Satellite Communication

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Overview

- Satellite is a microwave repeater in the space.

- There are about 750 satellite in the space, most of them are used for communication.

- They are:
  - Wide area coverage of the earth's surface.
  - Transmission delay is about 0.3 sec.
 - Transmission cost is independent of distance.

- Satellite up links and down links can operate in different frequency bands:

| Band	Up-Link (Ghz)	Down-link (Ghz)	ISSUES
C	4	6	Interference with ground links.
Ku	11	14	Attenuation due to rain
Ka	20	30	High Equipment cost

- The up-link is a highly directional, point to point link
- The down-link can have a footprint providing coverage for a substantial area "spot beam".

Orbits:

- LEO: Low Earth Orbit.

- MEO: Medium Earth Orbit

- GEO: Geostationary Earth Orbit

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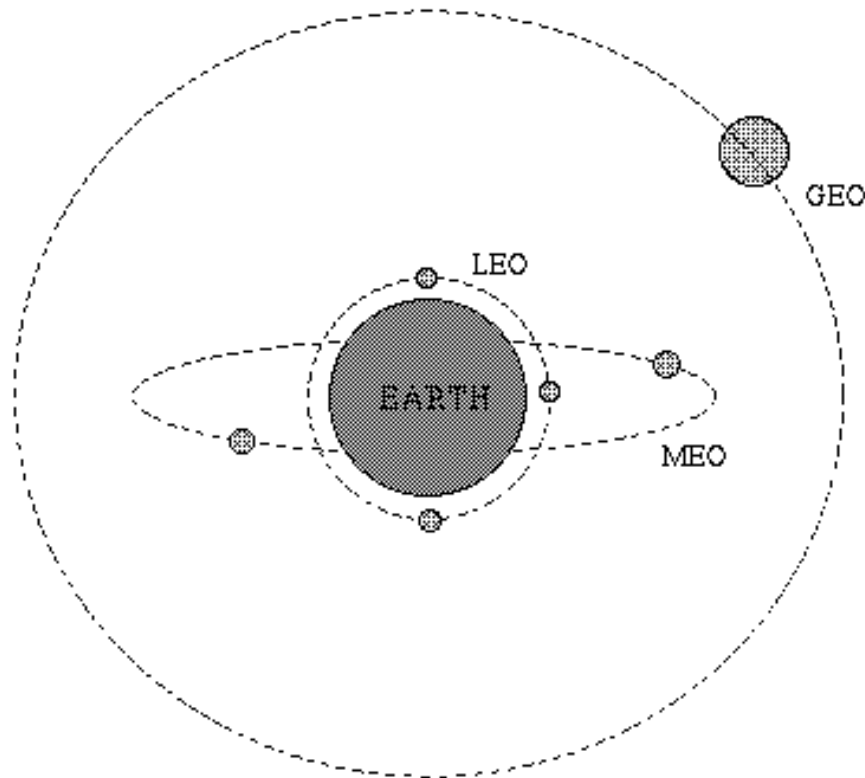
- At the Geostationary orbit the satellite covers 42.2% of the earth's surface.

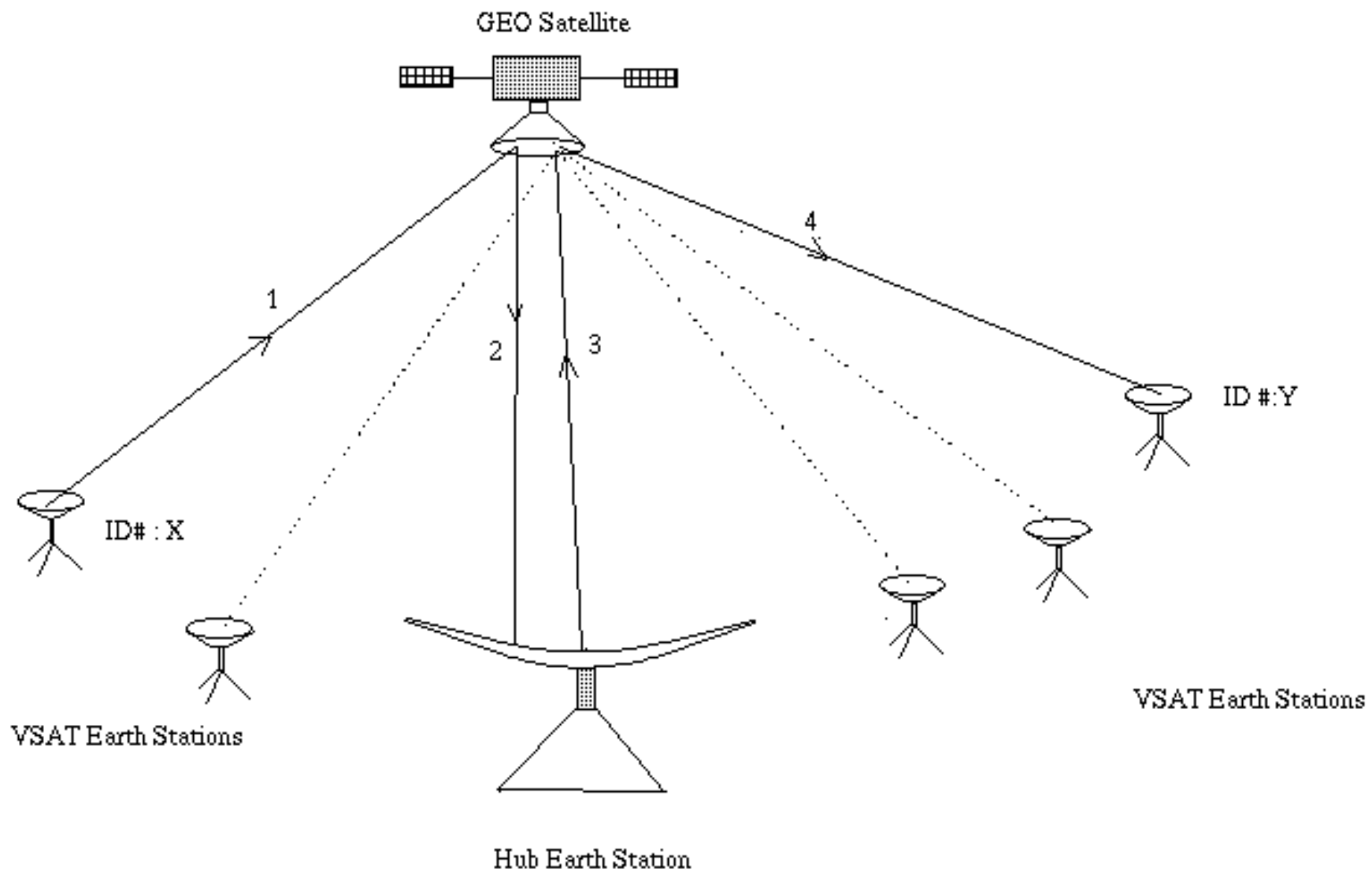- Theoretically 3 geostaionary satellites provides 100% earth coverage
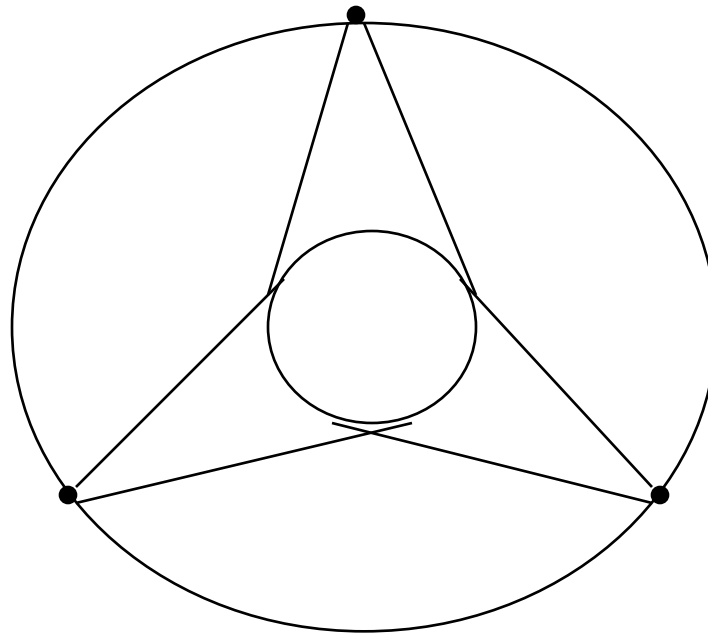
MAC(Media Access Control) protocols for satellite links

- ALOHA:

  - Every station can transmit any time
  - Very low efficiency 18- 36 %.

- FDMA (Frequency Division Multiple Access)

  - It is the oldest and most common.
  - the available satellite channel bandwidth is broken into frequency bands for different earth stations.

- TDMA (Time Division Multiple Access)
  - channels are time multiplexed sequentially
  - Each earth station gets to transmit in a fixed time slot only.
  - More than one time slot can be assigned to stations with more bandwidth requirements.
  - Requires time synchronization between the Earth Stations.

- CDMA : (Code Division Multiple Access)
  - Combination of time/frequency multiplexing
    (a form of spread spectrum modulation).
  - It provides a decentralized way of providing separate channels without timing synchronization. It is a relatively new scheme but is expected to be more common in future satellites.

VSAT Network

- At the Very Small Aperture Terminal a lower performance microwave transceiver and lower gain dish antenna (smaller size) is used.

- VSAT networks are arranged in a star based topology.

- Ideal for centralized networks with a central host (Banking institutions with branches all over the country).

- Use the S-ALOHA and TDMA

GEO Satellite

ID# : X

ID #:Y

1

2

3

4

VSAT Earth Stations

VSAT Earth Stations

Hub Earth Station

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DirecPC services:

- One of the most useful applications of VSAT networks

- Comes with an ISA computer card, a RF dish antenna (2 ft dia) equipped with an LNA, and supporting software.

Supporting two kinds of services

1. Digital Package Delivery
2. Turbo Internet

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1. Digital Package Delivery

- downloading files at a speed 100 times faster than that supported by public telephone network.

- Large files can be received by multiple DirecPC end points.

- The download requests are made using the standard analog modem over telephone lines.

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2.   Turbo Internet

- The end user overcomes the telephone line barrier and is capable of receiving data at 400 kbps.

- A connection is setup with the local ISP (internet server provider) using the analog telephone line modem.

- All mouse and keyboard actions in the web browser are communicated to the web server on the other end using this link.

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GEO Satellite

400 Kbps

4

VSAT

IBM PC
with modem

1

ISP

Internet Service
Provider

2

WWW

Web Server

3

NOC

Network Operations Center

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