# SNS COLLEGE OF TECHNOLOGY COIMBATORE

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# DEPARTMENT OF MCA

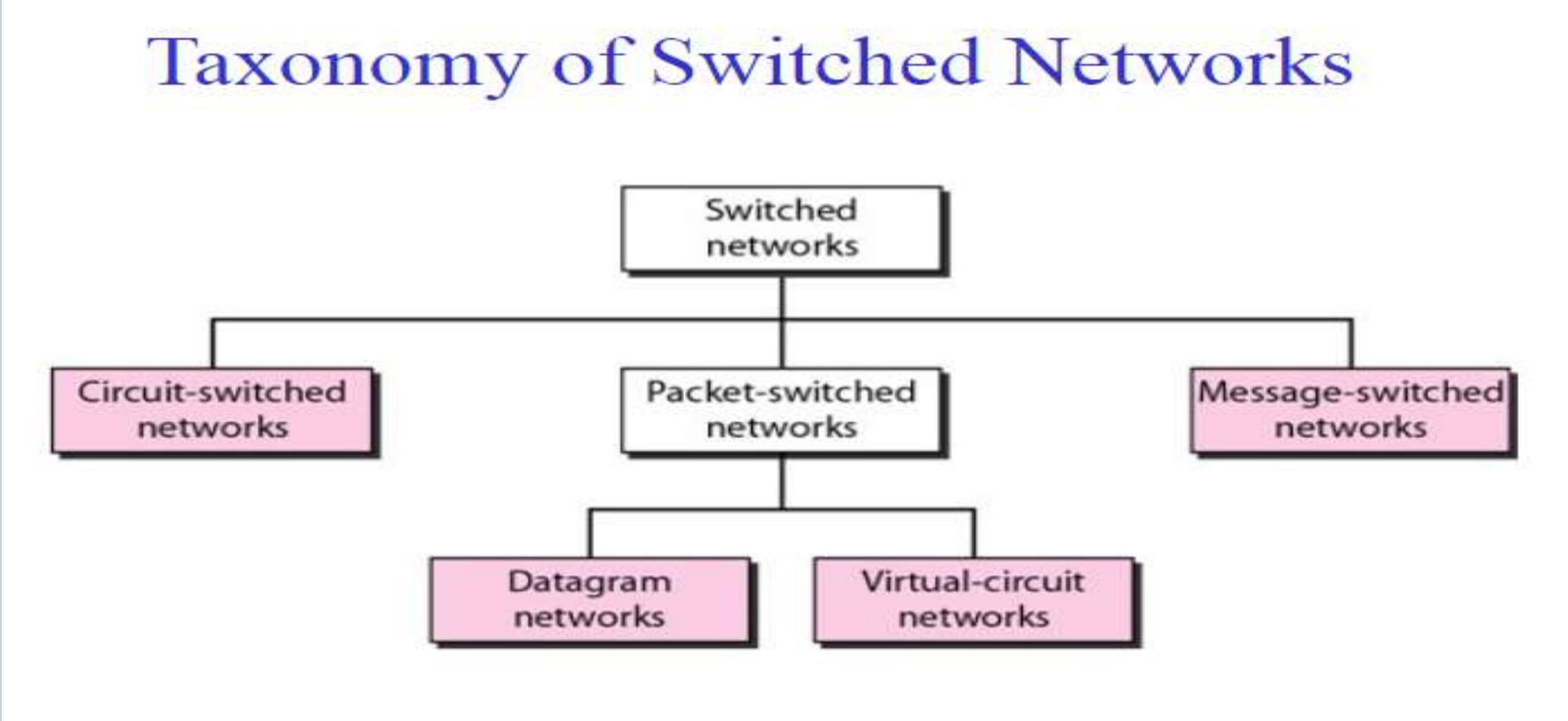
## Course Name : 19CAT603 - DATA COMMUNICATION AND NETWORK

## Class : I Year / I Semester

## Unit III – NETWORK AND SWITCHING,NETWORK DEVICES

## Topic 1 – SWITCHING

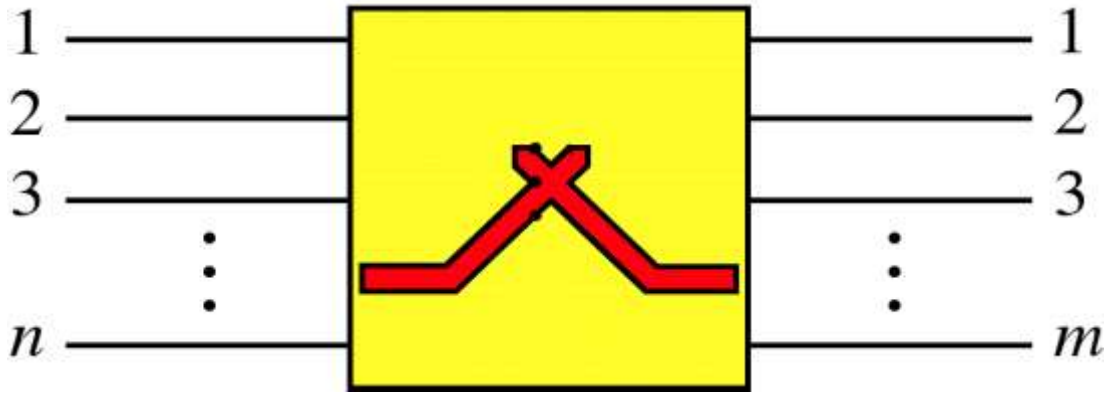
# Topic: Introduction To Switching and Circuit Switching



Q. What is a switch?

Q. What is switching?

Q. What is switched network?




## Switch

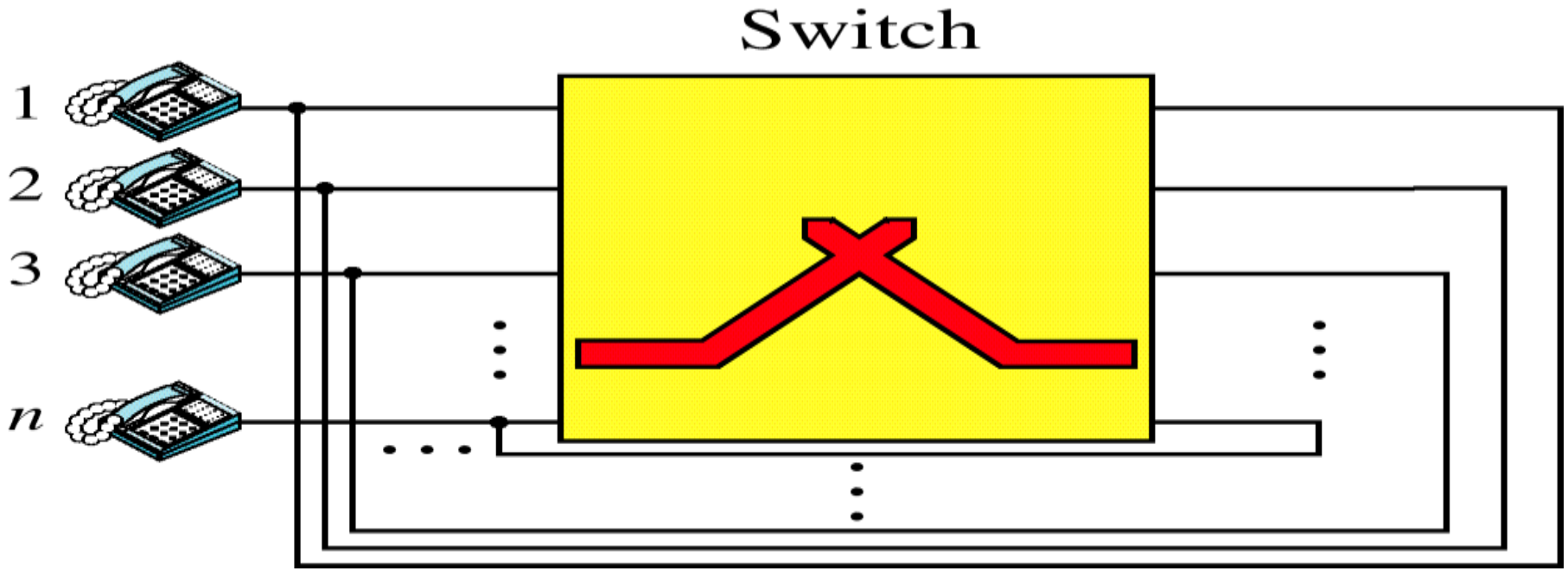
Switches are the hardware or software devices capable of creating temporary connections between two or more devices linked to the switch but not to each other.

It is a device which connects multiple communication lines together.

# Folded Switch



An n by n folded switch can connect n line in full duplex mode.



# Switching

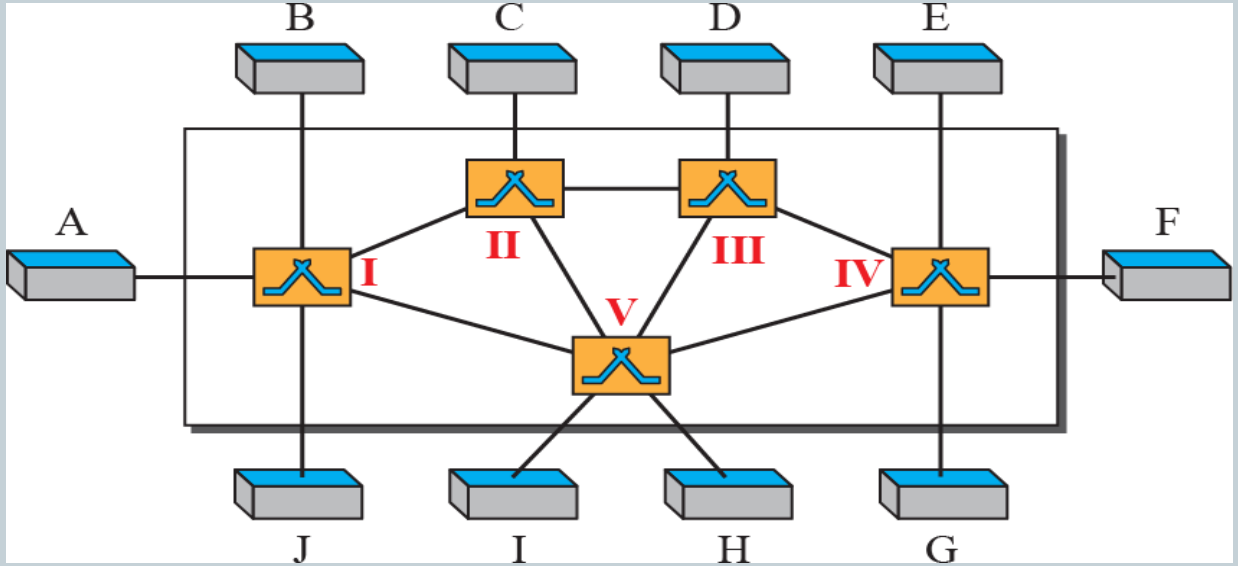


- A network is a set of connected devices. Whenever we have multiple devices, we have the problem of how to connect them to make one-to-one communication possible.
- The solution is switching.
- A switched network consists of a series of interlinked nodes, called switches.

# Switched Network

- A Computer network in which connectivity is provided by using numbers of switches.
- A fully switched network uses only switches for connecting all devices used in that network.

Switched network
(Networking using Switches )



# Methods of switching



1.Circuit switching

2.Packet switching

a. Virtual circuit

b. Datagram

3.Message switching

# Switching and TCP/IP Layers



Switching takes place at several layers of the TCP/IP protocol suite:

1.At the physical layer it is circuit switching. There is no exchange of packets at PL. The switches at PL allow signals to move in one path or another.

2.At the data-link layer we can have packet switching. However, the packet can mean frame or cells here. Packet switching is done normally using Virtual Circuit Approach.

3. At the network layer we can have packet switching.

Here, either a virtual circuit or datagram approach can be used. Internet uses datagram approach.

4. Switching at Application Layer : we can have only message switching at AL. It is done by exchanging messages like email etc. So such communication can be called as message switched communication. As such there is no concept of message switched Network.

# Circuit switching

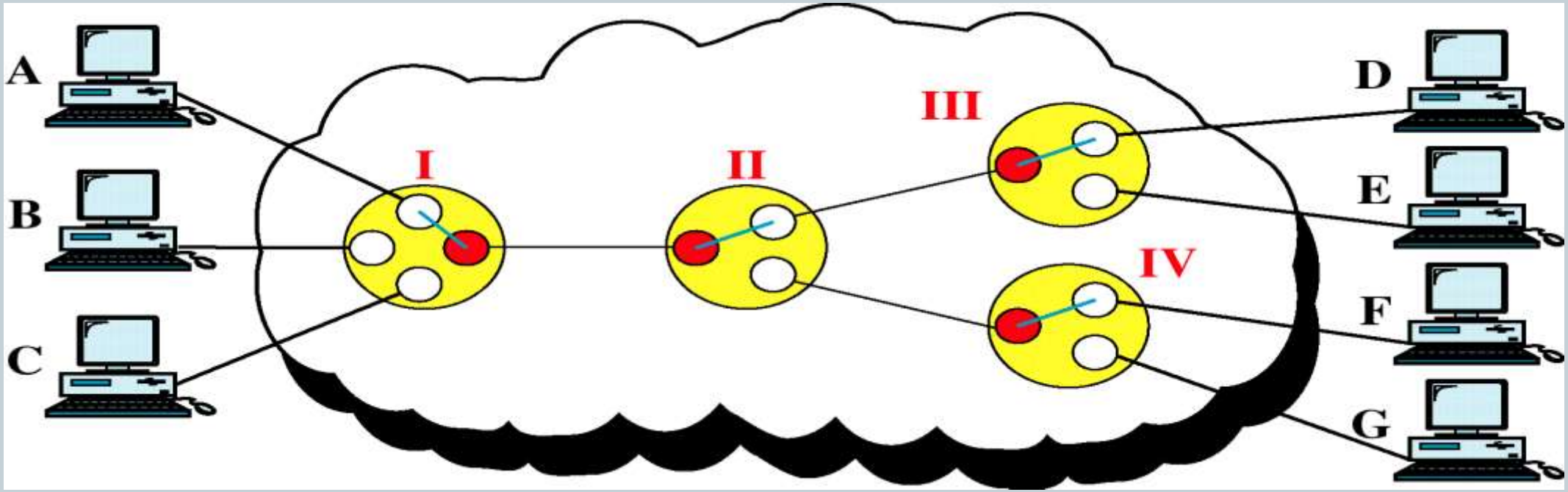


- Circuit switching is used in public telephone network but it is used for data transmission also along with voice communication
- Voice communication is efficient but data communication is not that efficient
- In this method a dedicated path is established between two computer using one or more switch

- The transfer mode of a network involves setting up a dedicated end to end connection. This path is maintained till the end of communication.
- Link is released after communication is over
- Circuit switching takes place at physical layer
- Data transfer may use FDM or TDM

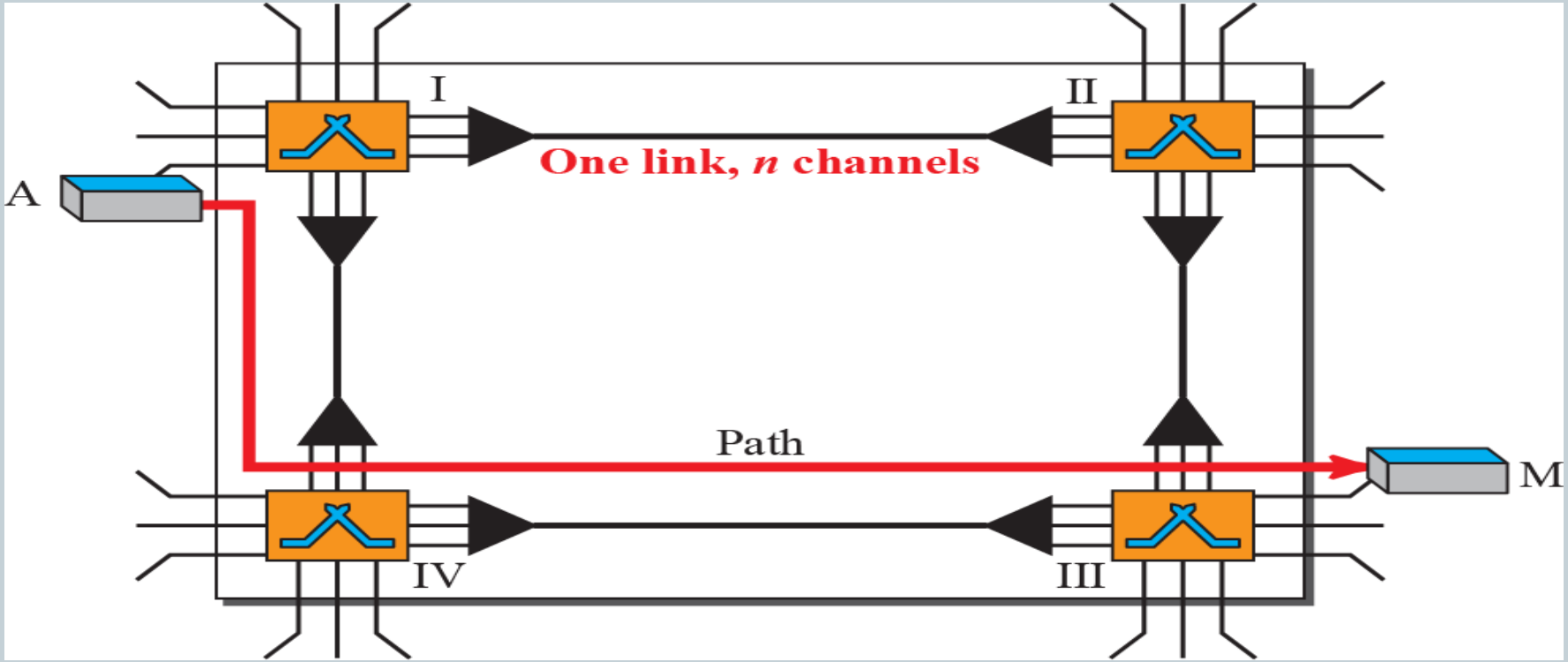
# Circuit-Switched Network






In place of using 3x4=12 point to point connections only 3 switches are used in above figure.

# A trivial circuit-switched network




- *4 switches*
- *4 links*
- *Each link divided into n=3 channels here using FDM or TDM*
- *2 end systems A & M; these may be computers*
- *If A has transmit to M, it will do through this circuit switched network*

# Three Phases of Circuit Switching

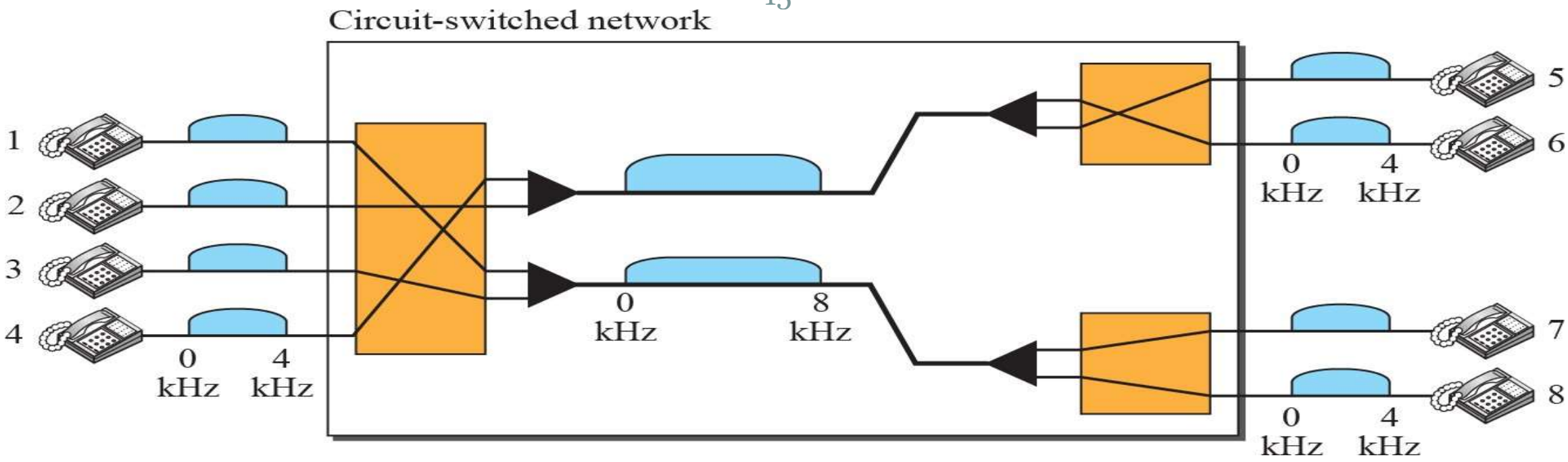


The actual communication in a circuit-switched network requires three phases:

1. *connection setup,*
2. *data transfer, and*
3. *connection teardown.*

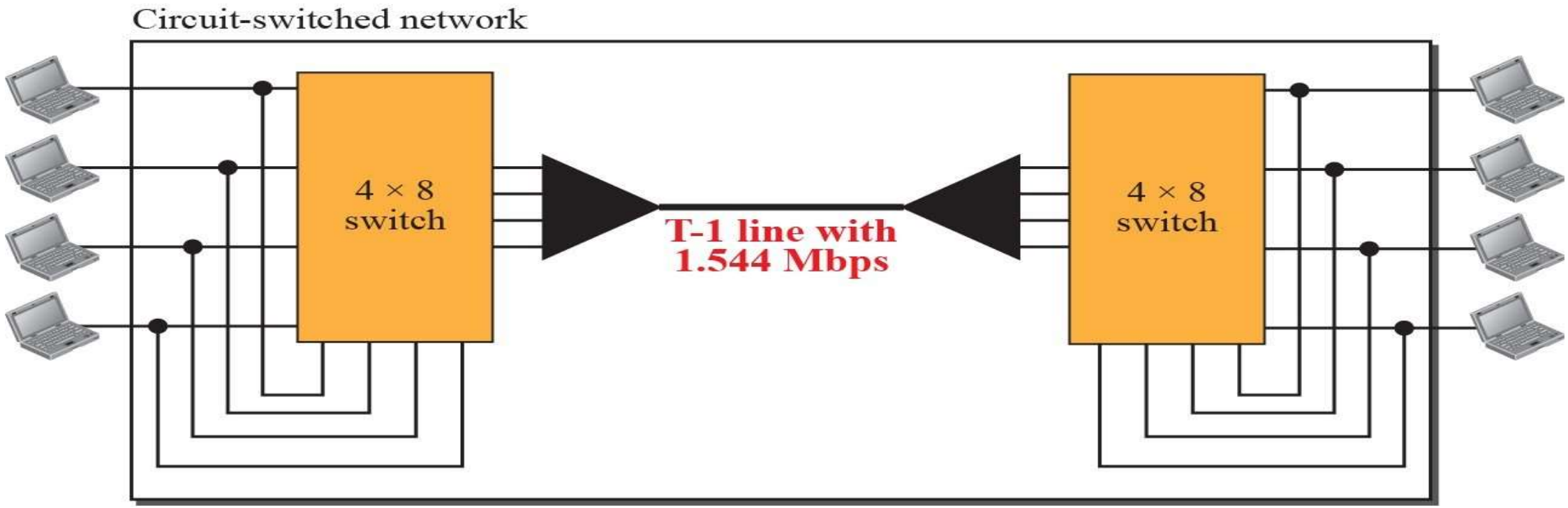
# Circuit-switched network used in Example





# rcuit-switched network used in Example



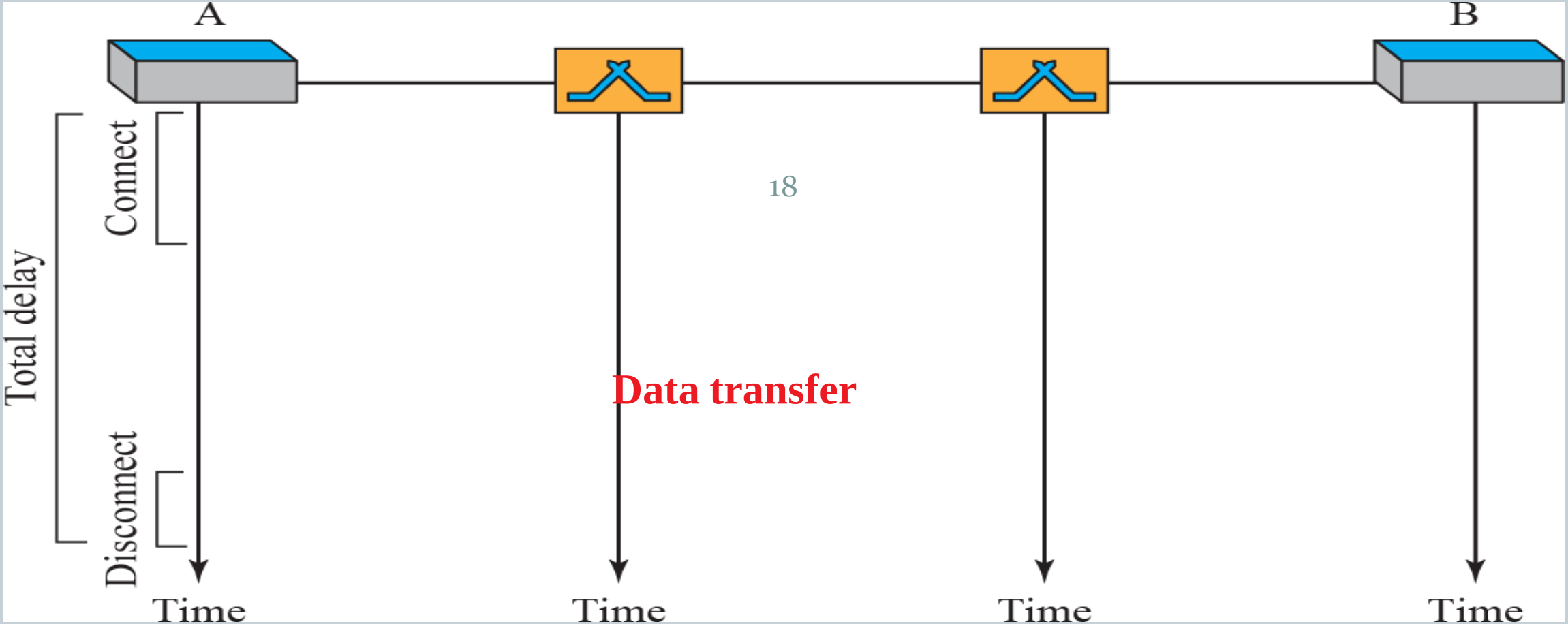


# Certain issues in circuit switching

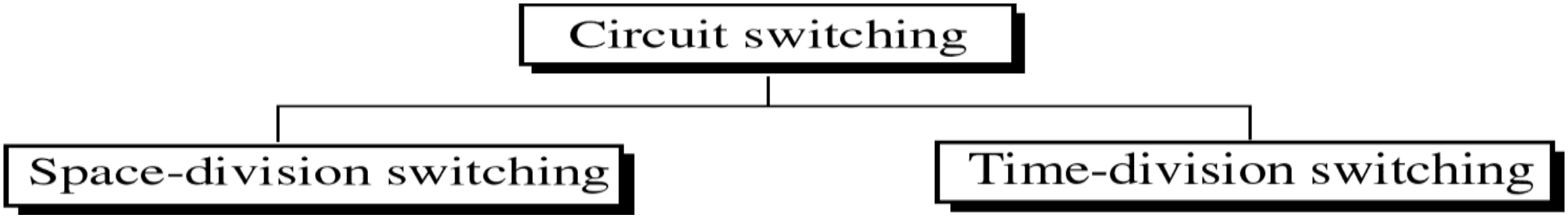


- Efficiency – low, because of resources remain dedicated through out the connection
- Delay – despite low efficiency there is very low delay in transmission.
  - Since connection is dedicate so only time taken in connection is the only delay in transmission

# Delay in a circuit-switched network



- Advantages
  - Dedicated transmission
  - No delay in transmission
- Disadvantages
  - Because of dedicated connection other devices waste time in waiting
  - Dedicated connection will consume all bandwidth
  - Sometimes it may take long time to establish a connection
- Applications – Public Switched Telephone Network (PSTN)


Circuit switching
Space-division switching
Time-division switching

# Space Division Switching

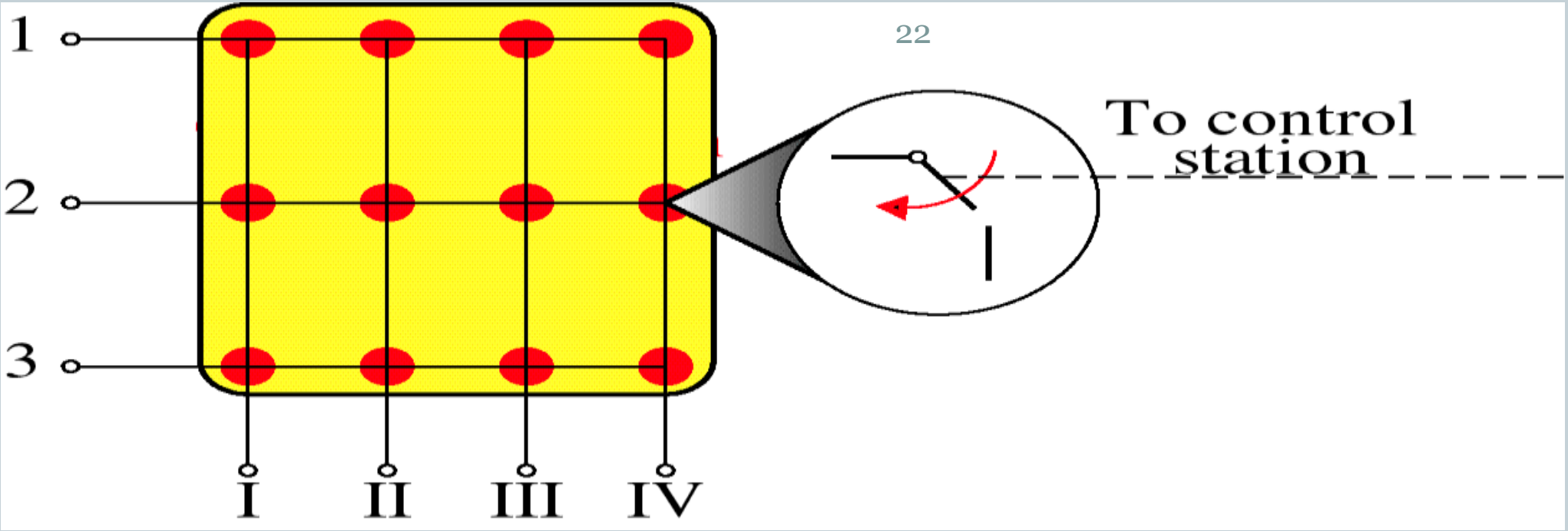


In space division switching, the paths in the circuit are separated from each other spatially. This technology is used in both analog & digital networks. It uses following switches for connection:

1. Cross bar switch
2. Multistage switch

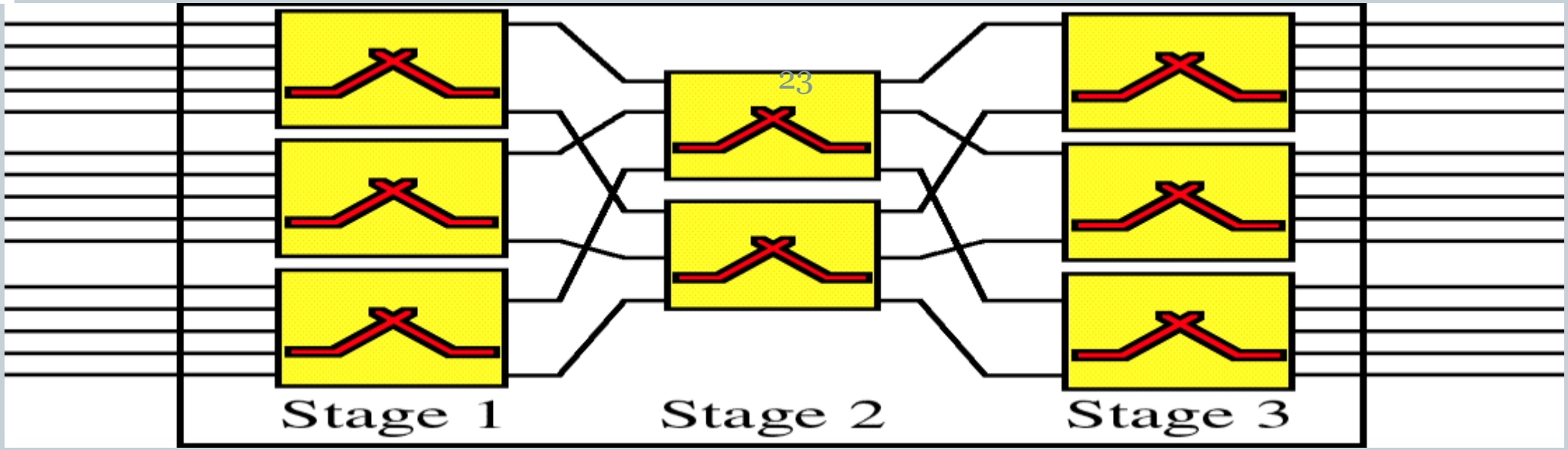
# Crossbar Switch






A cross bar switch connects n input lines to m output lines in a grid using micro switches (transistor) at each cross point.

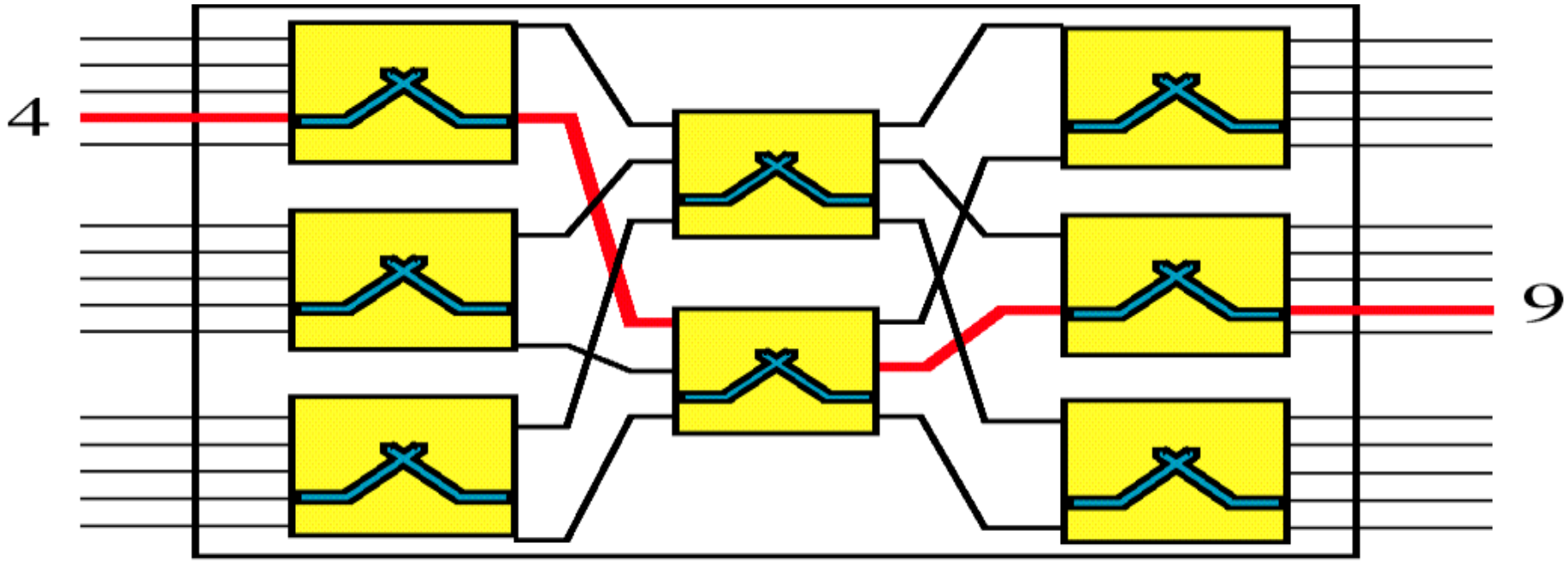
# Multistage Switch




1. The limitations of crossbar switch is removed by multistage switch. In fact it combines cross bar switches in several stages.
2. In multistage switching, devices are linked to switches that, in turn are linked to a hierarchy of other switches.

# Switching Path Using Multistage Switch






4 connected to 9

# Time-division multiplexed switch



- Time slot interchange reads bits from incoming slots in each frame and writes these into a register. Call setup would have created a permutation table for how the contents are read out.
- These switches are only used in voice calling.

# Examples of Circuit Switched Network



- Public switched telephone network (PSTN)
- ISDN B-channel
- Circuit Switched Data (CSD) and High-Speed Circuit-Switched Data (HSCSD) service in cellular systems such as GSM
- Datakit
- X.21 (Used in the German DATEX-L and Scandinavian DATEX circuit switched data network)
- Optical mesh network

# Thank You