1-11-07

802.11 Protocol Stack

Infared	FHSS	DSSS	a OFDM	b HR-DSSS	g OFDM

ISM Band

Industrial/Scientific/Medical

902 - 928 MHz

b, g 2400 - 2483.5 MHz ←

a 5725 - 5850 MHz

FHSS

Frequency Hopping
Spread Spectrum

2.4 GHz - 79 channels

Each 1 MHz wide

DSSS

Direct Sequence S S

CDMA (Similar)

Code Division Multiple Access

1-2 Mbps

Each bit m short intervals
64 or 128 - Chips

Example: 8 chips for a bit

A: 00011011
B: 00101110
C: 01011100
D: 01000010

Bipolar representation

A: (-1 -1 -1 +1 +1 -1 +1 +1)

$$S \cdot T = \frac{1}{m} \sum_{i=1}^{m} S_i T_i = 0$$

~~$A \cdot B = \frac{1}{8}(0+0+0+0$~~

$B : (-1\ -1\ +1\ -1\ +1\ +1\ +1\ -1)$

$A \cdot B = \frac{1}{8}(+1+1-1-1+1-1+1-1)$

$= \frac{1}{8} \cdot 0 = 0$

Orthogonal

$B \cdot B = 1$

DSSS - 11 chips per bit

Barker Sequence

HR-DSSS - High Rate

802.11 b

11 million chips/sec

to 1 Mbps in 2.4 GHz

Data rates

1, 2, 5.5, 11 Mbps

1.375 M baud

4 or 8 bits per baud

5.5 11 Mbps

802.11 a and g

OFDM

Orthogonal Frequency Division Multiplexing

52 different frequencies

48 for data 4 for synchronization

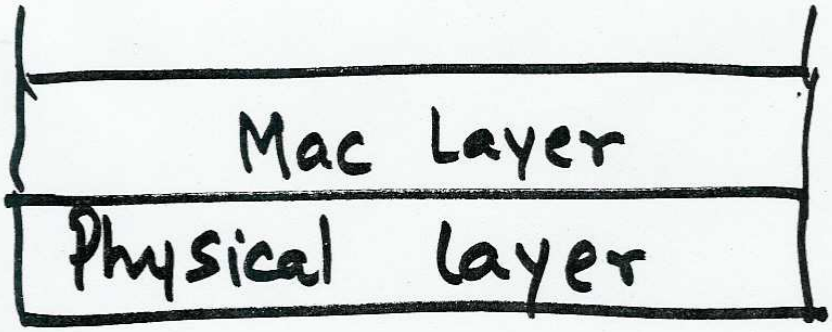
Complex encoding Scheme based on

Phase Shift Modulation

upto 18 Mbps

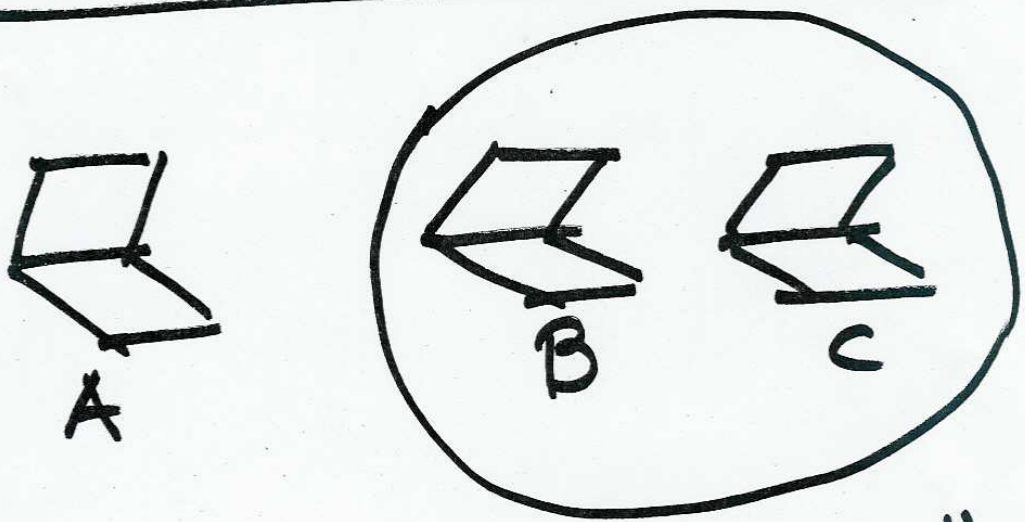
Quadrature Amplitude Modulation

216 data bits encoded in 288 bit symbols



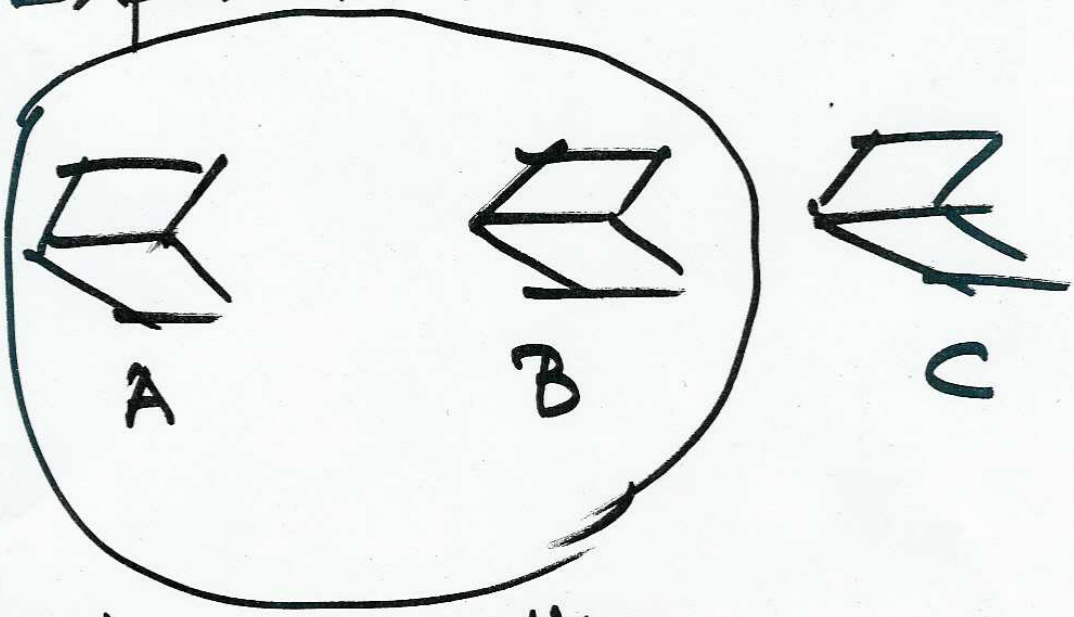
Ethernet - CSMA/CD

Hidden Station Problem



C is transmitting to B

Exposed Station Problem



A is transmitting
B wants to transmit

Error Rate

CSMA/CA

Two modes of operation

DCF. Distributed Coordination Function

PCF. Point Coordination Function