

Introduction

by

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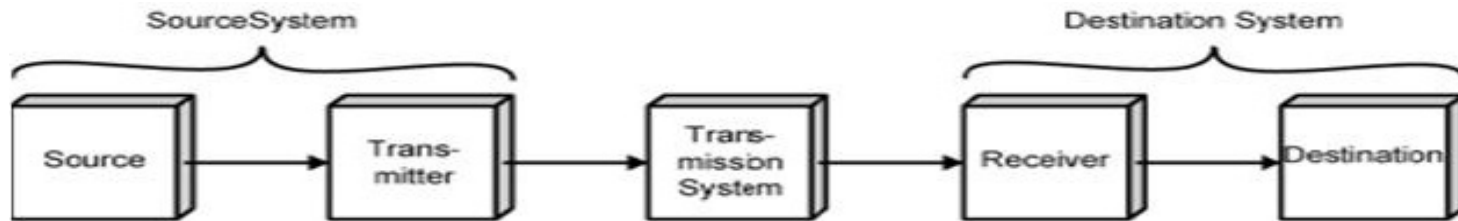
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A Simple Data Communication Model



- 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



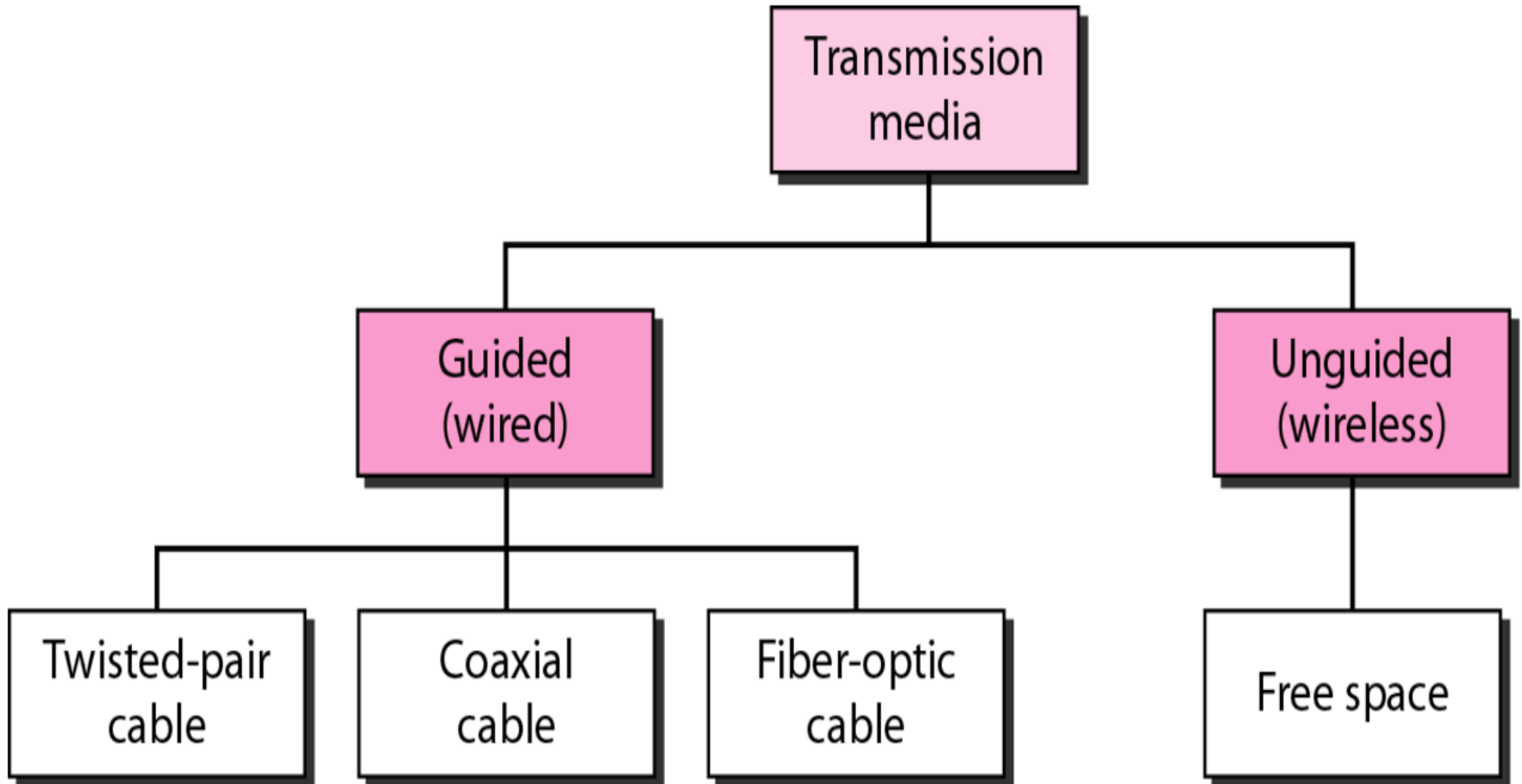
- Data and data types
- Analog and digital data
- Signal and signal Types
- Examples of Analog and Digital Signals
- Periodic Signal characteristics
- Time and frequency domain representation
- Spectrum and bandwidth of a signal
- Propagation time and wavelength

Transmission Impairments and Channel Capacity

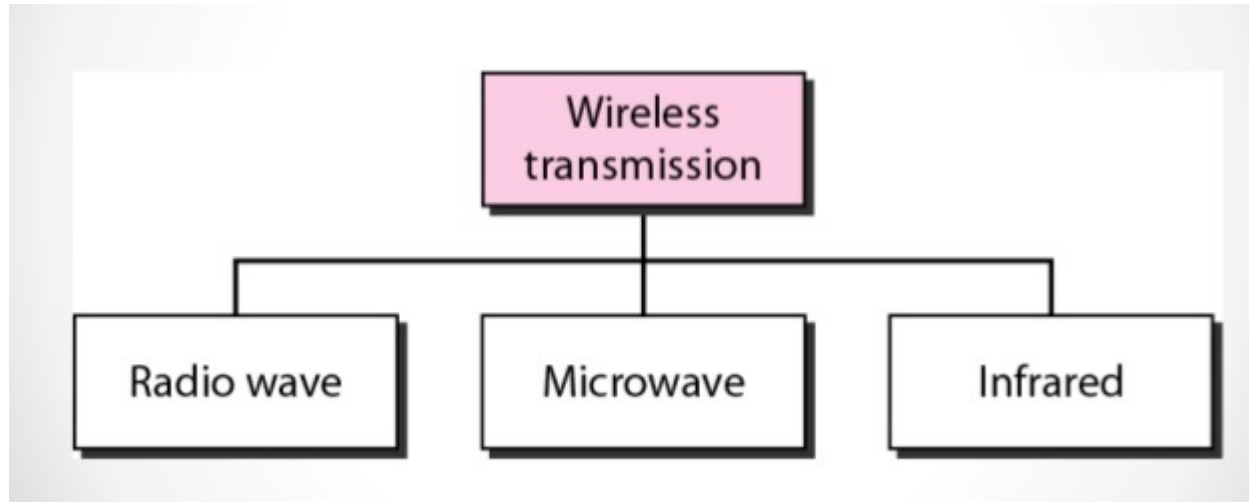


- Sources of impairments
- Attenuation and Unit of Attenuation
- Bandwidth of a medium
- Distortions
- Data Rate Limits
- Nyquist Bit Rate
- Bit Rate and Baud Rate
- Noise sources
- Shannon Capacity in a Noisy Channel

Transmission media



Transmission Media



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

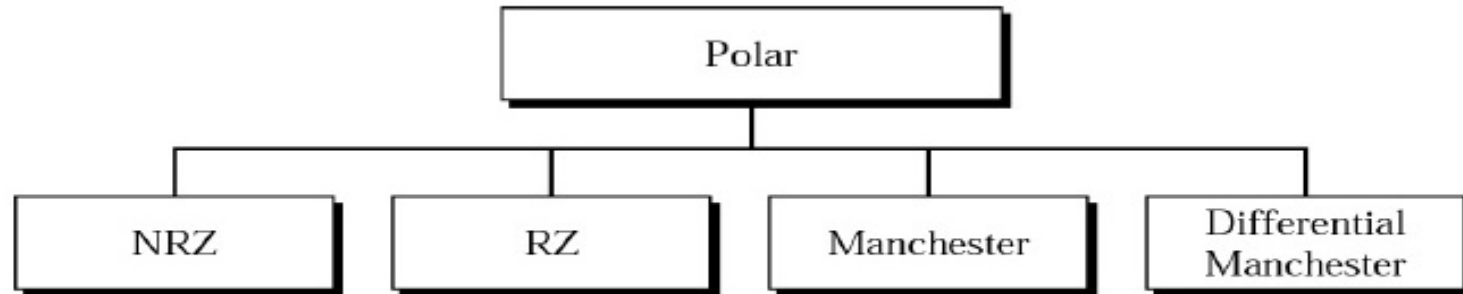
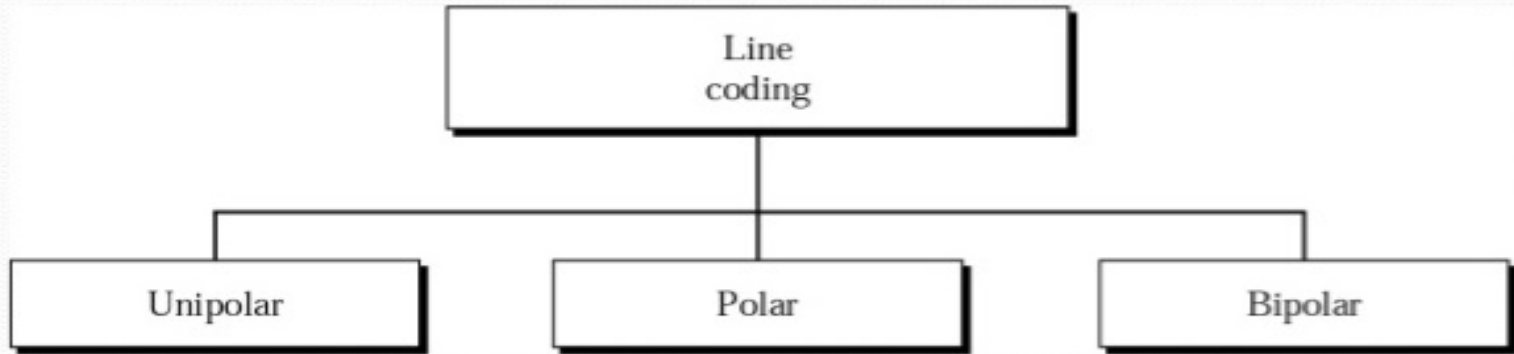
Conversion Techniques



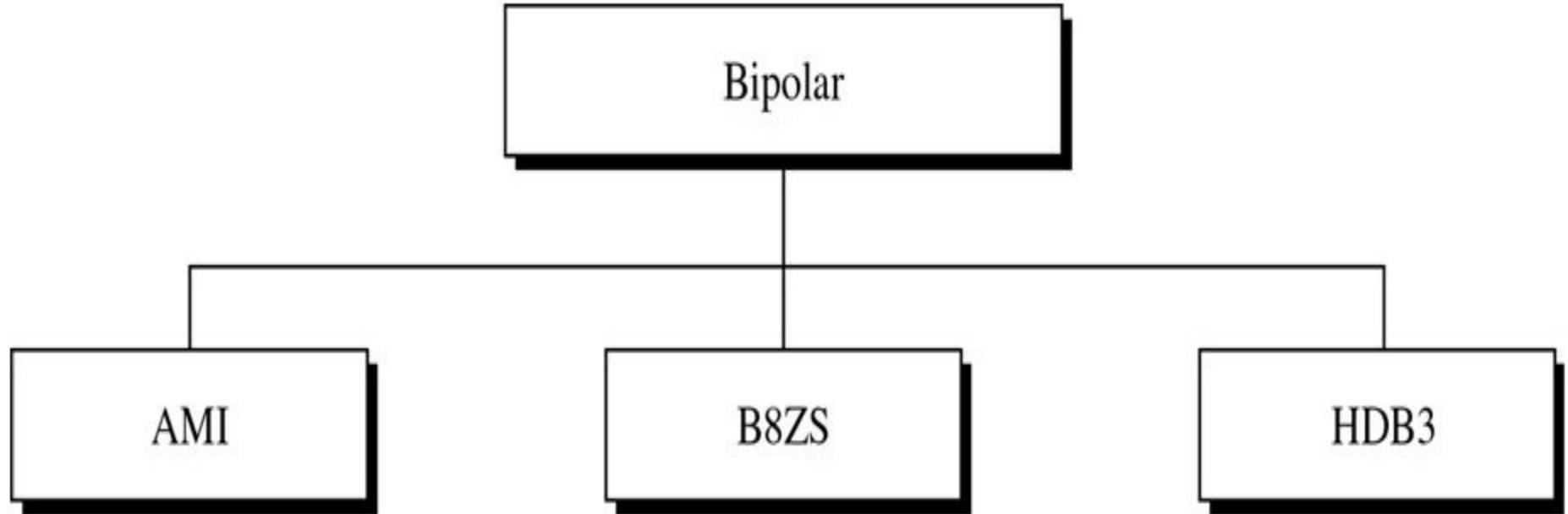
Data	Signal	Approach
Digital	Digital	Encoding
Analog	Digital	Encoding
Analog	Analog	Modulation
Digital	Analog	Modulation

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

Coding Techniques



Biopolar Coding Schemes

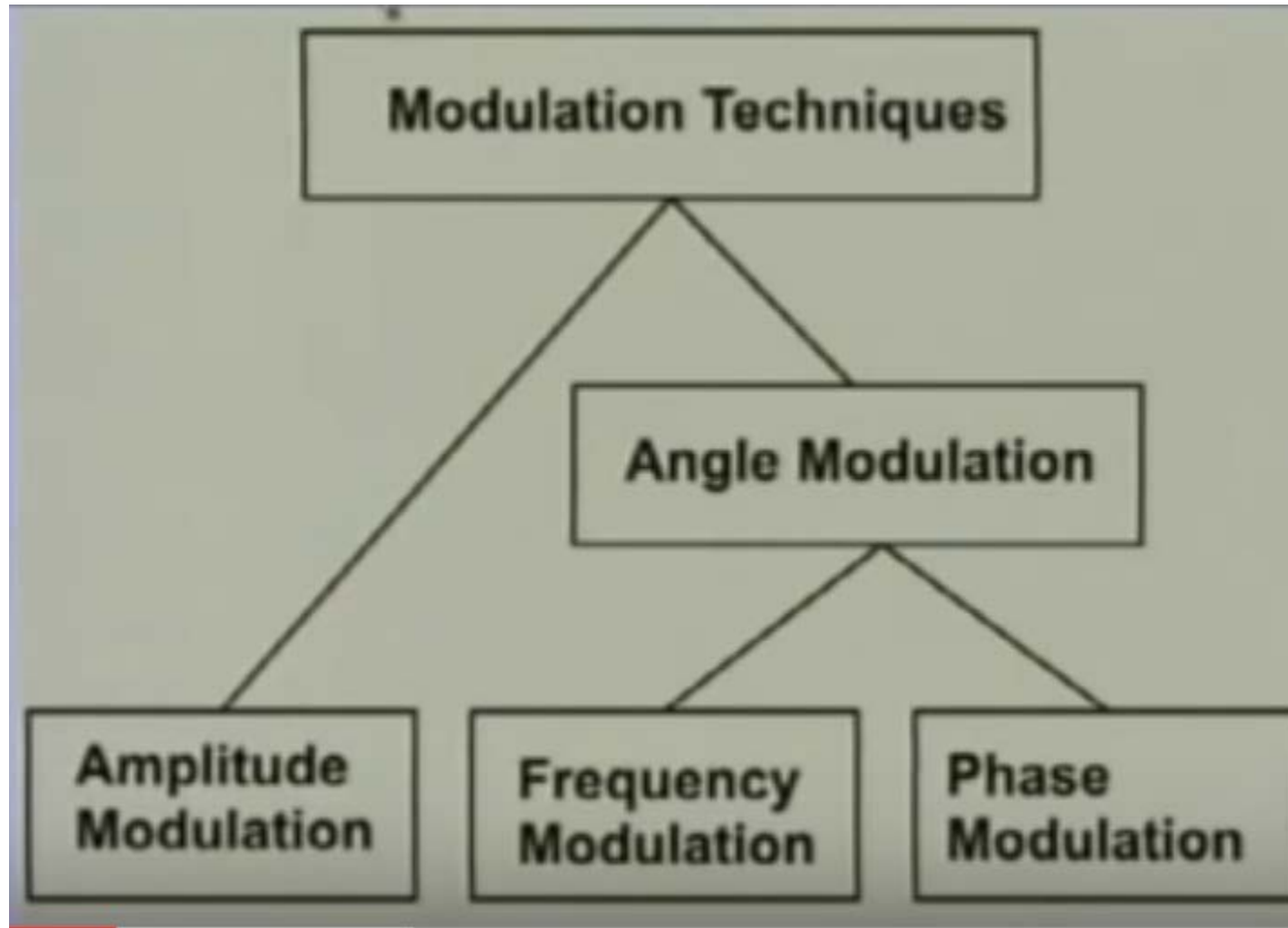


Analog Data to Digital Signal

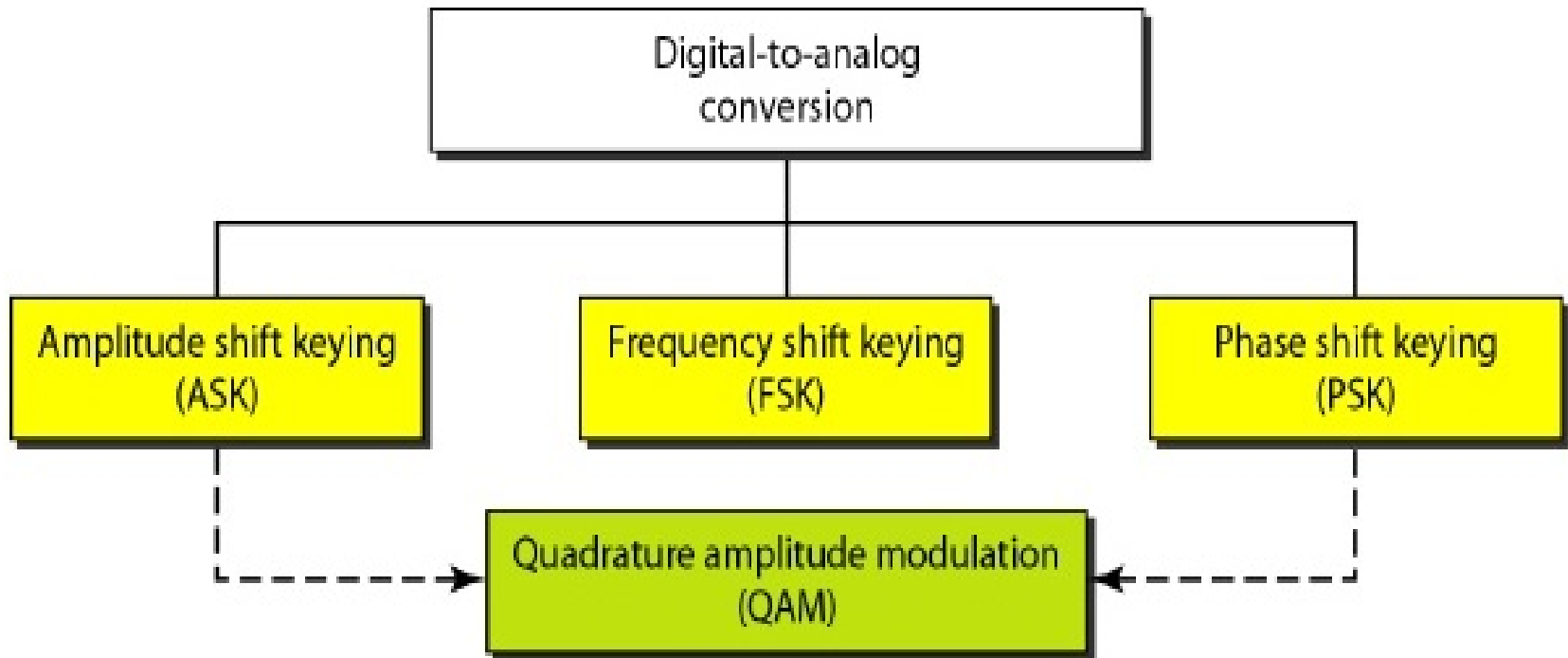


- Two basic approaches :
 - Pulse code Modulation
 - Delta Modulation
- Limitations of PCM and DM
- Comparison of the two approaches

Analog Data to Analog Signal



Digital-to Analog Modulation



Multiplexing Techniques



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

Multiplexing Applications



- The telephone system
 - Analog Services
 - Digital services
- DSL Technology : ADSL, SDSL, HDSL and VDSL
- Cable Modem
 - Hybrid Fibre-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



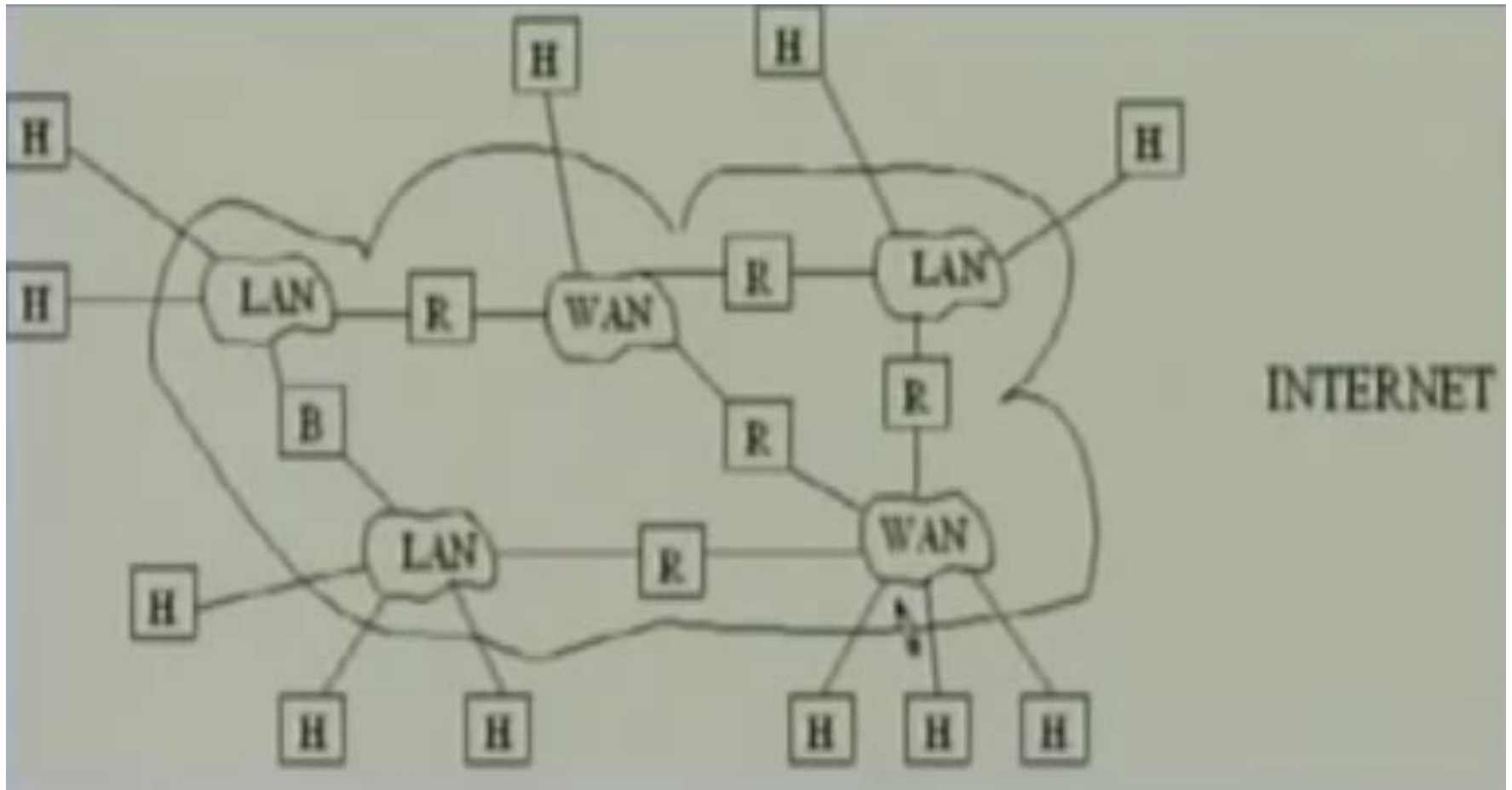
- Switched communication network
- Circuit switching fundamentals
 - Advantages and disadvantages
- Switching concepts
 - Space Division switching
 - Time division switching
- Message switching and packet switching
 - Virtual circuit and datagram approaches

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

Thanks!

Figure and slide materials are taken from two main sources:

1. Data and Computer Communications, by W. Stallings
2. NPTL lecture on Data Communication, by Prof. A. K. Pal, IIT Kharagpur