

A variety of switching methods in Communication Networks

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ABSTRACT: This article proposed to variety of switching methods in communication networks such as Circuit Switching, Packet Switching, Cell-switching, Frame Switching and Message Switching. Switched methods of communication networks are those in which data transferred from source to destination routed between various intermediate knobs. Switching is the technique by which knobs control or switch data to transmit it between specific points of a network. Transmission between sender and receiver, called as circuit switching. When any network knob wants to send any type of information, a call request signal sent to the receiver and acknowledged. Cell switching handles both the digital voice and data signals. The frame switching either uses a permanent or switched virtual circuit to set the connection and enable the transfer of bit from source to the destination. Message switching network consists of transmission links (channels), store-and-forward switch knobs and end stations.

KEYWORDS: Circuit Switching, Packet Switching, Cell switching, Frame Switching and Message Switching.

I. INTRODUCTION

A switched network consists of a series of interlinked knobs, called switches. Switches are devices capable of creating impermanent connections between two or more devices linked to the switch.

There are three common switching techniques: Circuit Switching, Packet Switching (Cell-switching and Frame Switching), and Message Switching.

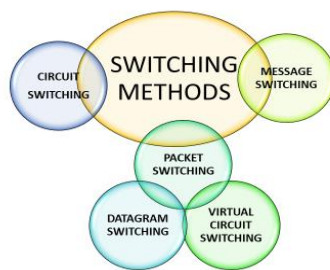


Figure1. types of switching

The following Figure shows a switched network. The end systems (communicating devices) named A, B, C, D, and the switches named I, II, III and IV. Each switches connected to links.

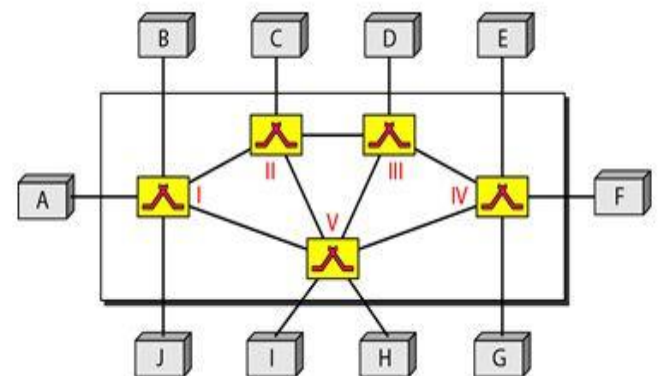


Figure2. Switched network

A circuit switch is a device that creates a temporary connection between the N input lines and M output lines may be not equal. In Packet Switched Networks data is converted in different Packets, “information of parts of packets and other controlled information are included in packets”. The process of packet switching is similar to cell switching. Frame switching used to transfer the data in the form of packets, with the help of the data link layer. Cell Switching is similar to packet switching, except that the switching does not necessarily occur on packet boundaries. Cell switching handles both the digital voice and data signals.

A message-switching knob is typically a general-purpose computer. The device needs sufficient secondary-storage capacity to store the incoming

long messages. A time delay introduced using this type of scheme due to store- and-forward time and it is required to transmission path.

II Circuit Switching:

Definition: It is establishes a physical path between the sender and receiver of the message before a message delivered. Circuit switching always executed at the **Physical Layer**. Circuit Switching can be implemented using two technologies either **SD** or **TD Switching**.

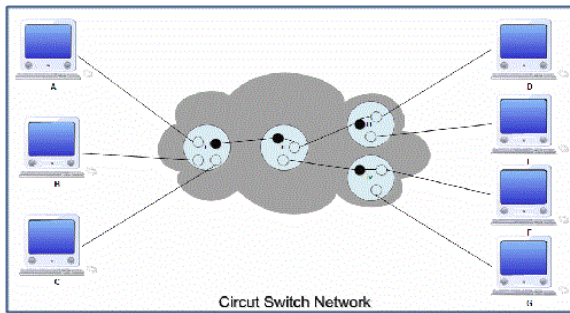


Figure3. Circuit Switching network

Operation of Circuit Switching:

- ✚ It consists of a set of switches by physical links.
- ✚ It has a small amount of buffer space to hold packets temporarily.
- ✚ If the outgoing line is busy, the packet in queue until line becomes available.
- ✚ The end systems (telephones or computers) directly connected to a switch.
- ✚ After all data transferred, the circuits called torn down.

Advantages of Circuit Switching:

- ✚ Data transmission speed is delay means when the path is set up.
- ✚ congestion or garbled message -no issues

Disadvantages of Circuit Switching:

- ✚ Needed for Long set up time
- ✚ A request token travel to receiver, if acknowledged before transmission can occurs.

III Packet Switching

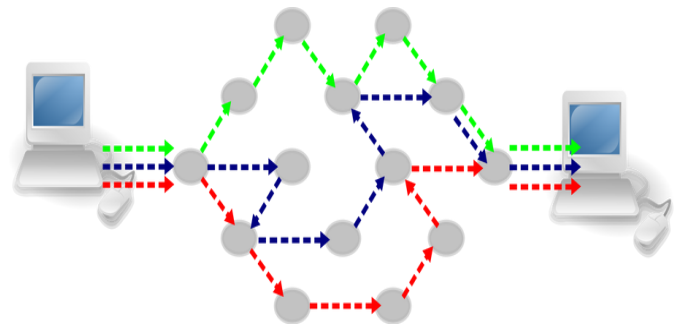


Figure4. packet switching network

Definition: Packet switching connectionless not begins any physical connection before the transmission starts. In packet switching before the message transmitted, it has divided into manageable parts called packets.

It always implemented at the Network Layer.

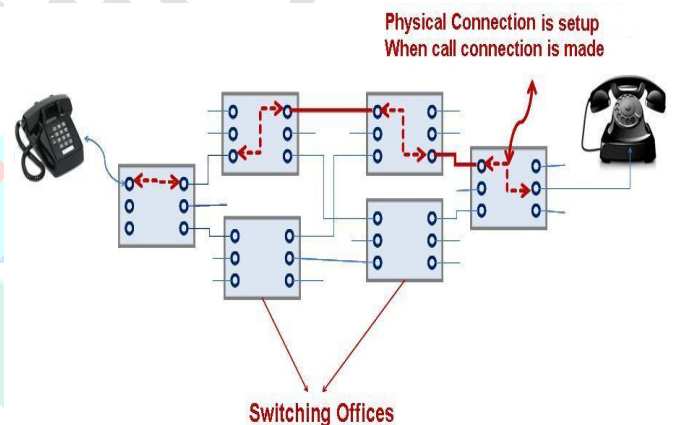


Fig5.Operation of Switching officies

Operation of Packet Switching:

- ✚ Packet switching into two: fixed, variable size.
- ✚ The size of packet network and central protocol.
- ✚ Resource allocation is not packet switching.

Packet switching uses two routing methods:

1. Datagram Packet Switching

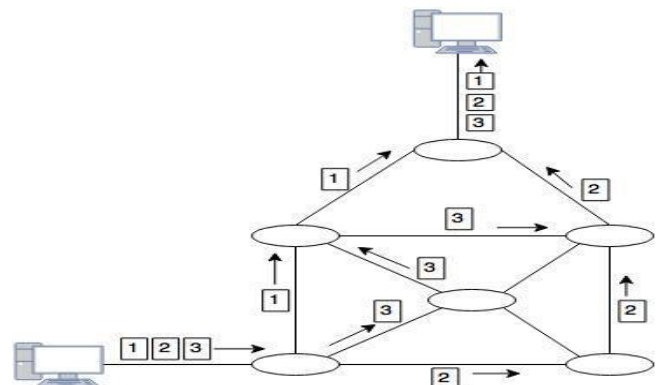
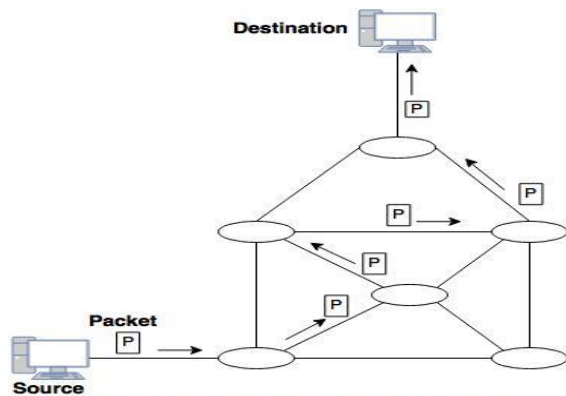


Fig: Datagram Packet Switching

- + It implemented in network layer.
- + Each packet routed freely through the network.
- + Each packet carries a header that contains the destination address.
- + Receives the packet, the destination address in the header of the packet is forwarded.

2. Virtual Circuit Packet Switching

- + It implemented at the data link layer.
- + It have begins a fixed path between a source and a destination to transfer the packets.
- + Also called as connection oriented network.



Three phases in a virtual circuit packet switching:

- i. Setup phase
- ii. Data transfer phase
- iii. Connection release phase

Advantages of Packet Switching:

- + Effective expensive
- + Improved delay characteristics
- + Maximize link efficiency, use of link bandwidth.
- + Share the same channel at the same time, because of many network users.

Disadvantages of Packet Switching:

- + Protocols for more complexes.
- + Not in same quality due to committed circuits in applications
- + Implementation of initial costs.
- + When packet is lost, sender needs to retransmit the data.

Table 1 Comparison Chart

FUNCTION	CIRCUIT SWITCHING	PACKET SWITCHING
Orientation	Connection oriented.	Connectionless.
Purpose	Voice communication.	Data Transmission.
Path	Inflexible, follows the same path.	Flexible, because a route is created.
Implementations	Physical Layer	Network Layer
Order	Message sent from the source.	Packets of a message.

IV Cell Switching

Definition: Cell switching uses a connection-oriented packet-switched network. It is associated with Asynchronous Transmission Mode (ATM) is considered to be a high speed switching technology to overcome the speed by the shared media like Ethernet and FDDI.

Operation of Cell switching:

Cell technology, packet switching uses variable length packets. This methodology uses a fixed length of packets of 53 bytes out of which 5 bytes reserved for header. It is also breaks the information into smaller packets of fixed length and delays. The header contains payload-type information, virtual-circuit identifiers, and header error check.

Advantages of Cell Switching

- + High performance, uses hardware switches
- + Common LAN/WAN architecture and multimedia support.
- + Dynamic bandwidth and scalability.
- + Virtual-circuit identifiers.

✚ Header error check.

Disadvantages of Cell Switching:

✚ Cost effective service.

V Frame Switching

Definition: Its packet mode transmission service devised to handle the upgraded type of WAN. X.25 was the earlier technology used in place of frame relay, low data rate, flow and error control.

Features of Frame Switching:

- ✚ It works in speed of 1.544 and 44.376 Mbps.
- ✚ physical and data link layers - two layers
- ✚ Burst data does not have any opposing
- ✚ The frame size is of 9000 bytes
- ✚ Low cost of the WAN technology.
- ✚ It supports error detection of the DLC, if frame damaged, there is no retransmission policy.

Table3 Layer functions

Layer	Functions	Unit of exchange
Application	Internet such as HTTP, SMTP, FTP.	message
Transport	Service between hosts (TCP/UDP).	segment
Network	Delivery & Routing service, IP protocol.	datagram
Data Link	Delivery of datagram between two adjacent knobs.	Frame
Physical	Move frames from one knob to the next.	bit

Advantages of the Frame Switching:

- ✚ Efficient communication process.
- ✚ It performs the user-network interface.
- ✚ Low delay.
- ✚ Produces higher output.
- ✚ Faster than its ancestor X.25.

Disadvantages of the Frame Switching:

- ✚ Unreliable service.
- ✚ Cost effective.
- ✚ Not maintain the order of the arriving packets.
- ✚ The specious packets directly dropped.
- ✚ The frame switches not any flow control.
- ✚ No acknowledgement

Table2 Comparison Chart

Frame Switching	Cell switching
connection-oriented	connection-oriented
data link layer	data link layer
does not handshakes	Requires a handshake
faster and more efficient,	high speed technology, cost effective
data link layer protocol	It supports Multimedia , hardware switches
variable length packets	fixed length of packets of 53 bytes

VI. Message Switching

Definition: It works in first stores the messages and then forwards messages to the committed receiver. The message transmitted from knob to knob and stored in a knob once the connection is available, the message sent to the next knob. While this delay is tolerable as the environment is not real time.

Operation of Message Switching:

- ✚ In establish a dedicated path between transmitter and receiver.
- ✚ Each message routed autonomously through the network.
- ✚ It carries a header that contains the full information about the destination.
- ✚ Also called as Store and Forward Switching.
- ✚ It is very slow, store-and-forward technique.
- ✚ Real time applications like voice and video.

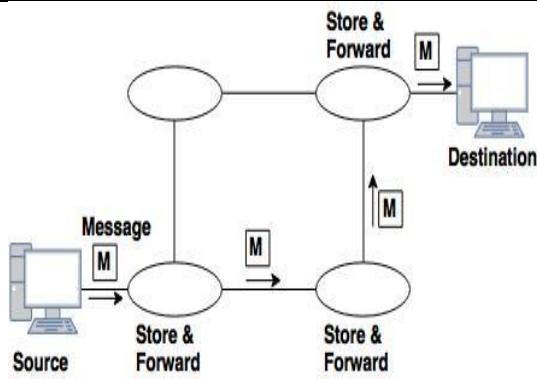


Fig: Message Switching

Advantages of Message Switching:

- + Channel efficiency
- + Reduced the traffic congestion
- + Message priorities & broadcasting

Disadvantages of Message Switching:

- + It is not friendly
- + More expensive

Characteristics of message switching: Two

1. Store and forward
2. Message delivery

Table 5 Comparison Chart

Function	Message Switching	Circuit Switching
Basic	A physical path set between the two systems.	The transfer of data is storing and forwarding
Addressing	Geographical	Hierarchical
Transmission media	Analog and digital	Digital
Routing	Manual type	Route is selected during call setup
physical path	Not required	Required transmission
Cost	Greater than	Reduced

VI. CONCLUSION

The switching is a technique that assists communication between two users. On the other hand, in circuit switching an entire channel committed for the communication. While both packet switching and circuit switching are the two

most common methods of transferring data between two communication devices. Circuit switching utilizes a connection-oriented approach in which a network link is committed to one connection at a time and no other user acceptable to use that circuit. On the contrary, packet switching dividing the data to transmit into small units called packets with no reservation of network links. The process of packet switching is similar to cell switching. The difference is the packets length is fixed. ATM technology is popular for packet switching. The frame switch is controlled through the software while ATM is implemented for hardware more costly and fast. It can higher processing and switching speed by providing flow and error control. Each has its fair share of depending on the switching devices. On the other hand, for message switching the sender and receiver need not to connect through a link but it uses a store and forward technique for sending the messages knob by knob to the destination.

Table 6 Comparison Chart

Function	Message Switching	Circuit Switching	Packet Switching
Concept	Stores the message and forwards.	Switching equipment telephone system.	Packets sent.
Terminal	Telegraph, teletype	Telephone, modem	Computer
Transmission media	Digital, Store and forward	Analog and digital, Store and forward	Digital, Store and forward
Information	Morse, Baudot, ASCII	Analog or PCM digital voice	binary information
Call setup	No	Required	Not needed

physical path	Not required	Yes	No
Addressing	Geographical	Hierarchical numbering plan	Hierarchical address space
Routing	Manual	Route call setup	individually
Multiple xing	Character, message	Circuit	Packet

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