JAIN
DEEMED-TO-BE UNIVERSITY
ONLINE

https://onlinejain.com

# Essentials of Computer Networks

Unit – 10

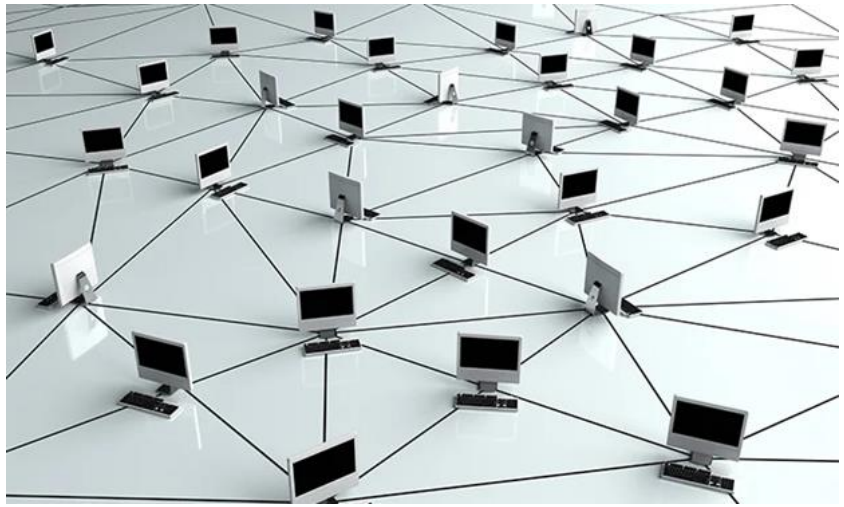
Divya Kshatriya

# Topics for Discussion

- Introduction to Network
- Network Components
- Network Classifications
- Data Representation and Data Flow: Simplex, Half Duplex, Full Duplex
- Network Protocol
- Layered Network Architecture
- OSI Reference Model
- TCP/IP Protocol Suite

# Introduction

When two or more computers and network components are connected to each other for sharing data and resource through any communication channel, that is called Network or Computer Network.



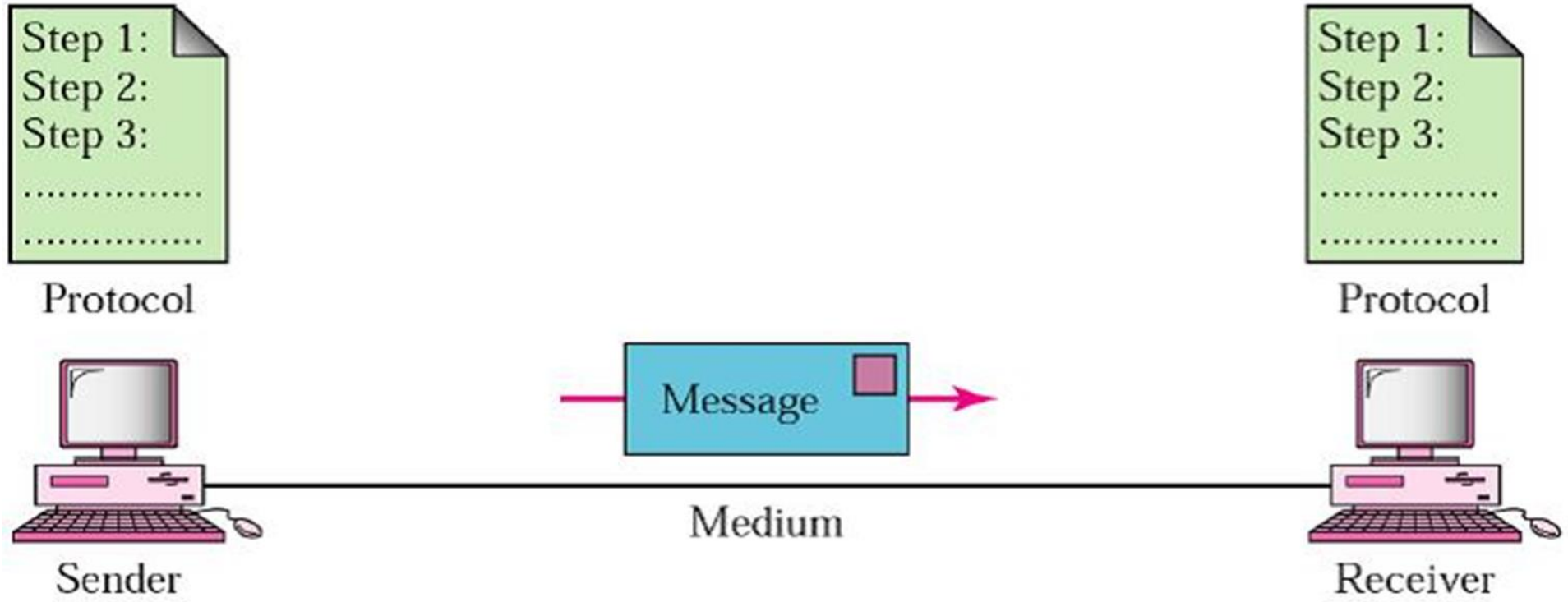
# Characteristics of Data Communication

Delivery: The System must deliver data to the correct destination.

Accuracy: The system must deliver data accurately.

Timeliness: The system must deliver data in a timely mode.

# Network


Step 1:
Step 2:
Step 3:
.....
.....
Protocol
Step 1:
Step 2:
Step 3:
.....
.....
Protocol
Message
Medium
Sender
Receiver

# Components of Networks

- Server: A server is a computer that serves the data to other computers and users. The term “server” usually refers to a computer system that receives a request for a web document and sends the request information to the client.

- Client: The device that send requests, and receives responses from the server, is called a client.

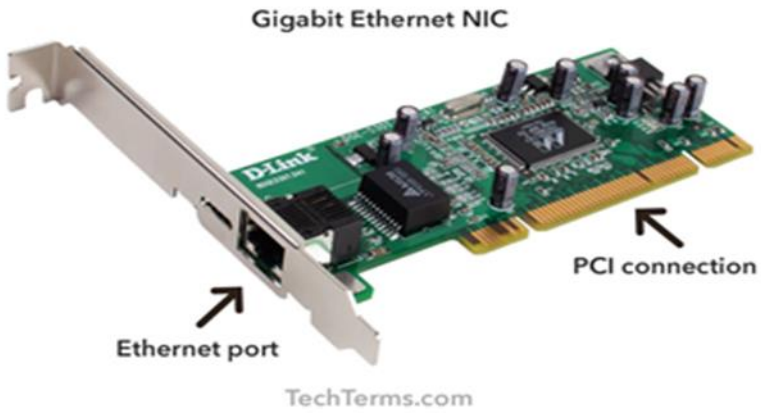
# Components of Networks

- Transmission Media: Transmission media are the medium through which data is transferred from one device to another in a network. Transmission media can be used either in a physical transmission medium or wireless transmission medium.

  - Physical transmission medium includes the use of wires and cables like fiber optic cables, coaxial cable, etc. and wireless transmission medium includes the use of unguided media like infra-red waves, electromagnetic, microwaves, etc.

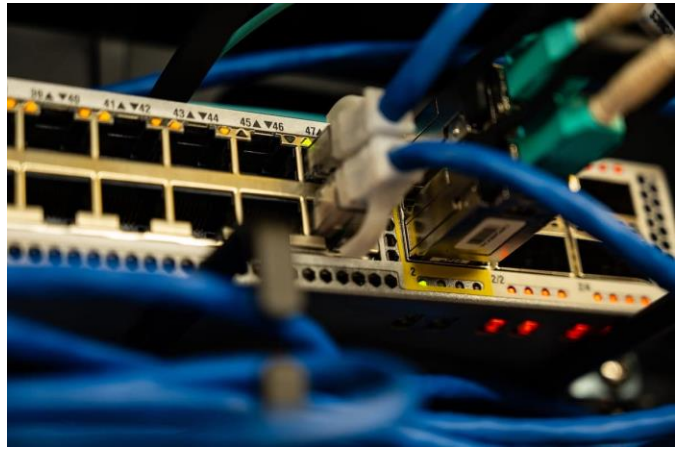
# Components of Networks

- NIC (Network Interface cards): Network Interface cards (NICs) are also called Network Interface Controller, Network adapter, LAN adapter, and Physical Network interface. NIC cards are hardware components used to connect computers with networks. Without NIC a computer cannot be connected to the network.



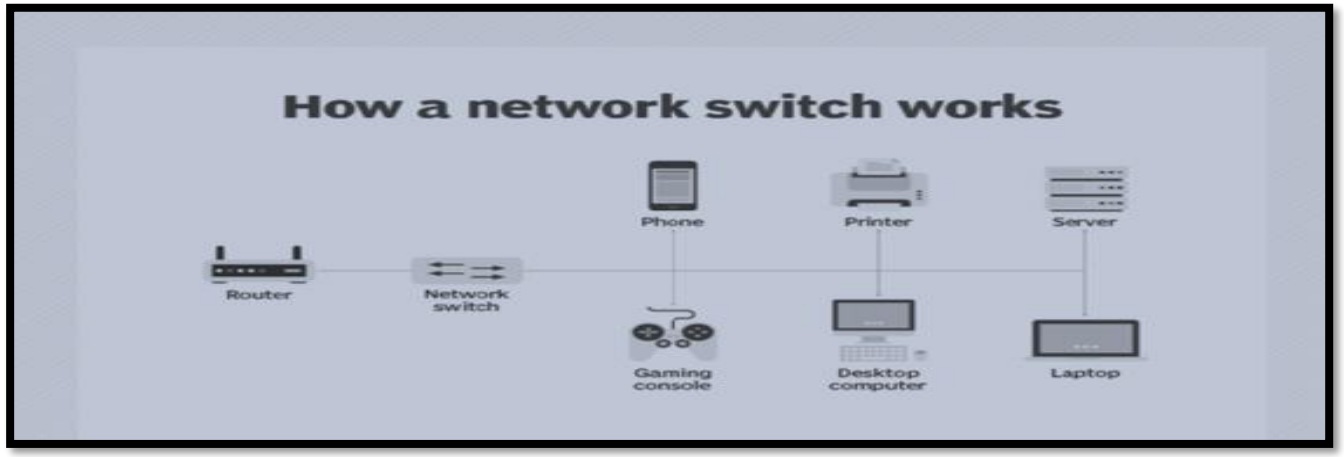
# Components of Networks

- Hub: A hub is a device that splits a network connection among multiple computers. It works similarly to a distribution center. When a computer requests information from one network or from a specific computer, then it sends the request to the hub through a cable. The hub then receives that request and transmits it to the entire network.



# Components of Networks

- Switch: The switch is a component that helps devices to connect the networks so that they can transfer data to other connected devices. These network switches are identical to network hubs, but a switch has more progressive features than a hub. It doesn't broadcast entire data on the network like a hub.

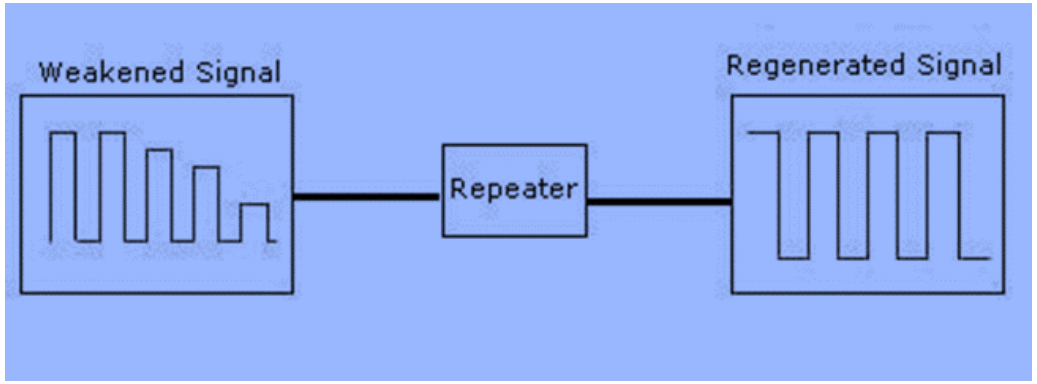


# Components of Networks

- Modem: The full form of the modem is ‘Modulator/Demodulator’. The process of converting a digital signal into an analog signal is called modulation. These components allow a computer device, such as a router or switch, to connect to the Internet. Similarly, when it converts outgoing digital data into an analog signal in a computer device such process is called Demodulation.

# Components of Networks

- Repeater: A repeater is a powerful network component that is used to regenerate signals. With this, the signal is fixed for a long time, so that the strength of the signal remains stable. Repeater takes data signals from the communication medium and amplifies them and sends them back to the communication medium.



# Classification of Network by Users

## Internet:

- The Internet is a global interconnection of computer systems. It is a massive collection of networks sharing information publicly in the form of interlinked web pages. IP or Internet Protocol defines a site's unique location on the World Wide Web.

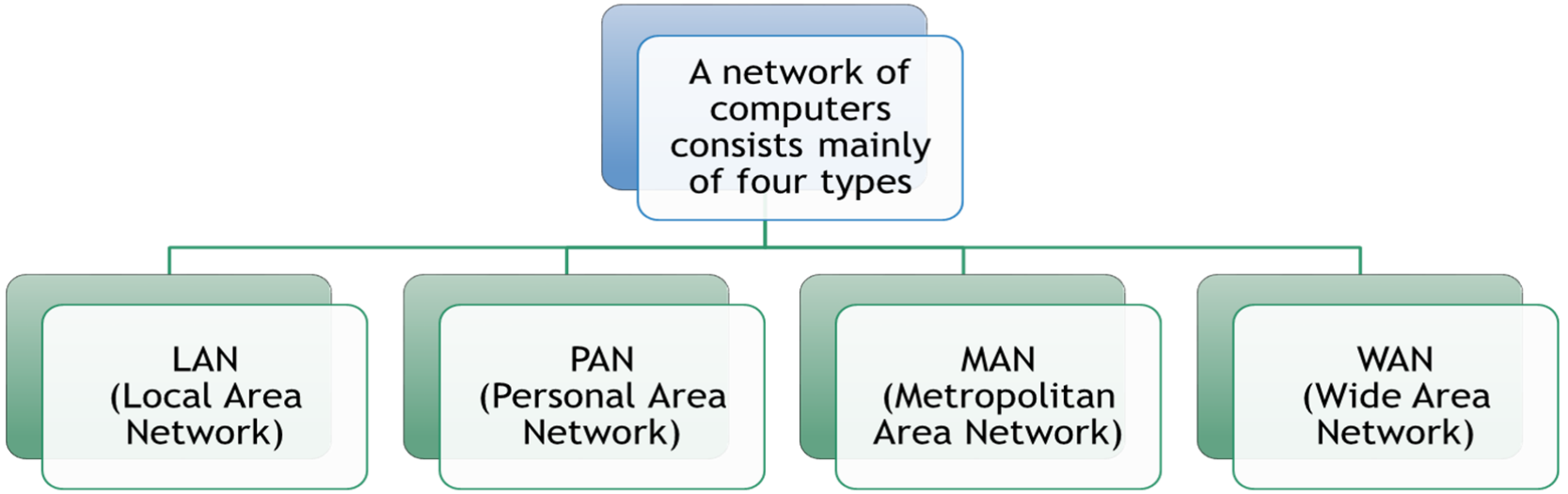
## Intranet:

- An intranet network is only accessible to a small group of people. Intranets are mainly used within businesses and organizations to provide access to files and applications on networked computers and servers. Intranets are sometimes defined as a private Internet.

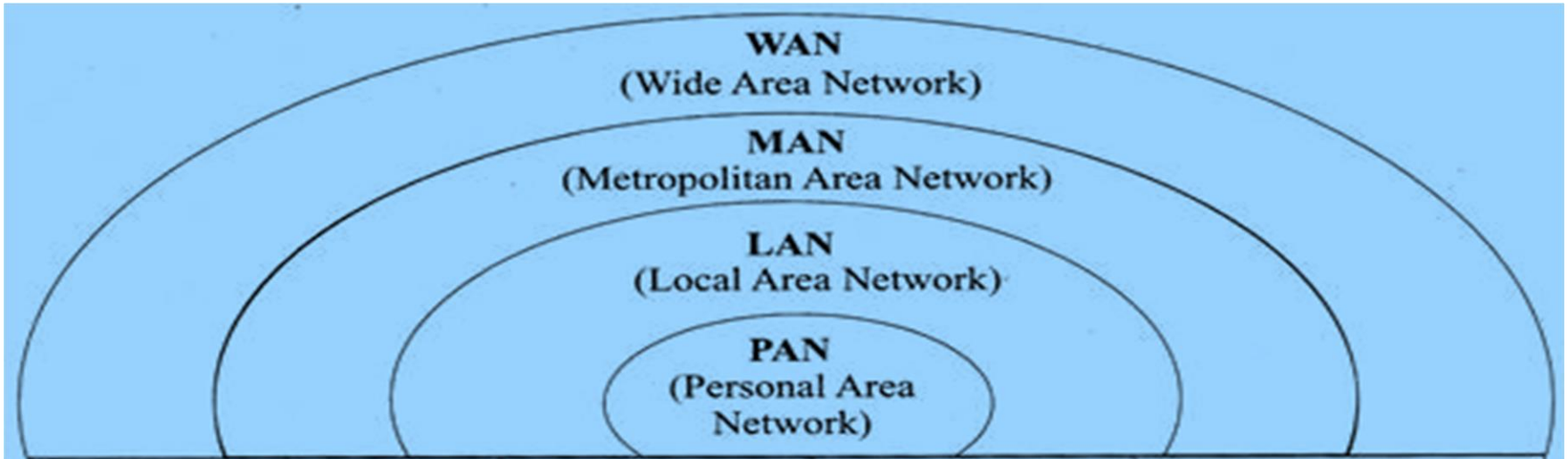
## Extranet:

- An extranet is a controlled private network allowing customers, partners, vendors, suppliers and other businesses to gain information, typically about a specific company or educational institution, and do so without granting access to the organization's entire network. An extranet is often a private part of a website. It is restricted to select users through user IDs, passwords and other authentication mechanisms on a login page.

# Classification of Network on the basis of Area Covered



# Classification of Networks:




| | PAN | LAN | MAN | WAN |
|---|---|---|---|---|
| Standards | Bluetooth, UWB | 802,11 HiperLAN2 | 802, 16 MMDS, LMDS | GSM, GPRS, CDMA, 2.5-3G,802.16 |
| Speed | < 1 Mbps | 11 to 54 Mbps | 11 to 100 + Mbps | 100 to 384Mbps |
| Range | Short | Medium | Medium-Long | Long |
| Applications | Peer-to-Peer Device-to-Device | Enterprise networks | T1 replacement, last mile access | PDAs, Mobile Phones, cellular access |

# Data Representation

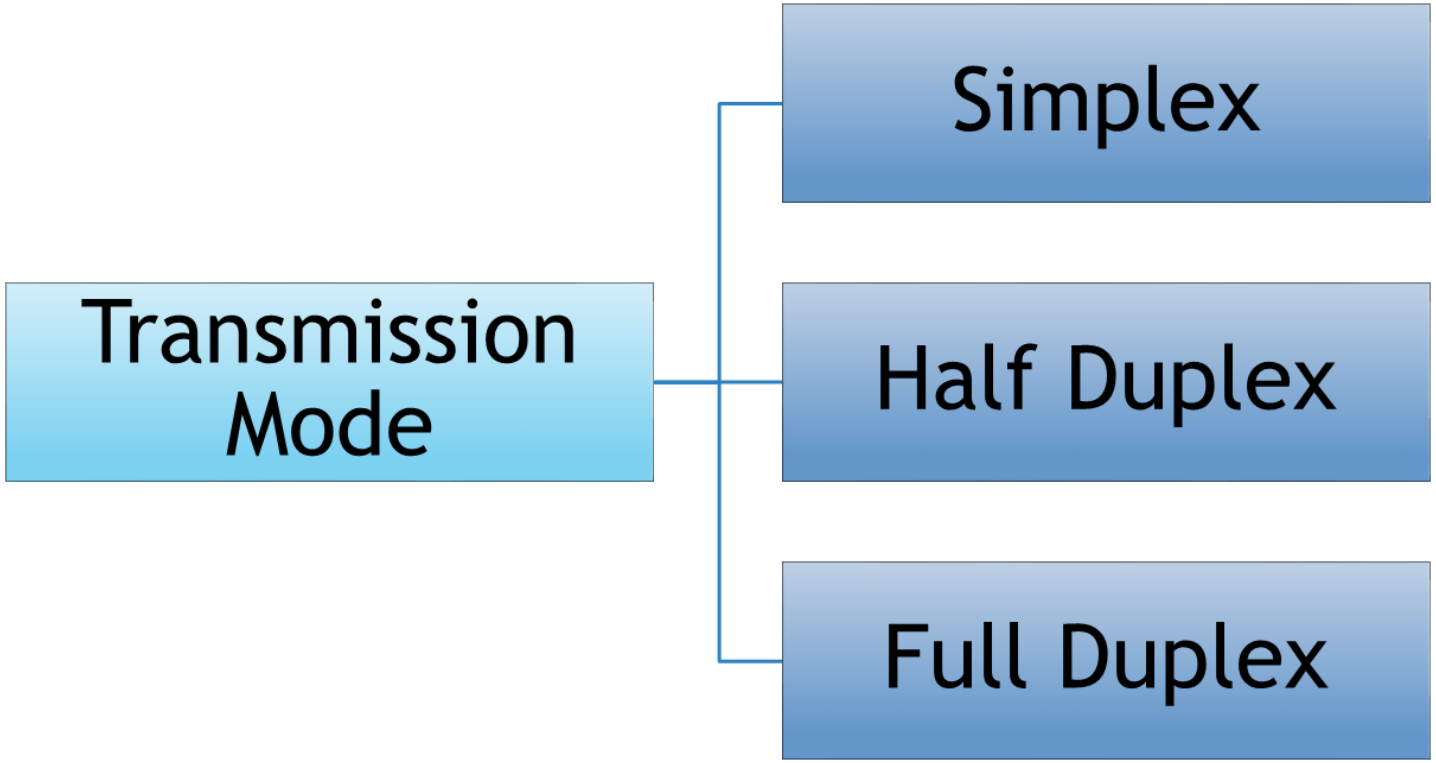
**Numbers:** Numbers can also be identified by bit patterns. However a code such as ASCII is not used to identify numbers as the number is directly converted to a binary number.

**Images:** Images are mostly identified by bit patterns. An image consists of pixels (a matrix form of picture elements).The resolution of a picture/image is calculated as no. of pixels per unit area that decides the picture clarity.

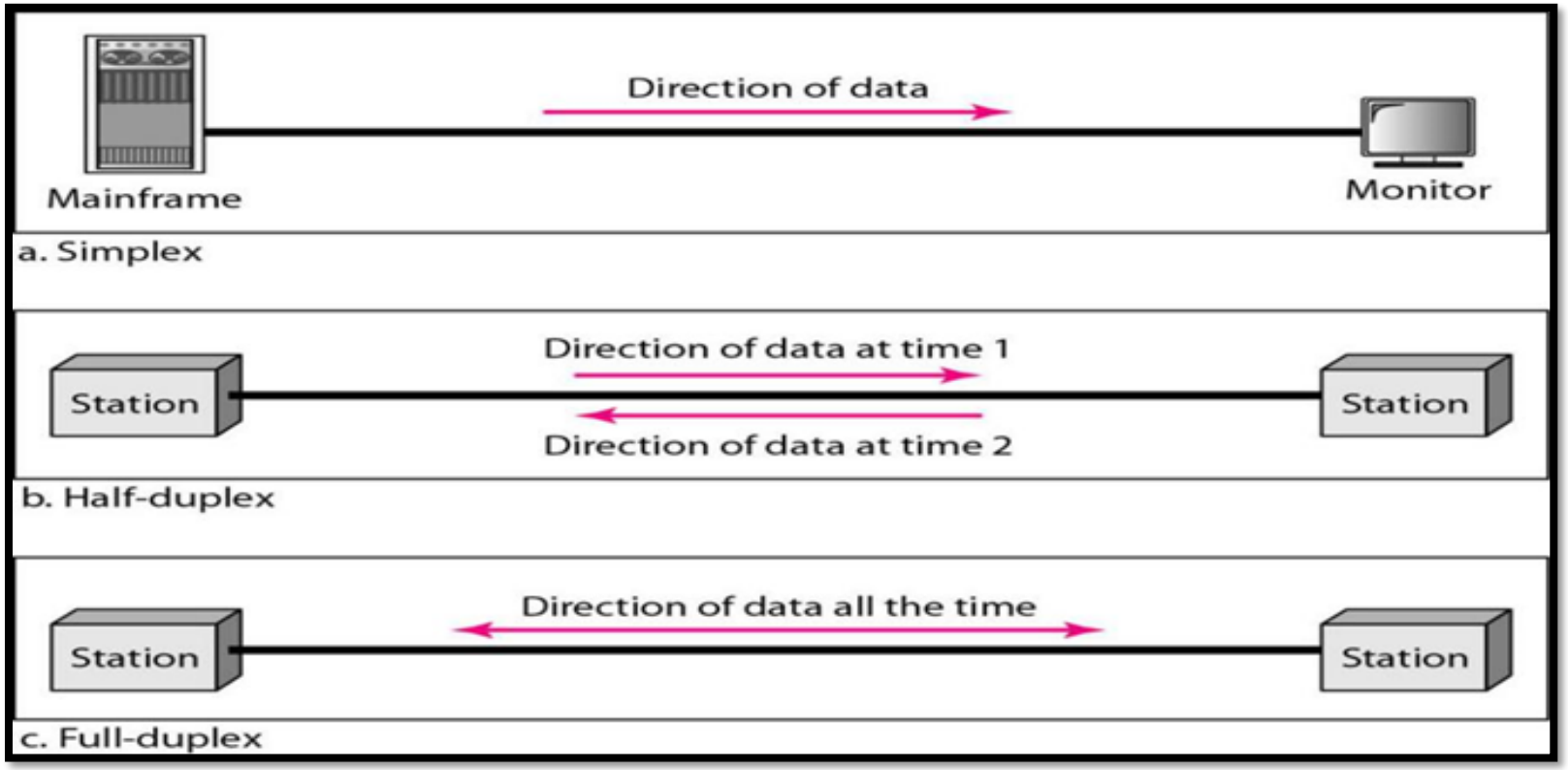
**Audio:** Audio is a medium for representation of sound. It is different from text, numbers or images. It is continuous, not discrete.

**Video:** Video can be created either as a continuous entity (e.g. by a TV or video camera) or it can be a mix of images, arranged in order to convey the idea of motion. Video may be mixed with audio called composite video.

# Mode of Data Communication



# Mode of Data Communication



# Network Protocol

- A network protocol is an established set of rules that determine how data is transmitted between different devices in the same network. Essentially, it allows connected devices to communicate with each other, regardless of any differences in their internal processes, structure or design.

# Layered Tasks

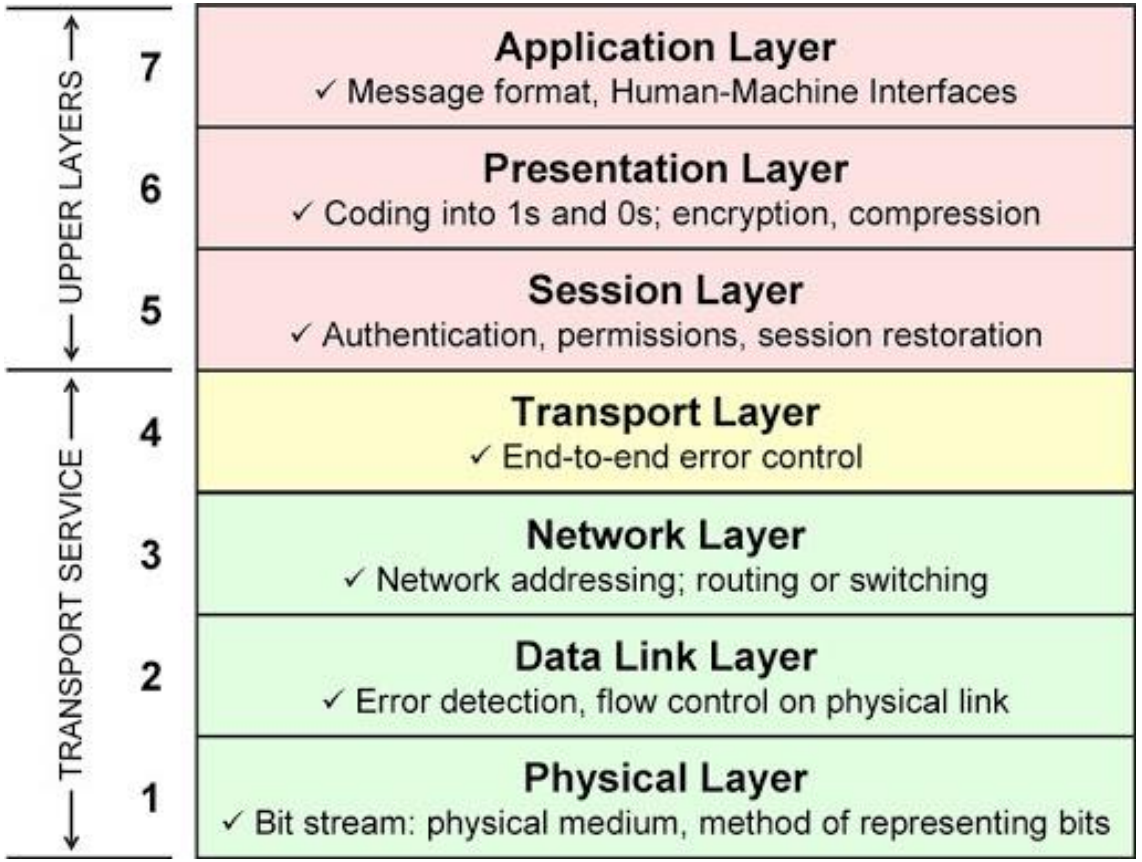
- In the Network Model layered architecture, one complete network process is split into many smaller tasks.
- Each individual small task is then assigned to a specific layer which works dedicatedly only to process that task.
- In order to transfer the information over a network from one device to another, the data must travel down the different layers of the reference model on the sending device and then travel up the different layers on the receiving device.

# Layers of OSI Model

An OSI model consists of seven different layers which are typically described from the top to bottom. In order from seven to one, the layers are as follows:

- 7) Application Layer
- 6) Presentation Layer
- 5) Session Layer
- 4) Transport Layer
- 3) Network Layer
- 2) Data Link Layer
- 1) Physical Layer

# OSI LAYERS & THEIR FUNCTIONS



# TCP/IP MODEL

The term TCP/IP refers to a suite of protocols for data communication. The name is misleading since only two of the dozens of protocols that form the suite are TCP and IP. Two of the most important protocols in the suite come from its name: the Transmission Control Protocol (TCP), and the Internet Protocol (IP).

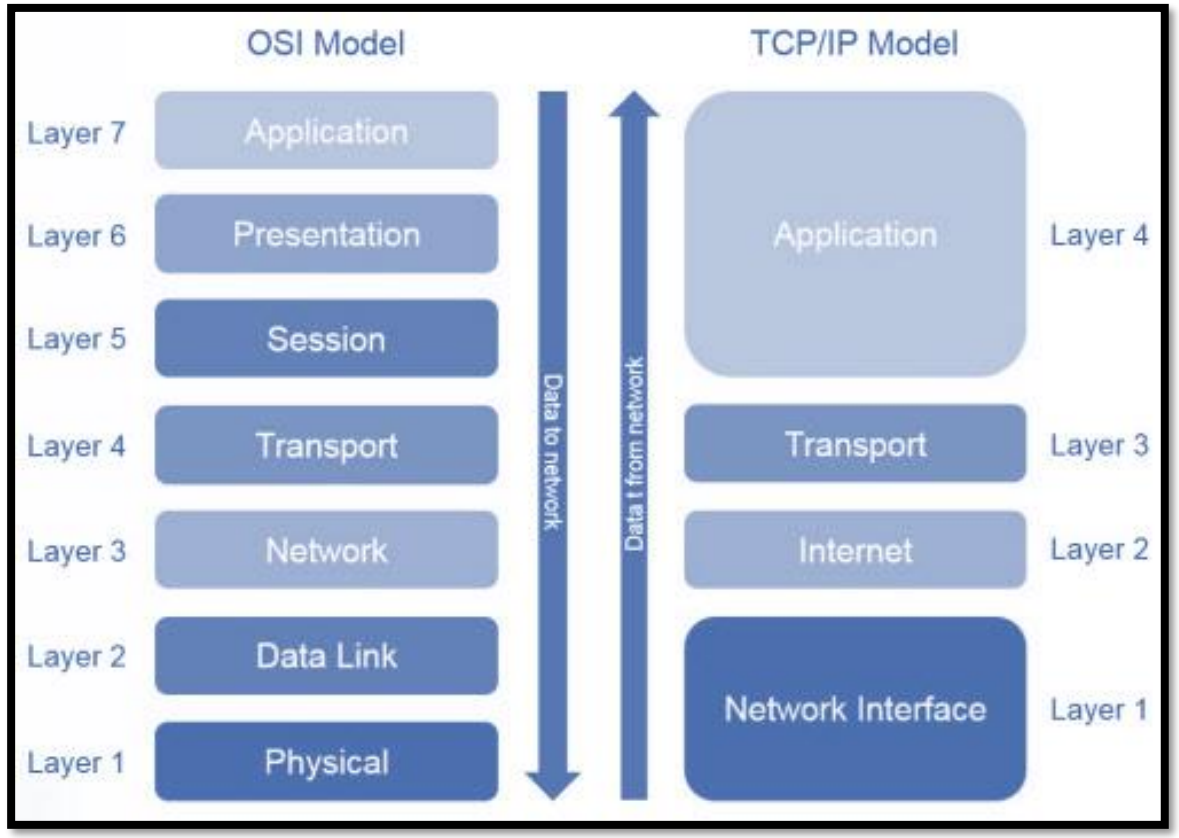
TCP/IP emerged out of the Department of Defense (DoD)'s investigative research into networking protocols launched in 1969. The DoD Advanced Research Projects Agency (ARPA) began studying the network technology now known as packet switching in 1968.

It is also referred to as the DoD protocol suite, or the Internet protocol suite, because of the history of the TCP/IP protocol suite.

# Layers of TCP/IP MODEL

| TCP/IP | OSI Model | Protocols |
|---|---|---|
| Application Layer | Application Layer | DNS - DHCP - FTP - HTTPS - LDAP - NTP - POP3 - RTP - RTSP - SSH - SIP - SMTP - Telnet - TFTP |
| | Presentation Layer | JPEG - MIDI - MPEG - PICT - TIFF |
| | Session Layer | NetBIOS - NFS - PAP - SCP - SQL - ZIP |
| Transport Layer | Transport Layer | TCP - UDP |
| Internet Layer | Network Layer | ICMP - IGMP - IPsec - IPv4 - IPv6 - IPX - RIP |
| Link Layer | Data Link Layer | ARP - ATM - CDP - FDDI - Frame Relay - HDLC - MPLS - PPP - STP - Token Ring |
| | Physical Layer | Bluetooth - Ethernet - DSL - ISDN - 802.11 - WiFi |

# OSI Model & TCP/IP MODEL



# Conclusion

*Information and communication are two of the most important strategic issues for the success of every enterprise. The new paradigm of organization of computer systems produced by the need to merge computers and communications. They are the means to converge the two areas; the unnecessary distinction between tools to process and store information and tools to collect and transport information can disappear. Computer networks can manage to put down the barriers between information held on several (not only computer) systems. Only with the help of computer networks can a borderless communication and information environment be built.*

JAIN DEEMED-TO-BE UNIVERSITY | ONLINE

# Q & A


THANK YOU