

Unit 3 (Part-1)

Switching Concepts (Page No 245)

Source: Data Communication and Networking by Fourozan

SWITCHED NETWORKS

- Why not Physical topology for large networks ?
- A better solution is Switching.
- A switch network consists of a series of interlinked nodes, called **switches**.

SWITCHED NETWORKS

Figure 1 Switched network

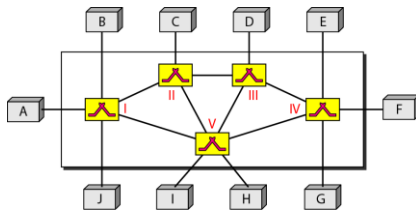
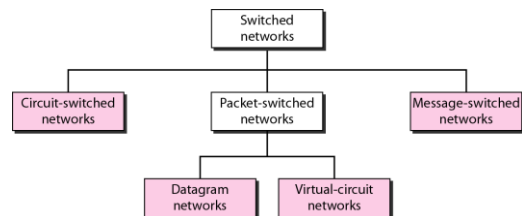


Figure 2 Taxonomy of switched networks

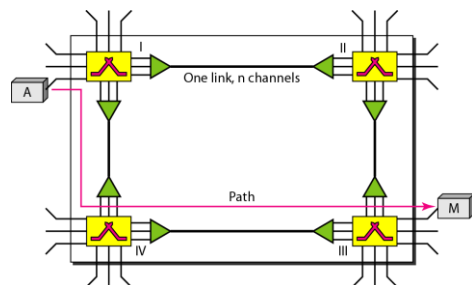


CIRCUIT-SWITCHED NETWORKS

A circuit-switched network consists of a set of switches connected by **physical links**. A connection between two stations is a dedicated path made of one or more links. However, each connection uses only one dedicated channel on each link. Each link is normally divided into n channels by using FDM or TDM.

CIRCUIT-SWITCHED NETWORKS

Figure 3 A trivial circuit-switched network

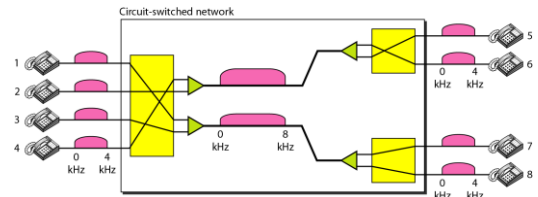


CIRCUIT-SWITCHED NETWORKS

- In circuit switching:
 - Switching takes place at the physical layer
 - Resources are reserved
 - No packetization
 - No addressing

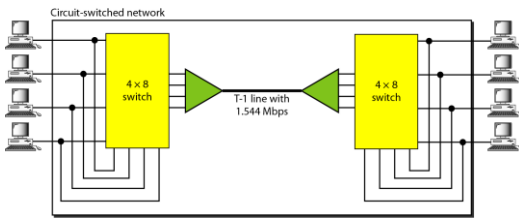
Example 1

Figure 4 Circuit-switched network used in Example 1



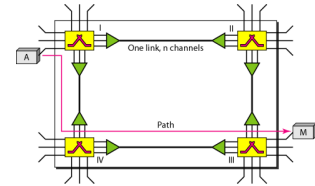
Example 2

Figure 5 Circuit-switched network used in Example 2



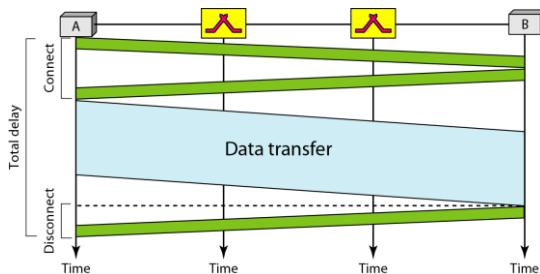
CIRCUIT-SWITCHED NETWORKS

- Three phases
 - Setup phase
 - Data transfer phase
 - Teardown phase



CIRCUIT-SWITCHED NETWORKS

Figure 6 Delay in a circuit-switched network



CIRCUIT-SWITCHED NETWORKS

- Switching at the physical layer in the traditional telephone network uses the circuit-switching approach.

PACKET SWITCHED NETWORKS

In data communications, we need to send messages from one end system to another. If the message is going to pass through a packet-switched network, it needs to be divided into packets of fixed or variable size. The size of the packet is determined by the network and the governing protocol.

PACKET SWITCHED NETWORKS

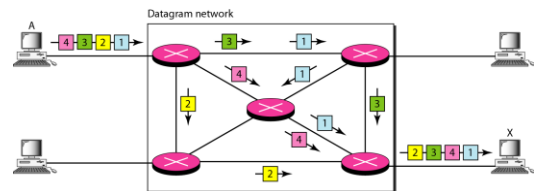
- No resource allocation
- First-come-first-serve policy
- Packets handled in two ways
 - Datagram
 - Virtual circuit

DATAGRAM NETWORKS

- Each packet treated independently
- Packets can take any practical route
- Packets may arrive out of order
- Packets may get lost or delayed
- Up to receiver to re-order packets and recover from missing packets

DATAGRAM NETWORKS

Figure 7 Datagram Network

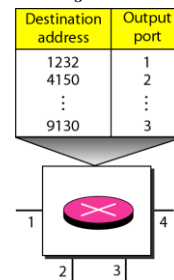


DATAGRAM NETWORKS

- A switch in a datagram network uses a routing table that is based on the destination address.
- The destination address in the header of a packet in a datagram network remains the same during the entire journey of the packet.

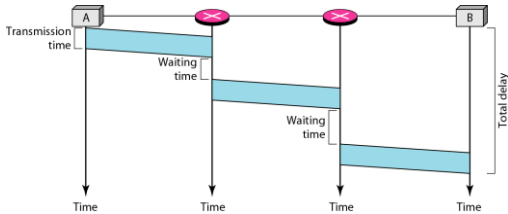
DATAGRAM NETWORKS

Figure 8 Routing table in a datagram network



DATAGRAM NETWORKS

Figure 9 Delay in a datagram network



DATAGRAM NETWORKS

- Switching in the Internet is done by using the datagram approach to packet switching at the network layer.

VIRTUAL-CIRCUIT NETWORKS

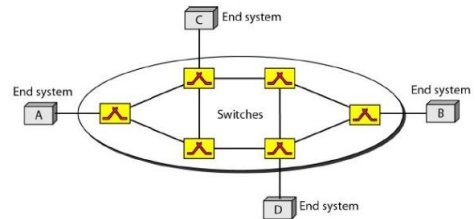
A virtual-circuit network is a cross between a circuit-switched network and a datagram network. It has some characteristics of both.

It has some characteristics of both:

- (1) 3 Phases
- (2) Resource allocation
- (3) Data packetized
- (4) Addressing
- (5) Dedicated path
- (6) At data link layer

VIRTUAL-CIRCUIT NETWORKS

Figure 8 Virtual Circuit Network



VIRTUAL-CIRCUIT NETWORKS

- Addressing:
 - Global Addressing
 - Virtual circuit identifier

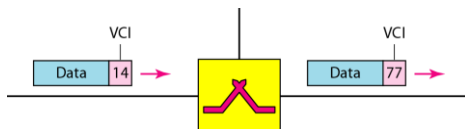


Figure 9 Virtual-circuit identifier

VIRTUAL-CIRCUIT NETWORKS

- Three phases:
 - Data transfer phase
 - Setup phase
 - Setup request
- Data transfer phase:
 - All switches need to have a table entry for virtual circuit.
 - This phase is active until all frame are sent.

Figure 10 Switch and tables in a virtual-circuit network

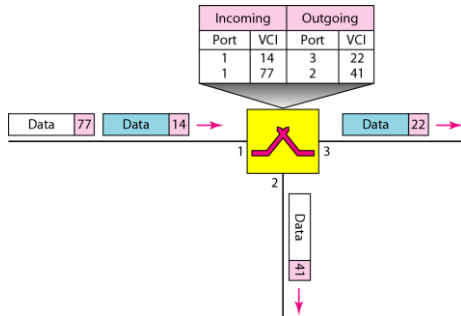
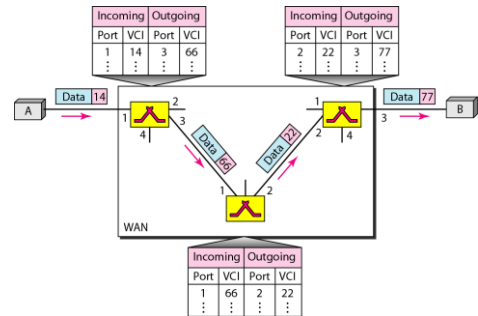


Figure 11 Source-to-destination data transfer in a virtual-circuit network



VIRTUAL-CIRCUIT NETWORKS

- In setup phase, switch creates an entry for virtual circuit.
- Setup Phase needs two steps:
 - Setup request
 - Acknowledgment

Figure 12 Setup request in a virtual-circuit network

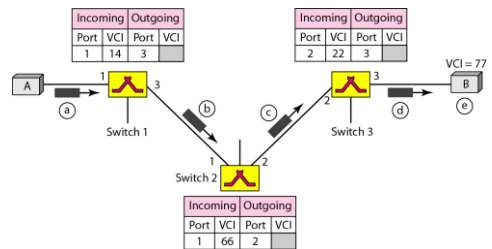
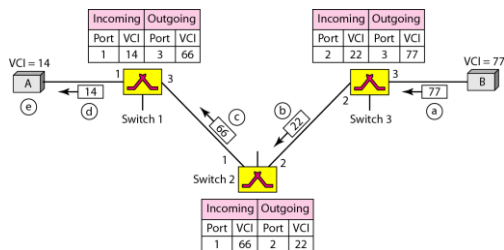


Figure 8.15 Setup acknowledgment in a virtual-circuit network

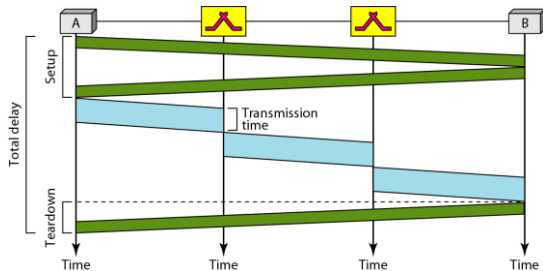


VIRTUAL-CIRCUIT NETWORKS

•In virtual-circuit switching, all packets belonging to the same source and destination travel the same path; but the packets may arrive at the destination with different delays if resource allocation is on demand.

•Switching at the data link layer in a switched WAN is normally implemented by using virtual-circuit techniques.

Figure 8.16 Delay in a virtual-circuit network



S(witched)VC vs. P(permanent)VC setup

- A virtual circuit can be either switched or permanent.
 - If permanent, an outgoing VCI is given to the source, and an incoming VCI is given to the destination.
 - The source always uses this VCI to send frames to this particular destination.

S(witched)VC vs. P(permanent)VC setup

- The destination knows that the frame is coming from that particular source if the frame carries the corresponding incoming VCI.
- If a duplex connection is needed, two virtual circuits are established.

In Summary

- What are the differences between a circuit switched network and a packet switched network?
- Where can the control signals travel in a telephone network?
- What is a non-blocking switch/network?
- What are the differences between datagram packet switched and virtual circuit packet switched?

In Summary

- What are the differences between a circuit switch and a packet switch?