Computer Communication Network

Topic: Switching

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Switching

- Switching in computer network helps in deciding the best route for data transmission if there are multiple path in a larger network.
- E.g. If you take internet there are multiple path between source and destination, switching will decide which path is best suited for data transmission.
- In other words, the connecting device acts as a switch that connects one port to another port.
- It also provide a feel like one to one connection.

Switching Technique

- Basically two techniques
  - Circuit Switching
  - Packet Switching

Packet Switching is devided into two types

1. Datagram Approach
2. Virtual Circuit Approach

Circuit Switching

- In This a physical circuit (or channel) is established between the source and destination of the message before the delivery of the message.
- After the circuit is established, the entire message, is transformed from the source to the destination, i.e. it is connection oriented switching.
- The source can then inform the network that the transmission is complete, which allows the network to open all switches and use the links and connecting devices for another connection.
- The circuit switching is implemented at the physical layer not at the network layer.
- In circuit switching, the whole message is sent from the source to the destination without being divided into packets.

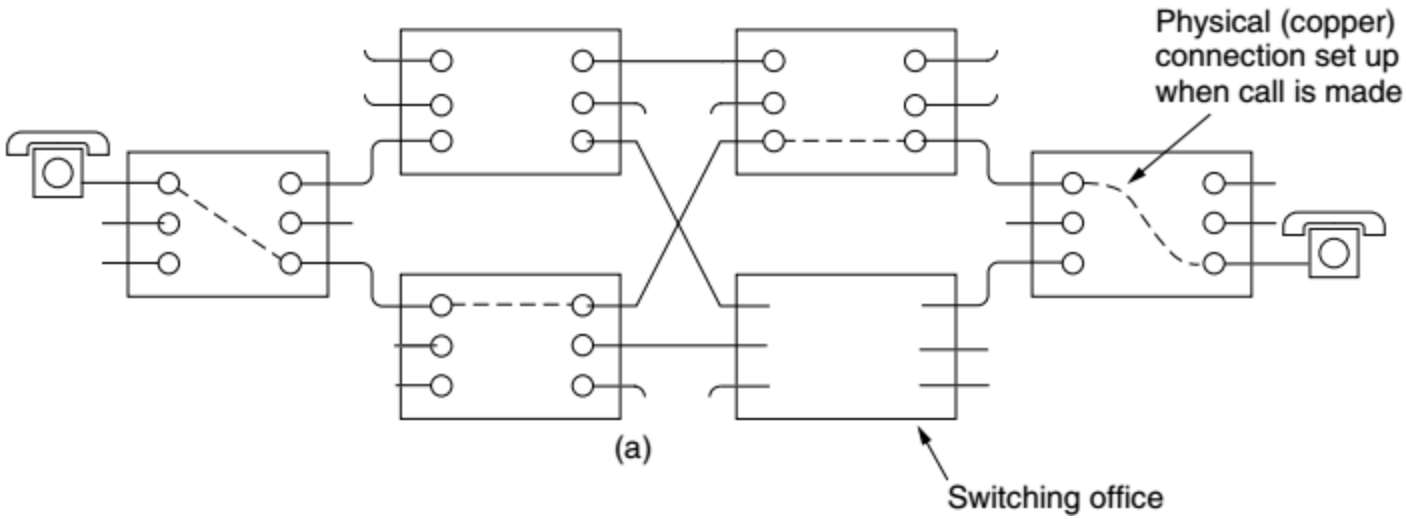


Fig (a). Circuit Switching

Step Involves in Circuit Switching.

1. Connection establishment.
2. Data Transfer
3. Connection termination.

Packet Switching

- The network layer is designed as a packet-switched network e.g. Internet.
- The packet at the source is divided into manageable packets, normally called **datagrams**.
- Individual datagrams are then transferred from the source to the destination.
- For example if any one have a large message and this message is divided into four packets. Then each packet has its own source and destination IP address and a sequence number.
- Sequence Number will help receiver in
  - Reordering the Packets
  - Detect missing packets.
  - Send acknowledgement

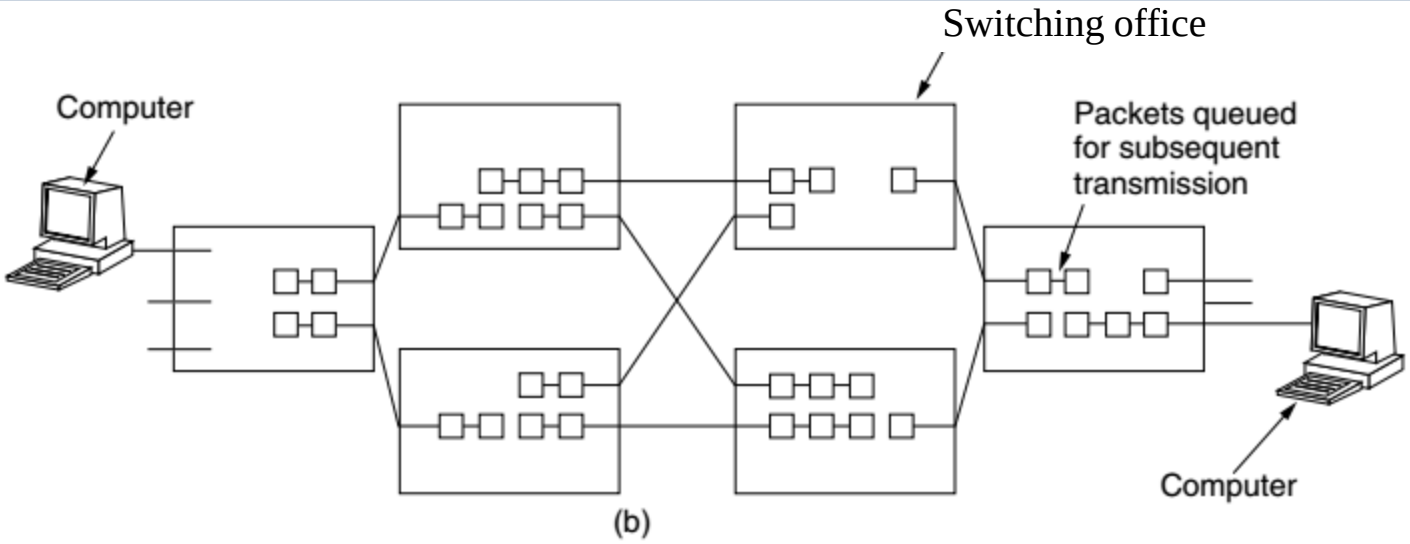


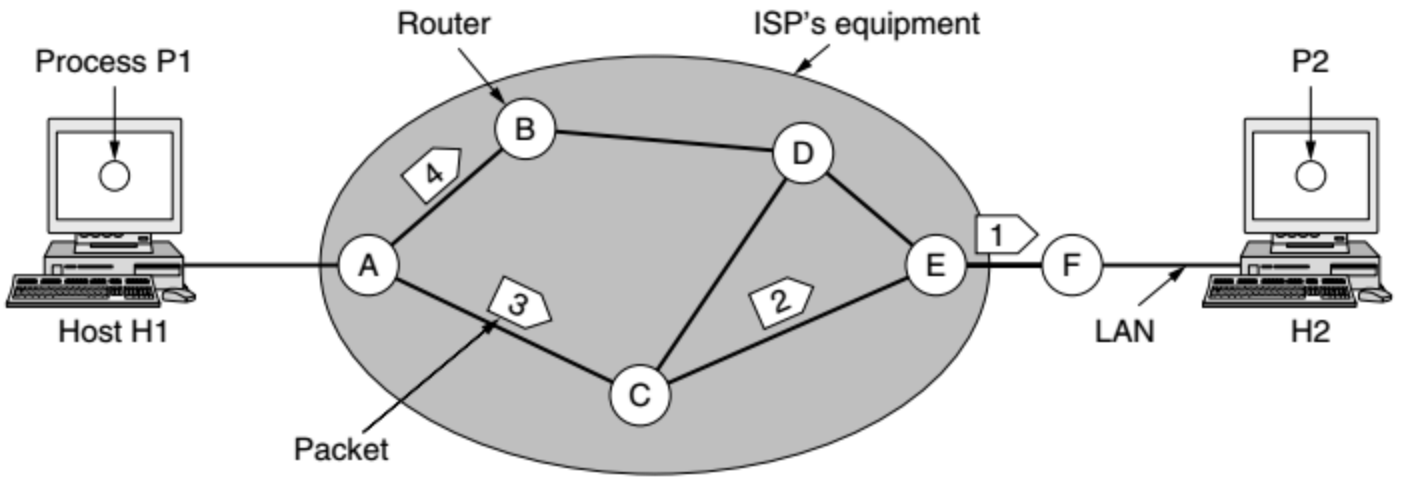
Fig.(b) Packet switching.

1. Packet-switching networks place a tight upper limit on the size of packets.
2. This ensures that no user can monopolize any transmission line for very long (e.g.many milliseconds), so that packet-switched networks can handle interactive traffic.

Datagram Approach

- It is also known as connection less switching.
- Each independent entity is called as datagram. With each datagram having no relationship to any other datagram.
- The datagram in a message may or may not travel the same path to their destination. There is no relationship between packets belonging to the same message
  The switches in this type of network are called *routers*.
- A packet belonging to a message may be followed by a packet belonging to the same message or a different message.
- A packet may be followed by a packet coming from the same or from a different source.
- Each packet is routed based on the information contained in its header: source and destination address.

Datagram Approach



A's table (initially)

Dest.	Line
A	–
B	B
C	C
D	B
E	C
F	C

A's table (later)

A	–
B	B
C	C
D	B
E	B
F	B

C's table

A	A
B	A
C	–
D	E
E	E
F	E

E's table

A	C
B	D
C	C
D	D
E	–
F	F

Fig. Routing within a datagram network.

Virtual Circuit Approach

- It is also known as connection oriented switching.
- Before all datagrams in a message can be sent, a virtual connection should be set up to define the path for the datagrams.
- In this type of service, not only must the packet contain the source and destination addresses, it must also contain a *flow label*, a *virtual circuit identifier* that defines the virtual path the packet should follow.
- Call request and call accept packet are used to establish the connection between sender and receiver.
- In this approach path is fixed for the duration of logical connection.

Virtual Circuit Approach

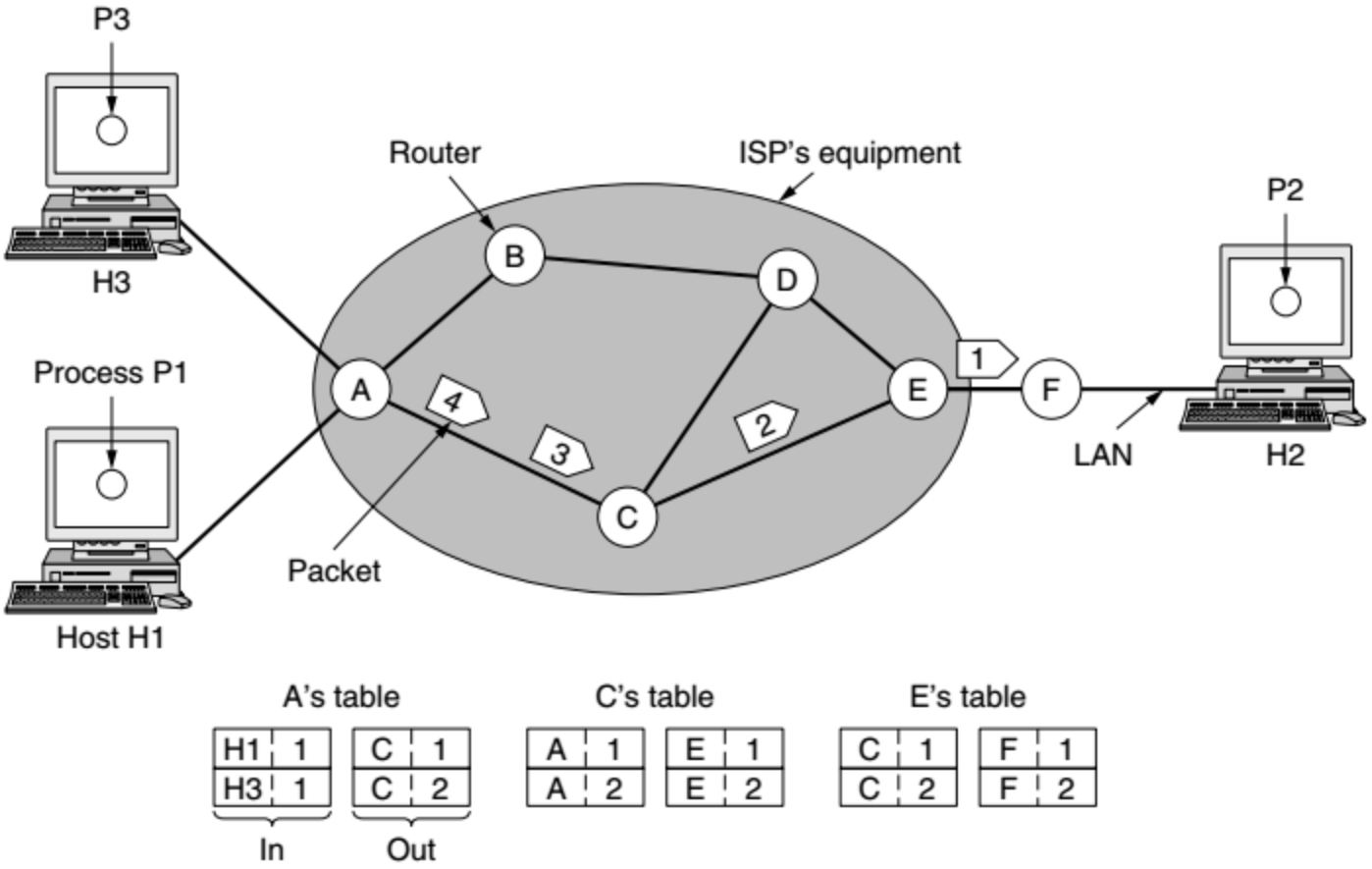


Fig. Routing within a virtual-circuit network.

Comparison of Virtual-Circuit and Datagram Networks

Issue	Datagram network	Virtual-circuit network
Circuit setup	Not needed	Required
Addressing	Each packet contains the full source and destination address	Each packet contains a short VC number
State information	Routers do not hold state information about connections	Each VC requires router table space per connection
Routing	Each packet is routed independently	Route chosen when VC is set up; all packets follow it
Effect of router failures	None, except for packets lost during the crash	All VCs that passed through the failed router are terminated
Quality of service	Difficult	Easy if enough resources can be allocated in advance for each VC
Congestion control	Difficult	Easy if enough resources can be allocated in advance for each VC

Fig. Comparison of datagram and virtual-circuit networks.

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