

Unit-2 Physical Layer

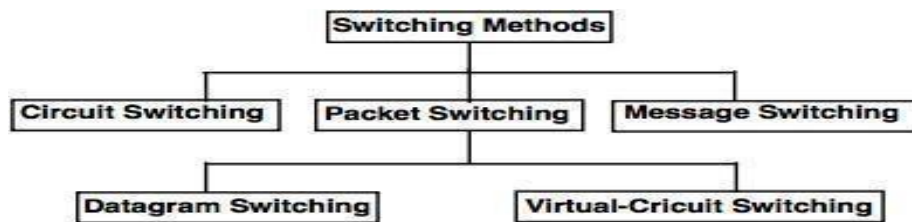
SWITCHING (Completed in Peer Teaching)

Introduction

A Network Switch is a constituent of computer network that connects two network slices and/or two network devices (switches or routers) together. Switch can be termed as a network bridge with multiple ports which helps to process and route packets at data link layer of the OSI reference model. There are some switches which have capabilities to process data at the upper layers (network layer and above).

Those switches are often termed as *multilayer switches*.

For data transfer, different types of switching methods are available. They are



Types of Switching

I. Circuit Switching

- Circuit switched network consists of a set of switches connected by physical links.
- In circuit switched network, two nodes communicate with each other over a dedicated communication path.

- There is a need of pre-specified route from which data will travel and no other data is permitted.
- Before starting communication, the nodes must make a reservation for the resources to be used during the communication.
- In this type of switching, once a connection is established, a dedicated path exists between both ends until the connection is terminated.

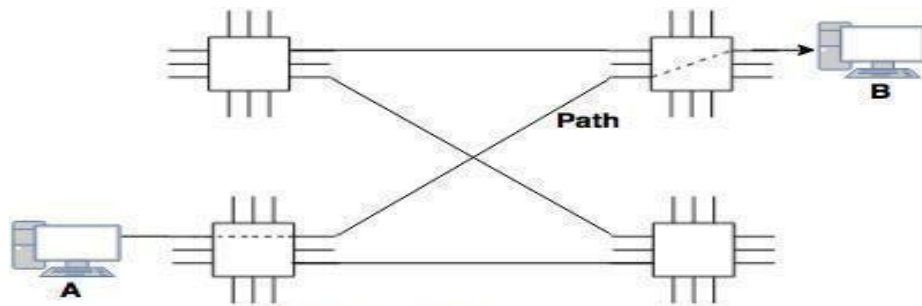


Fig: Circuit Switching

Advantages of Circuit Switching:

- The dedicated path/circuit established between sender and receiver provides a guaranteed data rate.
- Once the circuit is established, data is transmitted without any delay as there is no waiting time at each switch.
- Since a dedicated continuous transmission path is established, the method is suitable for long continuous transmission.

Disadvantages of Circuit Switching:

- As the connection is dedicated it cannot be used to transmit any other data even if the 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 channels require more bandwidth.
- Prior to actual data transfer, the time required to establish a physical link between the two stations is too long.

II. Packet Switching

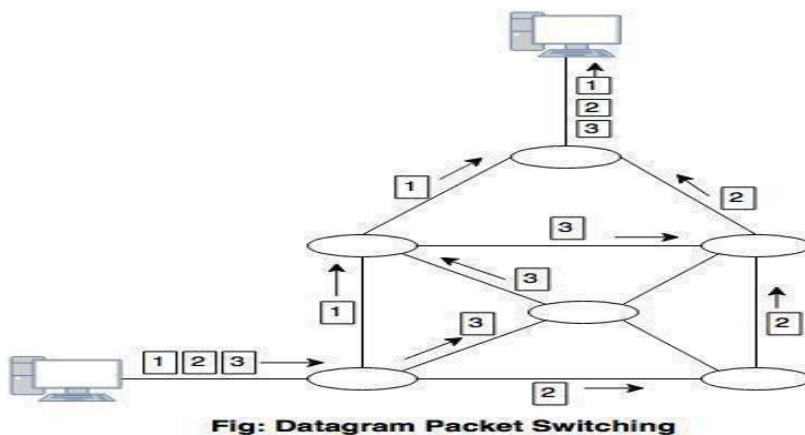
- In packet switching, messages are divided into packets of fixed or variable size.
- The size of packet is decided by the network and the governing protocol.
- Resource allocation for a packet is not done in packet switching.

- Resources are allocated on demand.
- The resource allocation is done on first-come, first-served basis.
- Each switching node has a small amount of buffer space to hold packets temporarily.
- If the outgoing line is busy, the packet stays in queue until the line becomes available.

Packet switching method uses two routing methods: 1.

Datagram Packet Switching

- Datagram packet switching is normally implemented in the network layer.
- In datagram network, each packet is routed independently through the network.
- Each packet carries a header that contains the full information about the destination.
- When the switch receives the packet, the destination address in the header of the packet is examined; the routing table is consulted to find the corresponding port through which the packet should be forwarded.



2. Virtual Circuit Packet Switching

- Virtual circuit packet switching is normally done at the data link layer.
- Virtual circuit packet switching establishes a fixed path between a source and a destination to transfer the packets.
- It is also called as **connection oriented network**.

->A source and destination have to go through three phases in a virtual circuit packet switching:

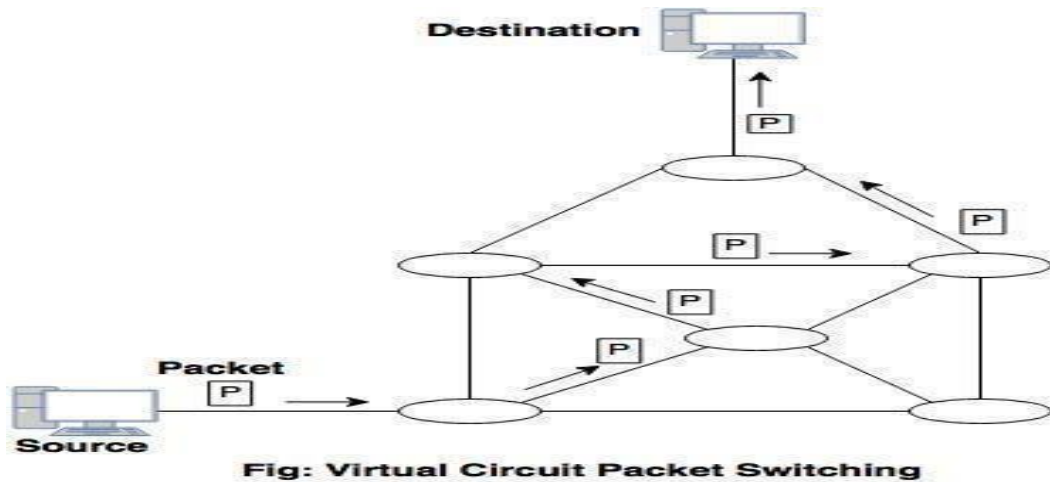
I. Setup phase

ii. Data transfer phase

iii. Connection release phase

- A logical connection is established when a sender sends a setup request to the receiver and the receiver sends back an acknowledgement to the sender if the receiver agrees.
- All packets belonging to the same source and destination travel the same path.

- The information is delivered to the receiver in the same order as transmitted by the sender.



Advantages of Packet Switching:

- Efficient use of Network.
- Easily get around broken bits or packets.
- Circuit Switching charges user on the distance and duration of connection but Packet Switching charges users only on the basis of duration of connectivity.

Disadvantages of Packet Switching:

- In Packet Switching Packets arriving in wrong order.
- Takes Transmission delay.

III. Message Switching

- In message switching, it is not necessary to establish a dedicated path between transmitter and receiver.
- In this, each message is routed independently through the network.
- **Store and forward** – The intermediate nodes have the responsibility of transferring the entire message to the next node. Hence, each node must have storage capacity. A message will only be delivered if the next hop and the link connecting it are both available, otherwise it'll be stored indefinitely. A store-and-forward switch forwards a message only if sufficient resources are available and the next hop is accepting data. This is called the store-and-forward property.

