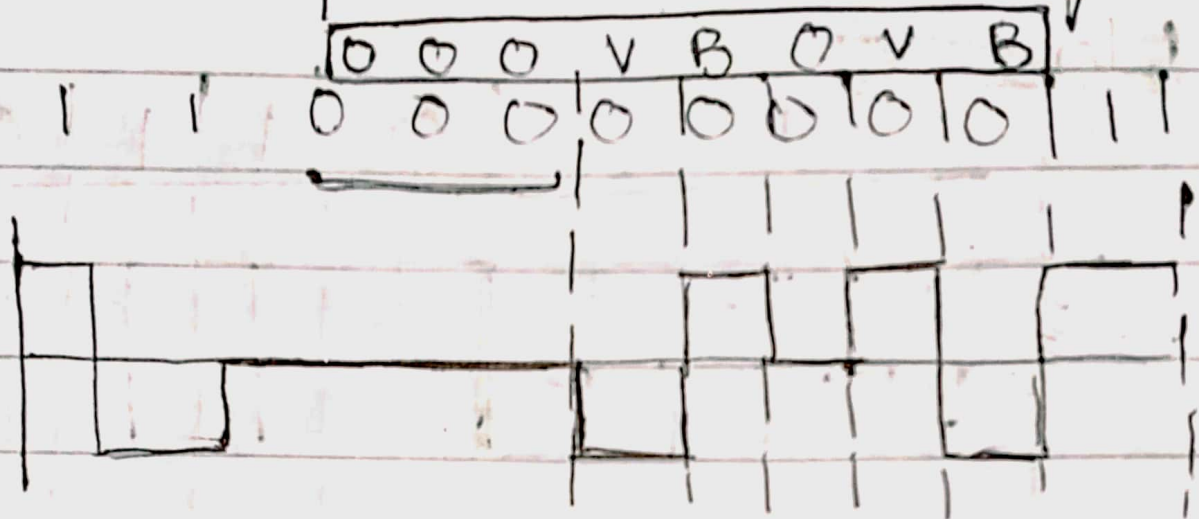


Lec 6:

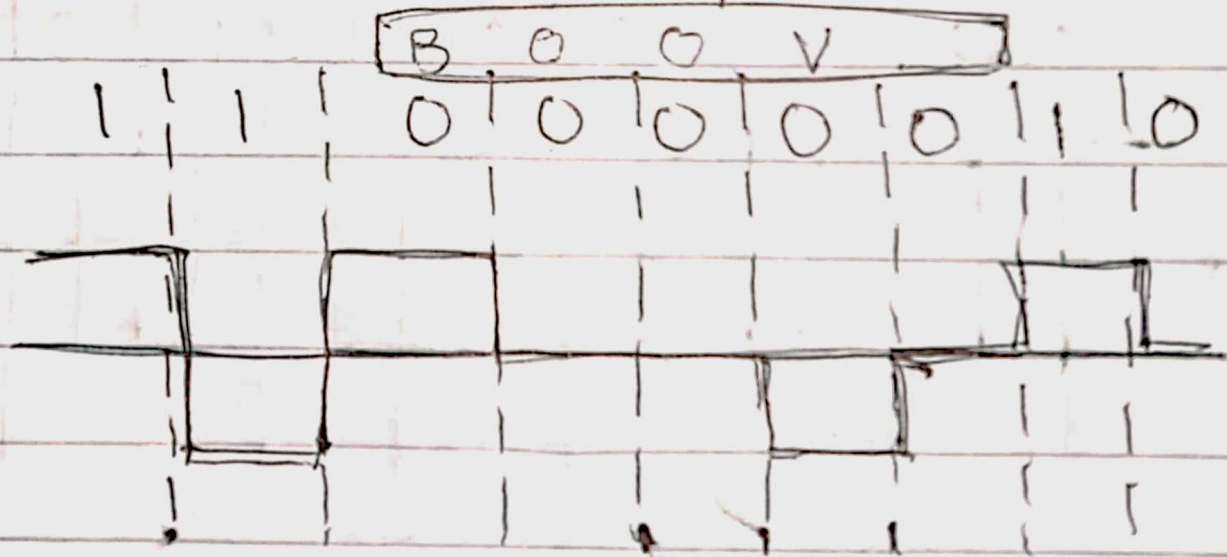
BBZS & HDB3



In case of 8 zeros consecutively



HDB3 → In case of 4 zeros



3 ways

FSK (Frequency Shift Keying)

0 \rightarrow no signal

1 \rightarrow signal with amplitude

change phase with π on
change in bit.

If we have 4 frequencies, we can send 2 bits in 1 sec.

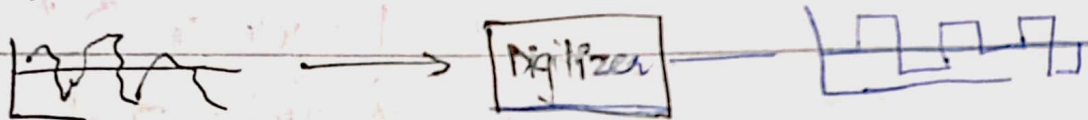
11 very high frequency

✓ Most used
QPSK → Quadruple PSK if we
change signal with $\pi/2$.

QAM → combo of ASK & PSK

Analog → Digital

• Digitization



PCM :

| | | |
|-----------|------------------|----------|
| PAM Value | → Quantized Code | PCM Code |
| 9.2 | 9 | 1001 |

Levels * 2 * Bits

$$4000 * 2 * 8 = 64 \text{ kbps}$$

Delta Modulation:

If amplitude is higher than
previous then → 1 otherwise → 0

~~Convert~~ Converts voices in 1, 0

If we increase sample size, it's better.

Analog → Analog

Types of modulation,

Frequency

Amplitude

Phase

Lec 8: Data link layer

Switches → 3 functions

address learning, forward decision
loop avoidance

Redundant topology → to avoid single point of failure

Disadvantages:

- 1) Broadcast storm, 2) mac table instability
- 3) multiple frame copies, loops

Solution:

STP (Spanning tree protocol)

by placing certain ports in block state

Switch with lowest Bridge ID will be root port.

| Bridging | LAN Switching |
|---------------------------|-------------------|
| Software based | Hardware based |
| 1 ST instances per switch | Many ST instances |
| up to 16 ports/bridge | many |

Transmitting frames:

Cut through

Store & forward

Fragment free

Lec 9: Configuration

Cisco IOS CLI commands

> usermode

enable

→ enabled mode

↓ conf term

(config) # Global configuration mode

interface e €0/12

(config-if) # interface mode

? to see all commands

name → to set name

ipaddress → to set ip

ip default-gateway → to set it

CSMA/CD

issues for wireless media/domain

- Hidden terminals
- Exposed terminals
- Near & far terminals

Solution:

- Moderator
- Open discussion, distributed system

CSMA versions:

non-persistent CSMA (No priority)

p-persistent CSMA (priority)

1-persistent CSMA (no backoff)

RTS and CTS signals help removing CSMA problems.

Request to Send | Clear to send.

CDMA \rightarrow codes, each device detects the signal code.

Steps: 1) Give every device a code from Walsh matrix

2) Assume $0 \rightarrow -1$, $1 \rightarrow +1$

3) If you hv to send 1, repeat code otherwise invert.

4) Detection by multiplying new code with actual code and sum.

5) If value of sum = +ve, signal = 1
if " " " = -ve, " = 0
If " " " = 0, " = idle

This means nothing sent

Lec 11: IEEE

IEEE header:

7 byte → Preamble

1 byte → Start frame delimiter

} → For synchronize

No data

Header 14B { 6 byte → Mac address → destination addr.

6 byte → " → Source "

2 byte → length of data

46 to 1500 bytes → data

Trailer 4B { 4 byte → Frame check sequence.

WLAN (Wireless Lan)

Advantages:

Less Planning

Robustness

Flexibility

Design

Disadvantages

Quality of service

Cost

Proprietary solution

Security & safety

WLAN → infrastructure networks

Pros → Simple design, controlled access, same as ^{wired} LAN

Cons → Single point of failure, planning, less flexible

WLAN → Ad-hoc networks

Pros → no infrastructure, direct comm., spontaneous networking

Cons → more complex terminals

MAC access algorithms:

2 contention based (Distributed Coordination func.)

RTS/CTS → CSMA/CA

1 contention-free (Point " ") PCF

using polling

IEEE WLAN Mac Layer Header:

| | | |
|---------------------|--------|----------------------------|
| Frame Control Field | 2B | (Type, Subtype, etc) |
| Duration/ID | 2B | (NAV) |
| 4 Address fields | 6B | (Mac addresses) |
| Sequence Control | 2B | (prevent duplicate frames) |
| Data | 0-2312 | |
| CRC | 4B | (check frame) |

DIFS (DCF Inter frame spacing)

largest time period (lowest priority)

PIFS (PCF - IFS)

Medium time period (medium ")

SIFS (Short IFS)

Short time period (Highest ")