

ITUWebinars

Space Connect

Authorization and Supervision of Large Constellations

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“Satellites” are no longer all the same: a LEO constellation is as fast as fiber



As reference: 100 km = the “Karman” line where ‘air space’ becomes ‘outer space’
254 km = altitude of Int’l Space Station

What is a “Constellation”?

Low Earth Orbit

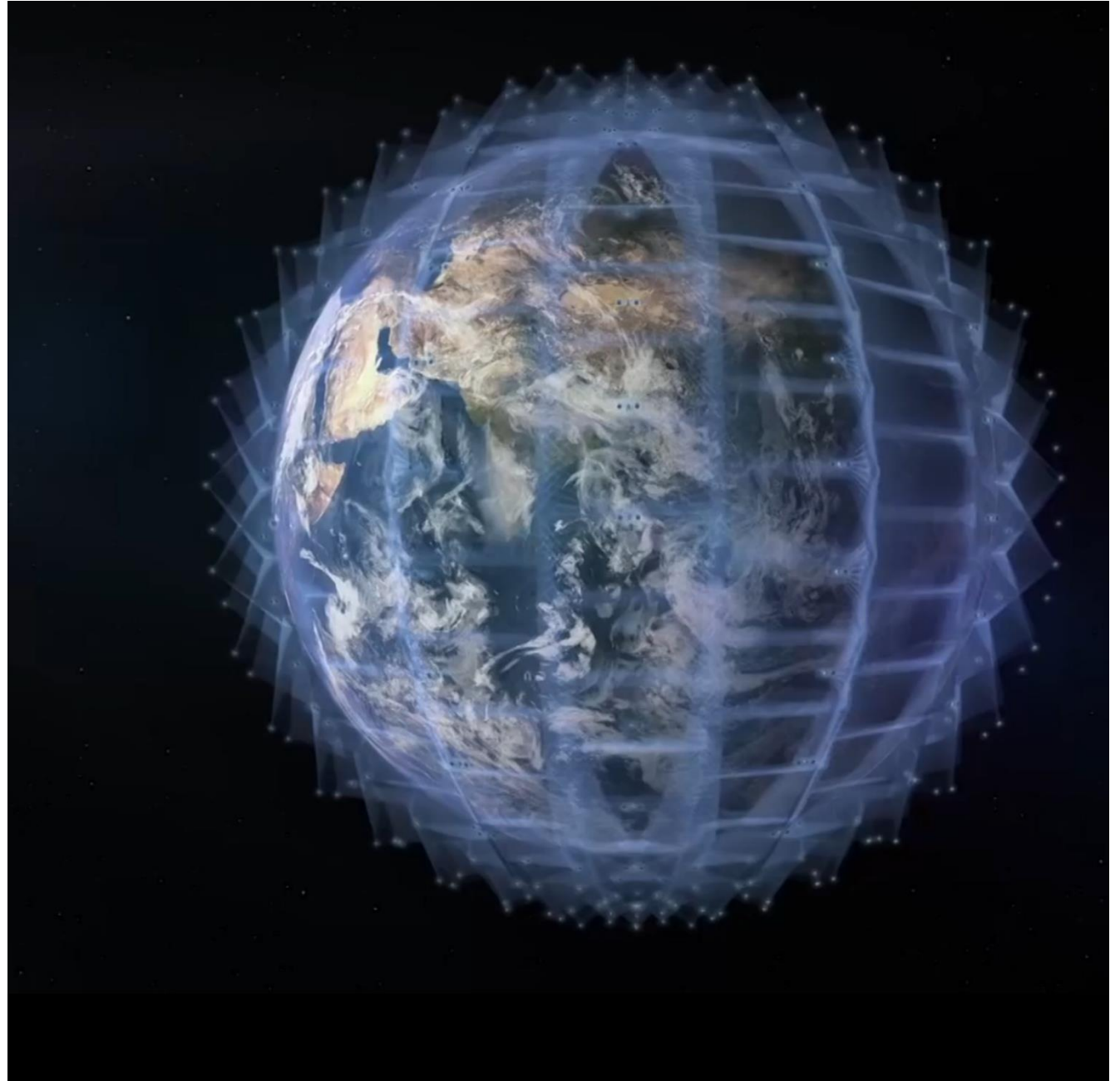
polar planes

Low latency (no delay)

High throughput
(broadband)

Inherently global coverage

Quick manufacture



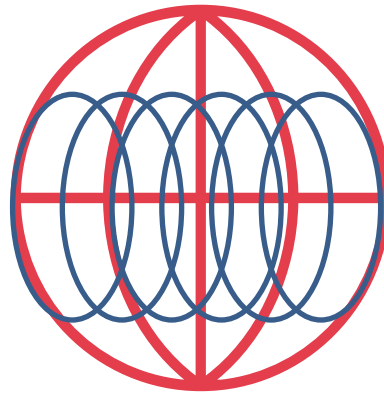
Why so many new LEOs?

- Many architectures possible; mostly untested so far

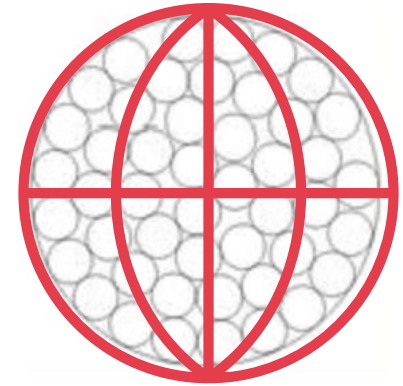
**GEO: 1 satellite
covers 1/3 of the
world**



**MEO: 8 satellites
can cover 2/3 of
the world**



**LEO: hundreds of
satellites cover
100% of world**



New Satellite Technologies disrupt old markets:

- National prestige & basic science no longer the sole drivers
- New space players (“Space 4.0”) hope to make money

Supply is cheaper:

Mass satellite
production

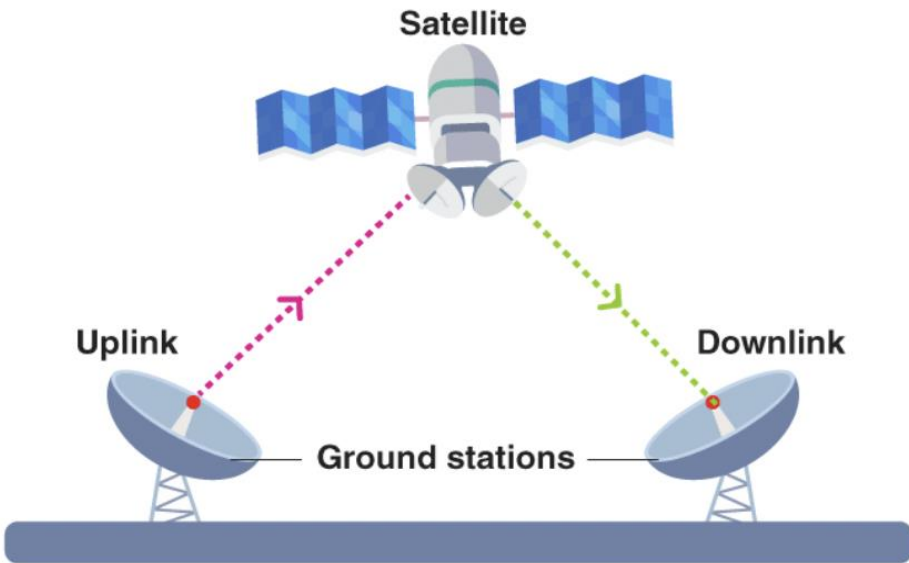
Launch costs
reduction

Demand has increased:

New uses
(2-way, real-time
internet & mobility)

“Licenses” are a way for Regulators to fulfil their Treaty obligation for “continuing supervision” (Art. VI, OST)

WHAT IS REGULATED – SATELLITES



But Also:

Overseas Market Access - services and ground infrastructure (sometimes foreign ownership limits)

Export Controls on trade in satellites and technical data

Content Controls for Imagery and Internet and Media

Ground Equipment Testing & Standards Certification

International Spacecraft Registration by UN

Space station: Satellite orbital location and on-orbit safety operations

Services: Video, Voice, Data communications, Earth Imagery data

Radio Frequencies:

- Tracking, Telemetry & Control - to “fly” satellite
- Uplink & Downlink – for communications services & data streams
- Orbit-raising - operations after launch

Ground equipment: TT&C, gateway earth stations, customer equipment (satellite dishes, satphones, custom antennas for aircraft/ships/ vehicles, tracking transmitters)

For a global constellation, that means over 200 licenses

- Any **infrastructure on the ground** (“earth stations” – terminals) or “points of presence” (PoPs – connecting to wires/fiber/cables that connect to a nation’s telephones, TV, or internet)
 - recognizing terminals licensed by other countries is important
 - “blanket” or class licensing is important
- **Spectrum** in their territory (including territorial waters and air space)
- A “**service**” – telephony, data, video?
 - Private (closed) or Public (common carrier)?
 - Domestic or international (cross-border)?
 - Is there an incumbent? Has the national invested?



Liability & Insurance

The State passes on some of its unlimited liability to the operator

Launch phase - indemnify State for EUR 60 Million per object; operators required to carry insurance – often millions

In-orbit operations - GEOs need insurance; LEOs do not

Collisions & Debris - must carry insurance for Third Party injuries

De-orbit - not yet required by all states, but likely will be (insurance can cover this too)

Every country does it differently:

- in the UK, both the satellite and the vehicle need launch licenses (CAA)
- in the USA, only the *vehicle* gets a launch license (FAA), while the satellite's choice of vehicle is assessed during licensing by the FCC (new "Space Bureau")

EU has "open skies" for the satellite to provide service and use spectrum in any country, but many other countries do not –

- "Landing rights" for a satellite to "land" its signal and be accessed by users

Might need permission to STOP operating!






- in the US, the FCC requires advance warning (if possible) when stop offering consumers a service

Might need authority to de-orbit, or at least have a de-orbiting plan approved by a regulator:

- avoid debris or the venting of pollutants
- avoid collisions

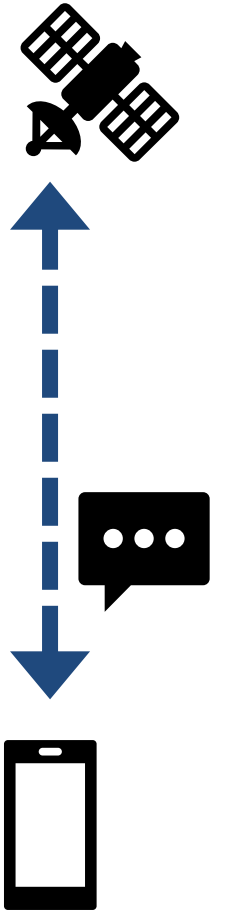


Current Large Constellations:

	 OneWeb	 SES [^] O3b mPOWER	 SPACE X STARLINK	 TELESAT LIGHTSPEED	 amazon project kuiper	China SatNet “Guowang”	China G60 Qianfan “Thousand Sails”
Constellation Size	634 (Gen1) (636 launched)	13 (8 launched)	12,000 (Gen1) (6994 launched; 6957 op'l)	198 (planned)	3,236 (planned) (2 demo's launched)	6080 Gen1 13,000 Gen2 (10 launched Jan 2025)	14,000 (72 launched as of Jan '25)
Frequency Bands	Ka gateways Ku users	Ka	Ka gateways Ku users L band MSS requested	Ka	Ka	Ka (maybe also V, Q)	Ku, Q, V
Orbit	1,200 km	8,062 km MEO	550 km	1000 km	600 km	590-600 km 1145 km	800-1060 km
Notes	Wholesale, B2B	Backhaul, trunking, cruise, aero NOTE: 20 Gen1 O3b also still in orbit	Residential	Possibly Canadian government		China “SatNet” Satellite Network Group; Belt & Road diplomacy; 2035 “modern China” goal	SSST: Shanghai Spacecom Satellite Technology, “SpaceSail” NOTE: China has also launched 8 MEOs: “Smart Skynet” 20,000 km, with inter-satellite links and multiple bands

HOT TOPIC: Direct link from satellites to ordinary mobile phones (not to a “satellite phone”) – “D2D”

- The mobile device can be built with satellite frequencies (D2D via MSS)
 - or -
- The satellite can be built to use mobile phone frequencies (D2D via IMT)
- Agenda Item 1.13 for WRC-27
- Note:
 - Blurring of spectrum allocations – the future?
 - If not yet authorized, can the signal be “geo-fenced”?
 - Text-only for now: voice and video are under development



Best Practices

Licensing is a process: don't have inflexible regulations with tick-box applications; think of a request for authorization as an opportunity for education on both sides; ask questions about the tech and think through the whole life of the project: financing, manufacture, launch, end-of-life (de-orbit? Graveyard? Retrieval possible?)

Consider milestones and rewards for good behaviour rather than penalties for bad behaviour; consider rebates on fees, or diminished fees/taxes if milestones are met

Have regular open meetings, where anyone can turn up

Have good websites! Access to all rules; databases of licensees

Assess applications for sustainability before licensing:

- IADC guidelines are a start
- avoid collisions
- avoid debris
- have a plan for end-of-life



A photograph of a snowy mountain landscape at night. A row of approximately 15 illuminated geodesic domes is visible on a snow-covered slope. The domes are lit from within, casting a warm yellow glow. The background shows dark, snow-covered mountains under a dark sky. The foreground is a snowy slope with some tracks or paths. The overall scene is serene and cold.

The end

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