CS311: DATA COMMUNICATION

Course Overview

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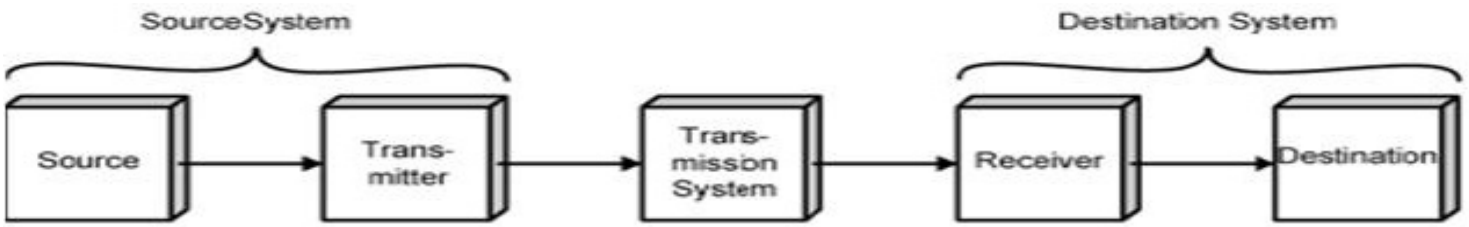
A Simple Data Communication Model



- Source : Where the data is originated
- Transmitter : Converts data into a suitable form for transmission through the medium
- Communication system :Medium through which signal is sent
- Receiver : Which receives the signal and converts it into data or message
- Destination : Where the data is sent

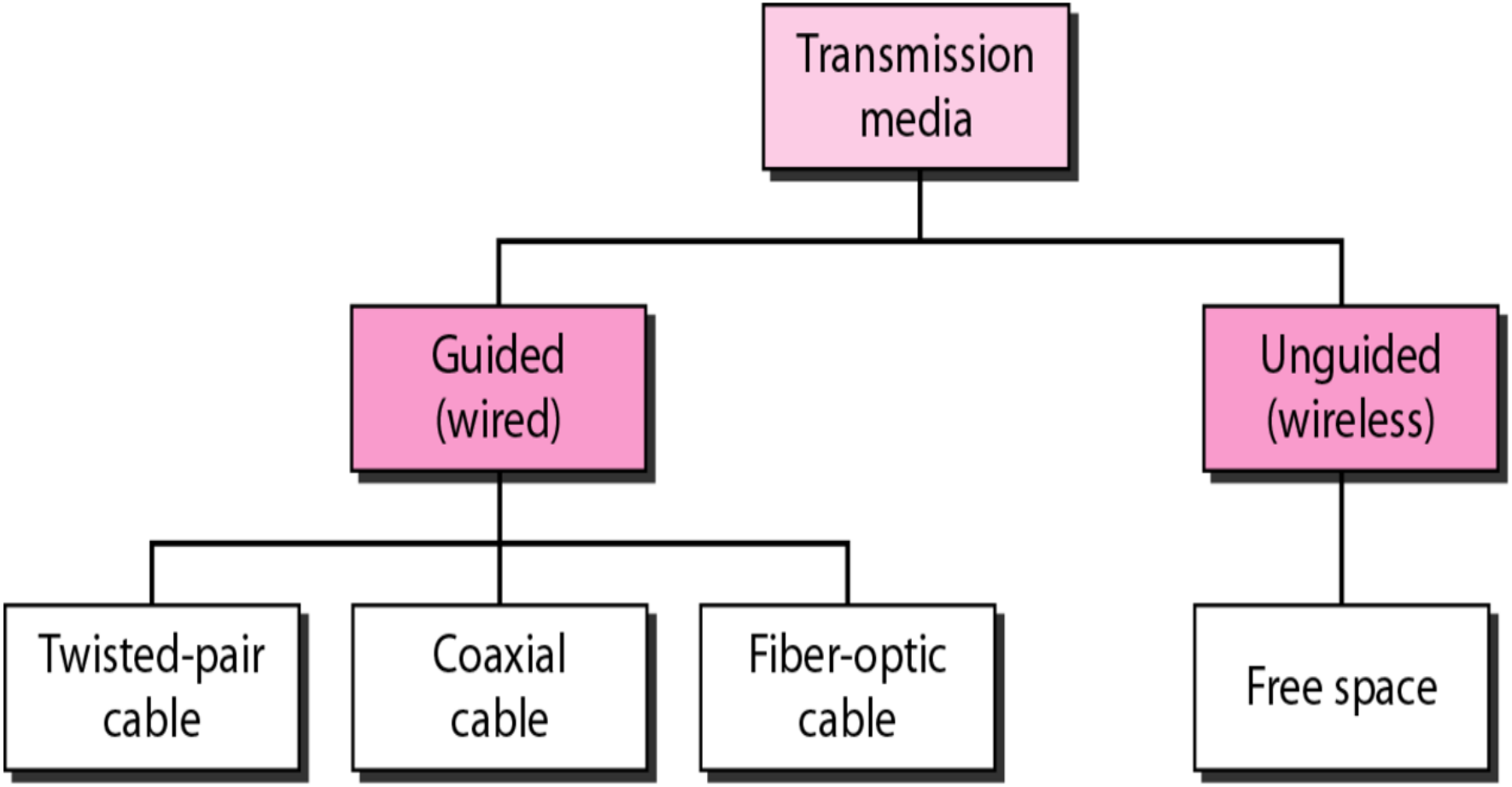
Data And Signal

- Data and data types
- Analog and digital data
- Signal and signal Types
- Examples of Analog and Digital Signals
- Periodic Signal characteristics
- Time and frequency domain representation
- Spectrum and bandwidth of a signal
- Propagation time and wavelength

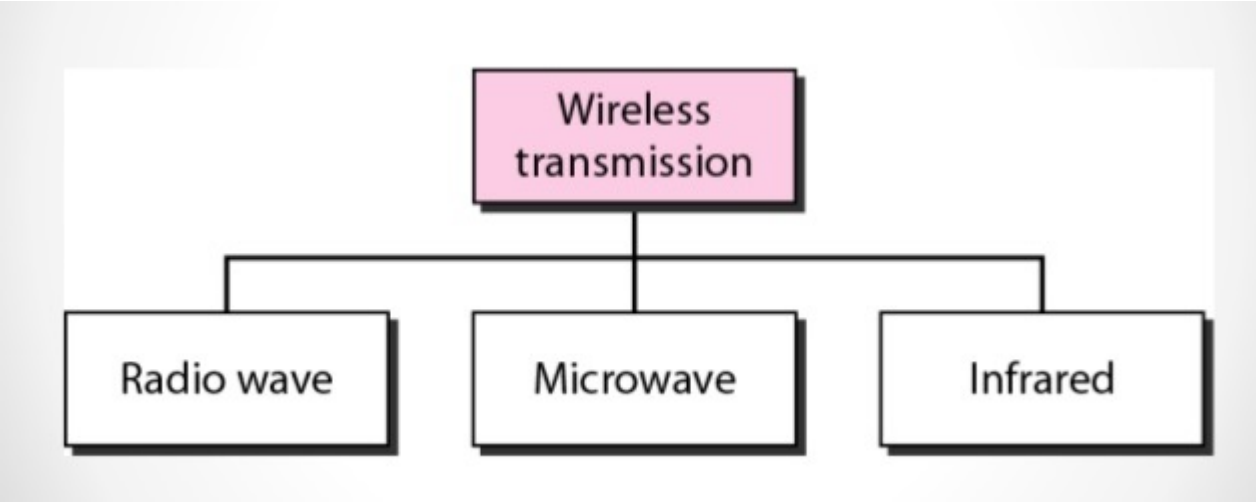
Transmission Impairments and Channel Capacity

- Sources of impairments
- Attenuation and Unit of Attenuation
- Bandwidth of a medium
- Distortions
- Data Rate Limits
- Nyquist Bit Rate
- Bit Rate and Baud Rate
- Noise sources
- Shannon Capacity in a Noisy Channel

Transmission media



Transmission Media



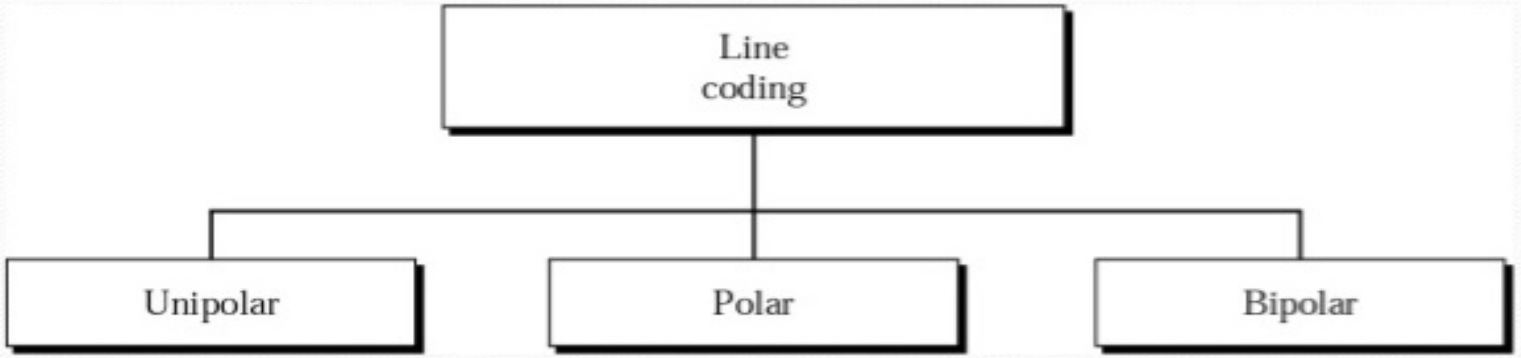
- Broadcast Radio , Terrestrial microwave
- Satellite Microwave , Infrared Communication

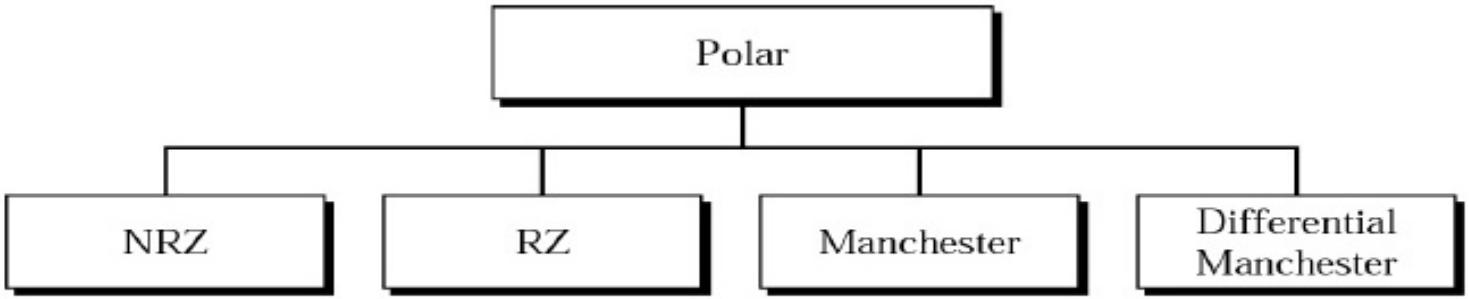
Conversion Techniques

Data	Signal	Approach
Digital	Digital	Encoding
Analog	Digital	Encoding
Analog	Analog	Modulation
Digital	Analog	Modulation

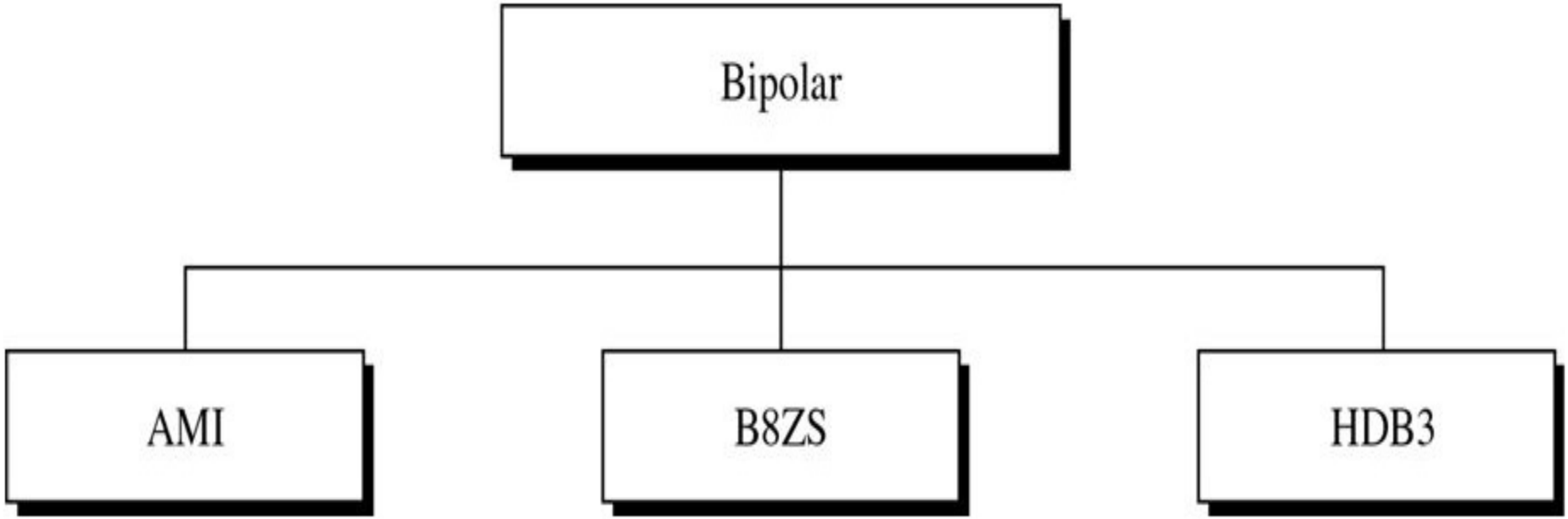
- What type of signal should we use
- It depends on the situation and available bandwidth

Coding Techniques





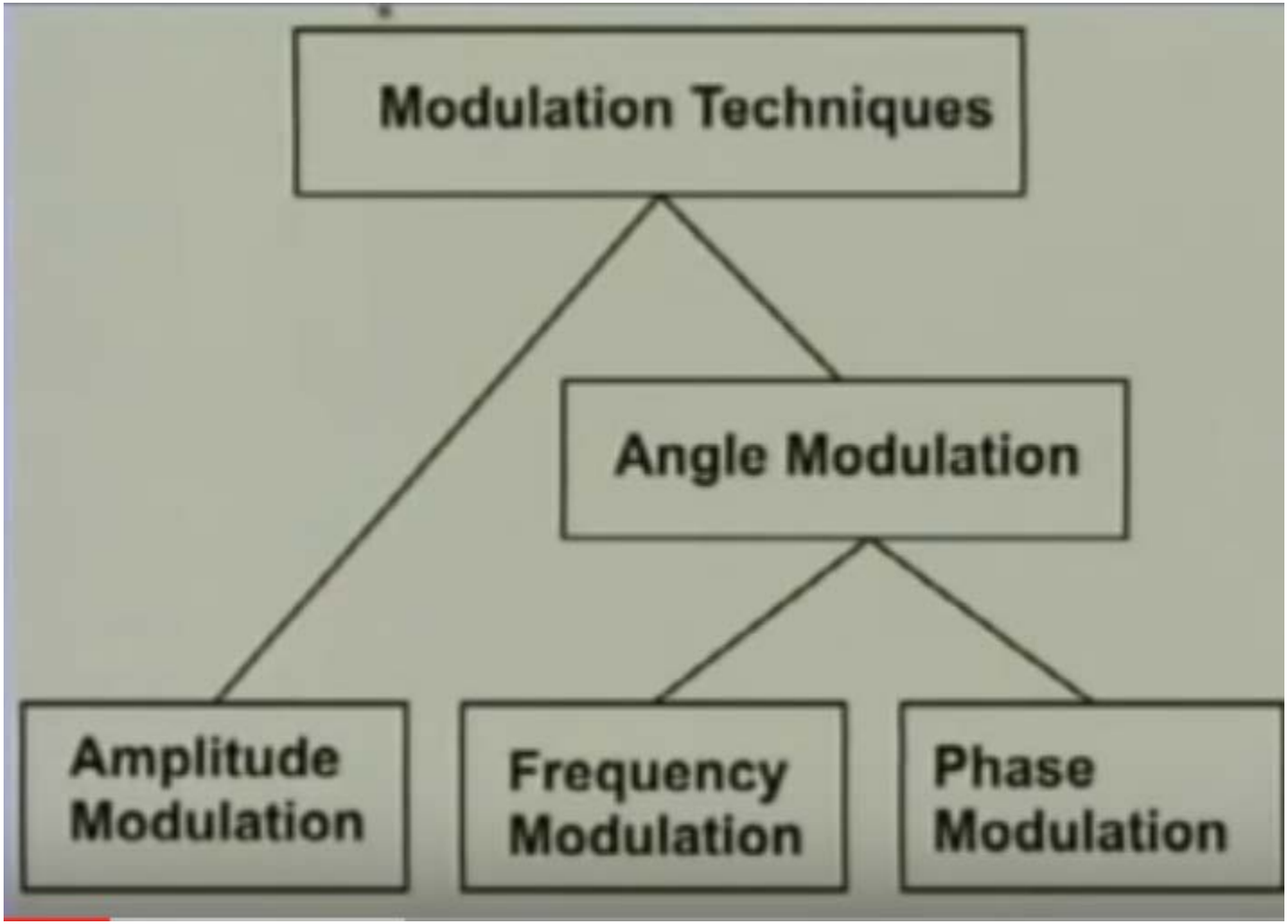
Biopolar Coding Schemes



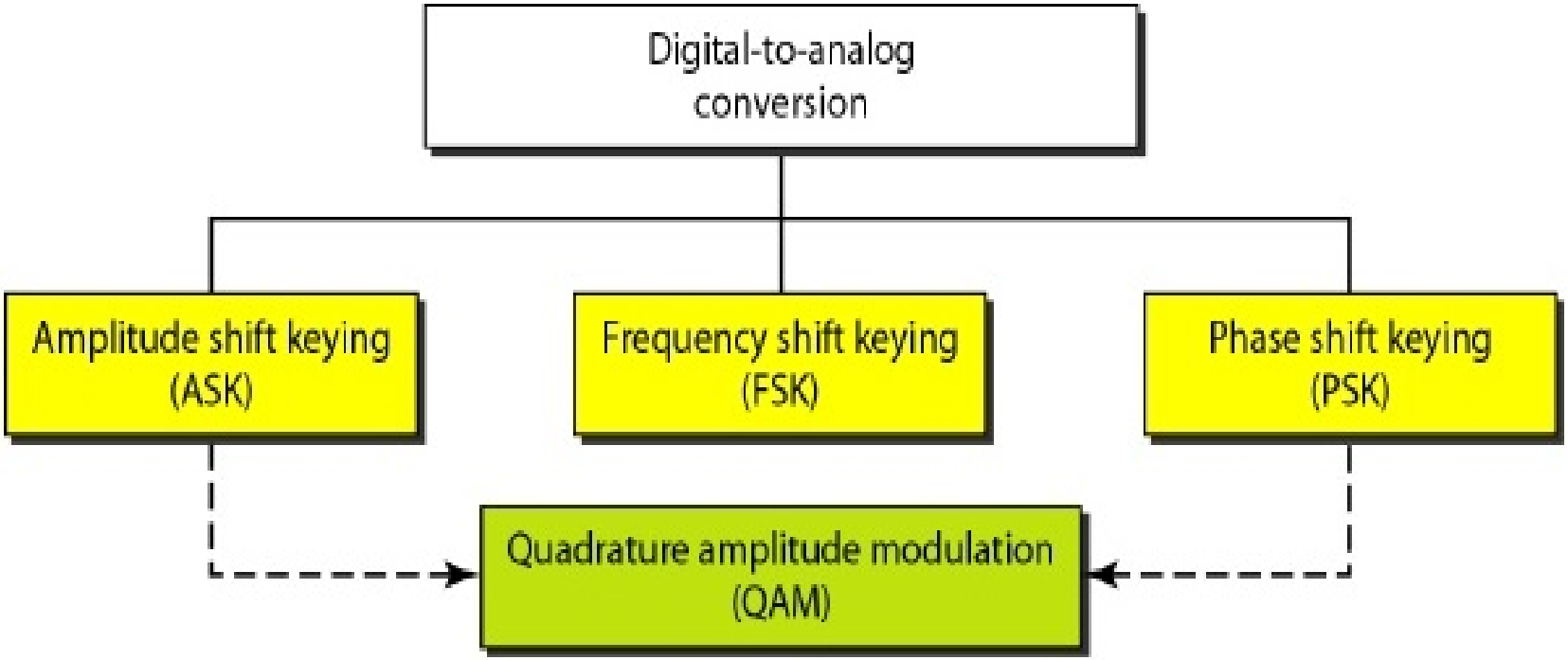
Analog Data to Digital Signal

- Two basic approaches :
  - Pulse code Modulation
  - Delta Modulation
- Limitations of PCM and DM
- Comparison of the two approaches

Analog Data to Analog Signal



Digital-to Analog Modulation



Multiplexing Techniques

- Basic concepts of Multiplexing
- Frequency Divison Multiplexing
- Wavelength Divison Multiplexing
- Time Divison Multiplexing
  - Synchronous
  - Asynchronous
- Inverse TDM

Multiplexing Applications

- The telephone system
  - Analog Services
  - Digital services
- DSL Technology : ADSL, SDSL, HDSL and VDSL
- Cable Modem
  - Hybrid Fiber-Coaxial (HFC) Network
- SONET

Interfacing

- The Interface
- Modes of Communication
  - Parallel and Serial
  - Simplex, Full-duplex and half-duplex
  - Asynchronous and synchronous
- DTE and DCE Interface
  - RS-232
  - Null Modem
- Standard MODEMS

Error Detection and Correction

- Types of error
  - Single bit error
  - Burst error
- Error detection techniques
  - Parity checks
  - Two dimensional parity check
  - Checksum
  - Cyclic redundancy check
- Error correcting codes

Flow and Error Control

- Flow control techniques
  - Stop-and-wait flow control
  - Sliding window flow control
- Performance of the flow control techniques
- Backward error correction techniques:
  - Stop-and-wait ARQ
  - Go-back-N ARQ
  - Selective-Repeat ARQ

Data Link Control

- Key Components of data link control
  - Frame synchronization
  - Flow control
  - Error control
  - Link management
- High-level Data link control (HDLC)
  - Types of stations
  - Data transfer modes
  - Frame format

Data Communication through WAN

- Issues Involved in WAN
  - Switching Techniques
  - Routing
  - Congestion control
  - Medium Access control
- Frame relay, X.25 and ATM
- Cellular telephone system
- Satellite communication

Switching Techniques

- Switched communicatin network
- Circuit switching fundamentals

  Advantages and disadvantages
- Switching concepts

  Space Divison switching

  Crosswar switching

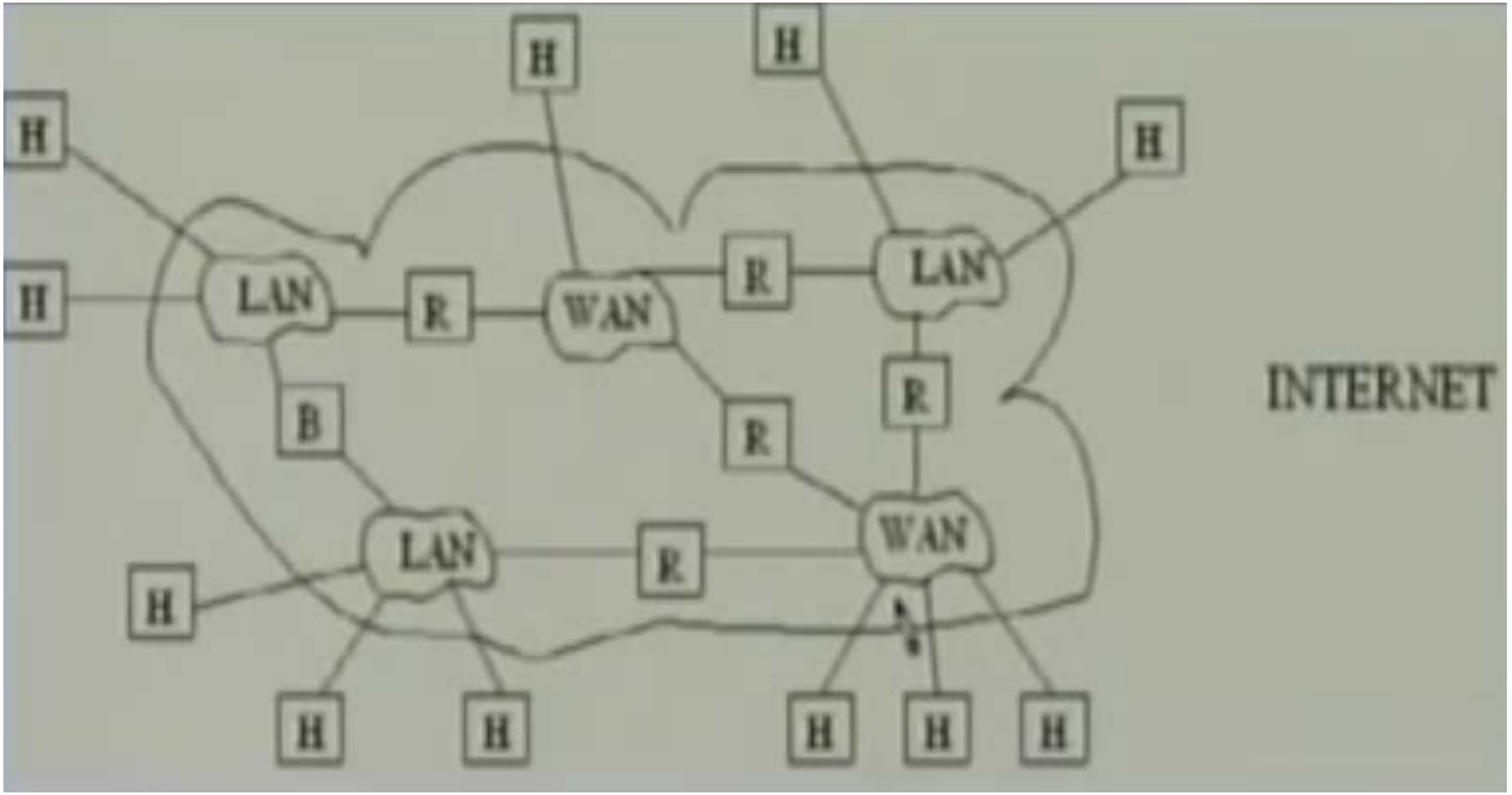
  Time divison swirtching
- Message switching and packet switching

  Virtual circuit and datagram approaches

Data Communication through LAN

- Issues involved in LAN
- Who, What and When?
  - Addressing
  - Error detection
  - Transmission Media
  - Topology
  - Medium Access control
- High speed LANs
- Wireless LANs

The Internet



Data Communication Through Internet

- Segmentation and reassembly
- Encapsulation
- Connection control
- Ordered Delivery
- Addressing
- Multiplexing
- TCP/IP
- Data Compression
- Data encryption
- Transmission Services (Priority Grade of service and Security)

Layered Architecture

- Why Layered Approach ?
- What is layered approach
- Basic Principles of Layered Approach
- Layers and Interfaces
- Entity and Protocols
- Services and services access Points
- Types of services
- Service primitives
- ISO's OSI Reference Model
- Functions of different Layers of OSI Model

Lecture Sequence

1. Introduction and Course Outline
2. Layered Architecture
3. Data & Signals
4. Transmission Impairments and Channel Capacity

5. Guided Transmission Media
6. Unguided Transmission Media
7-8. Transmission of Digital Signal
9-10. Transmission of Analog Signal
11. Multiplexing Techniques

Cont…

12. The Telephone System and DSL Technology
13. Error Detection and Correction
14. Flow and Error Control
15. Data Link Control
16. Circuit Switching
17. Packet Switching

18. Routing in Packet Switching Network
19. Congestion Control in Packet Switching Network
20-25. Medium Access Control Techniques

Thanks!