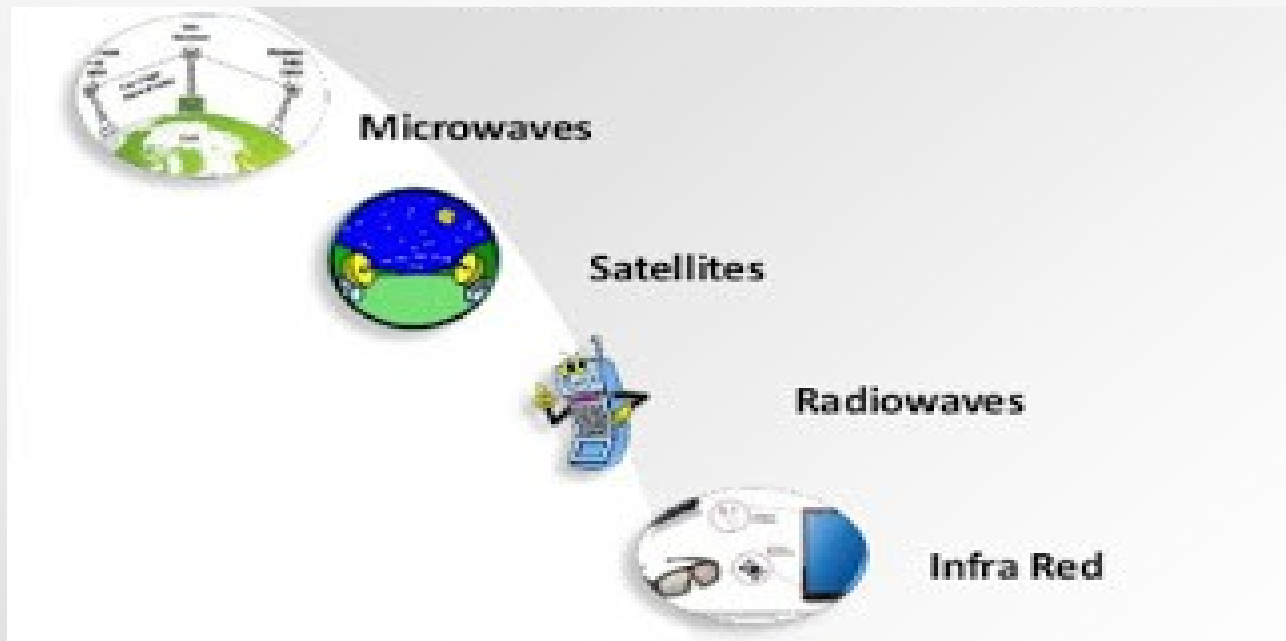


Transmission Media : Unguided Media

- Unguided media also called **wireless communication**.
- An unguided transmission transmits the electromagnetic waves without using any physical medium. Therefore it is also known as wireless transmission.
- Send communications signals through air or space.
- Used when inconvenient or impossible to install cables.

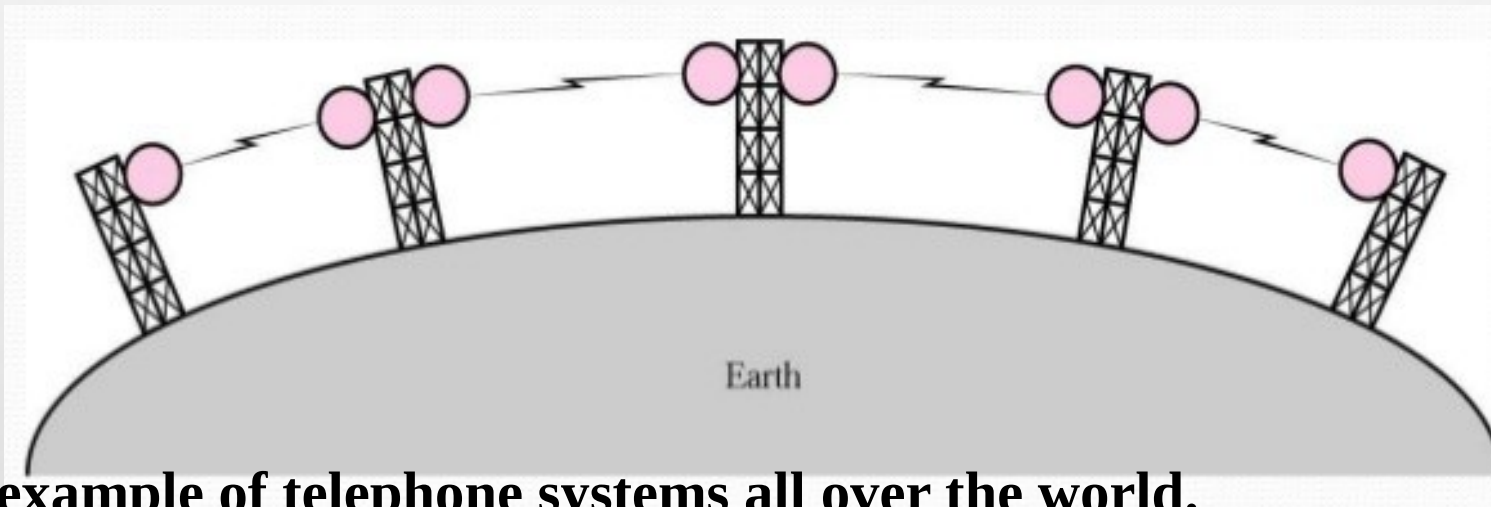


Transmission Media : Unguided Media – Wireless Band

- **VLF: Very Low Frequency**, Usually spread through air and water. VLF waves do not suffer attenuation but affected by atmosphere. It is generally used for long distance.
- **LF: Low Frequency**, waves work with long-distance-radio frequency.
- **MF: Middle Frequency**, waves rely on line-of-sight antennas to increase control problems. AM radio.
- **HF: High Frequency** used in amateur radio, citizen band radio, international broadcasting, military communication, telephone and telegraph.
- **VHF: Very High Frequency**, are used in television, FM radio, aircraft AM radio.
- **UHF: Ultra High Frequency**, used for television, mobile phone, cellular radio, paging and microwaves
- **SHF: Super High Frequency**, in space used for terrestrial and satellite microwave and radar communications.
- **EHF: Extremely High Frequency**, are transmitted into space and used for radar, satellite and experiment communication.

Transmission Media : Unguided Media - Microwave

- Microwave uses the **line of sight** method of propagation as the signals **do not travel along the surface of the earth**.
- So, two **antennas** must be in a **straight line** able to look at each other without any obstacle in between.
- The taller the antenna the more is the distance that these waves travel.
- The antennas are positioned on mountains to avoid obstacles.
- Microwave signals travel only in one direction at a time. Therefore for two way communication two frequencies are required.
- Repeaters are used to enhance the signal.

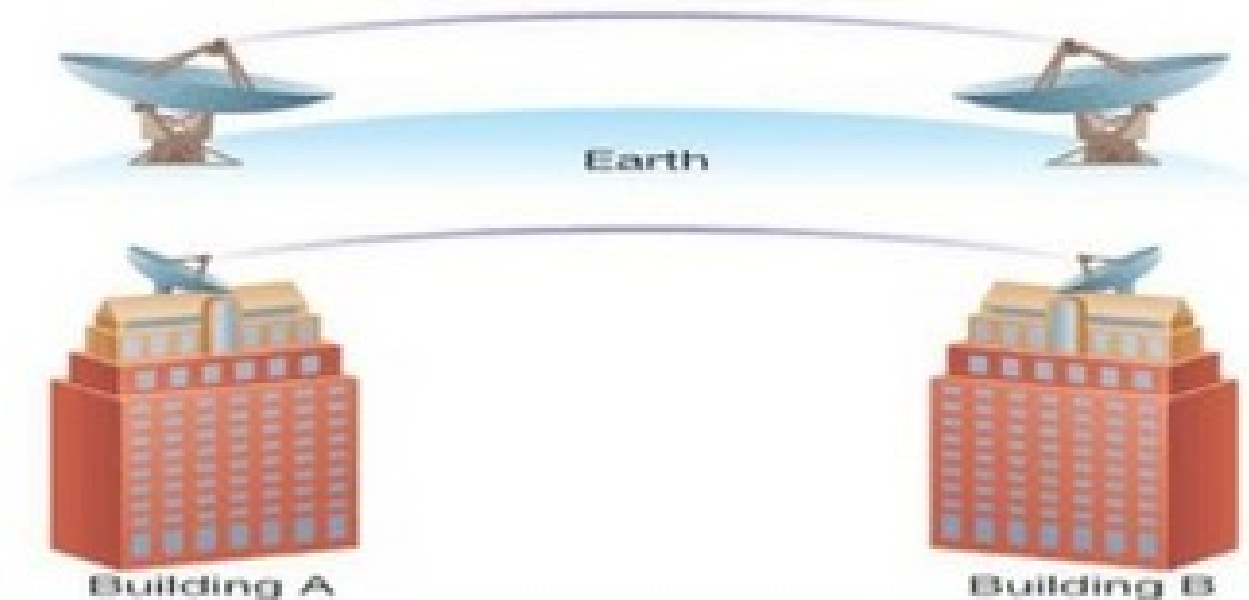


It is an example of telephone systems all over the world.

Transmission Media : Unguided Media - Microwave

- Microwaves are used for unicast(single sender and a single receiver) communication such as cellular telephones, satellite networks, and wireless LANs.
- The frequencies used are in the low-gigahertz range.

Terrestrial microwave requires a line of sight path between a sender and a receiver



Transmission Media : Unguided Media - Microwave

- **Characteristics of Microwave:**

- Bandwidth: It supports the bandwidth from 1 to 10 Mbps.
- Short distance: It is inexpensive for short distance.
- Long distance: It is expensive as it requires a higher tower for a longer distance.
- Attenuation: Attenuation means loss of signal. It is affected by environmental conditions and antenna size.



Transmission Media : Unguided Media - Microwave

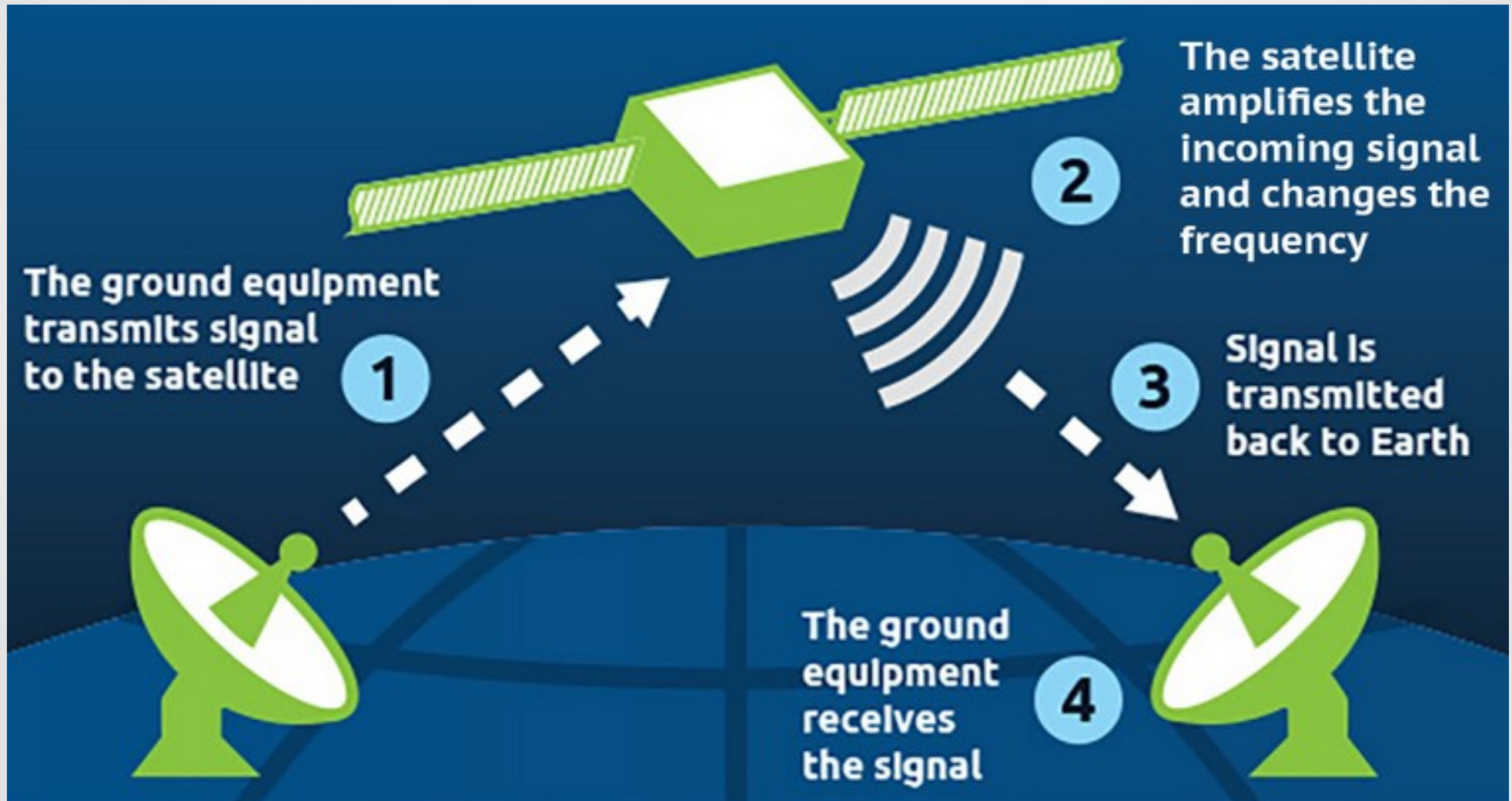
- **Advantages of Microwave Communication:**
- Microwave transmission is cheaper than using cables.
- It is free from land acquisition as it does not require any land for the installation of cables.
- Microwave transmission provides an easy communication in terrains as the installation of cable in terrain is quite a difficult task.

Transmission Media : Unguided Media - Satellite

- The main problem with micro wave communication is the mountains & other structure often block the line of side.
- Due to this reason, many repeats are required for long distance which increases the cost of data transmission between the two points.
- This problem is recommended by using satellites.

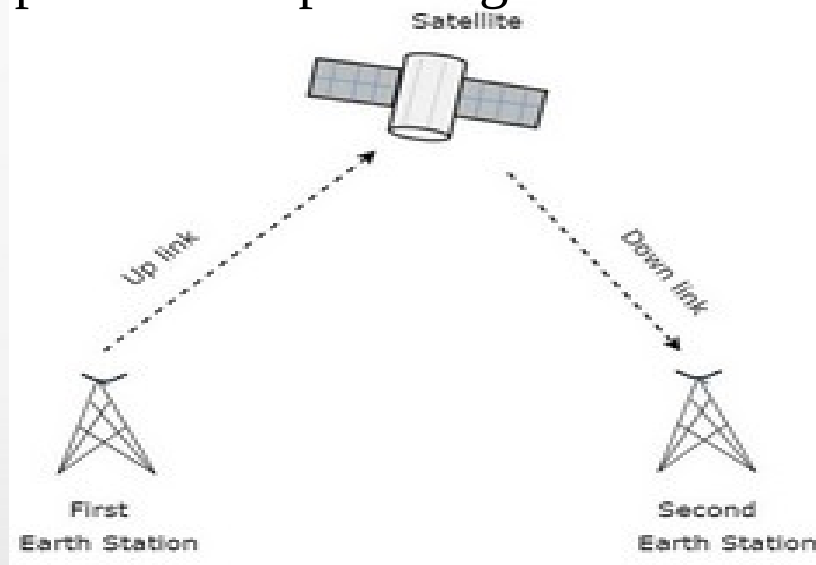
Satellite micro wave transmission is used to transmit signals through out the world. These system use satellites in orbit about 50,000 Km above the earth.

Transmission Media : Unguided Media - Satellite



Transmission Media : Unguided Media - Satellite

- Satellite communication is similar to microwave communication, except that the satellite acts as one of the station.
- The satellites are launched either by rockets or space shuttles carry them.
- These are positioned 3600KM above the equator with an orbit speed that exactly matches the rotation speed of the earth.
- **The satellite performs the functions of an antenna and the repeater together.**
- Receives on one frequency (uplink), amplifies or repeats signal and transmits on another frequency (downlink)



Transmission Media : Unguided Media - Geosynchronous Satellite

- If the earth along with its ground stations is revolving and the satellite is stationery, the sending and receiving earth stations and the satellite will be out of sync as time passes by.
- So **geosynchronous satellites** are used which move at the same **RPM (Revolution Per Minute)** as the earth in the same direction exactly like the earth.
- Therefore both the earth and the satellite complete one revolution exactly in the same time.
- Using this satellite we can communicate between any two parts of the world.
- **Minimum three satellites are needed to cover the earth's surface.**



Transmission Media : Unguided Media - Geosynchronous Satellite

- **Features of Satellite Microwave :**

- Bandwidth capacity depends on the frequency used.
- Satellite microwave deployment for orbiting satellite is difficult.

- **Advantages of Satellite Microwave :**

- Transmitting station can receive back its own transmission and check whether the satellite has transmitted information correctly.
- A single microwave relay station which is visible from any point.

- **Disadvantages of Satellite Microwave :**

- Satellite manufacturing cost is very high
- Cost of launching satellite is very expensive
- Transmission highly depends on whether conditions, it can go down in bad weather

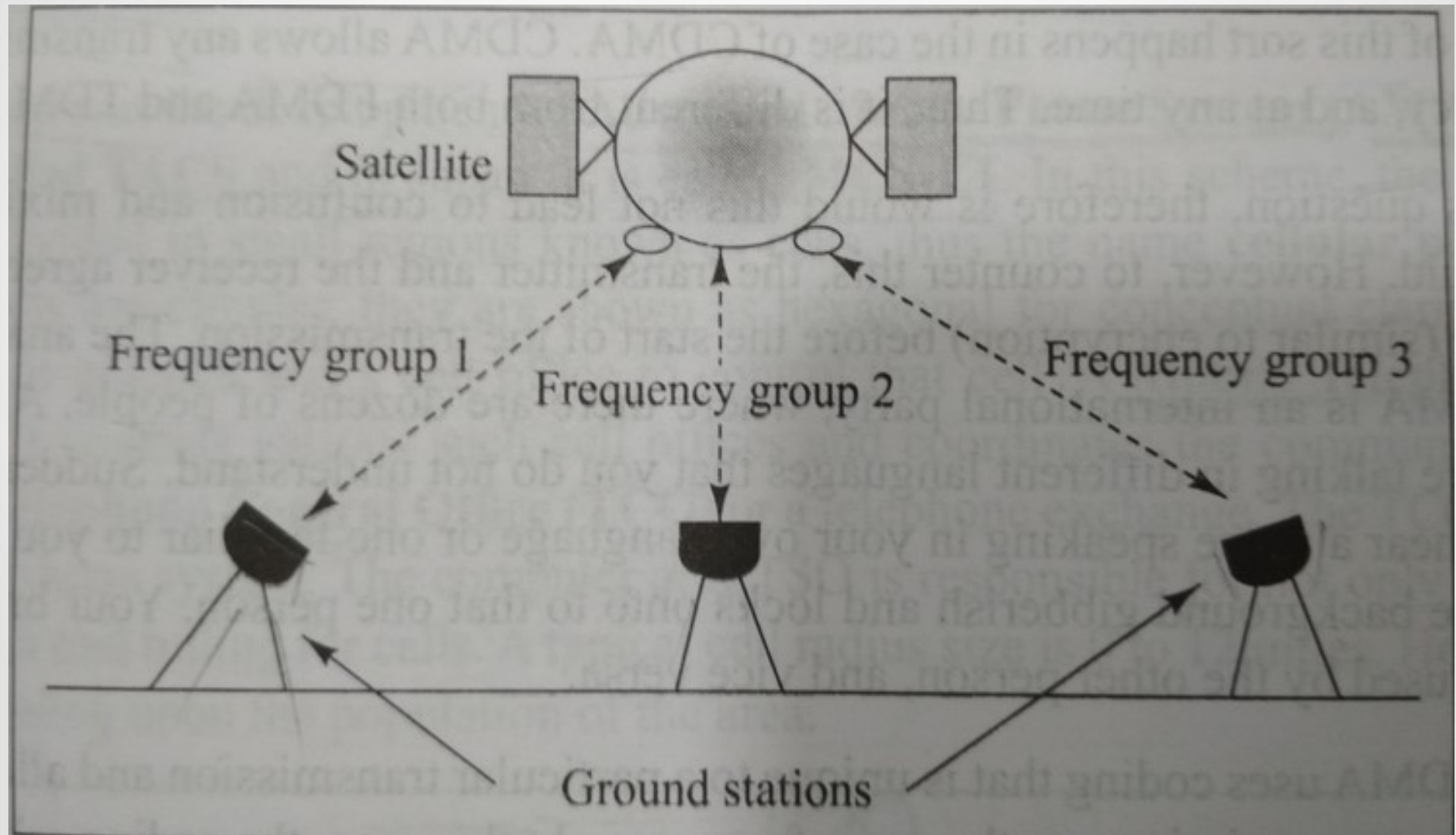
Transmission Media : Unguided Media - Satellite

- If communication takes place between any two earth stations through a satellite, then it is called as satellite communication. In this communication, electromagnetic waves are used as carrier signals. These signals carry the information such as voice, audio, video or any other data between ground and space and vice-versa.
- Two frequency bands are used for signals from the earth to satellite called uplink and from satellite to earth called downlink.
- Three methods of communication using satellites.
 1. **FDMA** – frequency division multiple access
 2. **TDMA** – time division multiple access
 3. **CDMA** – code division multiple access

Transmission Media : Unguided Media - Satellite

- **FDMA**
- FDMA puts each transmission on a separate **frequency**.
- FDMA splits the total bandwidth into multiple channels.
- Each ground station on the earth is allocated a particular frequency group.
- Within each group, the ground station can allocate different frequencies to individual channels.
- FDMA is the process of dividing one channel or bandwidth into multiple individual bands, each for use by a single user.
- **Used in GSM mobile and FM Radio.**

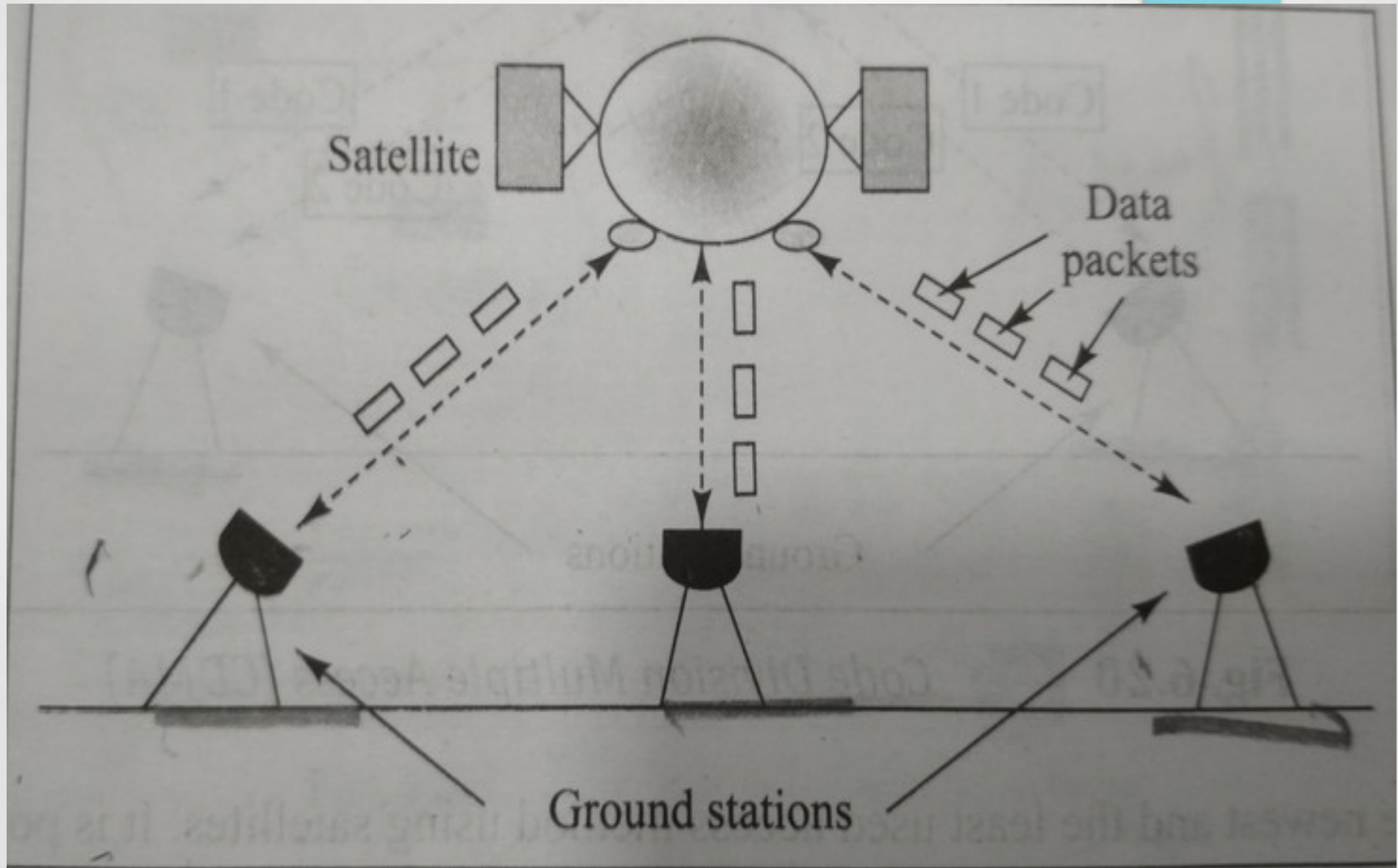
Transmission Media : Unguided Media - Satellite



Transmission Media : Unguided Media - Satellite

- **TDMA:**
- TDMA allows access to the full bandwidth of the frequency.
- In TDMA, each transmitter is allocated a predefined time slot.
- TDMA is a digital technique that divides a single channel or band into time slots.
- Each time slot is used to transmit one byte or another digital segment of each signal in sequential serial data format.
- This technique works well with slow voice data signals, but it's also useful for compressed video and other high-speed data.
- **Use in 2G phone.**

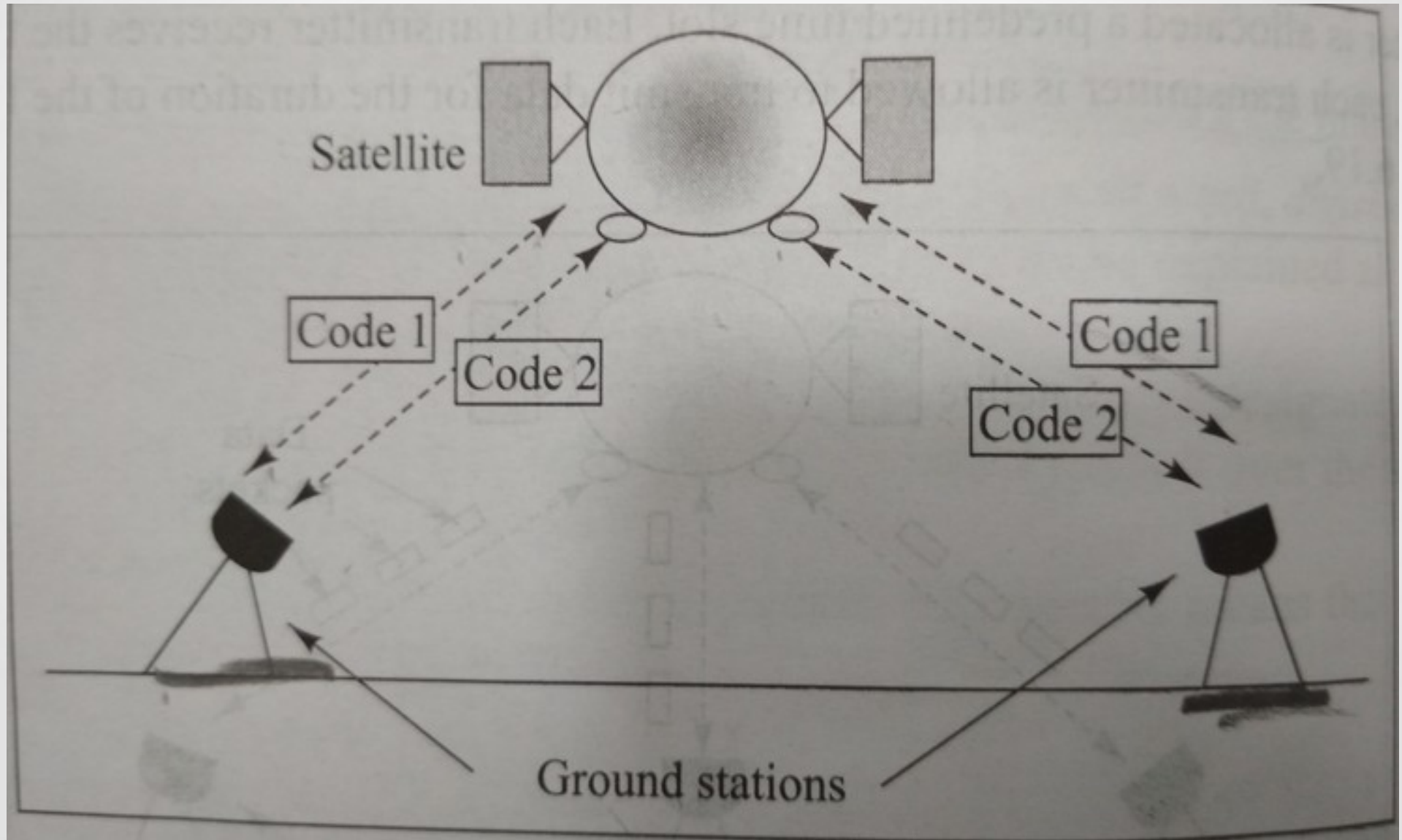
Transmission Media : Unguided Media - Satellite



Transmission Media : Unguided Media - Satellite

- **CDMA:**
- CDMA – Code Divison Multiple Access
- CDMA allows any transmitter to transmit in any frequency and at any time.
- The transmitter and the receiver agree upon a unique coding scheme (similar to encryption) before the start of transmission.
- Used in CDMA card in dedicated phone.
- It is popular in military installations.

Transmission Media : Unguided Media - Satellite

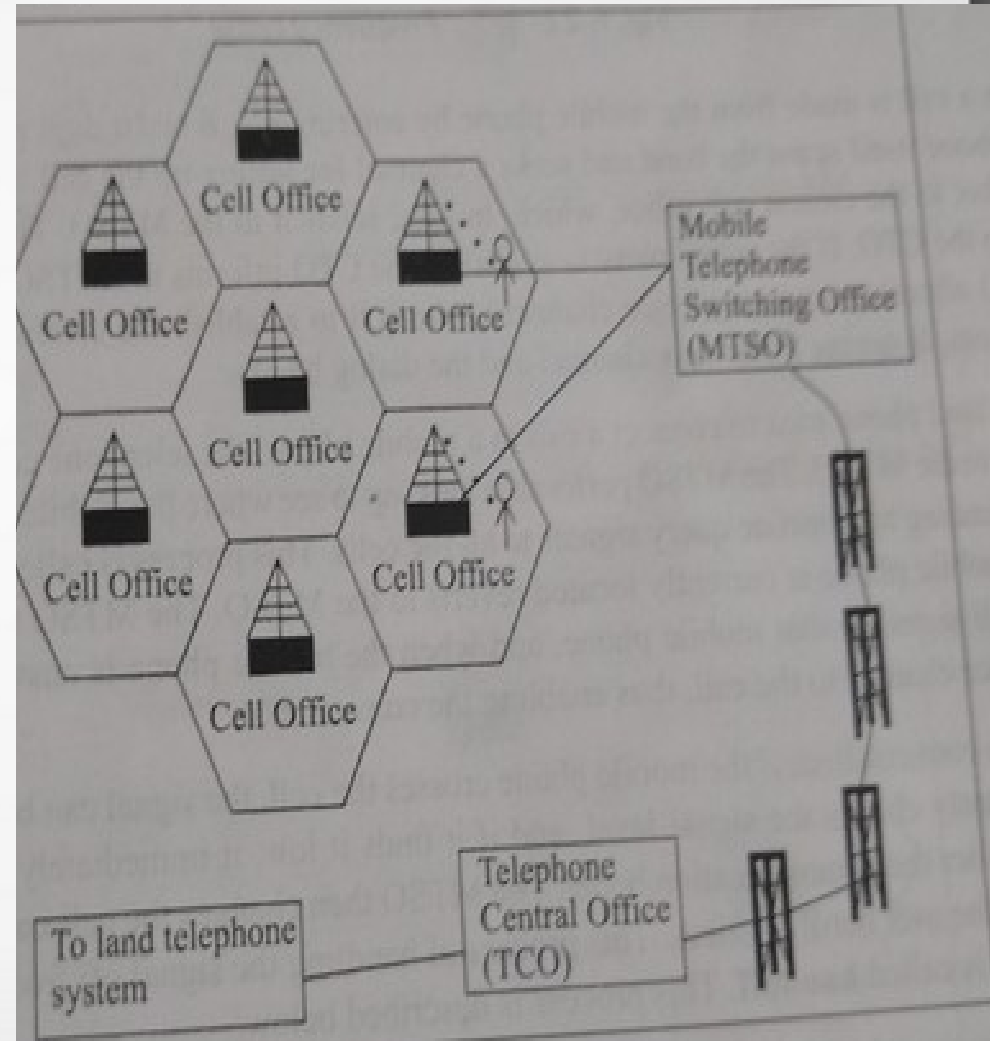


Transmission Media : Unguided Media – Cellular Telephones

- The emergence of the first mobile telephone as early as 1946.
 - Difficult to operate .
 - Single channel for both sending and receiving communication.
- Also known as **push to talk system**.
- Second development took place in 1960, known as Improved Mobile telephone System (**IMTS**)
 - Stronger and used two frequencies.
 - One frequency was used for sending and other for receiving.
- Third Development was Advance Mobile Phone System(**AMPS**).
 - In this schema, the area covered is conceptually divided in small region known as cells, thus the name cellular phones.

Transmission Media : Unguided Media – Cellular Telephones

- Each cell has an antenna and a cell office to control that cell.
- A Mobile Telephone switching Office (**MTSO**) controls various such cell offices and coordinates the communication between them and the Telephone Central Office (**TCO**) or a telephone exchange.
- TCO is part of wired land telephone system.
- MTSO is responsible for connections, information and billing for calls.
- A typical cell radius size is 0 to 12 miles which can be changed upon the population of the area.



Transmission Media : Unguided Media – Cellular Telephones

- During the conversation, if the mobile phone crosses the cell, the signal can become weak. The MTSO constantly checks the signal level, and if it finds low then immediately seeks a new cell.
- The process of handling the signal off from the old channel to the new one is called handoffs.

