

Satellite Applications

Services

- Some of the services provided by satellites are,
 - Fixed satellite service (FSS)
 - Broadcasting satellite service (BSS)
 - Mobile satellite services
 - Navigational satellite services
 - Meteorological satellite services
- The fixed satellite service provides links for existing telephone networks as well as for transmitting television signals to cable companies for distribution over cable systems.
- Broadcasting satellite services are intended mainly for direct broadcast to the home, sometimes referred to as *direct broadcast satellite* (DBS) service in Europe it may be known as *direct-to-home* (DTH) service.

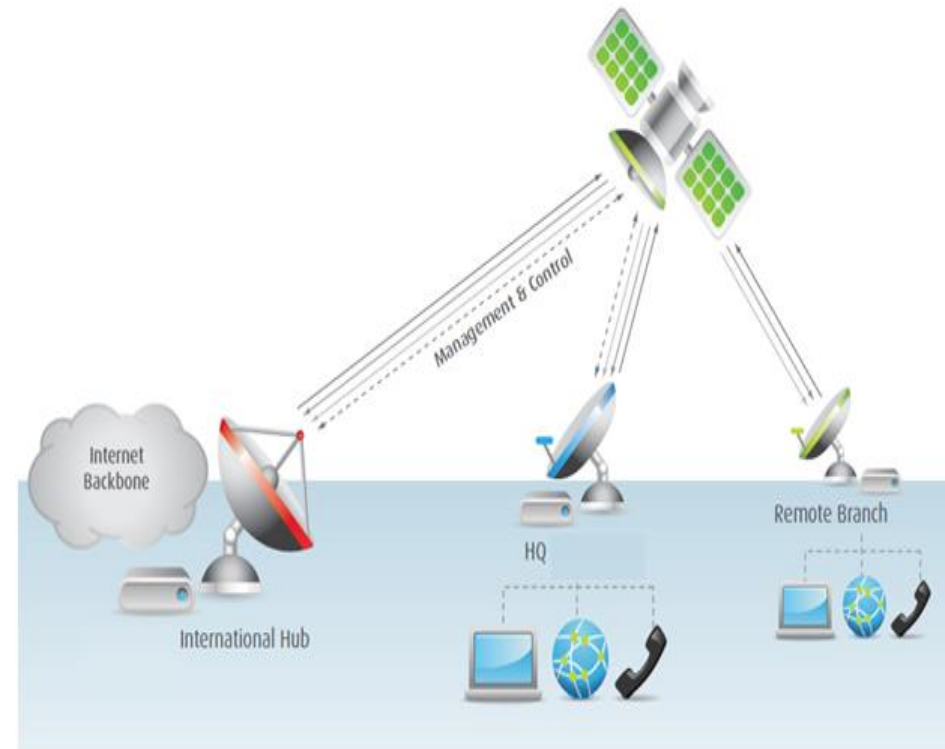
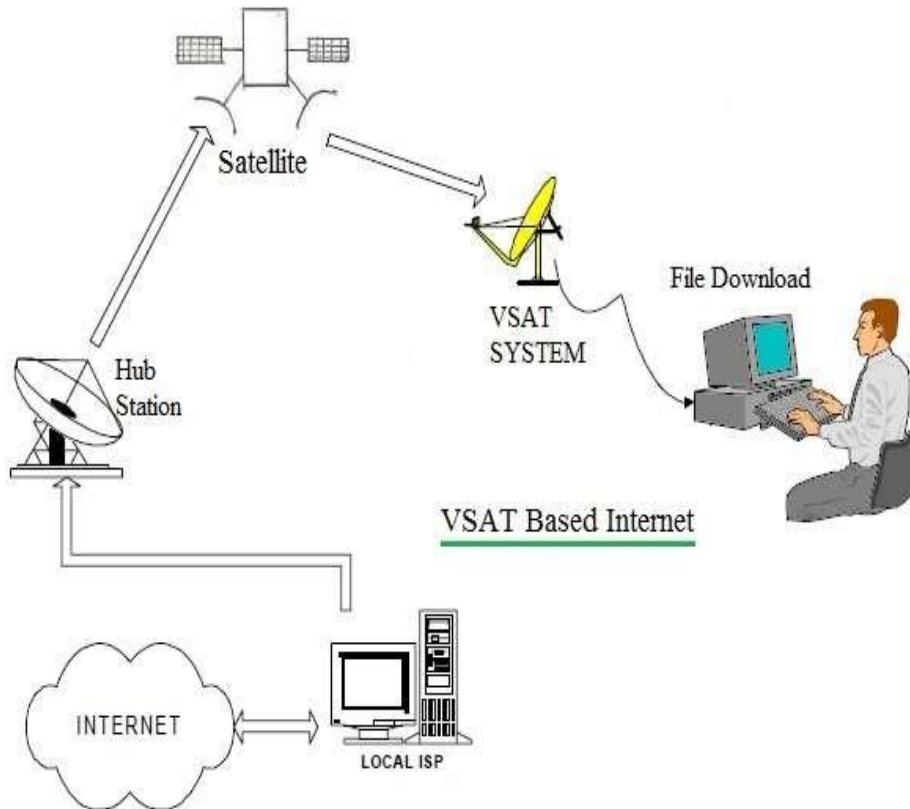
- Mobile satellite services would include land mobile, maritime mobile, and aeronautical mobile.
- Navigational satellite services include global positioning systems, and satellites intended for the meteorological services often provide a search and rescue service.
- The Ku band is the one used at present for direct broadcast satellites, and it is also used for certain fixed satellite services.
- The C band is used for fixed satellite services.
- The VHF band is used for certain mobile and navigational services and for data transfer from weather satellites.
- The L band is used for mobile satellite services and navigation systems.

- Direct-to-home broadcasting, referred to as direct broadcast satellite (DBS) service in the United States, represents one major development in the field of geostationary satellites.
- Another is the use of very small aperture terminals (VSATs) for business applications.
- A third geostationary development is mobile satellite service (MSAT), which extends geostationary satellites services into mobile communications for vehicles, ships, and aircraft.

- Radarsat is a large polar-orbiting satellite designed to provide environmental monitoring services.
- Global Positioning Satellite (GPS) system which has come into everyday use for surveying and position location generally.

VSAT

- VSAT stands for *very small aperture terminal* system.
- The earth station antennas are less than 2.4 m in diameter.
- Typical user groups include banking and financial institutions, airline and hotel booking agencies, and large retail stores with geographically dispersed outlets.



- The basic structure of a VSAT network consists of a hub station which provides a broadcast facility to all the VSATs in the network and the VSATs themselves which access the satellite in some form of multiple-access mode.
- The hub station is operated by the service provider, and it may be shared among a number of users
- Time division multiplex is the downlink mode of transmission from hub to the VSATs, and the transmission can be broadcast for reception by all the VSATs in a network
- Address coding can be used to direct messages to selected VSATs.

- The most popular access method is frequency-division multiple access (FDMA), which allows the use of comparatively low-power VSAT terminals.
- Time-division multiple access (TDMA) also can be used but is not efficient for low-density uplink traffic from the VSAT.
- The traffic in a VSAT network is mostly data transfer of a bursty nature.
- A form of demand assigned multiple access (DAMA) is employed in some systems in which channel capacity is assigned in response to the fluctuating demands of the VSATs in the network.

- CDMA coupled with the Aloha protocol can be used in VSATs. The basic Aloha method is a random-access method in which packets are transmitted at random in defined time slots.
- The system is used where the packet time is small compared with the slot time, and provision is made for dealing with packet collisions which can occur with packets sent up from different VSATs.
- VSAT systems operate in a star configuration, which means that the connection of one VSAT to another must be made through the hub.
- Most VSAT systems operate in the Ku band, although there are some C-band systems in existence.
- The major shortcomings of present-day VSAT systems are the high initial costs.

Mobile Satellite Services (MSS)

- A telephone connection using MSS is similar to a cellular telephone link, except the repeaters are in orbit around the earth, rather than on the surface.
- MSS repeaters can be placed on geostationary, medium earth orbit (MEO), or low earth orbit (LEO) satellites.
- A MSS can link any two wireless telephone sets at any time. MSS systems are interconnected with land-based cellular networks.

MSS

Name	Orbit	User Frequency Range, MHz		Feeder Frequency, GHz	
		Uplink	Downlink	Uplink	Downlink
AceS	GEO	1626.5–1660.5	1525.0–1559.0	6.425–6.725	3.400–3.700
Ellipso	MEO	1610.0–1621.5	2483.5–2500.0		
Globalstar	LEO	2483.5–2500.0	1610.0–1626.5	5.025–5.225	6.875–7.055
MSAT	GEO	1626.5–1660.5	1550.0–1559.0		
New ICO	MEO	1985.0–2015.0	2170.0–2200.0		
Thuraya	GEO	1625.5–1660.5	1525.0–1559.0	6.425–6.725	3.400–3.625

AceS

- The Asian Cellular System, or AceS, utilizes one Garuda geostationary satellite covering the Asia Pacific area.
- Satellite has capacity for at least 11,000 simultaneous telephone channels, servicing up to 2 million subscribers. The satellites utilize two 12-m antennas that generate 140 spot beams, with onboard digital switching and routing of calls between beams.
- Services include voice telephony, Internet connectivity, data, and alerting.

Ellipso

- Ellipso is designed on the basis that the population density to be served is concentrated in the northern hemisphere.
- The system uses a combination of medium earth orbits (MEOs) consisting of an equatorial orbit at height 8040 km and two elliptical orbits with apogee height 7846 km and perigee height 520 km.
- No on-board signal processing takes place, the satellites operating in the bent pipe mode. CDMA is used. Services include voice telephony, Internet, data, and alerting

Globalstar

- Globalstar employs 48 satellites in circular low earth orbits (LEOs) in eight planes at a height of 1414 km.
- A range of services is offered, including voice telephony, mobile (hands-free), and two-way short messaging service (SMS). Service is also provided to fixed telephone sites, bringing telephone services to underserved and developing economies without the need for extensive infrastructure on the ground.

MSAT

- Operated by Telesat Mobile Inc., in Ottawa, the MSAT-1 satellite covers the primary service area of Canada and the United States.
- A variety of services are offered, including tracking and managing trucking fleets, wireless phone, data and fax, dispatch radio services, and differential GPS

New ICO

- The space segment consists of 12 satellites in medium earth orbits (MEOs). Two orbits are used, at inclinations of 45° and 135° .
- Ten of the satellites are active, and 2 are in-orbit spares.
- The satellites operate in the “bent pipe” mode, the switching and routing being carried out at the ground stations.
- Services include voice telephony, Internet connectivity, data, and fax.

Thuraya

- The Thuraya satellite is in geostationary orbit located at 44°E and serving an area between about 20°W to 100°E longitude and 60°N to 2°S latitude.
- A 12.25 16 m antenna is employed providing 250 to 300 spot beams, with onboard beam-switching.
- The network capacity is about 13,750 telephone channels.
- QPSK modulation is used, with FDMA/TDMA.
- Service features include voice telephony, fax, data, short messaging, location determination and emergency services.

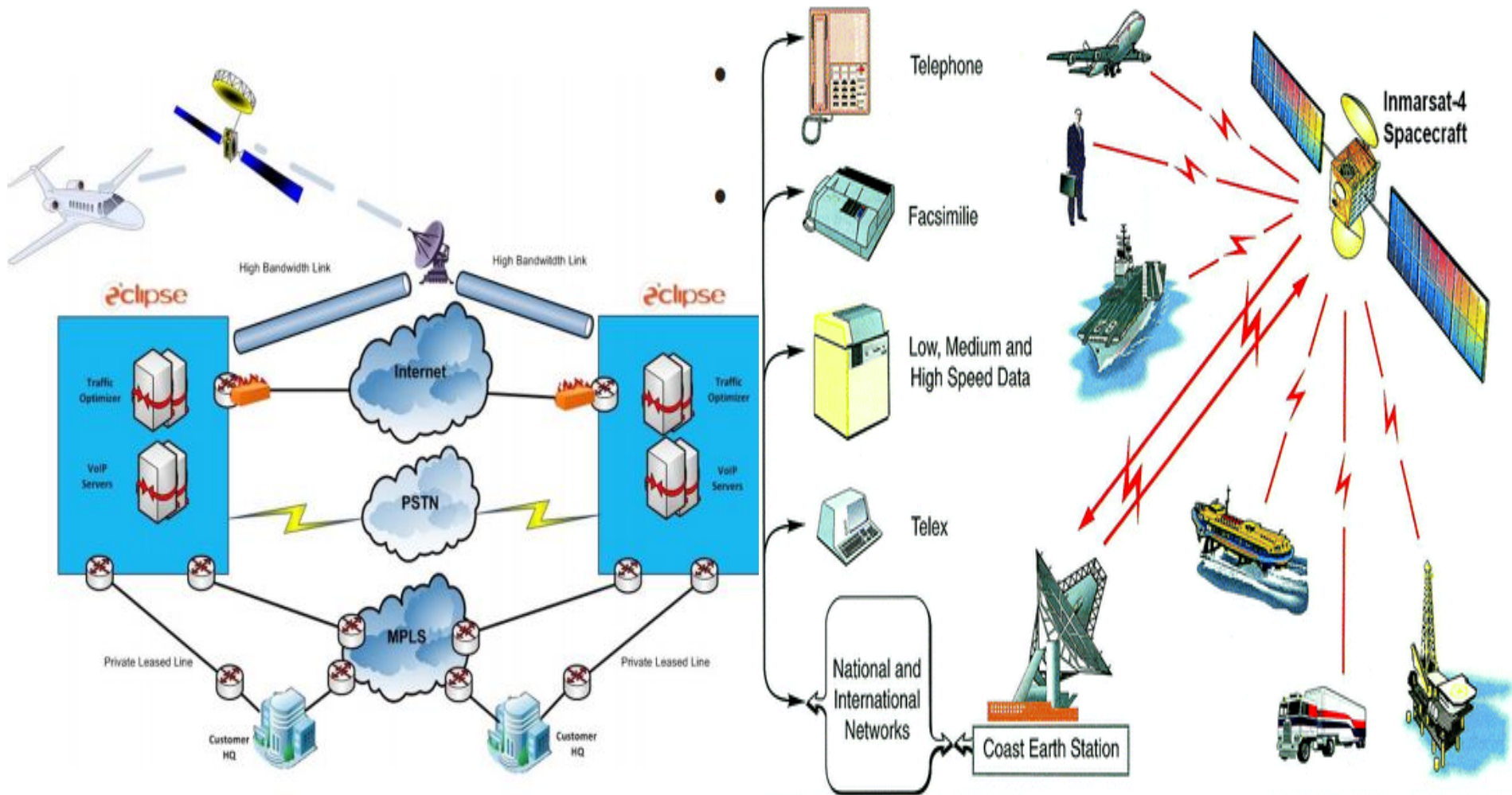
Maritime MSSS

- This service consists of different types of earth stations such as mobile earth station, ship earth station and communication earth station.
- This service is mainly used in shipyards and military ships.

INMARSAT (International Maritime Satellite communications systems)

- **Inmarsat** is a British satellite telecommunications company, offering global mobile services. It provides telephone and data services to users worldwide, via portable or mobile terminals which communicate with ground stations through thirteen geostationary telecommunications satellites.
- Inmarsat's network provides communications services to a range of governments, aid agencies, media outlets and businesses (especially in the shipping, airline and mining industries) with a need to communicate in remote regions or where there is no reliable terrestrial network.

Inmarsat



- Until 1990, ships at sea depended primarily on HF radio communication using Morse code; that was replaced by Inmarsat terminal usage as the service achieved 100% penetration on large commercial vessels.
- An Inmarsat terminal can pass one or more digital telephone channels plus two-way data. The ship's directional antenna is protected from the elements by an umbrella-shaped "radome."
- To compensate for the rolling and pitching of the ship, the antenna is attached to a controlled mount that centers the beam on the satellite. The satellite repeater translates the link to C-band for transmission to a fixed Earth station. Telephone and data traffic then can be routed to distant points over the public telephone network and the Internet.
- The maritime mobile satellite system is being expanded, but the number of satellites that can operate simultaneously around the world is limited to fewer than 25.
- The satellite constellation of Inmarsat is the most mature and has seen four generations of GEO satellites.
- Their current design is called the Inmarsat 4, two of which were operational, one in the Atlantic and one in the Pacific.
- Inmarsat 4 employs a large antenna in space and provides small spot beams to increase performance and capacity.
- Inmarsat services were extended to land-based users with the Inmarsat M and Mini-M standards. The Inmarsat 4 satellites have sufficient power to support portable user terminals

Aeronautical MSS

- A MSS in which earth stations are located onboard aircraft, survival aircraft, airplanes and helicopters is known as AMSS.
- This aeronautical mobile-satellite service (AMSS) will be offered to commercial airlines to provide their passengers full Internet access — including e-mail, secure corporate intranet connectivity, shopping, travel destination information, and more.
- In addition, broadband connectivity will allow the airlines to improve their operational efficiencies by providing the ability for real-time monitoring of equipment and inventories, allowing for the faster turn-around of aircraft at the gate, as well as dynamic weather maps, crew information services and other non-safety-of-life services.

Principle of *AMSS*

