

What is switching and its types? ^

In large networks, there may be more than one paths for transmitting data from sender to receiver. Selecting a path that data must take out of the available options is called **switching**. There are two popular **switching** techniques – circuit **switching** and packet **switching**.

### What is meant by circuit switching?

**Circuit switching** is a method of implementing a telecommunications network in which two network nodes establish a dedicated communications channel (**circuit**) through the network before the nodes may communicate.

Circuit switching is defined as the method of switching which is used for establishing a dedicated communication path between the sender and the receiver. The link which is established between the sender and the receiver is in the physical form. Analog telephone network is a well-known example of circuit switching.

(i) CIRCUIT SWITCHING:- It is a transmission mode that involves setting up a dedicated end to end Conn<sup>n</sup>.

- ↳ Commonly used in Telephone Systems.
- ↳ Connection Oriented.
- ↳ No delay in data flow
- ↳ Link of the Conn<sup>n</sup> Can't be used to send any other data even when free.
- ↳ More bandwidth is required.
- ↳ Conn<sup>n</sup> establish time is more.

The communication in a circuit switched network takes place in three phases:

1. Circuit establishment or setup phase.
2. Data transfer phase.
3. Circuit disconnects or tears down phase.

### **Circuit establishment or Setup Phase**

In circuit switched network, before actual data transfer takes place, a dedicated circuit or path is established between the sender and receiver.

**For example**, if station A is willing to send a message to station C, it first sends a message to node 2, requesting a connection to station C, using the dedicated link between station A and node 2. Node 2 must find the next link in a route, leading to node 4. Based on routing information and availability, node 2 selects the circuit to node 5 and sends a message, requesting connection to station C. So far, a dedicated path has been established from station A through node 2 to node 5. Node 5 now gets a channel to node 4 and internally connects it to the previously established path. Node 4 completes the connection to station C. After completing the connection, a test is made to check whether station C is busy to accept the connection or not. That completes the circuit establishment phase.

### **Data Transfer Phase**

Actual data transfer between the source and destination takes place after the dedicated path is set up between them. The data flows are continuous between sender and receiver. There may be periods of silence in between. Generally all the internal connections are duplex.

### **Circuit Disconnect or Teardown Phase.**

After the completion of data transfer, the established connection is terminated, and notification signal is propagated to all the nodes in the established path to release the dedicated resources.

Circuit switching can be an inefficient technique if the channel capacity is not used properly. However, once the connection is established, data can be transmitted at full speed, supported by the channel. This makes the complete utilization of the channel capacity.

## Advantages of Circuit Switching

- The bandwidth used is fixed.
- The quality of communication is increased as a dedicated communication channel is used.
- The rate at which the data is transmitted is fixed.
- While switching, no time is wasted in waiting.
- It is preferred when the communication is long and continuous.

## Disadvantages of Circuit Switching

- Since dedicated channels are used, the bandwidth required is more.
- The utilization of resources is not full.
- Since a dedicated channel is been used, the transmission of other data becomes impossible.
- The time taken by the two stations for the establishment of the physical link is too long.
- Circuit switching is expensive because every connection uses a dedicated path establishment.
- The link between the sender and the receiver will be maintained until and unless the user terminates the link. This will also continue if there is no transfer of data taking place.

## Packet Switching

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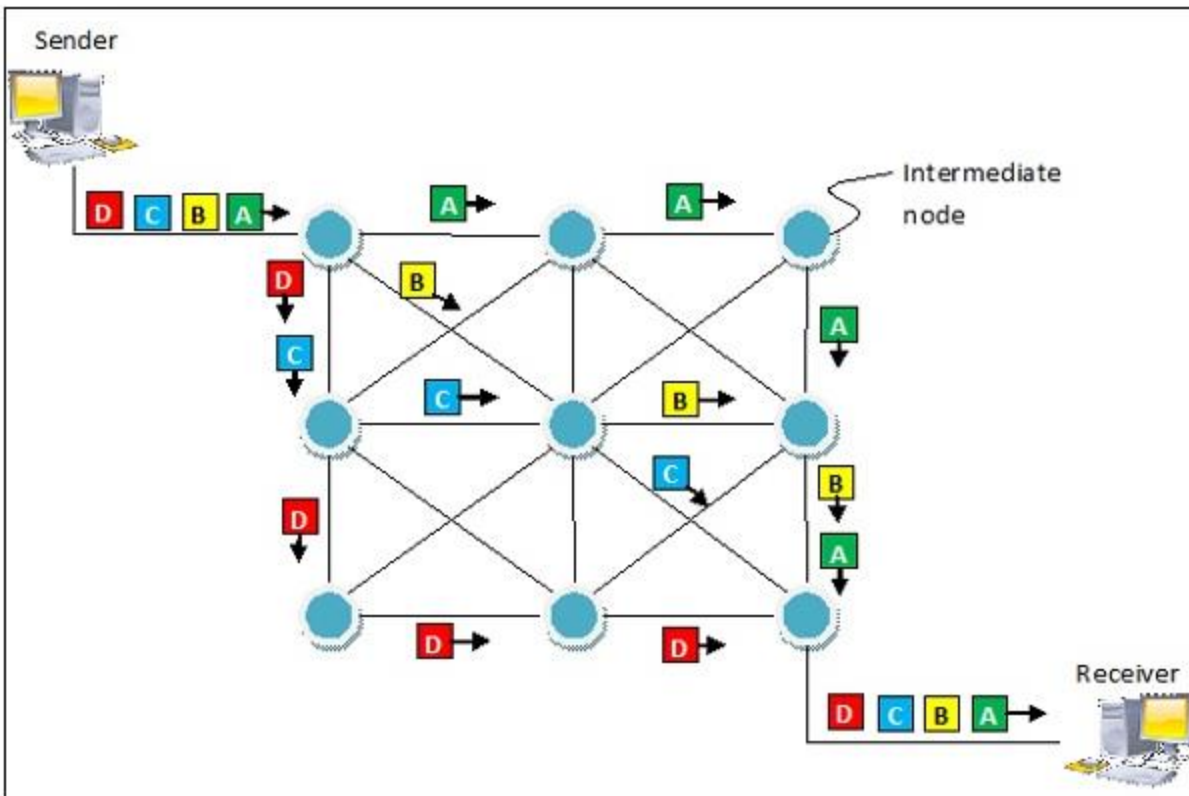
Packet switching is a connectionless network switching technique. Here, the message is divided and grouped into a number of units called packets that are individually routed from the source to the destination. There is no need to establish a dedicated circuit for communication.

### Process

Each packet in a packet switching technique has two parts: a header and a payload. The header contains the addressing information of the packet and is used by the intermediate routers to direct it towards its destination. The payload carries the actual data.

A packet is transmitted as soon as it is available in a node, based upon its header information. The packets of a message are not routed via the same path. So, the packets in the message arrives in the destination out of order. It is the responsibility of the destination to reorder the packets in order to retrieve the original message.

The process is diagrammatically represented in the following figure. Here the message comprises of four packets, A, B, C and D, which may follow different routes from the sender to the receiver.



## Advantages and Disadvantages of Packet Switching

### Advantages

- Delay in delivery of packets is less, since packets are sent as soon as they are available.
- Switching devices don't require massive storage, since they don't have to store the entire messages before forwarding them to the next node.
- Data delivery can continue even if some parts of the network faces link failure. Packets can be routed via other paths.
- It allows simultaneous usage of the same channel by multiple users.
- It ensures better bandwidth usage as a number of packets from multiple sources can be transferred via the same link.

### Disadvantages

- They are unsuitable for applications that cannot afford delays in communication like high quality voice calls.
- Packet switching high installation costs.
- They require complex protocols for delivery.
- Network problems may introduce errors in packets, delay in delivery of packets or loss of packets. If not properly handled, this may lead to loss of critical information.

<b>Circuit Switching</b>	<b>Packet Switching</b>
Connection Oriented	Connection Less
Entire Message Have to follow same route during transmission	Entire Message can be divided and routed Independently
Implemented at Physical Layer	Implemented at Network Layer
Waste of bandwidth if Idle	No Waste of bandwidth if Idle
Initially designed for Voice Transmission	Initially designed for Data Transmission