Date : Tuesday 19th November 2024

To
Shri Akhilesh Trivedi
Advisor - Network, Spectrum and Licensing
Telecom Regulatory Authority of India

Subject : Comments on Consultation Paper on the Terms and Conditions of Network Authorizations to be Granted under the *Telecommunications Act, 2023*

Dear Sir,

We would like to firstly thank you for the inclusion of the emerging GSaaS segment in the ongoing consultation on network authorisations to be granted under the *Telecommunications Act 2023*.

In furtherance to the Satellite Reforms and the Indian Space Policy, the Space sector in India has rapidly emerged with a growing number of Space missions being launched and planned by private enterprises.

The upcoming space missions slated to be launched from India by the private Space enterprises will require establishment and operations of Ground Stations for Space Operations and Payload Data Downlink Services, which will also unlock the potential for Indian enterprises to offer Ground Station as a Service in addition to using the Ground Stations for use in their own Space missions.

With this background, we are writing to submit our comments, specifically for the issues pertaining to provision of Ground Station as a Service **(Annexure II**), along with a short note explaining the nuances of GSaaS given its nascent emergence in India from our experience **(Annexure I)** for the benefit of the consultation process.

We hope that our submission is of help in the consultation process and we look forward to our continued contribution in achieving the National goals of the Space sector.

Thanks & Regards,

Keyur Gandhi
Director - Space Regulatory
Dhruva Space Private Limited

ANNEXURE - 1

Overview of Ground Station as a Service (GSaaS)

Overview

GSaaS is a service model through which Satellite operators access and utilize Ground Station infrastructure on a pay-per-use basis rather than investing and maintaining their own Ground Station for various services such as Space Operations, Payload Data Downlink, Ranging, and allied activities. The commercial model for providing / availing Ground Station as a Service is flexible i.e. either pay per use/Satellite pass or block fixed time slots for usage as per the visibility of the Satellite from any authorized Ground Station operator across the globe in the network of that GSaaS provider.

Necessity of GSaaS in Space Missions and Data

The emergence of NGSO satellite constellations in Low and Medium Earth Orbits coupled with the need for reduced latency and economic efficiency in Satellite-based applications, has resulted in the requirement of having a global Ground Station Network access for Satellite operators.

a. The necessity for a global Ground Station Network emerges from the nature of the Satellites' orbit around Earth, typically around 90 mins per orbit. The Ground Path (visibility) of the Satellite is also not similar in each orbit. Therefore, if a Satellite is to be tasked (command) for certain activities and/or if data is needed to be downlinked from the Satellite (payload data downlink), the latency (availability) of such actions is determined by the presence (visibility) of necessary Ground Station/s in its orbital path with respect to Earth.
b. The cost of establishment and maintenance of a Ground Station is high, and individual Ground Stations are often under utilized due to the aforementioned nature of Satellite (availability) visibility in orbit. Thus, it is economic if multiple satellite operators can utilize a single station, increasing the potential revenue generation from a Ground Station.
c. The cost of operating and maintaining a Ground Segment is ultimately factored into the cost of data generation & availability (Earth Observation, AIS, Scientific etc.) which is available to the end customer. Reduced capex investment and operational costs will ultimately result in cost effective space based solutions for diverse applications of national and global importance.

Thus, GSaaS has emerged as a rapidly growing market across the globe, with an increasing number of satellite operators relying on third-party Ground Stations and GSaaS Service Providers for Space Operations and Payload Data Downlink as a Service. GSaaS plays a crucial role in the global goal of democratizing and easing access to Space and Space-based data for development and security.

Data Handling & Security Mechanism

Each Ground Station established by a GSaaS Service Provider may be used by Satellites belonging to diverse enterprises from any country, unless provision of service to satellites of certain nations is controlled or banned. Each nation deals with access to Satellite data in strictest terms through their supervision and authorisation mechanism. In line with the laws applicable to Satellite data (including TT&C Data), a Satellite operator does not provide access to

unencrypted data to any third party Ground Station operator or service provider. Therefore, Data Handling and Security mechanism is one of the fundamental pillars in shaping the offering of GSaaS.
In order to ensure the above objectives are met, Ground Station and Satellite Operator usually work with the following framework:

a. All Satellite data as a standard practice carry at least AES or equivalent grade of encryption.
b. The Ground Station Operator (including GSaaS Service Provider) does not require to decrypt or process the data received from the Satellite or the data being sent to the Satellite.
c. The data is relayed between the MCC / Data Generation or Processing Center (as per the definition in NGP released by IN-SPACe) and the Ground Station over Cloud or VPN or equivalent secured mechanisms.
d. A satellite operator may also set up an independent network at the premises of the Ground Station Operator for processing data in the interest of latency (turn-around-time) and cost effective data relay in case the Ground Station is established at a remote site with limited connectivity on other networks.

Novel Considerations

1. **Ground Stations integrated into other networks**
   Due to commercial considerations tied to independently providing services and the economics of Space missions, a Ground Station Owner / Operator (authorized GSaaS service provider) may choose to integrate the licensed Ground Station or part of it (certain antennas) into a global Ground Station Network, without any change in the Data Handling or Security Mechanism. This is done to consolidate availability of Ground Stations across the globe on a single platform for Satellite operators.

2. **Autonomous / unmanned operation of Antennas**
   As a measure to reduce the Operational Cost associated with operations of Ground Stations, certain Ground Stations / Antennas are operated remotely by a Ground Station operator without physical presence of any person/s after implementation of necessary physical- and network-based security measures.

3. **Spectrum Assignment for Satellite operator through GSaaS Licensee**
   A Satellite operator works with Ground Stations in multiple jurisdictions for availing TT&C and Remote Sensing Data Downlinking services. Given the shorter lifespan of NGSO constellations, low cost of services and complexity of Regulatory regimes across the globe in the Space domain; it is common practice for a GSaaS licensee to obtain Spectrum on behalf of the Satellite operator for providing services within the scope of the GSaaS license.

Advantages of GSaaS

In the course of making the framework for GSaaS, it is necessary to consider the advantages of GSaaS to balance the needs and regulation of the service:

1. **Cost of Ground Segment for Space Missions and Satellite Data**
   The service model for availing Ground Segment services reduces the Capex required for establishment and operations of Satellite constellations. Ground Stations established for captive use by Satellite operators can be economically efficient by integrating into GSaaS networks, allowing to recover capex investment over a period of time, thus reducing financial burden.
   Relevant Recommendation: Rationalize fees for GSaaS license and Spectrum assignment in Space Operation, Earth Exploration Satellite Service, Meteorological Satellite, and allied frequency bands.

2. **Availability of Data**

Satellite Data availability contingent on Ground Segment Network availability across the globe. Timely availability of Satellite data in emergency situations like disaster, weather, traffic, search & rescue etc. will aid national and global efforts on safety, growth and prosperity. In other applications like construction, agriculture, fisheries, mining etc. the cost of Ground segment and subsequently Satellite data will define both the pace and ease of Space Technology products adoption across the globe.

Relevant Recommendation: Ease of Spectrum assignment and flexibility in licensing conditions for GSaaS service, along with allowing GSaaS licensees to get Spectrum assignment on behalf of Satellite operators.

3. **Independent business in Space Economy**

Ground Station as a Service is rapidly emerging as an independent area of business and technology, with a significant potential contribution towards achieving the decadal vision for Space Economy. As an independent business, it derives substantial economic utility from models such as asset light model (using existing underutilized antennas of third-party), Antenna hosting (hosting independent third-party antenna at an existing Ground Station premises), Cloud-based Ground Stations etc.

Relevant Recommendation: Retaining flexibility in models of establishment, operations and service by defining clear conditions necessary for interference mitigation, safety & security considerations and allied compliance.

ANNEXURE - II

Response to Consultation Paper

Q9. Whether there is a need to introduce an authorisation under Section 3(1) of the *Telecommunications Act, 2023* for establishing, operating, maintaining or expanding Ground Stations, which may be used to provide Ground Stations as a Service (GSaaS)? If yes, what should be the eligibility conditions, area of operation, validity period of authorisation, scope, and terms & conditions (general, technical, operational, security etc.) for the authorization to establish, operate, maintain, or expand Ground Stations, which may be used to provide GSaaS? Kindly provide a detailed response with justifications.

Response to Question 9

1. **Need for separate GSaaS License**

   The Ground Station as a Service includes such services for which there has been no specific license in light of the recent space reforms in the country. Given the economic background and the nature of service described above, it is imperative to introduce a new license category for Ground Station as a Service with relevant terms and conditions.

   The standards developed by TEC (Telecommunications Engineering Center), the financial and technical conditions under existing licenses issued by DoT and MIB are aligned with the notion that the licensed network is used for processing communication and broadcasting services. Accordingly, a number of requirements under NOCC, MTCTE, Lawful Interception and Monitoring, Feed Monitoring etc. are structured in line with the operational, technical and financial capabilities with respect to the said infrastructure. However in case of GSaaS, the said considerations would not apply as both - Nature of Data and Service to End User are not of the nature which align with service licenses given by DoT and MIB.

   Even though the considerations discussed have significant similarities with SESG, substantial distinctions can be drawn in nature of service, technology and related techno-legal measures practiced globally with respect to GSaaS. Hence, a separate license is necessary to avoid confusion and enable a desirable Regulatory framework for GSaaS.

2. **Service Area Level for GSaaS**
   Like the SESG license, the GSaaS license should also be a license that only operates at the National level.

3. **Scope for GSaaS**
   - **3.1.** The GSaaS licensee should be allowed to provide any authorized Indian or foreign Satellite operator the service of downlinking any data that their Satellites are providing (except in BSS, FSS services) uplinking/downlink any TT&C commands that the Satellite operators want to send.
   - **3.2.** GSaaS licensees should be able to host the equipment of any authorized Indian or Foreign Satellite operator (INSPACe provides for authorization of each new Satellite operator within its authorisation framework), with the equipment (including antenna) functioning exclusively for that Satellite operator, provided the security and data handling measures are not violated.
   - **3.3.** Further, the GSaaS licensee should also be allowed to obtain Spectrum assignment in a time-bound manner on behalf of the Satellite operator.

4. Considerations for Terms and Conditions

4.1. Fees

There should be minimal fees for GSaaS licensees as no service is provided to End Users and utilization (revenue generation) is also staggered and volatile unlike communication networks in BSS, FSS, MSS services.

4.2. Spectrum

GSaaS service licensees do not require Spectrum themselves when getting requisite license for establishment and operations of Ground Station/s. GSaaS licensee should have a blanket authorisation to establish equipment for operations in broad frequency bands identified for operations in Space-based Services. The operation of the Ground Station is subject to availability of authorized Space Objects (Satellites / Launch Vehicles / Space Stations) against the frequency bands of which spectrum assignment is to be sought for each operator / constellation. In such a case, for the purpose of promoting export of services and growth of the Indian Space Sector, a mechanism should be introduced for GSaaS licensees to acquire Spectrum assignment on behalf of the Satellite operator.

4.3. Eligibility

Any company registered under the *Companies Act, 2013* should be able to apply for this license with no further conditions for eligibility. Since the establishment and operations of Ground Stations requires prior authorization from IN-SPACe, the relevant eligibility criteria sufficiently addresses issues of technical and financial capability of an application along with necessary security concerns.

4.4. Security Conditions

4.4.1. All data which is exchanged through the Ground Station is encrypted by the satellite / payload operators. The GSaaS licensee does not have the capability to decrypt any of the received data. Hence, the scope of implementation of lawful interception and monitoring mechanisms may be limited.

4.4.2. RF Feed for the Ground Station is not continuously active due to the nature of staggered use of the station and antennas. Hence, the RF Feed Monitoring requirement may be rationalized with specific technical measures defined.

4.4.3. Given the nature of data sovereignty and integrity which is expected of each Satellite operator and the nature of services covered under GSaaS, a revised and rationalized framework for security conditions should be developed with respect to data handling.

4.4.4. Further, given the critical dependence of Satellite operators and users (including strategic) on the availability of Satellite Ground Stations, necessary physical and technical security measures should be mandated to treat the Ground Station sites as infrastructure of critical importance.

In summary, it is imperative to orient the license terms & conditions in line with the financial, technical and operational considerations tied with Ground Station as a Service as described in Annexure -1. As an emerging sector with ongoing research and development and continuous innovation, adequate flexibility should also be provided within the license framework.