

Satellite constellation and regulatory issues

Mr. Nguyen Huy Cuong
ARFM- MIC- Vietnam

Content

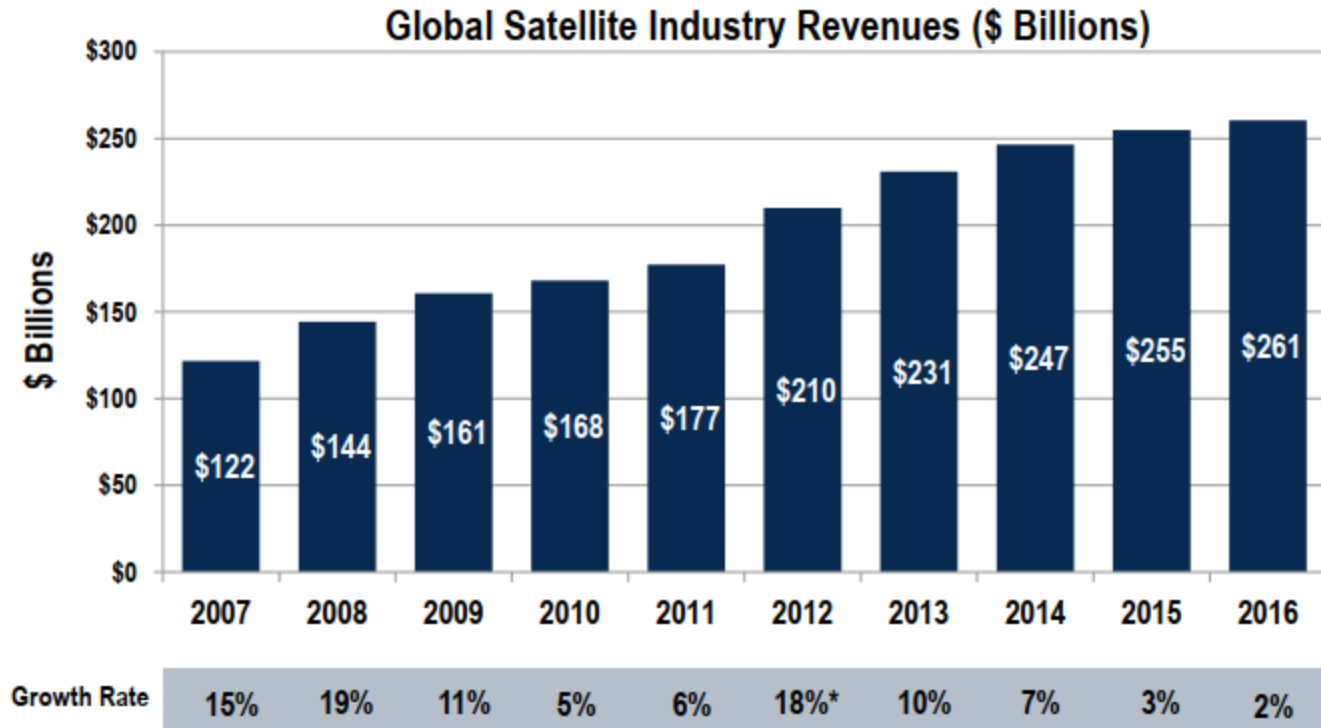


1. Satellite constellation

2. Satellite sector in Vietnam

Satellite constellation

- In the 2014-2017 period, a decline in demand for global satellite industry.



Satellite constellation

- Recent years, a trend of developing satellite constellation

Satellite Quick Facts *(includes launches through 3/31/19)*

Total number of operating satellites: 2,062

United States:
901

Russia: 153

China: 299

Other: 709

LEO: 1,338

MEO: 125

Elliptical: 45

GEO: 554

Total number of US satellites: 901

Civil: 38

Commercial: 523

Government: 164

Military: 176

22.000 satellites

Satellite constellation

❑ Satellites constellations:

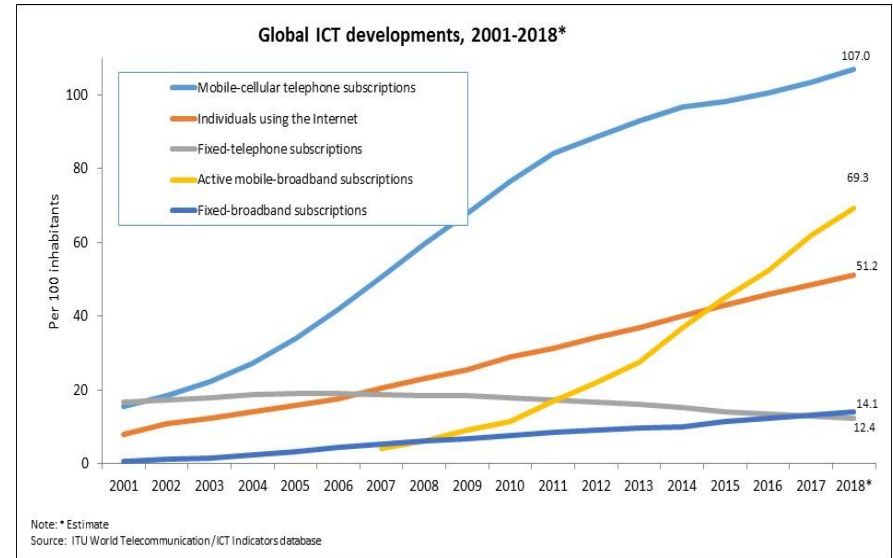
- Non-GSO: Starlink-SpaceX, Oneweb, SES, Amazon, Boeing ...

COMPANY	NO. OF SATELLITES	BAND(S)	NOTES
Starlink	7,518	V	SpaceX project
	4,425	Ka, Ku	Two test satellites launched in 2018; 60 satellites launched, additional launches planned in 2019
Amazon	3,236	Ka	Kuiper constellation
Boeing	2,956	V	
OneWeb	600	Ku	Six satellite launched in February 2019
China Aerospace Science and Technology Corporation (CASC)	320	L, Ka	First satellite launched in December 2018; scheduled for completion in 2022
Russian Space Systems Company	288	?	Planned completion in 2025
Sky and Space Global	200	L, S	
China Aerospace Science and Industry Corporation (CASIC)	156	Ka	First satellite launched in December 2018; planned completion in 2025
Telesat	117	Ka	First satellite launched in January 2018
LeoSat Enterprises	108	Ka	
Iridium	75	L	Completed Iridium-NEXT constellation in 2018
Boeing	60	Ka	
SES	42	Ka	20 O3b satellites launched
Globalstar	24	S	Constellation completed in 2013
ViaSat	24	Ka, V	
Karousel LLC	12	Ka	

Satellite constellation

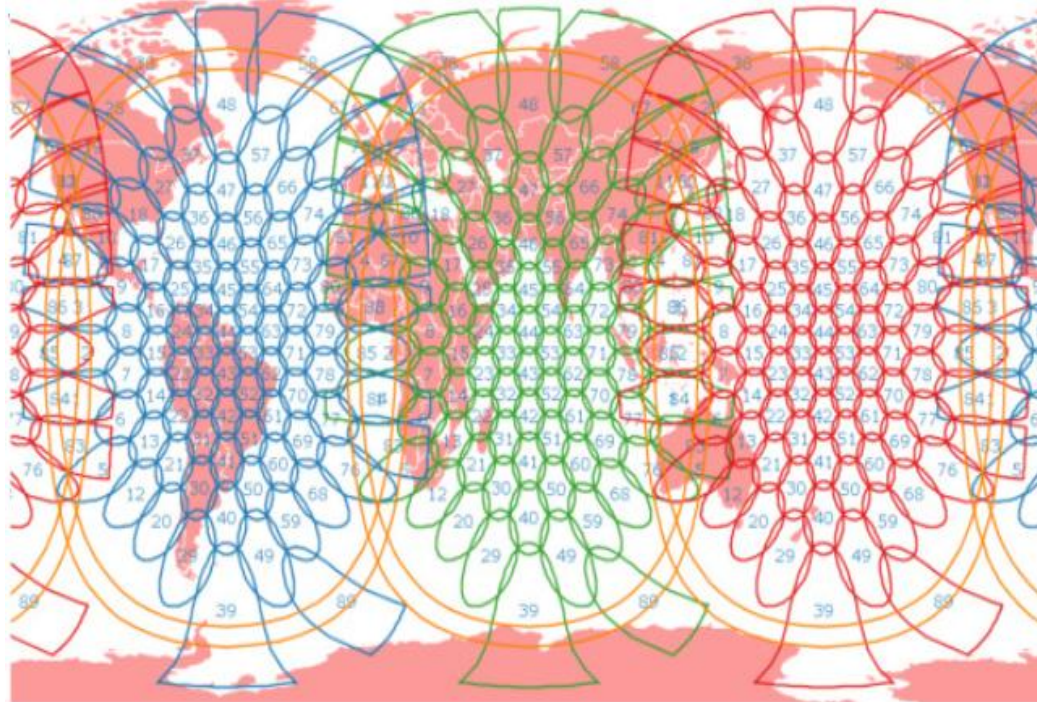
ITU: 2018, 51.2 % or 3.9 billion people, were using the Internet:

- Booming: satellite constellation
- Throughput: SpaceX -each satellites: 20Gbps/ 240Tbps/the total Internet traffic 295Tbps
- A bandwidth of 1 Tbps per launch might support 40,000 users trying to stream 4K (or ultra-high-definition) content at once
- **purpose:** global coverage, cheap price?
- **Issues:**
 - Debris/collision/bandwidth
 - Maintenance



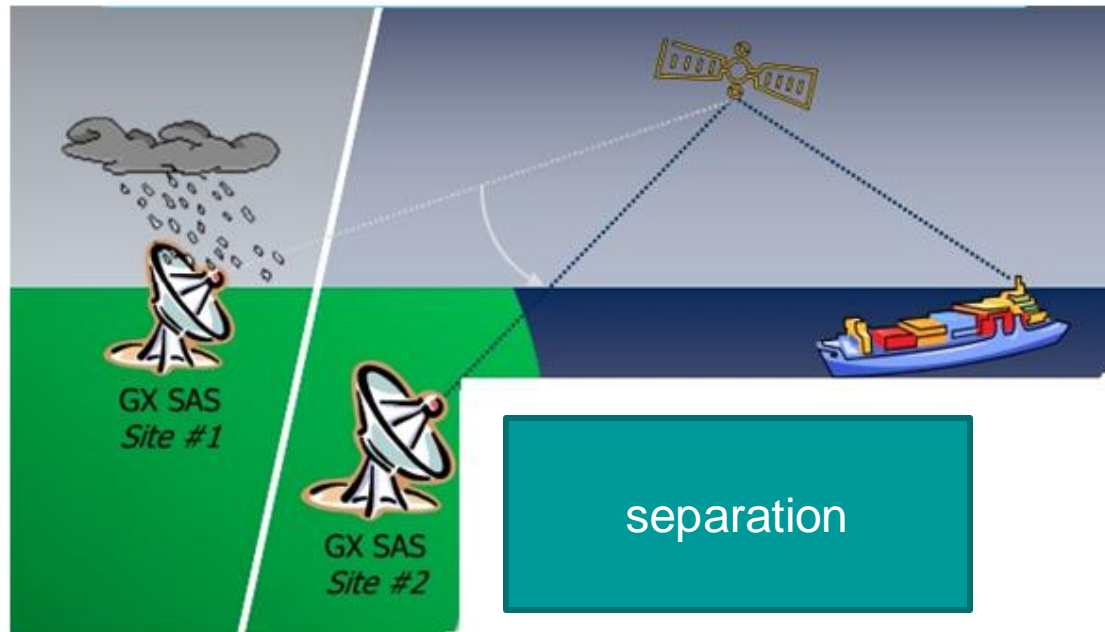
Satellite constellation

- GSO: GX - Inmarsat, [Epic^{NG}](#) - Intelsat, Viasat 3 - Viasat
- Use of higher frequency Ka-band, which has more spectrum available
- Extensive frequency reuse, through a multi spot beam architecture

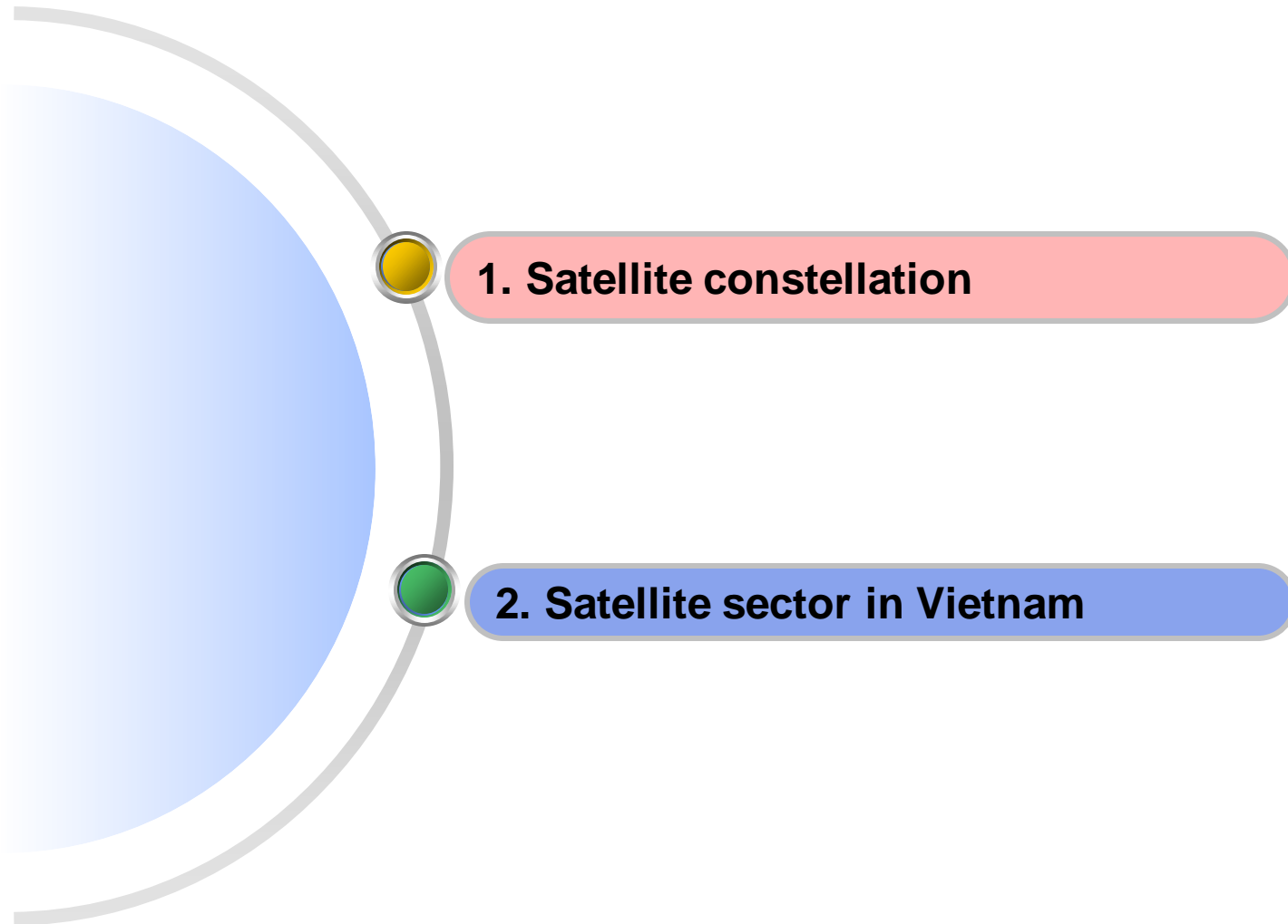


Satellite constellation

Rain loss				
	Hồ Chí Minh	Hà Nội	Đà Nẵng	Nha Trang
Jan	10,7	6,9	19,1	12,3
Oct	24,0	8,2	24,1	25,0



Satellite constellation



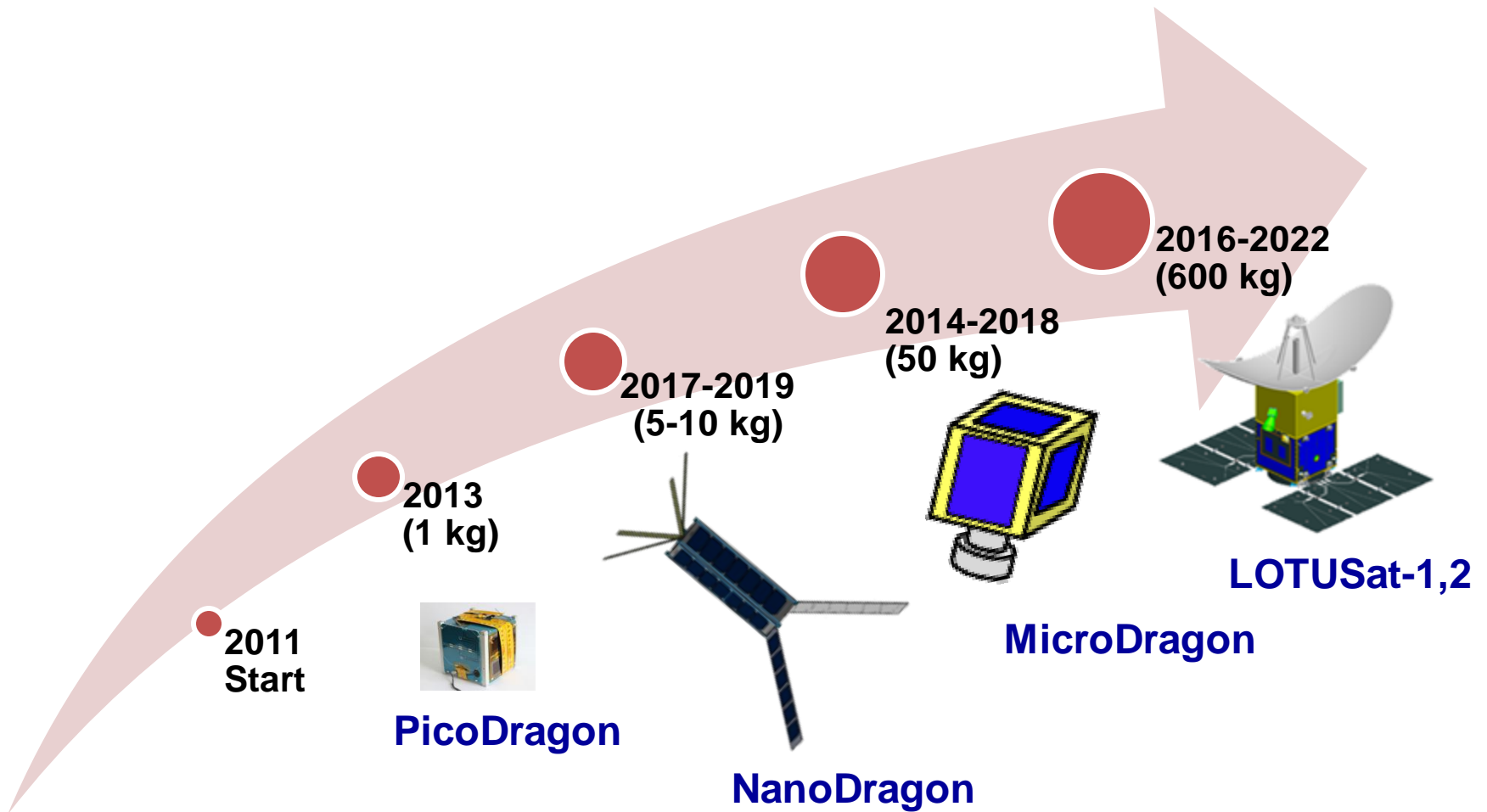
Satellite sector

Satellite development program in Vietnam

- **5 satellites (VINASAT-1&2, VNREDSat-1, F-1, PicoDragon)** launched to space until 2014
- **Next 4 satellites (NanoDragon, MicroDragon, LOTUSat-1&2)** will be launched by 2022
- **National Research Program** on space technology
- **Education and training** activities
- **International Cooperation**

Satellite technology is playing an **increasingly important role in Vietnam** society

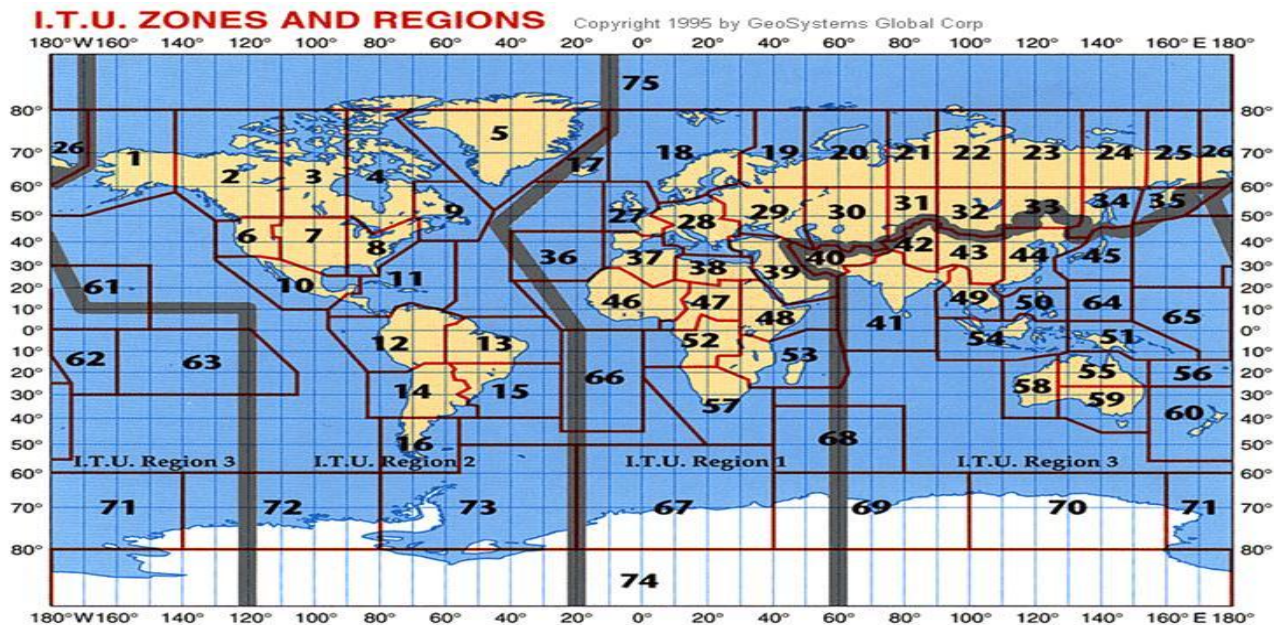
Earth exploration satellite

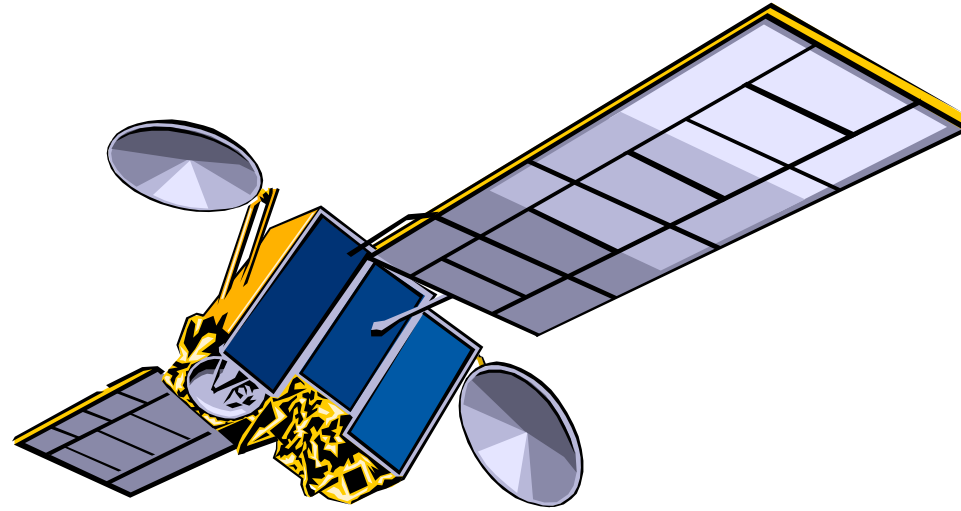


Roadmap of VNSC Satellite development

Regulatory Issues

- Licensing, providing service
- How to ensure information security.
- Fees: equal to mobile operators
- Spectrum usage
 - + Satellite coordination
 - + WRC-19 agenda item 1.5, 1.6 and 9.1.3, 7 item A





Thank you !