Course Name: A Level (2nd Sem) Subject: DCN

Topic: Channelization [CDMA] Date: 18-05-20

Types of Channelization Techniques:

The **three** Channelization methods are:

1. **Frequency-Division Multiple Access (FDMA)**
2. **Time-Division Multiple Access (TDMA)**
3. **Code-Division Multiple Access (CDMA)**

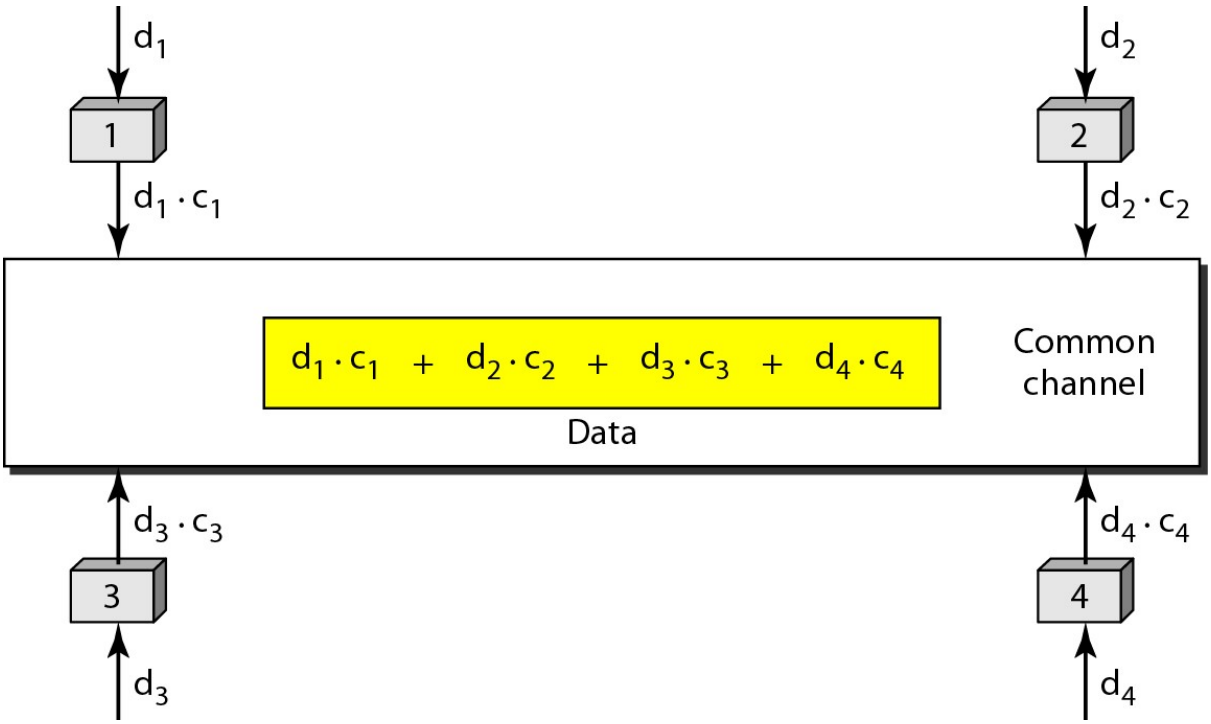
3. Code-Division Multiple Access (CDMA)

- CDMA is a digital cellular technology that uses spread-spectrum techniques. CDMA does not assign a specific frequency to each user. Instead, every channel uses the full available spectrum. Individual conversations are encoded with a pseudo-random digital sequence.
- CDMA consistently provides better capacity for voice and data communications that allows more subscribers to connect at any given time.
- Code-division multiple access (CDMA) was conceived several decades ago. It is a military technology first used during World War II by English allies to foil German attempts at jamming transmissions.
- CDMA differs from FDMA because only one channel occupies the entire bandwidth of the link. It differs from TDMA because all stations can send data simultaneously; there is no timesharing.
- Hence, CDMA simply means communication with different codes.

Let us assume we have four stations 1, 2, 3, and 4 connected to the same channel. The data from station 1 are d1, from station 2 are d2, and so on. The code assigned to the first station is c1, to the second is c2, and so on. We assume that the assigned codes have two properties.

1. If we multiply each code by another, we get 0.
2. If we multiply each code by itself, we get 4 (the number of stations).

With these two properties, let us see how the above four stations can send data using the same common channel, as shown in Figure.



Station1 multiplies its data by its code to get d1 . c1. Station2 multiplies its data by its code to get d2 . c2 and so on. The data that go on the channel are the sum of all these terms, as shown in the box (in the figure). Any station that wants to receive data from one of the other three multiplies the data on the channel by the code of the sender. For example, suppose stations 1 and 2 are talking to each other. Station2 wants to hear what station1 is saying. It multiplies the data on the channel by c1 the code of station 1.

Because (c1 . c1) is 4, but (c2 . c1), (c3 . c1), and (c4 . c1) are all 0s, station 2 divides the result by 4 to get the data from station 1.

data = (d1 . c1 + d2 . c2 + d3 . c3 + d4 . c4) . c1

= d1 . c1 . c1 + d2. c2 . c1 + d3 . c3 . c1 + d4 . c4 . c1

= 4 X d1

d1 = data/4

Exercises:

A. **What is CDMA? How does it differ from FDMA and TDMA?**

B. **In CDMA multiple devices can communicate with different codes in a common channel. How does a station differentiate other's station's data with the help of codes? Explain the process.**