

Ethernet Standards - IEEE 802.3
[10Mbps - 10Gbps]

X base Y

X = speed of transmission

Y = Type of Cabling.

- a) 10 Base T = 10Mbps over UTP Cat 3.
- b) 100 Base T = 100Mbps over UTP Cat 5 or 5e.
- c) 100 Base F = " " Fiber-optic Cable.
- d) 10GBase T = 10Gbps over UTP Cat 6 or above.

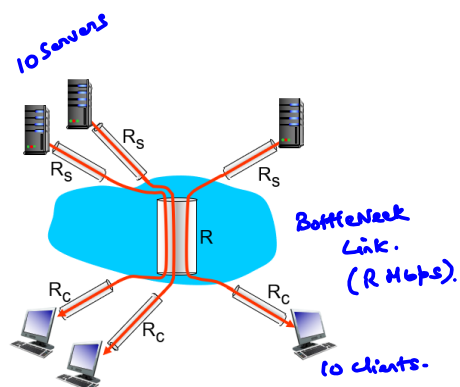
Throughput

Instantaneous Throughput - rate (bits/time) at which the receiver is downloading/receiving the file.

$$\text{Rate} = \frac{F}{T} \frac{\text{bits}}{\text{sec.}}$$

Average end-to-end Throughput = $\min \{R_s, R_c\}$.
 [Bottleneck Link]

R_s = Rate of the Server
 R_c = " " " client.



10 connections (fairly) share
 backbone bottleneck link R bits/sec

$$R_s = 2 \text{ Mbps}$$

$$R_c = 1 \text{ Mbps} \checkmark$$

$$R = 5 \text{ Mbps} \Rightarrow \text{for 10 Connections} = 0.5 \text{ Mbps}$$

$$\min \{R_s, R_c, R\} = 0.5 \text{ Mbps or } 500 \text{ kbps.}$$

Ch. 7 - Wireless Networking.IEEE 802.11 → Wi-Fi

Cellular Networks - 3G, 4G, LTE, CDMA, GSM

Components

a) Wireless Host.

b) " Link.

c) Base Station. - Access Point [WAP], Cell Towers

A Wireless host is associated with a Base Station,

1) the host is within the wireless communication range of the base station.

2) the host uses the base station to relay data.

Hand off.

Two Criteria that define the Categories of Wireless Infrastructure.

- a) Number of Hops.
 - b) Infrastructure.
- 1) Single Hop, Infrastructure based.
 - 2) Single Hop, Infrastructure less
 - 3) Multihop, Infrastructure based. — Wireless Mesh Networks.
 - 4) Multihop, Infrastructure less — HAVETS, VANETS

CDMA [Code Division Multiple Access]

a) Chipping Sequence or Code — Unique to every user.

General Example : 2 Users

User 0 :- $\overset{\text{Data}}{a_0}$

User 1 :- $\overset{\text{Data}}{a_1}$

chipping Code [1 0 0 0]

$C_0 [1, 1, 1, 1]$

$C_1 [1, -1, -1, 1]$

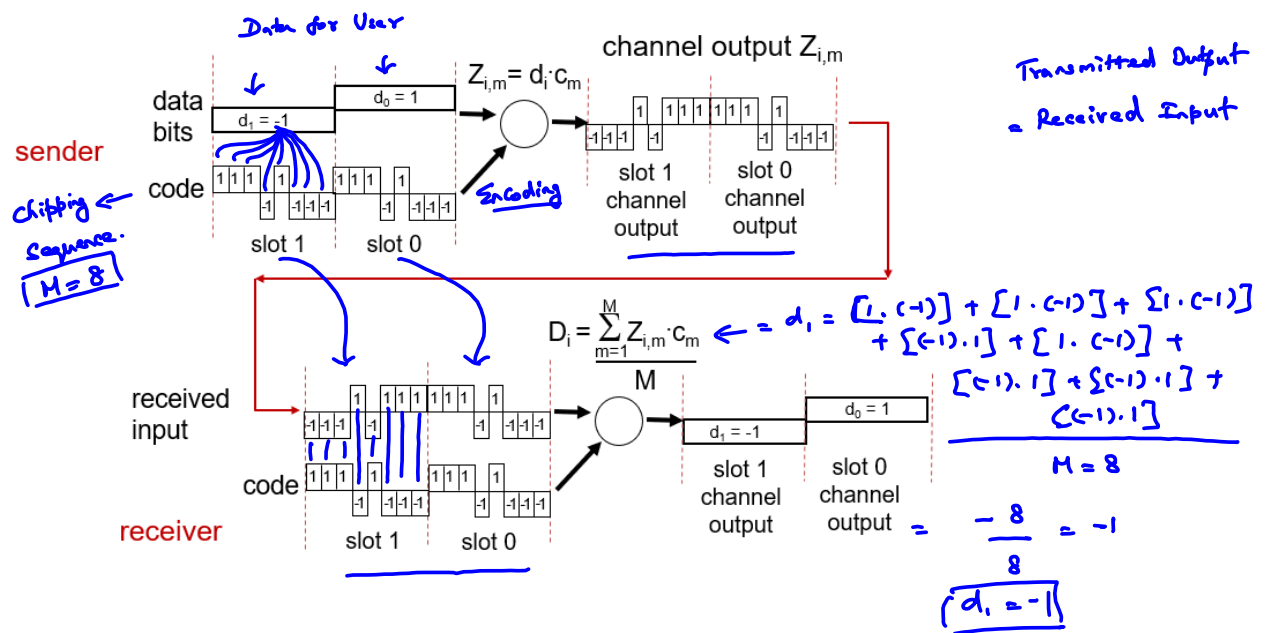
Chipping Rate

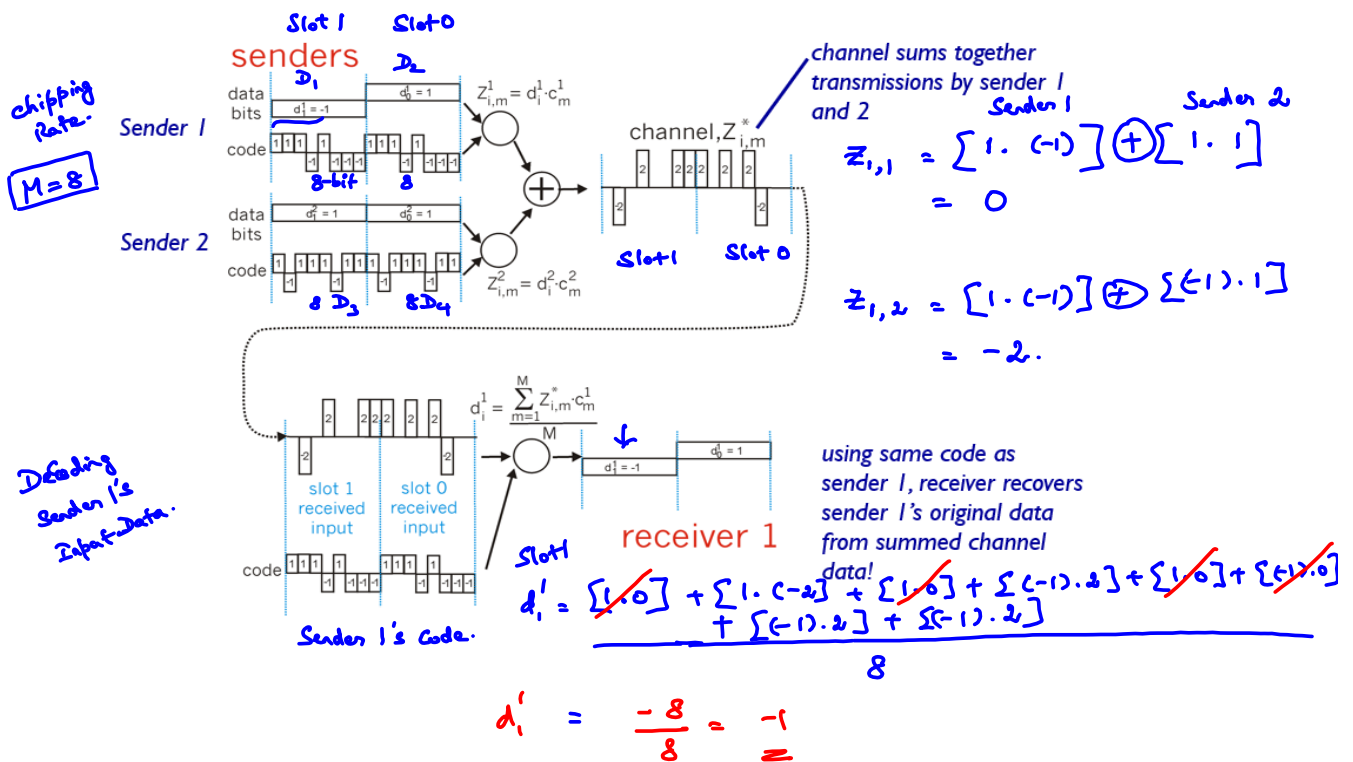
$M=4$

Encoding : $a_0 \cdot C_0 + a_1 \cdot C_1 = \boxed{a_0 + a_1, a_0 - a_1, a_0 - a_1, a_0 + a_1}$
Transmitted Signal.

Decoding : For User 0 :- Apply C_0 to the transmitted signal
 $\Rightarrow (a_0 + a_1) \cdot 1 + (a_0 - a_1) \cdot 1 + (a_0 - a_1) \cdot 1 + (a_0 + a_1) \cdot 1$
 $= 4a_0 = \frac{4a_0}{M} = \boxed{a_0}$
 $= a_0 + a_1 + a_0 - a_1 + a_0 - a_1 + a_0 + a_1$

For User 1 :- Apply C_1 to the transmitted signal.
 $\Rightarrow (a_0 + a_1) \cdot 1 + (a_0 - a_1) \cdot (-1) + (a_0 - a_1) \cdot (-1) + (a_0 + a_1) \cdot 1$
 $= 4a_1 = \frac{4a_1}{M} = \boxed{a_1}$





Channels and Association in Wi-Fi Networks

Access Point [AP] → SSID.

802.11 channels frequency range - 2.4 GHz - 2.4835 GHz.

85 MHz band = 11 partially overlapping channels.

Process of Association.

a) Beacon Frames. - Access Points.

b) User can associate with the chosen SSID.

c) Scanning Process. - Active & Passive.

Bluetooth Network or Protocol [Self-Read]

Chapter 6 : Data Link Layer

Error Detection :- Remember your data is binary 0 or 1.
Sequence of bits $10 \neq 01$ [Corruption of Data bits]

① Parity Checks - Detecting error in bits using Odd or Even Parity Condition.

1- \rightarrow Parity : Single parity added to the data.

Example Data $\Sigma Dc'$

a) 011 000 1101 01 011 1

Even-Parity. (No. of 1's)

b)

011 000 1101 00 111	0
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Odd-Parity

Transmitted Data :

Data

$\Sigma Dc'$

Received Data : 011 000 1101 01 111 0 1-bit flipped
 \Rightarrow Even no. of 1's \Rightarrow Error is detected.

011 000 1101 01 111 1 2-bits flipped.

There are odd-no. of 1's \Rightarrow error goes undetected.