FACULTY OF ENGINEERING & TECHNOLOGY

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Topics Covered

CDMA
How Does CDMA Work?
CDMA Capacity
Advantages of CDMA
Disadvantages of CDMA

CDMA

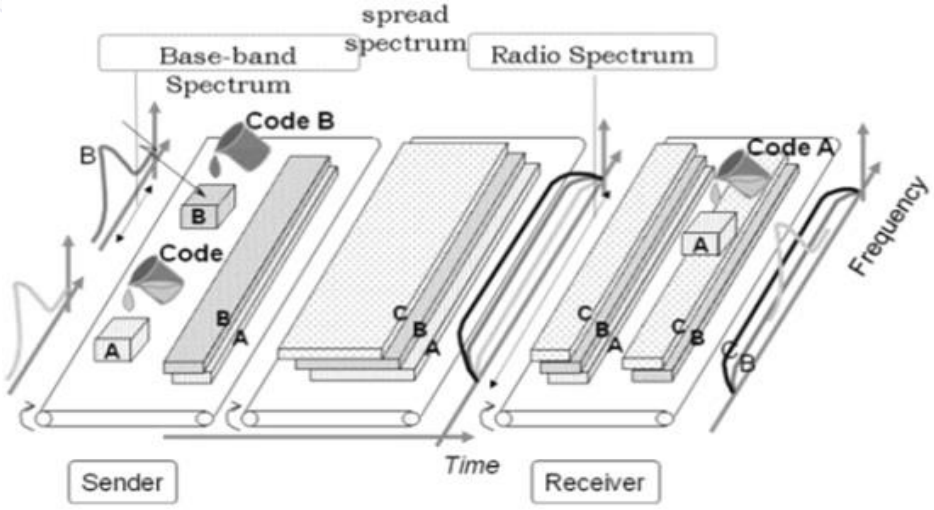
Code Division Multiple Access system is very different from time and frequency multiplexing. In this system, a user has access to the whole bandwidth for the entire duration. The basic principle is that different CDMA codes are used to distinguish among the different users.

echniques generally used are direct sequence spread spectrum modulation (DS-CDMA), frequency hopping or mixed CDMA detection (JDCDMA). Here, a signal is generated which extends over a wide bandwidth. A code called **spreading code** is used to perform this action. Using a group of codes, which are orthogonal to each other, it is possible to select a signal with a given code in the presence of many other signals with different orthogonal codes.

How Does CDMA Work?

CDMA allows up to 61 concurrent users in a 1.2288 MHz channel by processing each voice packet with two PN codes. There are 64 Walsh codes available to differentiate between calls and theoretical limits. Operational limits and quality issues will reduce the maximum number of calls somewhat lower than this value.

In fact, many different "signals" baseband with different spreading codes can be modulated on the same carrier to allow many different users to be supported. Using different orthogonal codes, interference between the signals is minimal. Conversely, when signals are received from several mobile stations, the base station is capable of isolating each as they have different orthogonal spreading codes.



CDMA Capacity

The factors deciding the CDMA capacity are −
Processing Gain
Signal to Noise Ratio
Voice Activity Factor
Frequency Reuse Efficiency
Capacity in CDMA is soft, CDMA has all users on each frequency and users are separated by code. This means, CDMA operates in the presence of noise and interference.

Centralized Methods

The band used in CDMA is 824 MHz to 894 MHz (50 MHz + 20 MHz separation).
Frequency channel is divided into code channels.
1.25 MHz of FDMA channel is divided into 64 code channels.

Advantages of CDMA

CDMA has a soft capacity. The greater the number of codes, the more the number of users. It has the following advantages −

CDMA requires a tight power control, as it suffers from near-far effect. In other words, a user near the base station transmitting with the same power will drown the signal latter. All signals must have more or less equal power at the receiver

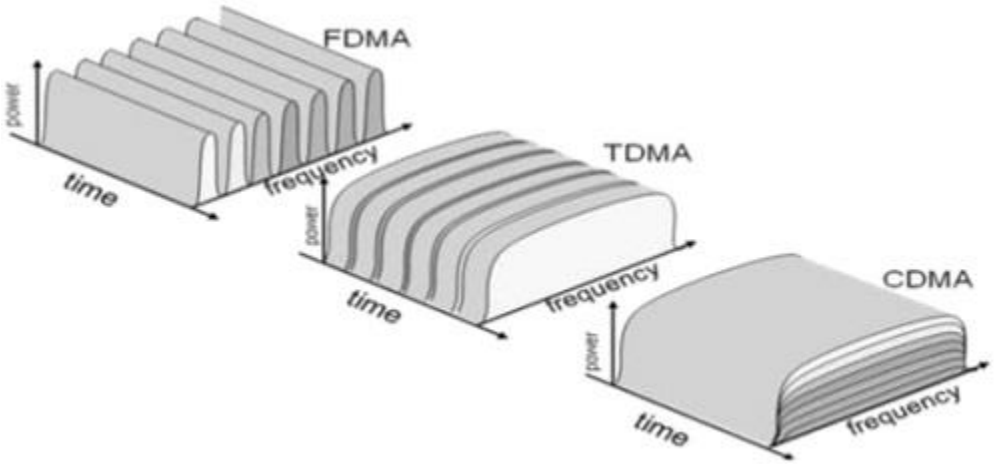
Rake receivers can be used to improve signal reception. Delayed versions of time (a chip or later) of the signal (multipath signals) can be collected and used to make decisions at the bit level.

Flexible transfer may be used. Mobile base stations can switch without changing operator. Two base stations receive mobile signal and the mobile receives signals from the two base stations.

Transmission Burst − reduces interference.

Disadvantages of CDMA

The disadvantages of using CDMA are as follows −
The code length must be carefully selected. A large code length can induce delay or may cause interference.
Time synchronization is required.
Gradual transfer increases the use of radio resources and may reduce capacity.
As the sum of the power received and transmitted from a base station needs constant tight power control. This can result in several handovers.



MCQ

Radio capacity may be increased in cellular concept by
a. Increase in radio spectrum
b. Increasing the number of base stations & reusing the channels
c. Both a & b
d. None of the above
ANSWER: Increasing the number of base stations & reusing the channels
27) The shape of the cellular region for maximum radio coverage is
a. Circular
b. Square
c. Oval
d. Hexagon
ANSWER: Hexagon
28) Hexagon shape is used for radio coverage for a cell because
a. It uses the maximum area for coverage
b. Fewer number of cells are required
c. It approximates circular radiation pattern
d. All of the above
ANSWER: All of the above
29) Centre excited hexagonal cells use
a. Sectored directional antennas
b. Omni directional antennas
c. Yagi uda antennas
d. None of the above
ANSWER: Omni directional antennas
30) Spectrum Efficiency of a cellular network is
a. The traffic carried by whole network
b. The traffic carried per cell divided by the bandwidth of the system and the area of a cell
c. Expressed in Erlang /MHz /km^2
d. Both b and c
e. Both a and c