Switching Techniques

Circuit -- packet

Outline

Why circuit switching ?

Switched Communication Network

Circuit switching fundamentals - Advantages and Disadvantages

Introduction

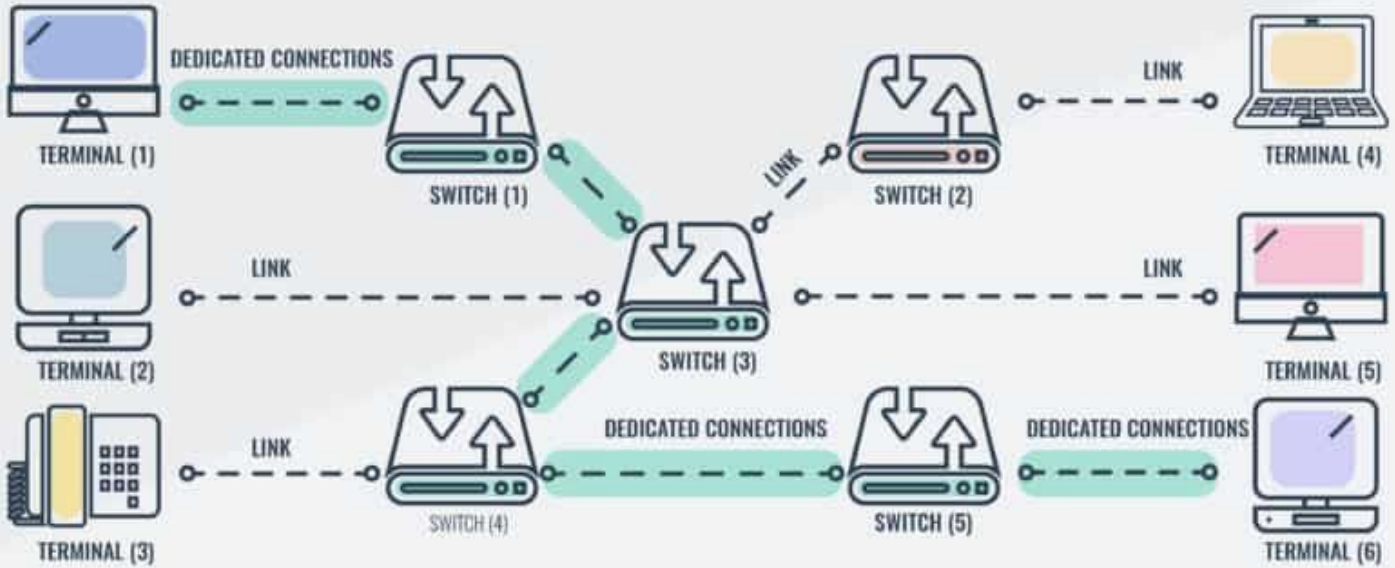
Switched communication networks are those in which data transformed from source to destination is routed between various intermediate nodes.

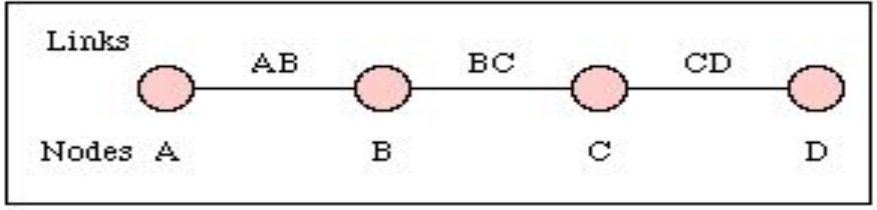
There are mainly two typical Switching Techniques available for digital traffic:

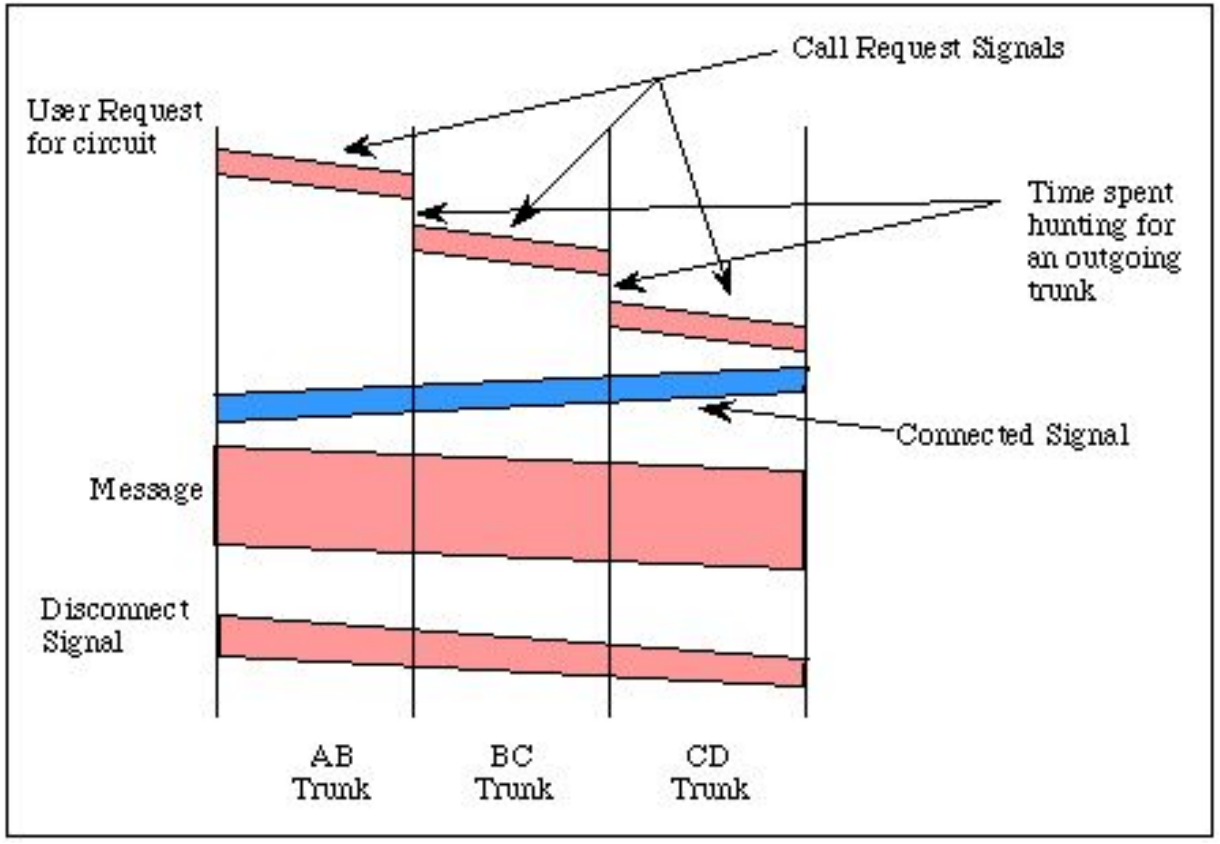
1. Circuit Switching

2. Packet Switching

CIRCUIT SWITCHING




Links
AB
BC
CD
Nodes A
B
C
D


Call Request Signals
User Request for circuit
Time spent hunting for an outgoing trunk
Connected Signal
Message
Disconnect Signal
AB Trunk
BC Trunk
CD Trunk

Circuit Switching

In circuit-switched voice communications, an entire circuit is consumed when a conversation is established between two people.

Technically:

- Circuit Switching is a technique that directly connects the sender and the receiver in an unbroken path.
- For example take telephone switching equipment establishes a path that connects the caller’s and receiver's telephone by making a physical connection.
- Routing decisions in circuit must be made when the circuit is first established, but there are no decisions made after that time.
- A complete end to end path must exist before communication can take place.
- Once the connection has been initiated and completed, the destination device must acknowledge that it is ready and able to carry on a transfer.

Advantage and Disadvantage

Advantages:

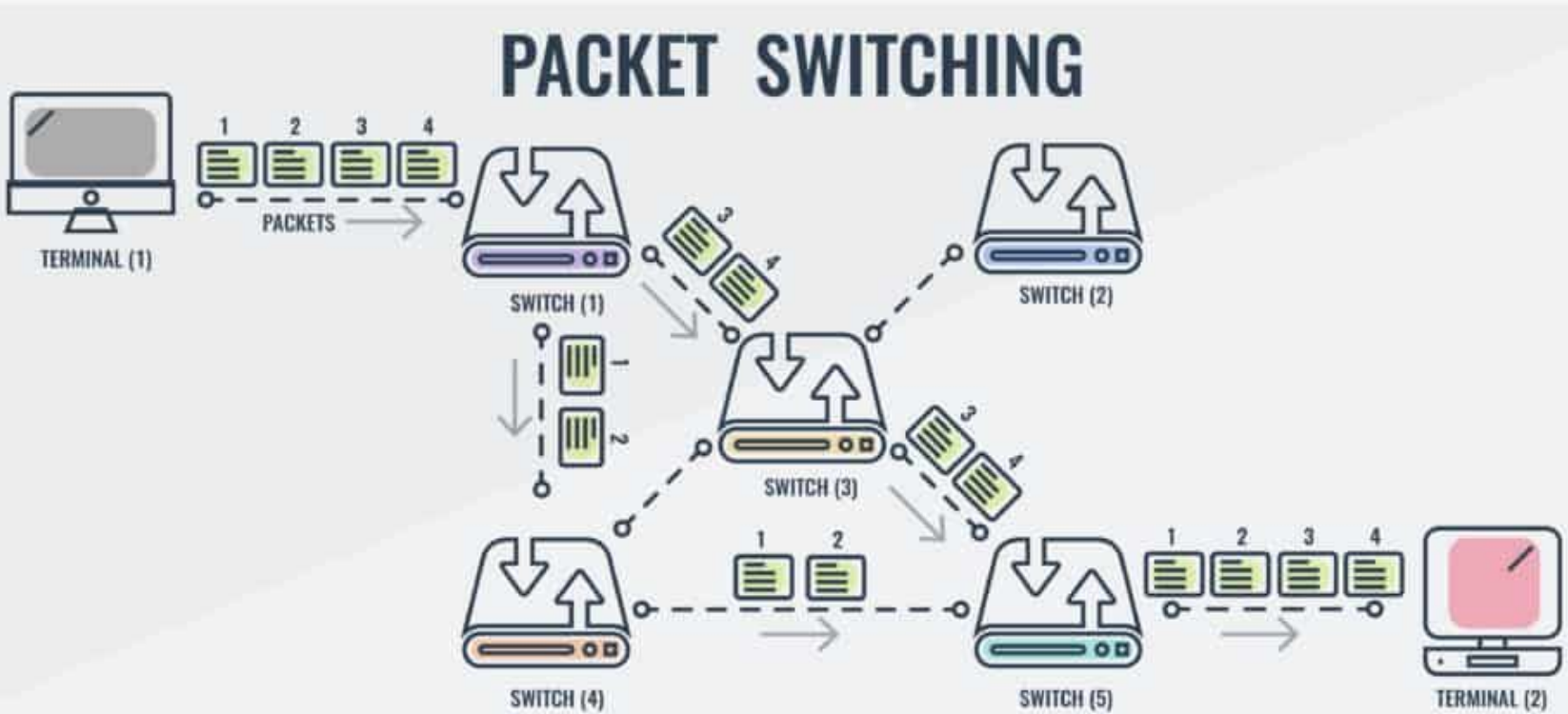
- The communication channel is end to end dedicated

Disadvantages:

- More bandwidth is required.
- Connection establishment time is more.
- More expensive than any other switching techniques because a dedicated path is required for each connection.
- Inefficient use of communication channel.

Packet Switching

- In packet switching message are broken up into packet.
- Each packet is tagged with appropriate source and destination address.
- Individual packets take different routes to reach the destination.


PACKET SWITCHING
1
2
3
4
PACKETS
TERMINAL (1)
SWITCH (1)
SWITCH (2)
SWITCH (3)
SWITCH (4)
SWITCH (5)
TERMINAL (2)

Packet switching: Datagram

- Datagram packet switching is a packet switching technology by which each packet is treated as a separate entity and are called as datagram.
- Packets have their own complete addressing information attached.
- Each packet follows different routes to reach the destination.
- So, the packets may arrive at different times, and may be in a disturbed order. In this case reordering is done.

Packet switching: Virtual

- In this type of switching a preplanned route is established before the packets are sent.
- Sender sends a **"call request packet"** to establish a logical connection and receiver sends back an acknowledgement packet **"packet accepted"**.
- It is a cross between circuit switching network and packet switching network.

Advantages:

- Packet switching is cost effective.
- Offers improved delay characteristics.
- Packet can be rerouted if any problem occurs.

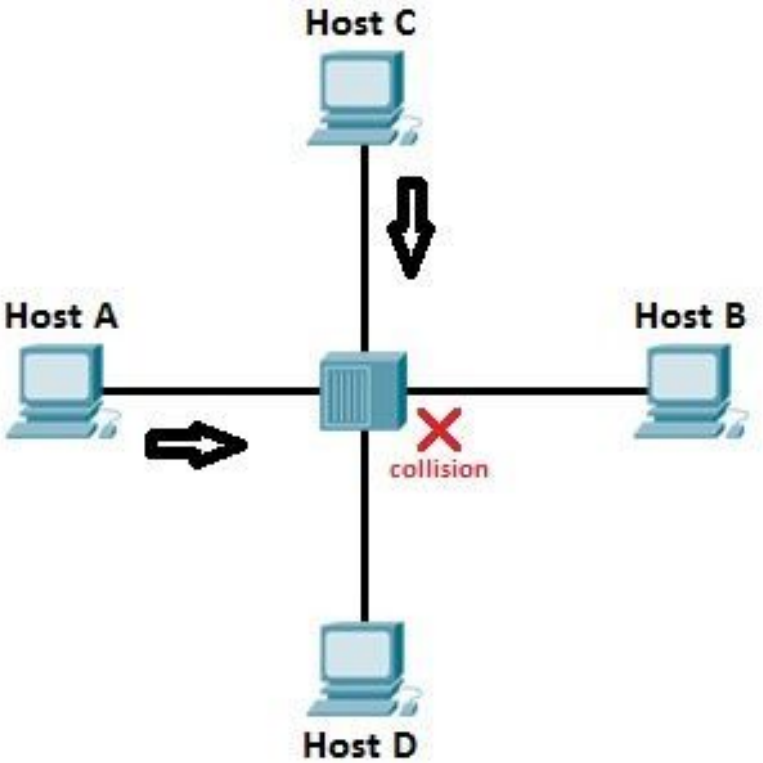
Disadvantages:

- Packet switching protocols are typically more complex.
- If packet gets lost sender needs to resend the data.

CSMA/CD

CSMA/CD

CSMA/CD (Carrier Sense Multiple Access with Collision Detection) helps hosts to decide when to send packets on a shared network segment and how to detect collisions if they occur. For example, in a hub network, two devices can send packets at the same time. This can cause a collision. CSMA/CD enables devices to “sense” the wire to ensure that no other device is currently transmitting packets. But, if two devices “sense” that the wire is clear and send packets at the same time, a collision can occur. If the collision occur, packets have to be resend after a random period of time.



In the topology above we have a hub network. Host A is trying to communicate with host B. Host A “senses” the wire and decides to send packets. But, in the same time, host C sends its packets to host D and the collision occurs. The sending devices (host A and host C) detect the collision and resend the packet after a random period of time.

Question - Quicks

The required resources for communication between end systems are reserved for the duration of the session between end systems in _____ method.

a) Packet switching

b) Circuit switching

c) Line switching

d) Frequency switching

2.

As the resources are reserved between two communicating end systems in circuit switching, _____ is achieved.

a) authentication

b) guaranteed constant rate

c) reliability

d) store and forward

3.

In _____ systems, resources are allocated on demand.

a) packet switching

b) circuit switching

c) line switching

d) frequency switching