

Satellite Technology to Tackle Digital Divide

Regional Workshop Regulatory Framework for Satellite Internet Services

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Global Association Representing the Entire Satellite Industry



GSOA provides a platform for collaboration between member companies involved in the satellite ecosystem globally and a unified voice for the sector

Economics of Digital Divide and Diminishing Returns



World population distribution as percentage of landmass (source UNdata)

• Terrestrial solutions currently cover 96% of the population using infrastructure deployed across 20% of the landmass.

• Extending this coverage to 99% would necessitate doubling the terrestrial infrastructure footprint to 39%.

• Achieving 100% requires a multiple increase in current investment.

Non-Terrestrial Networks (NTNs)



Aero & Maritime



Satellite IoT



Satellite Direct-to-Device



Cellular Backhaul



Connected Cars

Concept

Multi-orbit approach utilizes satellites at various orbits (GSO and NGSO) to exploit their unique characteristics in coverage, throughput, latency, and operational ease.

Benefits

Optimizes system to meet customers' service level requirements by leveraging advantages of different orbits. Enables efficient relay of large amounts of data from earth observation and satellite imagery.

Future Potential

Creating a global holistic network ecosystem for software-defined satellites, modems, antennas, and waveforms to realize full potential of future applications and connectivity needs.



Flexibility

Introduces programmability into telecom networks, simplifying management and reducing operating costs.

Superior Connectivity

Beam shapes and power allocation can be constantly adapted to optimize coverage and link performance.

Dynamic Capacity

Bandwidth allocation based on demand - satellites adjust capacity availability to follow traffic.

End-to-End Networking

Dynamic software-based interaction with user terminals and central networks enables service orchestration.

1.

Enabling real-time offloading of Earth imaging and IoT traffic from NGSO satellite constellations

3.

Facilitating continuous data relay and transmission between satellites in different orbits

5.

Enabling crewed space stations to communicate with Earth at all times, even when over water

2.

Overcoming the limited ground station visibility for NGSO satellites through inter-satellite communication

4.

Improving resilience and redundancy in satellite communications networks



EVOLVING GROUND SEGMENT

The ground segment is evolving to support the changing nature of both geostationary (GSO) and non-geostationary (NGSO) satellite constellations. This includes the need for tracking antennas and an agnostic ground ecosystem for interoperability.

TRACKING ANTENNAS

With the proliferation of NGSO constellations and satellites in inclined orbits, the need for antennas that can track the satellites has become essential. This can be served by traditional parabolic antennas or by flat panel antennas (FPA).

AGNOSTIC GROUND ECOSYSTEM

The industry is moving towards an agnostic ground ecosystem where interoperability is key. Initiatives like the Digital Intermediate Frequency Interoperability (DIFI) are enabling a generic form of signal presentation for onward processing, supporting hub architectures and wider implementation in terminals.

UNIFIED, SOFTWARE-DEFINED NETWORK

The development of a unified network that uses a multi-orbit, multi-layer, multi-band system, which is software-defined and supported on the ground by smart edge terminals, can help unlock the true potential of satellite communications.



Satellite technologies are well-suited for large-scale, global IoT deployments, providing coverage across wide geographies. Standards bodies, like 3GPP and the LoRa alliance, have embraced satellite technology, allowing cost-effective deployments and operations worldwide.

D2D in MSS bands

- Uses spectrum allocated to Mobile Satellite Service
- Leverages 3GPP Release 17 and later NTN specifications
- Requires no additional regulatory action if MSS authorized
- Support L- and S-Band, and Ka- Ku in future release
- Additional MSS spectrum allocations studies in WRC-27 Agenda Items 1.12 and 1.14

Challenges:

- Needs mobile chipset vendors to include those 3GPP bands

D2D in Terrestrial bands

- Uses terrestrial spectrum
- Can use off-the-shelf mobile handsets
- Requires partnerships with MNOs
- Complements existing mobile coverage
- Using IMT bands < 3GHz
- Coexistence being studied under WRC-27 Agenda Item 1.13

Challenges:

- Interference management between MNOs and satellite operators
- International regulatory hurdles (ITU RR 4.4)

Government roles for bridging the connectivity gap

Technology-Neutral Policies

- Adopt inclusive, solution-based approaches rather than mandating specific technologies
- Allow service providers to select the most appropriate solutions for each region

Universal Service Fund Reform

- Restructure USFs to channel resources from high-revenue urban areas to rural initiatives, so USF recipients should not be only the contributors
 - Grant USF recipients autonomy to select the most economically viable technologies

Public Private Partnership

- Create joint public-private projects with sustainable business models
- Implement cost-sharing mechanisms for operational expenses
- Support proven partnership models like GIGA, Smart Villages, and Internet para Todos

Regulatory Incentives

- Offer reduced taxes and regulatory fees for operators serving underserved areas
- Streamline compliance requirements for satellite-based solutions

1 **Dynamic Evolution**

Ongoing development of multi-orbit networks, inter-satellite links, and non-terrestrial networks is transforming global connectivity.

3 **Bridging the Digital Divide**

Cutting-edge technologies are driving a new era of satellite communications that fosters global inclusivity.

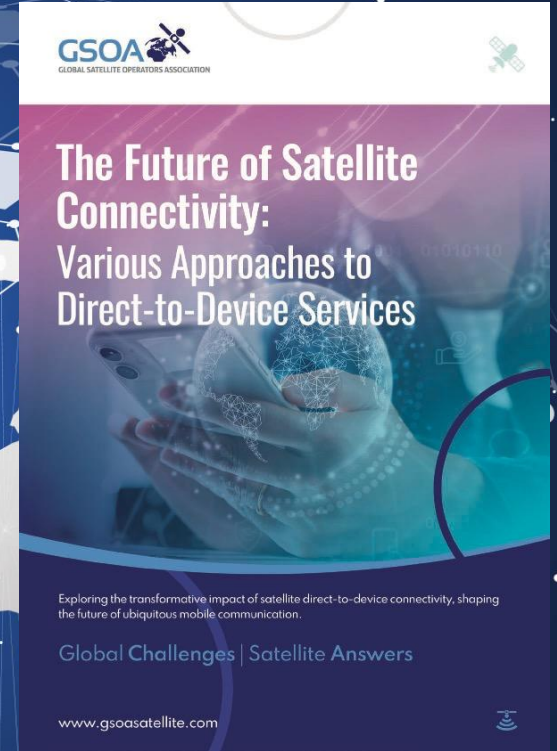
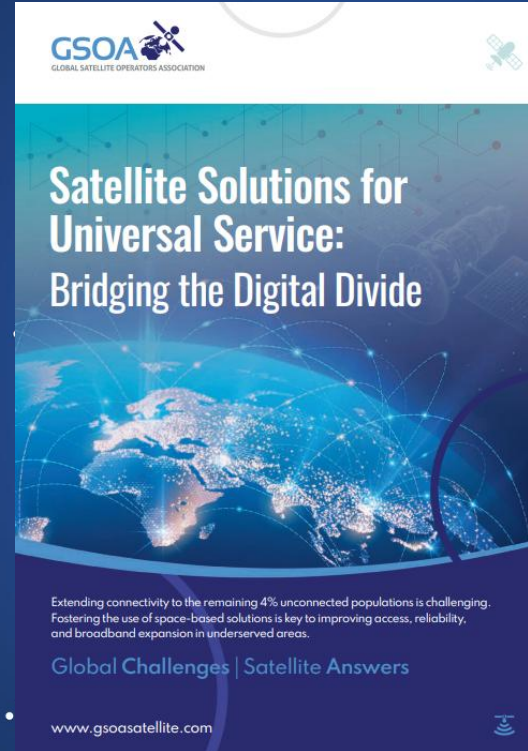
2 **Meeting Demand**

Advancements are pivotal to meet increasing demand for reliable, secure, and high-capacity communication services.

4 **Future Role**

The satellite communications industry is positioned to play a crucial role in ensuring an inclusive digital future for all.

THANK YOU!



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