

Infocomm Media Development Authority (IMDA) Singapore

ATx Summit 2025

"Navigating the Future of Space: New Opportunities, Regulatory Models and Global Cooperation" Roundtable

Singapore, 27 May 2025

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Introduction

- Space is critical for our societies and economies and a key enabler for security.
- The Space sector is witnessing remarkable growth, with the global Space economy set to reach \$1.8 trillion by 2035.

European Union (EU) framework

- EU Strategic Compass identifies Space as a strategic domain. EU Space Strategy for Security and Defense was released in 2023.
- The IRIS² is the new EU Space-based secure communication system where the European Quantum Communication Infrastructure (EuroQCI) will be integrated.
- According to the Competitiveness Compass for the EU, the competitiveness of the European Space sector must be preserved through greater coordination of public spending, supporting the investments of European innovative start-ups and scale-ups, and reinforcing the resilience of the Space supply chain.
- The first EU Space Act is expected in 2025. Its main objective is to safeguard and improve the functioning of the internal market for Space activities through a set of measures that harmonise requirements for the safety, resilience and sustainability of Space activities at Union level and remove fragmentation arising from national legislation.

Development and usage of satellites technology

- Telecom networks deployment is capital intensive. Achieving high quality connectivity for all in the most cost-efficient way requires the use of a mix of technologies.
- LEO satellites are changing the model of connectivity and increase options to close the connectivity divide from space. Satellite connectivity is a complement to terrestrial and can close coverage gaps in hard-to-reach areas (rural/remote) where the deployment of fiber and mobile/5G networks is very expensive.



- LEO satellites represent an important trend in fixed connectivity bringing some very interesting features such as low latency, low transmission delay, smaller propagation loss, high area capacity, and lower manufacturing and launching cost when compared with GEO satellites.
- Direct-to-device (D2D) services from LEO satellites become a trend and the number of devices such as normal unmodified smartphones which may be connected is broad.
- The initial satellite-to-device services include emergency services, text services, IoT services. When additional LEO satellites are launched more capacity will be available and services will be extended with voice and data connectivity at locations with no coverage of fixed or mobile terrestrial networks.
- Advanced satellite services may also provide complementary solutions for backhaul or to ensure service continuity in case of crisis or disaster relief (back up option scenario). They can also provide resilient emergency services in disaster or crisis situations.
- Non-Terrestrial-Networks (NTNs) can also augment service continuity for machine-to-machine and Internet
 of Things (IoT) devices for industries as varied as agriculture, transportation, environmental monitoring, and
 asset tracking. By adding a layer of resilience and redundancy to the existing 5G network, NTNs will also
 bolster the reliability of mission-critical communications.

Regulatory landscape

- Digital Networks Act (DNA) will aim at increasing incentives for the deployment of future fixed/mobile/Satellite networks, by reducing administrative costs and by creating an integrated Single market for connectivity.
- DNA will give emphasis on a more coordinated EU spectrum policy in particular towards the emerging 6G and satellite communication systems.

Regulatory Challenges for LEOs

Fixed connectivity:

- Easy licensing of radio equipment installation
- Flexibility on infrastructure sharing initiatives
- Careful monitoring antenna output power levels

Direct to Device

- Roaming issues (technical and regulatory)
- Lawful intercept
- Ground station authorisations
- Efficient management of the numbering resources
- Interoperability of devices
- Regulatory market access and authorisation processes
- Competition issues

<u>Most important challenges</u> (for LEOs internet service provision and Direct-to-Device LEOs operated mobile base stations)



- Properly guard Legal Intercept (LI) lawful provisions as well as the ones related to limiting access to certain content and services over the Internet
- Upstream interference Safeguard space-based assets by identifying ground sources attempting to upstream interfere with their normal operation

Spectrum monitoring

- Safeguarding Space communications and infrastructure grows in importance.
- The principles and framework of Spectrum Monitoring infrastructure deployment projects followed the evolution of wireless telecommunications over the last 20 years, and relied exclusively on terrestrial means.
- Uplink transmissions spectrum monitoring remains a challenge
- Satellite radio communications utilize highly-directional propagating signals, so intercepting them from the ground-level ranges from 'technically challenging' to 'physically impossible', as almost direct 'line-of-sight' access is needed.
- LEOs can introduce enough distance, between a ground-based (transmitting) antenna and a spectrum monitoring instrument, to allow such transmitted (propagating) signals to spread over larger areas, making them easier to intercept. LEOs also increase the geographical coverage of the equipment/surveillance network.
- CubeSats can be the 'carrying platforms' of the antennas and signal processing equipment needed for spectrum monitoring.
- EETT's feasibility study on the potential of using small number of LEO CubeSats as the Space vehicle of choice, for the effective and cost-efficient Space spectrum monitoring