

SANJIVANI UNIVERSITY

(Est Under Government of Maharashtra Act No. XX of 2024)

Kopargaon, Maharashtra- 423603

Department of CSE



ACADEMIC YEAR: 2025- 2026

Name : Akash Vilas Pingale

PRN NO : 2124UCEM1027

COURSE NAME : Computer Networks

COURSE CODE : 24UCSPC201

Case Study 3

Title: Network Devices and Protocol Stack

Key Features/Activities: To demonstrate how different network devices (Hub, Switch, Router) operate at different layers of the OSI model by creating a small network in Cisco Packet Tracer and observing PDUs in Simulation Mode.

Software Tool: Cisco Packet Tracer

Solution : (Step to Execute task)

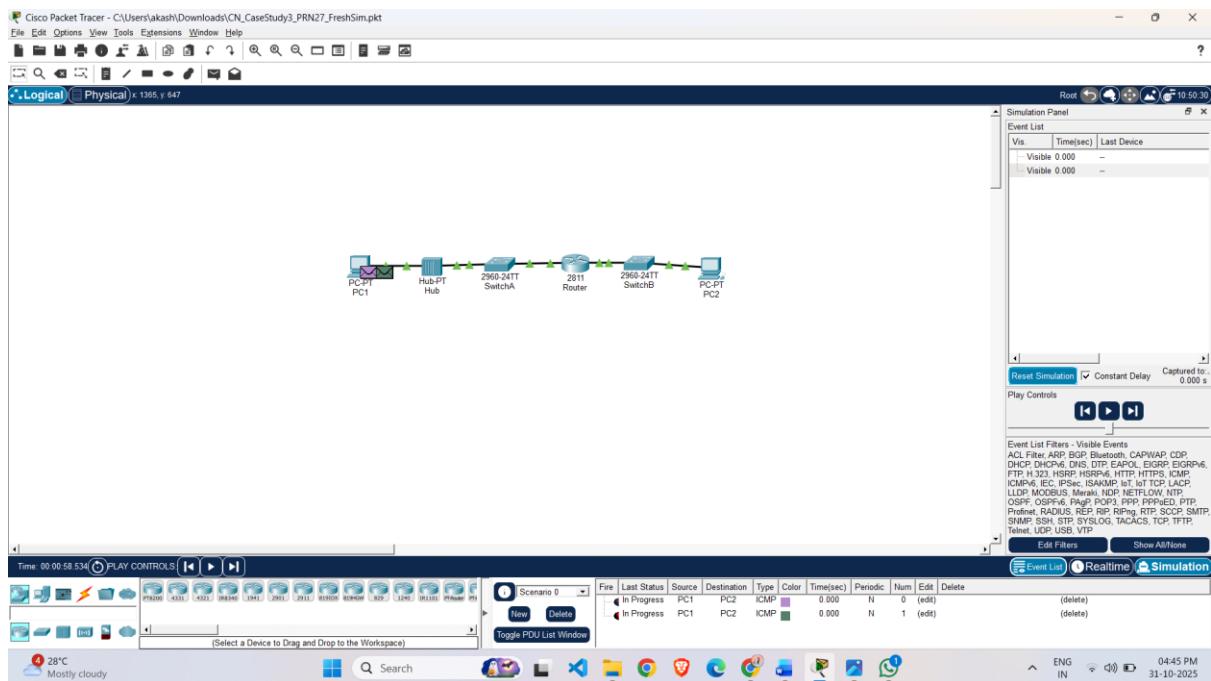
1. Devices used:

- 2 × PC-PT (PC1, PC2)
- 1 × PT-Hub
- 2 × 2960 Switches (SwitchA, SwitchB)
- 1 × 2811 Router

Cables used: Copper Straight-Through

2. Topology: (Screenshot)





3) IP Addressing table

IP Addressing:

Device	Interface	IP Address	Subnet Mask	Default Gateway
PC1	NIC	10.0.0.10	255.255.255.0	10.0.0.1
Router	Fa0/0	10.0.0.1	255.255.255.0	—
Router	Fa0/1	20.0.0.1	255.255.255.0	—
PC2	NIC	20.0.0.10	255.255.255.0	20.0.0.1

4.) Router configuration (Screenshot)

The screenshot shows a window titled "Router" with a toolbar at the top featuring icons for Physical, Config, CLI (which is selected), and Attributes. Below the toolbar is a title bar "IOS Command Line Interface". The main area contains the following text:

```
cisco 2811 (MPC860) processor (revision 0x200) with 60416K/5120K bytes of memory
Processor board ID JAD05190MTZ (4292891495)
2 FastEthernet interface(s)
DRAM configuration is 64 bits wide with parity disabled.
255K bytes of non-volatile configuration memory.
249856K bytes of ATA System CompactFlash 0 (Read/Write)

--- System Configuration Dialog ---

Would you like to enter the initial configuration dialog? [yes/no]: no

Press RETURN to get started!

Router>enable
Router#configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
Router(config)#interface FastEthernet0/0
Router(config-if)#ip address 10.0.0.1 255.255.255.0
Router(config-if)#no shutdown

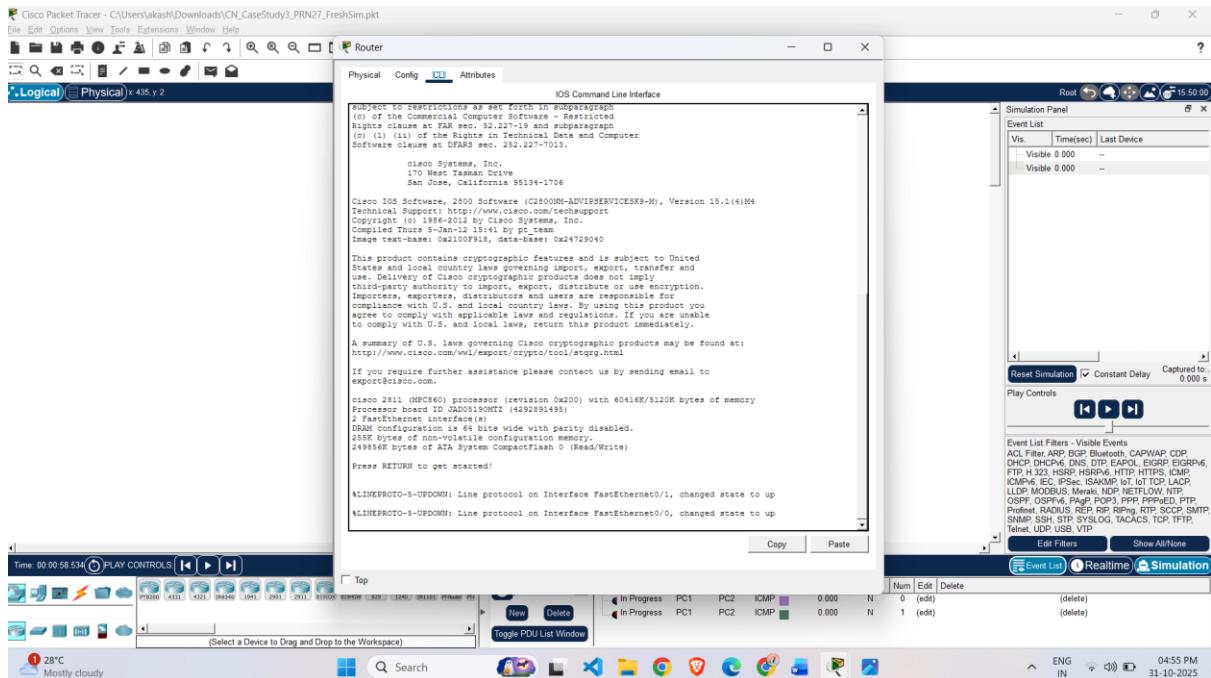
Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/0, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
exit
Router(config)#interface FastEthernet0/1
Router(config-if)#ip address 20.0.0.1 255.255.255.0
Router(config-if)#no shutdown

Router(config-if)#
%LINK-5-CHANGED: Interface FastEthernet0/1, changed state to up

%LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/1, changed state to up
exit
Router(config)#end
Router#
%SYS-5-CONFIG_I: Configured from console by console
write memory
Building configuration...
[OK]
Router#
```

At the bottom right of the text area are "Copy" and "Paste" buttons. At the bottom left is a "Top" button.



5.) Connectivity test (ping) (Screenshot)

PC1

Physical Config Desktop Programming Attributes

Command Prompt

```
Cisco Packet Tracer PC Command Line 1.0
C:\>ping 10.0.0.1

Pinging 10.0.0.1 with 32 bytes of data:

Reply from 10.0.0.1: bytes=32 time<1ms TTL=255

Ping statistics for 10.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
    Minimum = 0ms, Maximum = 0ms, Average = 0ms

C:\>
```

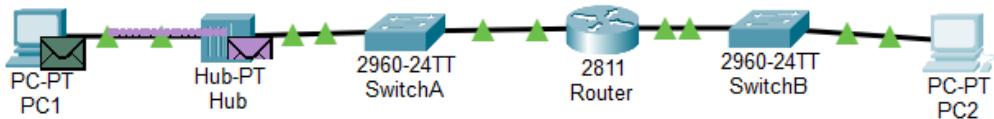
6) Simulation Mode (PDU capture) :

Steps performed :

1. Switched Packet Tracer to Simulation mode.
2. Used Add Simple PDU (envelope) tool and created ICMP from PC1 → PC2.
3. Played the simulation and inspected PDU details at Hub, Switch, and Router.

(Screenshot)

1)PC 1 to HUb



2)Hub to switchA



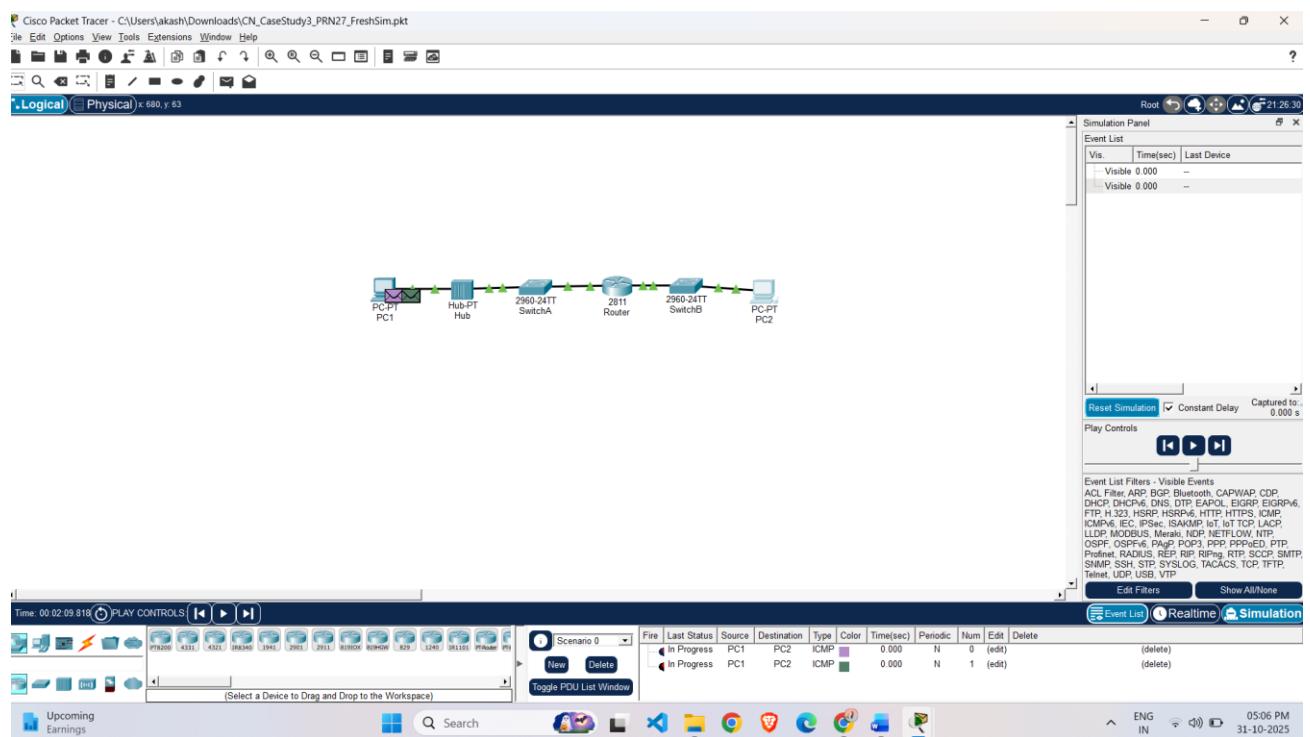
3)Router to SwitchB



4) PC1 to PC2 (Successful Execute)



5)



7). Observations (Simplified)

- **Hub (Layer 1):**
The hub only passes electrical signals to all connected devices.
It does not read or change any data.
- **Switch (Layer 2):**
The switch sends data to the correct device using MAC addresses. It learns which device is on which port.

- Router (Layer 3):

The router sends data between different networks using IP addresses. It changes MAC addresses when forwarding packets, but the IP addresses stay the same.

8) Output (Screen recording)

[https://github.com/Akashpingale/Computer Network Case Study/blob/main/Screen%20Recording%202025-10-31%20170750.mp4](https://github.com/Akashpingale/Computer_Network_Case_Study/blob/main/Screen%20Recording%202025-10-31%20170750.mp4)

8). Result (copy)

The ICMP packet from PC1 to PC2 was successful. Simulation mode confirmed the Hub operates at OSI Layer-1, the Switch at Layer-2, and the Router at Layer-3. Packet Tracer PDU details showed Ethernet headers at switches and IP headers at routers as expected.

9).Conclusion

This experiment shows how each network device works at different OSI layers.

The hub works at the physical layer, the switch works at the data link layer, and the router works at the network layer.

All devices help the data move correctly from one PC to another in a network.