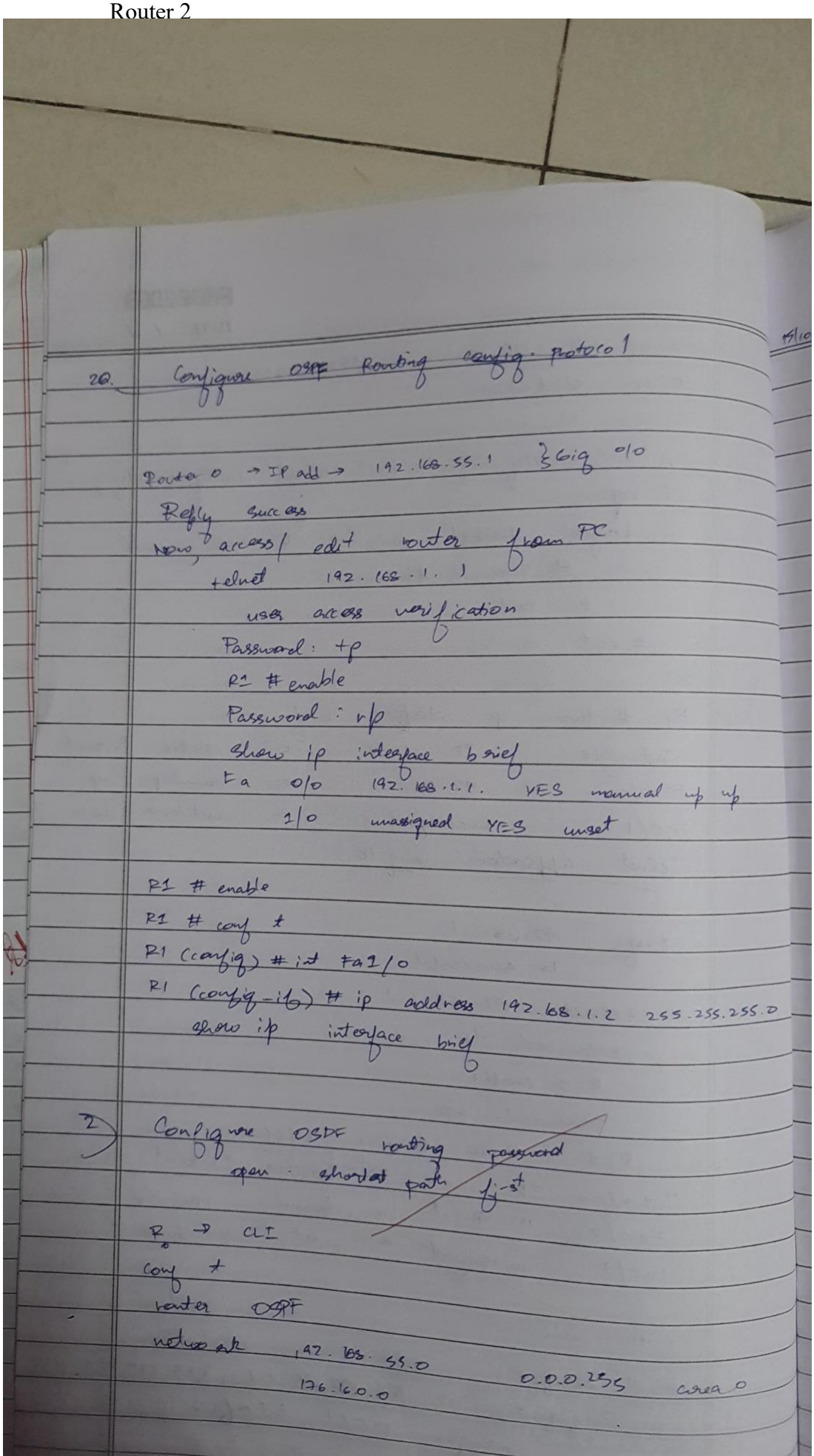
Router 0

1. Go to Config → Routing → OSPF
2. Set Process ID = 1
3. Add networks:
    - 192.168.1.0 /24
    - 10.0.0.0 /30 (link to center router)

Router 1 (Center Router)

1. Process ID = 1
2. Add networks:
    - 10.0.0.0 /30 (left link)
    - 20.0.0.0 /30 (right link)

Router 2



20. Configure OSPF Routing config. protocol

Router 0 → IP add → 192.168.55.1 } Gig 0/0

Reply success

now, access / edit router from PC

telnet 192.168.1.1

user access verification

Password: tp

R1 # enable

Password: rp

show ip interface brief

Fa 0/0 192.168.1.1 YES manual up up

1/0 unassigned YES unset

R1 # enable

R1 # conf t

R1 (config) # int Fa1/0

R1 (config-if) # ip address 192.168.1.2 255.255.255.0

show ip interface brief

2) Configure OSPF routing password

open shortest path first

R0 → CLI

conf t

router OSPF

network 192.168.55.0 0.0.0.255 area 0

176.100.0

## Output:

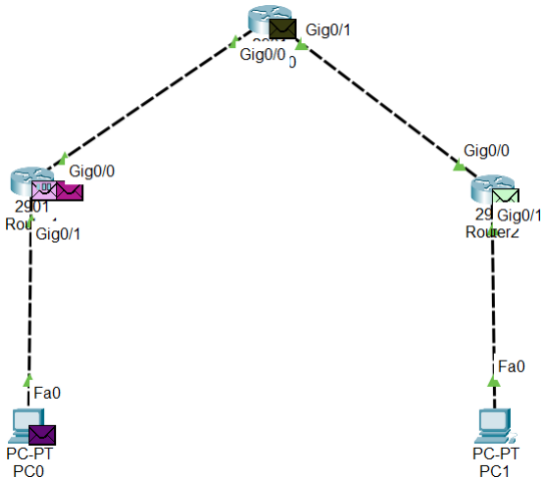


Fig 1. Sending PDU message from PC0 to PC1

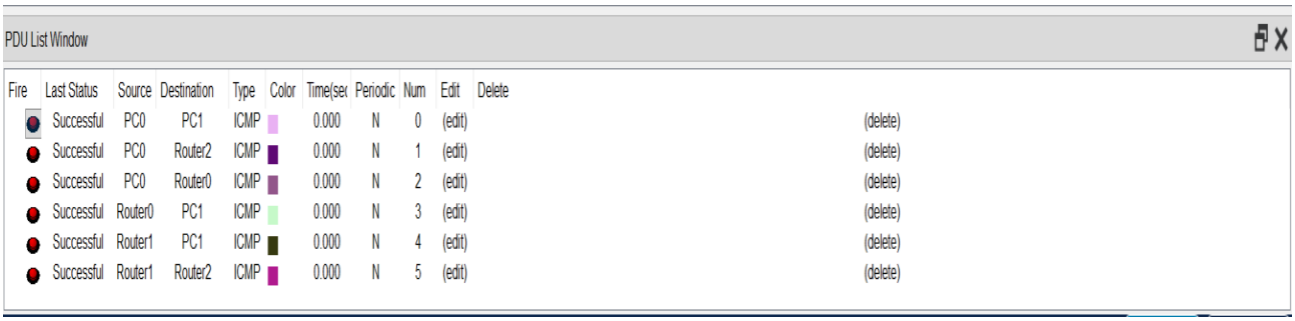
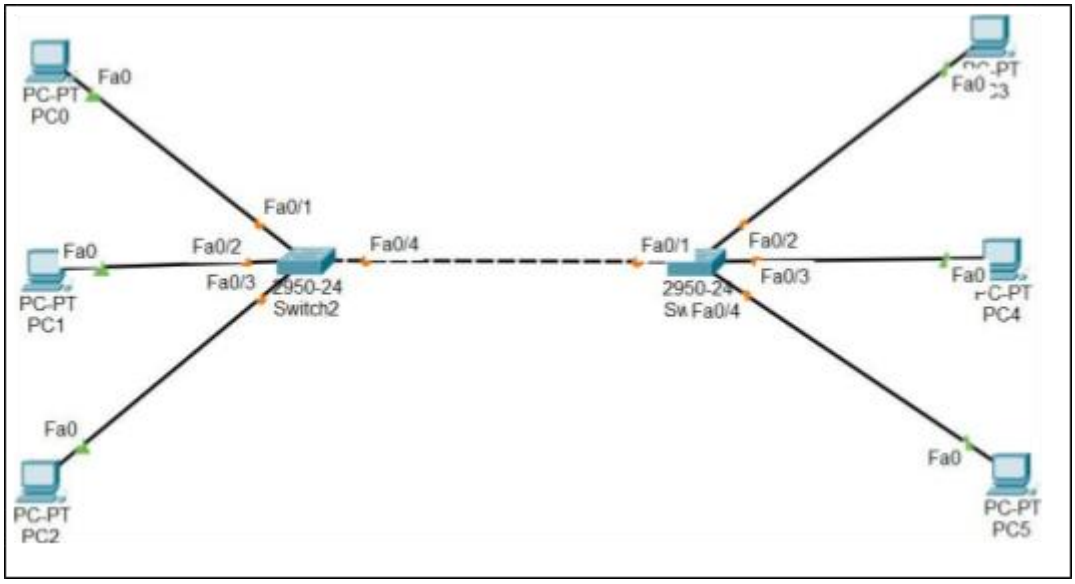



Fig 2. Checking PDU messages

## Program 8:

**Aim:** To construct a VLAN and make the PC's communicate among a VLAN.

## Topology:




## Procedure:

**1. Create VLANs on Both Switches**

1. Open each switch → Config → VLAN Database
2. Create VLANs (example):
    - VLAN 10
    - VLAN 20

**2. Assign Ports to VLANs**

Assign PCs to the required VLAN:

Switch 1 (Left Side)

- PC0 (Fa0/1) → VLAN 10
- PC1 (Fa0/2) → VLAN 10
- PC2 (Fa0/3) → VLAN 20

Switch 2 (Right Side)

- PC3 (Fa0/2) → VLAN 10
- PC4 (Fa0/3) → VLAN 10
- PC5 (Fa0/4) → VLAN 20

**3. Configure Trunk Between Switches**

1. Select the link between Fa0/4 (Switch1) ↔ Fa0/1 (Switch2)
2. On both ends → Config → Interface
3. Set Mode = Trunk
4. Allow VLANs 10 and 20 on the trunk.

**4. Assign IPs to PCs**

1. On each PC → Desktop → IP Configuration
2. Assign IPs in VLAN-specific networks (example):
    - VLAN 10 → 192.168.10.x
    - VLAN 20 → 192.168.20.x

**5. Test Connectivity**

1. Use Add Simple PDU or ping:
    - Devices in the *same VLAN* should communicate.
    - Devices in *different VLANs* should not communicate.

## Observation:

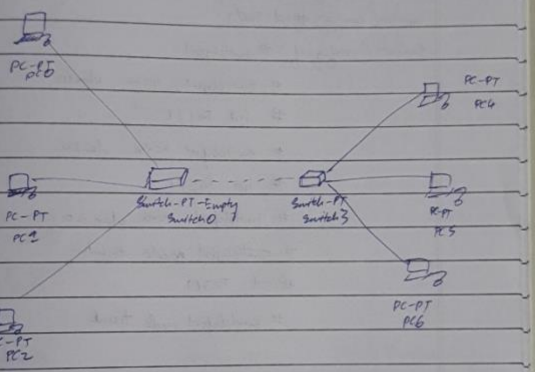
PAGE EDGE

DATE: / /

LAB - 07

Aim:

To configure a VLAN & make the PCs communicating among a VLAN.




| | Components | Display Name | IP address/config |
|---|---|---|---|
| 1. | PC-PT | PC0 | 192.168.1.2/24 |
| 2. | PC-PT | PC1 | 192.168.1.3/24 |
| 3. | PC-PT | PC2 | 192.168.1.4/24 |
| 4. | PC-PT | PC4 | 192.168.1.5/24 |
| 5. | PC-PT | PC5 | 192.168.1.6/24 |
| 6. | PC-PT | PC6 | 192.168.1.7/24 |
| 7. | Switch-PT-Empty | Switch2 | |
| 8. | Switch-PT | Switch3 | |

| VLAN 10 | | VLAN 20 | | VLAN 30 | |
|---|---|---|---|---|---|
| PC0 | Fa0/1 | PC1 | Fa1/1 | PC2 | Fa2/1 |
| PC4 | Fa3/1 | PC5 | Fa3/1 | PC6 | Fa1/1 |

→ Switch-PT

Switch 4 CONFIGURATION

```
Switch > enable
Switch # config t
Switch (config) #int Fa0/1
Switch (config-if) # switchport
        # switchport access vlan 10
        # int Fa1/1
        # switchport access vlan 20
        # int Fa2/1
        # switchport access vlan 30
        # switchport mode trunk
        # int Fa3/1
        # switchport mode trunk
```

→ Switch 5 CONFIGURATION

```
→ CLI
Switch > enable
Switch # config t
Switch (config) # int Fa0/1
Switch (config-if) # switchport access vlan 10
        # int Fa1/1
        # switchport access vlan 20
        # int Fa2/1
        # switchport access vlan 30
        # int Fa3/1
        # switchport mode trunk
        # exit
```

Realtime Simulation OBSERVATIONS :-

- Successful PC4 → PC0
- Successful PC5 → PC1

**Output:**

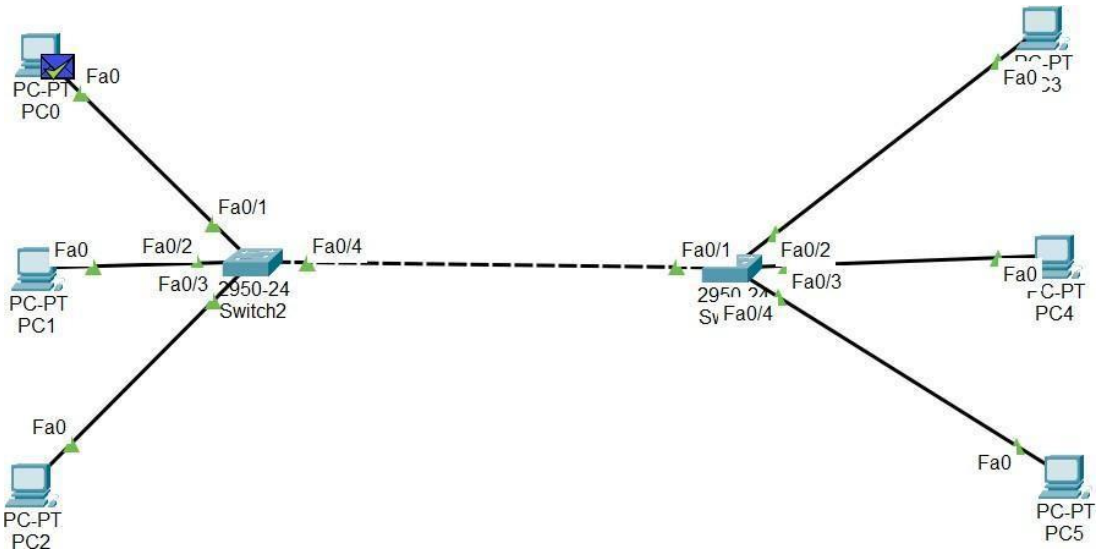



Fig 1. Sending PDU message from PC0 to PC5

PDU List Window

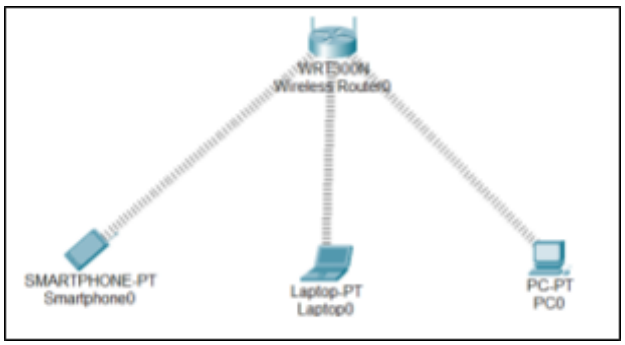
| Fire | Last Status | Source | Destination | Type | Color | Time(sec | Periodic | Num | Edit | Delete | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Successful | PC0 | PC3 | ICMP | | 0.000 | N | 0 | (edit) | | (delete) |
| | Successful | PC0 | PC4 | ICMP | | 0.000 | N | 1 | (edit) | | (delete) |
| | Successful | PC0 | PC5 | ICMP | | 0.000 | N | 2 | (edit) | | (delete) |
| | Successful | PC1 | PC3 | ICMP | | 0.000 | N | 3 | (edit) | | (delete) |
| | Successful | PC1 | PC4 | ICMP | | 0.000 | N | 4 | (edit) | | (delete) |
| | Successful | PC1 | PC5 | ICMP | | 0.000 | N | 5 | (edit) | | (delete) |
| | Successful | PC2 | PC3 | ICMP | | 0.000 | N | 6 | (edit) | | (delete) |
| | Successful | PC2 | PC4 | ICMP | | 0.000 | N | 7 | (edit) | | (delete) |
| | Successful | PC2 | PC5 | ICMP | | 0.000 | N | 8 | (edit) | | (delete) |
| | Successful | PC3 | PC2 | ICMP | | 0.000 | N | 9 | (edit) | | (delete) |

Fig 2. Checking PDU messages

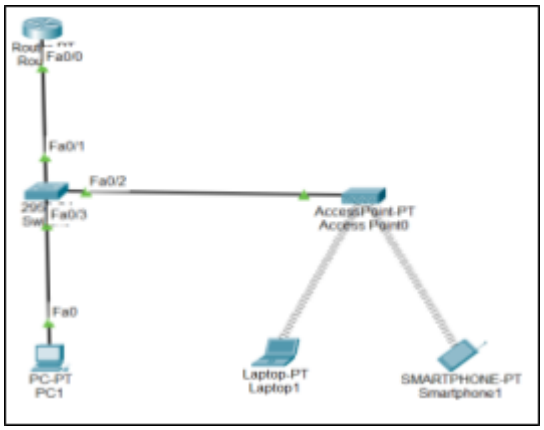
## Program 9:

**Aim:** To construct a WLAN and make the nodes communicate wirelessly.

**Topology:**




Configuration 1




Configuration 2

## Procedure:

**1. Add Wireless Devices**

1. Place Wireless Router, Access Point, Laptops, Smartphones, and PCs as shown.
2. For laptops/PCs without wireless modules →
    - Power off → Insert Wireless NIC → Power on.

**2. Configure Wireless Router / Access Point**

1. Click the Wireless Router / AP → Config → Wireless
2. Set:
    - SSID = BMSCE
    - Authentication = WPA2-PSK
    - Passphrase = bmsce123
3. Keep channel and encryption default.

**3. Configure Wireless Settings on Laptop & Smartphone**

1. Open device → Desktop → PC Wireless / Wi-Fi
2. Select SSID BMSCE
3. Enter password bmsce123
4. Connect.

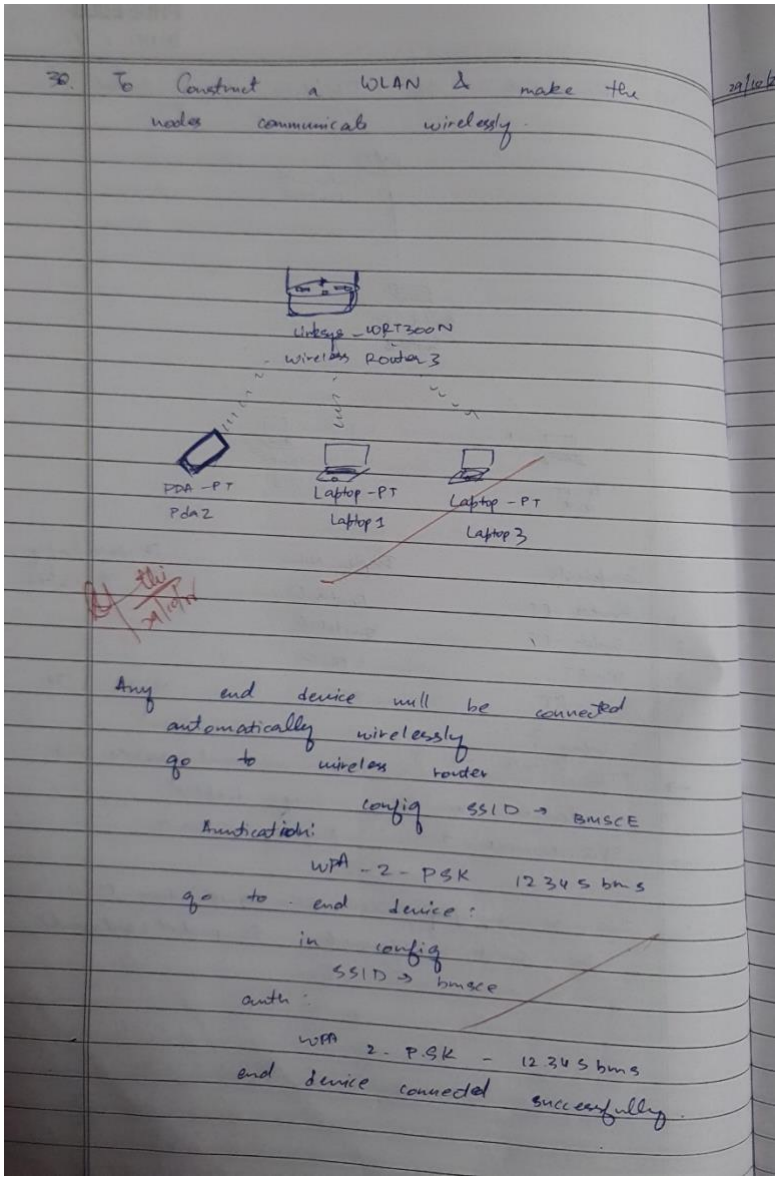
**4. Assign IP Addresses (if required)**

1. Use DHCP (automatic) or manually assign from the same network.

**5. Test Wireless Communication**

1. Use Add Simple PDU or ping between wireless devices.
2. Successful replies confirm WLAN communication.

## Observation:



## Output:

1. Do Physical Connections In:

- Laptop
- PC

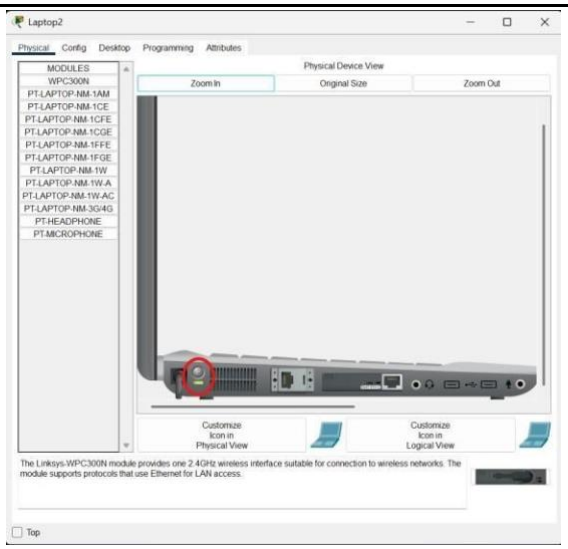



Fig 1.1 Step1: Turn off light / Power off laptop

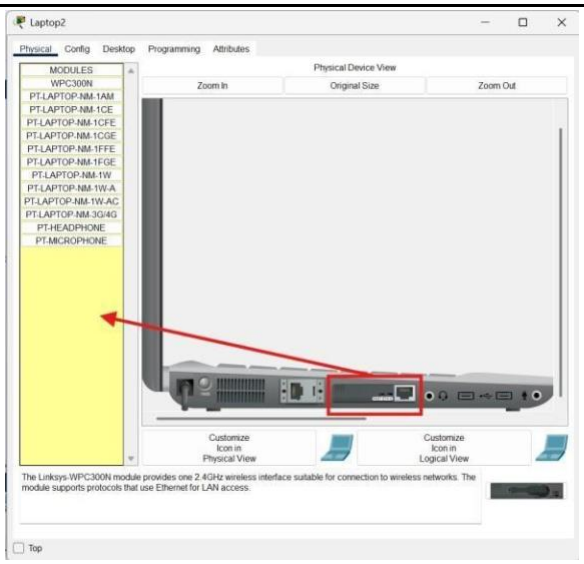



Fig 1.2 Step2: Drag and Drop the Ethernet into pointed location

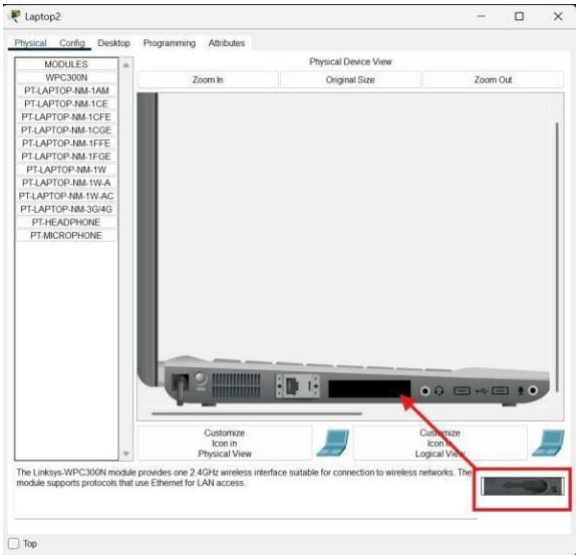



Fig 1.3 Step3: Drag and Drop the device into pointed location and Turn on light/Laptop

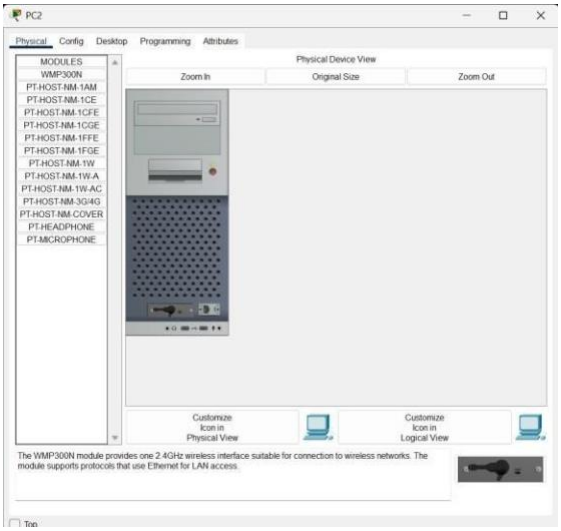



Fig 2. PC physical connection (combined 3 steps)

2. Do Wireless Connection in:


Fig 1. Config at Device Wireless Router0

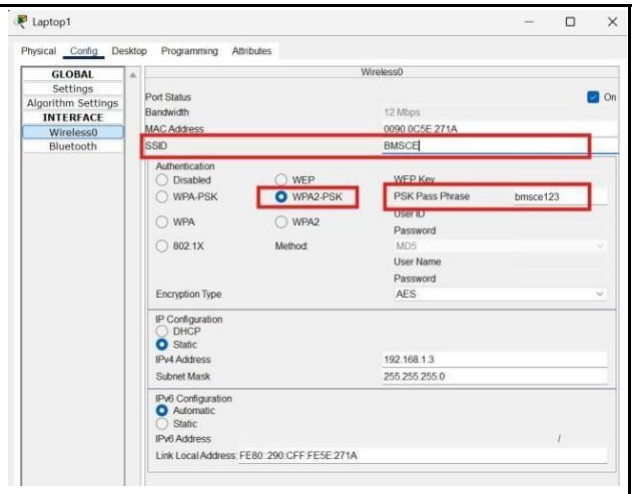



Fig 2. Config at Device Laptop0

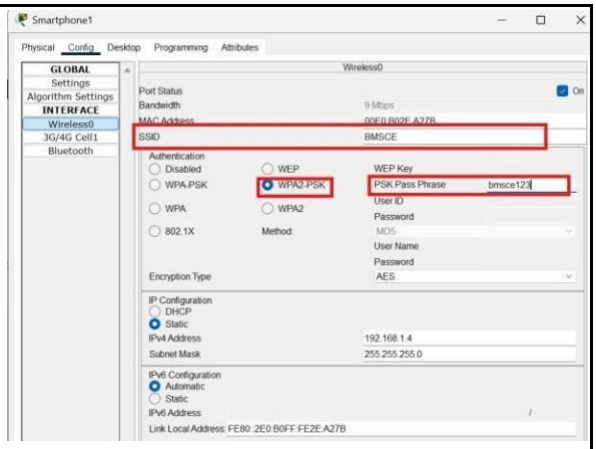



Fig 3. Config at Device Smartphone0

PDU List Window

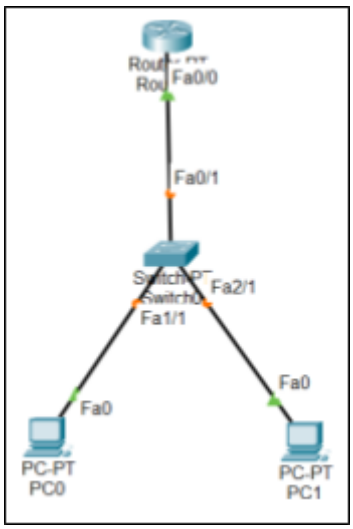
| Fire | Last Status | Source | Destination | Type | Color | Time(sec | Periodic | Num | Edit |
|---|---|---|---|---|---|---|---|---|---|
| | Failed | Smar... | Laptop0 | ICMP | | 0.000 | N | 0 | (edit) |
| | Successful | Lapto... | PC0 | ICMP | | 0.000 | N | 1 | (edit) |
| | Failed | PC0 | Laptop0 | ICMP | | 0.000 | N | 2 | (edit) |
| | Successful | PC0 | Smartphone0 | ICMP | | 0.000 | N | 3 | (edit) |
| | Failed | PC0 | Laptop0 | ICMP | | 0.000 | N | 4 | (edit) |
| | Successful | Lapto... | Smartphone0 | ICMP | | 0.000 | N | 5 | (edit) |
| | Successful | Lapto... | PC0 | ICMP | | 0.000 | N | 6 | (edit) |
| | Successful | PC0 | Smartphone0 | ICMP | | 0.000 | N | 7 | (edit) |
| | Successful | Lapto... | PC1 | ICMP | | 0.000 | N | 8 | (edit) |

Fig 3. Checking PDU messages

## Program 10:

**Aim:** Demonstrate the TTL/ Life of a Packet.

**Topology:**




## Procedure:

**Create the Network**

1. Place one Router, one Switch, and two PCs as shown in the topology.
2. Connect:
    - Router → Switch (Fa0/0 to Fa0/1)
    - Switch → PC0 (Fa1/1)
    - Switch → PC1 (Fa2/1)

**2. Assign IP Addresses**

1. On each PC → Desktop → IP Configuration
    - PC0: 192.168.1.2 /24
    - PC1: 192.168.1.3 /24
    - Gateway: 192.168.1.1
2. On Router → Config → Interface Fa0/0
    - IP: 192.168.1.1 /24
    - Turn Port Status = On

### 3. Switch to Simulation Mode

1. Click Simulation Mode (bottom right).
2. Select Add Simple PDU tool.

### 4. Send the Packet

1. Click PC0 → then click PC1 to send an ICMP (ping) PDU.
2. Observe packet movement step-by-step.

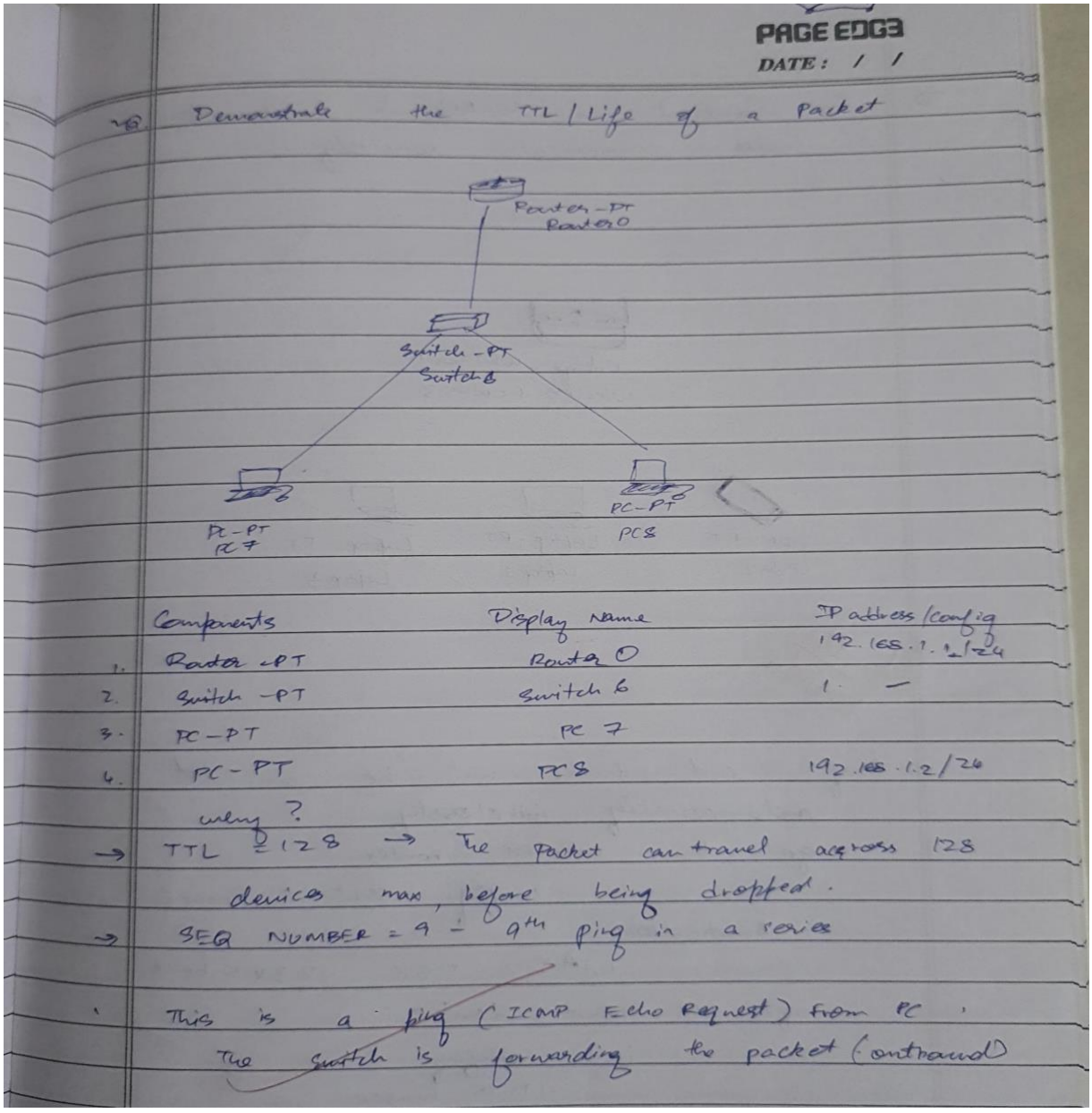
### 5. Check TTL (Time To Live)

1. Click the PDU in the event list.
2. Open Inbound PDU Details and Outbound PDU Details.
3. Note the TTL value:
    - At source PC → TTL usually starts at 255
    - After passing Router → TTL reduces (example: 128)

### 6. Observe TTL Decrement

Each time a packet passes through a router, TTL decreases by 1, demonstrating the packet's lifespan on the network.

**Observation:**



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29. Demonstrate the TTL / Life of a Packet

Router-PT
Router0

Switch-PT
Switch6

PC-PT
PC7

PC-PT
PC8

| | Components | Display Name | IP address / config |
|---|---|---|---|
| 1. | Router-PT | Router 0 | 192.168.1.1/24 |
| 2. | Switch-PT | Switch 6 | 1 — |
| 3. | PC-PT | PC 7 | |
| 4. | PC-PT | PC 8 | 192.168.1.2/24 |

why ?

→ TTL ≥ 128 → The packet can travel across 128 devices max, before being dropped.

→ SEQ NUMBER = 9 - 9th ping in a series

This is a ping (ICMP Echo Request) from PC
The switch is forwarding the packet (continued)

## Output:

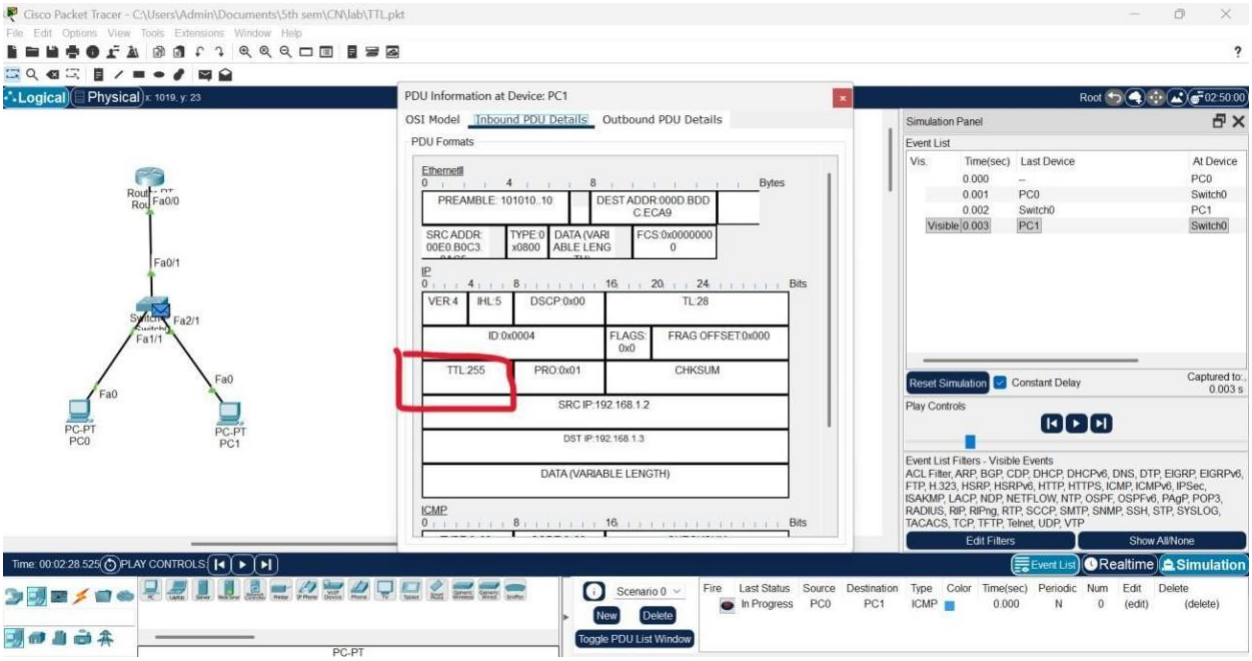



Fig 1. Inbound PDU Details at Device PC1

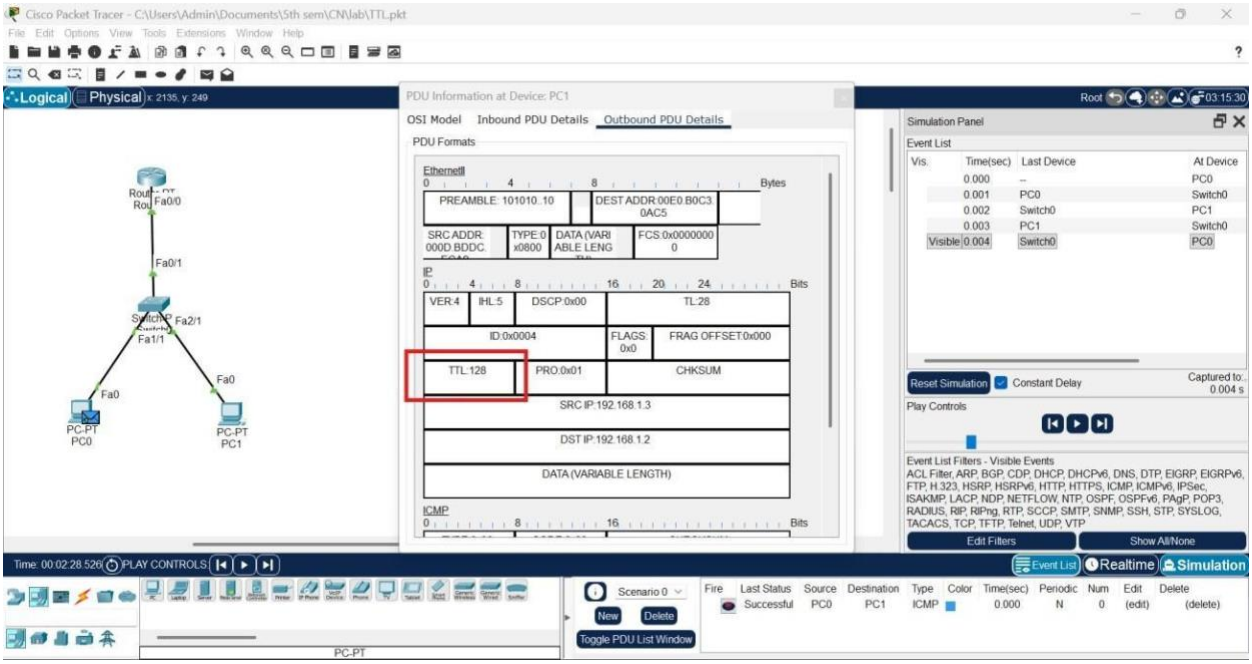
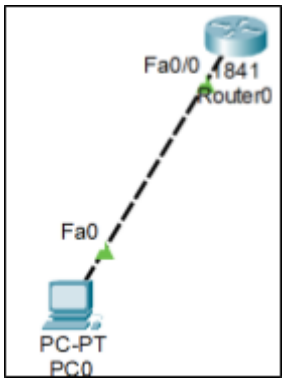



Fig 1. Outbound PDU Details at Device PC1

## Program 11:

**Aim:** To understand the operation of TELNET by accessing the router in server room from a PC in IT office.

## Topology:




## Procedure:

## Procedure

**1. Configure the Router for Telnet**

1. Open Router0 → CLI and enter:
2. enable
3. configure terminal
4. hostname R1
5. line vty 0 4
6. login
7. password cisco
8. enable secret tp
9. interface fa0/0
10. ip address 192.168.1.1 255.255.255.0
11. no shutdown
12. exit
13. end
14. Verify interface status:
15. show ip interface brief

**2. Assign IP to PC**

1. On PC0 → Desktop → IP Configuration:
    - IP Address: 192.168.1.2
    - Subnet Mask: 255.255.255.0
    - Gateway: 192.168.1.1

**3. Test Connectivity**

1. On PC0 → Command Prompt, ping the router:
2. ping 192.168.1.1

**4. Access Router Using Telnet**

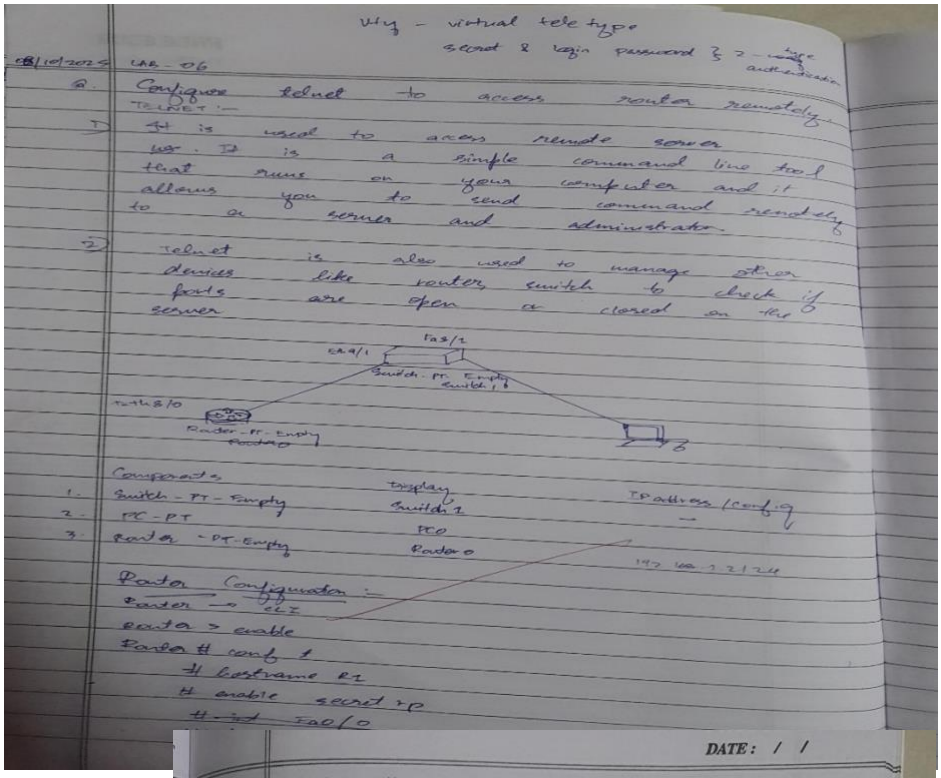
1. On PC0 → Command Prompt:
2. telnet 192.168.1.1
3. Enter password: cisco to log in.
4. You now have remote access to the router.

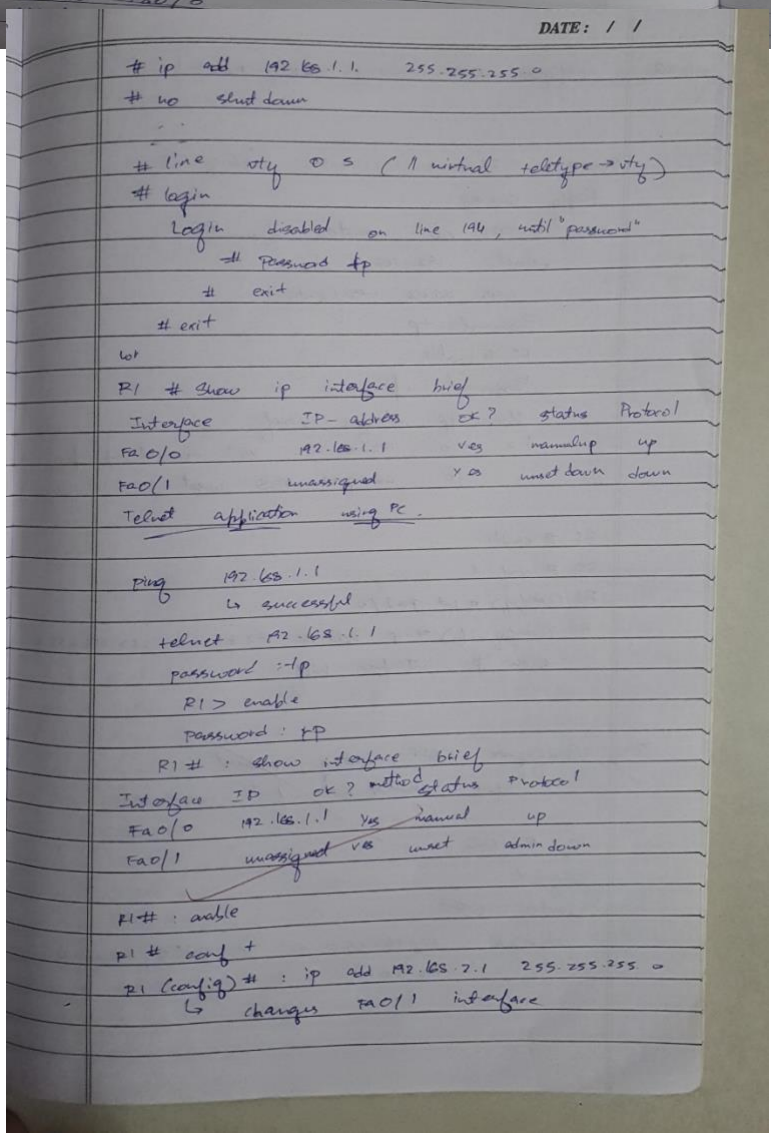
**5. Verify Telnet Access**

1. Execute any router command remotely, e.g.:

   show ip interface brief

# Observation



## Output:

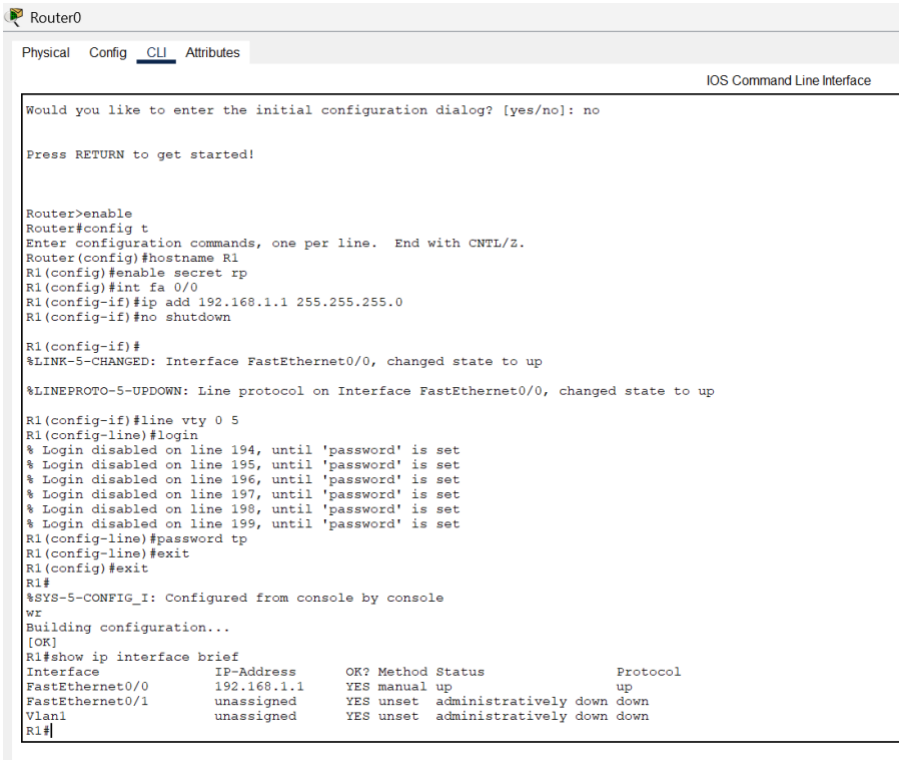



Fig 1. Router0 – CLI commands

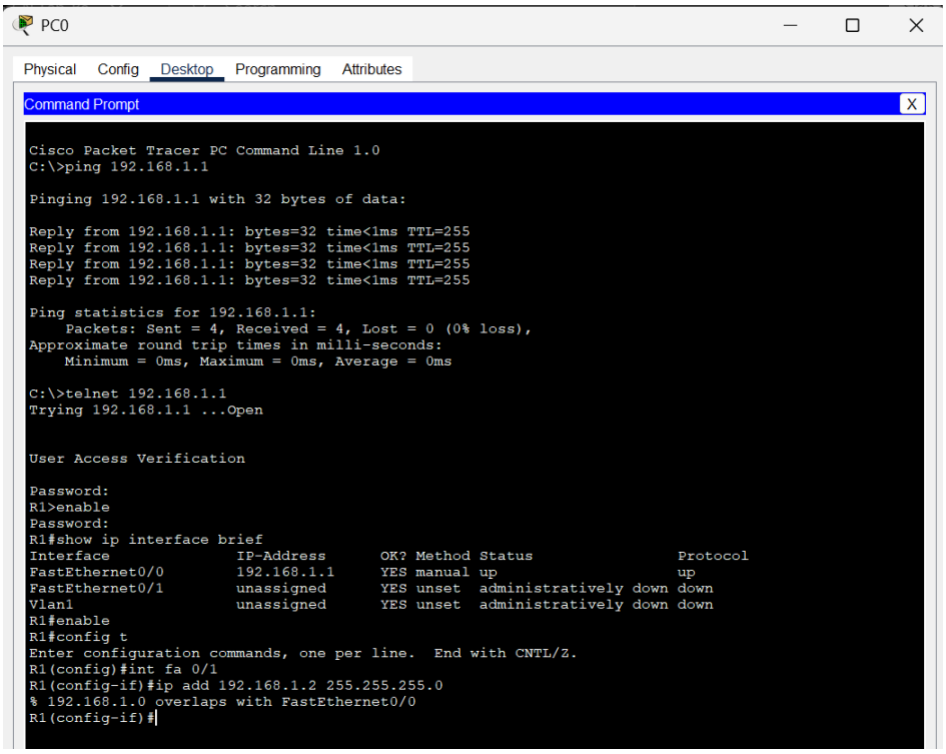



Fig2. PC command line prompt

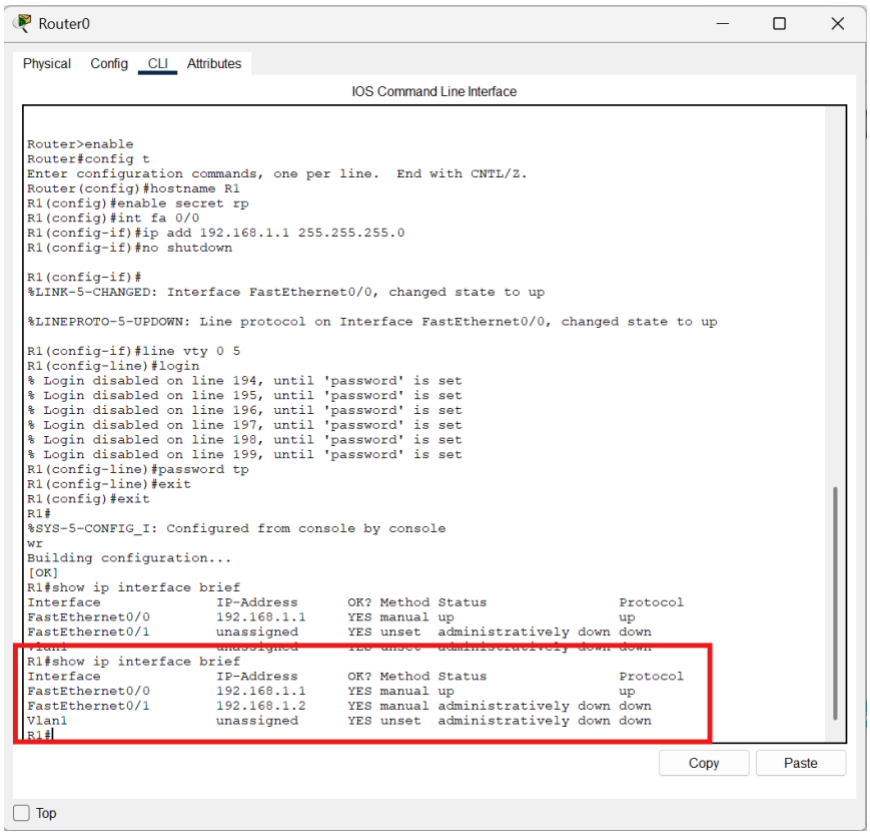



Fig 3. Updated the changes into Router0

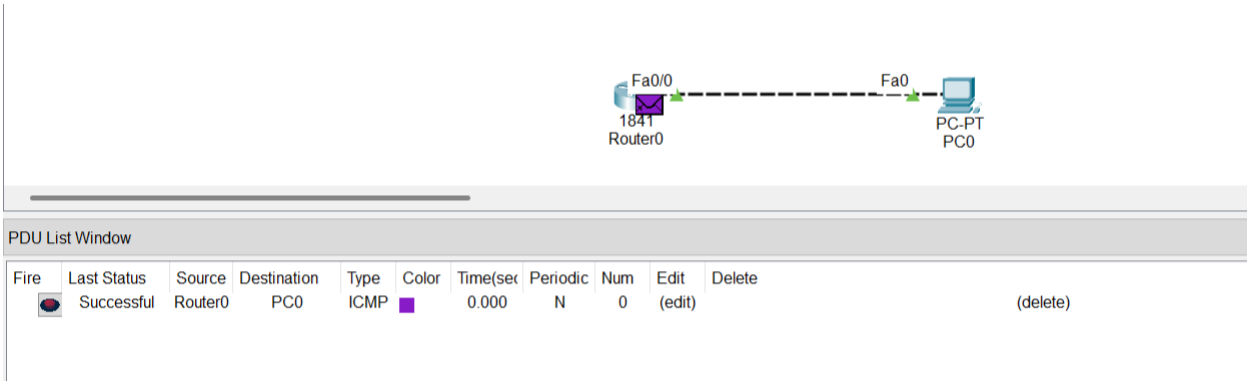
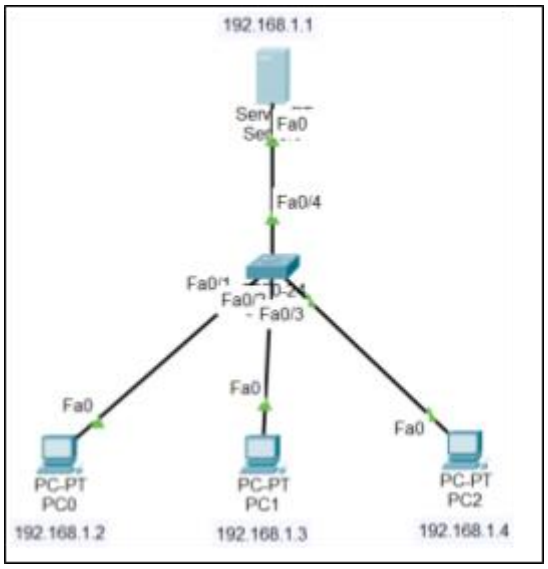



Fig 4. PDU message Successful

## Program 12:

**Aim:** To construct simple LAN and understand the concept and operation of Address Resolution Protocol (ARP).

## Topology:




## Procedure:

**1. Create the LAN**

1. Place one server, one switch, and three PCs as shown.
2. Connect all devices to the switch using straight-through cables.

**2. Assign IP Addresses**

1. On each PC and the Server → Desktop → IP Configuration
    - Server: 192.168.1.1
    - PC0: 192.168.1.2
    - PC1: 192.168.1.3
    - PC2: 192.168.1.4
    - Subnet Mask: 255.255.255.0
    - Gateway: (none needed for LAN)

**3. Check ARP Table (Before Communication)**

1. On each device → Command Prompt
2. Type:
3. arp -a
4. The ARP table will be empty initially.

**4. Generate Traffic (Ping)**

1. On PC0 → Command Prompt:
2. ping 192.168.1.1

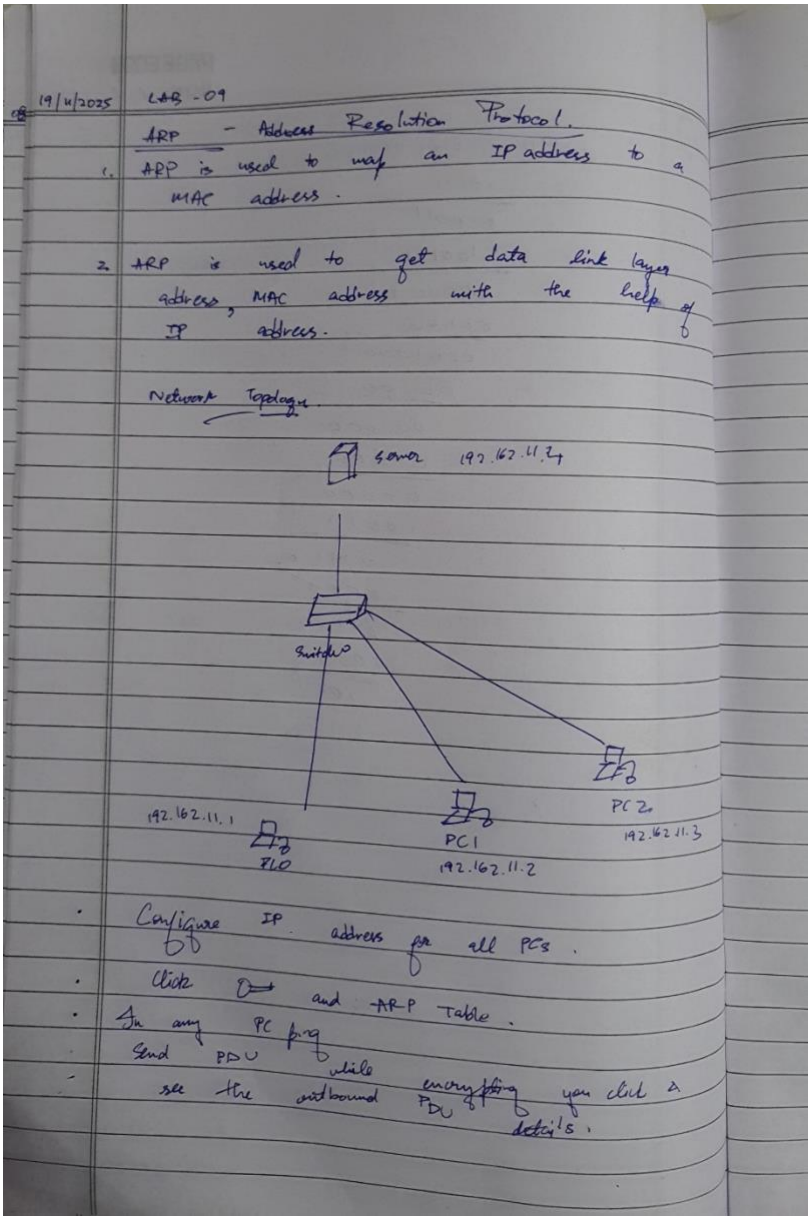
3. PC0 sends an ARP request → switch → server.
4. Server replies with its MAC address.

**5. Check ARP Table (After Communication)**

1. On each device, again run:
2. arp -a
3. Entries now appear showing:
    - IP Address
    - MAC Address
    - Interface

This demonstrates how ARP resolves IP → MAC mapping.

## Observation:




## Output:

ARP Table for Server0

| IP Address | Hardware Address | Interface |
|---|---|---|
| 192.168.1.2 | 00E0.F736.0126 | FastEthernet0 |
| 192.168.1.3 | 0090.0C24.1CCC | FastEthernet0 |
| 192.168.1.4 | 00D0.D396.D2B5 | FastEthernet0 |

Fig 1.1 ARP table at Server0

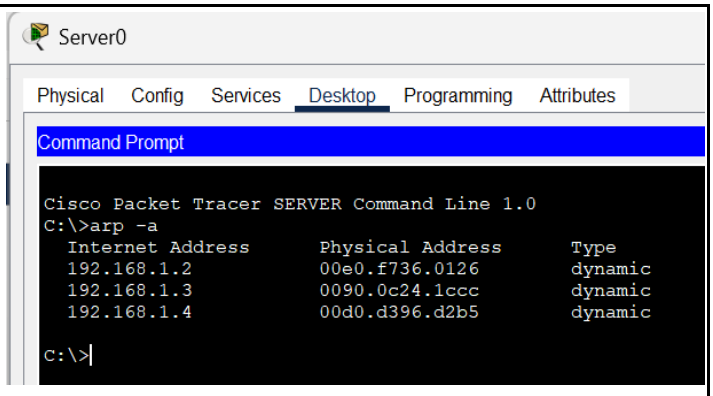



Fig 1.2 Command Prompt at Server0

ARP Table for PC0

| IP Address | Hardware Address | Interface |
|---|---|---|
| 192.168.1.1 | 00E0.F7C6.AC93 | FastEthernet0 |

Fig 2.1 ARP table at PC0

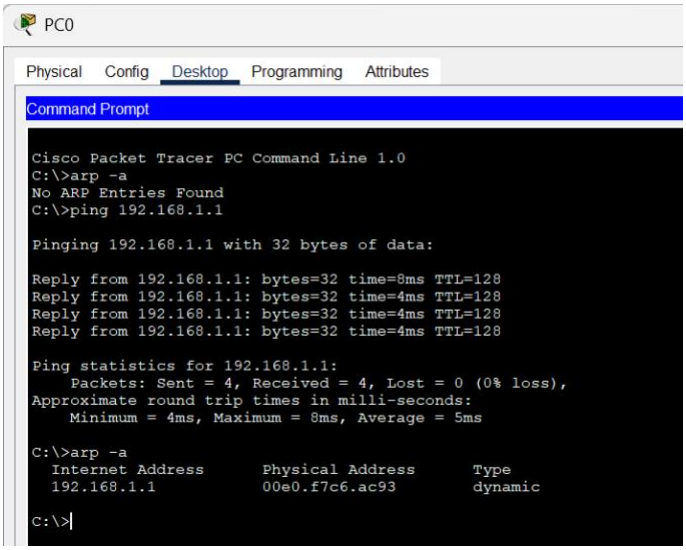



Fig 2.2 Command Prompt at PC0

ARP Table for PC1

| IP Address | Hardware Address | Interface |
|---|---|---|
| 192.168.1.1 | 00E0.F7C6.AC93 | FastEthernet0 |

Fig 3.1 ARP table at PC1

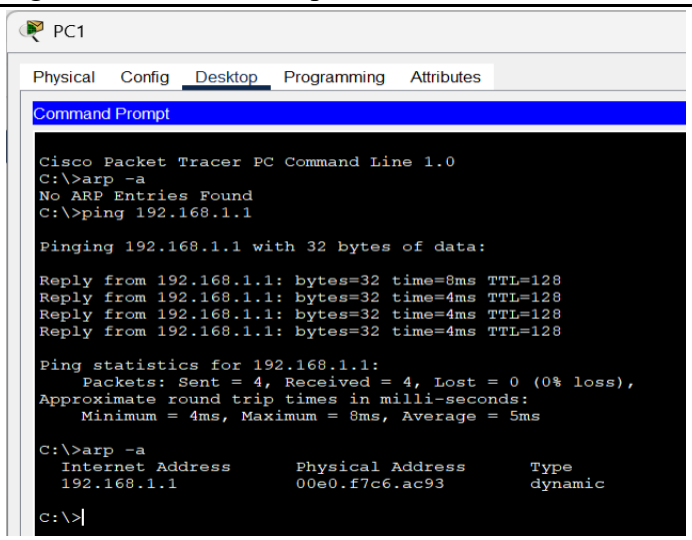



Fig 3.2 Command Prompt at PC1

ARP Table for PC2

| IP Address | Hardware Address | Interface |
|---|---|---|
| 192.168.1.1 | 00E0.F7C6.AC93 | FastEthernet0 |

Fig 4.1 ARP table at PC2

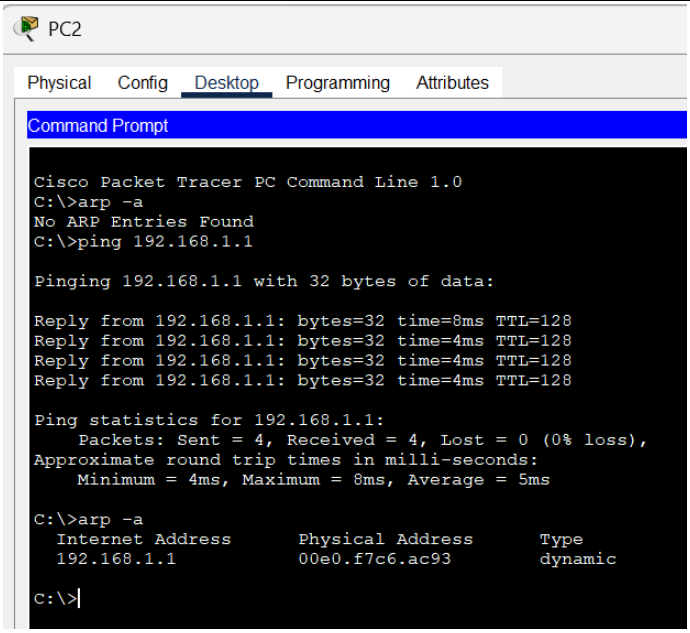



Fig 4.2 Command Prompt at PC2

# PART - B

## Program 1:

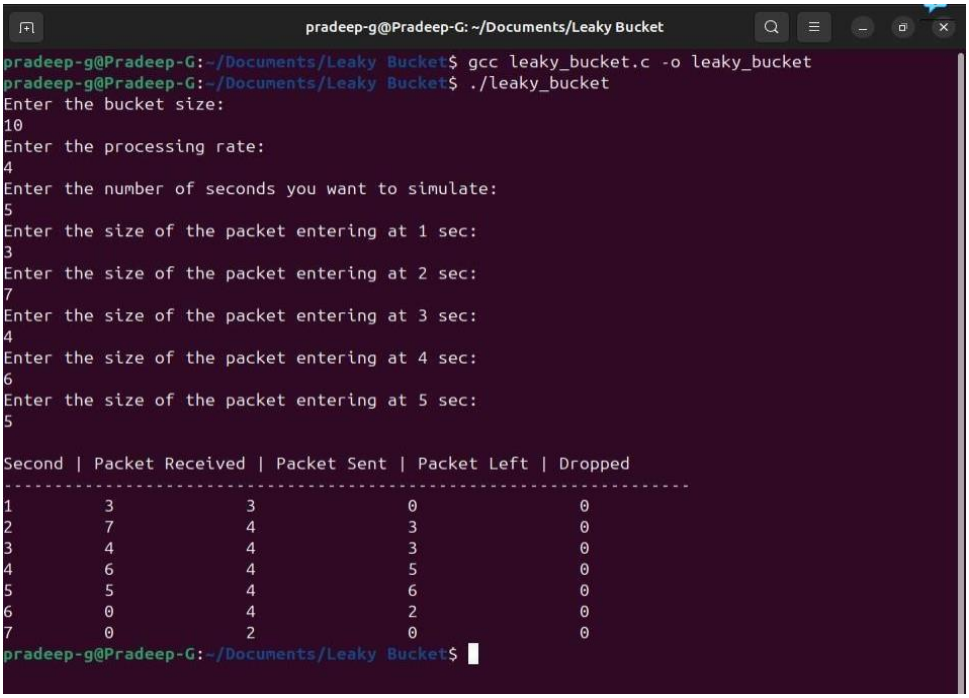
**Aim:** Write a program for congestion control using Leaky bucket algorithm.

**Code:**

```
#include <stdio.h>


int min(int x, int y) {
    if (x < y)
        return x;
    else
        return y;
}


int main() {
    int drop = 0, mini, nsec, cap, count = 0, i, inp[25],
process;


    printf("Enter the bucket size:\n");
    scanf("%d", &cap);


    printf("Enter the processing rate:\n");
    scanf("%d", &process);


    printf("Enter the number of seconds you want to
simulate:\n");
    scanf("%d", &nsec);


    for (i = 0; i < nsec; i++) {
        printf("Enter the size of the packet entering at %d
sec:\n", i + 1);
```

```
        scanf("%d", &inp[i]);
    }

    printf("\nSecond | Packet Received | Packet Sent | Packet
Left | Dropped\n");
    printf("----------------------------------------------------------------------------------------------------------
-----------------------------------\n");

    for (i = 0; i < nsec; i++) {
        count += inp[i];

        if (count > cap) {
            drop = count - cap;
            count = cap;
        }

        printf("%d\t %d\t\t", i + 1, inp[i]);

        mini = min(count, process);
        printf("%d\t\t", mini);

        count = count - mini;
        printf("%d\t\t %d\n", count,
        drop);

        drop = 0;
    }

    // Remaining packets after time ends
    for (; count != 0; i++) {
        if (count > cap) {
```

```
            drop = count - cap;
            count = cap;
        }

        printf("%d\t 0\t\t", i + 1);

        mini = min(count, process);
        printf("%d\t\t", mini);

        count = count - mini;
        printf("%d\t\t %d\n", count,
        drop);

        drop = 0;
    }

    return 0;
}
```




**Out**

## Program 2:

**Aim:** Using TCP/IP sockets, write a client-server program to make client sending the file name and the server to send back the contents of the requested file if present.

**Code:**

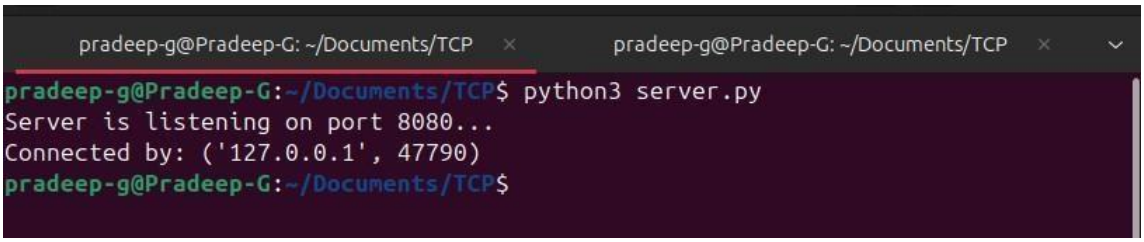
```
# tcp_client.py


import socket


# Step 1: Create TCP socket
client_socket =
socket.socket(socket.AF_INET,
socket.SOCK_STREAM)


# Step 2: Connect to server
client_socket.connect(('localhost',
8080))


# Step 3: Send filename
filename = input("Enter filename to
request: ")


client_socket.send(filename.encode())


# Step 4: Receive file contents
data =
client_socket.recv(4096).decode()


print("\n--- File Content ---\n")
print(data)


# Step 5: Close connection
client_socket.close()
```

```
# tcp_server.py

import socket

# Step 1: Create a TCP socket
server_socket =
socket.socket(socket.AF_INET,
socket.SOCK_STREAM)

# Step 2: Bind to address and
port
server_socket.bind(('localhost',
8080))

# Step 3: Listen for client
connections
server_socket.listen(1)
print("Server is listening on
port 8080...")

# Step 4: Accept connection
conn, addr = server_socket.accept()
print("Connected by:", addr)

# Step 5: Receive file name
filename =
conn.recv(1024).decode().strip()

try:
    # Step 6: Open and read file
    with open(filename, 'r') as
    f:
        data = f.read()

    conn.send(data.encode()) # Send
file contents

except FileNotFoundError:
    conn.send(b"File not found on
server.")

# Step 7: Close connection
```

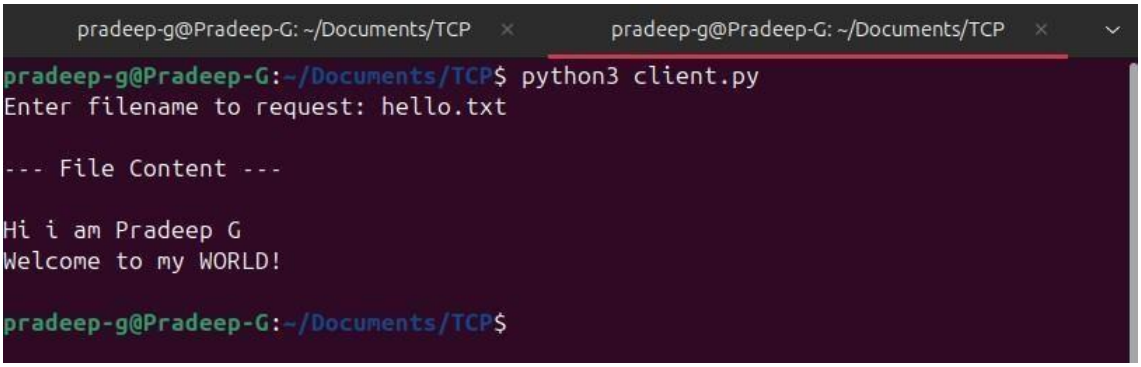
| | |
|---|---|
| | conn.close()<br>server socket.close |

**Output:**

Server side Terminal:




Client side Terminal:




**Observation:**

**Program 3**:

**Aim:** Using UDP sockets, write a client-server program to make client sending the file name and the server to send back the contents of the requested file if present.

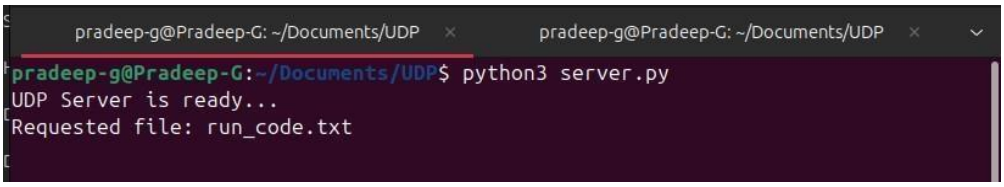
## Code:

```
# udp_client.py

import socket


# Step 1: Create UDP socket

client_socket =
socket.socket(socket.AF_INET,
socket.SOCK_DGRAM)


server_address = ('localhost',
8081)


filename = input("Enter filename
to request: ")


# Step 2: Send filename to
server

client_socket.sendto(filename.en
code(), server_address)


# Step 3: Receive response

data, addr =
client_socket.recvfrom(4096)


print("\n--- File Content ---
\n")

print(data.decode())


# Step 4: Close socket
client_socket.close()
```

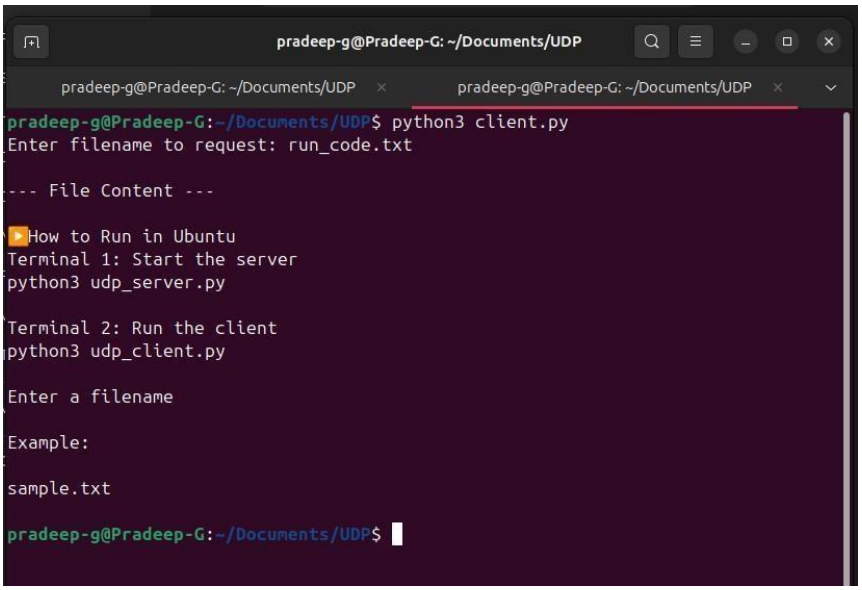
```
# udp_server.py

import socket

# Step 1: Create UDP socket
server_socket =
socket.socket(socket.AF_INET,
socket.SOCK_DGRAM)

# Step 2: Bind to address and port
server_socket.bind(('localhost',
8081))
print("UDP Server is ready...")

while True:

    # Step 3: Receive filename
from client
    filename, addr =
server_socket.recvfrom(1024)
    filename =
filename.decode().strip()

    print(f"Requested  file:
{filename}")

    try:
        # Step 4: Open file and
send content
        with open(filename, 'r')
as f:
            data = f.read()

        server_socket.sendto(data.
encode(), addr)

    except FileNotFoundError:
        server_socket.sendto(b"Fil
e not found on server.", addr)
```

## Output:

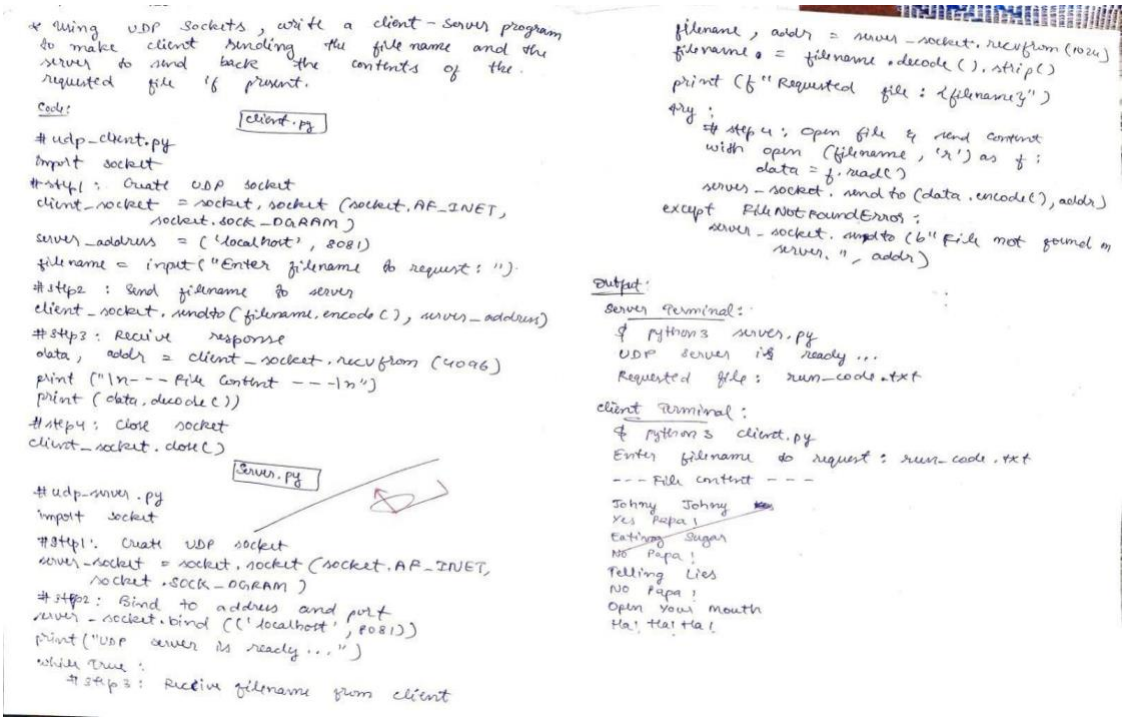
Server side Terminal:




Client side Terminal:




## Observation:



**Program 4:**

**Aim:** Write a program for error detecting code using CRC-CCITT (16-bits).

**Code:**

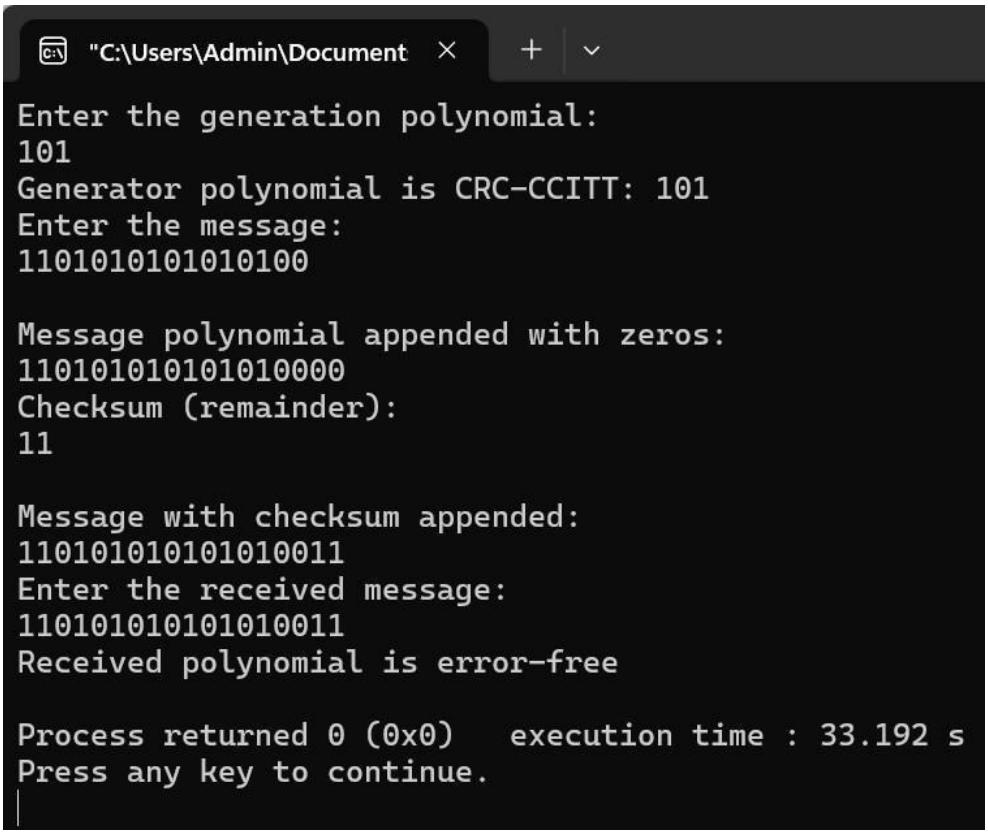
```
#include <stdio.h>
#include <string.h>
#include <stdlib.h>

int main() {
    char rem[50], a[50], s[50], c, msj[50], gen[30];
    int i, genlen, t, j, flag = 0, k, n;

    printf("Enter the generation polynomial:\n");
    gets(gen);
    printf("Generator polynomial is CRC-CCITT: %s\n", gen);

    genlen = strlen(gen);
    k = genlen - 1;

    printf("Enter the message:\n");
    n = 0;
    while ((c = getchar()) != '\n') {
        msj[n] = c;
        n++;
    }
    msj[n] = '\0';

    for (i = 0; i < n; i++)
        a[i] = msj[i];
```

```
for (i = 0; i < k; i++)
    a[n + i] = '0';
a[n + k] = '\0';

printf("\nMessage polynomial appended with zeros:\n");
puts(a);

for (i = 0; i < n; i++) {
    if (a[i] == '1') {
        t = i;
        for (j = 0; j <= k; j++) {
            if (a[t] == gen[j])
                a[t] = '0';
            else
                                a[t] = '1';

            t++;
                    }
           }
      }


for (i = 0; i < k; i++)
    rem[i] = a[n + i];
rem[k] = '\0';

printf("Checksum (remainder):\n");
puts(rem);

printf("\nMessage with checksum appended:\n");
for (i = 0; i < n; i++) a[i] = msj[i];
```

```
for (i = 0; i < k; i++) a[n + i] =
rem[i];
        a[n + k] = '\0';
        puts(a);

        n = 0;
        printf("Enter the received message:\n");
        while ((c = getchar()) != '\n') {
            s[n] = c;
            n++;
        }
        s[n] = '\0';

        for (i = 0; i < n; i++) {
            if (s[i] == '1') {
                t = i;
                for (j = 0; j <= k; j++, t++) {
                    if (s[t] == gen[j])
                        s[t] = '0';
                                else
                                    s[t] = '1';

                                }
                    }
                }


        for (i = 0; i < k; i++)
            rem[i] = s[n + i];
        rem[k] = '\0';
for (i = 0; i < k; i++)
```

```
if (rem[i] == '1') flag = 1;
        }

        if (flag == 0)
            printf("Received polynomial is error-free \n");
        else
            printf("Received polynomial contains error \n");

        return 0;
    }
```

**Output:**



**Observation:**