

Computer Networks

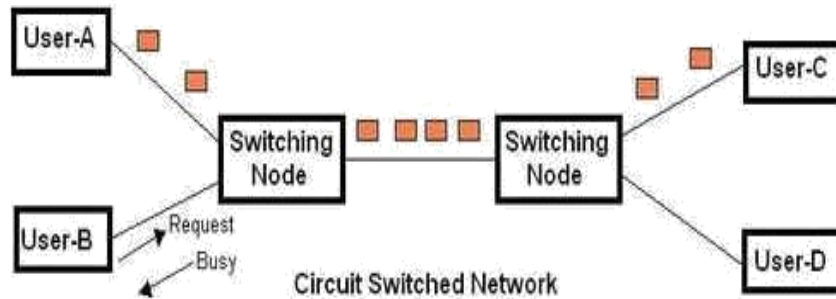
Switching techniques

Switching, as applied to networking and IT, is **the practice of directing a signal or data element toward a particular hardware destination.**

- In large networks, there can be multiple paths from sender to receiver.
- The switching technique will decide the best route for data transmission.
- Switching technique is used to connect the systems for making one-to-one communication.

Circuit Switching

In circuit switching network dedicated channel has to be established before the call is made between users. The channel is reserved between the users till the connection is active. For half duplex communication, one channel is allocated and for full duplex communication, two channels are allocated. It is mainly used for voice communication requiring real time services without any much delay.

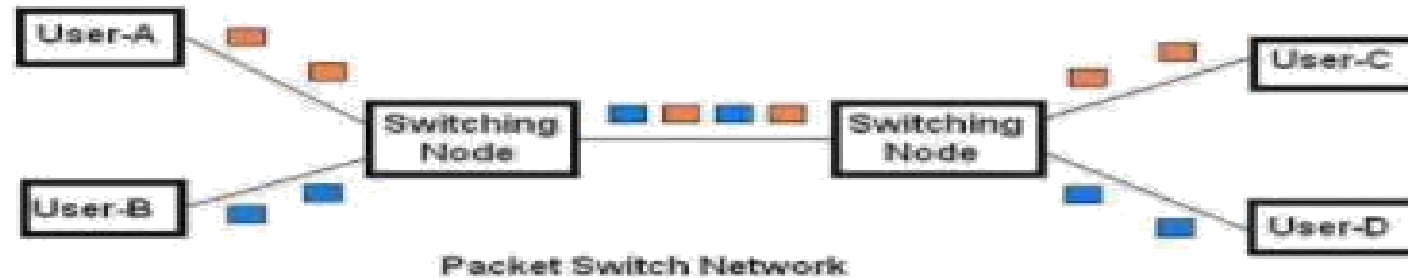


As shown in the figure 1, if user-A wants to use the network; it need to first ask for the request to obtain the one and then user-A can communicate with user-C. During the connection phase if user-B tries to call/communicate with user-D or any other user it will get busy signal from the network.

In circuit switching , every node remain connected (user-A , user-B ...) and it results in heavy cost. If one path becomes disconnected , whole network will be disconnected.

Packet Switching

In packet switching network unlike CS network, it is not required to establish the connection initially. The connection/channel is available to use by many users. But when capacity or number of users increases then it will lead to congestion in the network. Packet switched networks are mainly used for data and voice applications requiring non-real time scenarios.



As shown in the figure 2, if user-A wants to send data/information to user-C and if user-B wants to send data to user-D, it is simultaneously possible. Here information is padded with header which contains addresses of source and destination. This header is sniffed by intermediate switching nodes to determine their route and destination.

In packet switching, station breaks long message into packets. Packets are sent one at a time to the network. Packets are handled in two ways, viz. datagram and virtual circuit.

In datagram, each packet is treated independently. Packets can take up any practical route. Packets may arrive out of order and may go missing.

In virtual circuit, preplanned route is established before any packets are transmitted. The handshake is established using call request and call accept messages. Here each packet contains virtual circuit identifier(VCI) instead of the destination address. In this type, routing decisions for each packet are not

In packet switching , data are sent in a packet. Data go to source to destination via different path. If one of the path disconnects , data go to destination by another path. Finally, data are arranged one by one in destination node.

Comparison between CS vs. PS networks

Circuit Switching	Packet Switching(Datagram type)	Packet Switching(Virtual Circuit type)
Dedicated path	No Dedicated path	No Dedicated path
Path is established for entire conversation	Route is established for each packet	Route is established for entire conversation
Call setup delay	packet transmission delay	call setup delay as well as packet transmission delay
Overload may block call setup	Overload increases packet delay	Overload may block call setup and increases packet delay
Fixed bandwidth	Dynamic bandwidth	Dynamic bandwidth
No overhead bits after call	overhead bits in each	overhead bits in each packet

The Advantages of Circuit Switching

- You will get the full Bandwidth for the duration of the call.
- It reduces the amount of delay the user experiences before and during a call.
- Circuit switching the call will be established with consistent channels, bandwidth, and an ongoing data rate.
- Under circuit switching, the call should be provided with logical channels, Bandwidth, and an ongoing data rate.
- A dedicated path/circuit provides guaranteed data delivery.
(Telephone call is an example of circuit switching).

Advantages of Packet Switching

- This method helps devices of different speeds to communicate with each other.
- High data transmission.
- Helps you to Instantly establish a connection.
- Independent travel
- Delay in delivery of packets is less as packets are sent as soon as they are available.
- Switching devices do not need any massive storage.
- Data delivery can be continued even if some parts of the network faces link failure issues.
- It provides simultaneous usage of the same channel with the help of multiple users.
- Packet switching protocols include Frame relay, IP and X-25.

(Internet is an example of a packet switching network)