23EC506: DATA COMMUNICATION & COMPUTER NETWORKS

Unit - I

Topic: DATA COMMUNICATIONS & PHYSICAL LAYER

MR. M SUDHAKAR

ASSISTANT PROFESSOR,

ELECTRONICS AND COMMUNICATION ENGINEERING
NARSIMHA REDDY ENGINEERING COLLEGE (AUTONOMOUS)
SECUNDERABAD, TELANGANA, INDIA - 500100.

1.Data Communications and Computer Networks

COMPREHENSIVE PPT ON DATA COMMUNICATIONS AND PHYSICAL LAYER CONCEPTS

Introduction to Data Communications

- Exchange of data between devices
- Uses transmission media
- Enables sharing of information and resources
- Fundamental part of computer networking

Components of Data Communication

1. Message
2. Sender
3. Receiver
4. Transmission Medium
5. Protocol

Direction of Data Flow

- Simplex: One-way communication
- Half Duplex: Both directions, one at a time
- Full Duplex: Simultaneous two-way communication

Computer Networks

- Interconnection of computers and devices
- Enables communication and resource sharing
- Uses protocols and transmission media

Components of Networks

- Nodes
- NIC (Network Interface Card)
- Transmission Media
- Routers and Switches
- Protocols

Categories of Networks

- LAN – Local Area Network
- MAN – Metropolitan Area Network
- WAN – Wide Area Network

Types of Connections

- Point-to-Point Connection
- Multipoint Connection

Network Topologies

- Bus
- Star
- Ring
- Mesh
- Tree
- Hybrid

Bus Topology

- Single backbone cable
- Low cost
- Easy installation
- Difficult fault isolation

Star Topology

- Central hub/switch
- Easy maintenance
- High reliability
- Hub failure affects network

Ring and Mesh Topology

Ring:

- Circular connection
- Data travels sequentially

Mesh:

- Every node connected to others
- Highly reliable

Protocols and Standards

Protocols:

- TCP/IP
- HTTP
- FTP

Standards Organizations:

- ISO
- IEEE
- ITU-T

OSI Model Overview

7 Layers:

1. Application
2. Presentation
3. Session
4. Transport
5. Network
6. Data Link
7. Physical

Application to Transport Layers

- Application – User services
- Presentation – Translation & encryption
- Session – Session management
- Transport – Reliable delivery

Network to Physical Layers

- Network – Routing
- Data Link – Framing & error control
- Physical – Bit transmission

ATM Network

Asynchronous Transfer Mode:

- High-speed switching
- Fixed-size cells
- Supports voice, video, and data

Frame Relay

- WAN packet switching technology
- Efficient data transfer
- Low overhead

ISDN

Integrated Services Digital Network:

- Digital communication system
- Supports voice and data
- BRI and PRI services

Physical Layer

- Lowest layer of OSI model
- Responsible for transmission of raw bits
- Defines media and signaling

Transmission Modes

- Parallel Transmission
- Serial Transmission
- Asynchronous
- Synchronous
- Isochronous

Multiplexing

- Combines multiple signals into one channel

Types:

- FDM
- TDM
- WDM

Transmission Media

Guided Media:

- Twisted Pair
- Coaxial Cable
- Optical Fiber

Unguided Media:

- Radio Waves
- Microwaves
- Infrared

Switching Techniques

- Circuit Switching
- Packet Switching
- Message Switching

Circuit Switched Networks

- Dedicated communication path
- Reliable communication
- Used in telephone systems

Datagram Networks

- Connectionless communication
- Packets travel independently
- Example: Internet

Virtual Circuit Networks

- Logical path established before transfer
- Connection-oriented
- Used in ATM and Frame Relay

Advantages and Disadvantages

Advantages:

- Efficient communication
- Resource sharing

Disadvantages:

- Security risks
- Network failures

Applications of Data Communication

- Internet
- Banking
- E-commerce
- Online education
- Video conferencing

Conclusion

- Data communication forms backbone of modern networks
- Physical layer enables reliable transmission
- OSI model standardizes networking