

Satellite Communication Applications

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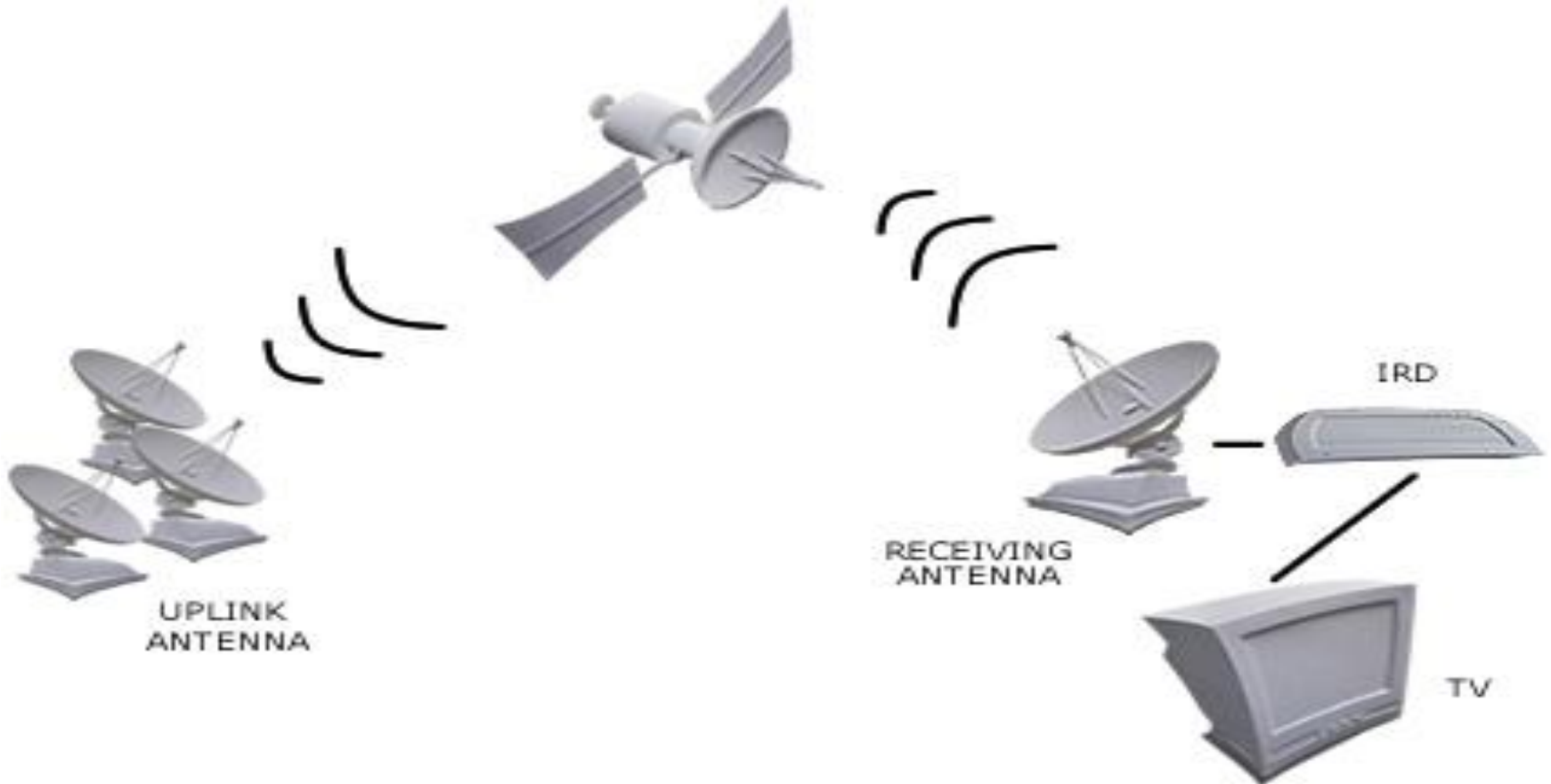
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TV Broadcasting

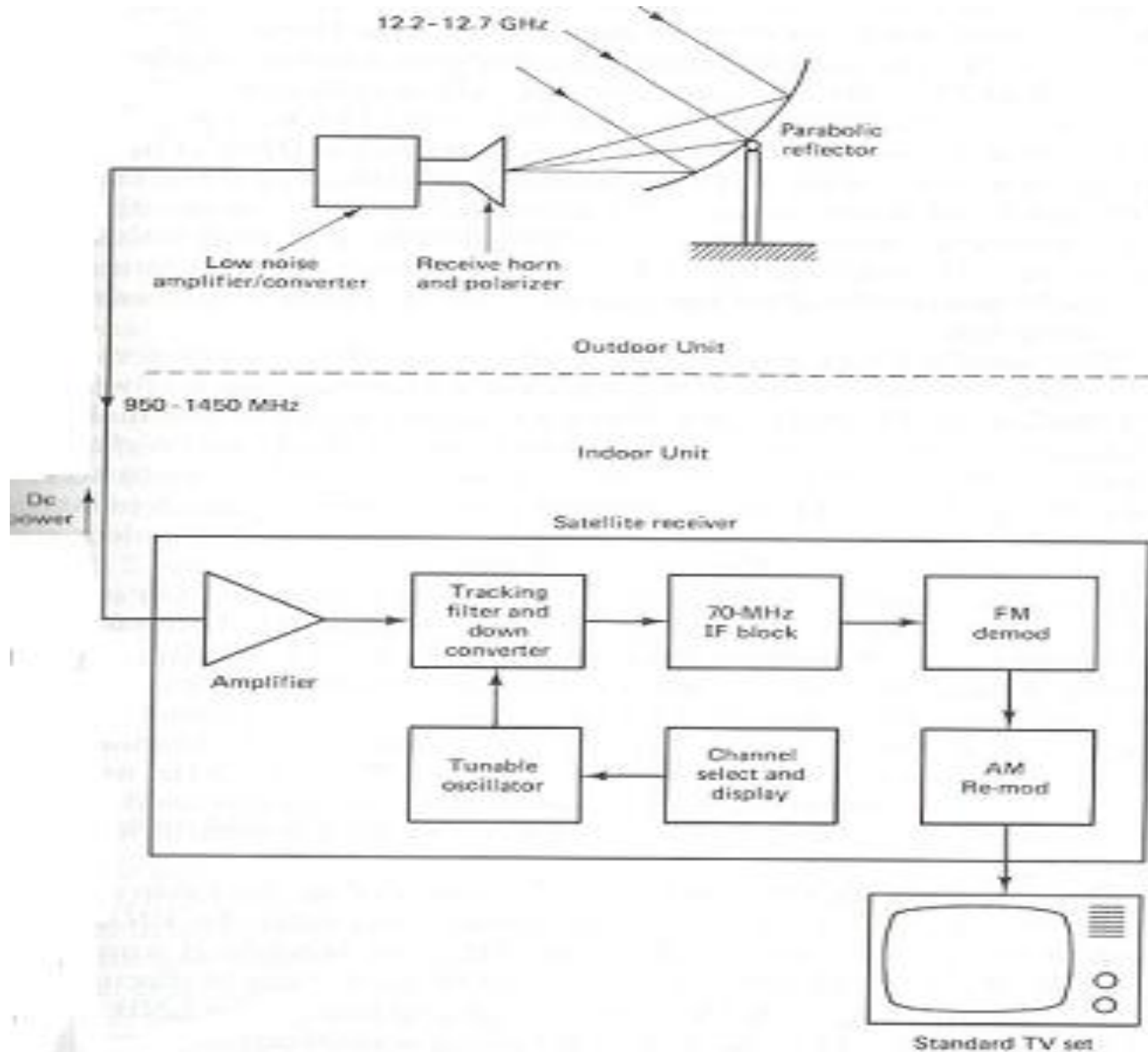
- One of the main uses of communications satellites is for TV broadcasting. This way, the TV signal can be transmitted to a large geographical region without detailed land transmitters or repeaters.
- Also for a live broadcasting, it is best to use a satellite for sending a live signal from anywhere on Earth
- DBS is Direct Broadcast Satellite for home viewing systems

DBS System

- The satellite is the space segment of the DBS system, the Earth segment consists of the satellite dish as well as the LNB and the satellite receiver



Home Terminal for DBS TV / FM Reception



Outdoor Unit of a DBS System

- The outdoor unit consists of a receiving antenna and a low noise amplifier / convertor.
- For the antenna, parabolic or offset reflector is used. The antenna is designed so that the focus will be in directly front of the reflector
- Usually 0.6 m to 1.3 m dishes are enough in the Ku band but for C band 2-3 m recommended



Outdoor Unit of a DBS System (LNB)

- LNB is the Low Noise Block which is the combination unit consisting of a low noise amplifier followed by a convertor.
- The LNB provides gain for the broadband 12 Ghz signal and then converts the signal to a lower frequency range so that low cost coaxial cable can be used as feeder to the indoor unit



Indoor Unit

- The indoor unit consists of coaxial cabling as well as the satellite DBS receiver.
- It will demodulate the signals and convert it into a form applicable for TV (PAL/SECAM/NTSC)



Bit Rates and Compression for Broadcasting TV Signals via Satellite

- Before transmission, all broadcasting signals must be converted to digital, compressed and time division multiplexed signals.
- The compressed bit rate and hence the number of channels depends on the type of the program material.
- Talk shows where there is little movement require the lowest bit rate, while sports channels with lots of movement requires larger bit rates.

Satellite Mobile Services

- For communications purposes, satellites are very useful for providing telephone coverage at any point in the world.
- Satellites provide full coverage for phone, fax and internet connection
- Some global satellite mobile services include:
 - Asian Cellular System
 - Thuraya Global System
 - MSAT (for North American coverage)

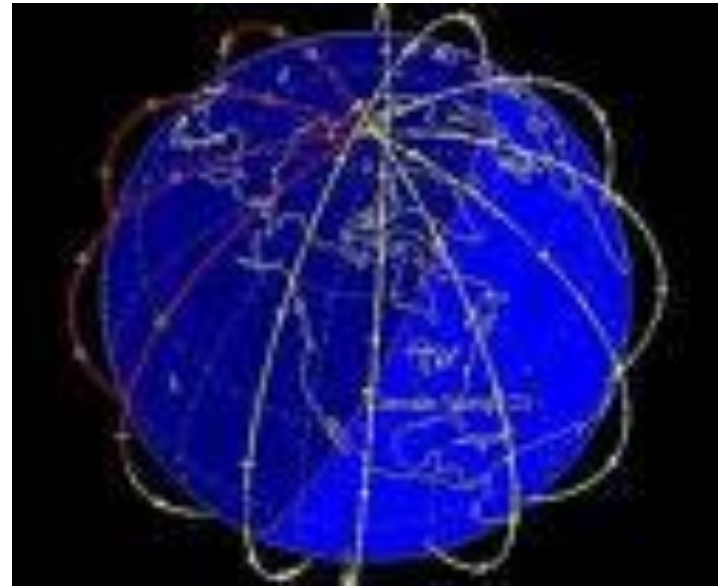
Thuraya

- Thuraya satellite system serves an area between 20W and 100E longitude to 60 N and 2S latitude. System covers more than 110 countries with a combined population of 2.3 billion. It spans Europe, North and Central Africa and some parts of Southern Africa
- Network capacity is about 13,750 telephone channels.



Iridium Satellite Network

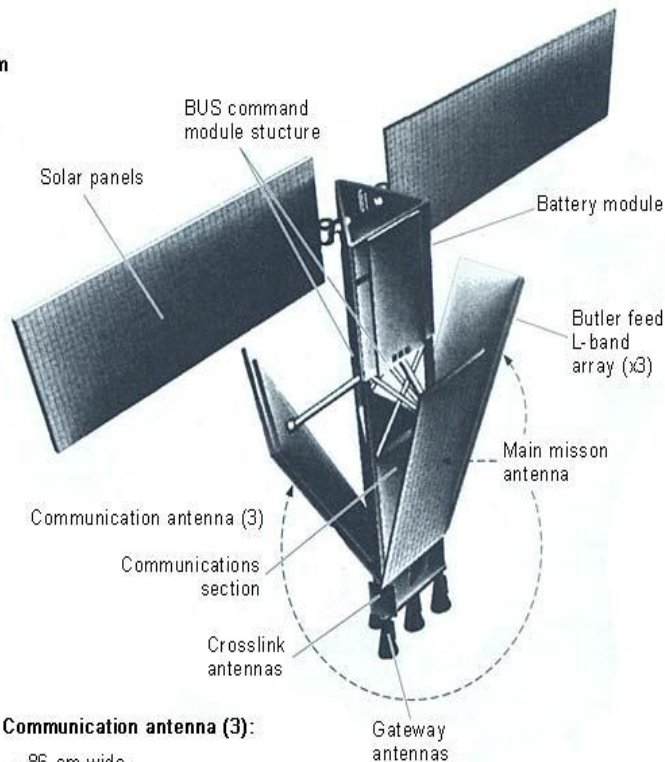
- Iridium satellite systems are special communications satellites for telephony that uses 66 satellites grouped in 6 orbital planes with each containing 11 satellites.



Iridium Satellite Network

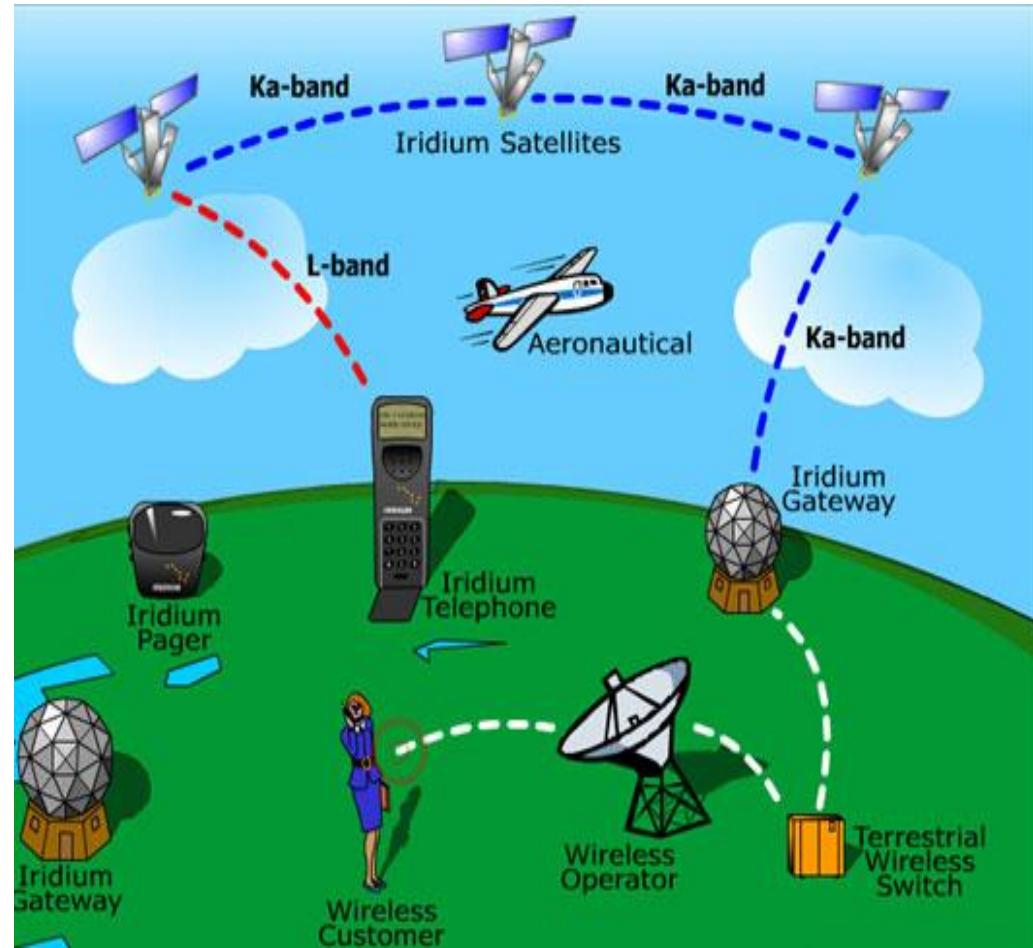
- Iridium satellite network has more coverage as compared to Thuraya system.

Sketch of the Iridium satellite design



Communication antenna (3):

- 86 cm wide
- 186 cm high
- 4 cm thick
- 106 radiating elements
- 16 beams per antenna
- 48 beams juxtaposed



Large Scale Communications Network



VSAT

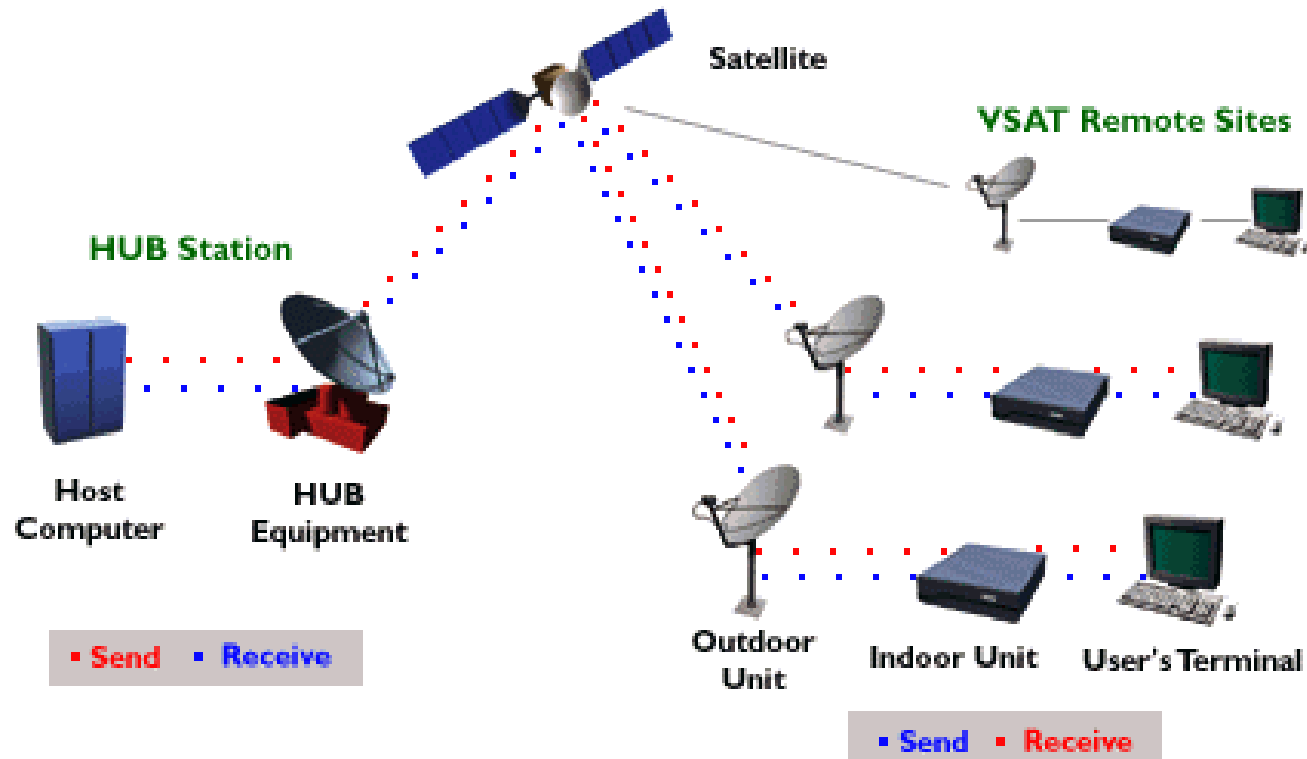


- VSAT stands for Very Small Aperture System
- In essence a VSAT terminal will be very small and it is used to create a two way communication between that point and the satellite



Applications of VSAT

- There are various different applications of VSAT. These include:
 - Remote ATM locations
 - Internet Connectivity in Remote Regions
 - Network Connectivity in Remote Regions



GPS Satellites

GPS stands for Global Positioning Satellite System.

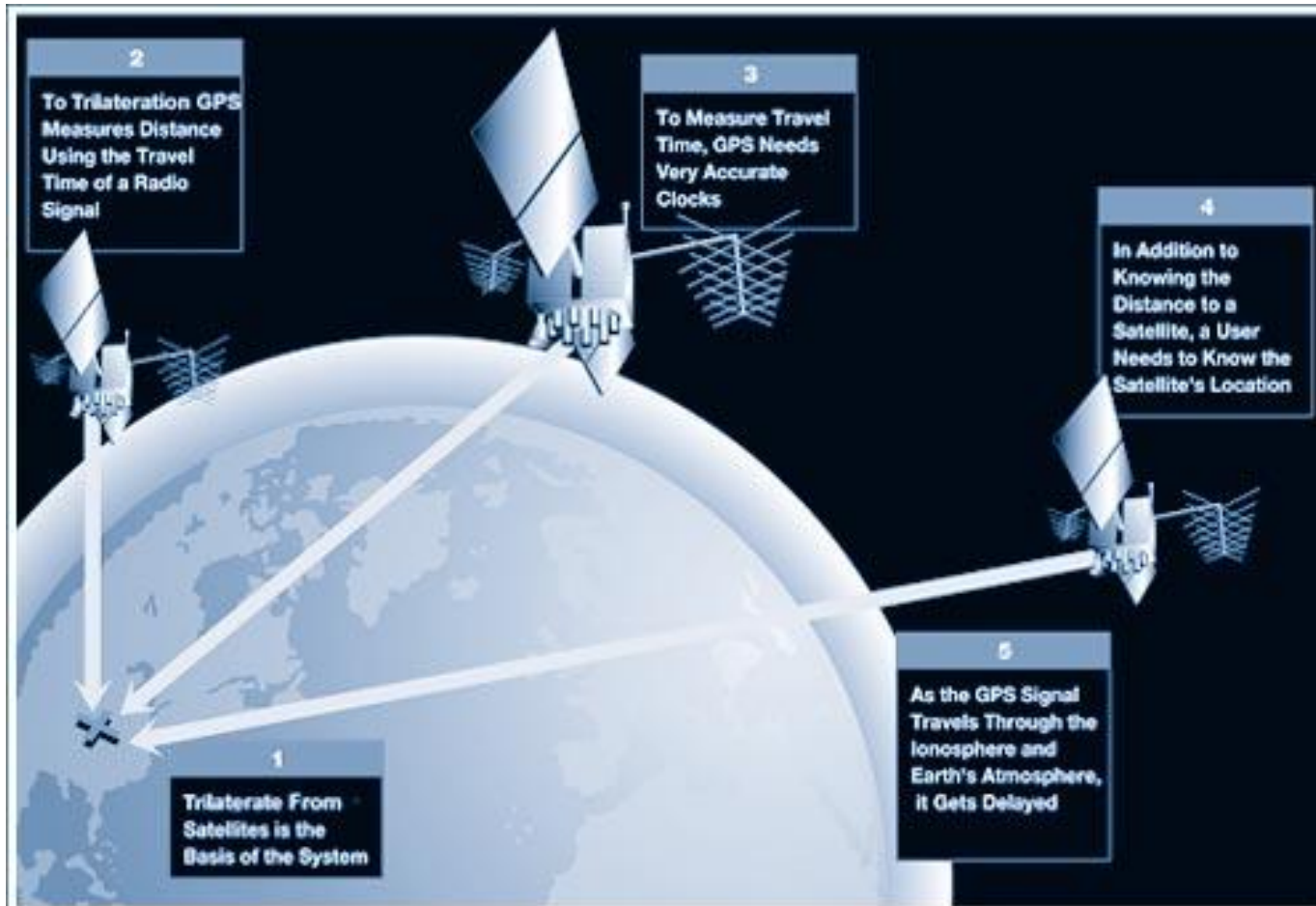
It consists of 24 satellites that circle the Earth.

By receiving signal from at least three/four of these satellites, the receiver position consisting of latitude, longitude and altitude can be determined accurately.



GPS Usage

- Four satellites are used for latitude, longitude, altitude and for time marking.
- GPS system uses one way transmission from satellites to users so the user requires only a GPS receiver



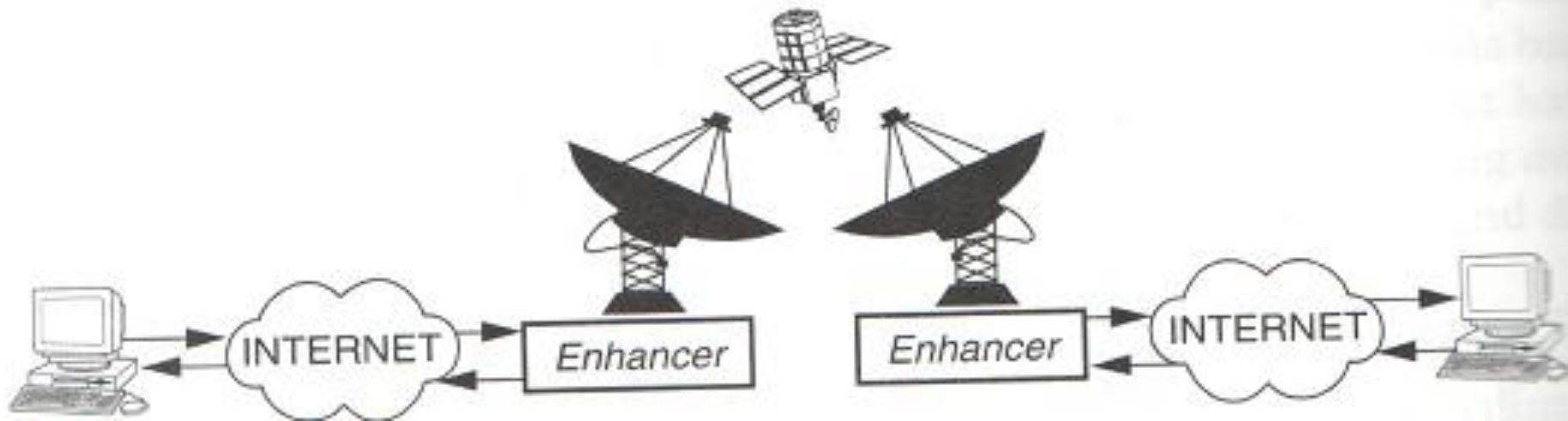
Remote Sensing & Imaging Satellites

- Remote Sensing and Imaging satellites are an important part of our world as full coverage and mapping of the Earth has been done.
- **Google Earth** is a good representation of this as the whole world has been imaged and mapped at your fingertips

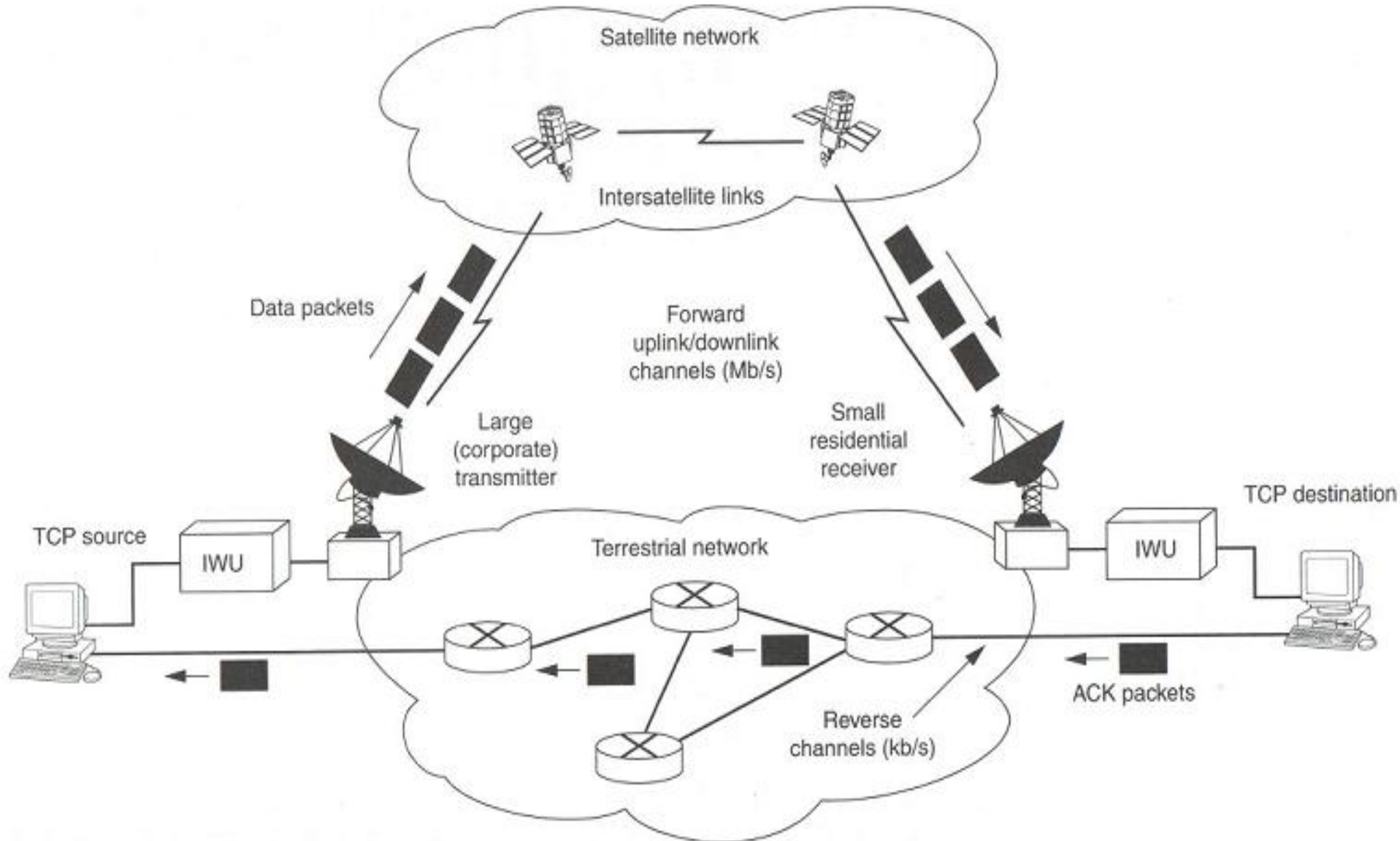


Satellite & Internet Communications

- Satellite links have been part of Internet's connectivity since its beginning.
- Satellite internet connection is used for satellite direct to home links as well as in creating a communications path between continents and major nodes. Inter-satellite links are also used for internet connectivity
- There is a delay of 0.532 s in GEO satellites. The delay is less in MEO and LEO but since they are not stationary, 24h coverage is not possible.



Satellite & Internet Communications



THANK YOU

- For further information consult Satellite Communications Textbook by Dennis Roddy

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