

# CS & IT ENGINEERING



## Computer Network

### Introduction

Lecture No. - 03

By - Abhishek Sir





# Recap of Previous Lecture



Topic

Topic

Transport Layer

Network Layer





# Topics to be Covered



Topic

Data Link Layer

Topic

Physical Layer

Topic

Switching technique



## ABOUT ME

Hello, I'm **Abhishek**

- GATE CS AIR - 96
- M.Tech (CS) - IIT Kharagpur
- 12 years of GATE CS teaching experience

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## Topic : Data Link Layer



-> Provide node-to-node connectivity



## Topic : Node-to-Node Connectivity

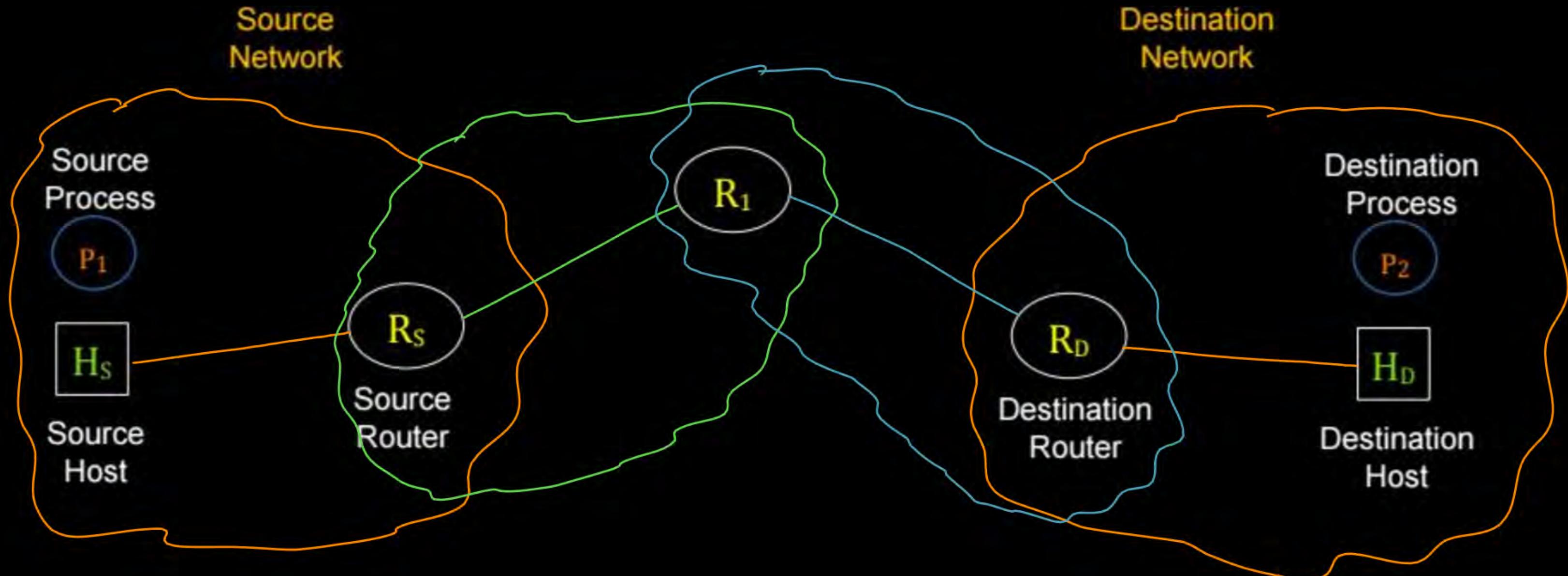
**Intra-network** : Sender & Receiver belongs to same network (with in a network)

**Node** : Host or Router (Any Layer-3 device and above) or Gateway.

↓  
Network Node



# Topic : Node-to-Node Connectivity





# Topic : Data Link Layer

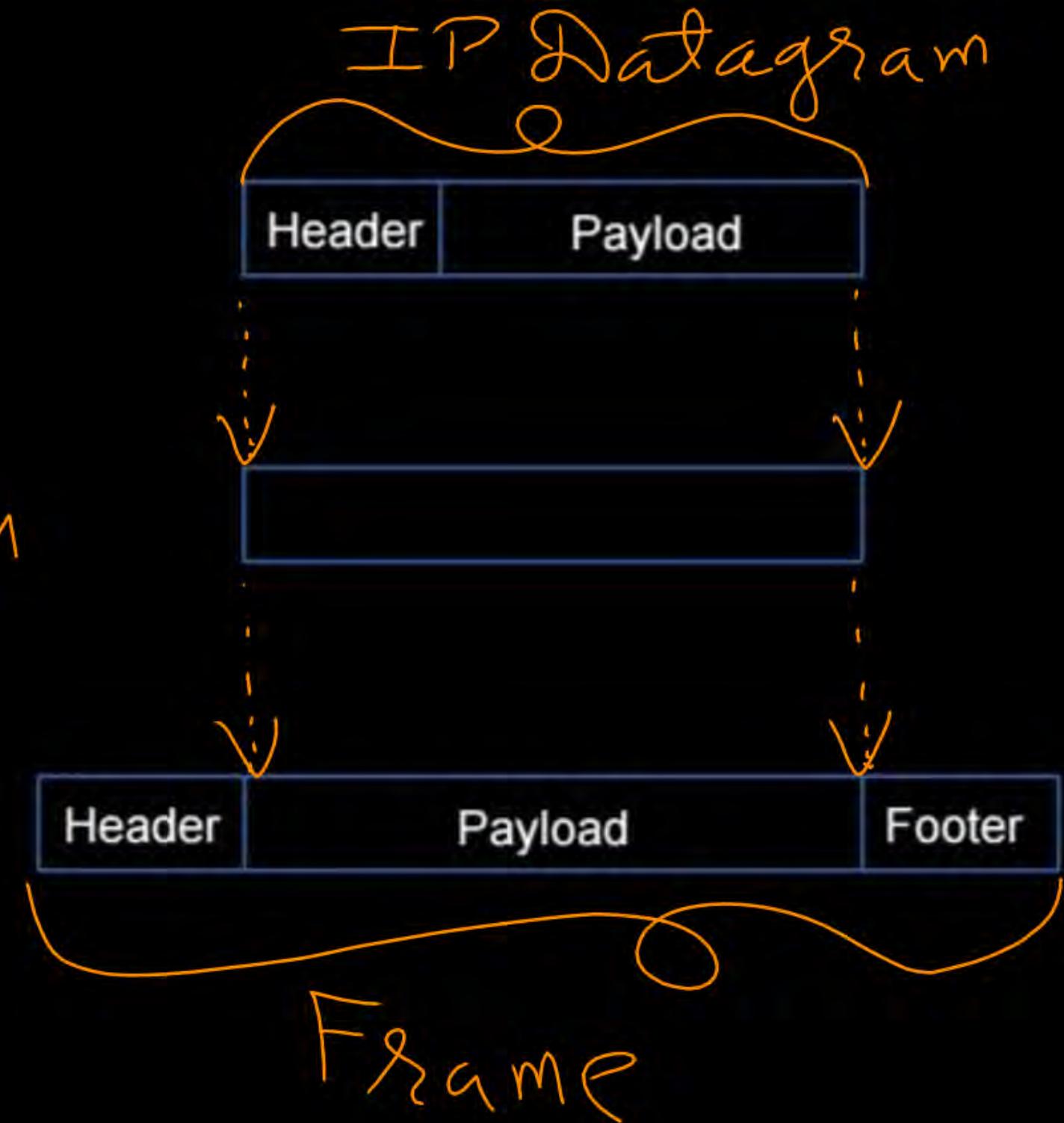
Data Link Layer PDU : **“Frame”**

- Sender : Encapsulate(datagram into frame,  
Frames passes to physical layer for transmission)  
Framing
- Receiver : Extract(datagram from frame,  
Datagrams passes to network layer)  
Extraction

Network Layer PDU  
"Datagram"

Data Link Layer SDU = Datagram

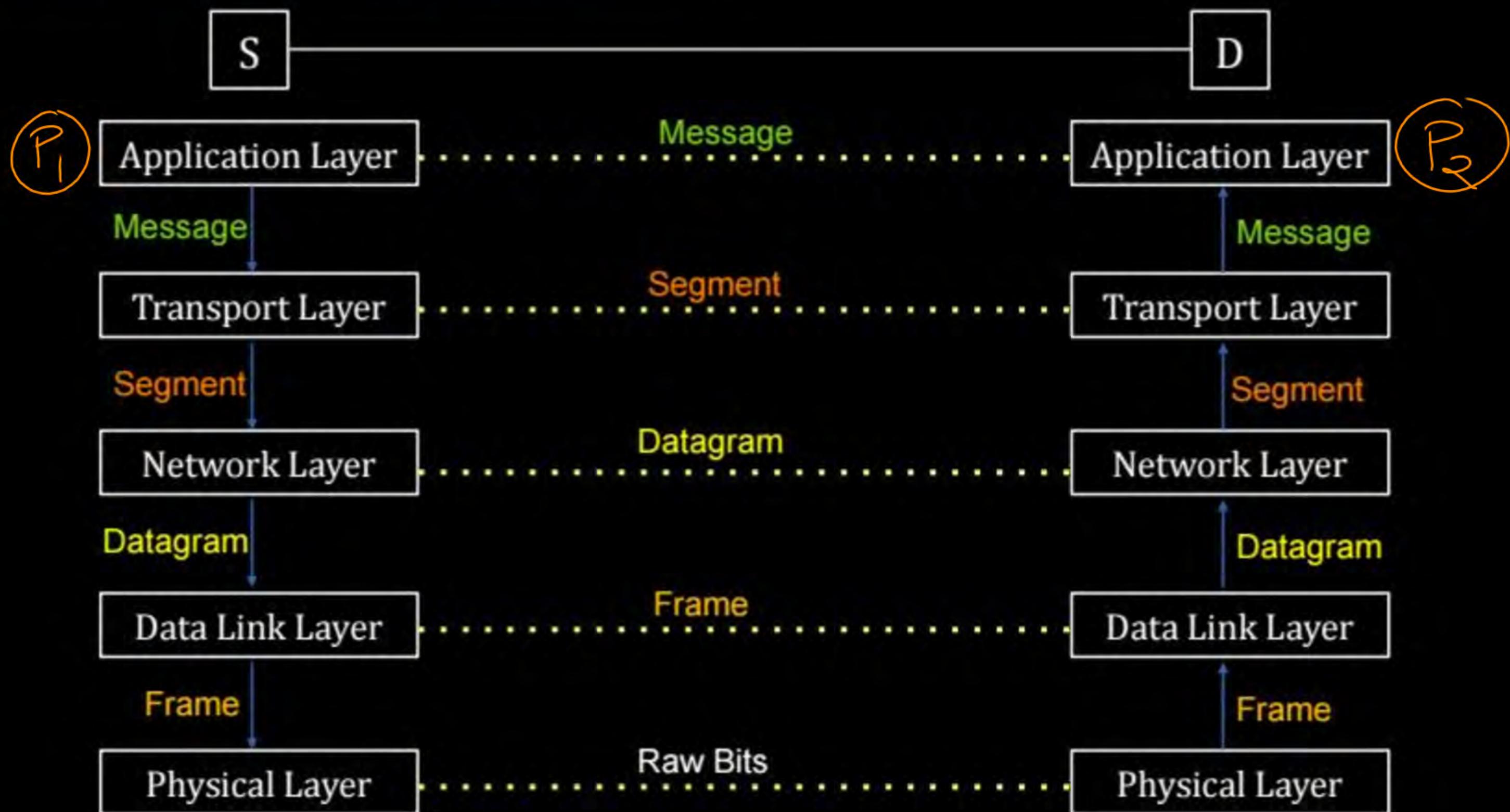
(Data Link Layer PDU  
"Frame")





# Topic : Protocol Data Unit

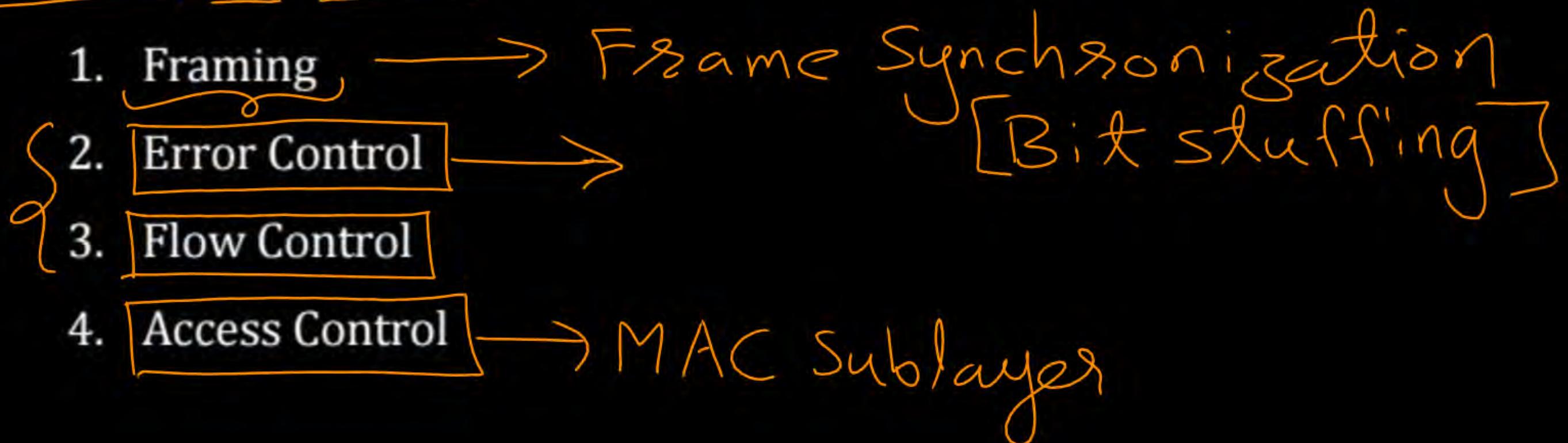
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# Topic : Data Link Layer

## Data Link layer services :-





# Topic : Data Link Layer

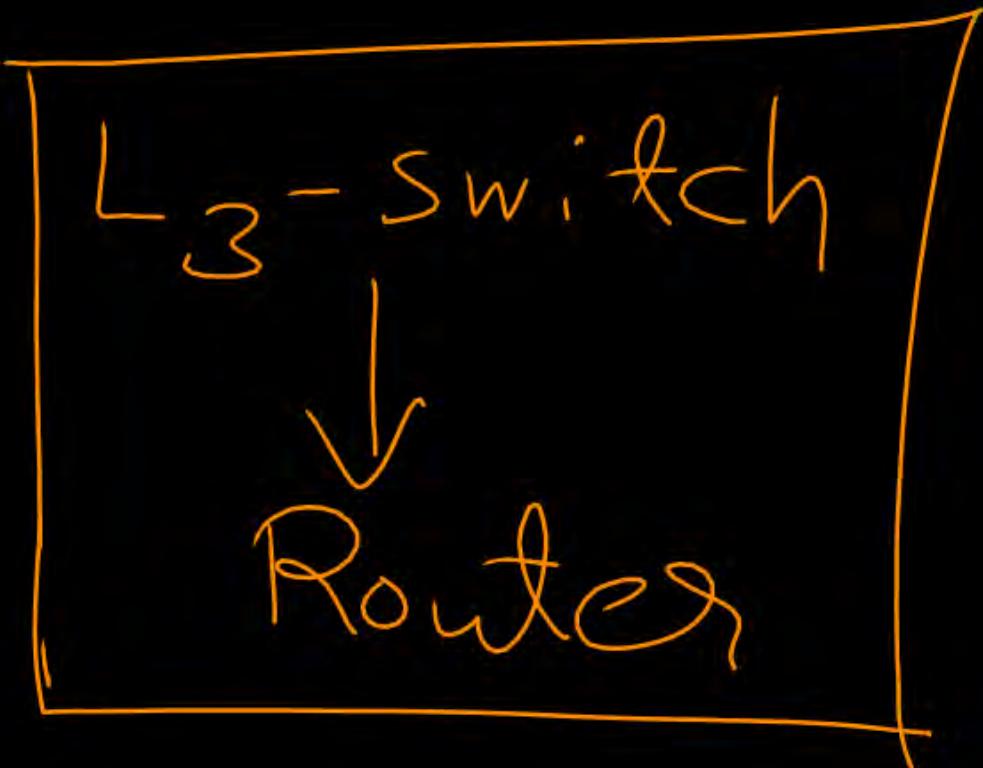
-> Data Link Layer Networking Device : **"Switch"**

[Layer - 2 device, Old name : "Bridge"]

-> Store and Forward device

[Store, Process and Forward]

-> Forwarding based on MAC Address





## Topic : Physical Layer



=> Responsible for transmission of "bit"  
\* [Bit synchronization between transmitter and receiver]

- Copper Cable
- Fiber Cable
- Wireless

=> Encoding / Signaling





# Topic : Physical Layer



- > Physical Layer Networking Device : "**Repeater** and **Hub**"  
[Layer - 1 device]
- > **Hub** : Multi-port **Repeater**

[MCQ]

[ISRO-2015] [1 Mark]

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#Q. Which layers of the OSI reference model are (host-to-host layers)?

A

Transport, session, presentation, application

B

Session, presentation, application

C

Datalink, transport, presentation, application

D

Physical, datalink, network, ~~transport~~

Media Layer

Ans: A

**[MCQ]****[GATE-2025][1 Mark]**P  
W

#Q. Identify the ONE CORRECT matching between the OSI layers and their corresponding functionalities as shown.

OSI Layers	Functionalities
(a) Network layer	(I) [Packet routing]
(b) Transport layer	(II) [Framing and error handling]
(c) Datalink layer	(III) [Host to host communication]

Network  
Layer

A

(a)-(I), (b)-(II), (c)-(III)

B

(a)-(I), (b)-(III), (c)-(II)

C

(a)-(II), (b)-(I), (c)-(III)

D

(a)-(III), (b)-(II), (c)-(I)

Ans : B



# Topic : Layer Services

Layer	Provide Services (to its upper layer)
Transport	Process-to-Process [end-to-end] Connectivity
Network	Host-to-Host Connectivity
Data Link	Node-to-Node Connectivity





# Topic : Protocol Data Unit

Layer	PDU
Application	Message
Transport	Segment
Network	Datagram
Data Link	Frame
Physical	Bit



# Topic : Networking Devices

Layer	Networking Device
Application	Gateway
Network	Router
Data Link	Switch or Bridge
Physical	Hub, Repeater

- Routing between different type of network
- Protocol conversion
- Routing between similar type of network



## Topic : Syllabus



Concept of layering : OSI and TCP/IP Protocol Stacks;

Basics of packet, circuit and virtual circuit switching;





# Topic : Switching



- Process to move data (or packets) towards destination over the network
- Types of switching techniques :
  - 1. Circuit Switching →
  - 2. Packet Switching



## Topic : Circuit Switching

⇒ Physical Devices

P  
W

- Establishes dedicated circuit between sender and receiver, before transmission  
[Over the links of the network]

- Phases of Circuit Switching :

1. Circuit establishment
2. Data transfer
3. Circuit disconnect

- Example : Telephone Networks  
[PSTN : Public Switched Telephone Network]



# Topic : Circuit Switching

=> Circuit in a link implemented with

1. Frequency Division Multiplexing [FDM]

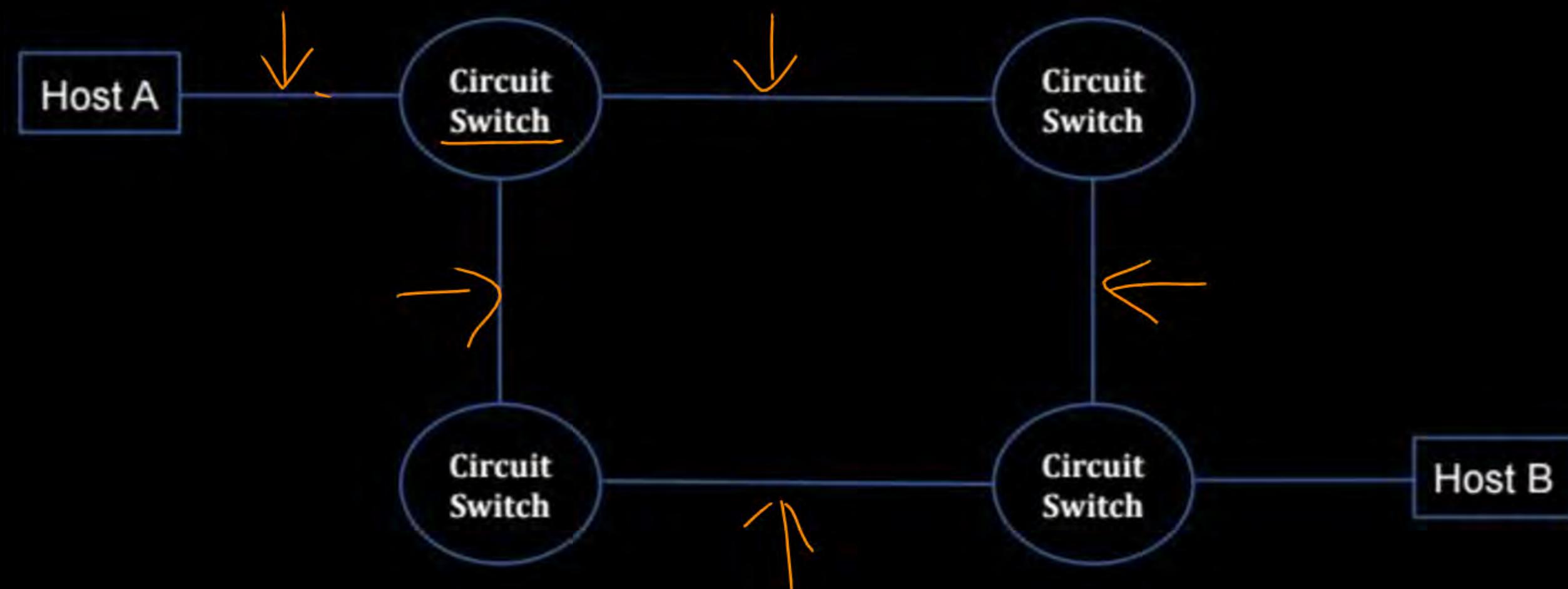
2. Time Division Multiplexing [TDM]

3. Code Division Multiplexing

=> Each link contains n “circuits” [TDM or FDM]



# Topic : Circuit Switching





## Topic : FDM



→ Frequency spectrum of a link

→ [Analog circuit switching]





## Topic : TDM



- Time is divided into frames of fixed duration
- Each frame is divided into fixed number of time slots
- [Digital circuit switching]



# Topic : Circuit Switching



Advantage :-

- Congestion may occur during circuit establishment  
[No any congestion occur, during data transfer] → ✓
- All data (or packets) follow each other on reserved path  
[Data (or packets) having same end-to-end delay]



# Topic : Circuit Switching

Disadvantage :-

- Inefficient utilization of network resources
- Expensive





# Topic : Message Switching

→ TCP/IP Model

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- Application processes doing communication by exchanging "messages"

Advantage :-

- No any dedicated path required between sender and receiver
- Store and Forward (Internet)

Disadvantage :-

- Entire message is transmitted as single unit



# Topic : Packet Switching

→ Message is divided into smaller size packets  
[Packets may be same or different size]

→ Example : Internet is a packet-switched network

\* Optimum Packet Size

TCP/IP Model : Packet switched Network



## 2 mins Summary



Topic

Data Link Layer

Topic

Physical Layer

Topic

Switching technique

\* Packet switching



# THANK - YOU

