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.
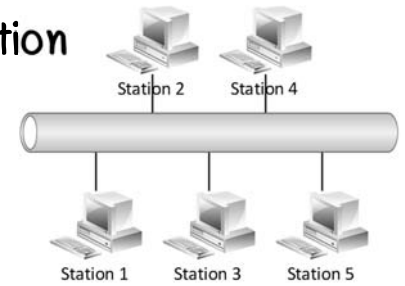 - Reservation
  - Polling
  - Token Passing

Reservation

- Reservation Frame
  - N stations
  - N reservation minislot
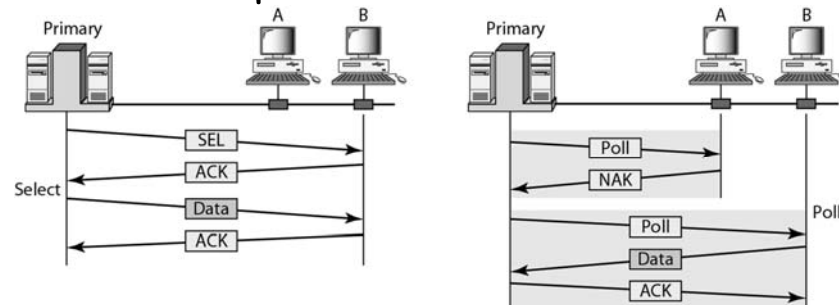 - Example
    - 5 stations
      - stations 1, 3, and 4 have made reservation
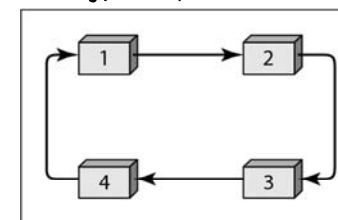   - station 1 has made reservation

Polling

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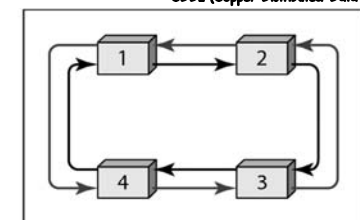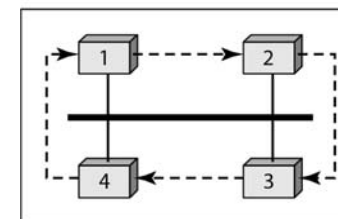- Select and poll functions

Token-passing
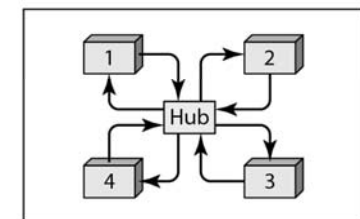
FDDI (Fiber Distributed Data Interface)
CDDI (Copper Distributed Data Interface)

a. Physical ring
b. Dual ring
c. Bus ring
d. Star ring

Token Ring (IEEE 902.5)
Token BUS (IEEE 902.4)

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

- In FDMA, 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.
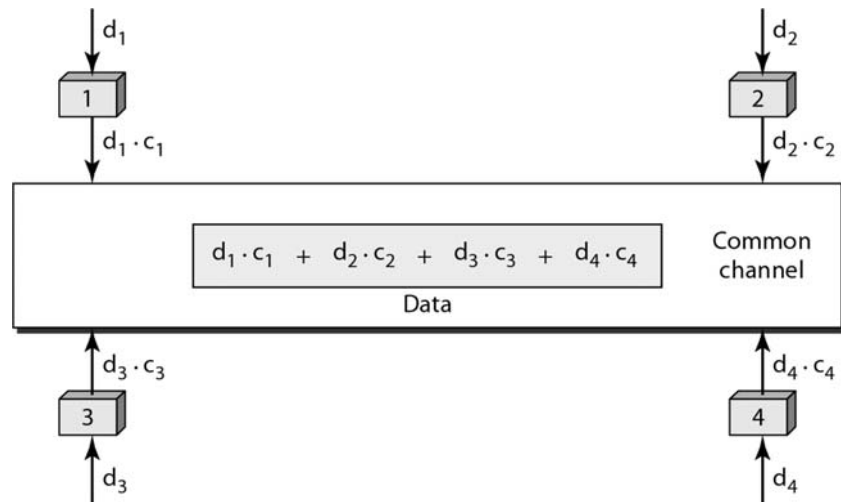- In CDMA, one channel carries all transmissions simultaneously.

Frequency-division multiple access (FDMA)
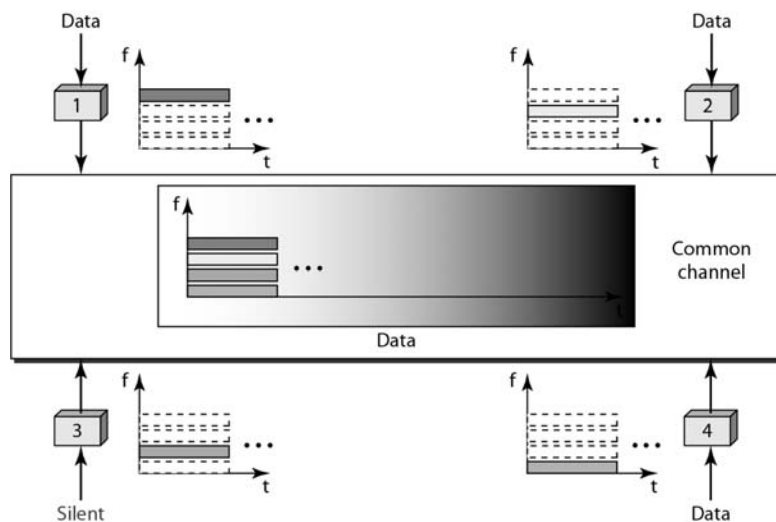
Time-division multiple access (TDMA)
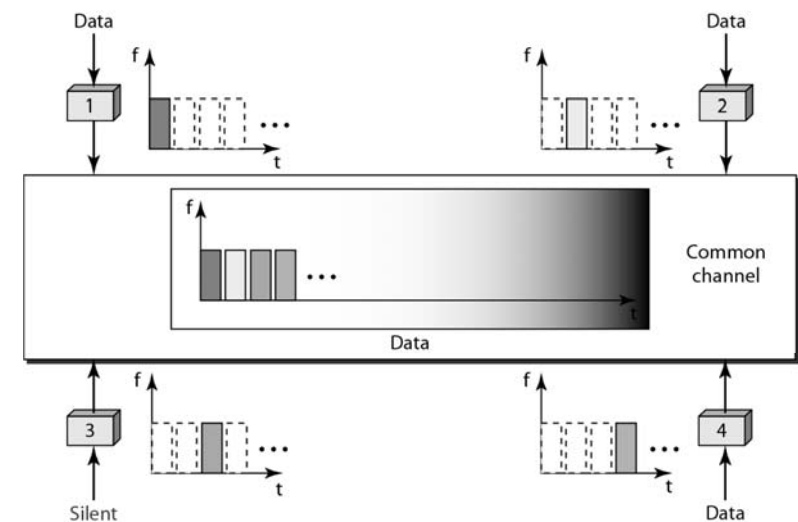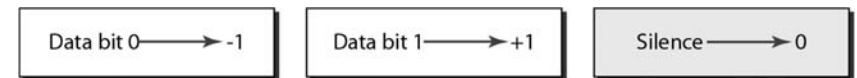
Simple idea of communication with code

Simple idea of communication with code

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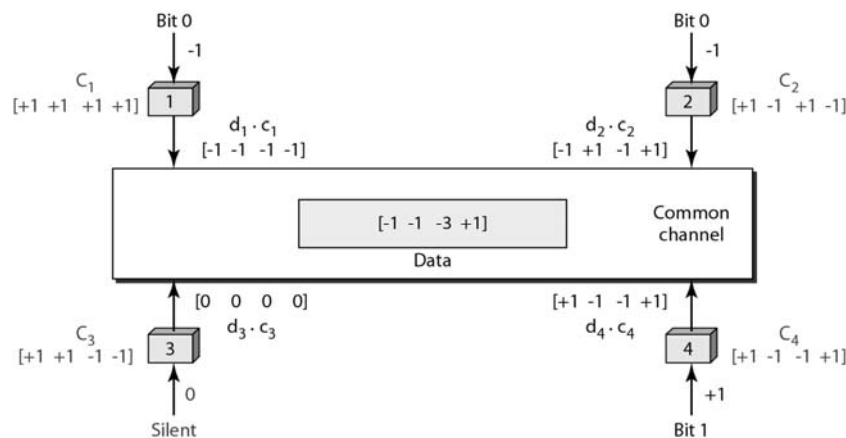 - If we multiply each code by itself, we get 4
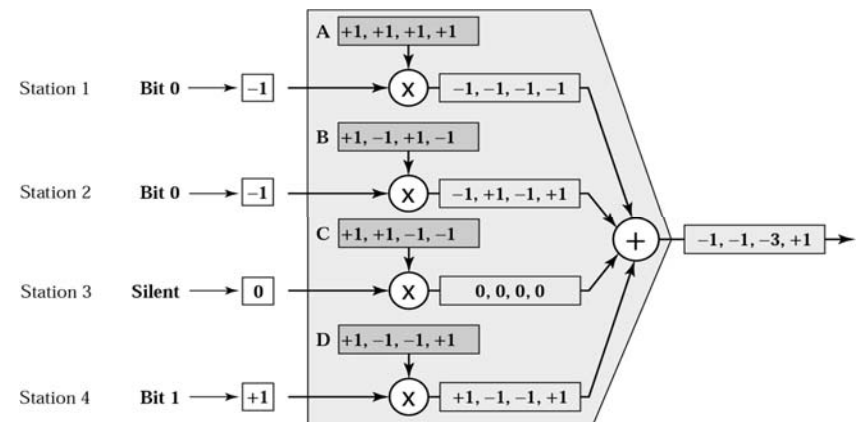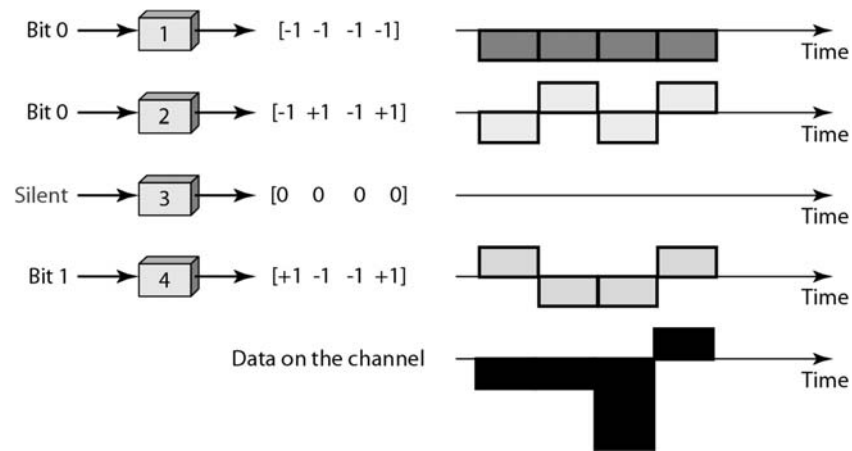- Chip sequences

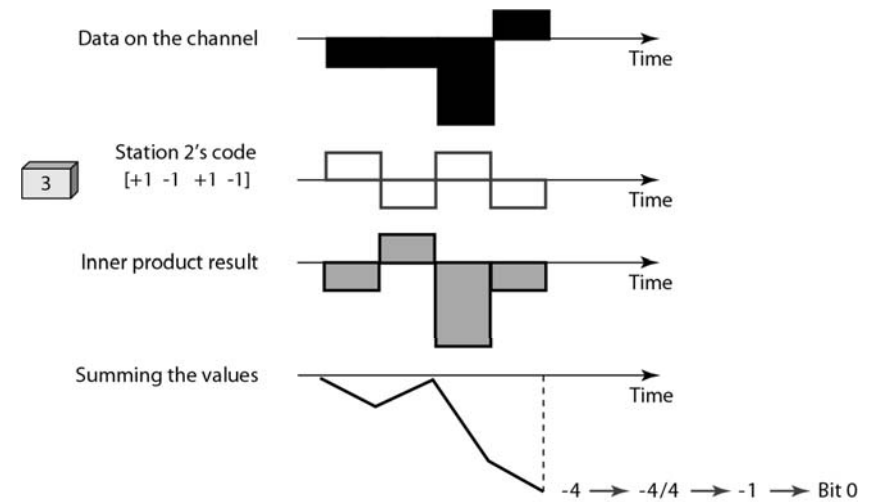- Data representation in CDMA

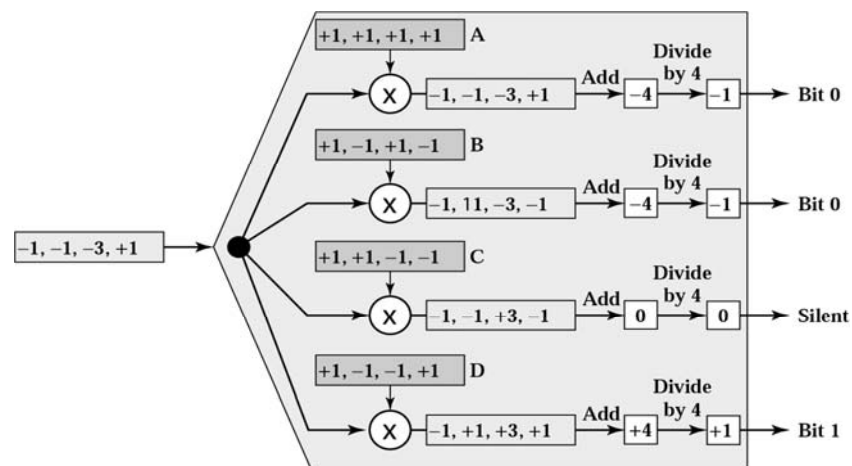## Sharing channel in CDMA

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

$$W_1 = \begin{bmatrix} +1 \end{bmatrix} \qquad W_{2N} = \begin{bmatrix} W_N & W_N \\ W_N & \overline{W_N} \end{bmatrix}$$

a. Two basic rules

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

$$W_2 = \begin{bmatrix} +1 & +1 \\ +1 & -1 \end{bmatrix} \qquad W_4 = \begin{bmatrix} +1 & +1 & +1 & +1 \\ +1 & -1 & +1 & -1 \\ +1 & +1 & -1 & -1 \\ +1 & -1 & -1 & +1 \end{bmatrix}$$

b. Generation of W_1, W_2, and W_4

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