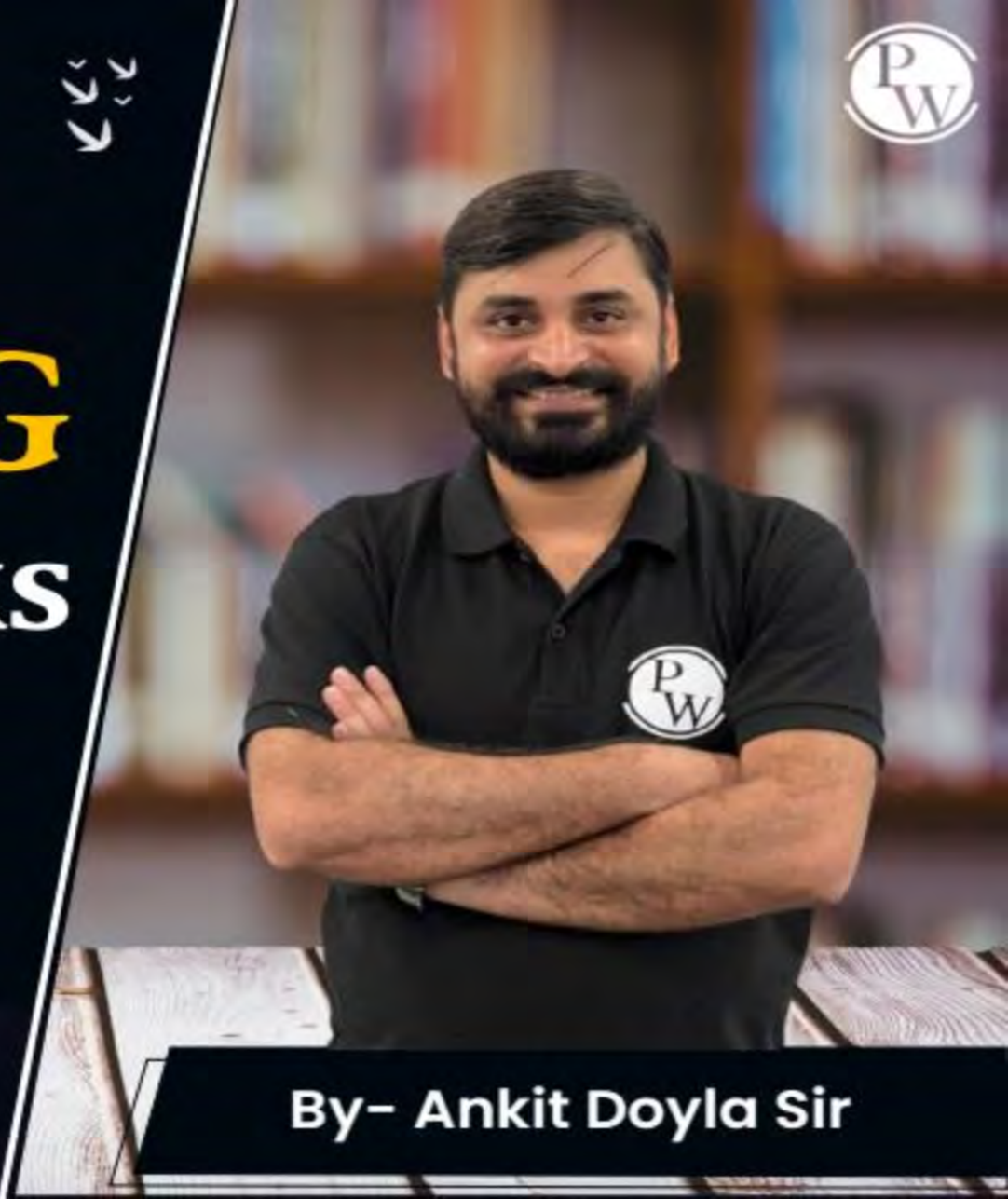
CS & IT ENGINEERING

Computer Networks

Switching

Lecture No.- 01



By- Ankit Doyla Sir

Recap of Previous Lecture

Topic DVR

Topic LSR

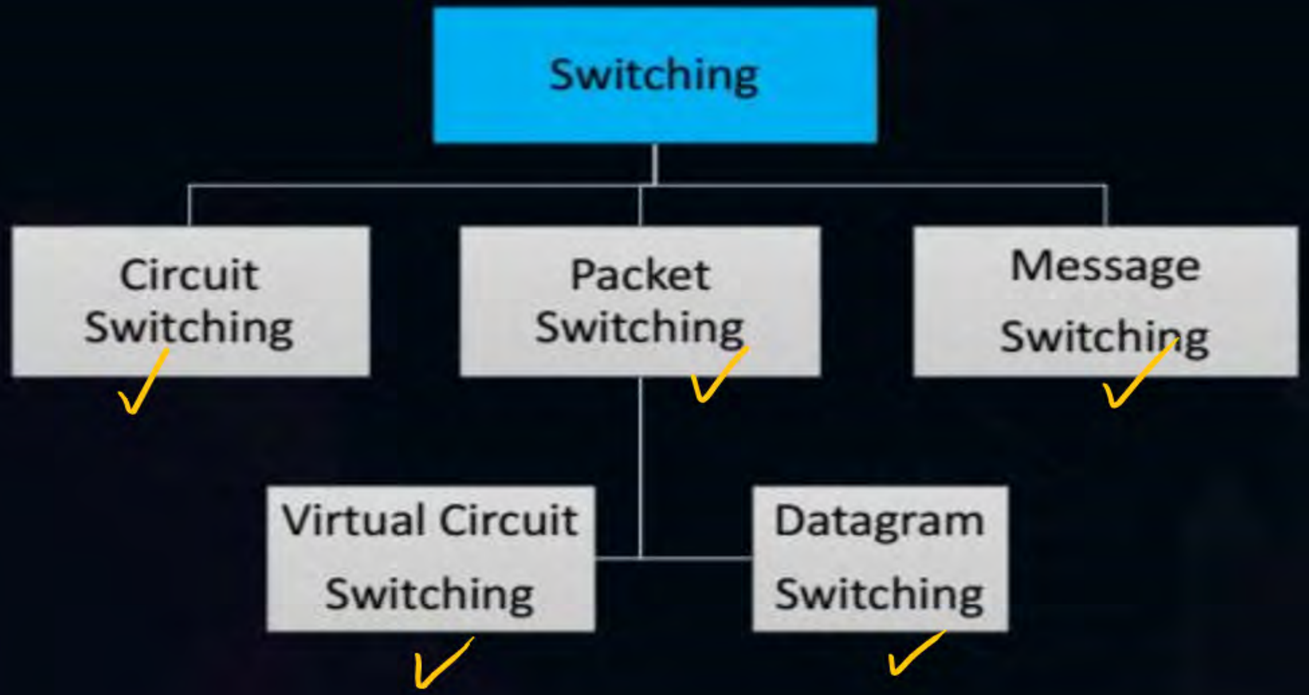
Topics to be Covered

Topic circuit switching > Packet switching

Topic : Switching

The process of forwarding packets from one port to another port is called as switching.

Topic : Switching



Topic : Switching

- Switching is done at Network layer but circuit switching is not done at Network Layer.
- Circuit switching was designed for telephone Network.
- When the Circuit switching was invented there was No concept of OSI Layer or TCP/IP Layer.

Topic : Circuit Switching

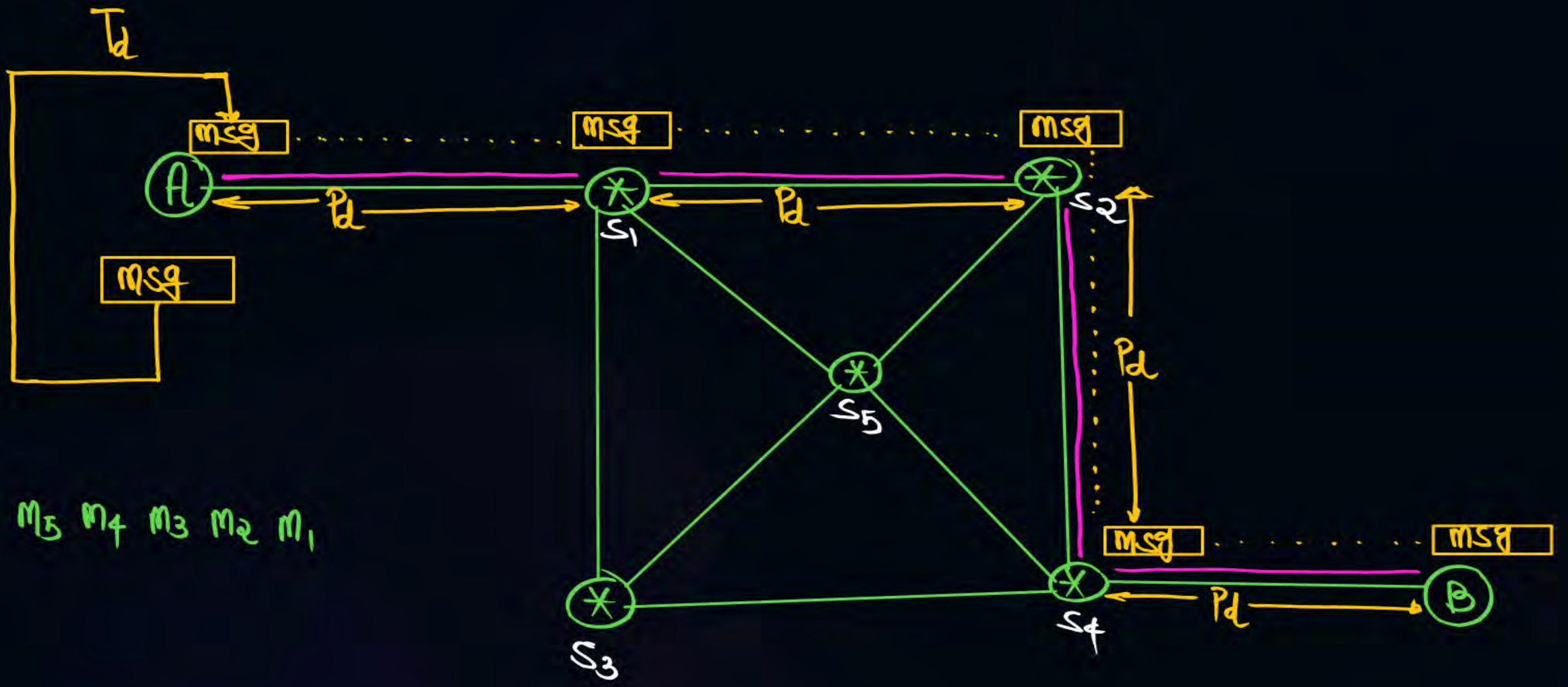
The Communication in a circuit switched network take place in 3 phases

(1) Circuit establishment or setup phase

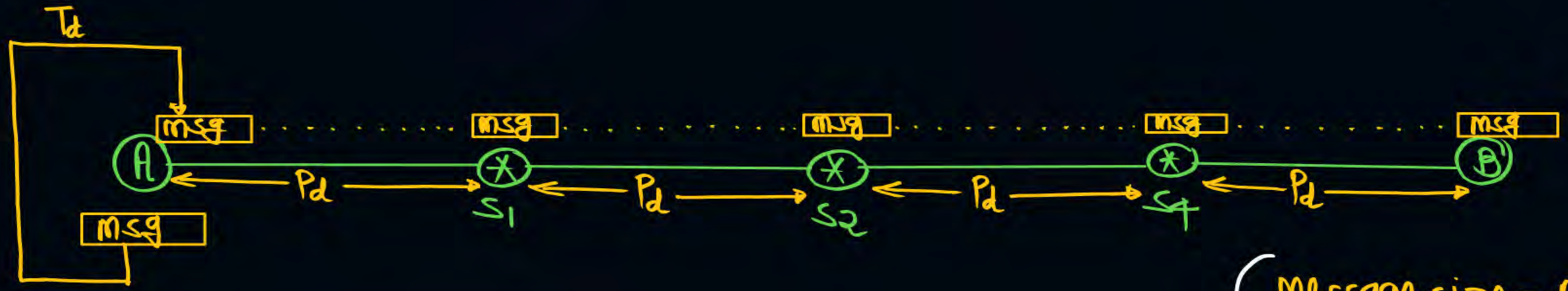
(2) Data transfer phase

(3) Circuit disconnection or tear down phase

Slide



M_5 M_4 M_3 M_2 M_1



Total time taken to send a message from source to destination = setup time + Transmission time + Propagation time + Teardown time

$$\text{Total time} = S + \frac{M}{B} + X\frac{d}{v} + T$$

- Message size = M
- Bandwidth = B
- No. of Hops = X
- Length of each Hop = d
- Velocity = v

Topic : Circuit Switching

1. Circuit establishment or setup phase:

- In circuit switched network before actual data transfer take place a dedicated circuit or physical path is established between sender and receiver.
- The dedicated path establish between the sender and receiver is maintained for entire duration of conversation .
- Before starting communication the station must make a reservation of resource to be used during the communication.
- These resources can be switch, buffers, switch processing time, switch input output port. These resources remains dedicated during the entire duration of data transfer.

Topic : Circuit Switching

2. Data transfer phase:

- After the circuit is established , the entire data travels over the dedicated path from sender to receiver .
- The data flows are continuous b/w sender and receiver .
- There is no addressing involved in the data transfer i.e no header.

Topic : Circuit Switching

3. Circuit disconnection or tear down phase:

- After the data transfer is completed , the circuit is disconnected.
- When sender needs to disconnect , a signal is sent to each switch to release the resources.

NOTE: Circuit switching is implemented at physical layer

Topic : Circuit Switching

Advantages of Circuit switching:

- A well defined and dedicated path exists for the data to travel.
- There is no waiting time at any switch Once the circuit is established data is transferred with out any delay.
- There is no header overhead.
- Data always reaches the receiver end in order.
- No reordering is required.

Topic : Circuit Switching

Disadvantages of Circuit switching:

- As the connection is dedicated it can not be used to transmit any other system data even if channel is free.
- It is inefficient in terms of utilization of system resources. As resources are allocated for the entire duration of connection these are not available to other connections.
- Dedicated channel required more bandwidth.
- Time required to establish a physical link b/w two station is too long.
- Routing decisions can not be changed once the circuit is established.

Topic : Computer Networks

#Q. Consider a circuit switched network. The circuit setup time is S sec, the propagation delay is d sec per hop, and the data rate is b bps. What is the delay in sending an x bit message over a k-hop path ?

A. S+x/b+kd

B. S

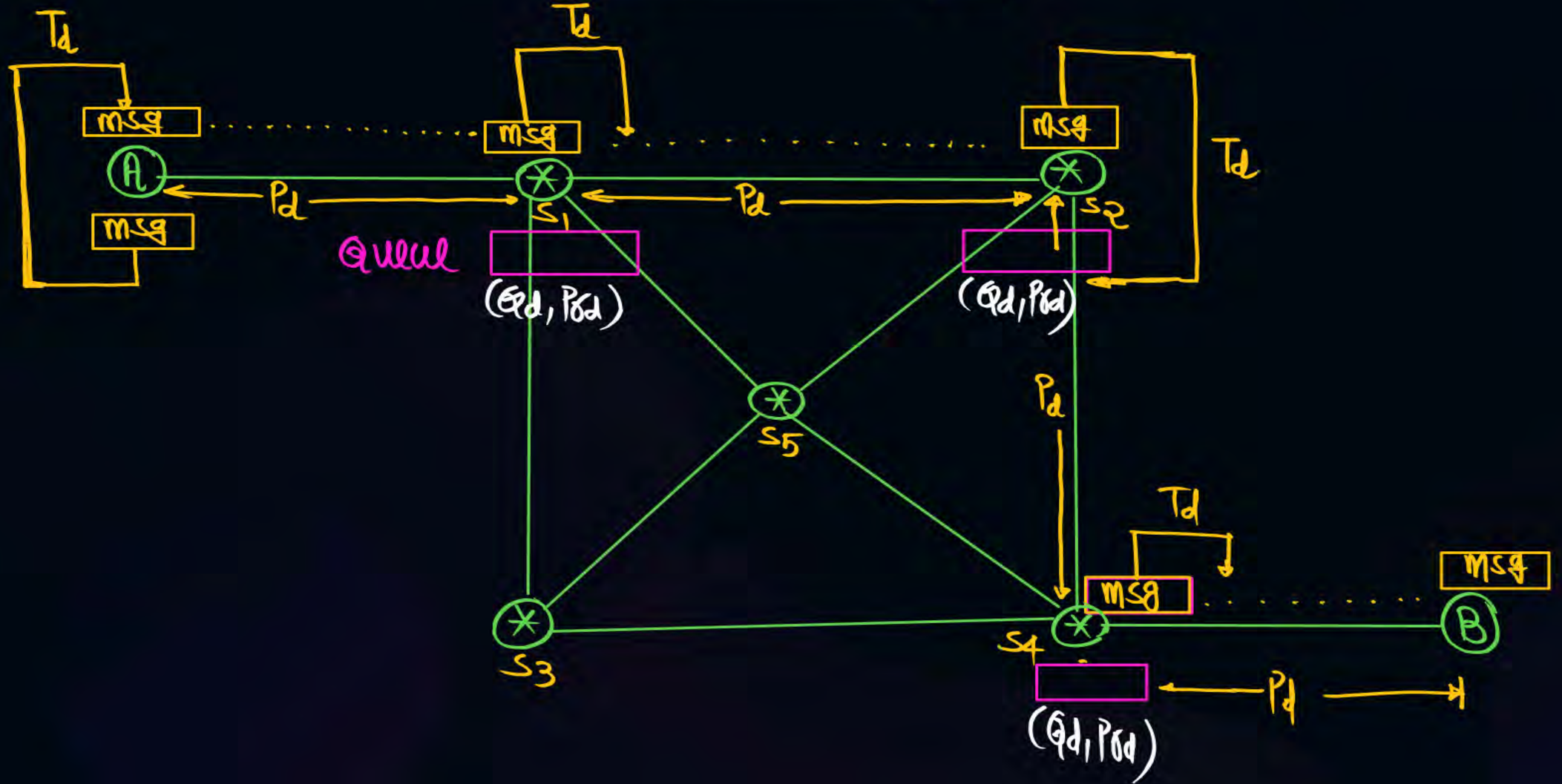
C. S+x/b

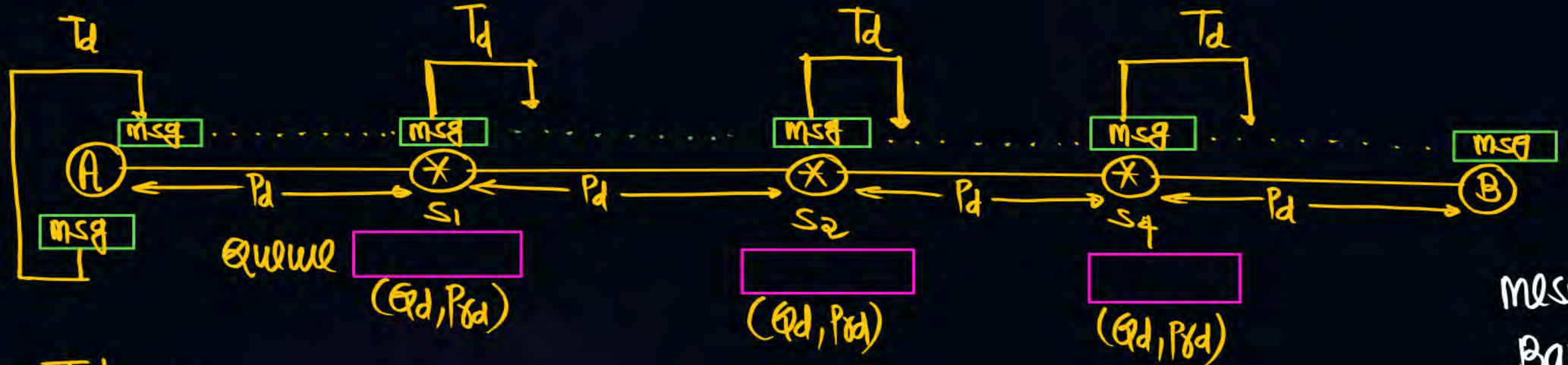
D. S+x/b+(k-1)d

$$\text{Total time} = S + T_d + P_d + T_o$$

$$\text{Total time} = S + \frac{X}{b} + Kd$$

Packet switching





Total time taken to send a Packet From source to destination = Transmission time + Propagation time + Queing delay + Processing delay

$= X\,Td + X\,Pd + (X-1)Qd + (X-1)Pd$

$$\text{Total time} = X[Td + Pd] + X-1[Qd + Pd]$$

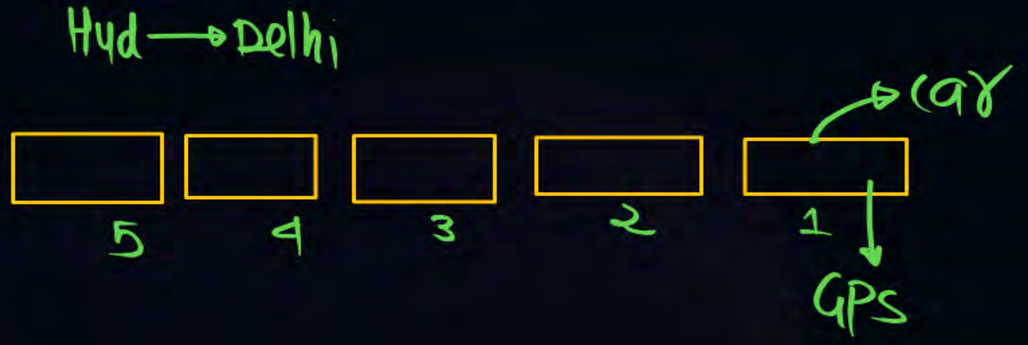
message size = m
Bandwidth = B
Velocity = v
No. of Hops = X
Length of each Hop = d

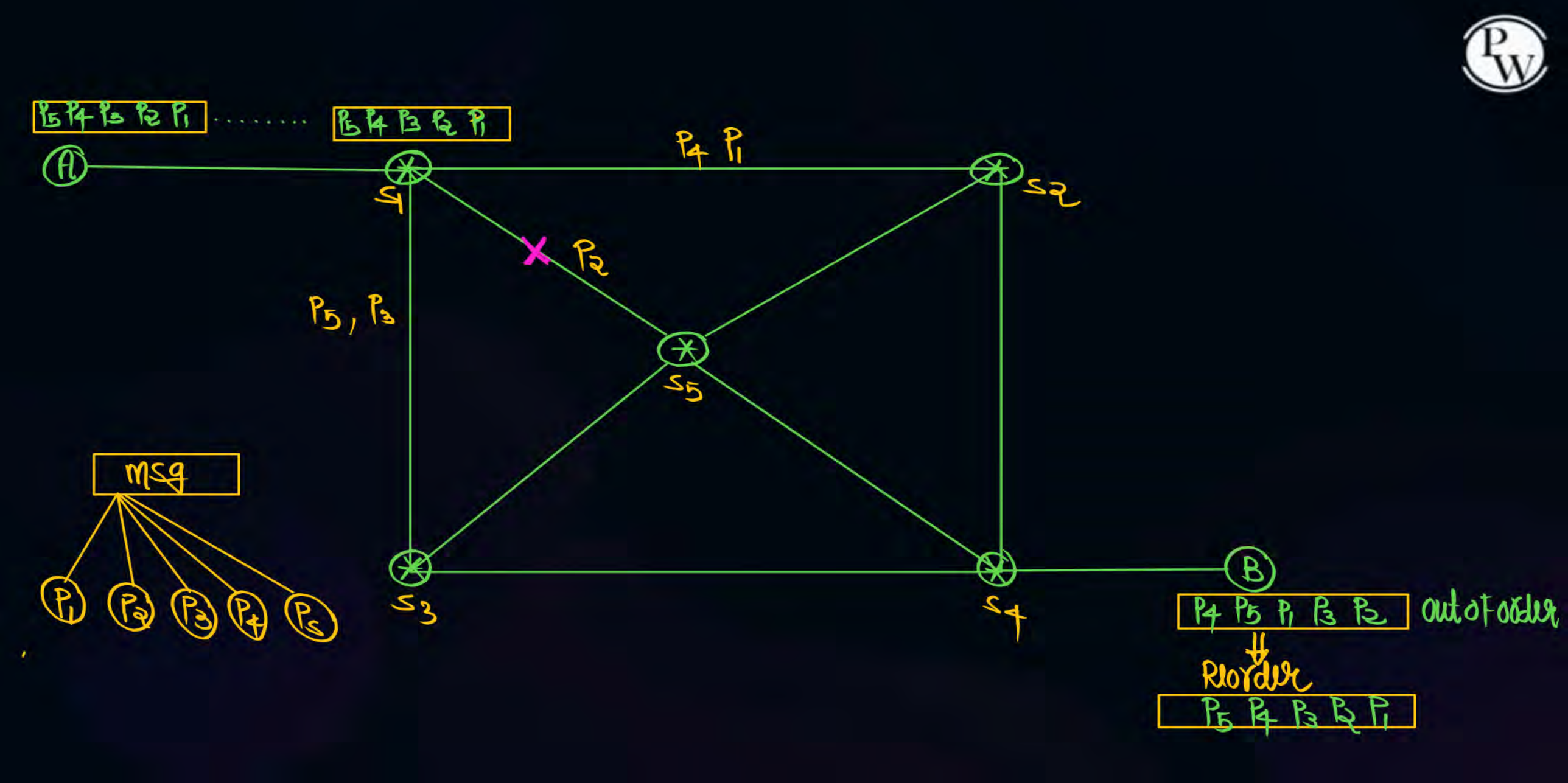
Topic : Packet Switching

- Packet switching is a method of transferring the message to a network in the form of packets.
- The message is broken into small pieces(fixed or variable size) called packet.
- At the destination all these small parts has to be reassembled belonging to same message.
- No pre setup or reservation of resource is needed.
- Packet switching uses store & forward technique.
- More than one path is possible b/w a pair of source and destination.
- Each packet contains source and destination address using which they independently travel through the network.
- Packets belonging to same message may travel different paths to reach their destination.
- If there is a congestion at some path , packets are allowed to choose different paths over an existing network.

Topic : Packet Switching

- Packet switched networks were designed to overcome the weakness of circuit switched networks since circuit switched networks were not effective for small messages.




P5 P4 P3 P2 P1 ..... P5 P4 P3 P2 P1
A
S1
P4 P1
S2
X P2
P5, P3
S5
msg
P1 P2 P3 P4 P5
S3
S4
B
P4 P5 P1 P3 P2
out of order
Reorder
P5 P4 P3 P2 P1

Topic : Packet Switching

Advantages of Packet switching:

- More fault tolerant because packet may follow different path in case link down.
- There is no setup or teardown phases.
- Efficiency of packet switching is better than that of circuit switching.
- Cost effective and comparatively cheaper to implement.

Topic : Packet Switching

Disadvantages of Packet switching:

- Packet switching doesn't give packets in order , whereas circuit switching provides ordered delivery of packets because all the packets follow the same path.
- Since the packets are unordered , we need to provide sequence numbers for each packets.
- Transmission delay is more in packet switching.
- Packet switching is beneficial only for small messages , but for Large messages circuit switching is better.

Circuit switching	Packet switching
Setup time + Tear down time	$(X-1)\frac{M}{B} + X-1\,(Qd+Pd)$

2 mins Summary

Topic One

Topic Two

Topic Three

Topic Four

Topic Five

Packet Switching

Circuit Switching


THANK - YOU