

CONTROLLED ACCESS

- In controlled access, the stations consult one another to find which station has the right to send. A station cannot send unless it has been authorized by other stations. We discuss three popular controlled-access methods.
 - Reservation
 - Polling
 - Token Passing

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Reservation

- Reservation Frame

- N stations

1	2	3	4	5
0	0	0	0	0

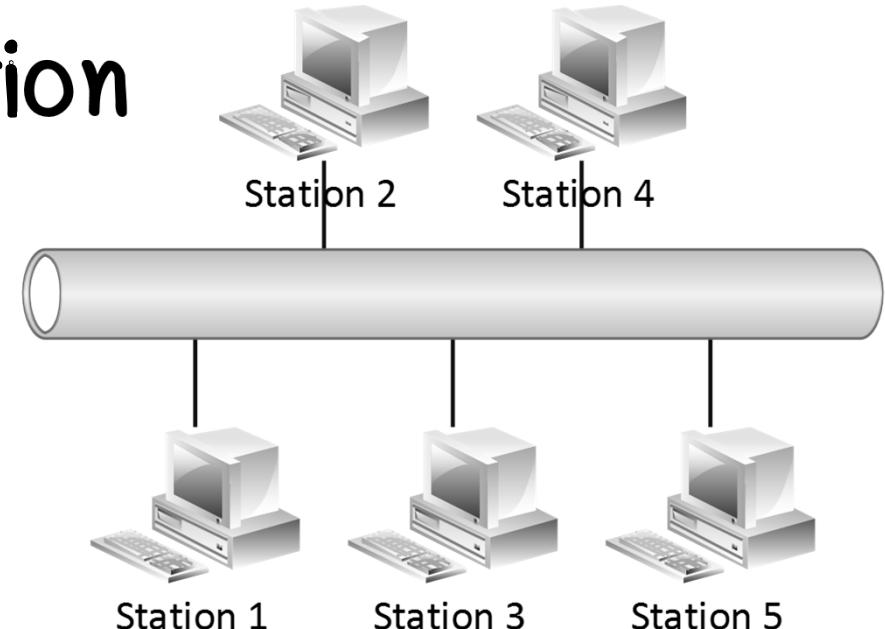
- N reservation minislot

- Example

- 5 stations

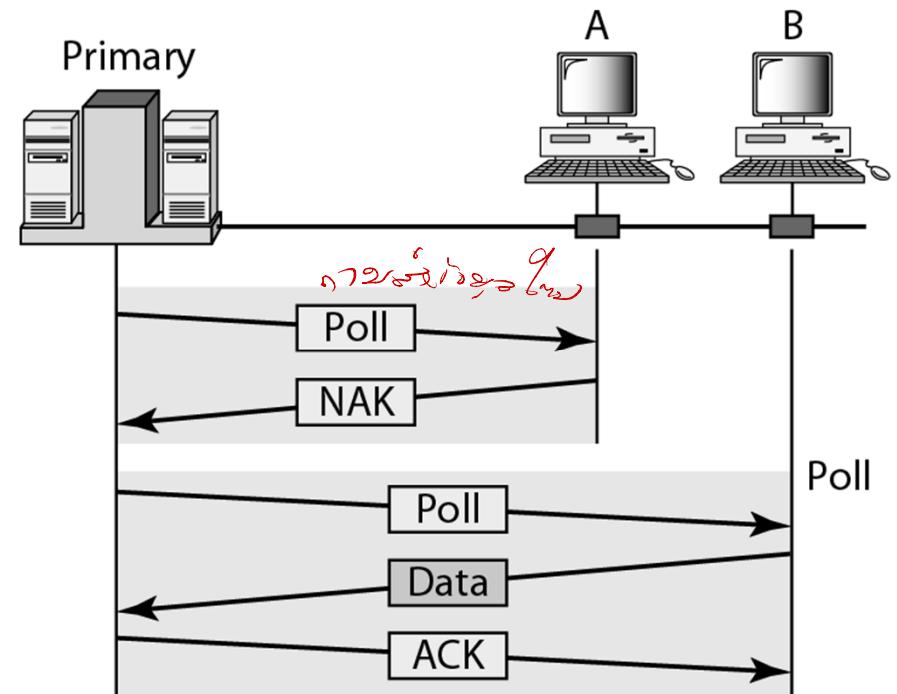
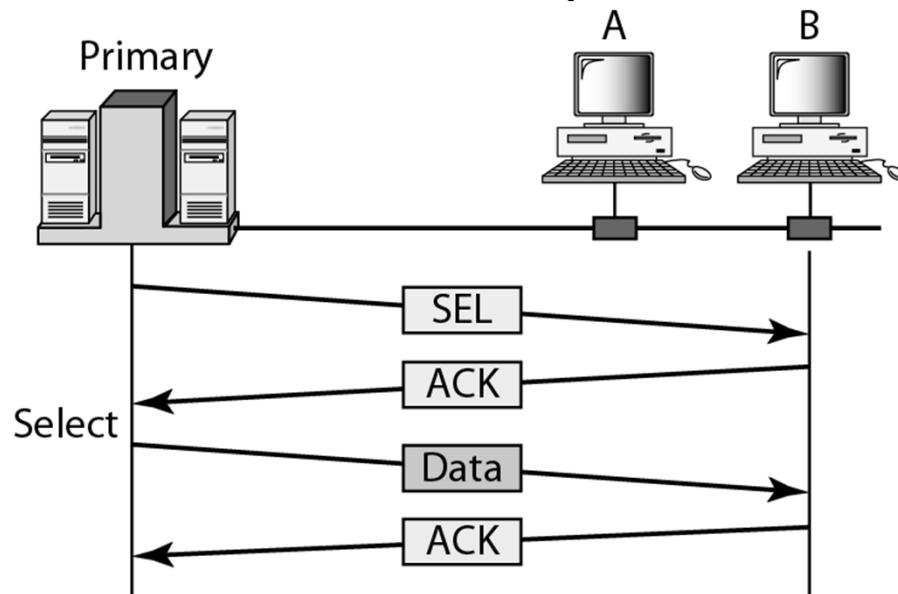
- stations 1, 3, and 4 have made reservation

- station 1 has made reservation



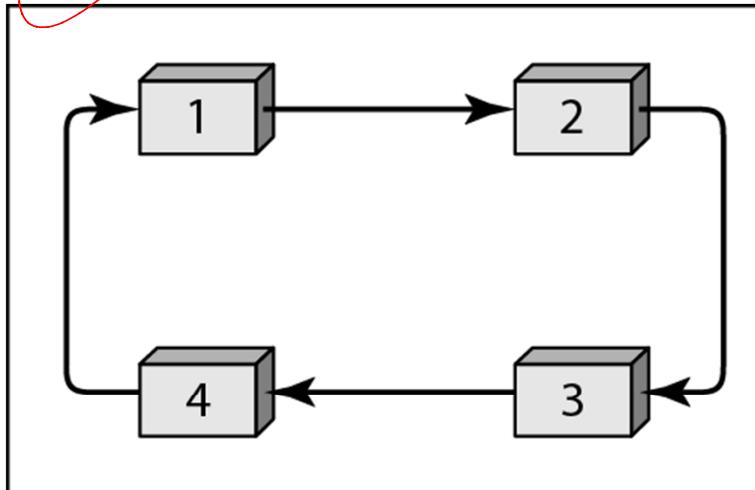
Polling

- Topologies
 - one device is designated as a primary station
 - the other devices are secondary stations
- Select and poll functions



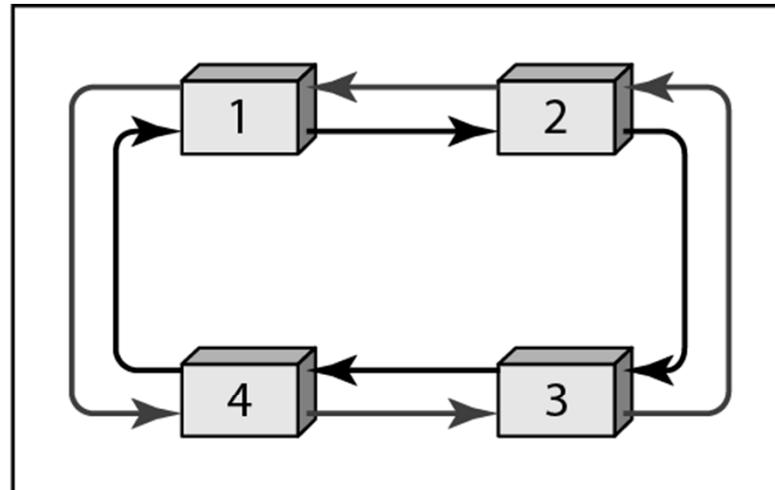
Token-passing

Token Ring (IEEE 802.5)

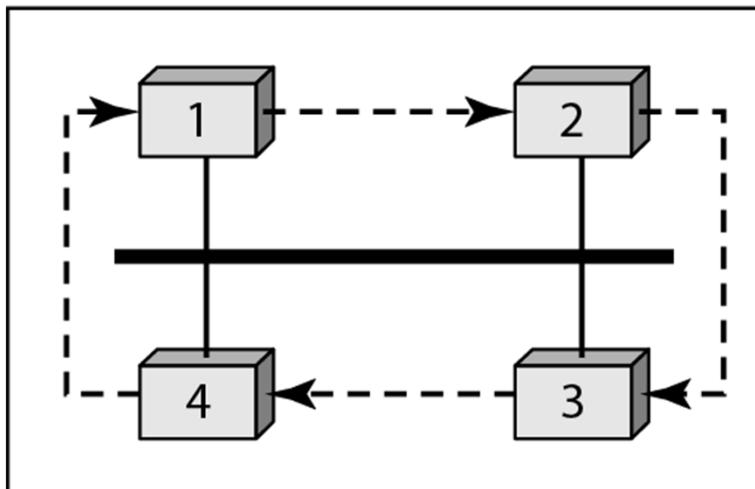


a. Physical ring

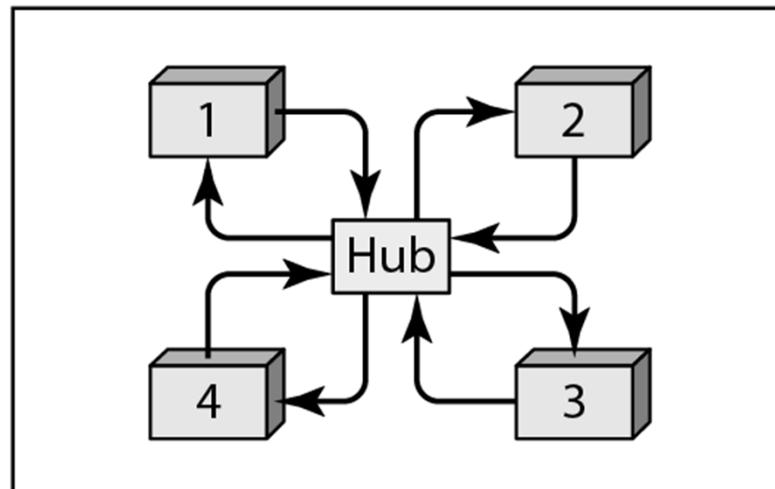
FDDI (Fiber Distributed Data Interface)
CDDI (Copper Distributed Data Interface)



b. Dual ring



c. Bus ring



d. Star ring

Token BUS (IEEE 802.4)

CHANNELIZATION

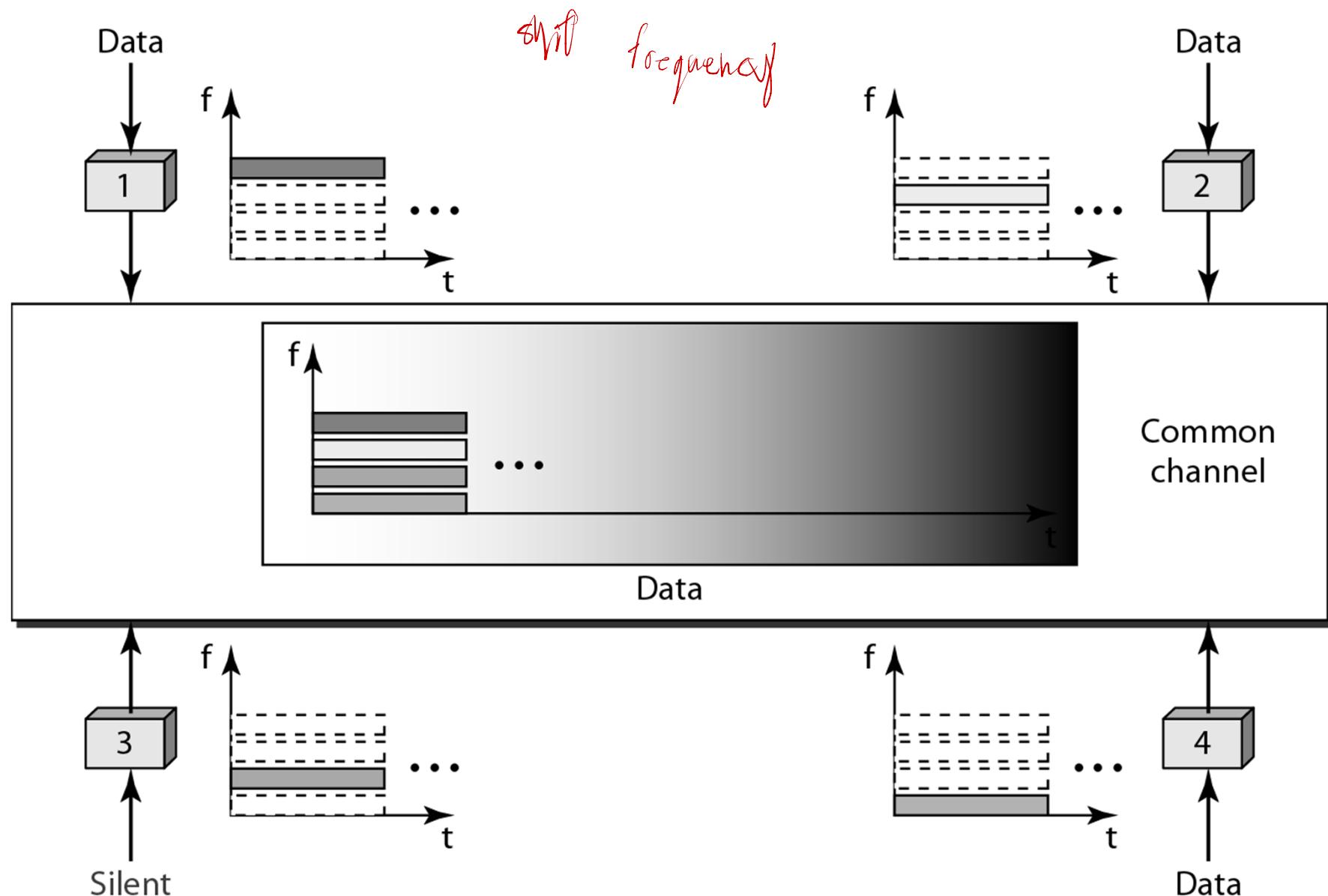
- Channelization is a multiple-access method in which the available bandwidth of ~~a link is shared in time,~~ frequency, or through ~~code,~~ between ~~different~~ stations. In this section, we discuss three channelization protocols.
 - Frequency-Division Multiple Access (FDMA)
 - Time-Division Multiple Access (TDMA)
 - Code-Division Multiple Access (CDMA)

Channelization

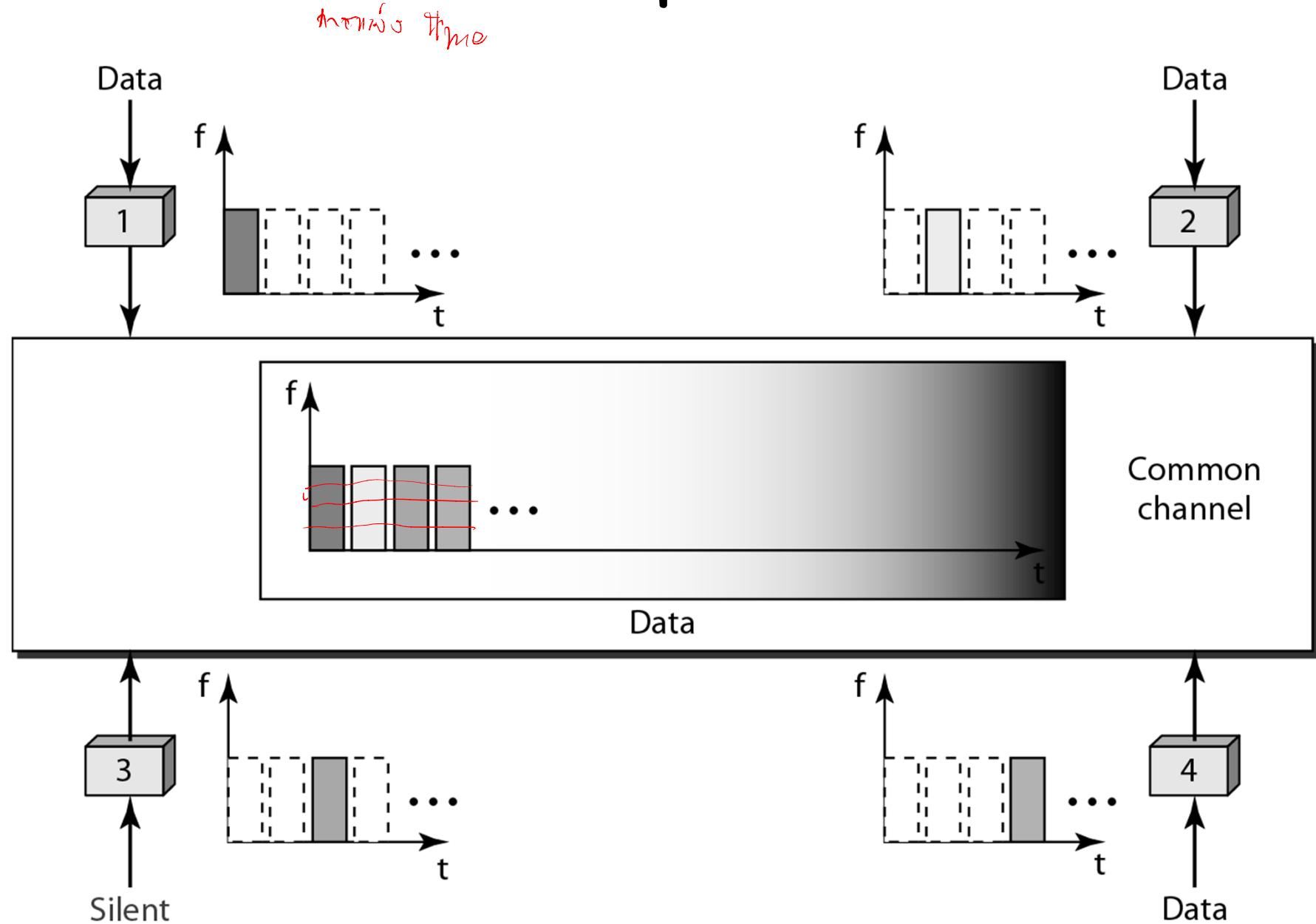
Frequently

- In ~~OFDMA~~, the available bandwidth of the common channel is divided into bands that are separated by guard bands.
- In ~~TDMA~~, the bandwidth is just one channel that is timeshared between different stations.
- In ~~CDMA~~, one channel carries all transmissions simultaneously.

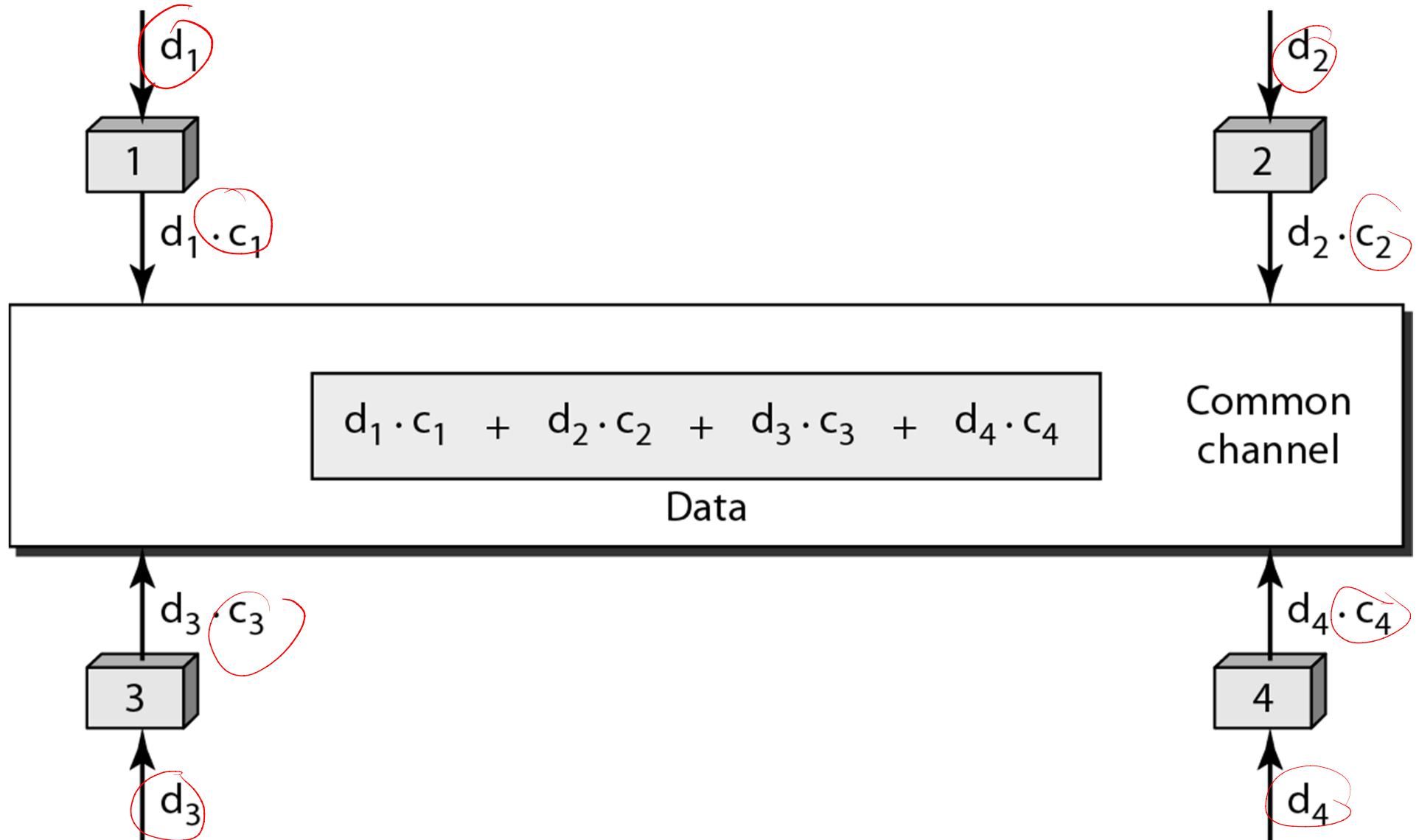
Frequency-division multiple access (FDMA)



Time-division multiple access (TDMA)



Simple idea of communication with code



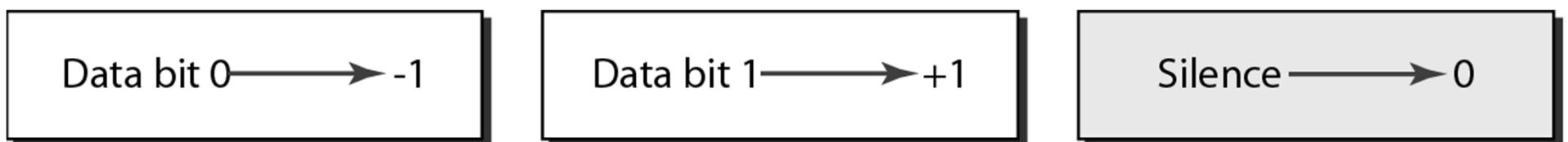
Simple idea of communication with code

- Idea
 - If we multiply each code by another, we get 0
 - If we multiply each code by itself, we get 4

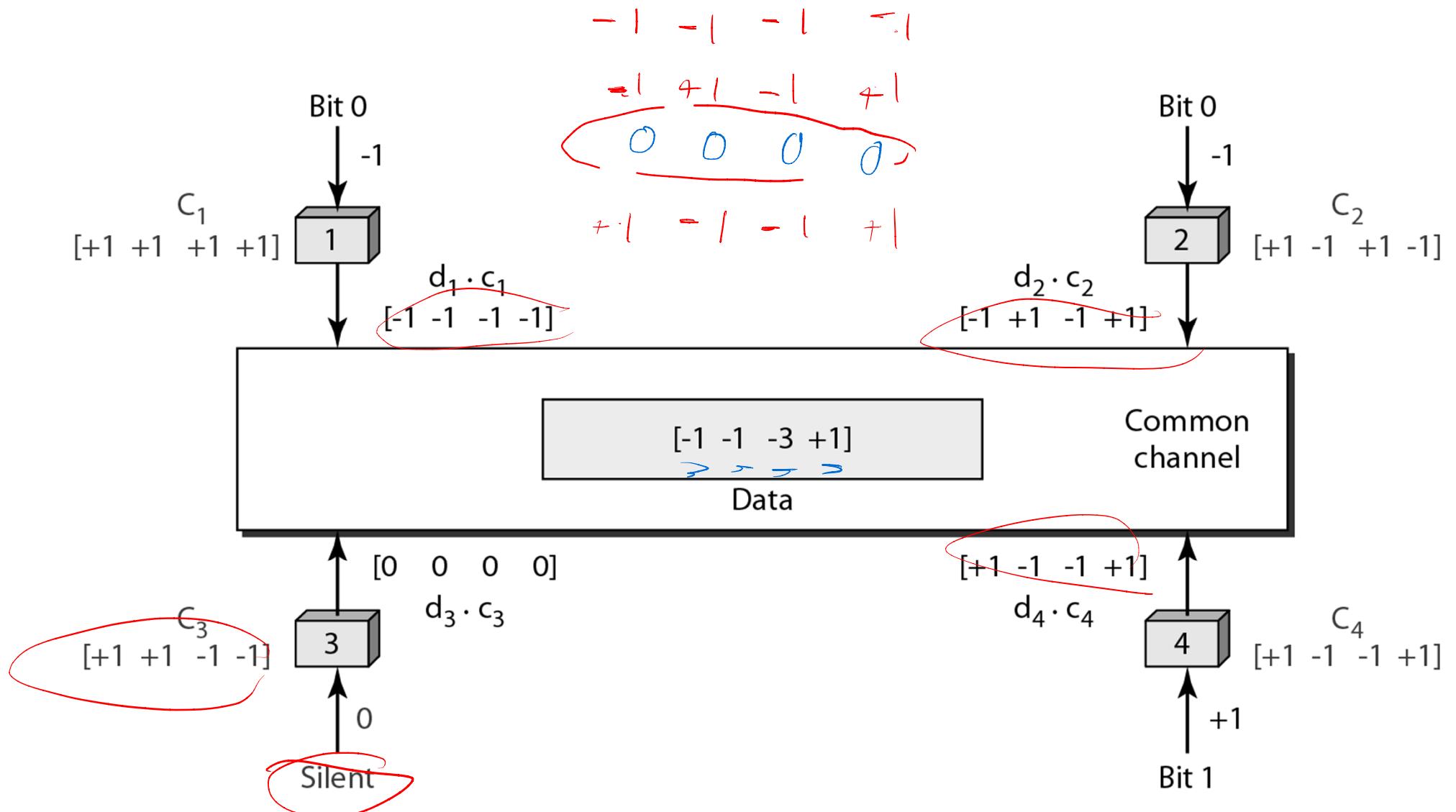
- Chip sequences

C_1	C_2	C_3	C_4
[+1 +1 +1 +1]	[+1 -1 +1 -1]	[+1 +1 -1 -1]	[+1 -1 -1 +1]

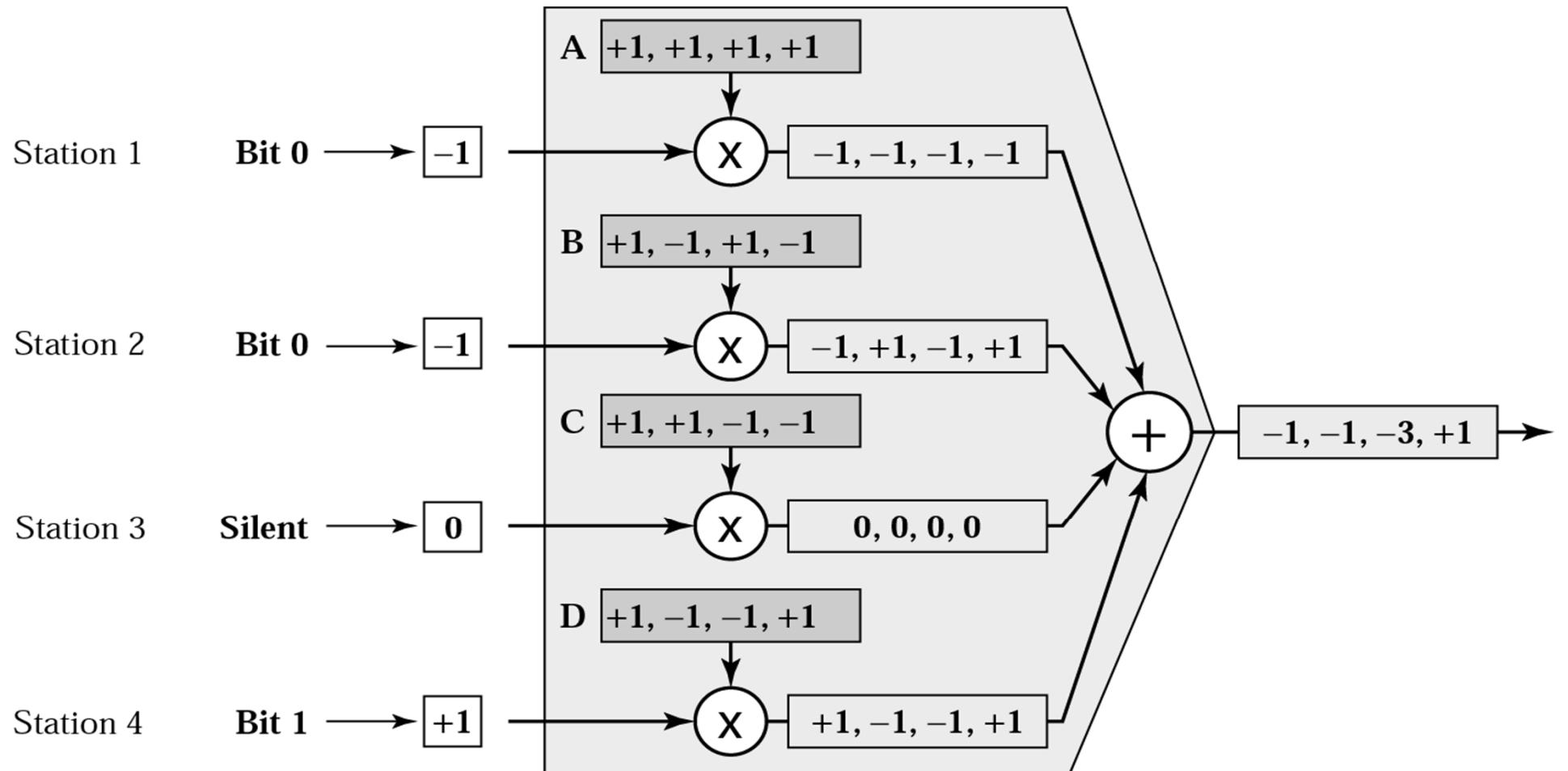
- Data representation in CDMA



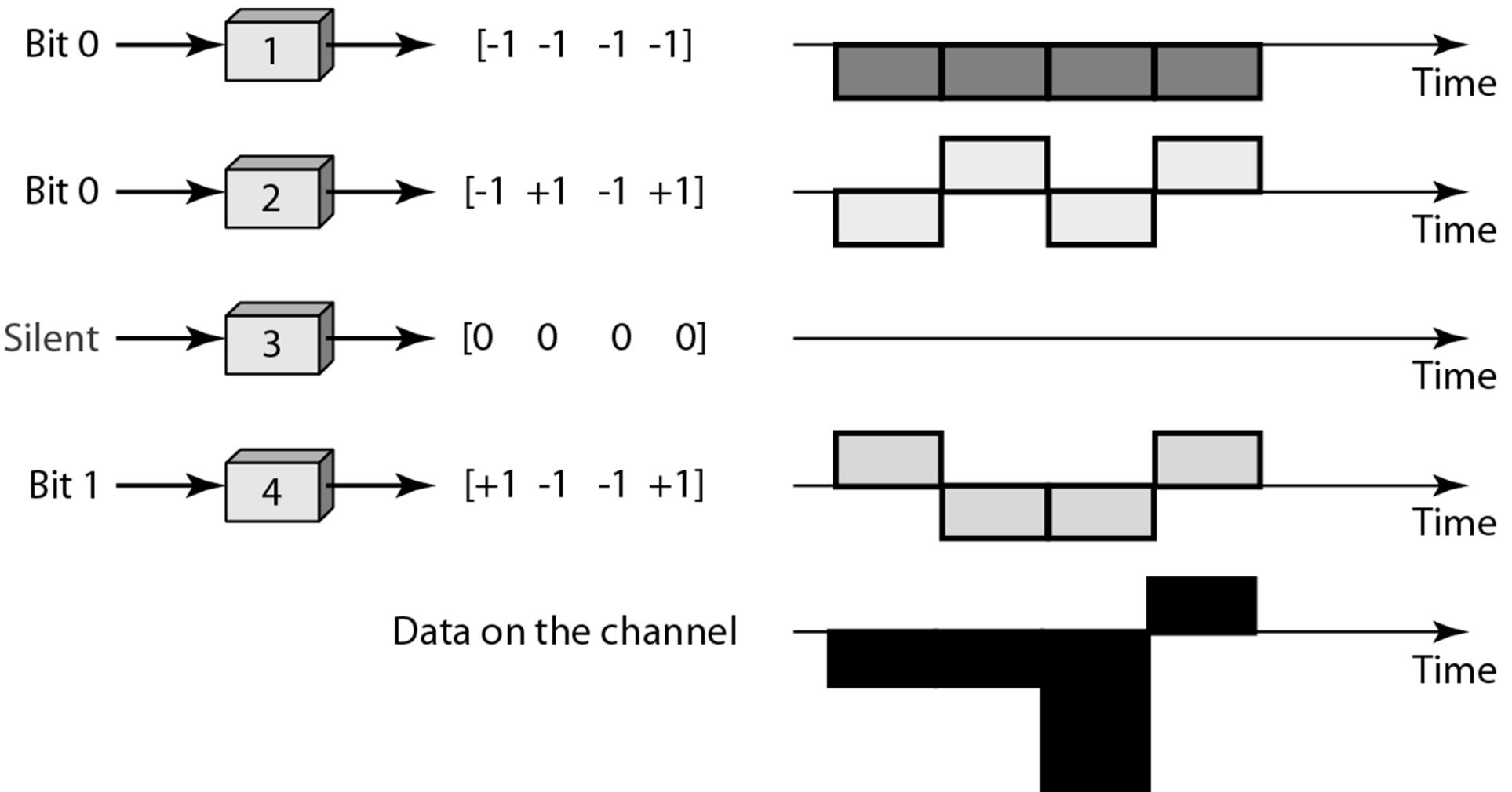
Sharing channel in CDMA



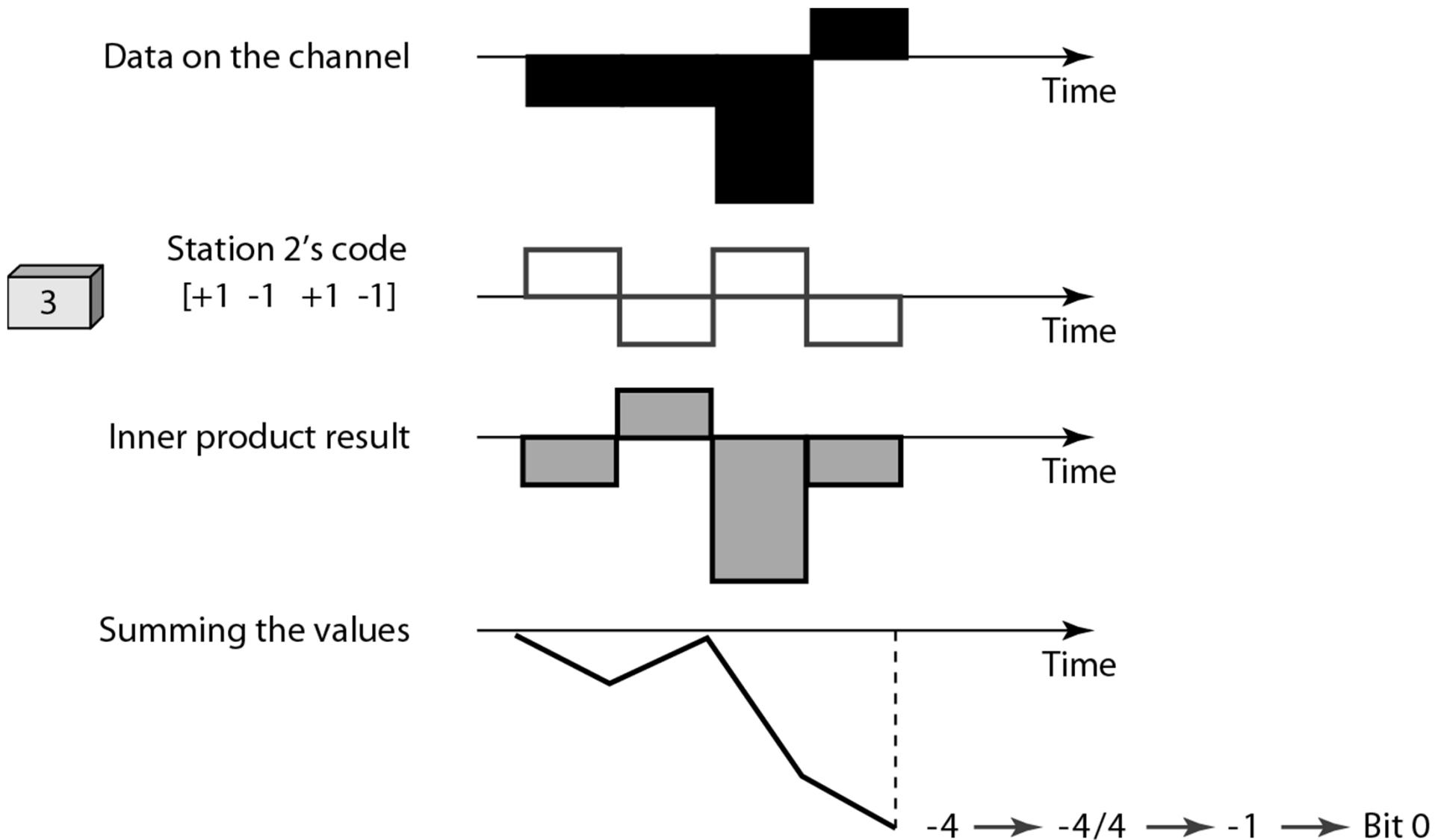
CDMA multiplexer



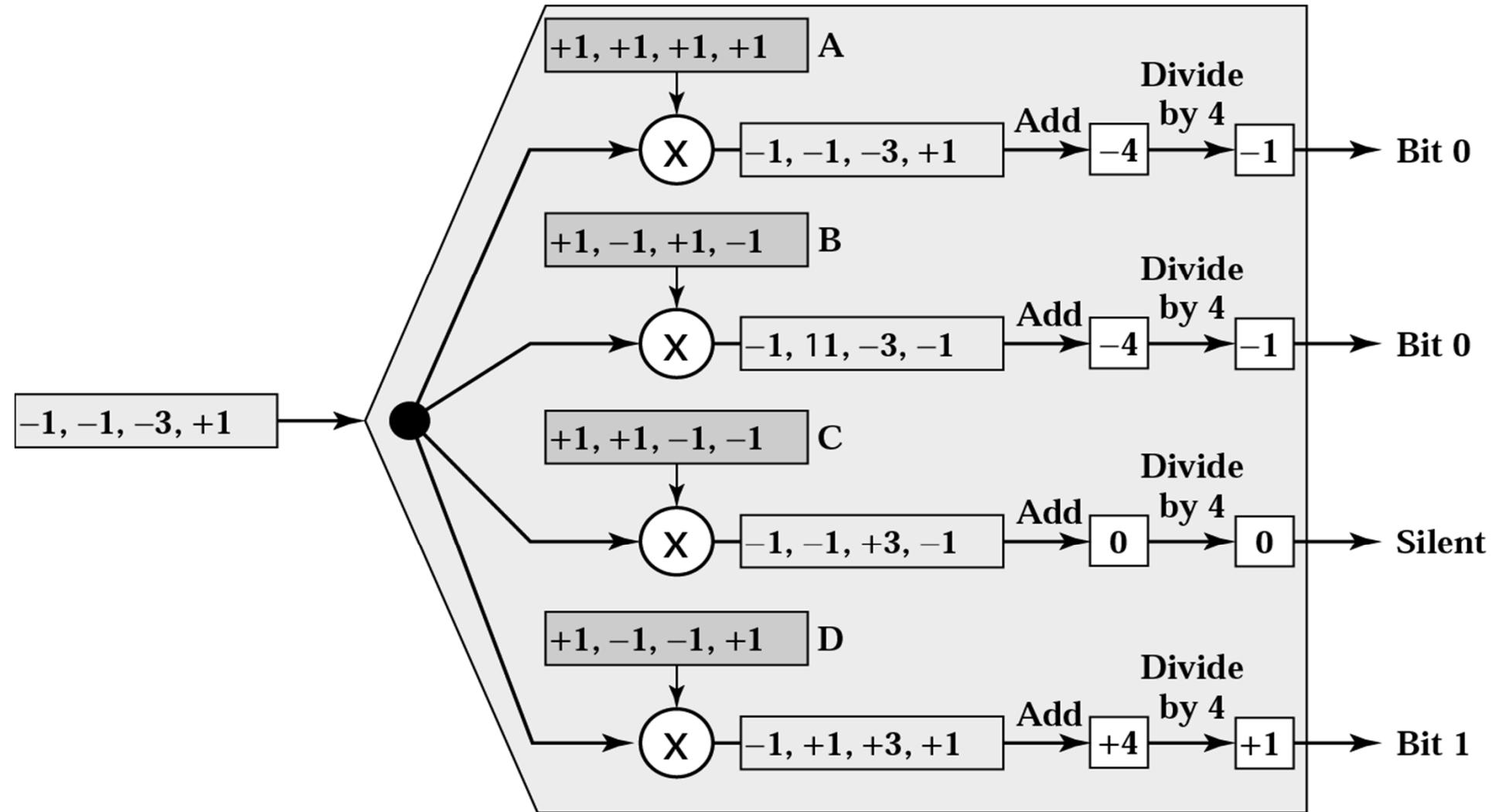
Digital signal created by four stations in CDMA



Decoding of the composite signal for one in CDMA



CDMA demultiplexer



General rule and examples of creating Walsh tables

$$W_1 = \begin{bmatrix} +1 \end{bmatrix}$$

$$W_{2N} = \begin{bmatrix} W_N & W_N \\ W_N & \bar{W}_N \end{bmatrix}$$

| 0

a. Two basic rules

$$W_1 = \begin{bmatrix} +1 \end{bmatrix}$$

$$W_2 = \begin{bmatrix} +1 & +1 \\ +1 & -1 \end{bmatrix}$$

$$W_4 =$$

$$\begin{bmatrix} +1 & +1 & +1 & +1 \\ +1 & -1 & +1 & -1 \\ +1 & +1 & -1 & -1 \\ +1 & -1 & -1 & +1 \end{bmatrix}$$

\bar{W}_c

b. Generation of W_1 , W_2 , and W_4

The number of sequences in a Walsh table needs to be $N = 2^n$