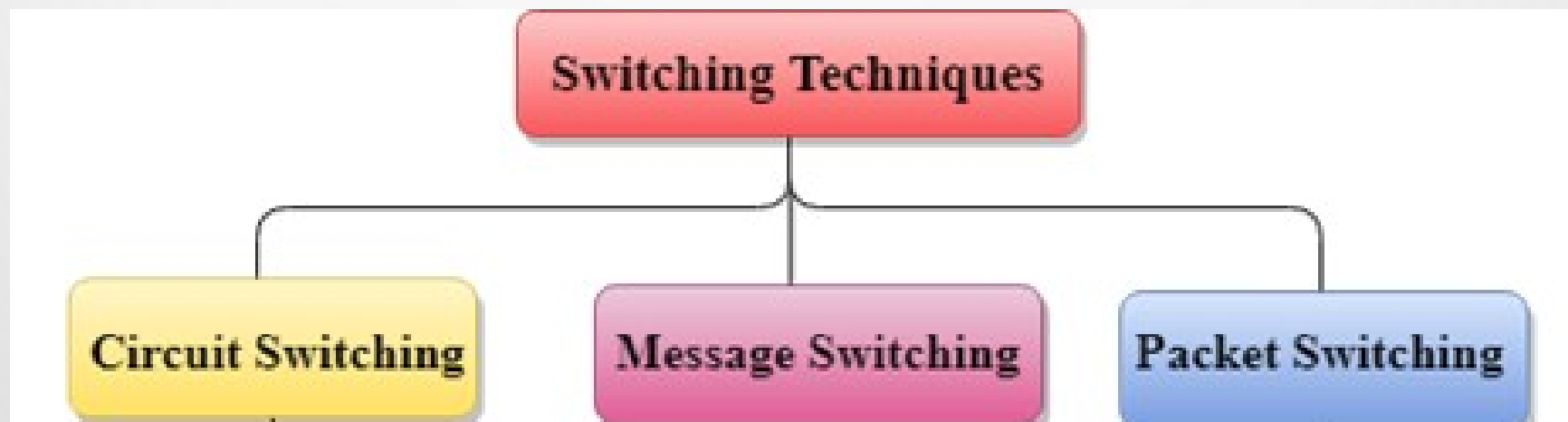# Types of Switching

- When a message travels from sender to receiver (from source to destination), it often passes through a network of intermediate nodes.
- This is because direct connectivity between any two nodes is not possible and uneconomical.
- The intermediate nodes are called **network switches** as they provide a switching facility for moving a message from one node to another until it reaches its destination.
- A switched network is made up of number of interlinked nodes called **switches**.
- A switch is a hardware device that allows a connection to be established between two or more devices, which are linked to it.
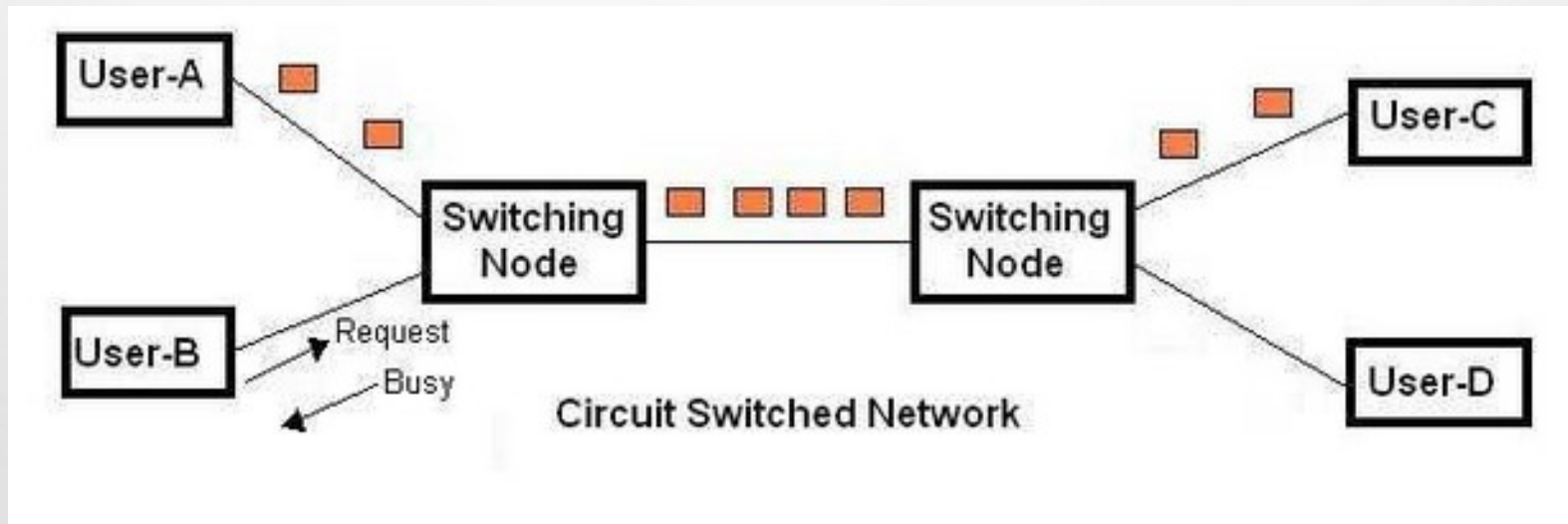
Types of Switching

- There are three commonly used switching techniques:

  1.Circuit switching
  2.Packet switching
  3.Message Switching

Types of Switching

- **Circuit switching:**
- A dedicated physical path called as circuit is established between the sender and the receiver through the intermediate node of the communication network.
- Once established, the circuit is available exclusively from source to destination.
- Data can be transmitted without any delays once the circuit is established.
- PSTN (Public Switched Telephone Network) is the best example of circuit switching.
- **Specifically developed for telephone communications.**


Circuit Switched Network

Types of Switching

- **Circuit switching:**
- **Advantages:**
  - The communication channel (once established) is dedicated.
- **Disadvantages:**
  - Possible long wait to establish a connection, (10 seconds, more on long-distance or international calls.) during which no data can be transmitted.
  - More expensive than any other switching techniques, because a dedicated path is required for each connection.
  - Inefficient use of the communication channel, because the channel is not used when the connected systems are not using it.
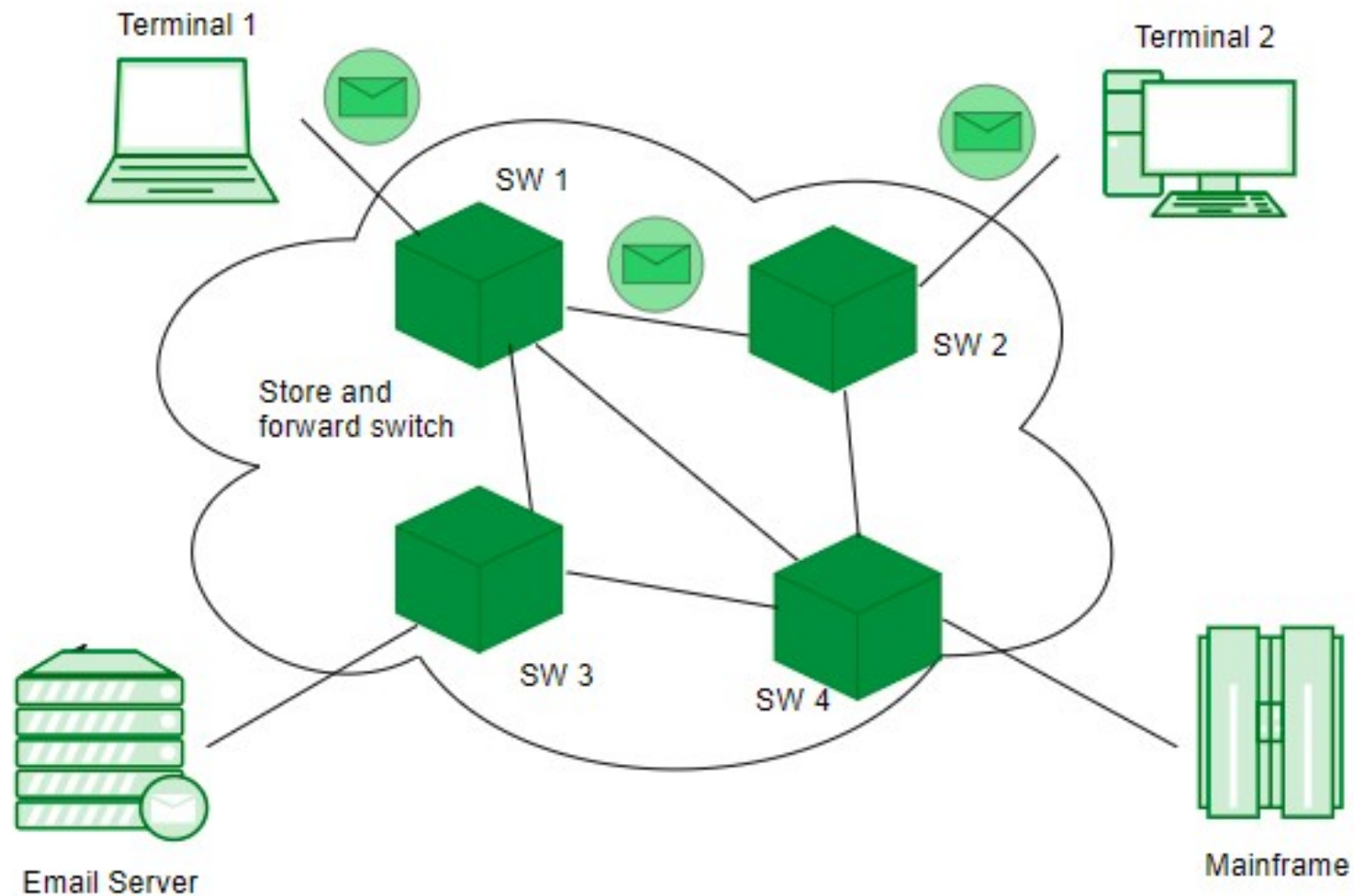
Types of Switching

- **Message switching:**
- Message switching is better known as the **store-and-forward** approach.
- This technique was somewhere in middle of circuit switching and packet switching.
- In message switching, the whole message is treated as a data unit and is switching / transferred in its entirety.
- In message switching, end users communicate by sending and receiving messages that included the entire data to be shared.
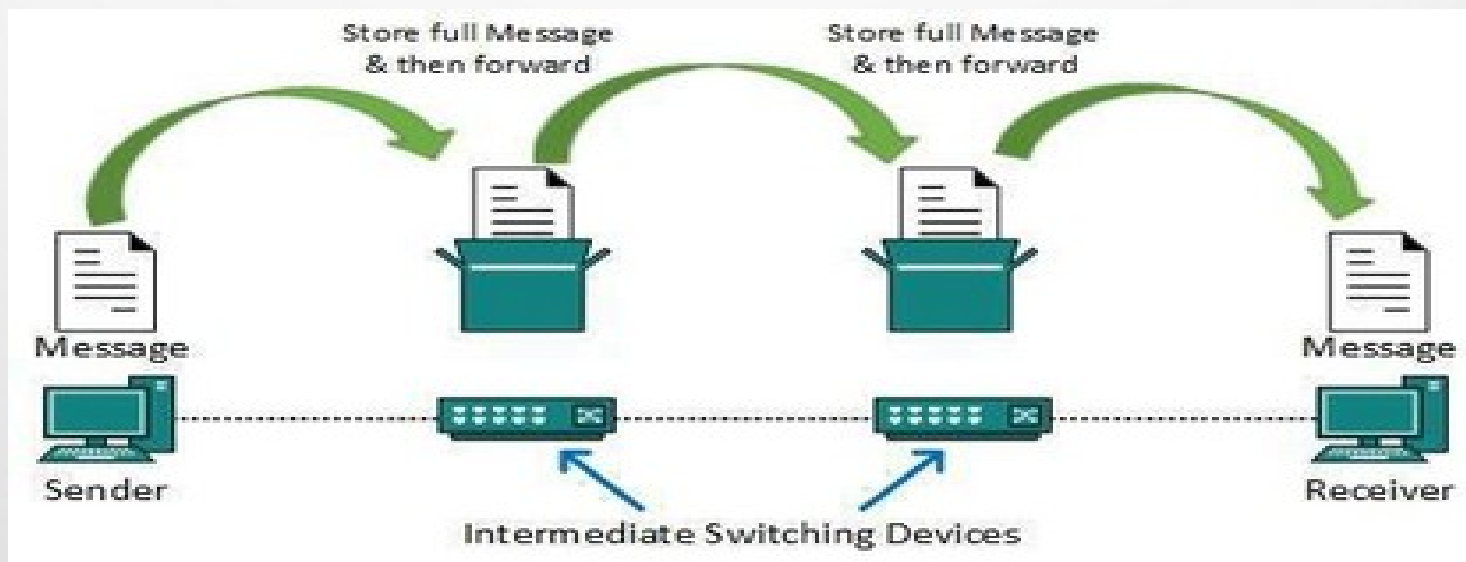
Types of Switching

- **Message switching:**
- Also, the sender and receiver are not directly connected. There are a number of intermediate nodes transfer data and ensure that the message reaches its destination.
- A switch working on message switching, first receives the whole message and buffers it until there are resources available to transfer it to the next hop. If the next hop is not having enough resource to accommodate large size message, the message is stored and switch waits
- **Advantages:**
- The store-and-forward capability of intermediary nodes, traffic can be efficiently regulated and controlled.
- Message delivery as one unit, rather than in pieces.

Types of Switching

Types of Switching

- **Message switching:**
- **Disadvantages:**
- Since messages are stored indefinitely at each intermediate node, switches require large storage capacity.
- This is **pretty slow** - This is because at each node, first there us wait till the entire message is received, then it must be stored and transmitted after processing the next node and links to it depending on availability and channel traffic.

For example, in most electronic mail systems the delivery process is based on message switching, while the network is in fact either circuit-switched or packet-switched.
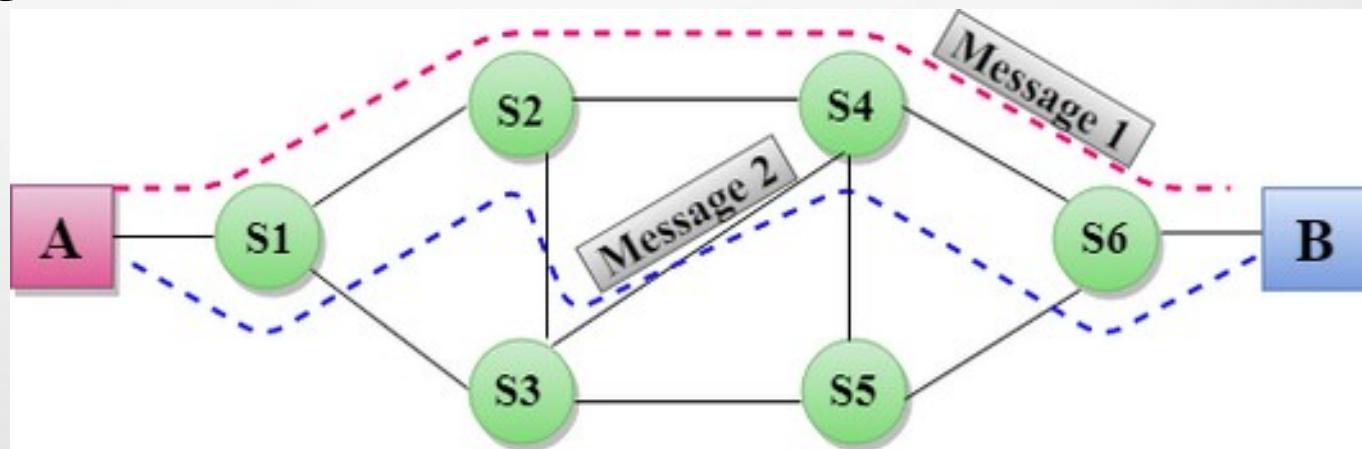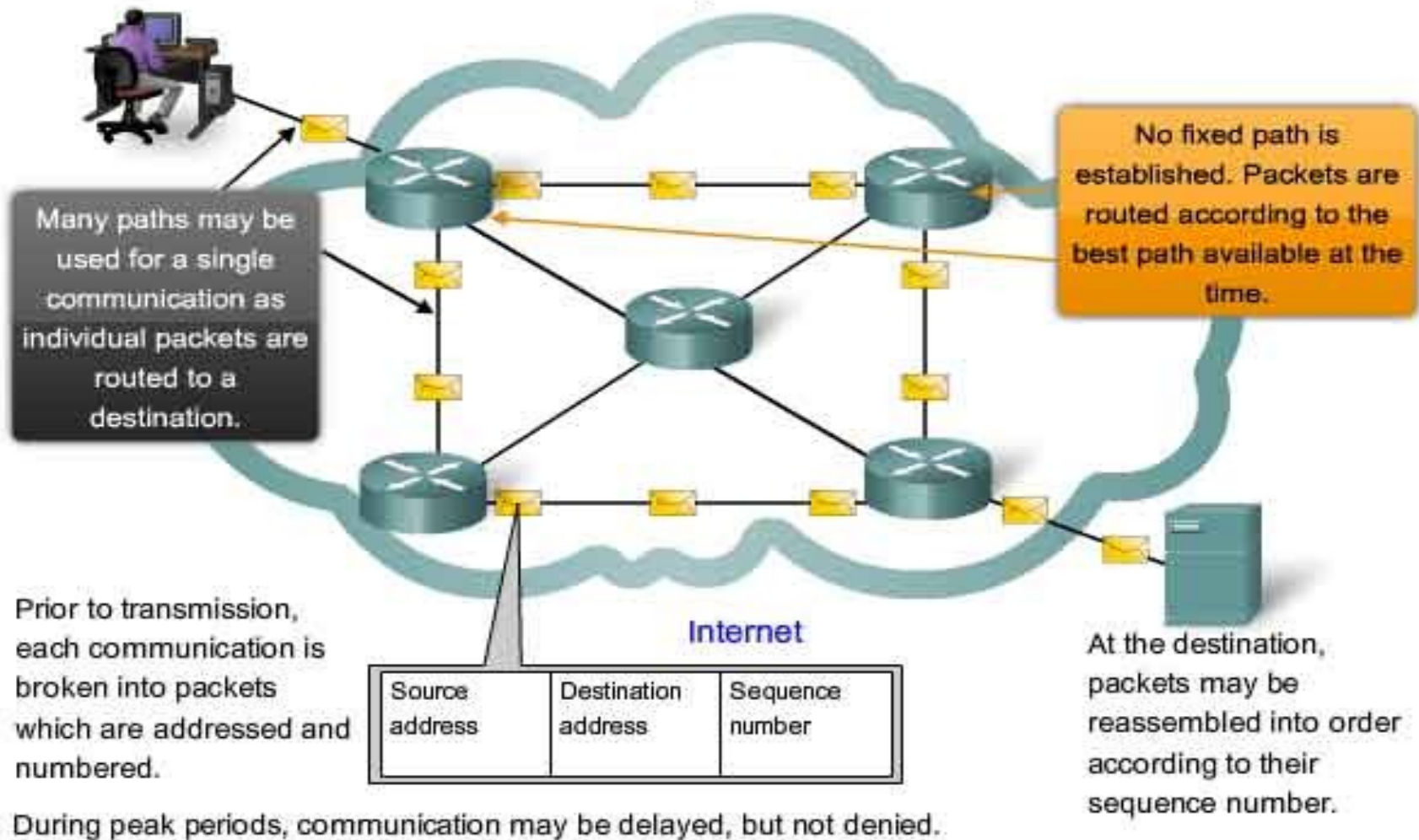
Types of Switching

- **Packet switching:**
- Packet switching has emerged as the standard switching technology for computer-to-computer communications, and therefore it is used by most communication protocols such as X.25, TCP/IP, Frame Relay, ATM, etc.
- In packet Switching, the sender node divides the message into fixed size data, packets.
- **Broken into small pieces of variable length – Packets.**
- **The destination nodes re-assembles the packets of message in correct sequence to create the original message.**
- It also adds the destination address, the message number, the sequence number of the current packet, the total number of packets to each packet.
- The packet is transmitted on the base of available free channel.
- **Internet uses packet switching for data transmission.**

Types of Switching

Packet Switching in a Data Network

Many paths may be used for a single communication as individual packets are routed to a destination.

No fixed path is established. Packets are routed according to the best path available at the time.

Prior to transmission, each communication is broken into packets which are addressed and numbered.

Source address	Destination address	Sequence number

Internet

At the destination, packets may be reassembled into order according to their sequence number.

During peak periods, communication may be delayed, but not denied.

Types of Switching

- **Packet switching:**
- **Advantages:**
  - More efficient in terms of bandwidth
  - More reliable as destination can detect the missing packet.
  - Cost effective and comparatively cheaper to implement.
- **Disadvantages**
  - Packet Switching don't give packets in order.
  - Since the packets are unordered, we need to provide sequence numbers to each packet.
  - Transmission delay is more because of rerouting.
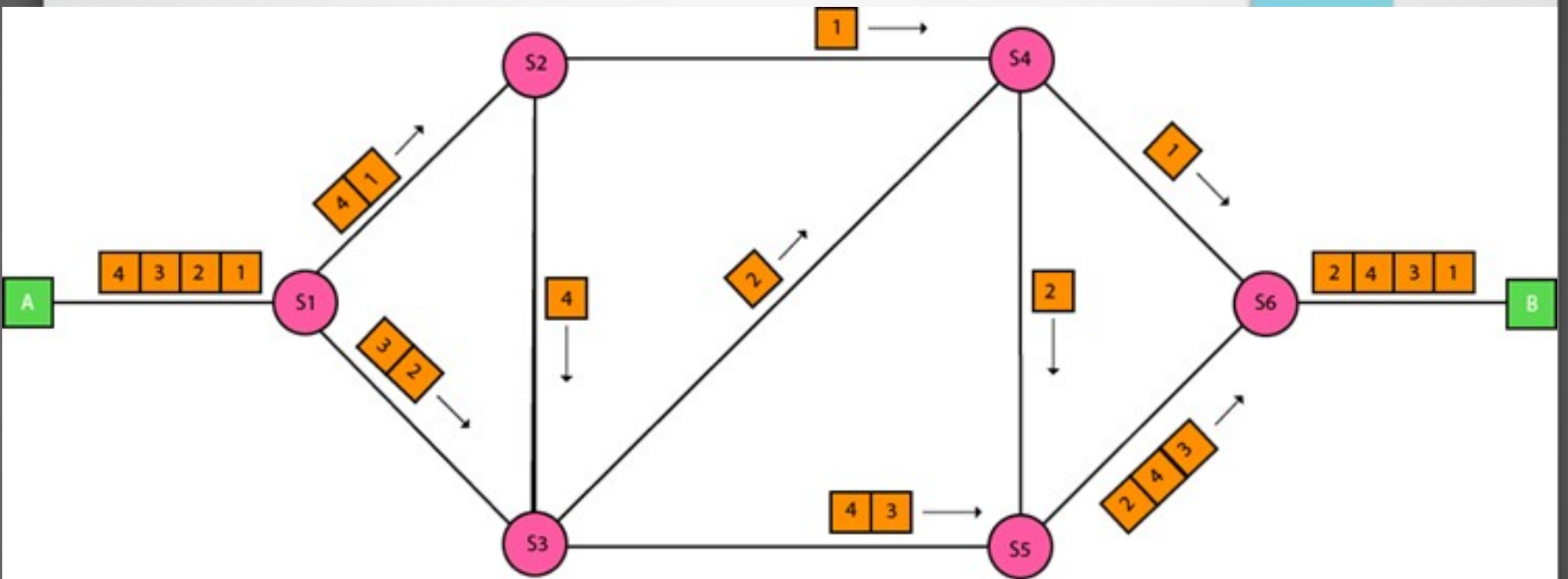
Types of Switching

- **Packet switching:**
- **Approaches Of Packet Switching:**
- There are two approaches to Packet Switching:

  - **Datagram Packet switching:**
  - It is a packet switching technology in which packet is known as a datagram, is considered as an independent entity. Each packet contains the information about the destination and switch uses this information to forward the packet to the correct destination.
  - The packets are reassembled at the receiving end in correct order.
  - In Datagram Packet Switching technique, the path is not fixed.
  - Intermediate nodes take the routing decisions to forward the packets.
  - Datagram Packet Switching is also known as connectionless switching.

Types of Switching

- **Packet switching:**

- **Virtual Circuit Switching**
  Virtual Circuit Switching is also known as connection-oriented switching.
  In the case of Virtual circuit switching, a preplanned route is established before the messages are sent.
  Call request and call accept packets are used to establish the connection between sender and receiver.
  In this case, the path is fixed for the duration of a logical connection.

Types of Switching

- **Packet switching:**
- **Virtual Circuit Switching**

  In the above diagram, A and B are the sender and receiver respectively. 1 and 2 are the nodes.

  Call request and call accept packets are used to establish a connection between the sender and receiver.

  When a route is established, data will be transferred.

  After transmission of data, an acknowledgment signal is sent by the receiver that the message has been received.

  If the user wants to terminate the connection, a clear signal is sent for the termination.