Communication System

IICT Lecture 10

What is Communication?

- exchanging of information by speaking, writing, or using some other medium.

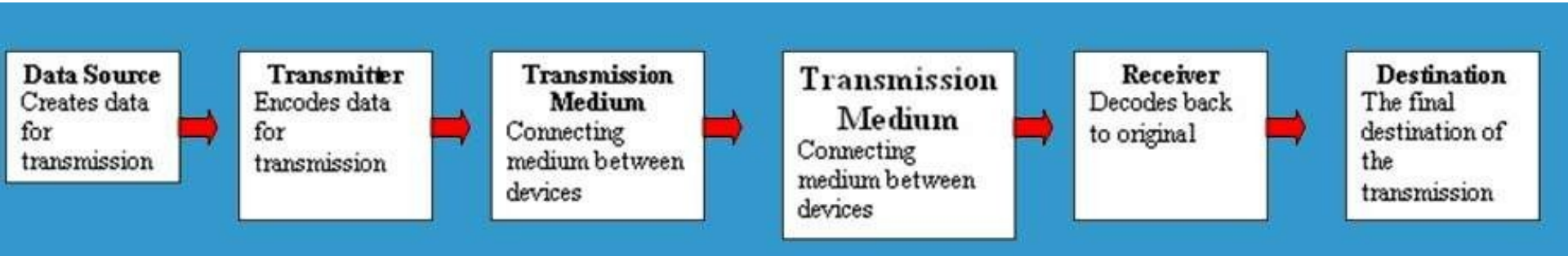
Characteristics of Communication System

- There must be a Sender and Receiver
- A protocol is a set of rules which governs the transfer of data between computers.
- Protocols allow communication between computers and networks.
- Handshaking is used to establish which protocols to use
- Handshaking controls the flow of data between computers
- Protocols will determine the speed of transmission, error checking method, size of bytes, and whether synchronous or asynchronous

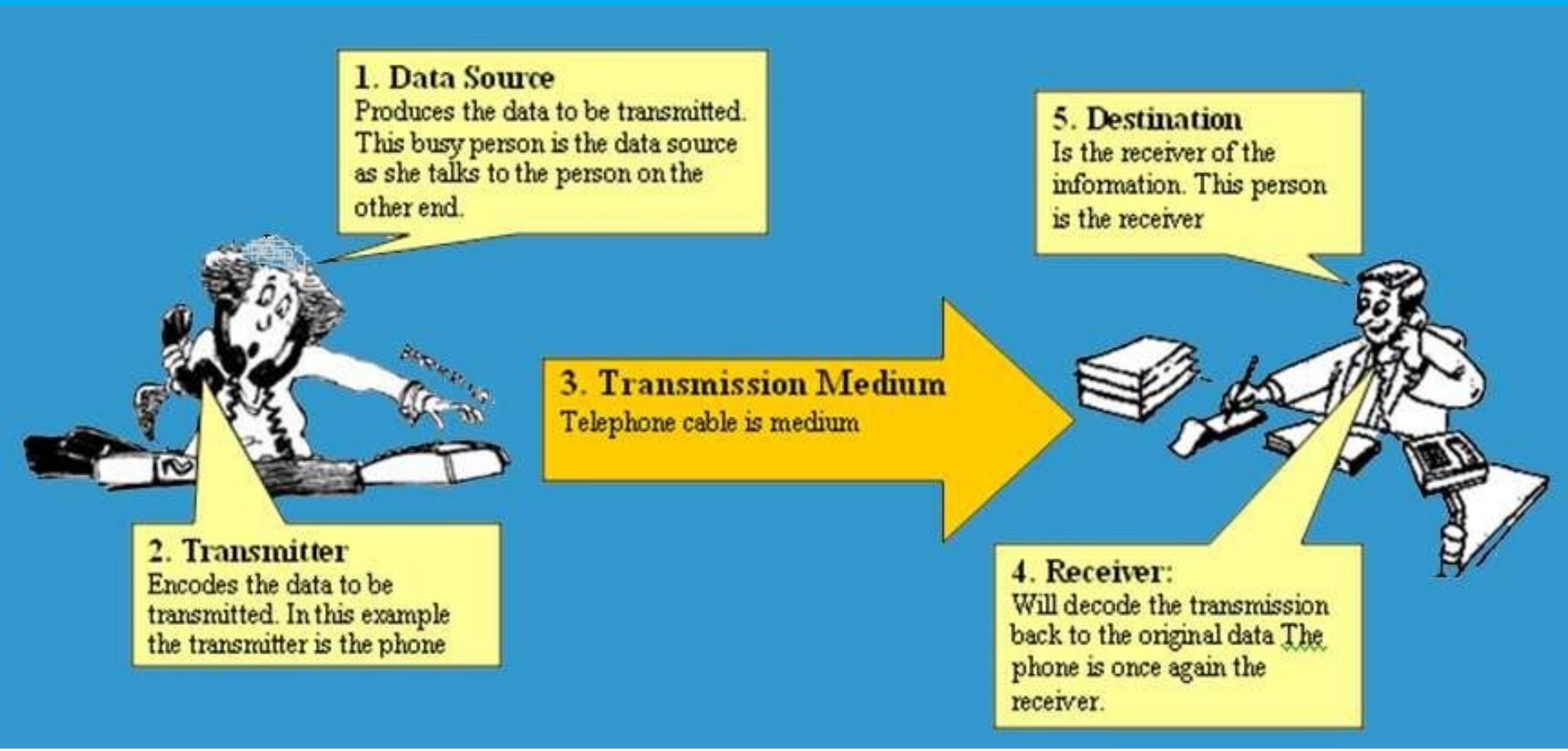
Five Basic Components

Every communication system has 5 basic requirements

- Data Source (where the data originates)
- Transmitter (device used to transmit data)
- Transmission Medium (cables or non cable)
- Receiver (device used to receive data)
- Destination (where the data will be placed)



Pictorial Representation



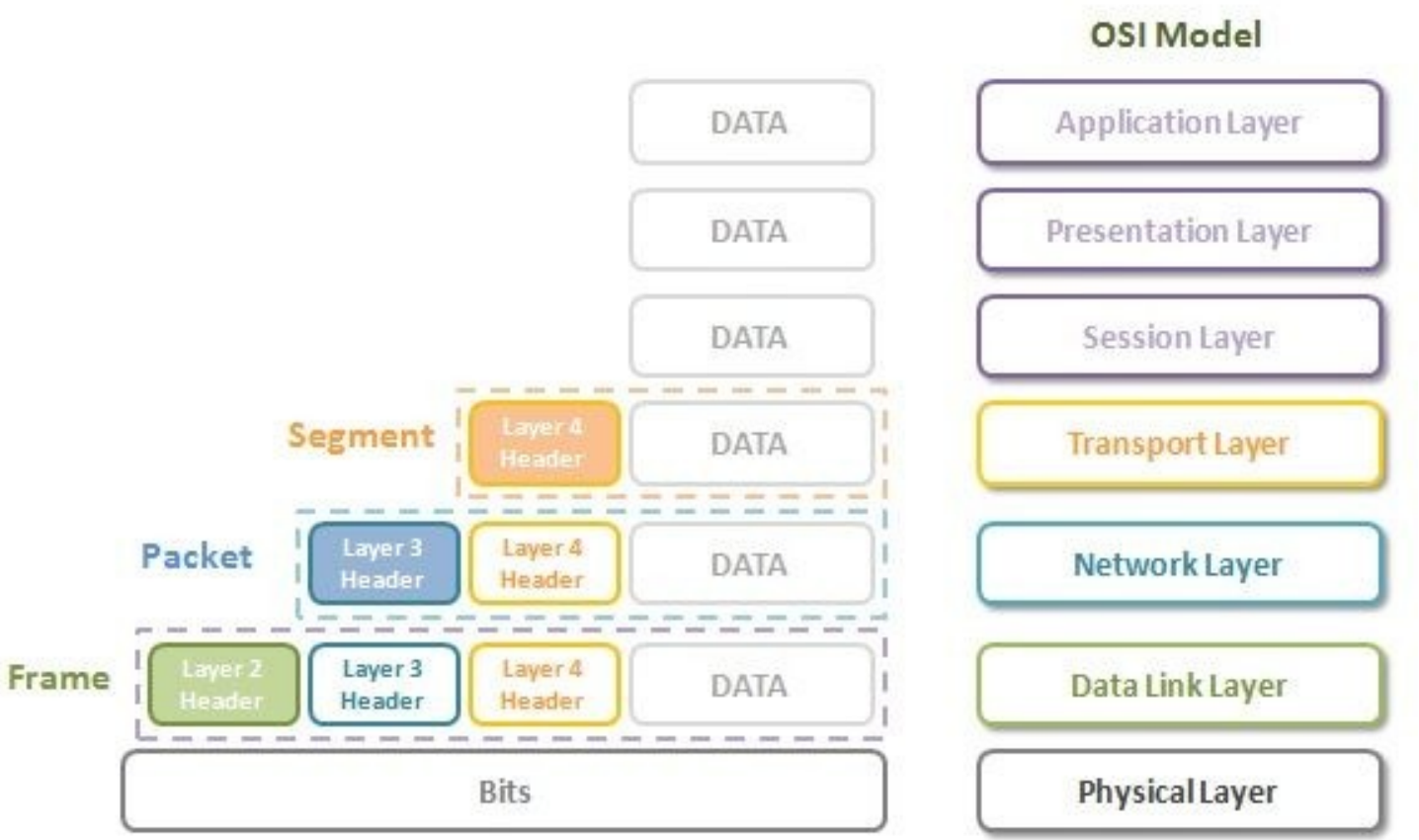
OSI Model

- The Open Systems Interconnection **model** (**OSI model**) is a conceptual **model** that characterizes and standardizes the communication functions of a telecommunication or computing system without regard to its underlying internal structure and technology.
- The OSI model also provides much more information which is included with each package.

7 Layers of OSI Model

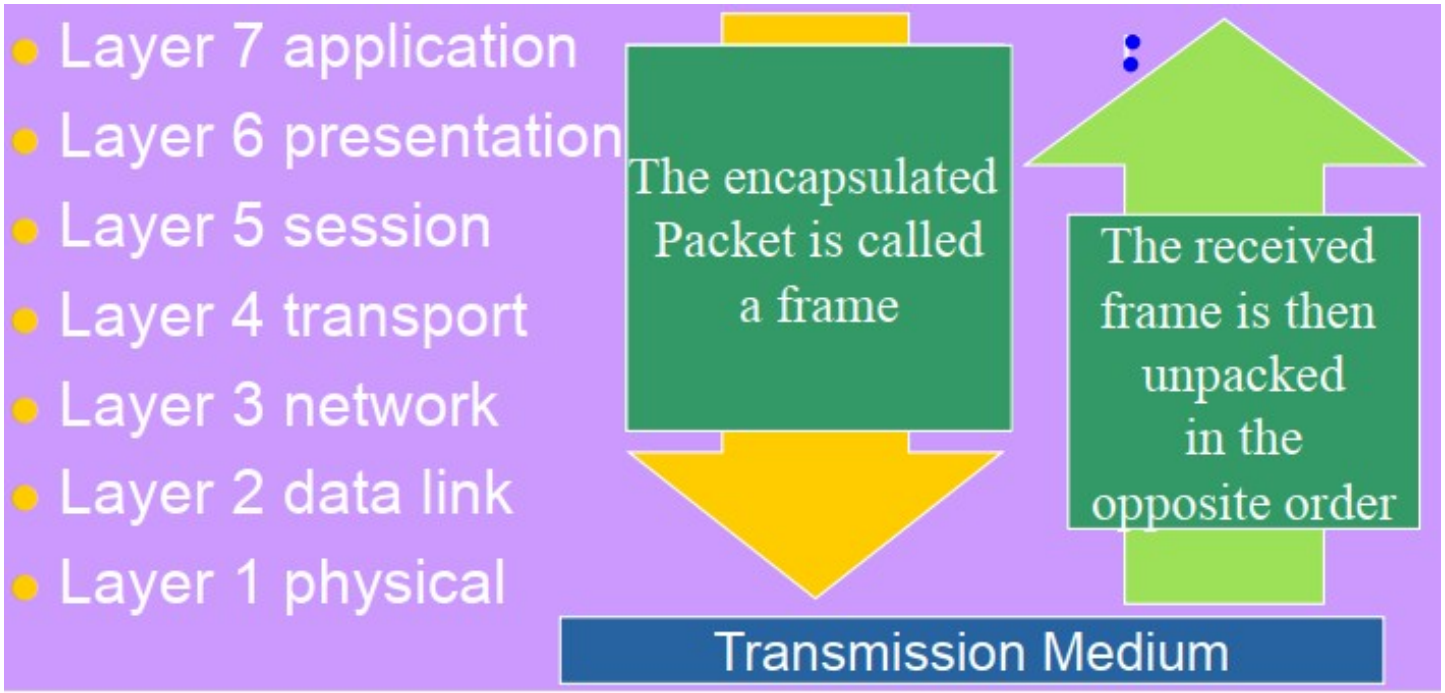
- OSI “Open System Interconnection”
- OSI is not a protocol but a list of protocols divided between 7 layers with each layer having a different set of functions.
- Each packet is layered/packaged with protocols from each of the layers as it is processed.
- The process of layering the protocols around each package is called encapsulation. The final encapsulated data packet is called a frame.

OSI Model


OSI Model
DATA
Application Layer
DATA
Presentation Layer
DATA
Session Layer
Segment
Layer 4 Header
DATA
Transport Layer
Packet
Layer 3 Header
Layer 4 Header
DATA
Network Layer
Frame
Layer 2 Header
Layer 3 Header
Layer 4 Header
DATA
Data Link Layer
Bits
Physical Layer

OSI Model

- OSI Reference Model



Service Performed at Each Layer

- Layer 7: the application layer (generates data – interface)
  - provides access to available network resources (format data for lower layers)
- Layer 6: the presentation layer
  - translates, encrypts, and compresses data
- Layer 5: the session layer
  - Establishes/terminates connection, manages, and terminates communicative sessions
- Layer 4: the transport layer (how much data, at what rate)
  - provides reliable process-to-process message delivery and error checking
- Layer 3: the network layer
  - moves packets from source to destination providing internetworking capabilities
- Layer 2: the data link layer
  - Control the flow of data – deal with transmission errors
- Layer 1: the physical layer
  - transmits bits over a medium establishing mechanical and electrical specifications

Service Performed at Each Layer

- Layer 7 application
- Layer 6 presentation
- Layer 5 session
- Layer 4 transport
- Layer 3 network
- Layer 2 data link
- Layer 1 physical

- E-mail, Web browser, Directory
- POP, SMTP, FTP, HTTP, DNS
- Sockets
- TCP
- IP
- PPP, Ethernet, Token ring
- 100baseT

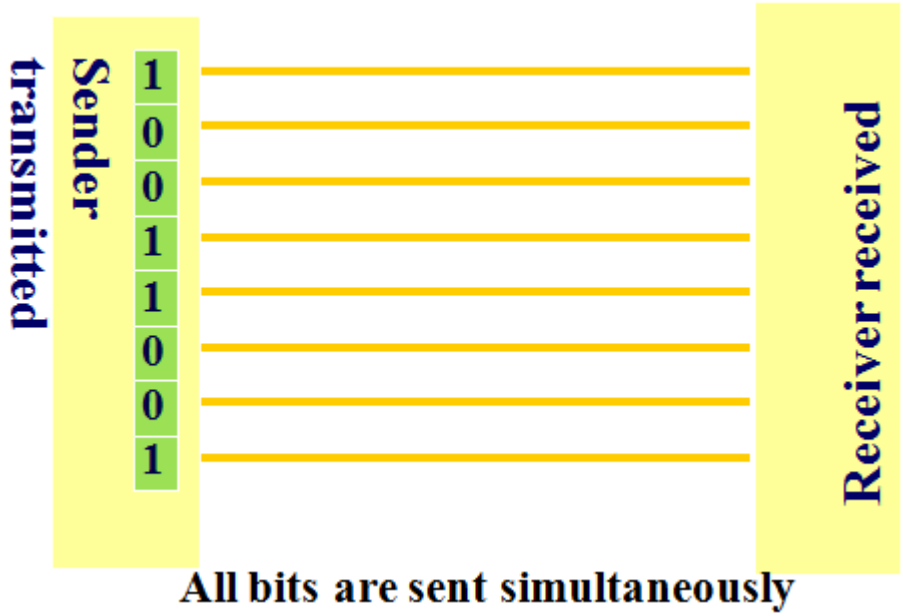
Transmitting and Receiving in Comm. Systems

Serial Transmission

- Data is transmitted, on a single channel, one bit at a time one after another
- Much faster than parallel because of way bits processed (e.g. USB ar

Parallel Transmission

- Each bit has it’s own piece of wire along which it travels
- Often used to send data to a printer



Why not to use Parallel instead Serial?

- Due to inconsistencies on channels data arrives at different times
- Because of the way it is transmitted packet switching cannot be used
- The above two points makes parallel slower than serial and requires higher bandwidth.
- Parallel transmissions are rarely used anymore

Synchronous VS Asynchronous Transmission

Synchronous Transmission

- All data sent at once and no packet switching (instant messaging, video conferencing)

Asynchronous Transmission (Telephone line)

- most common type of serial data transfer
- Allows packet switching
- Allows sharing of bandwidth (i.e. talk on phone while another person is using internet)

Synchronous VS Asynchronous Transmission

BASIS FOR COMPARISON	SYNCHRONOUS TRANSMISSION	ASYNCHRONOUS TRANSMISSION
Meaning	Sends data in the form of blocks or frames	Sends 1 byte or character at a time
Transmission Speed	Fast	Slow
Cost	Expensive	Economical
Time Interval	Constant	Random
Gap between the data	Absent	Present
Examples	Chat Rooms, Video Conferencing, Telephonic Conversations, etc	Letters, emails, forums, etc

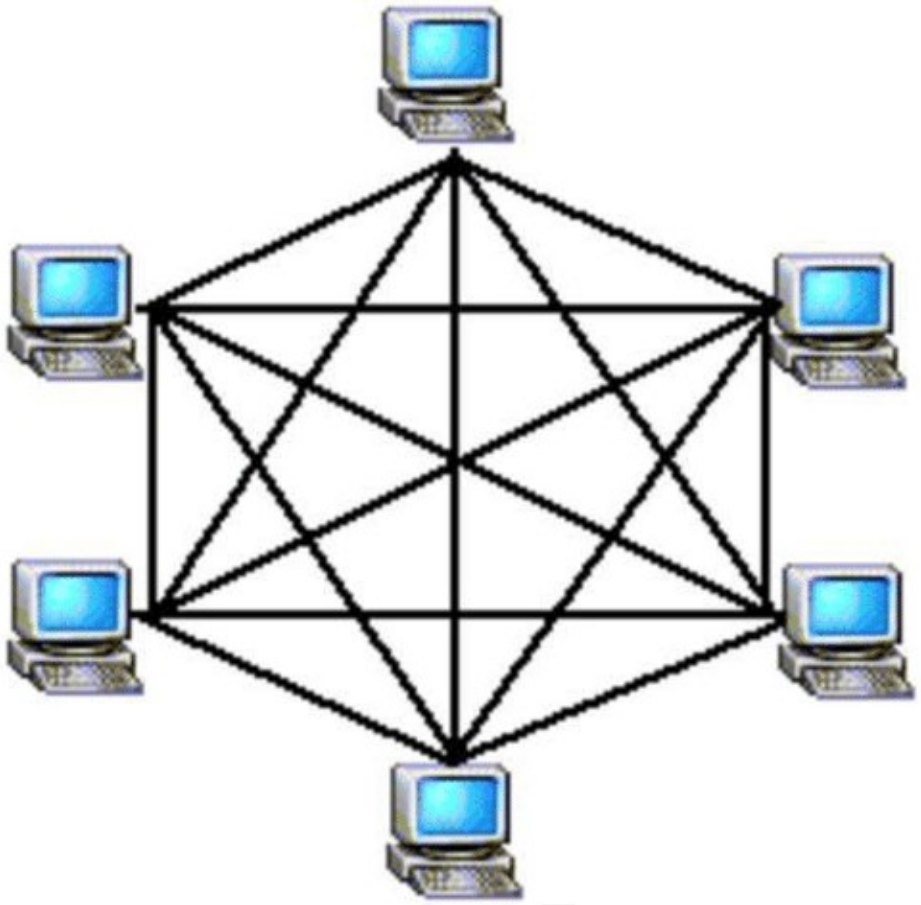
Transmission Directions

- Simplex: One direction only
- Half duplex: Both directions but only one
  direction at a time
- Full duplex: send and receive both directions at once

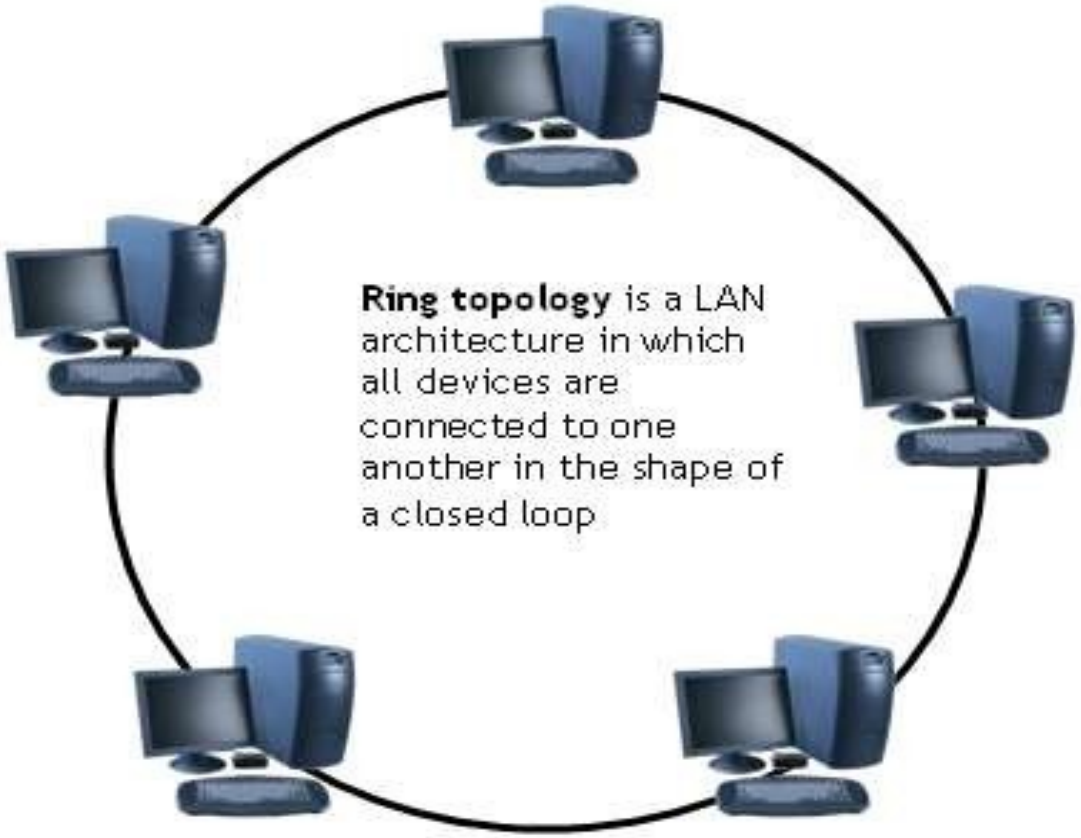
Network Topologies

- Mesh Topology
- Ring Topology
- Bus Topology
- Star Topology

Mesh Topology



Ring Topology

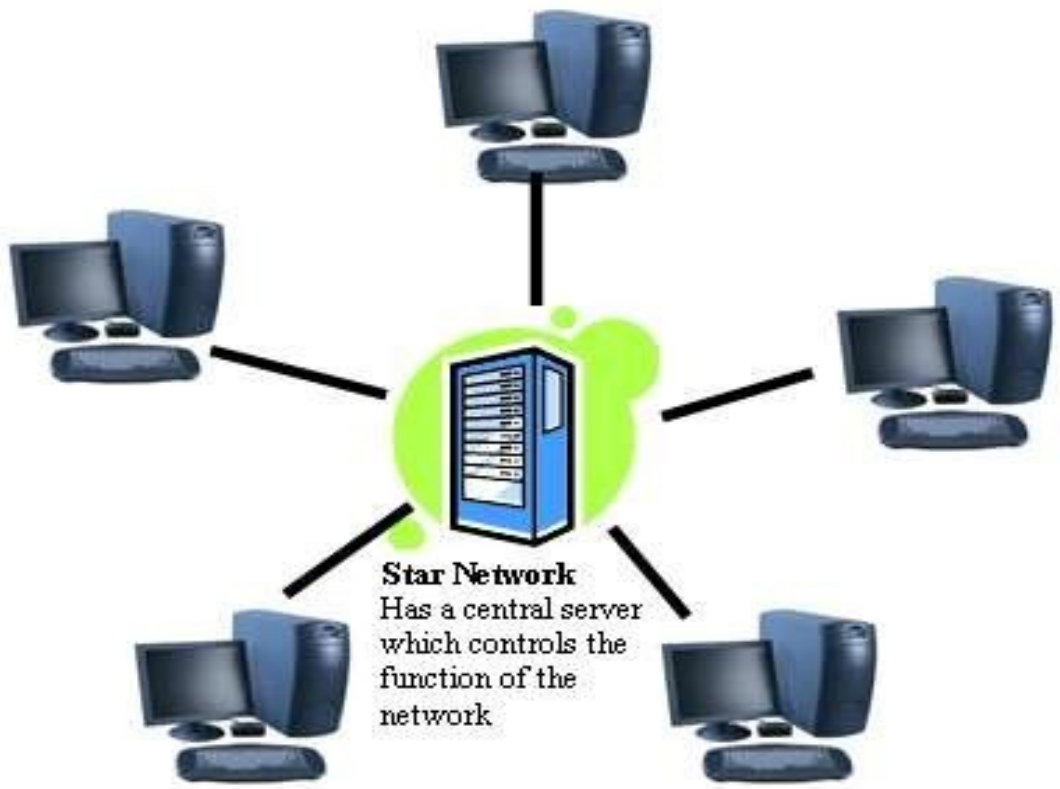


Bus Topology

Bus Topology

In bus topologies, all computers are connected to a single cable or "trunk or backbone", by a transceiver either directly or by using a short drop cable. All ends of the cable must be terminated, that is plugged into a device such as a computer or terminator.

Star Topology



Network Hardware

Bridge

Large networks can be separated into two or more smaller networks using a bridge. This is done to increase speed and efficiency. This type of network is called a segmented LAN and has largely been superseded by the use of switches which can transfer data straight to a computer and thus avoid bottleneck jams which bridges were designed to fix.

Gateway

- **passage to connect two networks together that may work upon different networking models**
- **Often used to connect a LAN with a WAN.**
- **Gateways join two or More different networks together.**

Some more

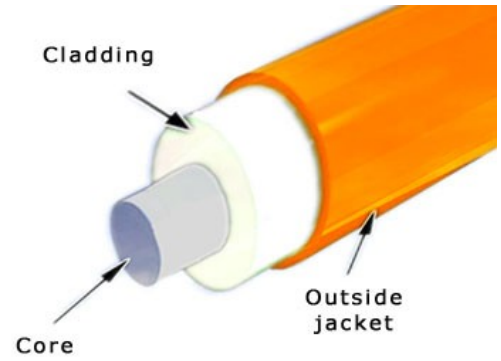
Routers: A router is a networking device that forwards data packets between computer networks. Can be used in place of a switch or bridge.

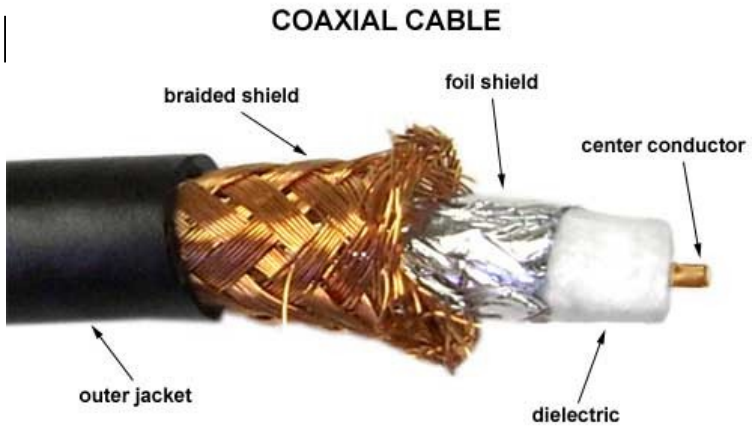
Switches: smart hubs which transmit packets to the
destination port only

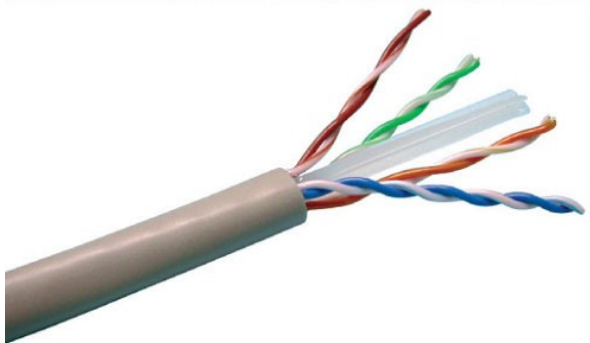
Hubs: like double adapters /power boards in the home
except instead of plugging in extension cords we are plugging

Transmission Media

Twisted pair – Ethernet cable
Coaxial cable –Thick black cable used for higher bandwidth communications than twisted pair (i.e. Optus cable)
Fiber optic – data transferred through pulses of light. Extremely fast.
Non cable methods such as satellite, microwave, wireless and







End of the Lecture