Counter Comments for the TRAI Consultation Paper on the Framework for Satellite Communication Network Authorisation, and Assignment of Spectrum to Satellite Communication Network Providers

Introduction

As the nature of connectivity requirements and applications have evolved, satellite based networks & services have diversified away from the uniform nature of "network" and "services" to cater for the global connectivity goals.

Satellite based IoT services are rapidly emerging as a niche market, to enable automation, alerting systems, tracking and several other enterprise & developmental applications. The nature of these services necessitates building of a cost effective solution for connectivity in remote areas, which requires optimisation across the space, ground and services segment.

There are active satellite constellations which are solely made for the purpose of delivering satellite based IoT services, some in the EESS (Data Collection Systems) and MSS Bands, while others which utilise IMT Bands for IoT. These satellite systems do not have any payloads (transponders equivalent) which can serve any purpose other than Store & Forward of IoT messages.

As noted by other stakeholders, asking for an appropriate framework for satellite IoT services, the technical, security and financial conditions proposed are not a suitable fit for such networks. It is to be noted that the satellites of such constellations are designed to provide cost effective IoT and Data Collection Services with minimal technical complexity and enhanced ease of use. Hence, the financial conditions proposed will not only be burdensome but prohibitive and the operational conditions may not be feasible in light of the satellite network capabilities.

Our primary and limited focus for these counter comments is towards :

a. Ensuring adequate parity in regulatory treatment based on the emerging nature of satellite networks which in turn enable technology neutral service regulation.
b. Ensuring accommodation of emerging technologies and network architectures within this phase of regulatory reforms to avoid long commercial gestation period for space technology enterprises in India.
c. Supporting representations made by stakeholders which advocate for an appropriate authorisation framework for satellite IoT constellation operators, so that they may offer their network and services in India without any undue regulatory burdens.

Nature of Constellations designed exclusively for Satellite based IoT Services

Certain constellations such as Kineis, ARGOS, Swarm, Kepler (Gen1) Thybolt (Dhruva Space demonstration mission) are designed such that they can be used only for receiving and transmitting few bytes of messages between satellites and the end user device (Store & Forward Payload). Unlike other constellations, these satellite network/s cannot be used to provide any other services such as broadband, messaging, calling or any form of direct communication between two different end user devices. The functionality of the network is such that :

- End user terminals / devices transmit messages directly to the satellite, which stores the same onboard for downlinking over authorised ground stations.

- Typically, post downlinking there are two layers of encryption to be removed - Layer 1 being satellite operator encryption which is decrypted at the Ground Station or Mission Control / Data Processing Center of the

satellite operator and Layer 2 being end user / service provider encryption which is removed within the country where the user data resides. It is then disseminated through cloud or equivalent methods to the users. Similar data handling is used also for sending commands / data to the End User Device from the satellite.

- Typically, the end user devices cannot directly communicate with each other without passing through the cloud layer of the service provider since data is encrypted.

- The transmissions are often of a few seconds only a few times per week. The devices are not always equipped with navigational aids either to enable use cases such as ocean buoy & sensor data collection, wildlife tracking, asset tracking : use cases where there is no possibility to access power charging sources for weeks or months.

- These constellations typically operate in lower bands such as VHF/UHF for technical suitability.

Benefits of Satellite based IoT Constellations

Satellite based IoT constellations are primarily built with the aforesaid architecture for providing cost effective and technically easy to use connectivity solutions for wildlife, asset tracking, oceanography, industrial automation and other IoT based applications. The ARGOS program and equivalent Data Collection Systems (a precursor to IoT) were built by Space Agencies decades ago to empower the ecosystem with these solutions.

The advent of M2M communication in automation, data collection & research in remote areas, management of remote assets for fleet management, farming, tracking, aquaculture, animal husbandry, hiking, tourism, safety & distress alerts, disaster management, climate monitoring, wildlife safety are pivotal in bringing the benefits of space technology development into other sectors. Recognising this need, the dedicated IoT satellite constellations are designed to deliver the following benefits to the users, bringing satellite based IoT closer to typical M2M solutions for ease of use, greater adaptability and for larger benefit of the end users:

- Cost effective access to satellite based services for coverage in remote locations. Since the cost of the space segment is lower compared to other constellations which are designed for higher throughputs and other services, the benefit of cost effective access to coverage is passed along to the end users enabling scientific experiments, industrial automation, asset tracking, search & rescue and much more.

- Technical architecture and use of lower frequency bands provides power and spectrum effective choice of end user terminals which can be miniaturised and operated remotely without a power source for a long time period.

- Given the technical architecture being suitable for IoT only, the related security concerns and considerations could be limited, since repurposing of such terminals and/or network is operationally limited : hence, limited Ground Stations across the globe are established to route all user data and distribute through Cloud Based Security and Encryption Mechanisms.

Issues and Recommendations

In light of the aforementioned nature of the satellite network and services, we kindly request consideration of the below mentioned concerns and recommendations :

1. **Inclusion of Satellite based IoT as Miscellaneous Service**
   The current framework for authorization of Satellite Communication Network is principally made for

such satellite networks which support Internet, Voice, Broadcasting and allied services. The nature of the constellation/s described above, more appropriately fits the use case of providing IoT services. This is especially important for such satellite networks which can only provide IoT services. Hence, in order to maintain parity in regulation, ease of use, commercial affordability and accessibility of services, the use of satellite network of M2M IoT which is not a Main Telecommunication Service but a Miscellaneous Telecommunication Service should also be framed not just for introduction of new services, but also for continuing existing services. The conditions given in Chapter 7 (Specific Conditions for Provision of Telecommunication Services Using Satellite System) of the Draft Rules should also be adapted accordingly, as elucidated in the next points.

2. Rationalizing Technical and Security Measures as Operating Conditions

It is given that Satellite Communication Networks meant for predominantly delivering IoT services are not technically equipped to handle voice, internet or any other form of data except a few bytes of messages. Further, the nature of service being delivered is such that it is not realtime connectivity, it is not between two devices, and it is also not any editable form of text message rather sensor generated standard status codes. In such a network, many operating conditions relating to the LIM requirements and continuous location tracking are not possible to be implemented. Further, the routing of all IoT data from a local gateway would not serve any additional purpose from a monitoring perspective, but will definitely in turn increase the infrastructure cost.

In light of these limitations, we request introduction of a separate regime with appropriate technical and security measures for such satellite constellations or introduce specific provisions which allow the Department of Telecommunications (and IN-SPACe) to provide necessary relaxations / amendments / exemptions depending on the nature of the constellation such as :

I. Establishment of a Cloud based gateway in India where user data shall be decrypted after being received from the satellite / ground station operator.
II. Storage of all data with identifiers for user ID and location being available with timestamp of transmissions and such other meta-data as required.
III. Cloud based gateway to be duplicated on local servers for tamperproofing storage and logging mechanism.
IV. No data to be shared directly with or from the end user without passing through this cloud based gateway.
V. Demonstration of anti-spoofing and tamper proofing measures to be compulsory for EUTs.
VI. Denial of service through the Cloud based Gateway, since many End User Terminals are transmit only devices.
VII. Location Reporting / Monitoring based on localisation / triangulation service of the satellite operator with diminished accuracy of up to 25 sq. kms, rather than being based on Navigational Aids such as GPS, NavIC and others.

3. **Recognition of EESS Data Collection Systems for Spectrum Assignment**

The nature of spectrum to be allocated to SCN authorised entities should also include EESS Bands recognised for Data Collection Services (in addition to MSS) for the purpose of delivering data from sensors which are meant for use in Environmental monitoring or such other Earth Exploration Services as permitted. The nature of such Data Collection Service payloads and End User Terminals is similar to IoT devices / networks with the exception that there is often only one way communication in such cases. The ARGOS satellite constellation built under an initiative led by CNES, with support and participation from NOAA, EUMETSAT and ISRO operates under the EESS DCS Bands as per Recommendation ITU-R SA.2045-0.

4. **Assignment of Spectrum for Satellite Networks capable of IoT Services only (in non-IMT Bands)**

A typical IoT constellation uses less than 60 KHz of aggregate spectrum in its user links, given that the data size is only a few bytes and there is no need for realtime connectivity in most cases. The number of satellites are relatively lesser than a typical LEO Satcom Constellation as well. The assigned spectrum is also not used fully in realtime, and is capable of being shared with other users / services as well. This is done by design to minimize the cost of the space segment which can in turn pass the cost benefit of global IoT connectivity to end users. Hence, given the quantum of spectrum and the commercial (pricing) terms of the service, it is necessary to assign spectrum through a light touch administrative framework with minimum pricing, in the UHF Band as well.

5. Entry Fees

The current framework envisages entry fees based on the assumption that the satellite networks have commercialization potential as per the market for Broadband, Voice and other communication services. The commercial potential of constellations designed solely for delivering IoT services is quite different when compared to a typical satellite constellation which is not designed exclusively for IoT services and delivers other services such as backhaul, MSS, IFMC and other services. The economics of these constellations is based on low investment and low pricing models to provide affordability. High entry fees would nullify the cost advantage which is achieved by building such dedicated satellite based networks for IoT and disproportionately impact innovation-stage deployment.

Hence, the entry fee should be at par with the entry fees prescribed for terrestrial M2M service providers or in any case less than 10 Lakhs.

A differentiated and proportionate framework for narrowband satellite IoT systems would support innovation, enable Indian participation in emerging global satellite IoT markets, and facilitate deployment of socially relevant and environmentally significant applications while continuing to address issues of National Interest.