

SATELLITE N/W's

WHAT IS A SATELLITE - An object which revolves around the earth's surface at a known orbit at a known height.
Path followed by the object (satellite) is called its orbit

COMMUNICATION SATELLITE

SPACE SEGMENT



GROUND SEGMENT

consists of earth station



WORKS IN REVERSE
DIRECTION

CLASSIFICATION OF SATELLITES

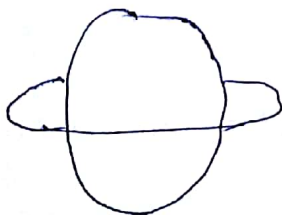
a) BASED ON PRINCIPLE OF OPERATION

• PASSIVE SATELLITES - Cannot generate power. only reflects the signal coming from one earth's surface to other. coverage area is less

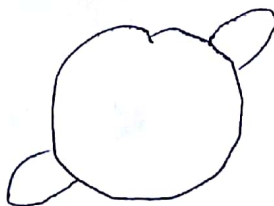
• ACTIVE SATELLITE

• Have transmitting equipment built on it like Transponders, receives signals from earth, amplify it & retransmit back to earth

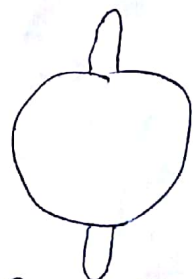
b) BASED ON ORBITS



• Equatorial orbit



• Inclined orbit



• POLAR ORBIT

BASED ON ALTITUDE OF SATELLITES

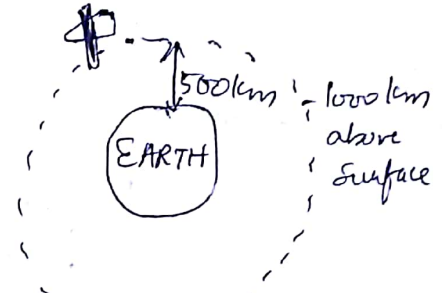
① LOW EARTH ORBIT (LEO) - The nearest orbit to the earth is called Low Earth orbit. orbits in which satellites are placed 500-1000 km above earth

Round trip time < 20 ms

• Due to lower orbit, LEO satellite exhibits much shorter time period of 95-120 min

• Cover small area of Earth

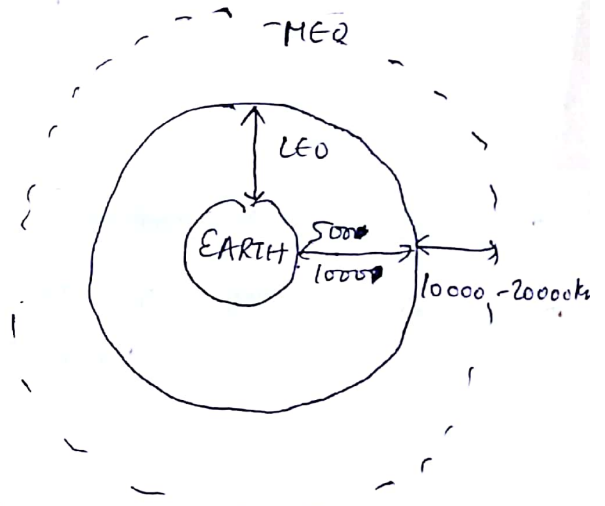
So around 66 satellites required to cover entire Earth



Example - Iridium System - Project started by Motorola in 1990 to provide world wide voice & data communication. Took 66 satellites to cover earth's surface.

② MEDIUM EARTH ORBITS

• orbits in which satellites are placed 10000 km - 20000 km above surface area



• VAN ALLEN RADIATIONS

• Lies b/w 2000 - 8000 km

• Can damage the ~~satellite~~ satellite.

So starts from 10000 km

• Satellite Period is 6 Hrs

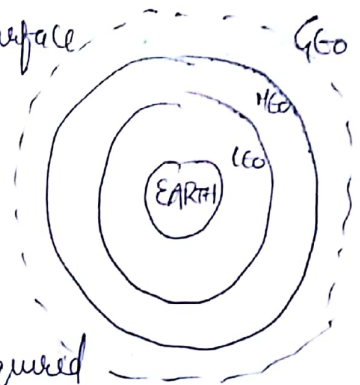
• Due to large coverage, requires 10-12 satellites

Example - GPS (Global Positioning System) - is a satellite based navigation system

22 satellites used.

3. GEO SYNCHRONOUS ORBIT (Geo)

- Orbit Placed at 36000 km away from earth surface
- Time Period of 23hr 59min 4sec
- 1 Geo Satellite Can cover
40% area of Earth's Surface
- So Minimum of 3 Geo Satellites of 120° are required



BASED ON APPLICATION

- 1) Communication Satellite Eg INTEL SAT
world's first Global n/w
- 2) REMOTE Sensing n/w - IRS (Indian remote Sensing)
- 3) Navigation Satellite - GPS of America
GLONASS of RUSSIA

BASED ON COVERAGE DISTANCE

- ① National Coverage
Example - INSAT (Indian National Satellite)
- ② REGIONAL COVERAGE
Example - ARAB
- ③ INTERNATIONAL Coverage
Example - INTEL SAT

NUMERICAL ON CELL REUSE CONCEPT

Q. Consider a cellular n/w with 64 cells. Each hexagonal cell has an approx area 10 km^2 . The total no. of radio channels allotted for the n/w is 336.

1) what is the total area covered by the cellular n/w.

Sol - Total no. of cells = 64 Each cell area = 10 km^2

$$\boxed{\text{Total area} = 64 \times 10 = 640 \text{ km}^2}$$

2. Find the total no. of channels of the n/w, if a) $N=4$ b) $N=7$ c) $N=12$, where N denotes cell reuse.

sol:- Given, total available channels in the n/w = 336

a) For $N=4$, available channel in a cell = $336/4 = 84$

$$\boxed{\text{Total channels} = 84 \times 64 = 5,376 \text{ channels}}$$

b) For $N=7$ $336/7 = 48$

$$\boxed{\text{Total channels} = 48 \times 64 = 3072 \text{ channels}}$$

c) For $N=12$ $336/12 = 28$

$$\text{Total channels} = 28 \times 64$$

$$\boxed{= 1792 \text{ channels}}$$