

ORBIT/SPECTRUM INTERNATIONAL REGULATORY FRAMEWORK

Challenges in the 21st century

Yvon HENRI

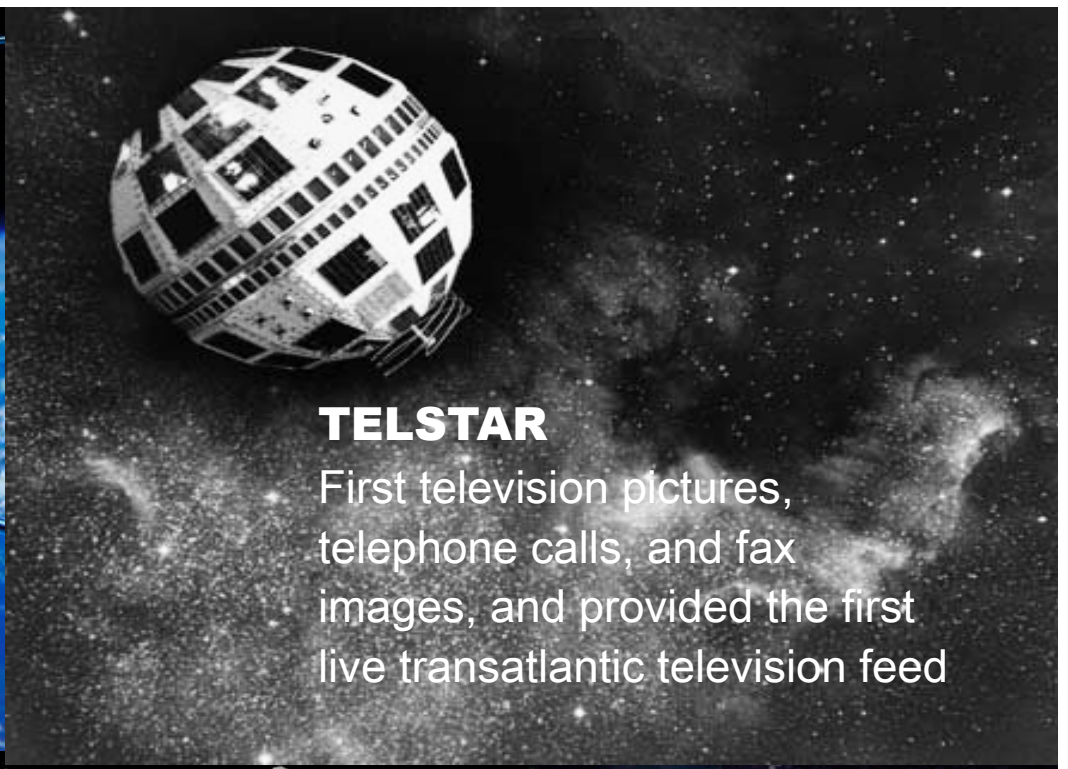
Chief Regulatory Advisor

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1957 .. 1965
Development of
communication satellites

© D. van Raemdonck



TELSTAR

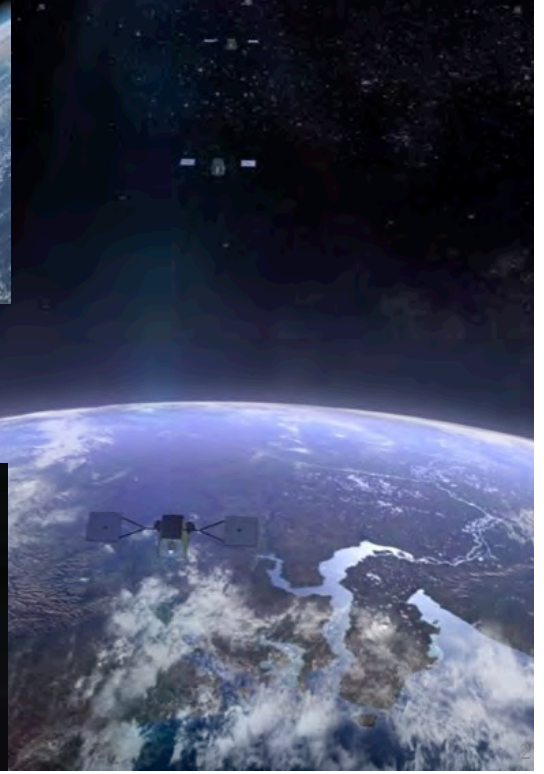
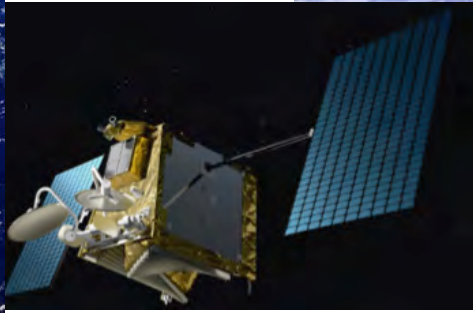
First television pictures,
telephone calls, and fax
images, and provided the first
live transatlantic television feed

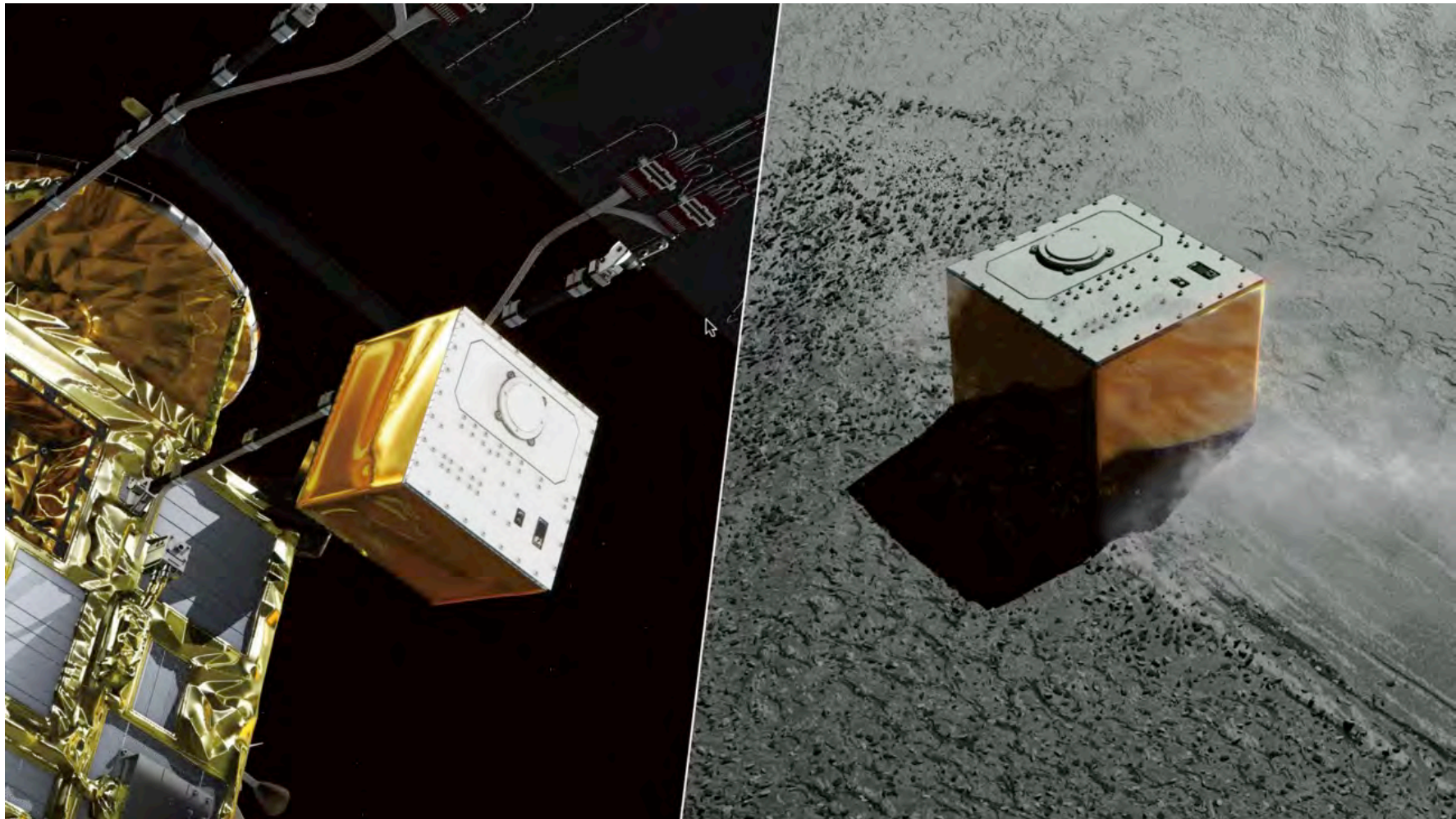
SPUTNIK 1 (Спúтник-1)

First artificial Earth satellite launched on
4th October 1957



2018





Mobile Asteroid Surface Scout (MASCOT)
deployed from Hayabusa2 spacecraft on Ryugu
asteroid (Oct.2, 2018)

Global Impact and Usage



Satellite Radio



Corporate networks



Maritime communication



Earth Observation



National Security & Defense



affordable, high-speed, low latency broadband access for all



E-learning



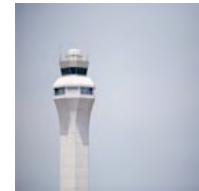
Agriculture



Cellular Backhaul



Telemedicine



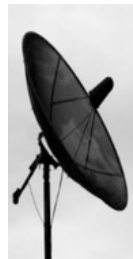
Aviation Security



Space Tourism



SNG



VSAT



Internet



Disaster Relief



Global Flight Tracking



Asteroid Harvesting/ Mining



And much more!
Space fosters creativity



DTH



Satnav



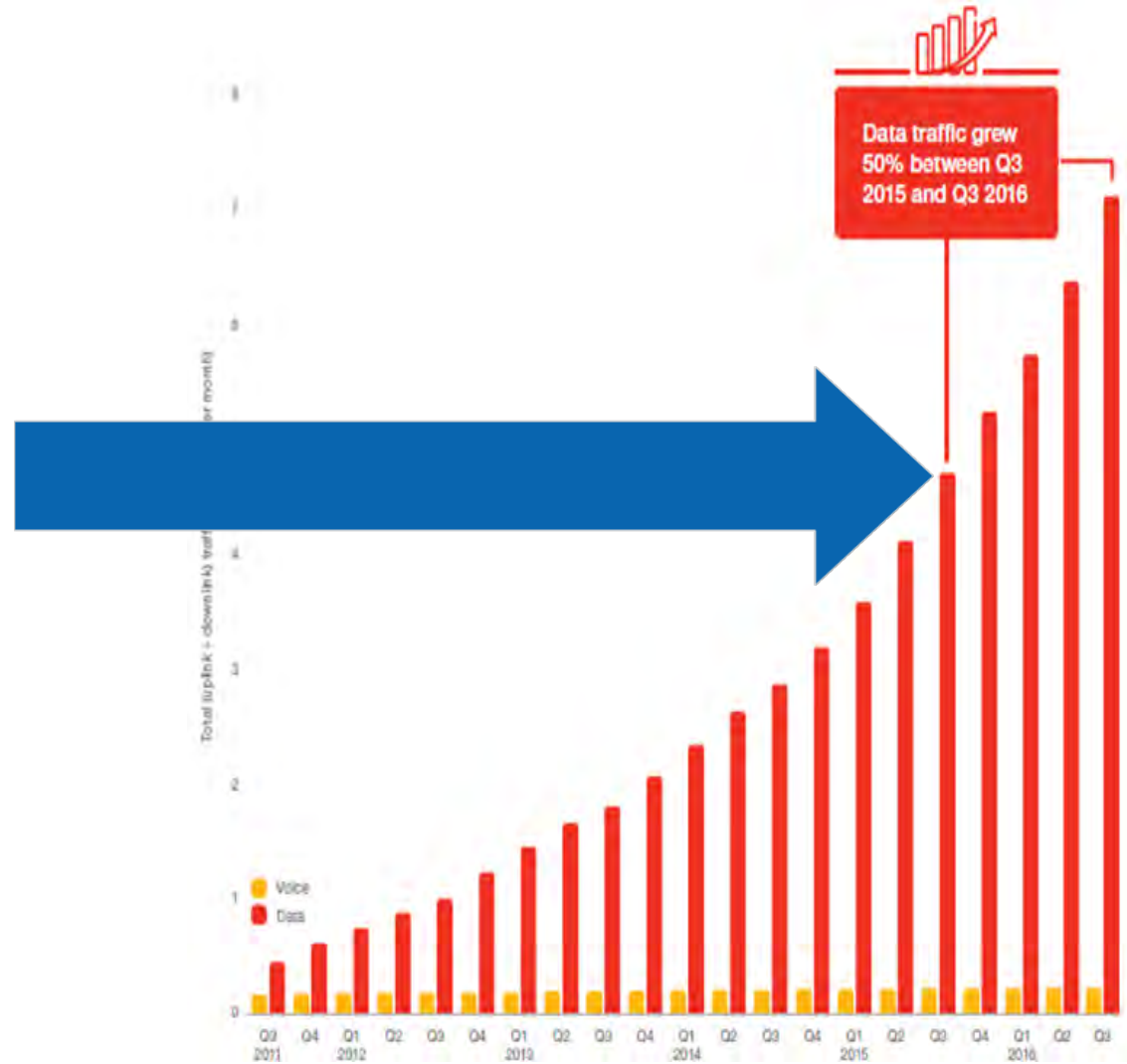
What is Driving Satellite Demand? ... **Big Data**

Traffic Trends:

- **Data traffic has seen unprecedented increase within 5 years**

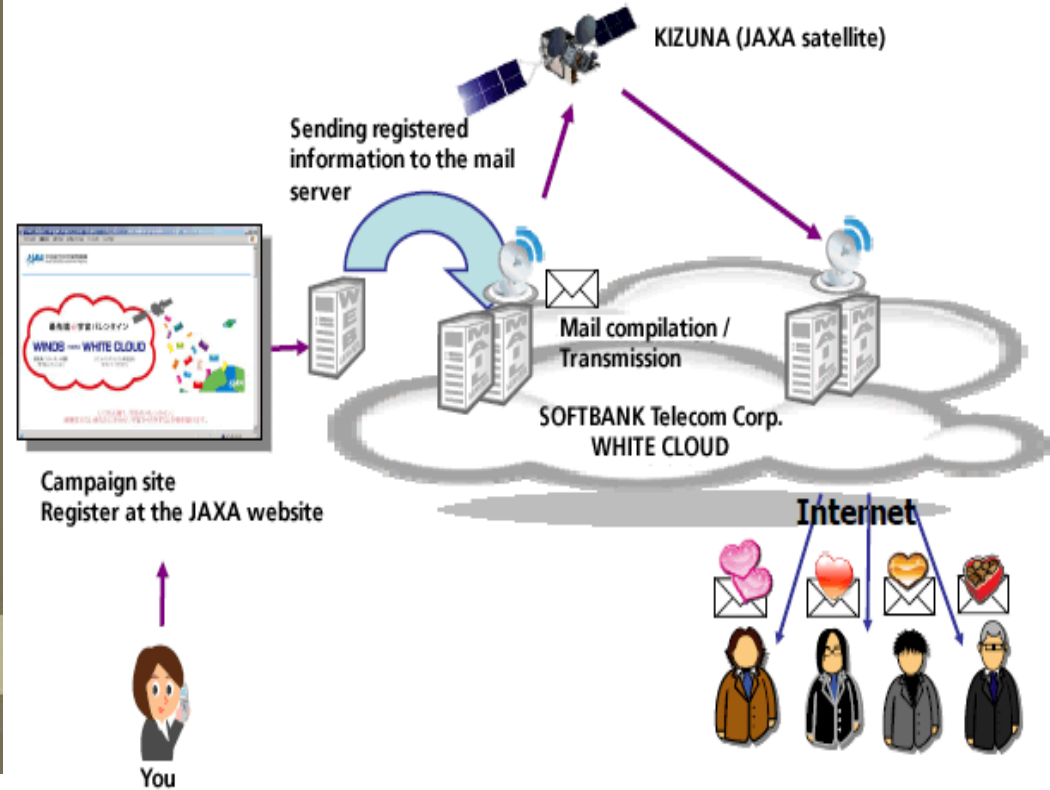
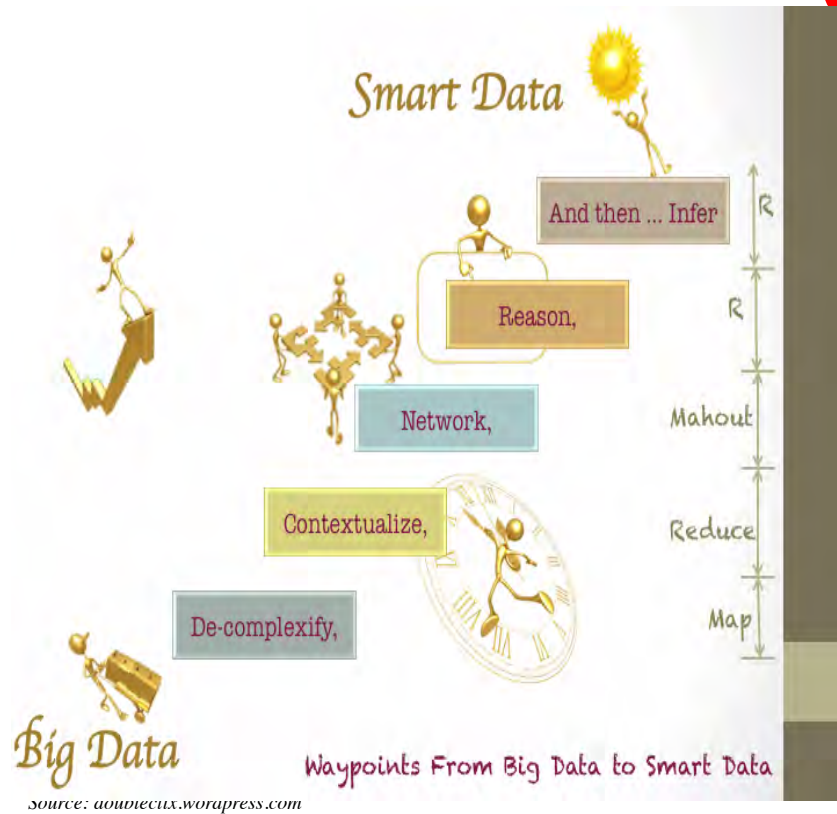
And growing at very high rates In just 12 months!!!!

Data traffic is exploding...that is why terrestrial networks need satellite



Source:Ericsson

What is Driving Satellite Demand? ... **Smart Data & “The Cloud”**

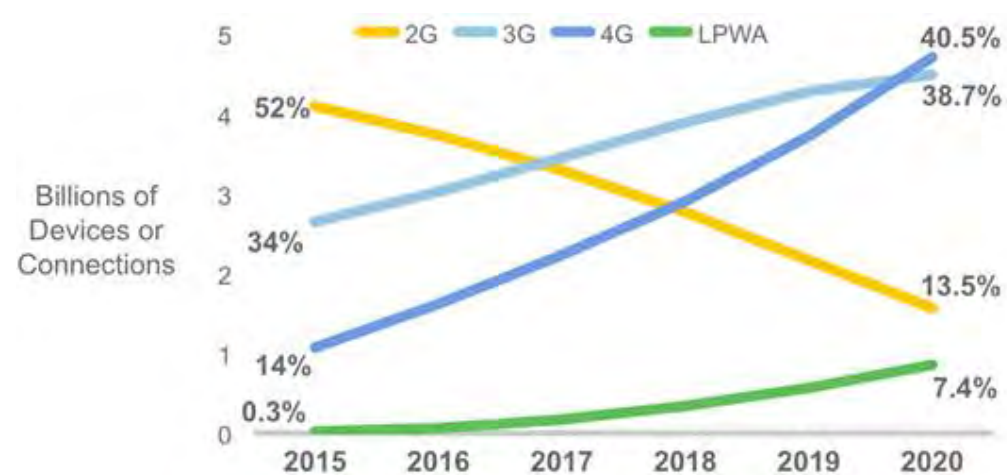


Future Traffic Trends:

- **Quantity and quality BUT security will be required at higher levels (encryption)**
- **Need for more Automation (protecting the GRID, SCADA, etc.)**
- **Near real-time to Real-time requirements – The Latency Card**

What is Driving Satellite Demand? ... **Devices**

- 2G devices & subscriptions will decline while 3G, 4G and LPWA (M2M) connections will increase substantially.
- **The mobile phone/smartphone will be the dominant personal electronic communications device.**
- Remote users (off-networks) **such as oil and gas personnel and shipping increasingly use smartphones** as part of their daily operational and personal communications

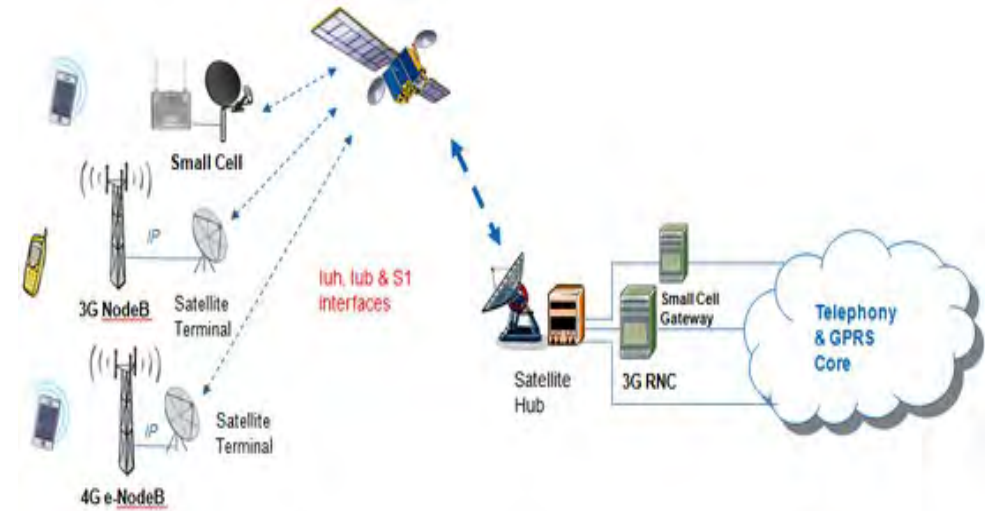


Source: Cisco

Future data traffic will follow the trend seen in urban areas in underserved and remote areas

i.e. more smartphones = more bandwidth.

Satellite for 3G/4G/5G?



Source: Cisco

Coverage Shortfall:

- Due to coverage issues or the lack of a large “pipe” to support high-bandwidth applications, rural, remote and underserved areas have to contend with 0.1 Mbps throughput.
- Applications typically restricted to SMS, voice and messaging/email.

An ever-widening “Digital Divide”

Satellite Play:

- Highly saturated and competitive urban markets means that market expansion in all regions of the globe lie in rural, remote and underserved areas where satellite is the key enabler of connectivity
- **Higher capacity satellite systems will help grow market given huge increase in 3G/4G bandwidth requirements**

Mobility via Satellite Applications



www.esa.int



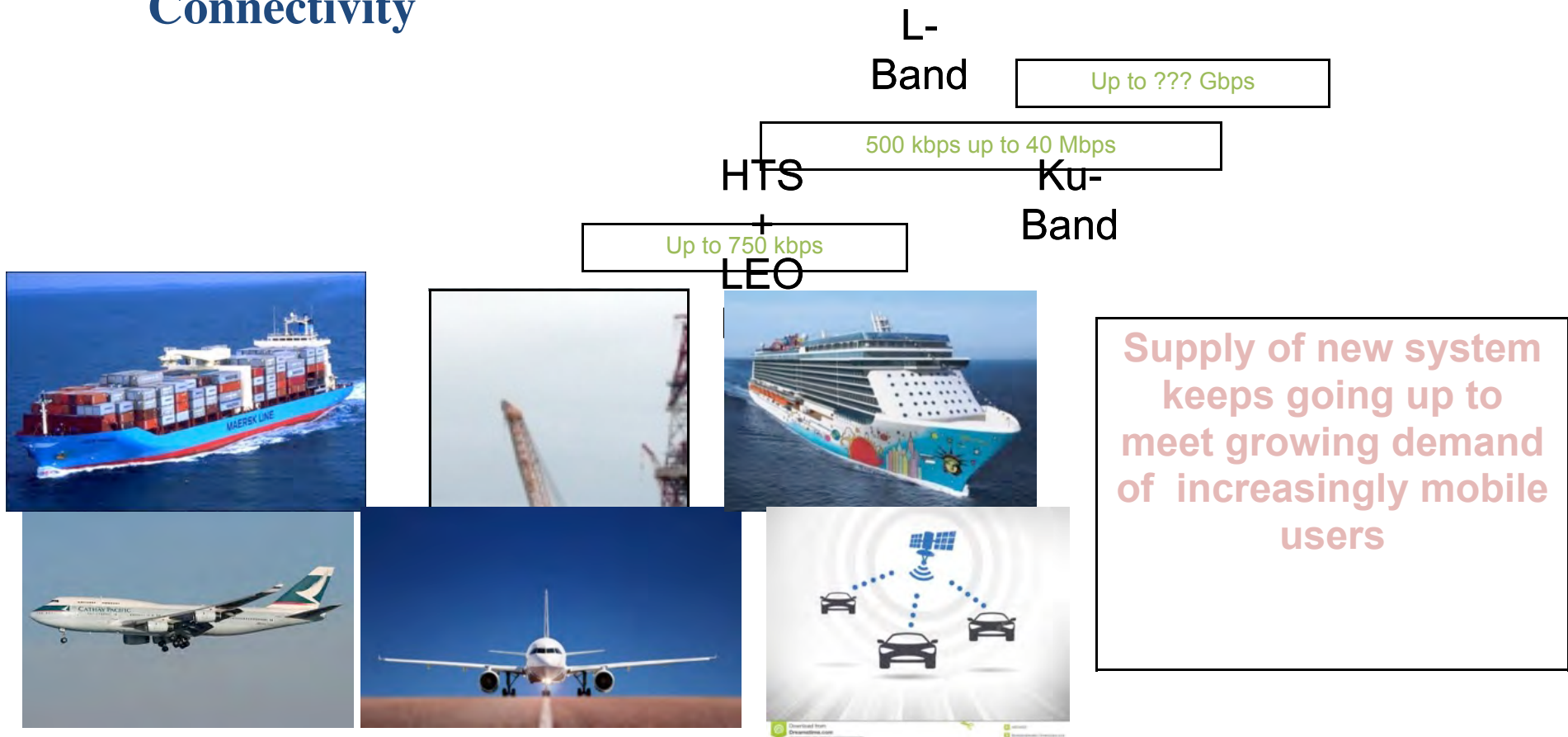
**A legacy market
that will continue
to grow**

**In-flight
connectivity is the
next “Big Thing”
for satellite**

**The Connected
Car and
Intelligent
Transportation
Systems**

Mobility via Satellite Applications — Demand Going Up

Trends in Satellite Communications Mirror Terrestrial Connectivity



The Future...within your lifetime



Not if ...but when this happens in the 2026-2035 timeframe, we will need satellites to communicate with our Martian counterparts!



Source: www.foxmovies.com



Source: Mars.NASA.Gov

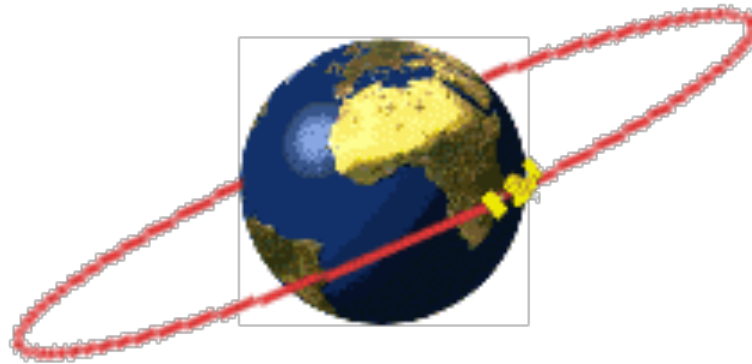
The Sustainable Development Goals



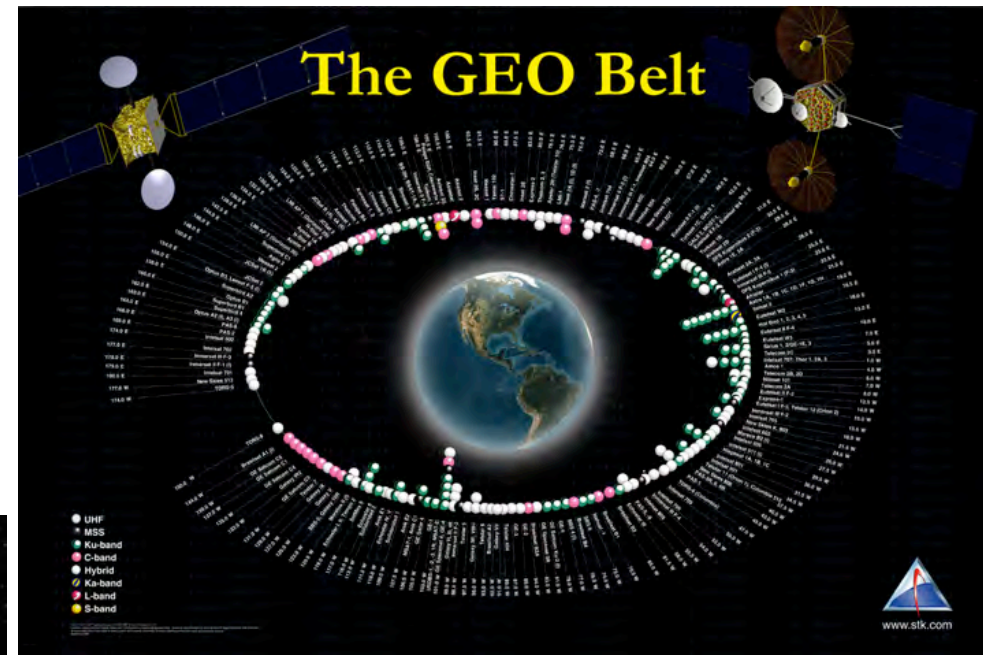
The Sustainable Development Goals

- In 2015, the United Nations adopted 17 Sustainable Development Goals (SDGs) as part of the Agenda 2030 to achieve a better future for all.
 - These goals apply to all countries, whether developing or developed.
 - Radiocommunications, including satellites have a key supporting role in achieving each and everyone of these 17 SDGs.
-

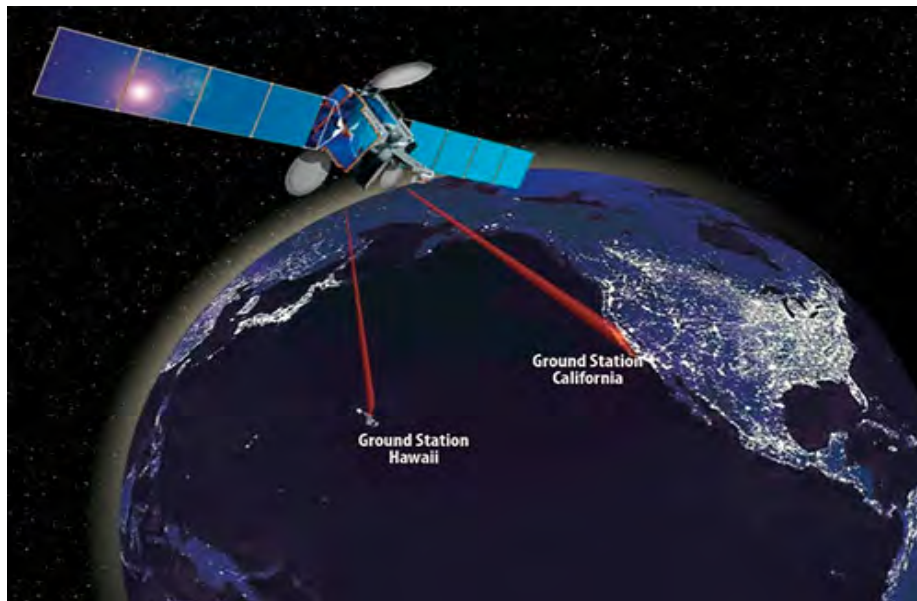
A Typical Geostationary Satellite



Source: www2.jpl.nasa.gov



Source: www.geek.com



Source: BBC

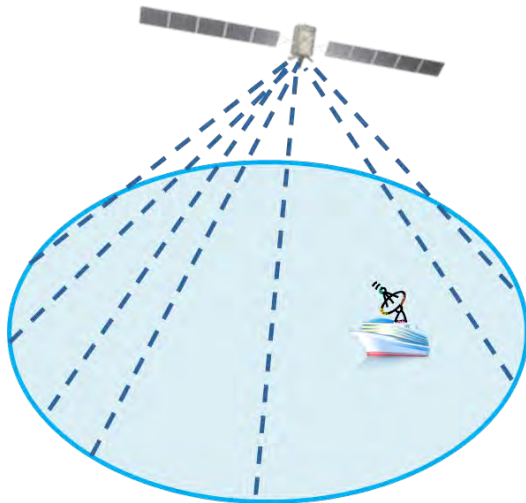
- Distance from Earth: 35,786 KM or 22,223 miles
- Geostationary satellites "parked" over equator travel at same direction and speed as the Earth revolves. Each "footprint" covers 40% of globe (for C-band).
- Speed: 11,300 km/h or 7,000 mph
- Directional antennae are aimed and fixed in position with no need for tracking.

Traditional GEOs and HTS GEOs

- Future Satellite Communications - High Throughput Satellites (HTS)

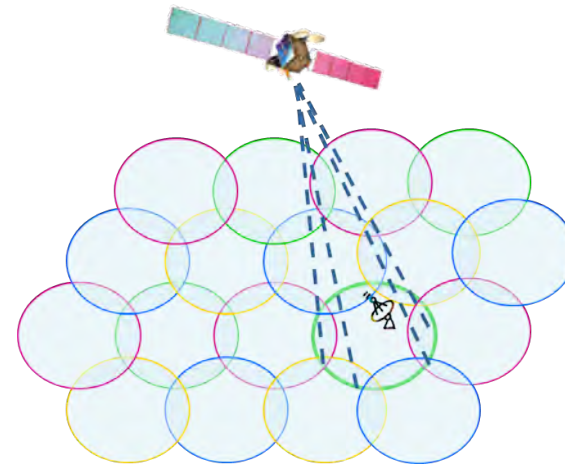
- Traditional

- Traditional FSS provide large hemi- or regional beams without frequency re-use
 - or multiple spot beams



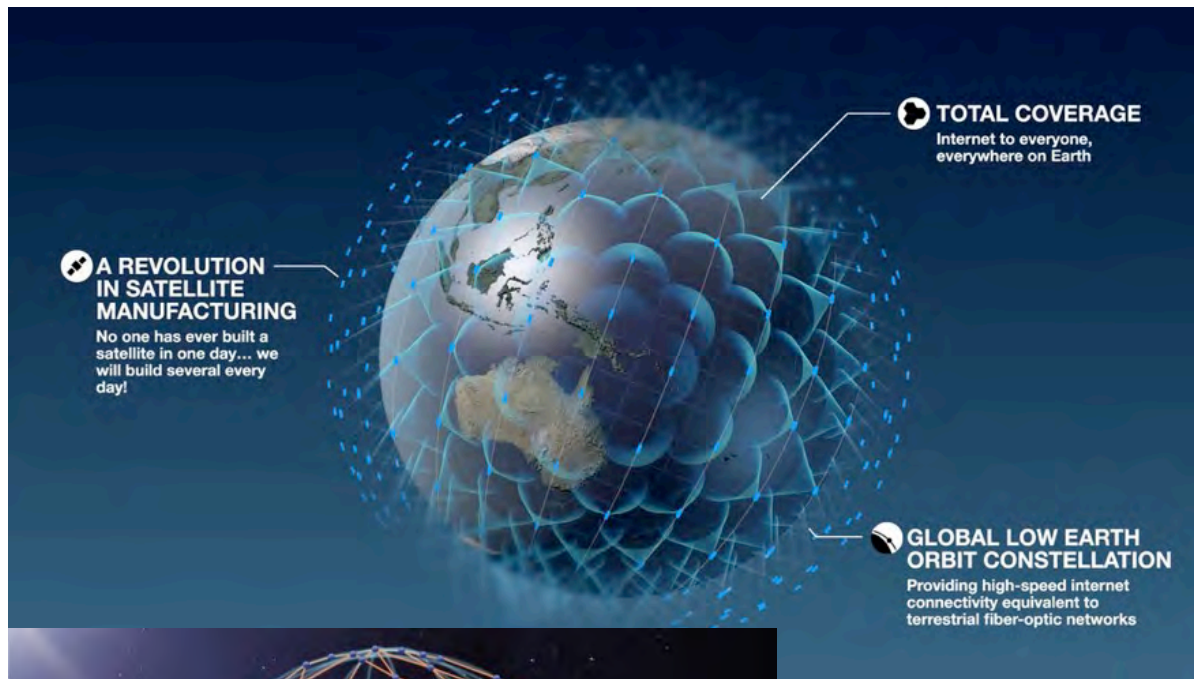
- HTS

- HTS almost exclusively make use of frequency re-use
 - + multiple spot beams

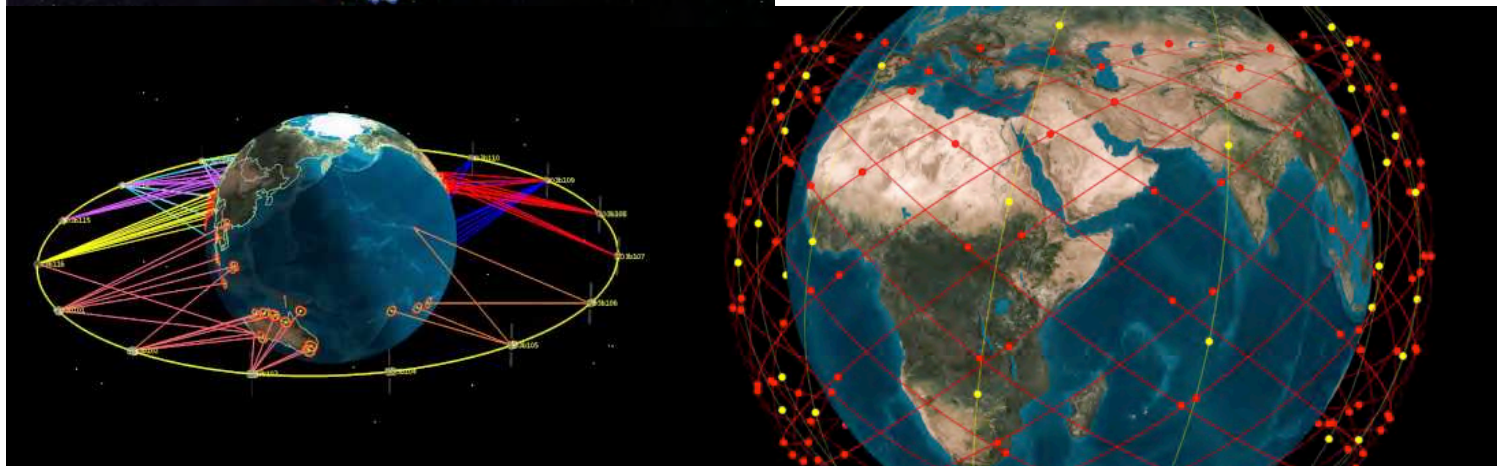


- Why? Higher throughput, more spectrum available, smaller equipment, lower cost-per-bit
- Main applications? Consumer broadband access and enterprise data services

LEO & MEO systems

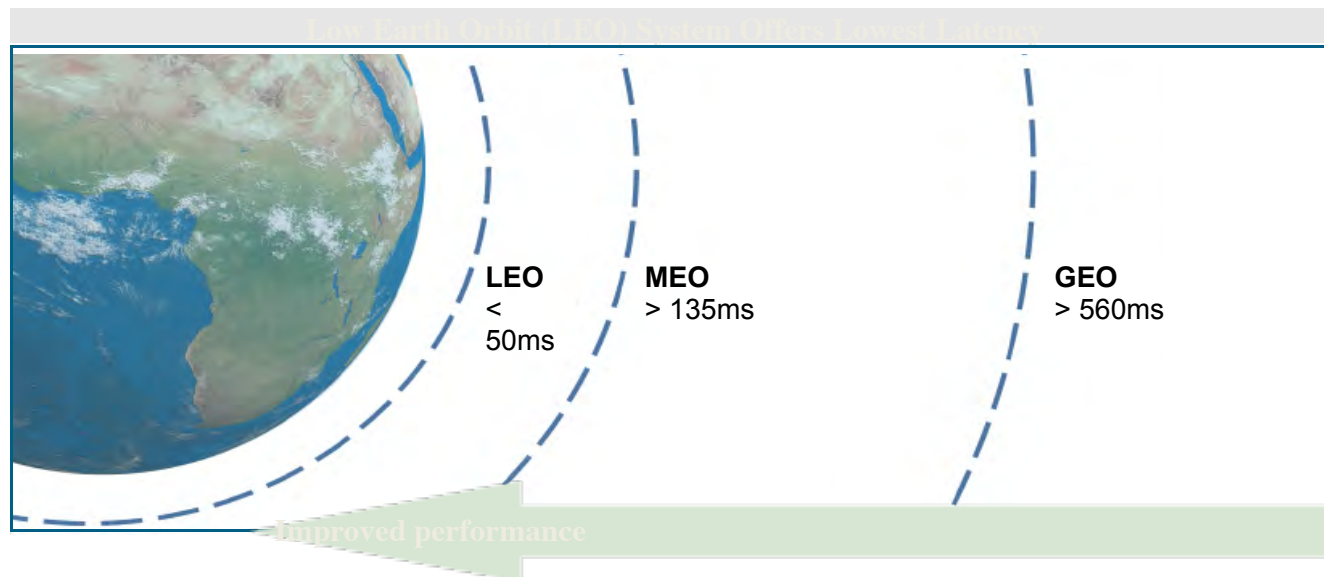


- **LEO/MEO distance from Earth is closer compared to GEO (1200-1400 km/10000 km)**
- **Lower latency for LEO**
- **Speed: LEOs faster**
- **LEO footprint is smaller so more satellites are needed to cover the globe.**



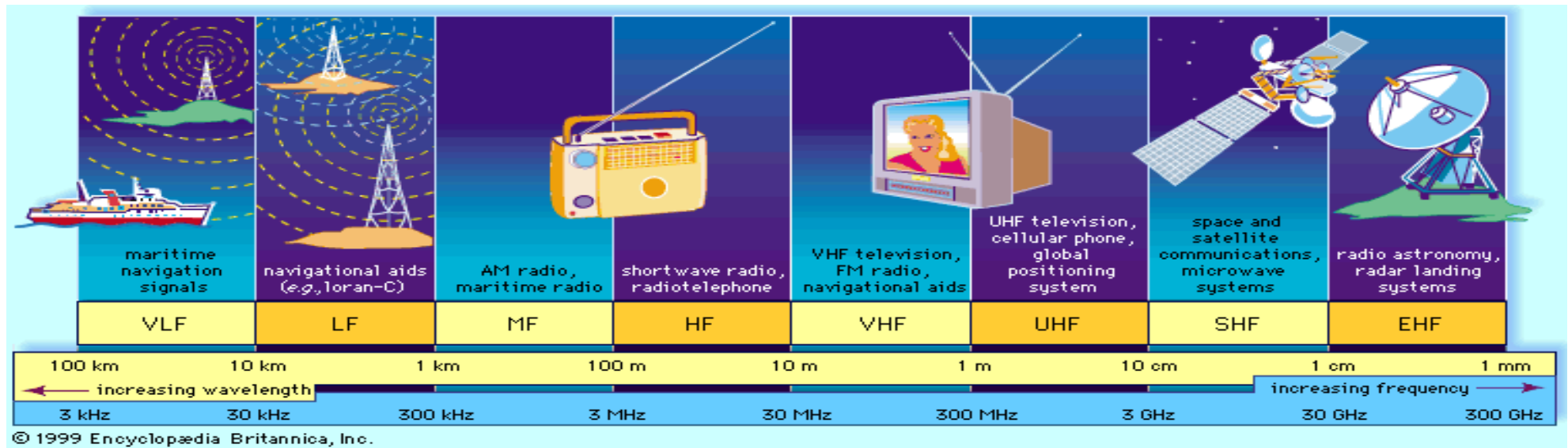
NGSO Low Latency

- Lower cost to build and launch LEO satellites □ lower cost per bit
- Low latency □ services comparable to terrestrial networks
- Polar Orbit □ high elevation and global coverage



FREQUENCY SPECTRUM

Limited natural resource



1.467 GHz to 1.492 GHz	1.518 GHz to 1.675 GHz	1.97 GHz to 2.69 GHz	3.4 GHz to 7.025 GHz	10.7 GHz to 14.5 GHz	17.3 GHz to 30 GHz
Satellite Audio Broadcasting to fixed and mobile units	Civilian Mobile-Satellite Services (two-way)	Satellite television & radio broadcasting to mobiles + two-way mobile services	Fixed-Satellite television, & data services (including broadcasting)	Fixed-Satellite television & data services (including broadcasting)	Fixed-Satellite television & data services (including broadcasting)

WHERE DO SATELLITES OPERATE ...

GEO
35,786 km above
equator

Molniya



MEO
8 000 - 20 000 km



LEO
400 - 2 000 km



International Space Station

HIGHLY-ELLIPTICAL
ORBIT

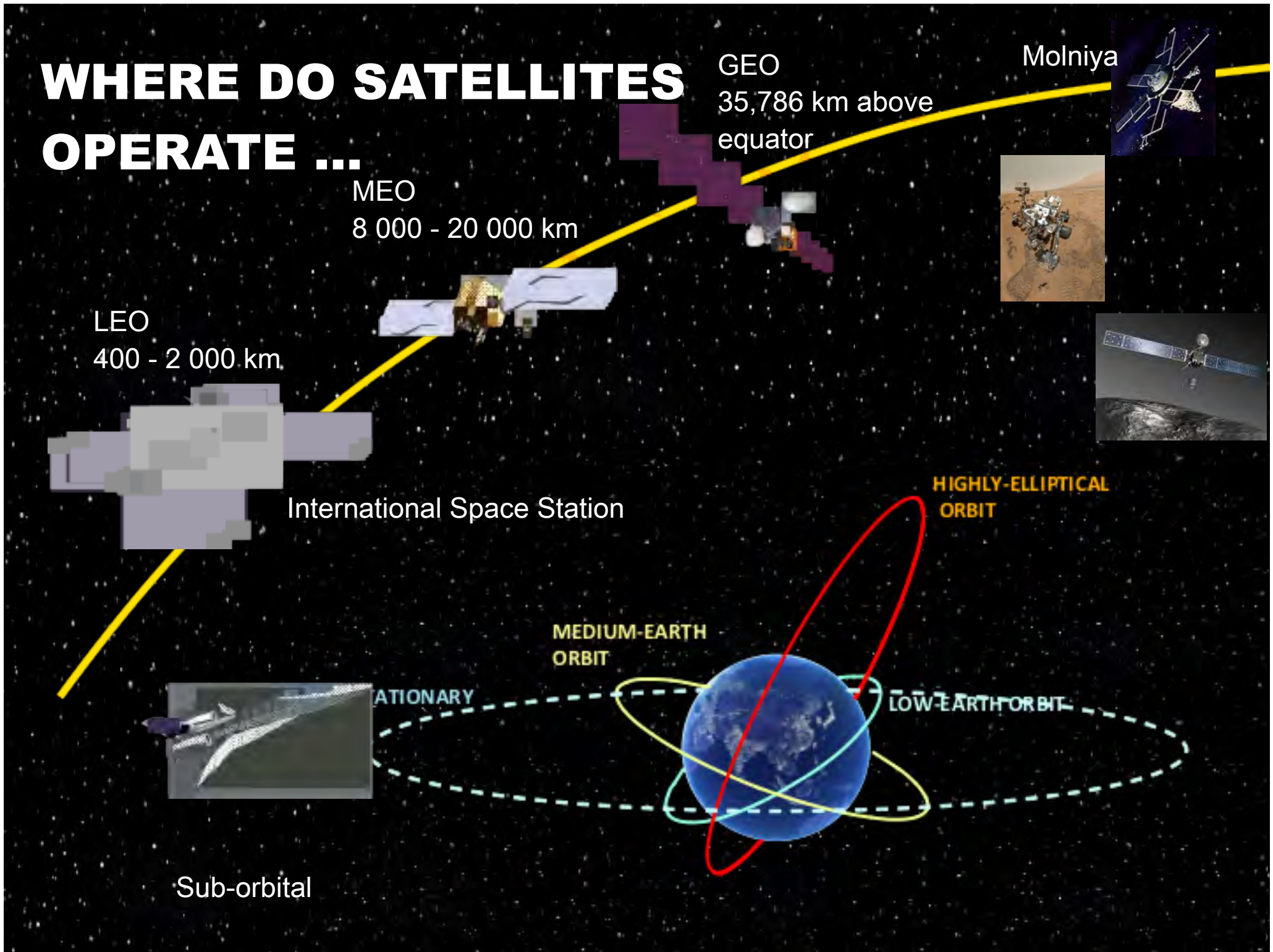
MEDIUM-EARTH
ORBIT



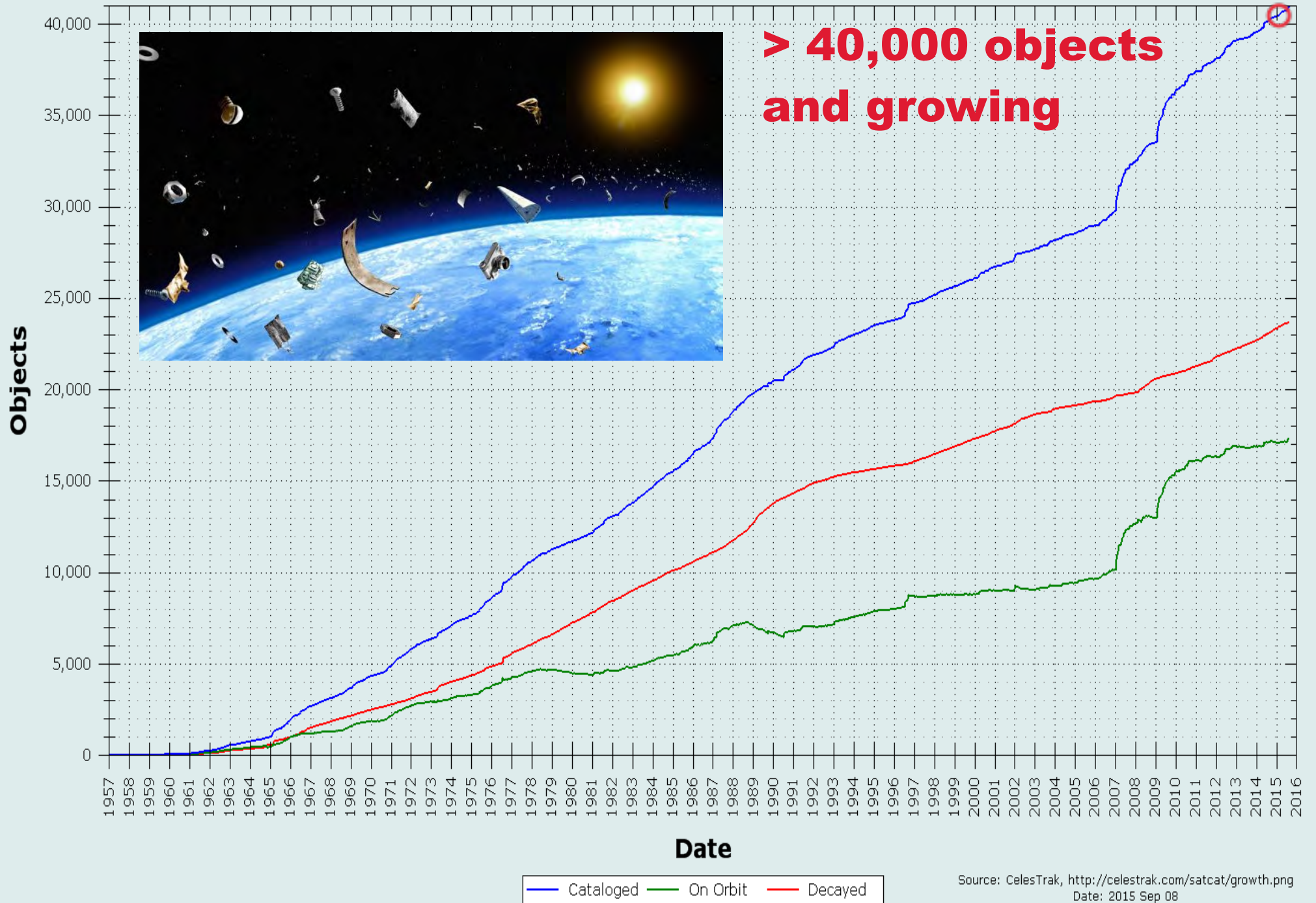
STATIONARY

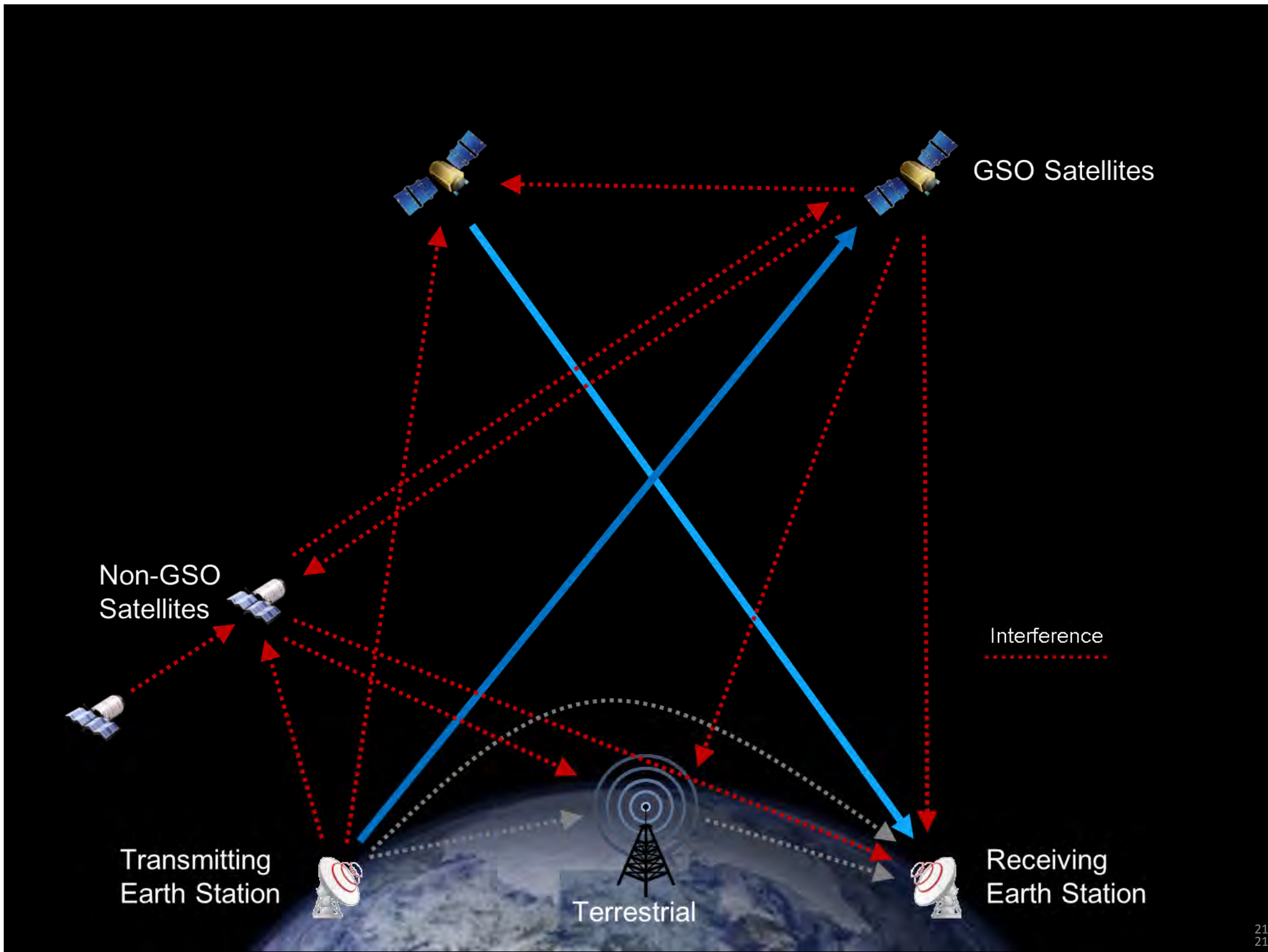
LOW-EARTH ORBIT

Sub-orbital



SATCAT Growth

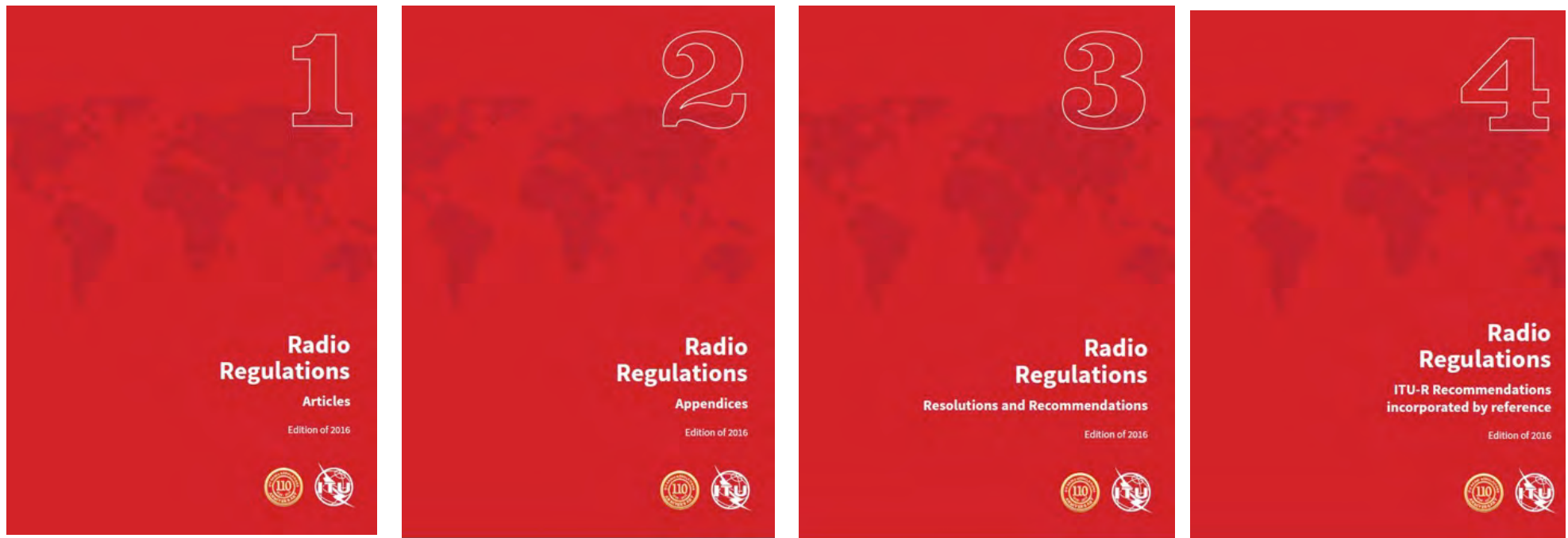






1963

Extraordinary Administrative Radio Conference to allocate frequency bands for space radiocommunication purposes

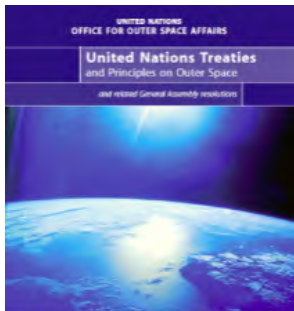


TODAY

More than 2000 pages of Radio Regulations
40 services from 8.3 kHz to 3 000 GHz

LEGAL FRAMEWORK FOR SPECTRUM ACCESS/USE

UN OUTER SPACE TREATY (1967)



- Outer space free for exploitation and use by all states in conformity with international regulations
- States retain jurisdiction and control over objects launched into outer space
- States shall be liable for damage caused by their space objects

INTERNATIONAL TREATIES

1967 “Outer Space Treaty”

Treaty on Principles Governing the Activities of States in Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies

1968 “Rescue Agreement”

Agreement on the Rescue of Astronauts, the Return of Astronauts and the Return of Objects Launched into Outer Space

1972 “Liability Convention”

Convention on International Liability for Damage Caused by Space Objects

1975 “Registration Convention”

Convention on Registration of Objects Launched into Outer Space

1979 “Moon Treaty”

Agreement Governing the Activities of States on the Moon and Other Celestial Bodies

ITU Constitution/Convention of 1982 listed under other agreements
ITU is recognized as the specialized agency responsible for
telecommunication issues



ITU is the United Nations **specialized agency for information and communication technologies (ICTs)**



ITU members

193

MEMBER STATES



+700

INDUSTRY & INTERNATIONAL ORGANIZATIONS



+100

ACADEMIA MEMBERS





ITU RECOGNIZED AS SPECIALIZED AGENCY RESPONSIBLE FOR

- Principles of use of orbit/spectrum
- Allocation of frequency bands
- Procedures, Plans, operational measures
- Instruments (Constitution, Convention, Radio Regulations, Rules of Procedures, Recommendations)

Role of ITU in radiocommunications

- Developing and updating international regulations on the use of orbit /spectrum
 - Applying these regulations
 - Developing and adopting standards and best practices on the use of orbit/spectrum
 - Disseminating information on these regulations, standards and best practices
-

ITU CONSTITUTION (Art.1)

ITU shall **effect allocation of bands** of the radio-frequency spectrum, the allotment of radio frequencies and the **registration of radiofrequency assignments** and, for space services, of **any associated orbital position** in the geostationary-satellite orbit or of any associated characteristics of satellites in other orbits, in order to **avoid harmful interference** between radio stations of different countries



ITU Constitution (Art.44)

```
graph TD; A["ITU Constitution (Art.44)"] --> B["Radio frequencies & satellite orbits are limited natural resources"]; B --> C["Rational, Efficient, Economical Use"]; C --> D["Equitable Access"];
```

Radio frequencies & satellite orbits
are limited natural resources

Rational, Efficient, Economical Use

Equitable Access



RADIO REGULATIONS

- Intergovernmental Treaty governing the use of spectrum/orbit resources by administrations
- Define the rights and obligations of Member States in respect of the use of these resources
- Recording of a frequency assignment in the Master Register (MIFR) provides international recognition



1. Harmonize global spectrum to create economies of scale, roaming and interoperability

3. Creating certainty requires consensus: time, efforts and patience

WRC PURPOSE



2. Create regulatory certainty for a multi-trillion dollars industry playing an increasingly important role in the development of our societies



UN

Outer Space instruments
on space objects

Free “exploration & use” under
international law

States
Responsibility & licensing
Jurisdiction & control

States
Registration OOSA

States
Liable for damage



ITU

Instruments
on radio frequencies

Equitable access & rational use of
spectrum under international law

States
Must license trans. radio stations
Shall not cause harmful interf.

States
API...CR/C...MIFR

No liability clause

REGULATION OF RADIO SPECTRUM AND SATELLITE ORBIT IN PRACTICE

In summary

INTERNATIONAL REGULATIONS

Equitable access
Rational, efficient,
economical use
Operation without harmful
interference

COMMON GOAL

SATELLITES

Wide coverage
Cross national borders
Facilitate connectivity

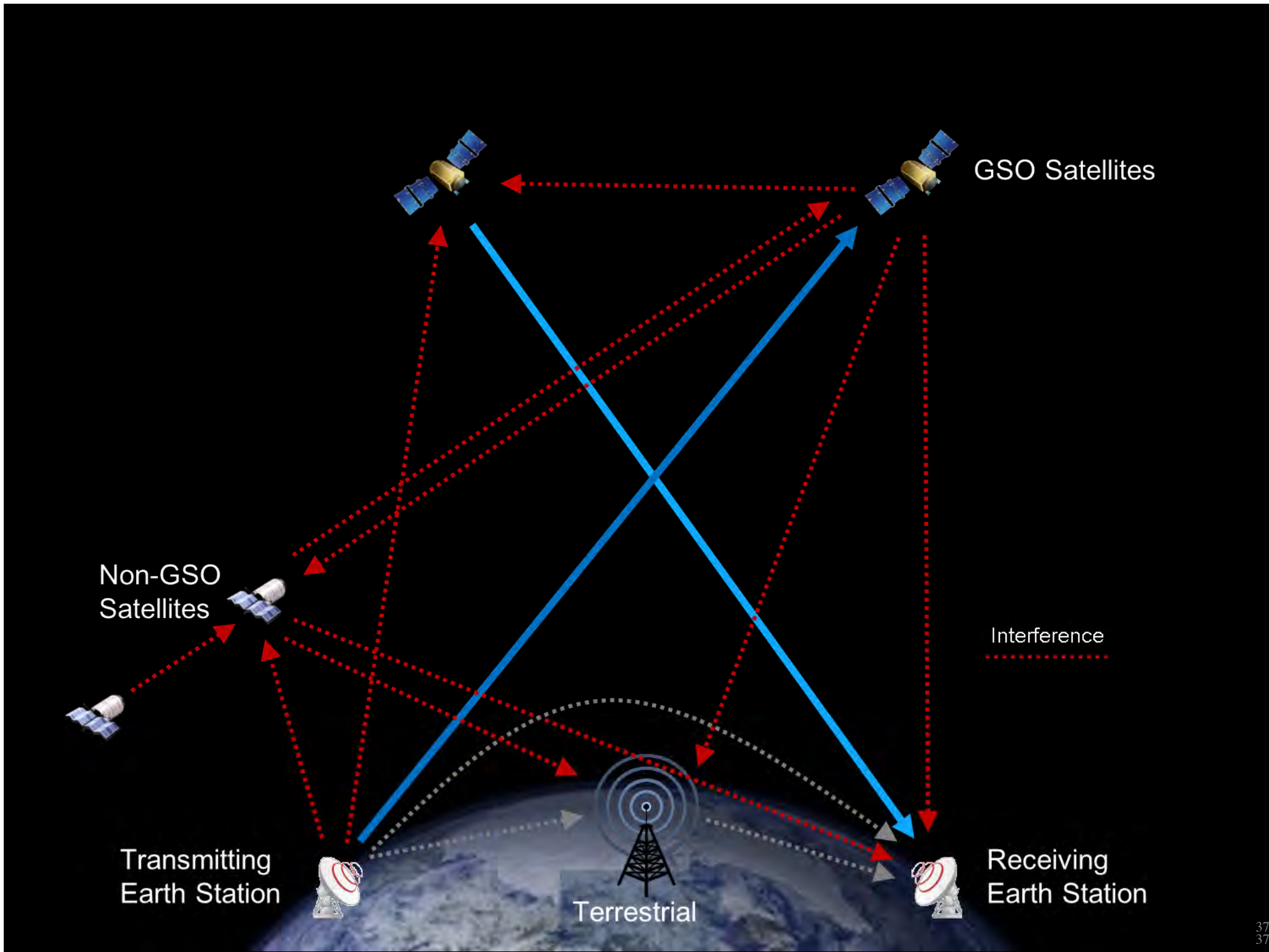
ORBIT/ SPECTRUM

Limited
Global/Natural/Public
resource

Launch Vehicle

Source: Articles 1, 44, 45 & Res 71 of ITU Constitution & Convention

Photo credit: ESA (for educational purposes)



PROPAGATION OF RADIO



Laws of physics

Radio waves do not stop at national borders

INTERFERENCE



Possible between radio stations of different countries

High risk in Space Radiocommunications

RADIO REGULATIONS



One of its main purposes:

Interference-free operation of Radiocommunications

CONTROL OF INTERFERENCE



RADIO REGULATIONS

ALLOCATION

Frequency separation of stations of different services

COORDINATION

between Administrations to ensure interference-free operations conditions

POWER LIMITS

PFD to protect TERR services / EIRP to protect SPACE services / EPFD to protect GSO from Non-GSO

RECORDING

In the Master International Frequency Register (MIFR)
International recognition

MONITORING

International monitoring system

SHARING ORBIT/SPECTRUM RESOURCE

1. COORDINATION APPROACH

- First come, first served
- Rational, Efficient, Economical Use
- Rights acquired through coordination with administrations concerning actual usage
- Efficient spectrum/orbit management
- Dense/irregular orbital distribution of space stations

2. PLANNING APPROACH

- Plan for future use
- Equitable Access
- Congestion of GSO
- Frequency/orbital position plans
- For future use by all countries
- Predetermined orbital position & frequency spectrum



International Recognition
Registration in **MIFR**

INTERNATIONAL REGULATIONS

Lengthy & complex procedures
Lack of incentive to review underused spectrum/orbital positions

CONSEQUENCE

Difficulty to coordinate
Multiple filings
Operation without coordination
Fait-accomplis approach
Fictitious recorded assignments

ORBIT/ SPECTRUM

Scarcity due to thousands of filings

ITU Constitution

(Art.44)

Radio frequencies &
satellite orbits are limited
natural resources

Rational, Efficient,
Economical Use

Equitable Access



Opportunity to resolve interference **BEFORE** operation



PREVENTS LOSS of investment, customers &
revenue by minimizing unusable capacity due to

KEY POINTS

- Natural limited resources to be shared and regulated: orbit & radiofrequency spectrum
- Legal framework: UN Outer Space Treaties, ITU Constitution/Convention, **Radio Regulations**, Rules of Procedures, Recommendations
- ITU Constitution, Articles 44 & 45:
 - To avoid harmful interference
 - To ensure efficient, rational, equitable economical use
- Radio Regulations: Allocation, registration, interference free operation
- Radio Regulations constantly being improved...Next **WRC-19**

“With a concerted effort, we can **reduce**, and to the extent possible **remove**, all **obstacles** impeding the development and bringing into operation of new satellite networks”

“Think carefully about how we can continue to use and improve satellite access to help **connect the unconnected**, and make the world a better and a fairer place for all”

MERCI

Yvon HENRI

Chief Regulatory Advisor

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ANNEX

Yvon HENRI

Chief Regulatory Advisor

E-mail: yhenri@oneweb.net



**Global Space Industry
in 2018**

\$ 360 billion



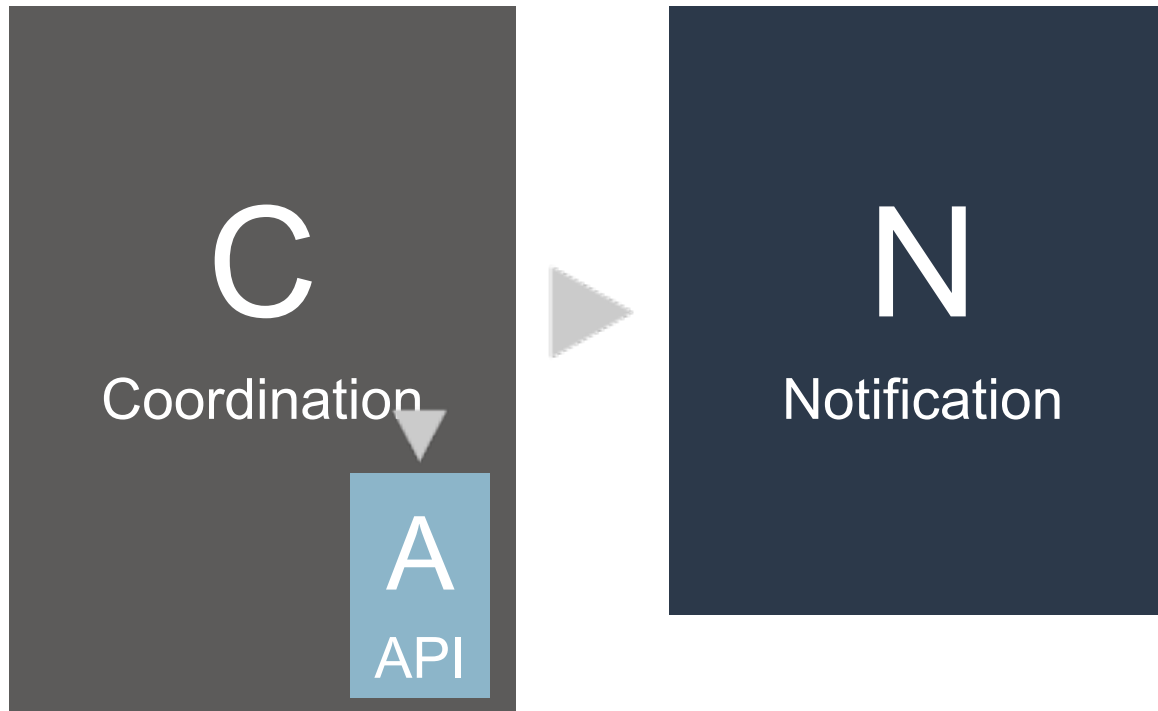
**Predicted to be
in 2040s**

\$ 1 trillion



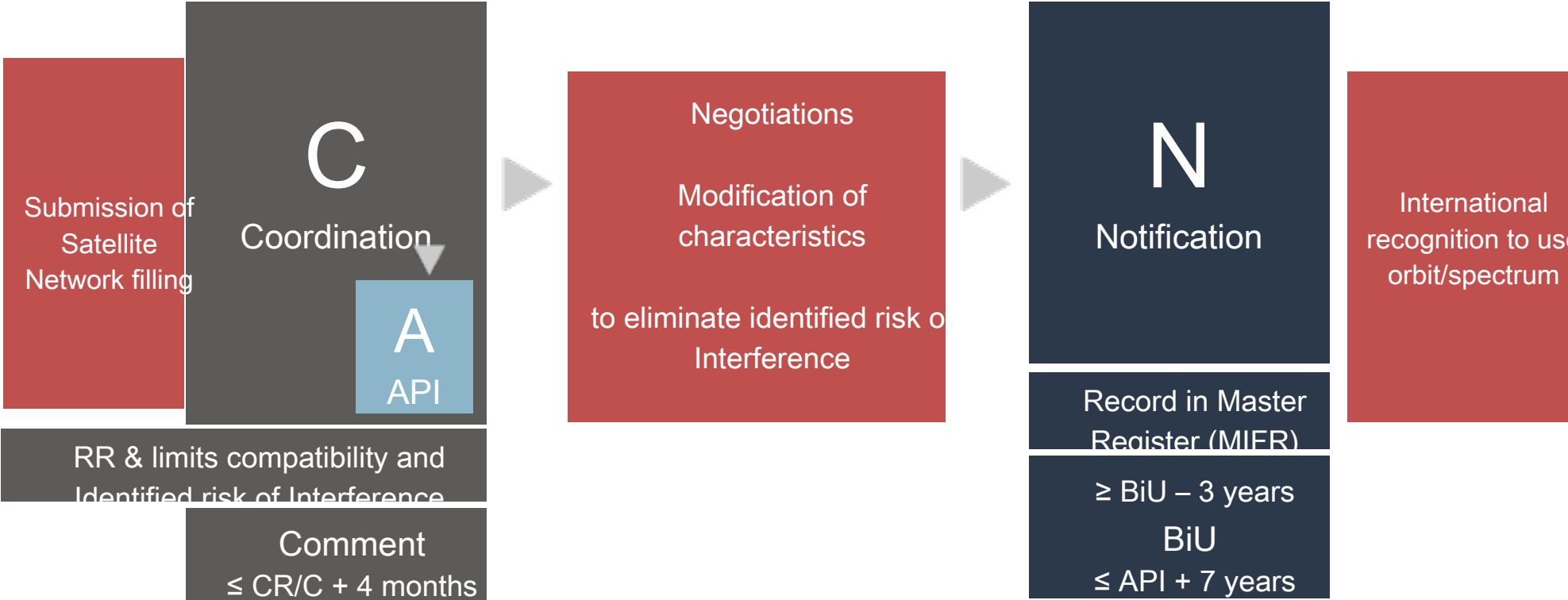
Source: SSIR 2016 Tauri Group

Non-plan service Procedures (GSO & non-GSO) subject to coordination (Articles 9 & 11)



7 years

Non-Plan Service Procedures (GSO & non-GSO) subject to coordination (RR Book 1 Articles 9 & 11)



Max 7 years

Source: Nos. 9.1, 9.5D, 9.52C, 9.43, 11.44.1, 11.25, 11.44 of Radio Regulations – BiU: Bringing into Use

Plan Service Procedures (GSO) (RR Book 2 Appendices 30/30A & 30B)

Broadcasting-Satellite Service and feeder-link Plans (BSS Plan)

11.7-12.2 GHz (Region 3),
11.7-12.5 GHz (Region 1),
12.2-12.7 GHz (Region 2),

17.3-18.1 GHz (Regions 1&3),
17.3-17.8 GHz (Region 2),
14.5-14.8 GHz (Regions 1&3 except Europe)

Fixed-Satellite Service Plan (FSS Plan)

4'500 – 4'800 MHz
6'725 – 7'025 MHz

10.70 - 10.95 GHz
11.20 - 11.45 GHz / 12.75 - 13.25
GHz

BSS Planned Procedures (GSO)
(Appendix 30/30A)

Region 2
Art. 4



Plan

Art. 5



MIFR

Regions 1&3
Art. 4



List

Plan

Art. 5



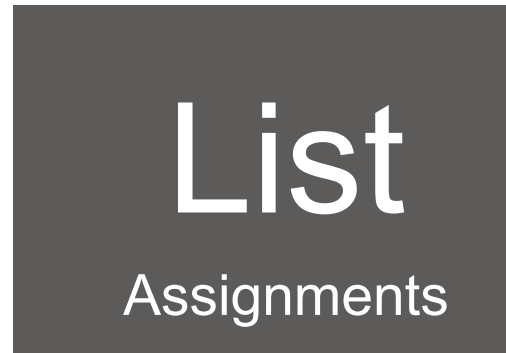
MIFR

4.
1.
2
6
/
4.
1.
2



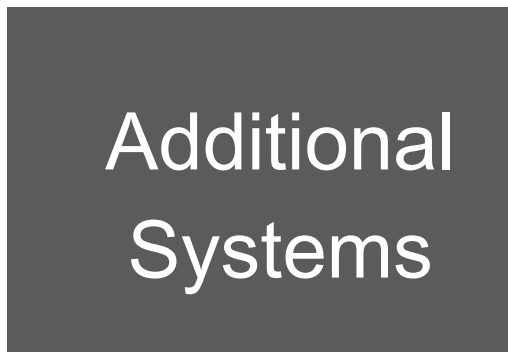
**FSS Planned Procedures (GSO)
(Appendix 30B)**

Art. 7



Art. 8

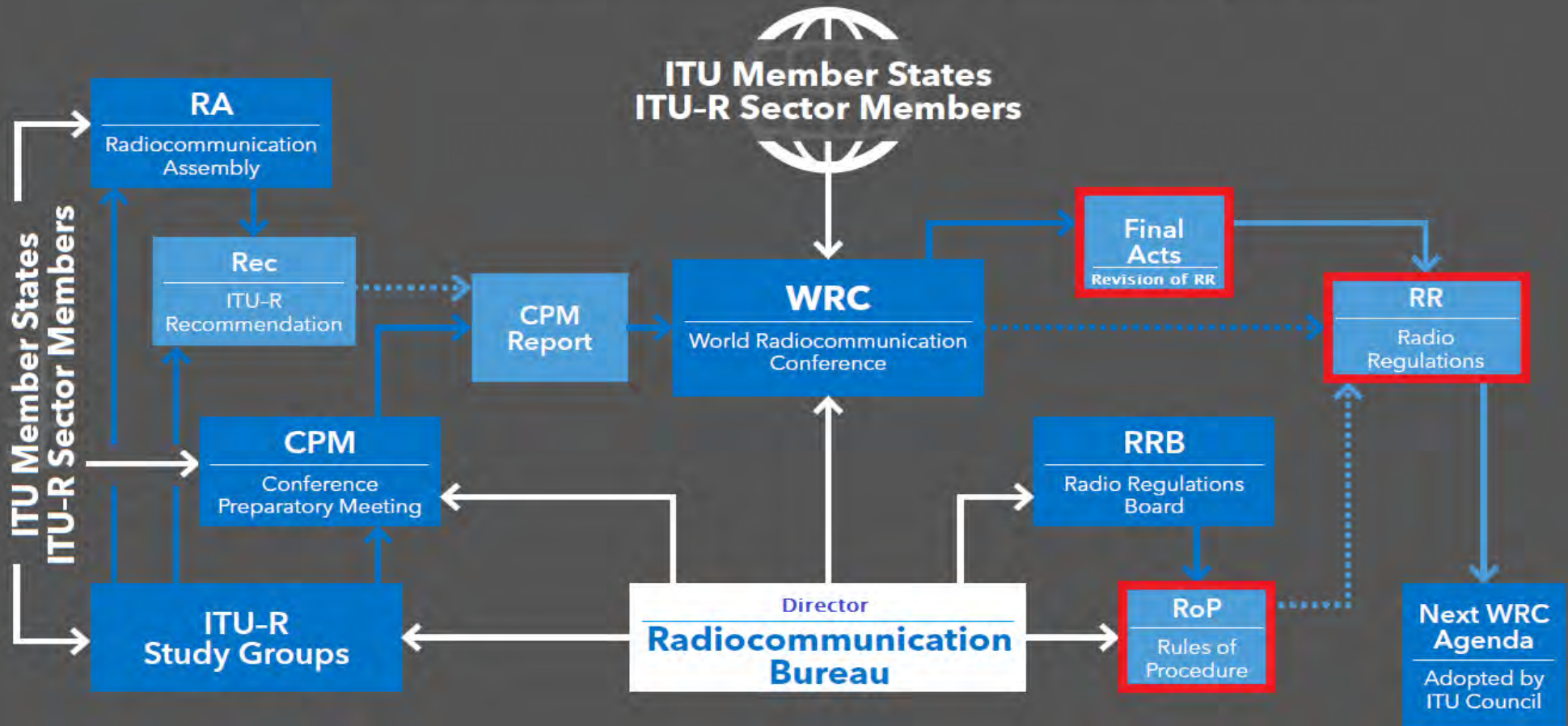
Art. 6



What if interference occurs during operation of the satellite? Article 15- Interference Infringement of the Constitution or Radio Regulations

- All stations are **forbidden** to carry out **unnecessary transmissions**, or the transmissions of **superfluous signals**, or the transmission of **false or misleading signals** or the transmission of **signals without identification**. (RR15.1)
 - The station which is causing harmful interference **shall immediately eliminate** this harmful interference
 - This assumes a legal link between the transmit station and the administration under the jurisdiction of which it is placed:
 - This is the purpose of the licence (Article 18 of the Radio Regulations)
-

The World Radiocommunication Conference process



ITU-R: ITU Radiocommunication Sector

Study Groups structure overview

- Study Group 1 (SG 1): Spectrum management
- Study Group 3 (SG 3): Radio wave propagation
- Study Group 4 (SG 4): Satellite services
- Study Group 5 (SG 5): Terrestrial services
- Study Group 6 (SG 6): Broadcasting service
- Study Group 7 (SG 7): Science services
- Coordination Committee for Vocabulary (CCV)
- Conference Preparatory Meeting (CPM)

The BR provides the Secretariat to every ITU-R SG, headed by each SG Counsellor <http://www.itu.int/en/ITU-R/study-groups>

GET INFORMATION: BR IFIC Publications (Main page)



BR IFIC 2834 International Frequency Information Circular (Space Services)

BR IFIC Publications	Special Sections	Parts I-S,
Databases	-- ALL --	-- ALL --
As received (Res.55)	AP30/E	PART I-S
Preface	AP30A/E	PART II-S
Cost Recovery	AP30B/A6A	PART III-S
BR Software	AP30B/A6B	
BR Circular Letters	API/A	
	API/B	
Print instructions		

BR IFIC PUBLICATIO



UNION INTERNATIONALE DES TÉLÉCOMMUNICATIONS
BUREAU DES RADIOCOMMUNICATIONS

INTERNATIONAL TELECOMMUNICATION UNION
RADIOCOMMUNICATION BUREAU

UNIÓN INTERNACIONAL DE TELECOMUNICACIONES
OFICINA DE RADIOCOMMUNICACIONES

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RÉSEAU À SATELLITE SATELLITE NETWORK RED DE SATÉLITE		ITS-AR-133.5E		SECTION SPÉCIALE N° SPECIAL SECTION No. SECCIÓN ESPECIAL N.º		CR/C/4474	
STATION TERRIENNE EARTH STATION ESTACIÓN TERRENA		---		BR IFIC / DATE BR IFIC / DATE BR IFIC / FECHA		2855 / 03.10.2017	
ADM. RESPONSABLE RESPONSIBLE ADM. ADM. RESPONSABLE		CHN		LONGITUDE NOMINALE NOMINAL LONGITUDE LONGITUD NOMINAL		133.5 E	
				NUMÉRO D'IDENTIFICATION IDENTIFICATION NUMBER NÚMERO DE IDENTIFICACIÓN		117520144	
RENSEIGNEMENTS REÇUS PAR LE BUREAU LE / INFORMATION RECEIVED BY THE BUREAU ON / INFORMACIÓN RECIBIDA POR LA OFICINA EL						23.03.2017	

Cette demande de coordination, reçue par le Bureau des radiocommunications en vertu du numéro 9.30 du Règlement des radiocommunications, a été examinée au titre des numéros 9.35 et 9.36 et est publiée conformément au numéro 9.38. Elle est subordonnée au type de coordination indiqué dans la colonne de gauche par un X dans la case pertinente.

This request for coordination, received by the Radiocommunication Bureau pursuant to No. 9.30 of the Radio Regulations, has been examined under Nos. 9.35 and 9.36 and is published in accordance with No. 9.38. It is subject to the form of coordination indicated in the left-hand column by an X in the relevant box

Esta solicitud de coordinación, recibida por la Oficina de Radiocomunicaciones de conformidad con el punto N° 9.30 del Reglamento de Radiocomunicaciones, se ha examinado de conformidad con los N° 9.35 y 9.36 y se publica de conformidad con el N° 9.38. Está sujeta al formulario de coordinación indicado en la columna de la izquierda con una X en la casilla correspondiente.

Type de coordination mentionné dans le Tableau I / Form of coordination referred to in Table I / Forma de coordinación mencionada en el cuadro I				
<input checked="" type="checkbox"/>	9.7	Conformément aux numéros 9.50 à 9.52 du Règlement des radiocommunications, les Administrations identifiées dans le Tableau I ci-après sont priées de communiquer leur décision à l'Administration responsable et au Bureau avant la date limite indiquée ci-dessous.	In accordance with Nos. 9.50-9.52 of the Radio Regulations, the Administrations identified in Table I below are requested to communicate their decision to the Responsible administration and the Bureau by the deadline indicated below.	De conformidad con los N° 9.50-9.52 del Reglamento de Radiocomunicaciones, se solicita a las administraciones señaladas en el cuadro I a continuación que comuniquen su decisión a la administración responsable y a la Oficina antes del plazo indicado más abajo.
	9.7A			
	9.7B			
<input checked="" type="checkbox"/>	AP30#7.1			
<input checked="" type="checkbox"/>	AP30A#7.1			
	RS539			
	RS33#3			
Type de coordination mentionné dans le Tableau II / Form of coordination referred to in Table II / Formulario de coordinación remitido al cuadro II				
<input checked="" type="checkbox"/>	9.11A	Les Administrations, énumérées ou non-énumérées dans le Tableau II ci-après, qui n'acceptent pas la demande de coordination au titre des numéros 9.11 à 9.14, 9.21 et RS33#2.1, sont priées de communiquer leurs observations à l'Administration responsable et au Bureau avant la date limite indiquée ci-dessous. Toute Administration qui ne réagira pas au titre du numéro 9.52 avant cette date limite sera considérée comme n'étant pas défavorablement influencée et, dans les cas couverts par les numéros 9.11 à 9.14 et RS33#2.1, les dispositions des numéros 9.48 et 9.49 s'appliqueront.	Administrations listed or not listed in Table II below, which do not agree to the request for coordination under Nos. 9.11 to 9.14, 9.21 and RS33#2.1 are requested to communicate their comments to the responsible administration and the Bureau by the deadline indicated below. Any administration not responding under No. 9.52 within this deadline shall be regarded as unaffected and, in the cases of Nos. 9.11 to 9.14 and RS33#2.1, the provisions of Nos. 9.48 and 9.49 shall apply.	Se invita a las administraciones, enumeradas o no en el cuadro II, que no estén de acuerdo con la solicitud de coordinación de conformidad con los N° 9.11 a 9.14, 9.21 y RS33#2.1 que comuniquen sus observaciones a la administración responsable y a la Oficina dentro del plazo indicado más abajo. Se considerará que toda administración que no responda de conformidad con el N° 9.52 dentro del plazo señalado, no está afectada y, en el caso de los N° 9.11 a 9.14 y RS33#2.1, se aplicarán las disposiciones de los N° 9.48 y 9.49
	9.12			
	9.12A			
<input checked="" type="checkbox"/>	9.13			
<input checked="" type="checkbox"/>	9.14			
<input checked="" type="checkbox"/>	9.21/A			
	9.21/B			
	9.21/C			
	RS33#2.1			

DATE LIMITE POUR LA DÉCISION / EXPIRY DATE FOR DECISION / FECHA LÍMITE PARA LA DECISIÓN

03.02.2018

III. Administrations susceptibles d'être défavorablement influencées au niveau du groupe (à titre d'information uniquement, voir N° 9.36.1)

三、在组的层面潜在的受干扰的主管部门(仅供参考, 见第9.36.1款)

III. Potentially affected administrations at group level (for information only, see No. 9.36.1)

III. Потенциально затрагиваемые администрации на уровне группы (исключительно для информации, см. п. 9.36.1)

III. Administraciones posiblemente afectadas a nivel de grupo (sólo para información, véase el N.º 9.36.1)

III. الإدارات التي يتحمل أن تتأثر متأثراً غير مؤات على مستوى المجموعة (انظر الرقم 1.36.9 للعلم فقط)

B1a Beam designation	B2 Emi-Rcp	BR7a Group id.	GHz	Administrations susceptibles d'être défavorablement influencées au titre du N° 9.13 潜在的受干扰的主管部门 9.13	Potentially affected administrations under No. 9.13 Администрации, потенциально затрагиваемые согласно № 9.13	Administraciones posiblemente afectadas según N.º 9.13 الإدارات التي يتحمل أن تتأثر بموجب الرقم 9.13
C1U	R	117687838	6	F IND		
		117687839	6	F IND		
		117687840	6	F IND		
		117687841	6	F IND		
KA1U	R	117673881	28	CAN CYP D F G	HOL LIE LUX NOR NZL RUS/IK RUS USA	
		117673884	28	CAN CYP D F G	HOL LIE LUX NOR NZL RUS/IK RUS USA	
		117673887	28	CAN CYP D F G	HOL LIE LUX NOR NZL RUS/IK RUS USA	
		117673890	28	CAN CYP D F G	HOL LIE LUX NOR NZL RUS/IK RUS USA	
S1U	R	117673832	1	AUS F G PNG SLM		
		117673833	1	AUS F G PNG SLM		
TKA1U	R	117673893	28	CAN CYP D F G	HOL LIE LUX NOR NZL RUS/IK RUS USA	
KA1D	E	117673855	18	CAN CYP D F G	HOL LIE LUX NOR RUS/IK RUS USA	
		117673859	18	CAN CYP D F G	HOL LIE LUX NOR RUS/IK RUS USA	
		117673863	18	CAN CYP D F G	HOL LIE LUX NOR RUS/IK RUS USA	
		117673867	18	CAN CYP D F G	HOL LIE LUX NOR RUS/IK RUS USA	
S1D	E	117673836	2	AUS F G NOR PNG SLM		
		117673837	2	AUS F G NOR PNG SLM		
TKA1D	E	117673878	18	CAN CYP D F G	HOL LIE LUX NOR RUS/IK RUS USA	

B1a Beam designation	B2 Emi-Rcp	BR7a Group id.	GHz	Administrations susceptibles d'être défavorablement influencées au titre du N° 9.14 潜在的受干扰的主管部门 9.14	Potentially affected administrations under No. 9.14 Администрации, потенциально затрагиваемые согласно № 9.14	Administraciones posiblemente afectadas según N.º 9.14 الإدارات التي يتحمل أن تتأثر بموجب الرقم 14.9
S1D	E	117673836	2	AFG ARS AUS/CHR AUS/HMD AUS/ICO AUS/NFK AUS BGD BRM BRU BTN CBG CLN F/AMS F/KER F/NCL F/OCE F/REU F/WAL FUI PSM G/DGA IND INS IRN J KAZ KGZ KIR/PHX KIR KOR KRE LAO MAU/ROD MAU MHL MLA MLD MNG NPL NRU NZL/CKH NZL/NIU NZL/TKL NZL OMA PAK PHL PLW PNG RUS SEY SLM SMO SNG THA TJK TKM TLS TON TUV UAE USA/ALS USA/GUM USA/HWA USA/HWL USA/JAR USA/JON USA/MDW USA/MRA USA/PLM USA/SMA USA/WAK UZB VTN VUT XZZ/XSP YEM		
				117673837	2	AFG ARS AUS/CHR AUS/HMD AUS/ICO AUS/NFK AUS BGD BRM BRU BTN CBG CLN

CR/C/4474

Future broadband

Wireless access system(5 GHz), pico-femto- cells (24.25-86 GHz) IMT, HAPS, global NGSO FSS (>30 GHz) , identification in 275-450 GHz for land-mobile and fixed services

ESIM

Communicating with GSO FSS in 17.7- 19.7 & 27.5-29.5 GHz

Safety of life

development of Global Aeronautical and Maritime distress and safety systems (GADSS and GDMSS)



Intelligent Transport System and unmanned transport M2M for maritime, railway, road transport

Earth resources & Climate monitoring, Weather forecast,

Stations on board sub-orbital vehicles

Broadband applications in the MS (WRC-19 agenda items 1.13 and 1.16)

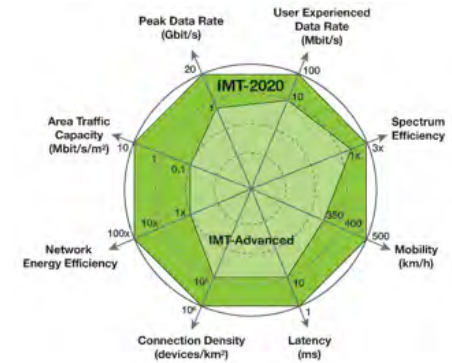
The following bands, which are already allocated to mobile, will be studied with a view to an IMT-2020 identification:

- 24.25 – 27.5 GHz
- 37 – 40.5 GHz
- 42.5 – 43.5 GHz
- 45.5 – 47 GHz
- 47.2 – 50.2 GHz
- 50.4 – 52.6 GHz
- 66 – 76 GHz
- 81 – 86 GHz

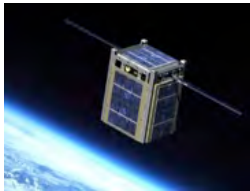
... and also

The following bands will also be studied, although they do not currently have global mobile allocations:

- 31.8 – 33.4 GHz
- 40.5 – 42.5 GHz
- 47 - 47.2 GHz



Studies for considering appropriate regulatory actions for HAPS, within existing FS alloc. at 47.2-47.5, 47.9-48.2 & 31.0-31.3**/27.9-28.2** GHz (**outside Reg. 2, +5 ADMs @6.5/6.5 MHz) or study new bands: 38-39.5 GHz & 21.4-22 & 24.25-27.5 GHz



Study spectrum needs for **TT&C in the SOS for non-GSO satellites** with short duration missions & consider, if necessary, new SOS allocations

... and also



Studies on development of a regulatory framework for non-GSO FSS systems that may operate in the bands 37.5-39.5 GHz (s-E), 39.5-42.5 GHz (s-E), 47.2-50.2 GHz (E-s) and 50.4-51.4 GHz (E-s)



Bringing into use of frequency assignments for NGSO systems subject to coordination

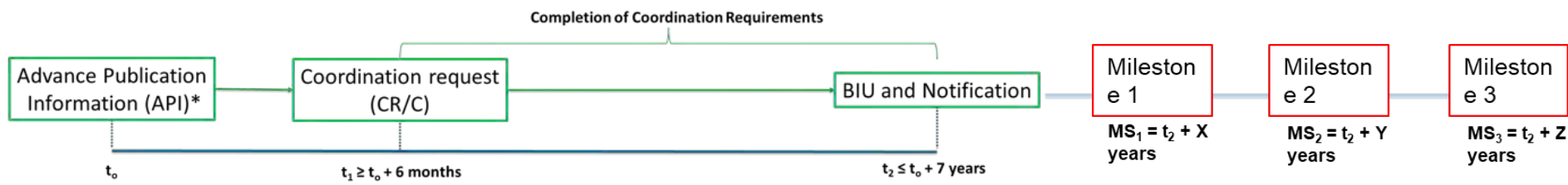
Agenda Item 7 Issue A



Completion of Coordination Requirements



* API is automatically generated with CR/C for Ku and Ka FSS bands as of July 2016



FREE ONLINE ACCESS

- The ITU Constitution
<http://www.itu.int/pub/S-CONF-PLEN>
 - World Radiocommunication Conference (WRC)
<https://www.itu.int/en/ITU-R/conferences/wrc/Pages/default.aspx>
 - ITU-Radio Regulations
<https://www.itu.int/en/history/Pages/RegulationsCollection.aspx>
<https://www.itu.int/en/history/Pages/RadioRegulationsA.aspx?reg=1.43>
 - ITU-R Recommendations
<http://www.itu.int/publ/R-REC/en>
 - Preface to the BR International Frequency Information Circular (Space services)
<https://www.itu.int/ITU-R/go/space-preface/en>
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