



CHAPTER – 8

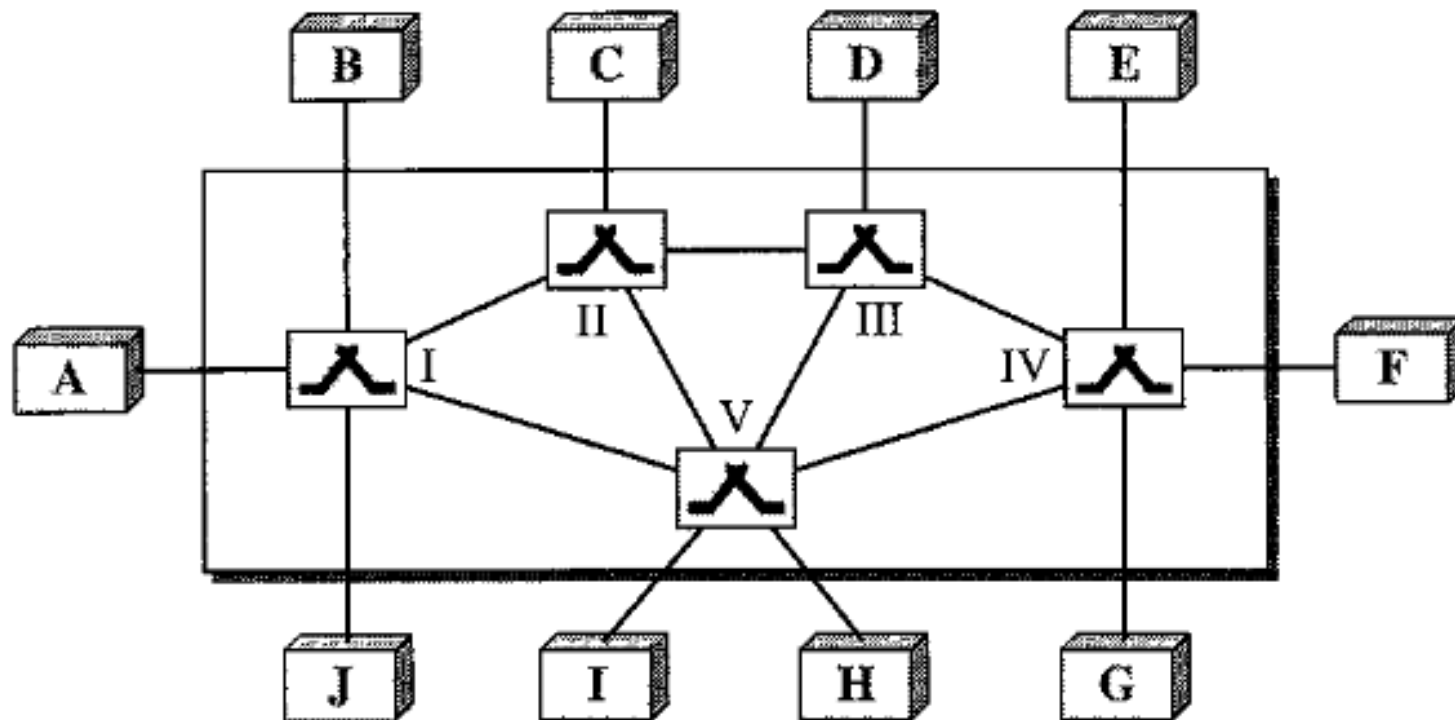
SWITCHING

SWITCH

- Switches are hardware and/or software devices capable of creating temporary connections between two or more devices linked to the switch
- Each switch
 - is connected to multiple links
 - is used to complete the connections between two communicating devices.



SWITCHED NETWORK

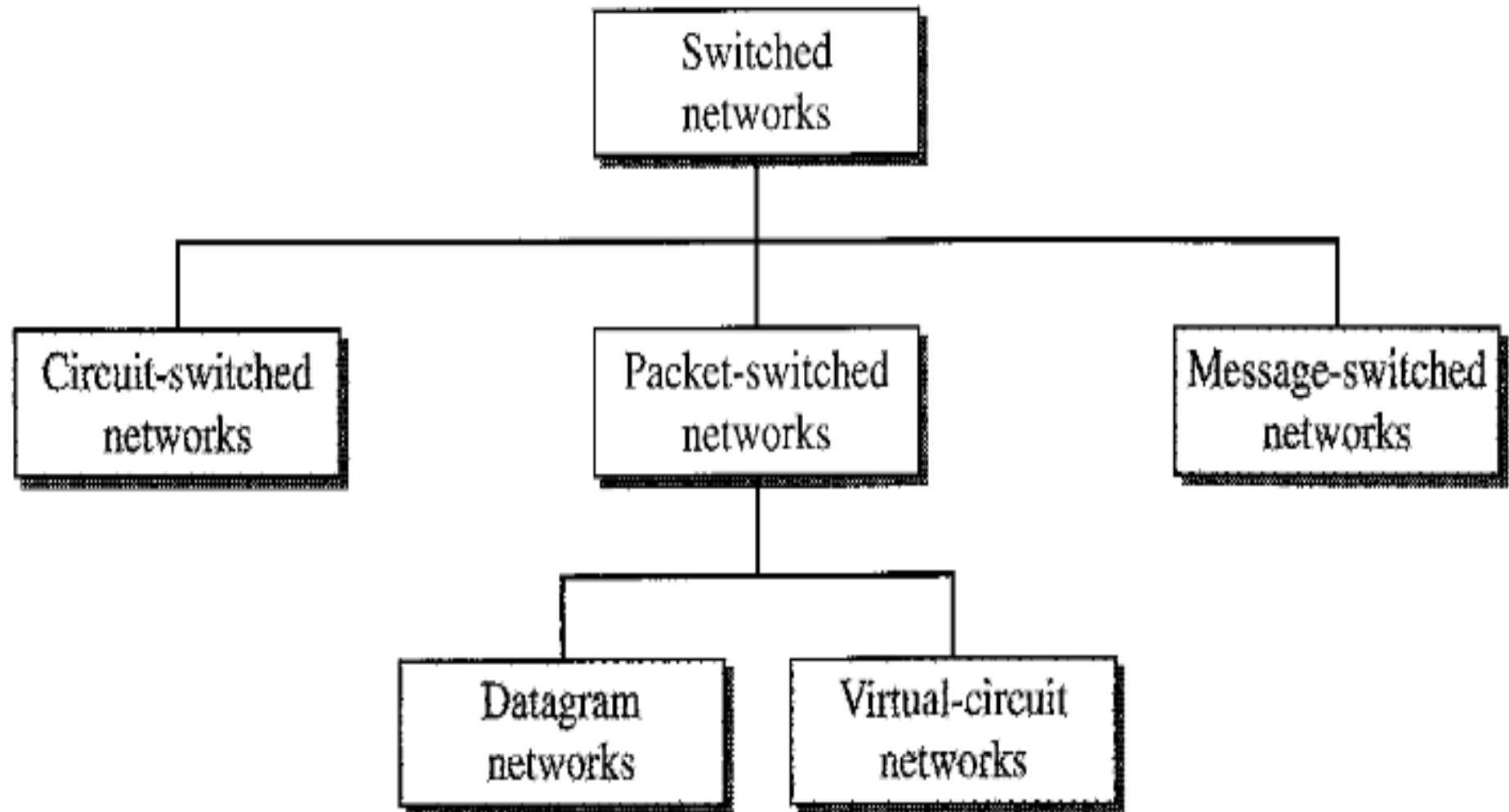


SWITCHING

- Why Switching is needed
 - Point-to-point topology is expensive and inefficient
 - Multipoint topology, for example, star or bus are also practically inefficient for bigger networks.
- Switching allows devices to communicate over a very large network
- A switched network consists of a series of interlinked nodes, called switches.

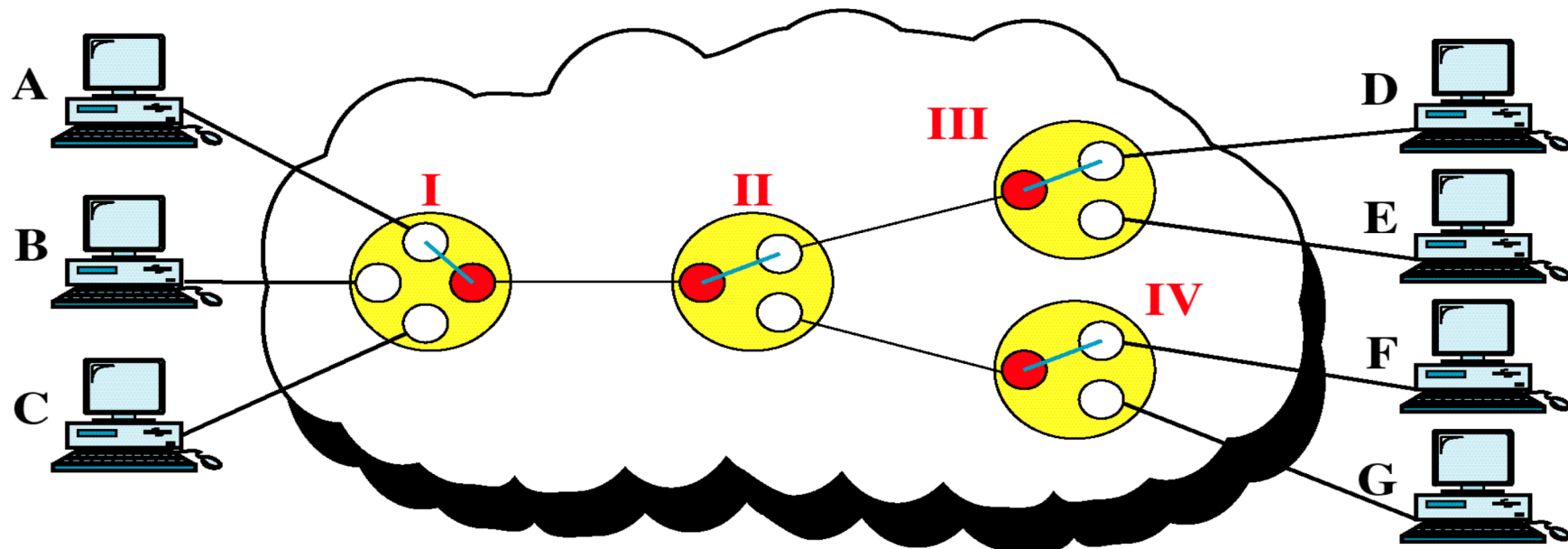


TYPE OF SWITCHING



CIRCUIT SWITCHED NETWORK

- Creates a dedicated path (direct physical connection) between two communicating devices.



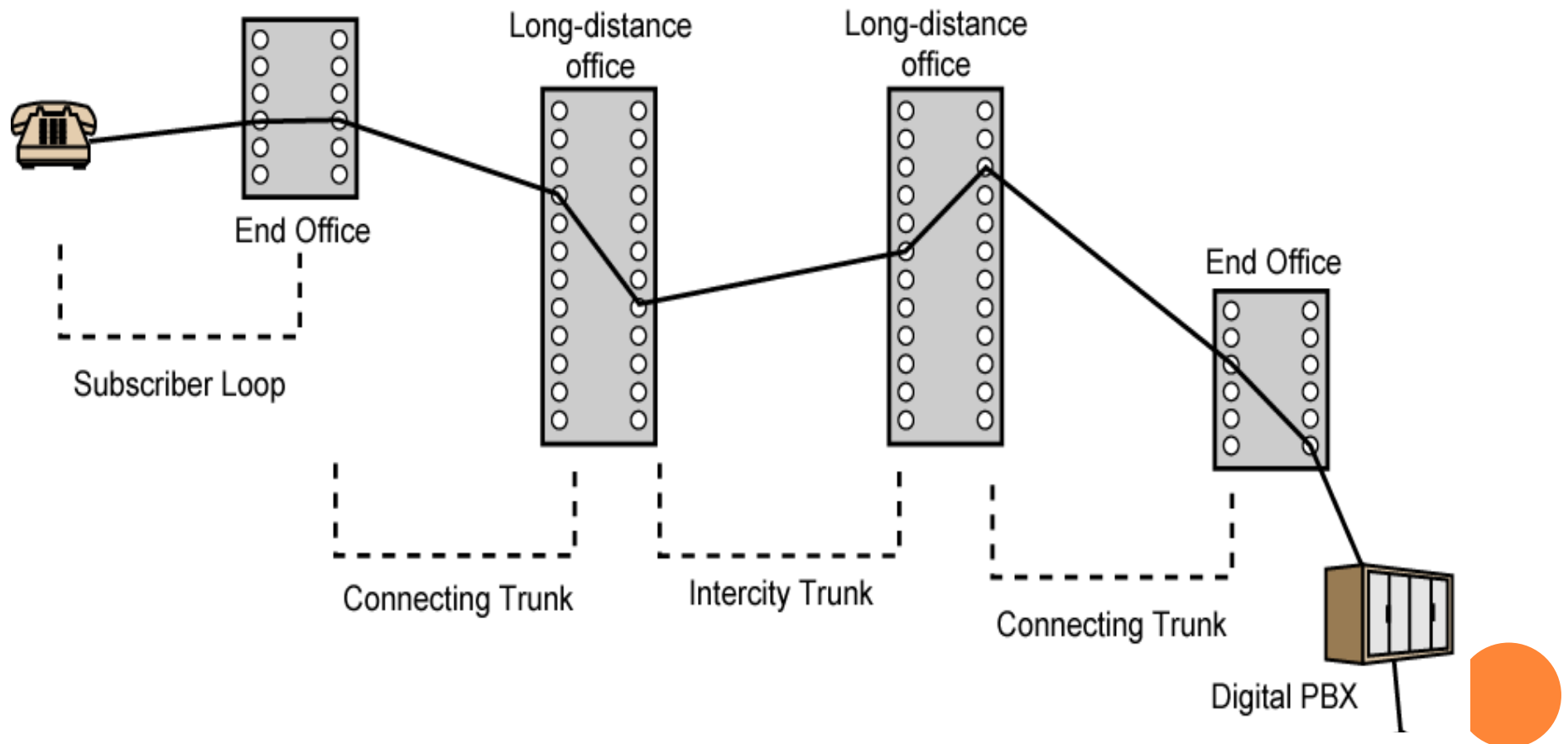
Example Network: Public Switched Telephone Network (PSTN)

CIRCUIT SWITCHED NETWORK (CONTD.)

- Three phases
 - Circuit establishment
 - Reserve the link bandwidth
 - Dedicated resources: No sharing
 - Call blocked, if no resources are available
 - If no data, channel capacity is wasted, so inefficient.
 - Not appropriate for non-voice transmission
 - Data transfer
 - No delay other than propagation delay
 - Circuit termination



PUBLIC CIRCUIT SWITCHED NETWORK



CIRCUIT SWITCHED - CHARACTERISTICS

○ Efficiency

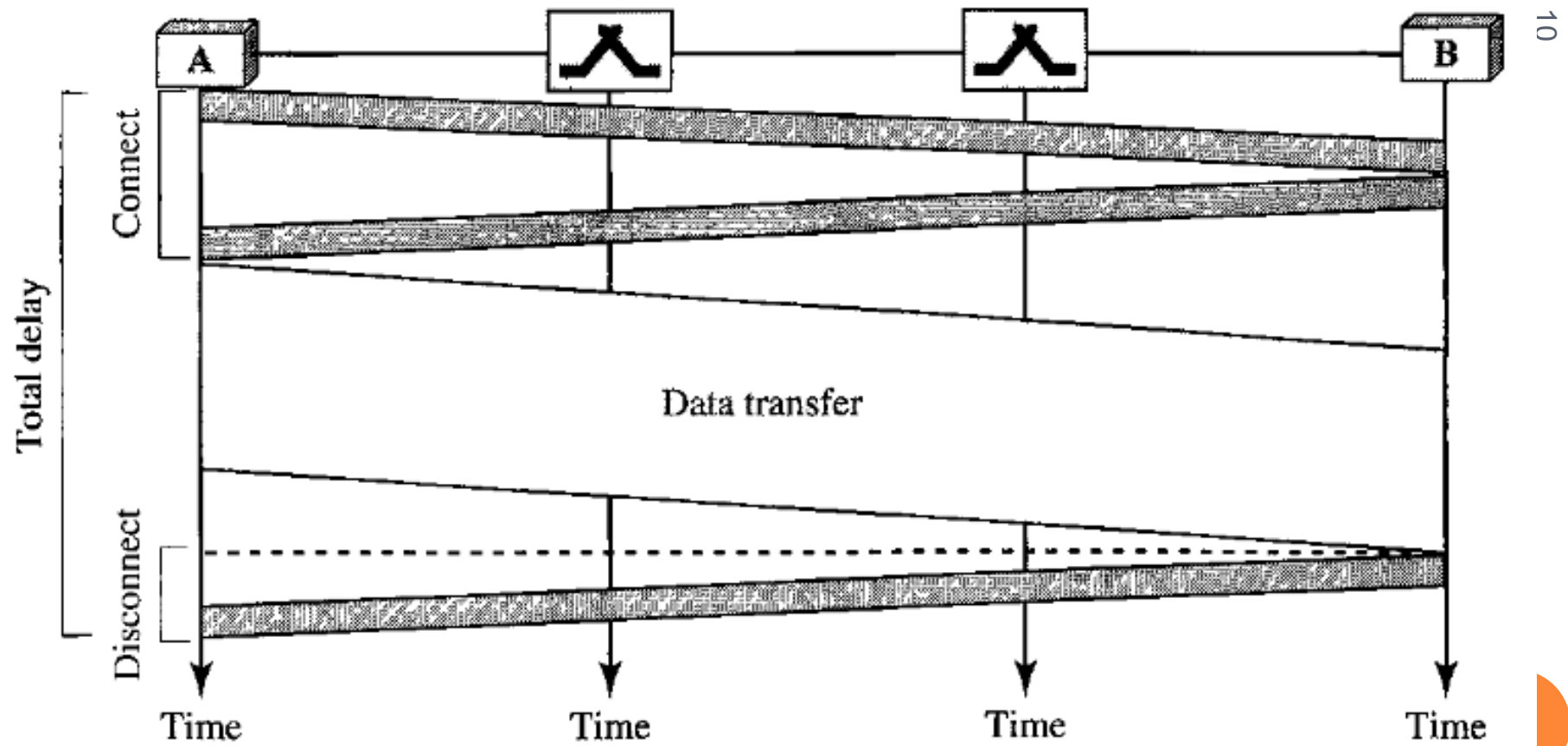
- Less efficient than others because all the resources are allocated during the entire conversation.
- These resources are unavailable to other parties.

○ Delay

- Minimal delay – individual packets are not delayed. Suffers from initial circuit setup delay.



TIMING OF CIRCUIT SWITCHED NETWORK

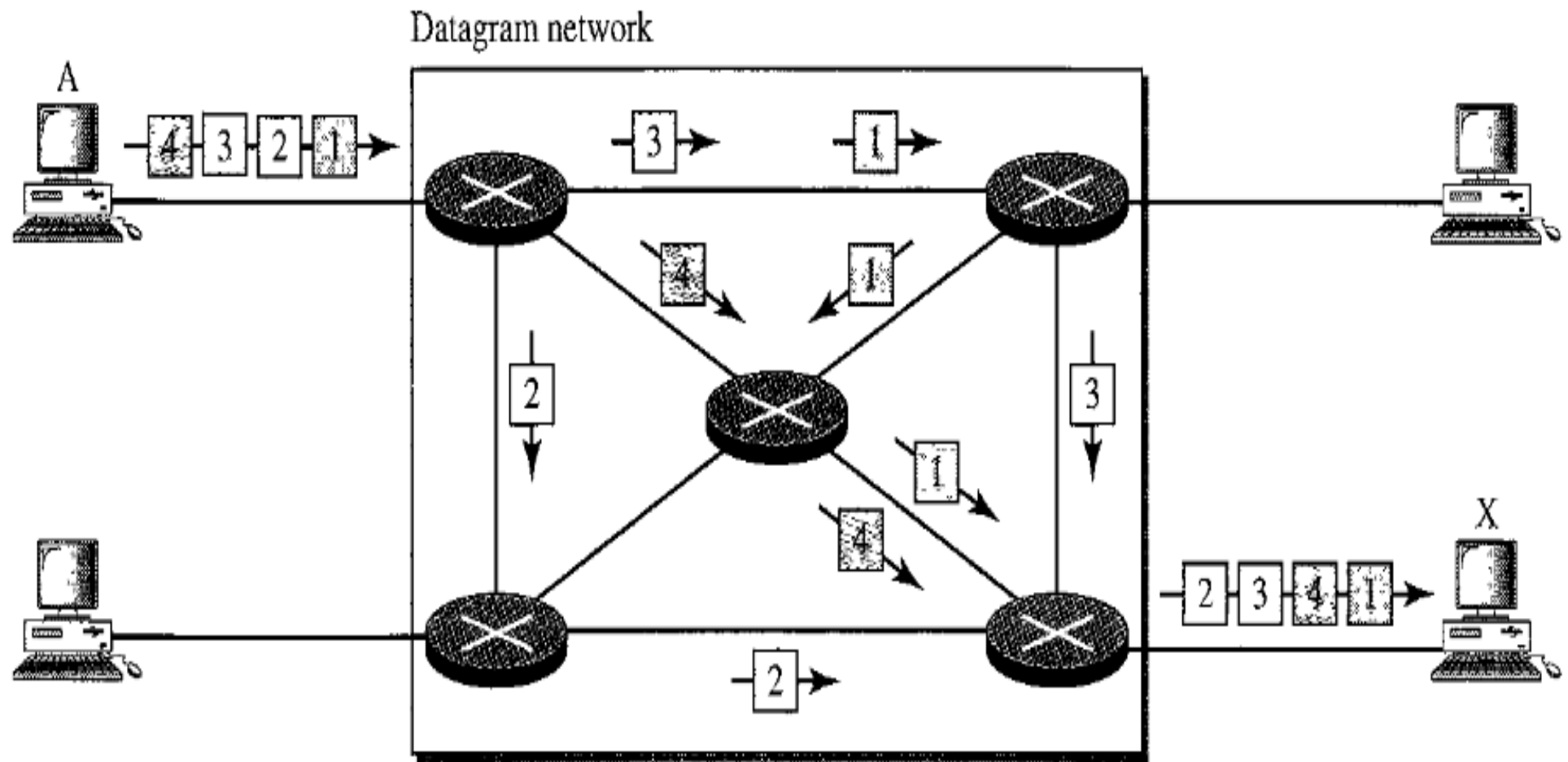


PACKET SWITCHED NETWORK – DATAGRAM NETWORK

- Data are transmitted as packets.
 - Longer messages split into series of packets
 - Each packets contain a portion of user data plus some control information as header and trailer.
- At each node, packets are received, buffered and then passed on to the next node.
 - This is called Store and Forward technique.

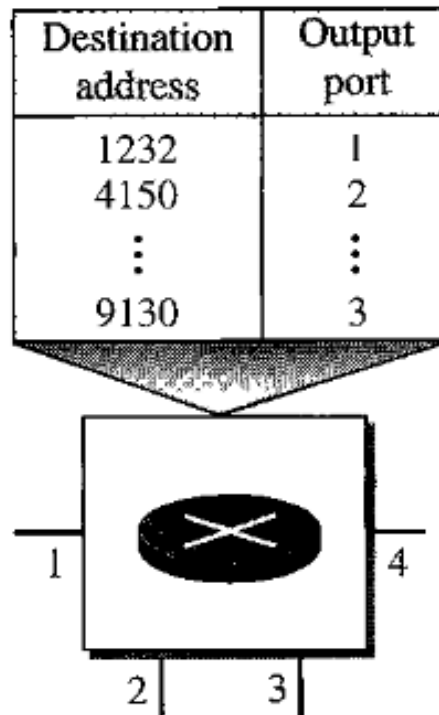


PACKET SWITCHED NETWORK – DATAGRAM NETWORK



ROUTING TABLE IN PACKET SWITCHED NETWORK

- A switch in a datagram network uses a routing table that is based on the destination address.
- Routing tables are dynamic and constantly updated

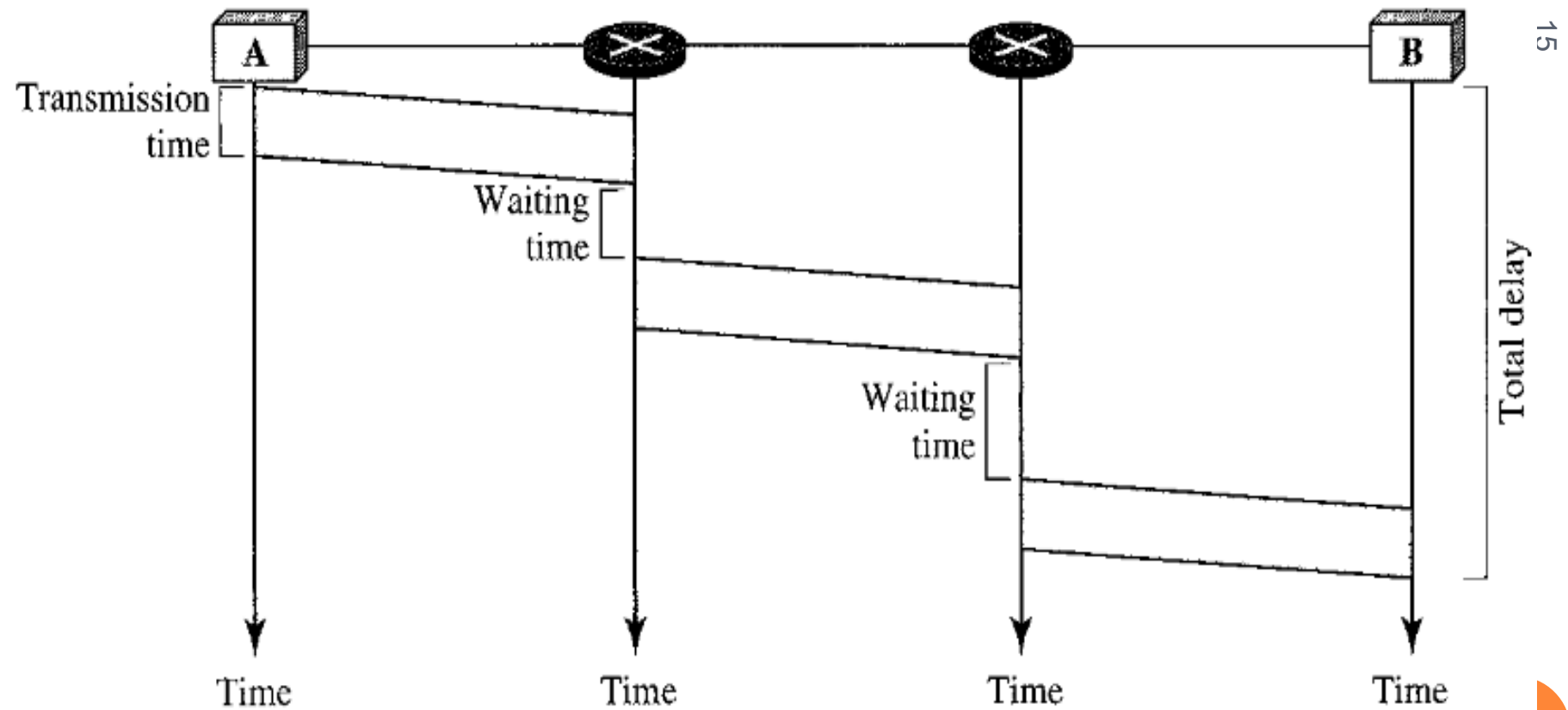


PACKET SWITCHED – CHARACTERISTICS

- Efficiency
 - Link can be shared by many packets over time
- Delay
 - Different delay for different packets
- Data rate conversion
 - Each station connects itself to local node at its own speed
 - Nodes can buffer data if required to equalize rates to avoid flooding
- Packets are accepted even when network is busy
- Priorities can be used



TIMING OF DATAGRAM PACKET SWITCHED NETWORK



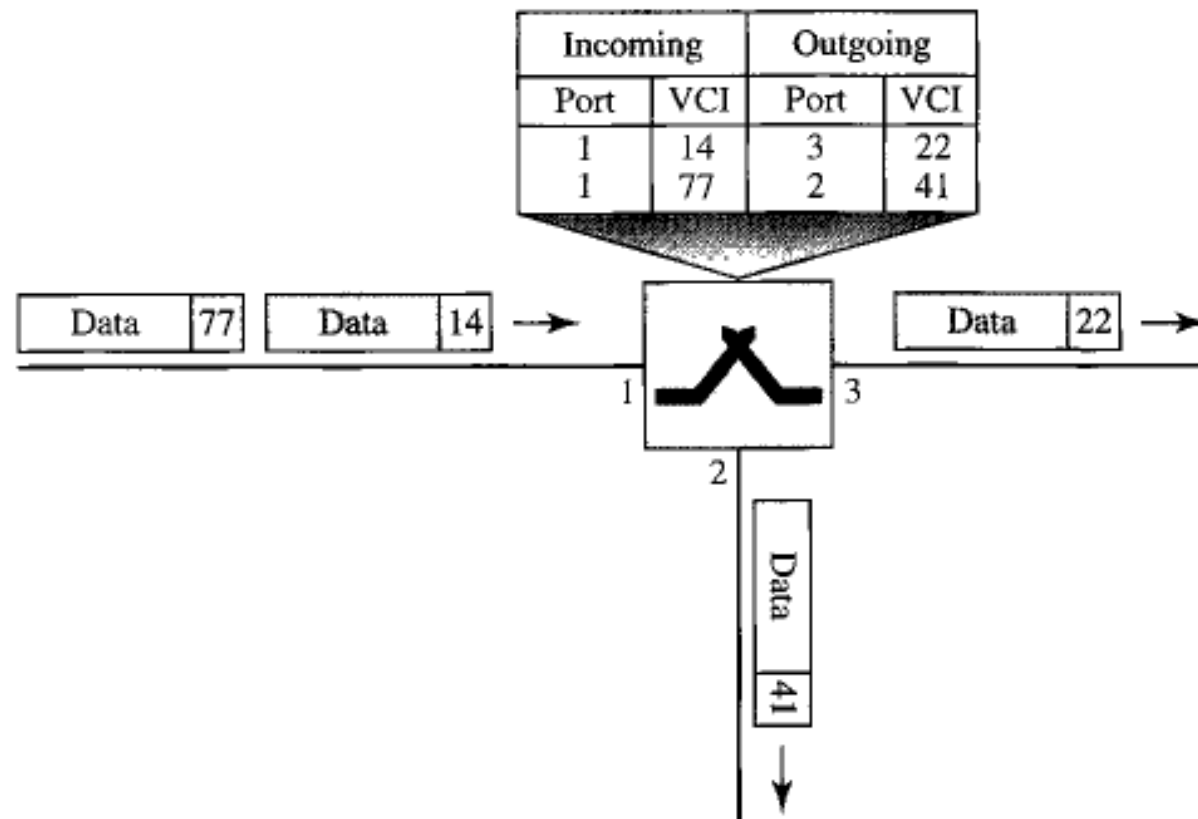
VIRTUAL CIRCUIT PACKET SWITCHED NETWORK

- A Virtual Circuit Packet Switched Network is a cross between Circuit Switched and a datagram packet switched network¹⁶
- It has circuit setup and circuit termination phases like circuit switched network. *All packets follow the same path !*
- Resources can be allocated during the circuit setup phase, as in circuit switched network, or in on demand, as in datagram network.

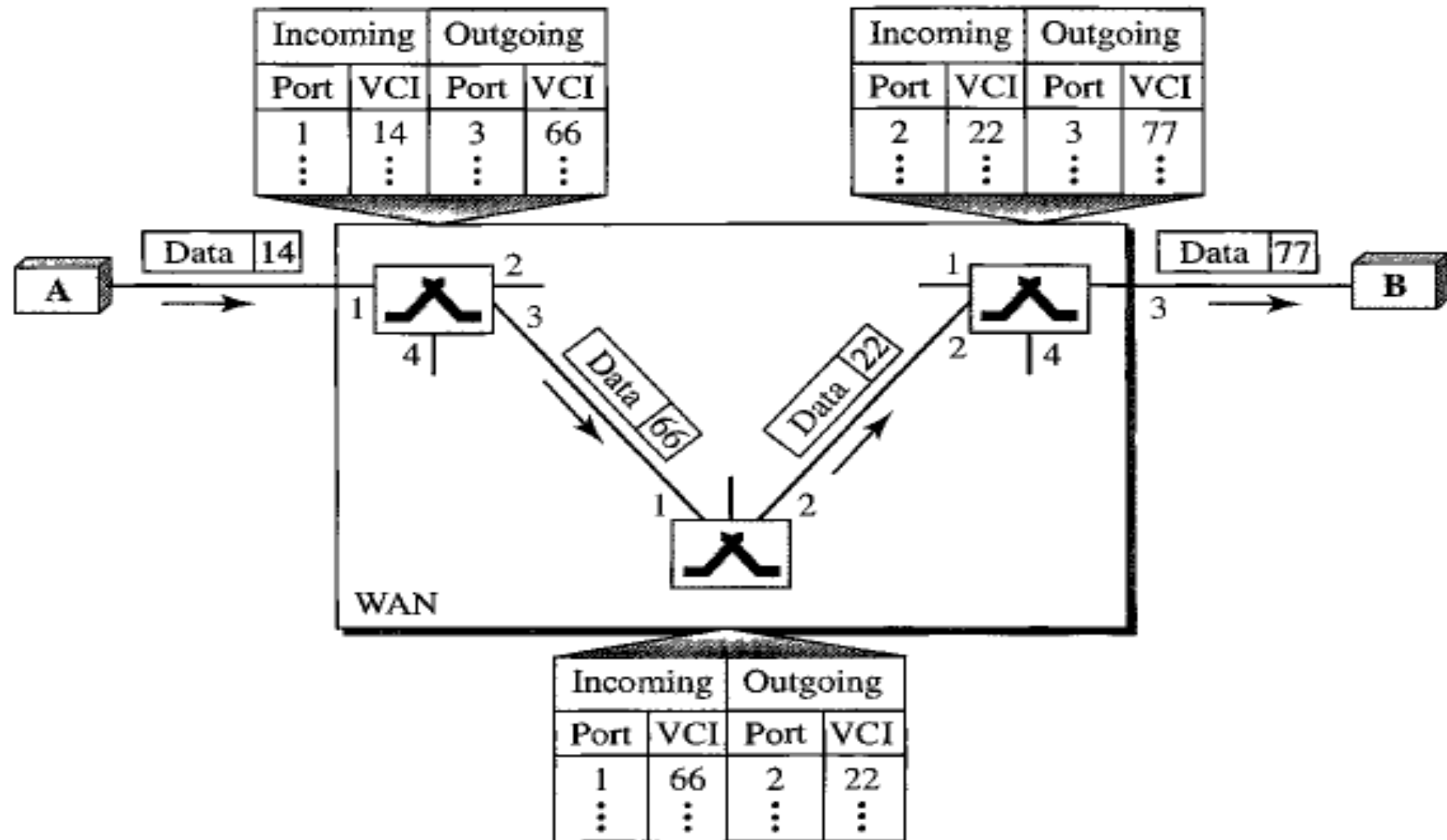


VIRTUAL CIRCUIT IDENTIFIER

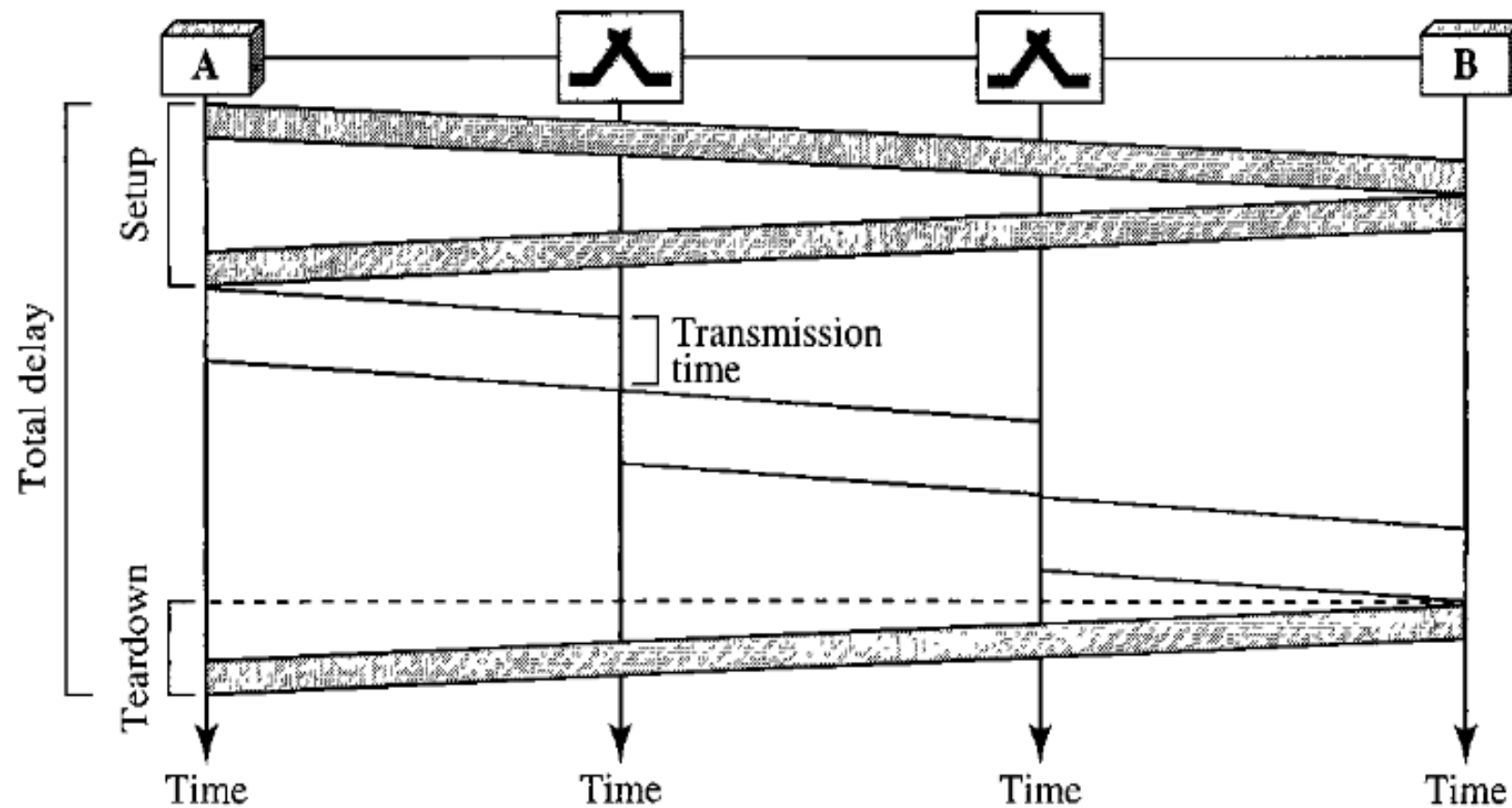
- Virtual Circuit Identifier (VCI) is used in source to destination transfer in Virtual Circuit Network.
- Its scope is only within one switch to another switch.
- When a frame arrives at a switch, it has a VCI; when it leaves, it has a different VCI.



VIRTUAL CIRCUIT



TIMING OF VIRTUAL CIRCUIT PACKET SWITCHING NETWORK



COMPARISON

Subject	Circuit Switching	Datagram Packet Switching	Virtual Circuit Switching
Circuit setup	Required	Not Required	Required
Dedicated path	Yes	No	No
Transmission	Continuous transmission of data	Transmission of packets	Transmission of packets
Store-and-forward	No	Yes	Yes
Establishment of route	For entire conversation	For each packet	For entire conversation
Delay	Call setup delay	Packet transmission delay	Call setup delay, Packet transmission delay

COMPARISON

Subject	Circuit Switching	Datagram Packet Switching	Virtual Circuit Switching
Packet arrives in order	Yes	No	Yes
Overload	May block call setup	Packet delay increased	May block call setup, Packet delay increased
Bandwidth	Fixed	Dynamic	Dynamic
Overhead bits	No overhead after call setup	Overhead bits in each packet	Overhead bits in each packet
Switch Crash	Fatal	Not fatal	Not fatal
Charging	Per minute	Per packet	Per packet

