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Merger of Euroconsult Group and SpaceTec Partners

India Space Congress

Mega-Constellations: Opportunities and Challenges

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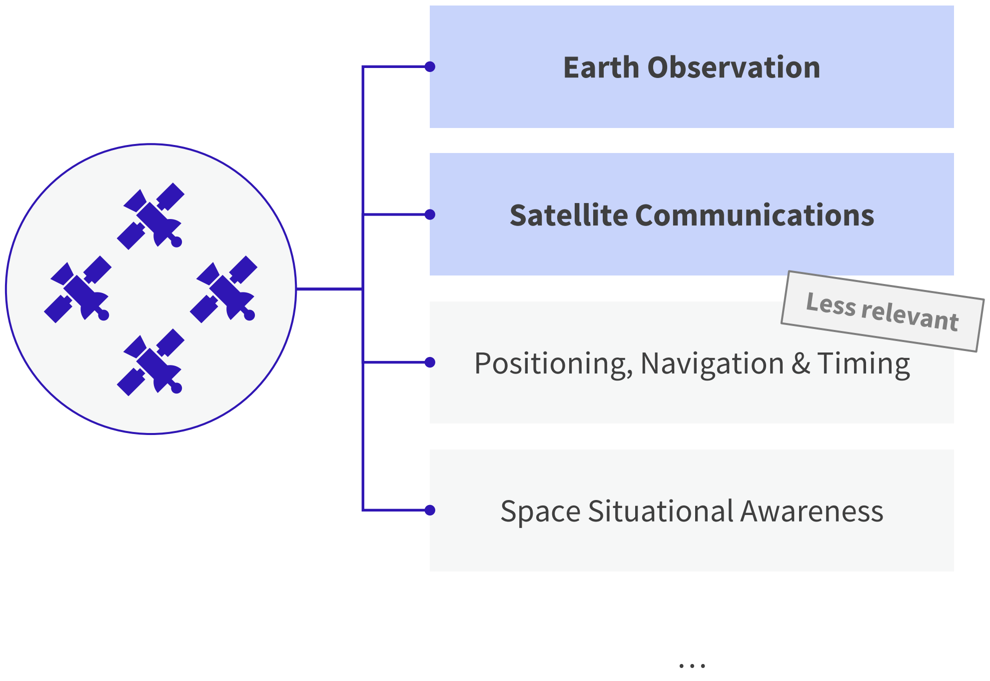
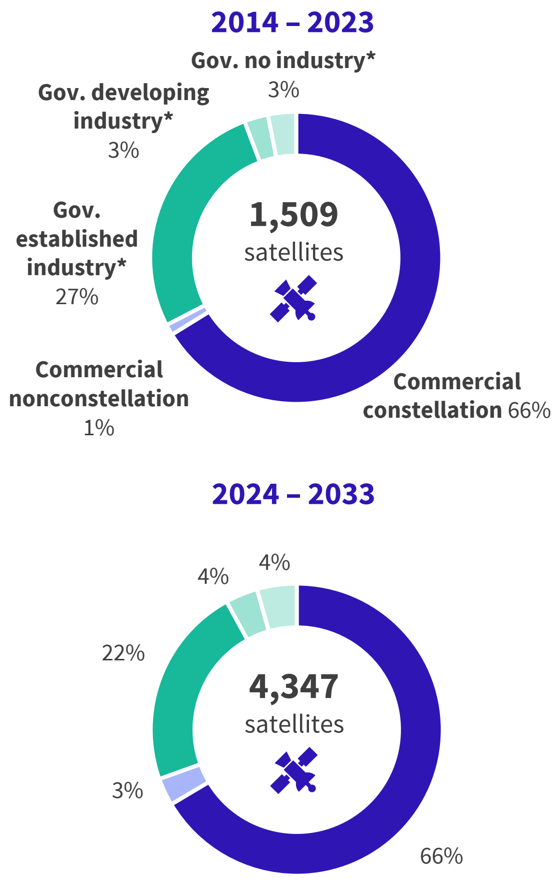
Constellations are typical for the larger satellite markets of EO & satcom – however, EO is not expected to see “megaconstellations” in the near future

Relevant markets for constellations

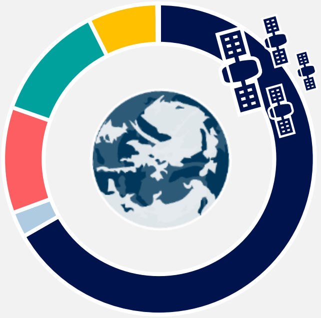
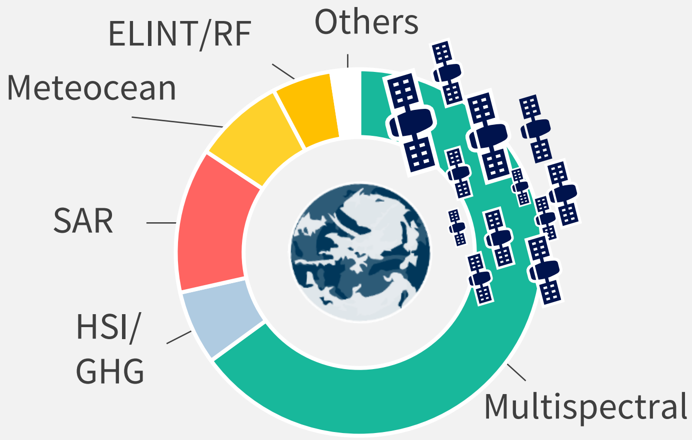


Number of EO satellite launches



*Established, developing and no-industry categories are part of the government typology, Source: Novaspace EO Satellite Systems report, 17th edition

Payload diversification is next priority for Earth Observation

2012	2022	2032
		
~50 sats	**~600** sats	**~1,600** sats
Incumbent operators	**Constellations era**	**Payload diversification**
MAXAR, AIRBUS, MDA, iSi, e-geos (AN ASI / TELESPAZIO COMPANY)	spire, ICEYE, SATELLOGIC, CG SATELLITE, planet., BLACKSKY, Capella Space	OSK, GHGSAT, unseenlabs (THE BRIGHT SIGHT), Synspective, tomorrow.io, SatVu, HawkEye 360, umbra, WYVERN, EOI Space, 航天宏图 PIESAT, ORORA TECHNOLOGIES, HYPERSAT, constellr, SATLANTIS

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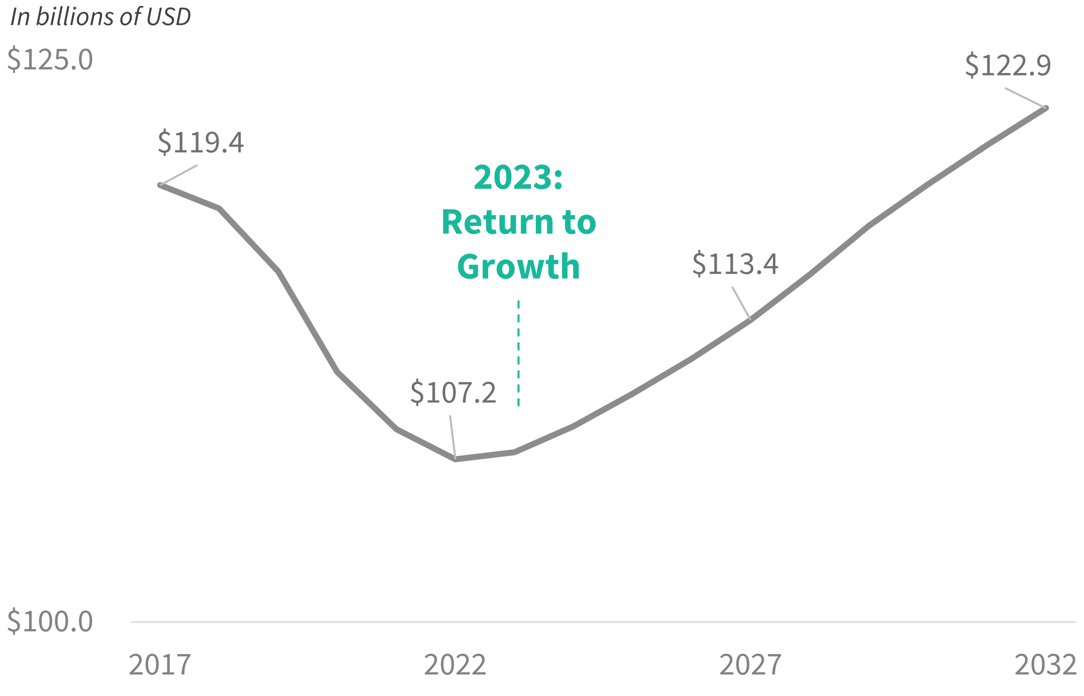
For satcom, market growth will be relevant for satcom megaconstellations



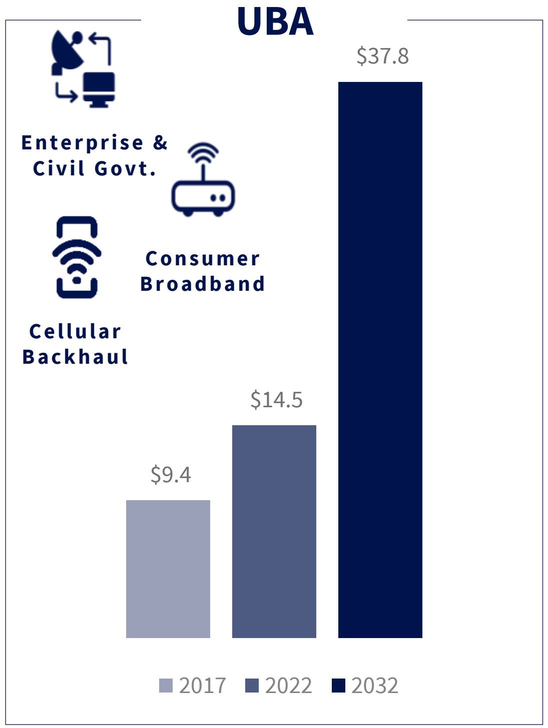
Revenue **declining** factors:
- Surge in OTT
- Change in viewing habits
- COVID-19 impact on mobility

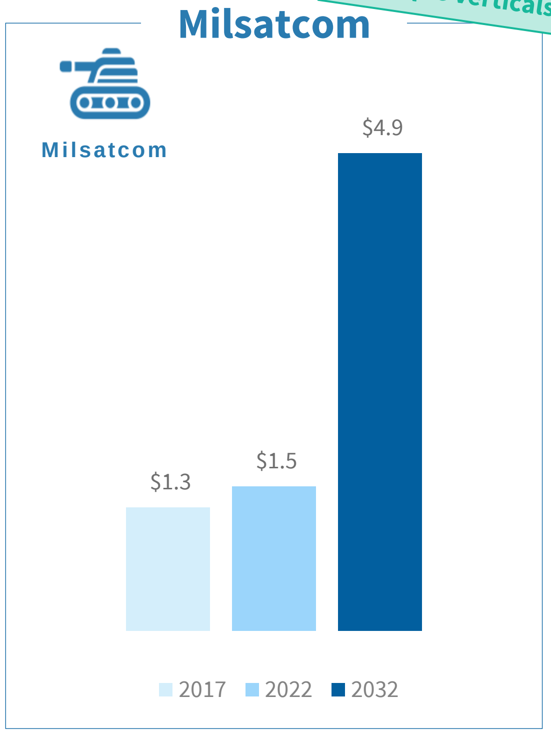
Revenue **growth** drivers:
- Connecting the unconnected
- Increased govt. spending
- Mobility: more connected terminals & new largely untapped land segment

Key takeaways

- While video markets have resulted in overall decline of satcom markets, return to growth is occurring from 2023, generating $122.9B USD by 2032
- Satcom megaconstellations will drive availability & demand

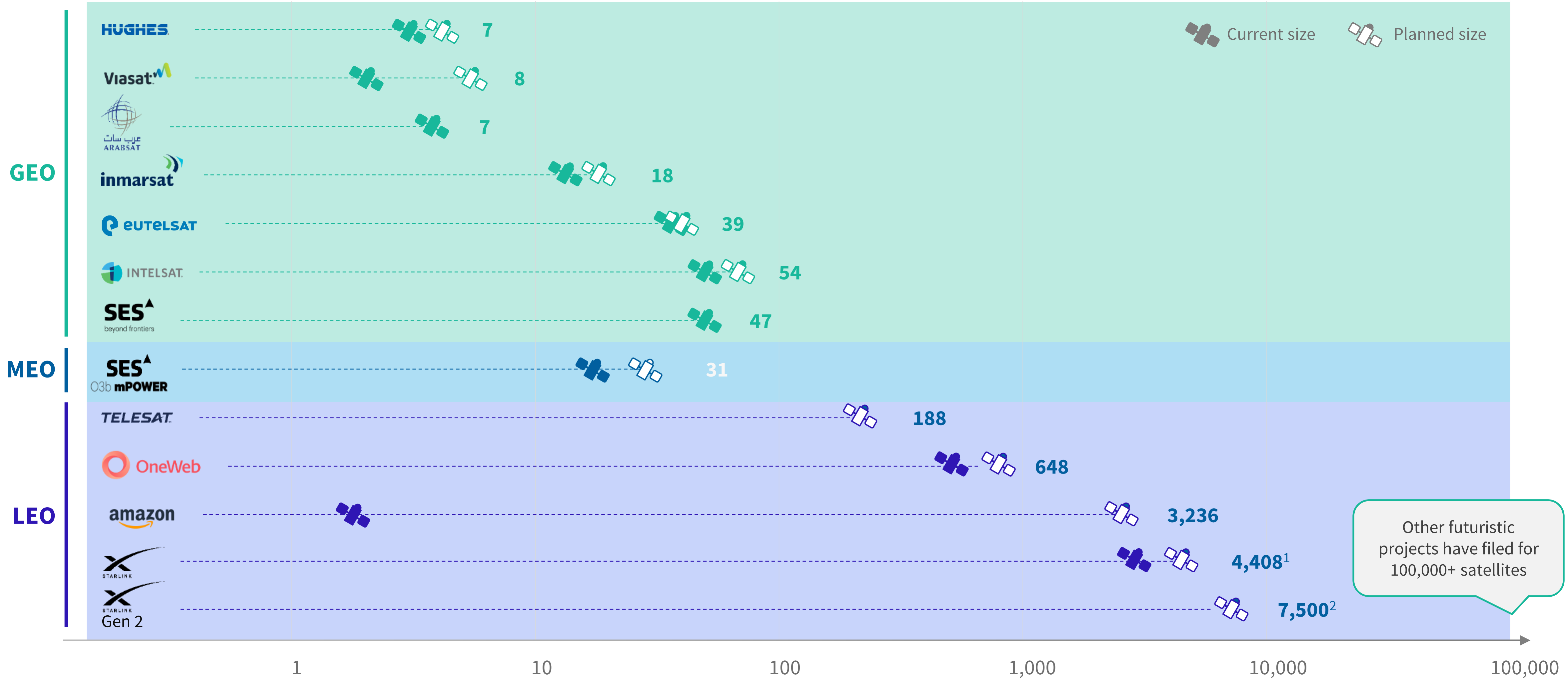
Example verticals





OTT – over-the-top media services; UBA – Universal Broadband Access

Larger satcom (mega-) constellations are emerging particularly in LEO



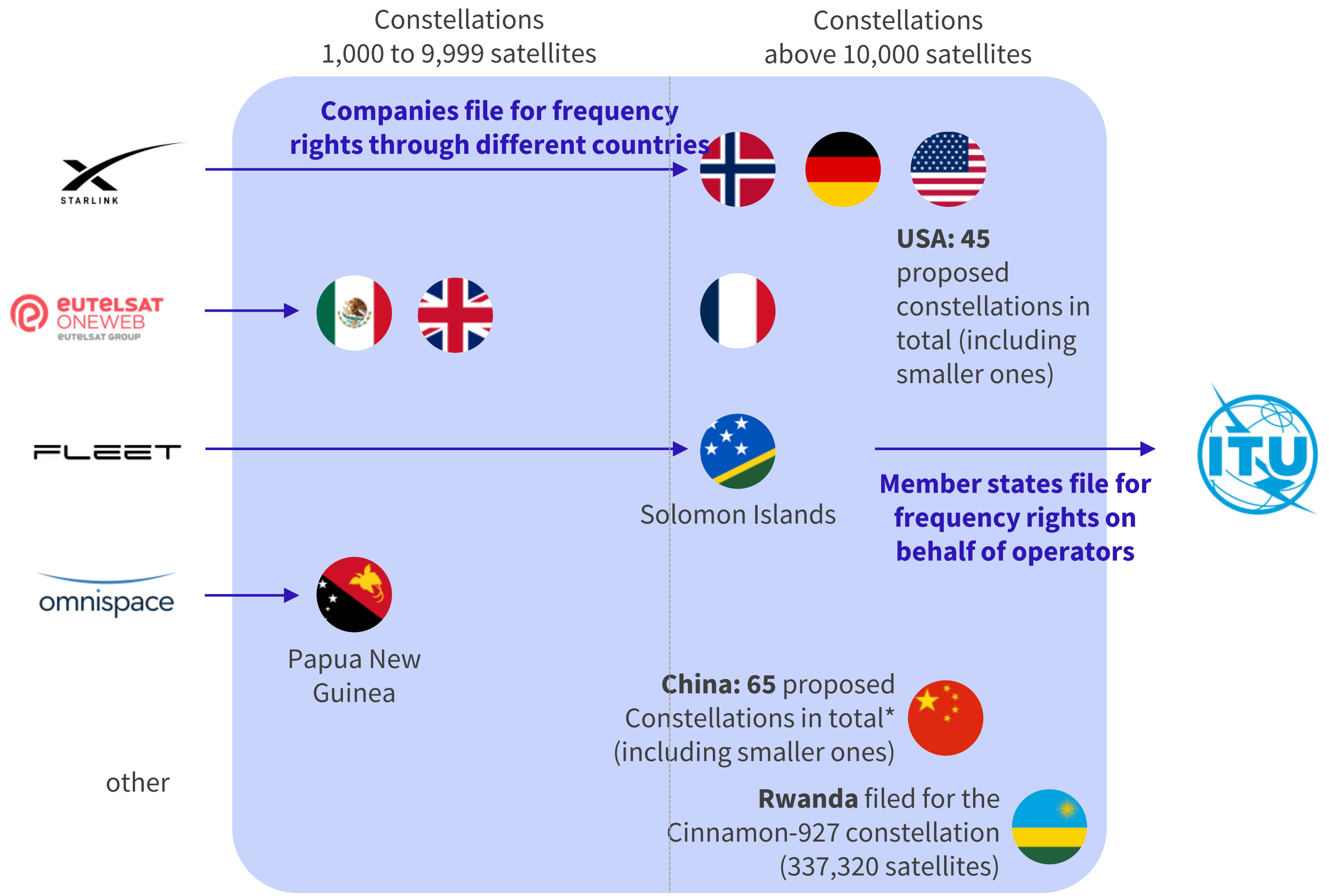
Notes: 1. Estimated constellation size for Gen 1 (while official numbers claim 12,000 LEO satellites in phase 1); 2. Hybrid constellation of Gen 1 and Gen 2 satellites expected, with gradual increase of Gen 2 and incremental decommissioning of Gen 1. Originally requested approval for 30k Gen 2 satellites; Source: Company websites, Novaspace Analysis

Leading NGSO-HTS satcom constellations differ strongly in their approach & relevant capabilities

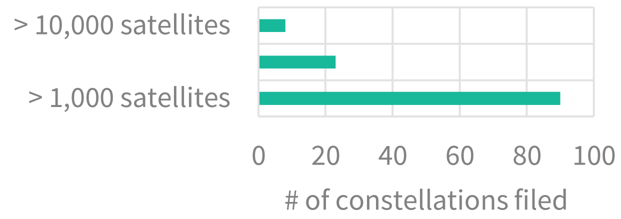
	TELESAT	SES O3b mPOWER	STARLINK (Leading (mega-) constellations)	EUTELSAT ONEWEB (Leading (mega-) constellations)	amazon
Planned Constellation Size	**198 satellites** (0% launched)	**11 satellites** (36% launched)	**4,408 Gen1 satellites** (>91% launched) **7,500 Gen2 satellites** *(9% launched)*	**648 Gen1 satellites** (100% launched) **360 Gen2 satellites** *(0 launched)*	**3,236 satellites** (0% launched)
Total Capacity	~10 Tbps (50 Gbps per sat.)	~2.7 Tbps (200-315 Gbps/sat.)	Gen1: ~88 Tbps Gen2: ~750 Tbps	Gen1: ~5 Tbps Gen2: ~22 Tbps	~164 Tbps (50 Gbps/sat.)
Usable Capacity (est.)	~5 Tbps	~1.9 Tbps	Gen1: ~22 Tbps Gen2: ~187 Tbps	Gen1: ~1.2 Tbps Gen2: ~5.4 Tbps	~40 Tbps
Frequency (user)	Ka-band	Ka-band	Ku-band	Ku-band	Ka-band
Orbit	LEO (1,000-1,350 km)	MEO (8,062 km)	LEO (550 km)	LEO (~1,200 km)	LEO (~600 km)
Satellite Mass	~750 kg	~1,700 kg	~290 kg	~150 kg	~650 kg
Satellite Life	~11 years	>10 years	~5 years	~5 years	5 to 7 years
Latency	< 50 ms	~150 ms	< 50 ms	< 50 ms	< 50 ms
Payload flexibility	Beam-hopping, optical ISLs, OBP	Dynamic beam-forming, steering, sizing	Steerable beams, ISLs (as of Q3 2021)	None	Beams: flexible shape, steering, capacity
Funding	Fully funded (internal and external)	Fully funded (internal)	$10.1b raised since 2015	$3.4b pre-bankruptcy, $2.7b post-	Likely internal (from cashflows)
Service start	Late 2027	Q4 2023	2021 (partial) Q4 2022 (global)	2022 (polar) Q4 2023 (global)	Likely >2026

Status as of Q3 2023

Filings show >1 Mn satellites planned – but how many constellations will actually come to fruition?



January 2017 – December 2022:
3000 constellations with more than 1 million satellites filed
(115x more than currently operationally deployed)



High possibility of overfiling:
Operators are **reserving frequency bands for satellites that might never be launched** (first come – first serve principle)

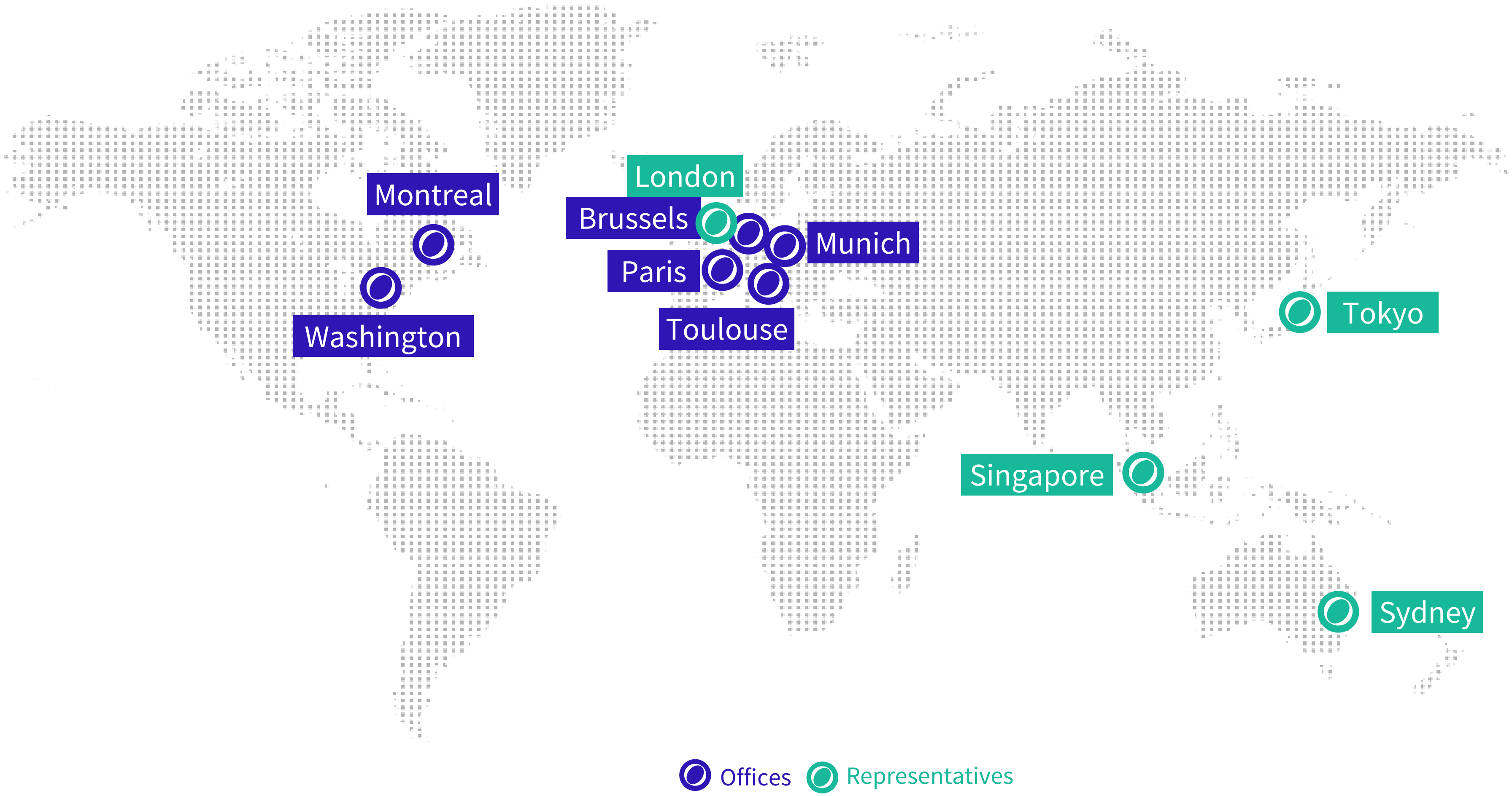
Status: 2023

Global Reach: Serving 1,200 Clients across 60 Countries

Our Clients

- Governmental & international organizations
- Financial institutions & insurance
- Service providers and end users
- Satellite operators
- Launch service providers
- Satellite & equipment manufacturers

Our Geographic Footprint



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