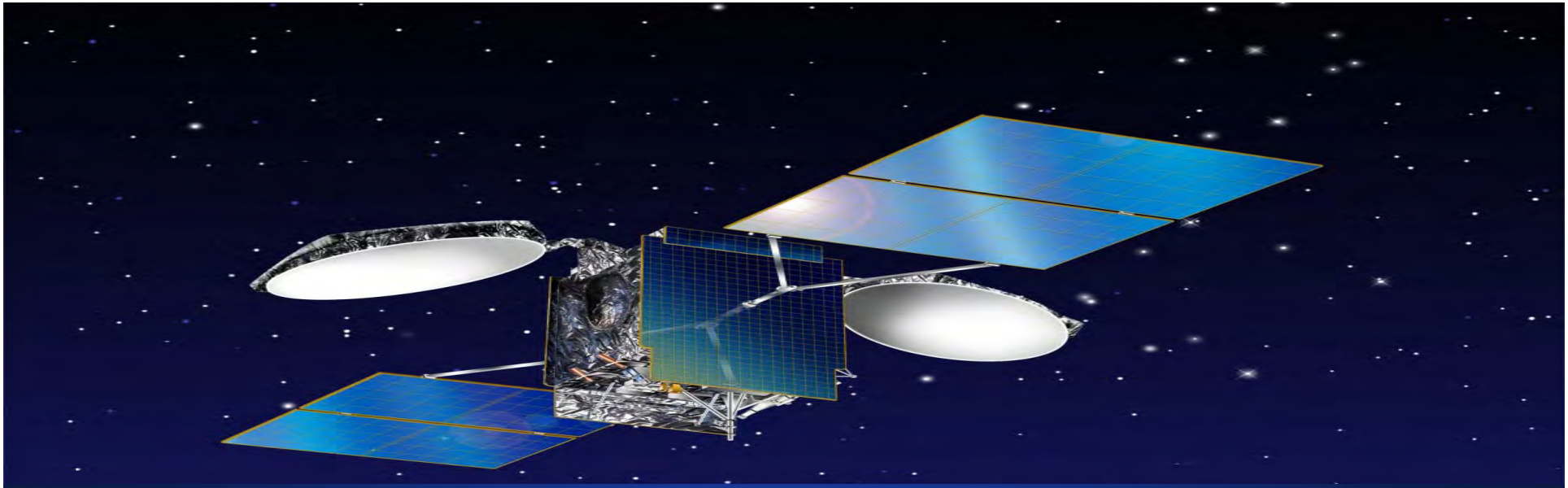
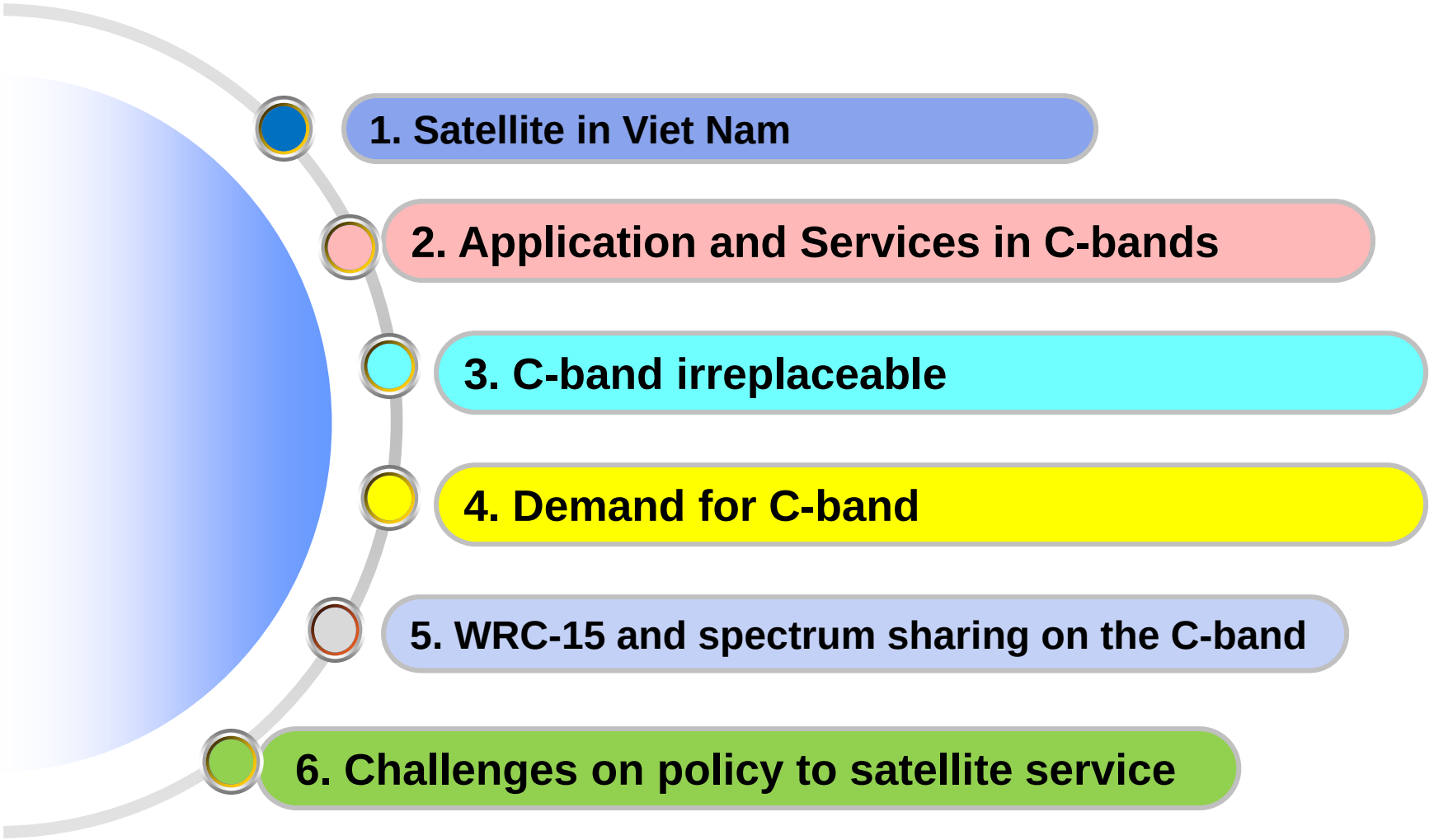


# Service, Spectrum demand on C-band and Regulatory Issues

**ITU International Satellite Symposium**

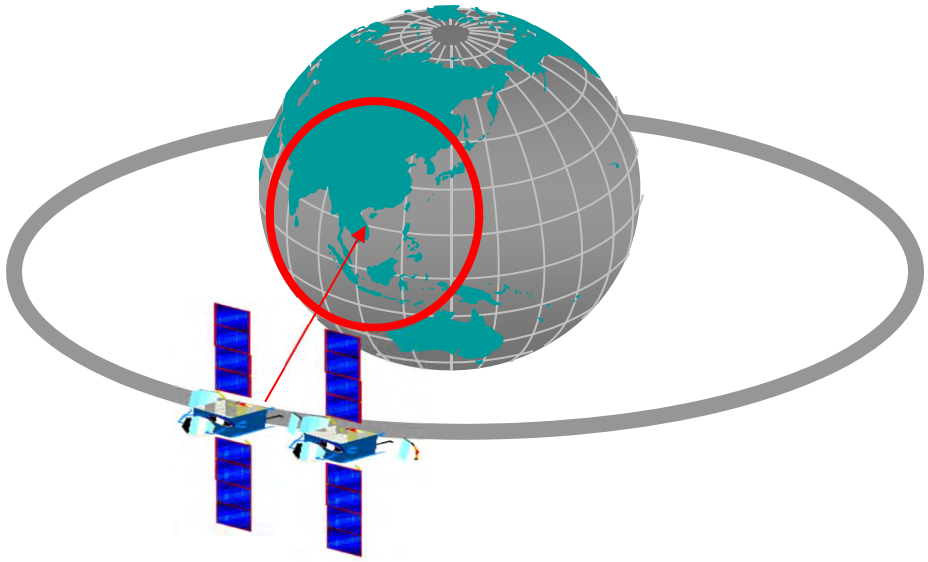
30 September – 1 October, 2015
Da Nang, Viet Nam

# Content


1. Satellite in Viet Nam
2. Application and Services in C-bands
3. C-band irreplaceable
4. Demand for C-band
5. WRC-15 and spectrum sharing on the C-band
6. Challenges on policy to satellite service

# 1. Satellite in Viet Nam

# Telecommunication satellites



**VINASAT-1: 20 C and Ku-Band transponders**
**Launch date: 18 April 2008**

**VINASAT-2: 24 Ku-Band transponders**
**Launch date: 16 May 2012**

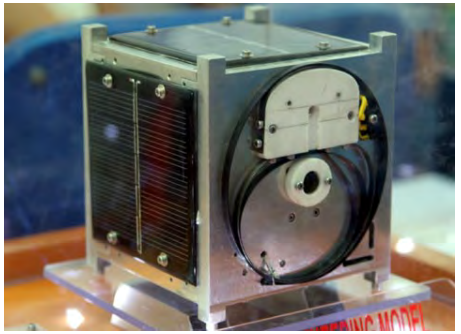
# Science satellite



## Cube Sat launched on 21 July 2012

## Pico Dragon

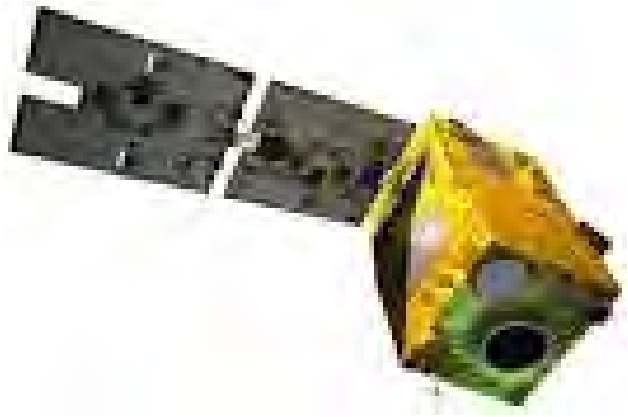
## Launch date: 4 August 2013



The project's goal is for education and training of young engineers and students about aerospace engineering

# Earth observation satellite





- **VNREDSAT-1  has been launched 7/5/2013.**
- **Altitude (perigee, apogee: 680 km)**
- **Inclination angle: 98º**

** Vietnam Natural Resources, Enviroment and Disaster*

# Future project

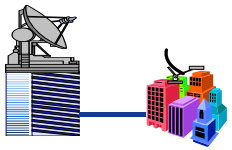


## Earth Observation satellite

- VNREDSAT-1B: 2017
- VNREDSAT-2: 2020
- LOTUSAT-1: 2017 (Radar)
- LOTUSAT-2: 2020 (Radar)

## 2. Application and Services in C-bands

# Application and services of satellite for C-band



CATV Contribution links

DTH

Transponder leasing

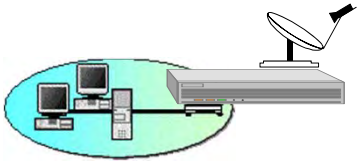
GPS

ATM

Teleport

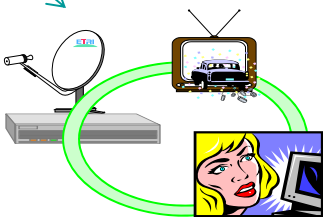
Distance learning

Telemedicin

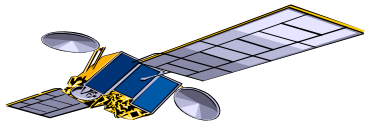


Internet

SNG



Multimedia

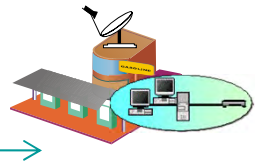


# Application and services of satellite for C-band

Maritime communications

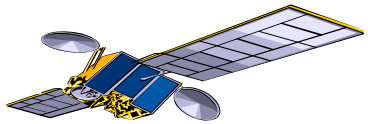

Aviation security

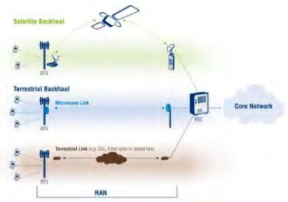
Peace keeping



VSAT, IPLC

Oil & Gas operation services





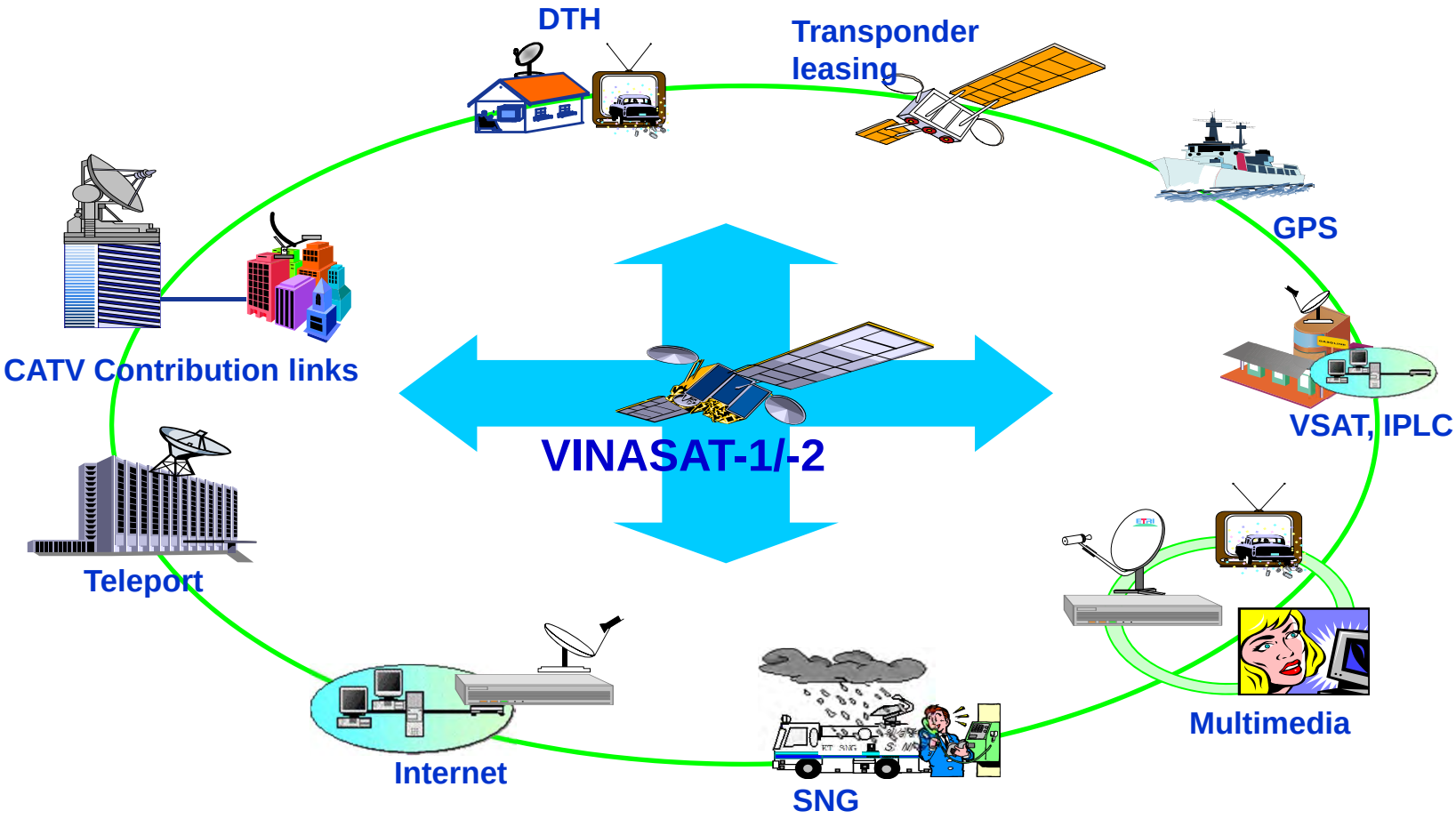
Backhaul for terrestrial mobile networks

Disaster relief

Convenient store

Corporate network

# Application and services of satellite in Viet Nam



# Demand for application and services

Satellite systems support a broad range of applications and services, both domestically and internationally

- GDP per capital
- Population
- Modern infrastructure
- Quality of life
- Safety of life
- Others

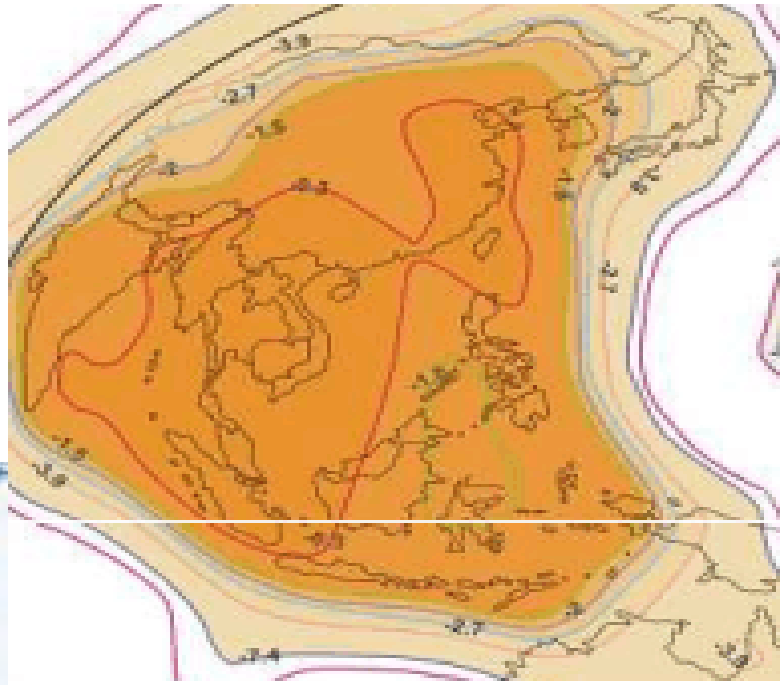
***Application and services for satellite continue increases***

## 3. C-band irreplaceable

# The importance of C-band

- **Large geographic coverage with a single beam:**
  - ✓ Reach across entire continents and oceans
  - ✓ Making vital and cost-effective for businesses and applications
  - ✓ Enabling broadcasters to reach more people

C-bands allows widely-dispersed earth station sites to be connected within a single satellite beam, meaning the satellite network is fully adaptable to geographic changes in traffic distribution

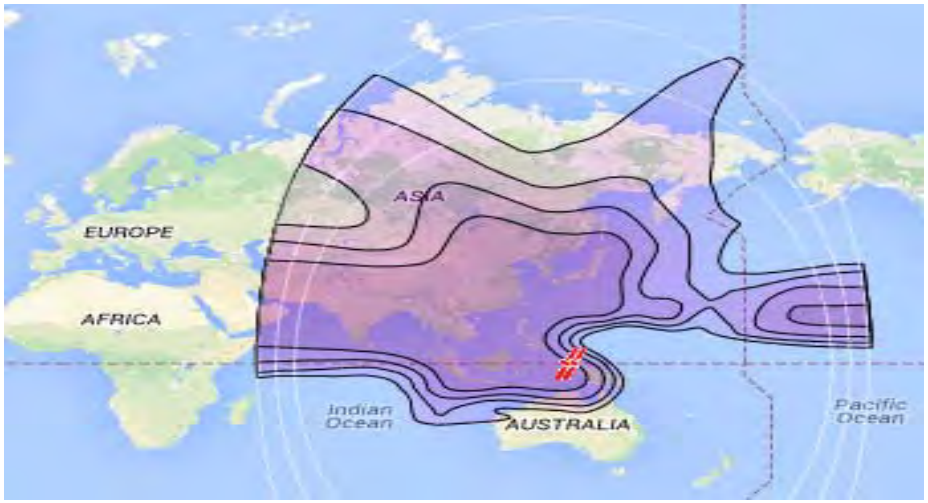


# The importance of C-band

- **Withstanding rain attenuation:** equatorial countries.

  *a unique choice: available throughout the world*

Reliable in Harsh weather




# The importance of C-band

- Contributing significantly in recovery, relief operations for disasters.
- Low cost of equipment

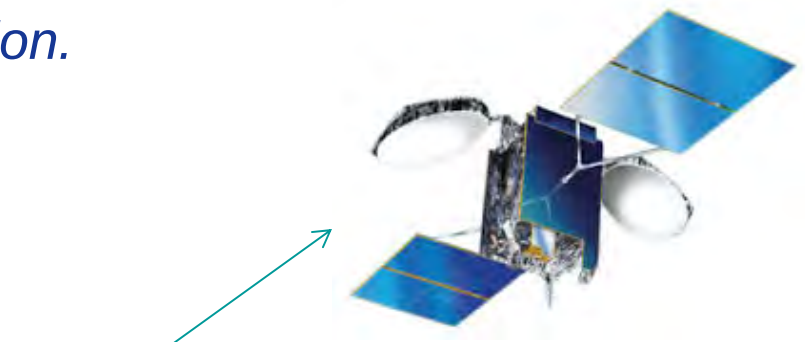
*Satellite in C-band play a vital role in recovery and relief operations for many disasters such as 2004 Asian tsunami, the 2010 Haiti earthquake, and other major natural disaster events*

# The importance of C-band

- C-band is used for the telemetry, telecommand and control of satellite.

*This application requires fully protection from all interferences*

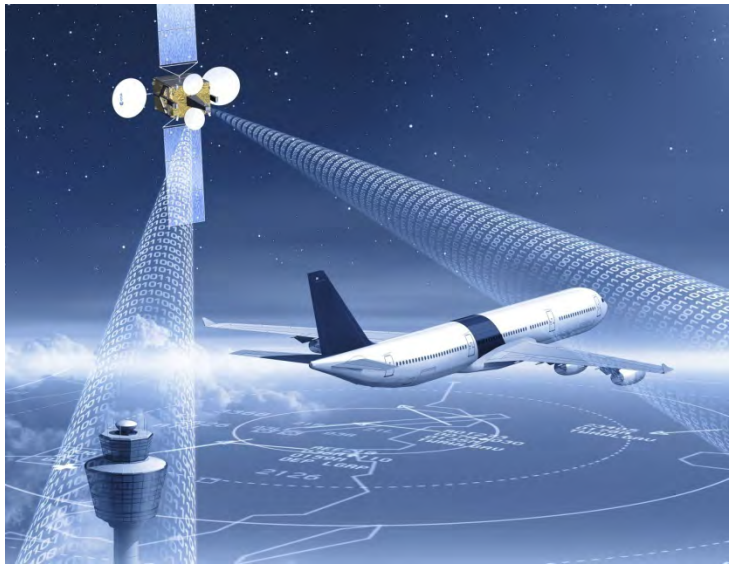
*- risk of losing control of the space station. As a result, huge lost for satellite operators and impact on the telecommunication infrastructure of concerned administration.*



# The importance of C-band

C-band is used for the support of air traffic control systems in regions where terrestrial coverage is poor or unreliable.

*The interconnection between the remote VHF aeronautical communication towers and the air traffic control centre is provided by C-band FSS systems. Only C-band can provide the necessary reliability for such safety services.*



# The importance of C-band

**Cannot be replaced using by other spectrum bands :**

- ✓ The large continental coverage within a single beam
- ✓ Withstanding rain attenuation
- ✓ Sufficiently high reliability in tropical and high-rain regions

- *Ku-band and Ka-bands are not practical alternatives for many C-band applications. The increased rain attenuation in the Ku and Ka bands means that the high availability of C-band cannot be achieve in many regions.*

# Why the extended C-band?

- The 3 400-3700 MHz frequency band has been used since the 1970's.

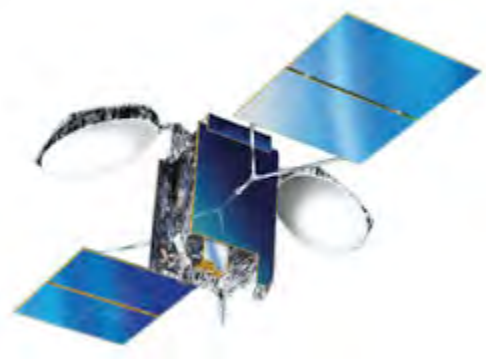
Currently, more than 100 satellites carry extended C-band transponders on their platform.

- ✓ Equipment is available at low cost.
- ✓ In specific orbital arcs, The standard C band is fully congested.
- ✓ Improving technologies, but increasing demand on spectrum.

-> ***Newcomer operators have only opportunity in the extended C-band.***

# 4. Demand for C-band

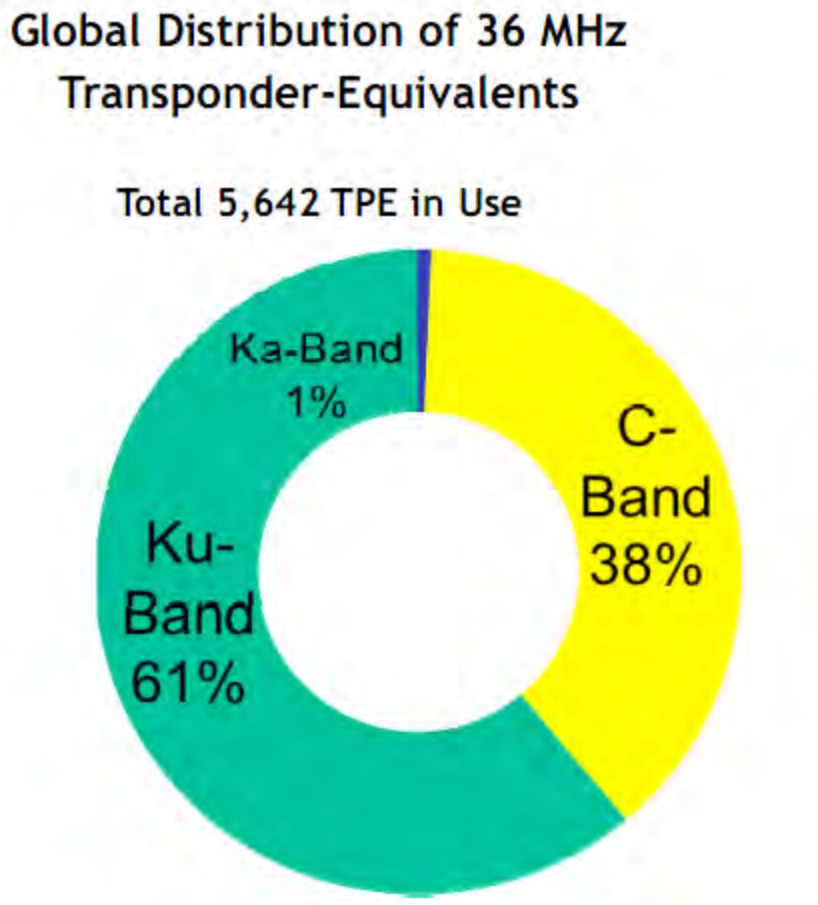
# Demand on C-band



- C- bands have been used for more than 40 years.
- The satellites networks typically spaced by 2-3 degrees in longitude.

- About **180 satellites in orbit,** provide **more than 2000 transponders** utilizing C-band frequencies.

# Demand on C-band




- C-band: heavily usage for many decades
- Billions of dollars invested

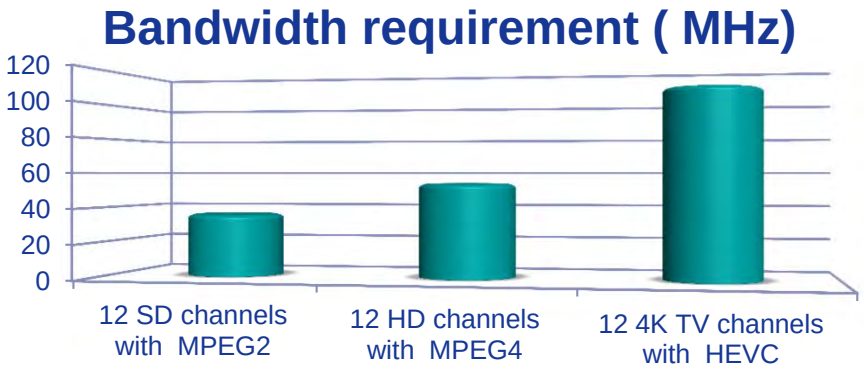
# Demand on C-band

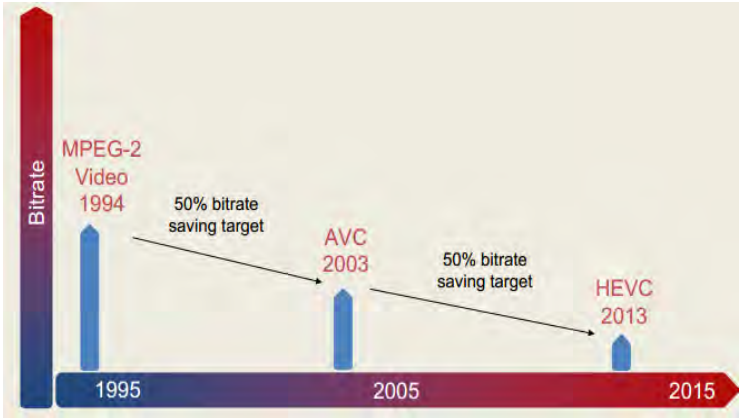
- Summary of satellite network filings in coordination and notification from 1/1/2014 to 21/9/2015.

| Frequency bands | Coordination | Notification |
|---|---|---|
| 3.4 – 3.7 GHz | 119 | 73 |
| 3.4 – 4.2 GHz | 197 | 91 |

# Demand on C-band

- Demand on C-band spectrum continues increases:
  - ✓ Technology is mature, Equipment is available at low cost.
  - ✓ Many countries (including countries in heavy rainy regions) have not satellites in C-band
  - ✓ Many satellite services are not available in developing countries depend on economic infrastructure.
  - ✓ Improving technologies, Bandwidth requirement for satellite service increases
  - ✓ Congestion in the standard C-band lead to extended C-band is looking for.



# 5. WRC-15 and spectrum sharing on the C-band

## Agenda Item 1.1:

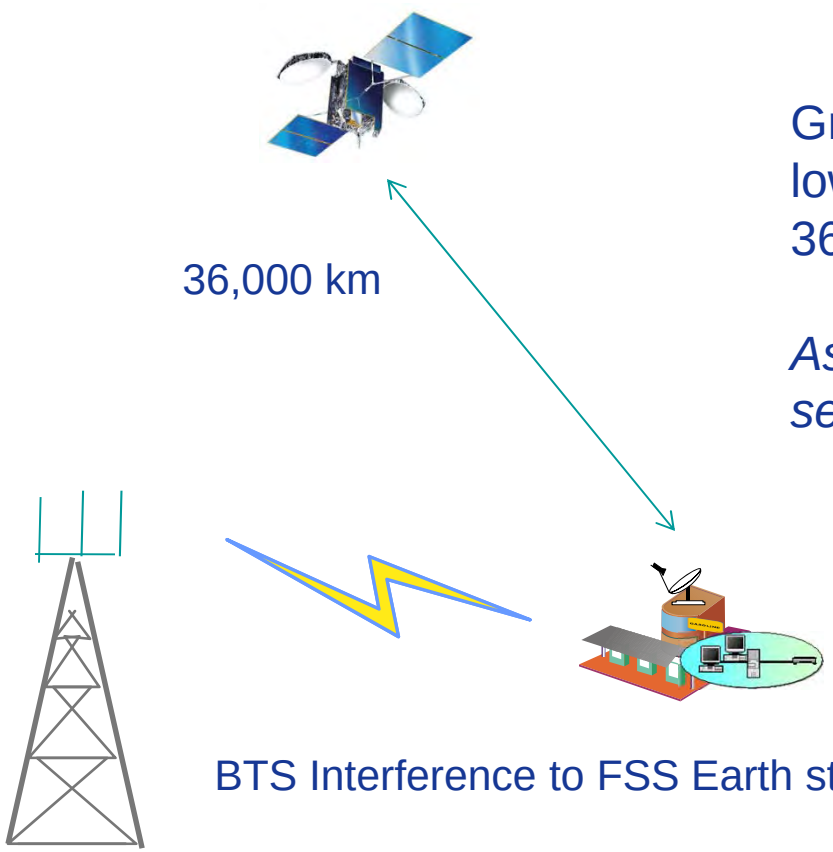
*Additional spectrum allocations to the mobile service on a primary basis*

**Renewed efforts to identify the 3.4 – 4.2 GHz band for IMT (AI 1.1)**

Three methods is considered to satisfy this agenda item

- **Method A** – No change.
- **Method B** – Make an allocation to the MS on a primary basis (either by a new allocation or the upgrade of an existing secondary allocation) with a view to facilitate the development of terrestrial mobile broadband applications.
- **Method C** – To identify the frequency band for IMT either in a new or existing footnote.

# Spectrum sharing between IMT and FSS




BTS Interference to FSS Earth station

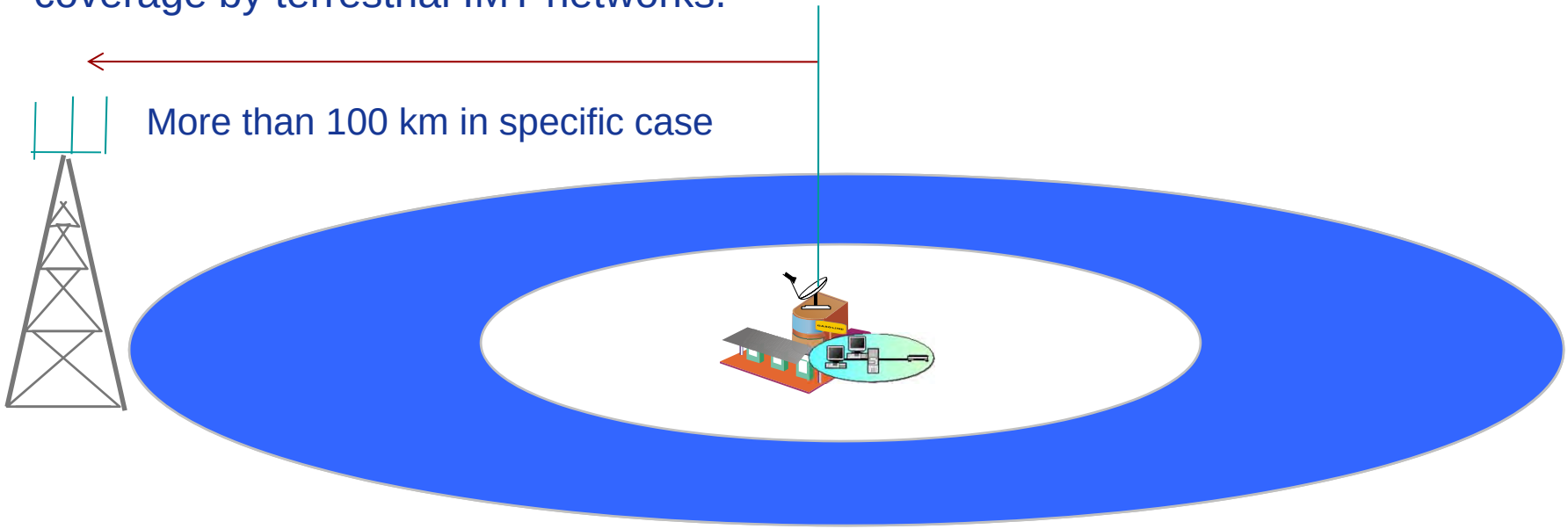
Ground terminals are designed to receive very low-power signal transmitted by a satellite located 36,000 km from the receiving earth stations.

*As a result, receiving hardware is usually very sensitive to any external interference.*

# Interference to the receiving earth stations

ITU-R studies showed that distance separations of at least 10 km up to more than 100 km between a transmitting IMT station and a receiving FSS station would be required to avoid harmful interference.

The requirement to protect ubiquitously deployed FSS earth stations by maintaining large separation distances leads to large holes in any potential coverage by terrestrial IMT networks.



# Spectrum sharing between IMT and FSS

**WRC-15 cycle:**

❑ At the JTG 4-5-6-7 meeting - Draft New Report ITU-R [FSS-IMT C-BAND DOWNLINK] on Sharing studies between IMT-Advanced systems and geostationary satellite networks in the fixed-satellite service which indicated that:

- Feasibility only when FSS earth stations are at known.
- Otherwise, no feasibility.

# Earth stations deployment

Casbaa estimates there are well over 60M C-band receive dishes in Asia today.

In Viet Nam:

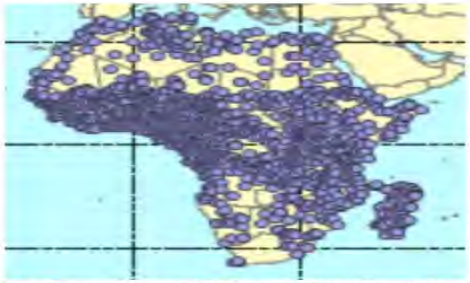
| TVROs/VSATs | | |
|---|---|---|
| **Antenna Diameter (m)** | **Number (million)** | **Isotropic Gain (dBi)** |
| 1.8 | 0.43 | 35.4 – 39.87 |
| 2.4 | 1.7 | |
| 3.0 | 0.7 | |

# Satellite earth stations worldwide

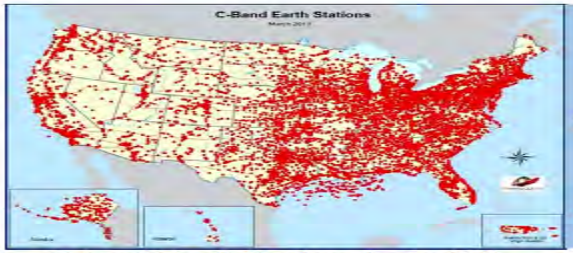


- Huge numbers of satellite earth stations deployed worldwide

C-band Earth Stations in Brazil



Intelsat C-band Earth Stations in Africa




C-band Earth Stations in the U.S.

C-Band Earth Stations in Europe

- The poor, developing countries invested a lot of money

***-> The sharing between IMT-Advanced and FSS is not feasible***

# Viet Nam position on C-band Agenda Item 1.1

**Which Method is best for satellite community?**

**Viet Nam is support Method A – No change.**

For Method B and C (depending to Options)

- Interference from IMT to FSS.
- Implementation of IMT stations would preclude the use of C-band receiving stations within a relatively large area around each IMT station.
- Deployment of IMT-Advanced would constrain future FSS earth stations from being deployed in the same area (coordination area of ES may be reached to 1000 km under No.9.17).
- Cost for deployment of FSS receiving station increases (*Resolving the interference, mitigation technical for ES, ES coordination*).
- Impact on satellite market.

## 6. Challenges on policy to satellite service

# Regulatory framework



## National Law:

- **Law on radio frequencies of Viet Nam (**The national assembly: no: 42/2009/QH12):
  - **Article 6:** The specialized management agency in charge of radio frequencies (ARFM).
  - **Chapter VI:** International registration and coordination in radio frequencies and satellite orbits
  - ✓ **Article 41:** Organizations that use radio frequencies **shall participate** in the international registration or coordination in radio frequencies and satellite orbits

# Allotments in 4500-4800 MHz

**How to use FSS planned C-band effectively? 246 allotments**

**Earth station characteristics**

The diameters of the earth station antennas are:

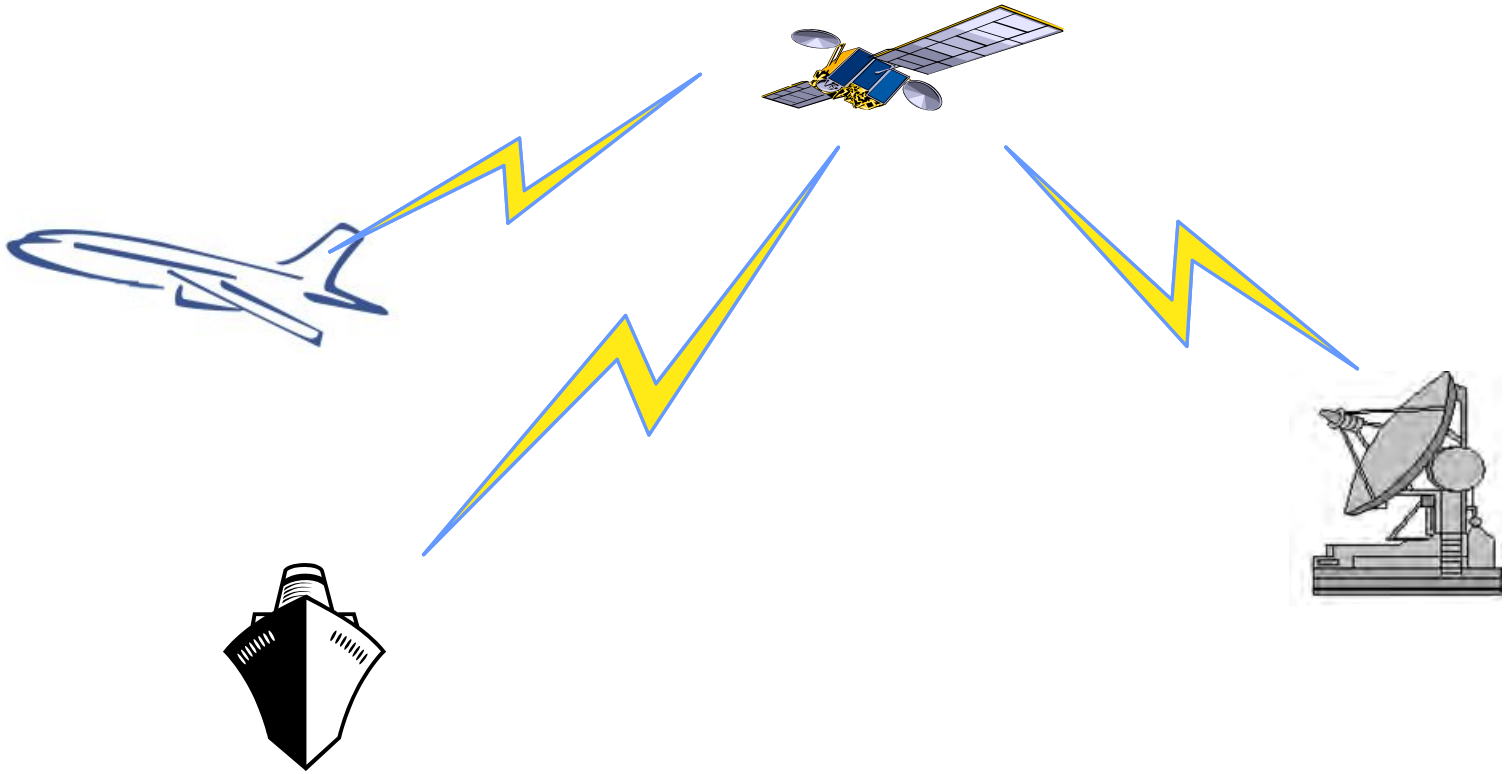
5.5 m for the 6/4 GHz band;

**→ Possibility to reduce earth station antenna size?**

# Challenges on policy to satellite service

**Regulatory frame work on new satellite services**

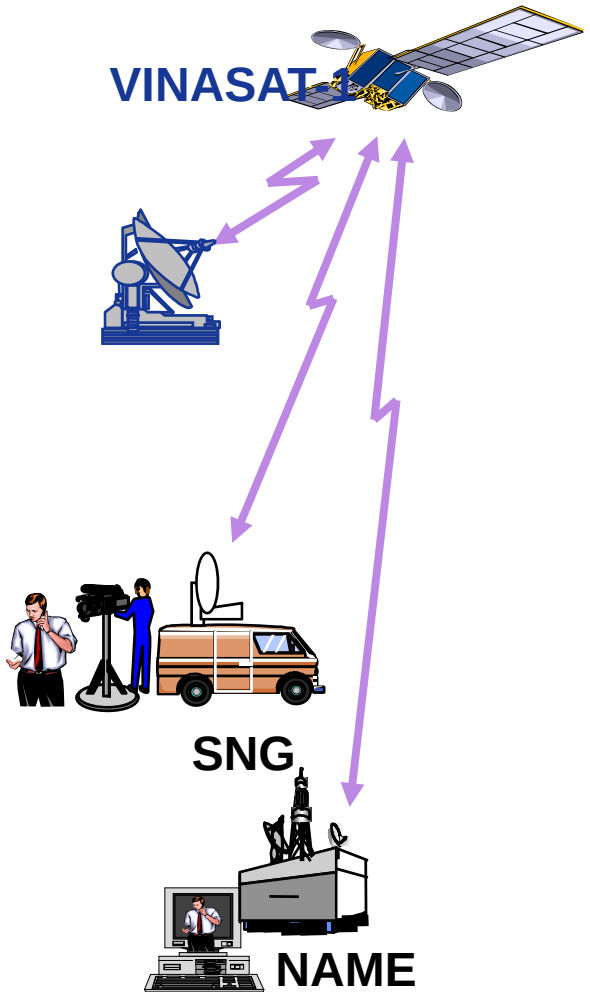
- Earth Stations on Vessels?
- Aeronautical Earth Stations?

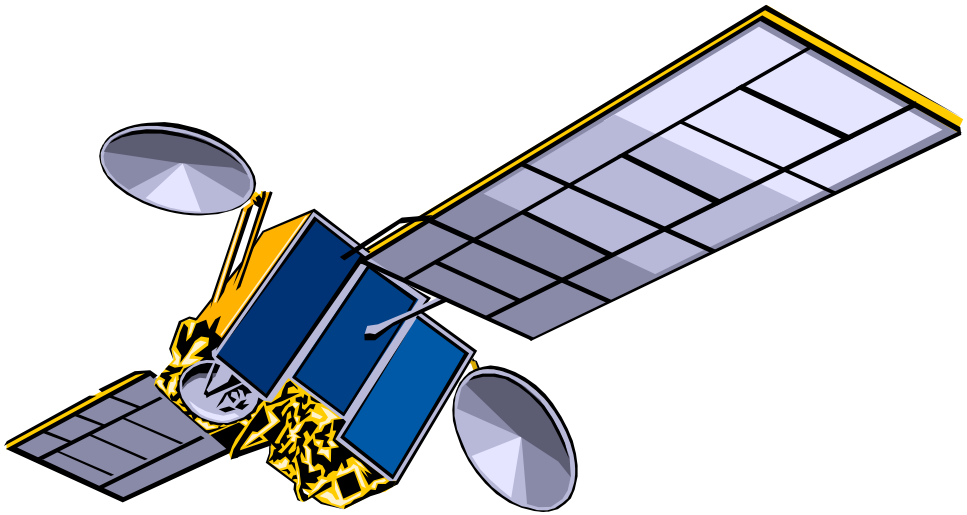


# Conclusion

# Conclusion

- C-band satellite spectrum: important and irreplaceable resource.
- Sharing between FSS and IMT is not technically viable.
- C-band demand for satellite service continue to increases.
- Huge numbers of satellites and ES have been launched and deployed.
- No change to RR for C-band under WRC-15, AG1.1 is best for satellite community.





# Thank you !