

# NGSO Constellations in Context

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# GSOA Members



amazon | project kuiper



ARSAT



28 operators | Global and Regional | CEO-driven

# GSOA VISION: Satellite In The Networks Of Tomorrow

GEO

MEO

LEO



MULTIPLE SATELLITES

MULTIPLE CONSTELLATIONS

MULTIPLE ORBITS



NGSO (non-geostationary orbits)

MULTIPLE BEAMS

MULTIPLE FREQUENCY BANDS

MULTIPLE ACCESS TECHNOLOGIES



SINGLE BEAM

INTEGRATED WITH TERRESTRIAL NETWORKS

# Evolution in Satellite Systems – Innovating across Orbits



Broadcast / multicast (incl. IP) / IP data communications / Fixed / mobile platforms

**> Gbps (per sat)**

Geostationary  
Wide-Beam  
Satellites



IP data communications / Fixed / mobile platforms

**Gbps - Tbps (per sat)**

Geostationary High-Throughput Satellites  
(HTS + VHTS)



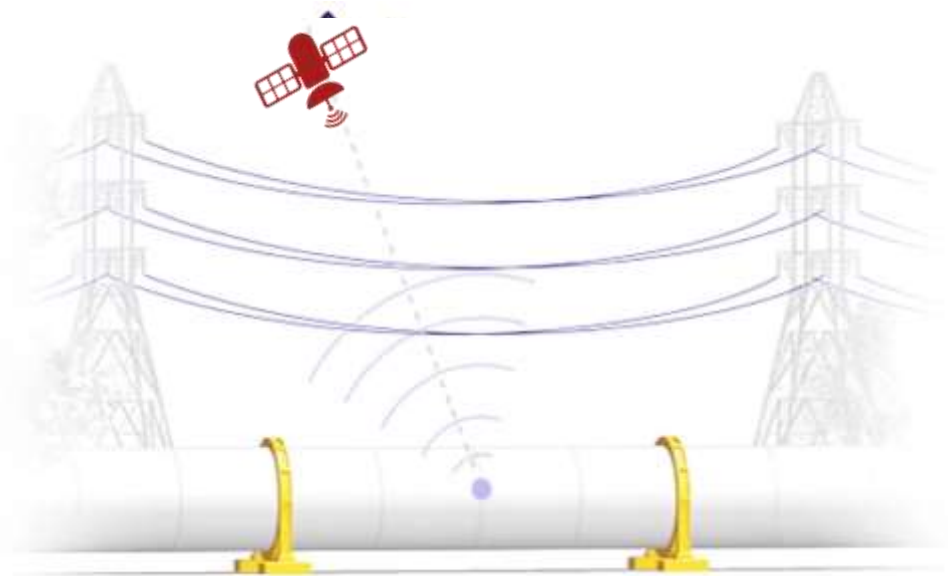
IP data communications / Fixed / mobile platforms

**Tbps across a system**

Non-geostationary HTS  
Constellations & hybrid  
systems across orbits

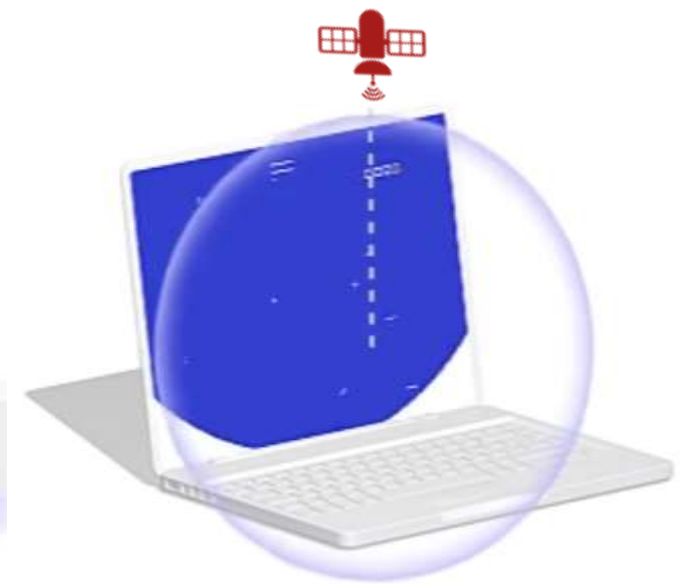
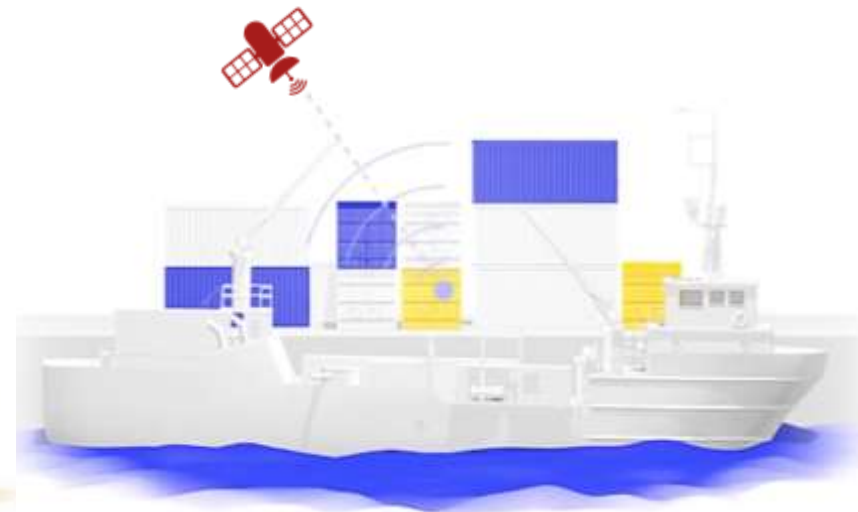
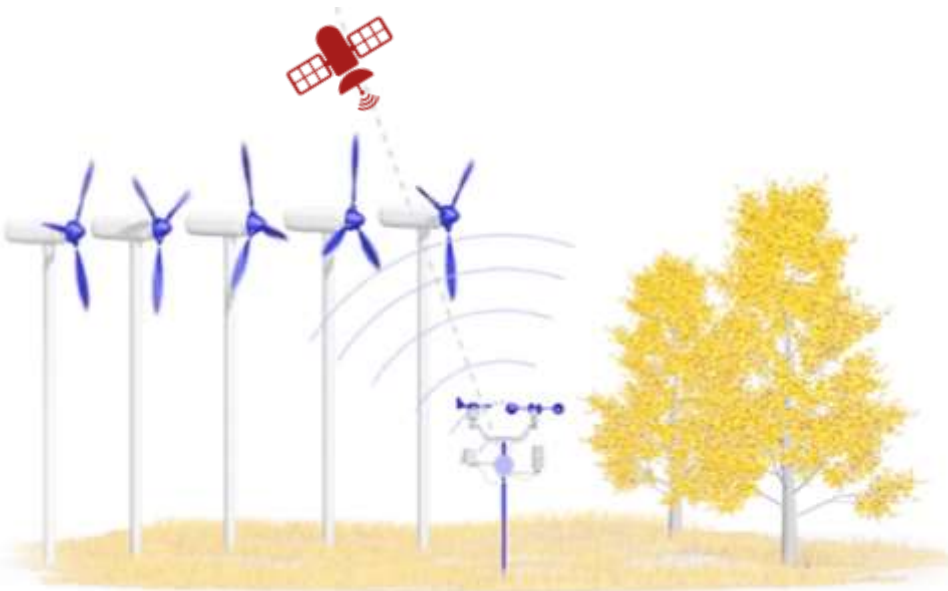
**A broad range of satellite capabilities to support connectivity requirements**

# NGSO Satellite Evolution



**To Date: Earth Observation - NB-IoT Applications**

**Future: + Broadband**



Source: Kepler

# Changing Economics of Satellite Industry

## Demand

Increasing need for universal broadband connectivity

- ⇒ Digitisation & demand for access to data is exploding
- ⇒ Pandemic & “Building back Better with Broadband” to achieve SDGs
- ⇒ Connectivity on the move (aero, maritime)

**Rapidly evolving government policies & investment landscape for connectivity**

## Supply

Technology advancement is driving down costs:

- ⇒ Lower production costs & different designs mean that more can be done with a smaller form factor
- ⇒ Lower cost to launch & increasing choice of launchers

**Lower barriers to entry - more systems being launched**



# A Complex, Evolving Environment

## Many ITU filings for NGSO systems

- ⇒ They cover a wide variety of constellations (MEO, LEO, multiple planes, different numbers of satellites, etc.)
- ⇒ A filing could list tens of thousands of satellites
- ⇒ However, unclear whether business plans are likely to need that many
- ⇒ Future generations may become more efficient & may require fewer satellites

## Reminder! NGSO is a Complex Business

- ⇒ Funding & business plan for complex technical infrastructure
- ⇒ International global ground network & market access requirements

# SPACE SUSTAINABILITY

## The Time to Act is Now



## GSOA Paper (Sept 2021)

GSOA members are committed to space sustainability & ongoing dialogue with the astronomy community

Read our Paper here:

[https://gsoasatellite.com/reports\\_and\\_studies/space-sustainability-the-time-to-act-is-now/](https://gsoasatellite.com/reports_and_studies/space-sustainability-the-time-to-act-is-now/)

The use of technology to drive solutions to social and environmental challenges has expanded beyond the Earth itself. The importance of these solutions is such that social and economic functioning and stability fundamentally rely on a host of space-based services for which there is often no alternative.