Dated April 22, 2021

Shri Syed Tausif Abbas,
Advisor (Networks, Spectrum and Licensing),
TRAI
New Delhi

Subject: Comments on TRAI Consultation of Licensing Framework for Satellite-based connectivity for Low bit rate applications

Dear Sir,
The ITU-APT Foundation of India (IAFI) is a registered non-profit and non-political industry association registered under the Cooperative Societies Act in India. IAFI has been recognized by the International Telecommunication Union (ITU) as an international/ regional Telecommunications organization and has been granted the sector Membership of all the three sectors of the ITU - the ITU Radio Sector (ITU-R), ITU Development Sector (ITU-D) and ITU Telecommunication Standardization Sector (ITU-T).

IAFI has been working for the last 18 years with the prime objective of encouraging the involvement of professionals, corporate, public/private sector industries, R&D organizations, academic institutions, and such other agencies in the activities of the ITU. Our Members also include many Indian and global satellite entities.

Our Response to the TRAI consultation is enclosed herewith.

Warm Regards,

Bharat B Bhatia,
President, ITU-APT Foundation of India
Vice Chairman - Asia Pacific, World Wireless Research Forum (WWRF)
Chairman, ITU-R WP5D SWG PPDR
Chairman, AWG Task group on PPDR
504, World Trade Center, New Delhi-110001
Phone: +919810173737 ; +91 836 884 9825

IAFI Response to TRAI Consultation of Licensing Framework for Satellite-based connectivity for Low bit rate applications

Overview

The ITU-APT Foundation of India (IAFI) believes that Industries can operate more safely and efficiently using satellite applications, which enable real-time data access and monitoring nearly anywhere and everywhere. Satellite technologies currently support several sectors including the agriculture, energy and critical infrastructure, manufacturing, ground transportation, aviation and maritime, and weather and environmental monitoring sectors. Modern IoT applications using satellite technologies allow industries to remotely monitor and more effectively manage both fixed and mobile activities. For example, satellite IoT can monitor the equipment status, operating parameters, environmental changes, energy consumption, and other metrics of fixed assets like electrical grids and machinery in manufacturing plants. They can also enable monitoring of mobile fleets of trucks, trains, planes, and ships, as well as personnel monitoring through wearables. These IoT applications help industries achieve cost savings, accelerated time-to-market, and improved safety.

Advancements in satellite technologies means that satellite technologies of today can deliver quality and affordable services to everyone and everywhere. Recent and upcoming HTS GSO systems with higher throughput and lower cost can provide economies of scale by serving the broader region. NGSO satellite systems which allow for very low latency for many real time IoT applications. These satellite technologies will complement GSO and current ground-based satellite services to fully support the Government's forward-looking vision of Digital India, ITU mission of removing the digital divide and providing broadband to all. In fact, despite the telecom revolution in India over the last decade, there is still a very significant portion of the Indian population living in remote and sparsely populated areas that lacks reliable and high-quality connectivity, which can be effectively addressed with the new satellite communication technologies.

Satellite communication system technologies have progressed by the introduction of large-capacity satellites such as high-throughput satellites (HTS) using multi-beams, and NGSO networks consisting of many low-earth orbit satellites. With that, high-speed, large-capacity and flexible channel control, reduction of communications cost, and improvement of satellite services are expected. For these situations, the integration of satellite communications into the **Next Generation Access Technologies (NGAT)** is

already happening. Joint projects on NGAT between the public and private sectors are being actively carried out in many countries. In particular, the joint projects on the integration of NGAT and satellite in Europe aims to apply SDN (Software Defined Network), NFV (Network Function Virtualization), Network slicing, Orchestration and Edge computing. We believe that the integration of satellite communications into the Next Generation Access Technologies (NGAT) is the right model for satellite-based connectivity for IoT devices. The following table provides details of the satellite based IOT applications that can be provided by next generation of NGSO satellite integrated with **NGAT.**

Category	Expected use cases
Smart city	- Various data communication services using satellite terminals and base stations installed on traffic lights - Provision of information for tourists by natural environment monitoring - Autonomous driving (effective in rural areas due to population decline) - Expansion of NGAT area - Telemedicine - Autonomous robot - Use of satellite link to local/private entities (e.g. construction site) - Large-scale agriculture
Mobility	- Monitoring data collection of various devices on ship - High-speed, large-capacity, low-cost aircraft communications - Land-sea seamless connection in logistics systems - Autonomous driving - Flying car
Emergency response	- Landslides / dam monitoring, etc. - Collecting and providing natural disaster prediction information using distributed sensors - Disaster situation observation by IoT

	(when ground system cannot be used)

Considering that billions of devices will be required to be connected for IOT applications, the correct policy framework that is very well suited for such applications is normally called “class” or “network” authorization (also referred to as “blanket” authorization) – similar to Wi-Fi delicensing regime in India. In other words, a license that authorizes a “family” of user terminals with given characteristics. This is also because, due to the ubiquitous nature of IOT usage, as specific coordination for individual user terminals is neither possible nor necessary. The continued growth of the Earth Stations in Motion (ESIM) service, which also enables IoT on board aircraft, ships, buses, trains, emergency response vehicles etc., will require a similar blanket license, as millions of devices under the category of ESIM will be used around the country. A blanket authorization, while adequately covering and regulating the user terminal operation with appropriate conditions, greatly simplifies the task of administrations and operator/service providers alike.

While the present TRAI consultation relates to Satellite-based connectivity for Low bit rate applications, we believe that satellite services will be able to provide connectivity for IOT and industrial devices for both low- and high-bitrate applications. Therefore, IAFI believes that it is logical to cover both Low bit rate and High bit rate (broadband) IOT devices together.
IAFI’s response to various TRAI questions below are guided by the following key ideas:

a) Both GSO and NGSO networks can serve the purpose of connectivity, both for narrowband as well as for broadband IOT applications.

b) Satellites have the potential to cover every point on earth and can bring tremendous benefits to the country and mankind. Both GSO and NGSO networks need the facilitating role of the government, in the form of light touch licensing and low amount of levies, for the operators to demonstrate their full capabilities. In such a scenario, the operators would also be encouraged to develop various innovative approaches to bring down the costs and tariffs further.

c) The integration of satellite communications into the Next Generation Access Technologies (NGAT) is the right model for satellite-based connectivity for IoT devices

d) A suitable integrated regulatory and licensing framework for timely

deployment of GSO and NGSO satellite systems based on domestic as well as foreign satellites in various frequency bands is urgently needed. This new integrated regulatory and licensing framework should lead to the issue of a single operating license under the UASL framework rather than multiple licenses and approvals under different and multiple legal frameworks. Such a framework should not be exclusively for Low Bit Rate applications for IoT devices but should allow satellite networks to serve India's broadband (and narrowband) connectivity and access needs for consumers, industry, government agencies, transportation as well as utilities and other use cases.

e) In line with the best international practices, light touch licensing, predictable regulatory policies and timely approvals through single window clearance, is essential.

f) Adequate amount of globally or regionally harmonized spectrum is a prerequisite for the satellite services to be deployed in a cost-effective manner.

Our responses to various questions are given below:

Q1. There are two models of provision of Satellite-based connectivity for IoT and low-bit-rate applications — (i) Hybrid model consisting of LPWAN and Satellite and (ii) Direct to satellite connectivity.
(i) Whether both the models should be permitted to provide satellite connectivity for IoT devices and low-bit-rate applications? Please justify your answer.
(ii) Is there any other suitable model through which the satellite-based connectivity can be provided for IoT devices? Please explain in detail with justifications.
Answer:
The answer to (i) is that all technologies should be allowed to prosper and compete, mainly because for the end users of the technology the decision on which satellite systems are used is a financial (business model/cost model) one. Any Regulatory restrictions on the choice of technology may impede the adoption of the appropriate technology that could be key for the nation.
Industries operate more safely and efficiently using satellite IoT applications, which enable real-time data access and monitoring nearly everywhere. Satellite technologies currently support several sectors including the agriculture, energy and critical infrastructure, manufacturing, ground transportation, aviation and maritime, and weather and environmental monitoring sectors. Modern IoT applications using satellite technologies allow industries to remotely monitor and more effectively manage both fixed and mobile activities. For example, satellite IoT can monitor the equipment status, operating parameters, environmental changes, energy consumption,

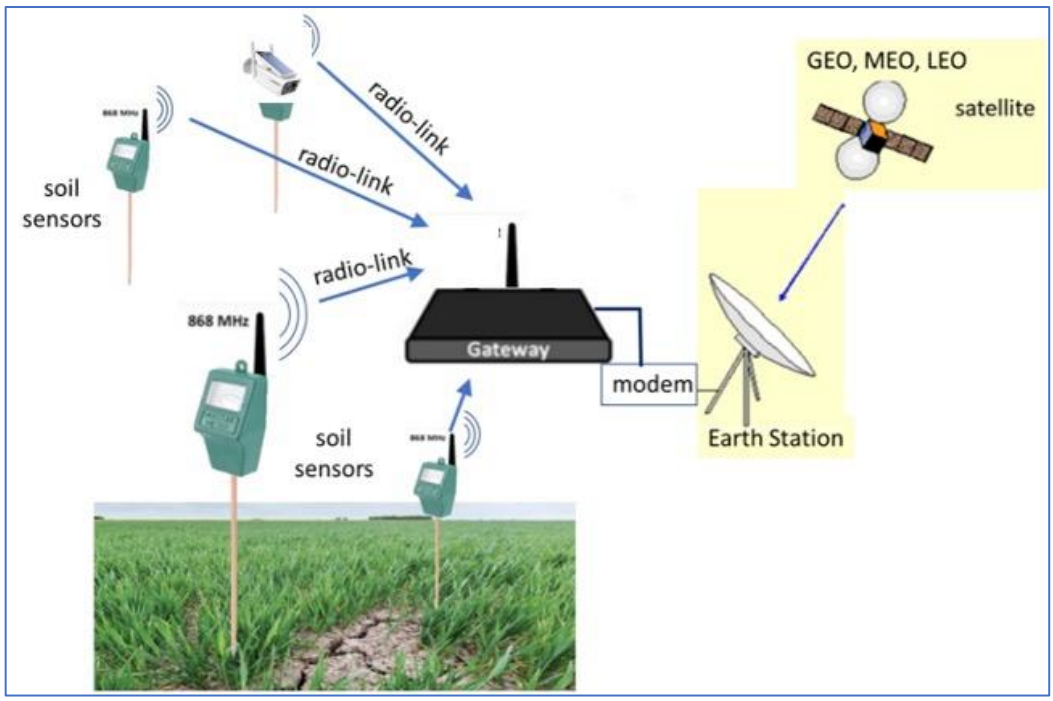
and other metrics of fixed assets like electrical grids and machinery in manufacturing plants. They can also enable monitoring of mobile fleets of trucks, trains, planes, and ships, as well as personnel monitoring through wearables. These IoT applications help industries achieve cost savings, accelerated time-to-market, and improved safety. This is important to put in picture of this consultation and its responses, because India as a country is in need of such technology which can be applicable to many sectors of the economy.

In order to understand what type of satellite systems can be used to support IoT applications, we need to explain that today there are different types of IoT systems, i.e.:

1. **TYPE 1 NETWORK**

   The **Type 1** satellite networks are where the IoT devices communicate between a "sensor" and a "base-station", using a low frequency/low power radio signal, and then the base station is connected to a satellite Earth station of any type (GEO, MEO, LEO);

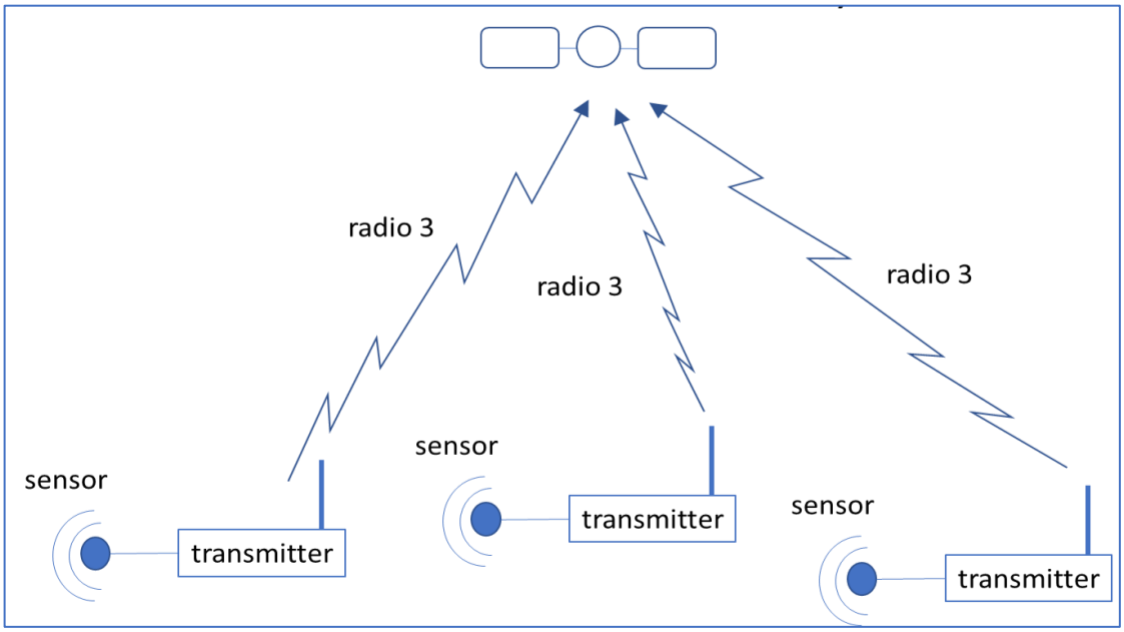
Figure 1: Type 1 IoT System using satellite network



2. **TYPE 2 NETWORK**

   Those systems where the IOT device is directly connected to a satellite (or a constellation of satellites) via a satellite radio transmitter at the device itself.

Figure 2: Type 2 IoT System directly connected to the satellite(s)



Both of these two types of IoT systems are being deployed presently, and depending on which one is used, a different satellite system and frequency band is required for the proper operations of the system. Cost of the satellite terminals and their capacity, and latency could be the deciding factor for the selection of the appropriate satellite solution as the IOT devices are expected to be dispersed geographically and in large numbers.

Satellite communication system technologies have progressed by the introduction of large-capacity satellites such as high-throughput satellites (HTS) using multi-beams, and NGSO networks consisting of many low-earth orbit satellites. With that, high-speed, large-capacity and flexible channel control, reduction of communications cost, and improvement of satellite services are expected. For these situations, the integration of satellite communications into the Next Generation Access Technologies (NGAT) is already happening. Joint projects on NGAT between the public and private sectors are being actively carried out in many countries. In particular, the joint projects on the integration of NGAT and satellite in Europe aims to apply SDN (Software Defined Network), NFV (Network Function Virtualization), Network slicing, Orchestration and Edge computing. We believe that the integration of satellite communications into the Next Generation Access Technologies (NGAT) is the right model for satellite-based connectivity for IoT devices. The following table provides details of the satellite based IOT applications that can be provided by next generation of NGSO satellite integrated with NGAT.

Category	Expected use cases

Smart city	- Various data communication services using satellite terminals and base stations installed on traffic lights - Provision of information for tourists by natural environment monitoring - Autonomous driving (effective in rural areas due to population decline) - Expansion of NGAT area - Telemedicine - Autonomous robot - Use of satellite link to local/private entities (e.g. construction site) - Large-scale agriculture
Mobility	- Monitoring data collection of various devices on ship - High-speed, large-capacity, low-cost aircraft communications - Land-sea seamless connection in logistics systems - Autonomous driving - Flying car
Emergency response	- Landslides / dam monitoring, etc. - Collecting and providing natural disaster prediction information using distributed sensors - Disaster situation observation by IoT (when ground system cannot be used)

For services that are of Pan India nature, like Disaster Warning and Management, Direct to satellite may be more suitable subject to the availability of cost effective and reliable remote end devices.
It may be noted that:

- Satellite systems employed in **Type-1** IoT systems are best suited for NGAT and this allow the use of broadband satellite systems in all the orbits, i.e., LEO, MEO and GEO. This is most commonly used system today.

- Satellite systems employed in **Type-2** IoT systems are mostly using

Low earth orbits about 1000 Km above the ground level.

The decision on which satellite systems are used is a financial (business model/cost model) one, and not a regulatory / legal one.

Advancements in satellite technologies means that satellite technologies can deliver quality and affordable services to everyone and everywhere. Recent and upcoming HTS GSO systems with higher throughput and lower cost can provide economies of scale by serving the broader region, and NGSO systems which allow for very low latency for many real time IoT applications. These satellite technologies will complement GSO and current ground-based satellite services to fully support the Government's forward-looking vision of Digital India, ITU mission of removing the digital divide and providing broadband to all. In fact, despite the telecom revolution in India over the last decade, there is still a very significant portion of the Indian population living in remote and sparsely populated areas that lacks reliable and high-quality connectivity, which can be effectively addressed with the new satellite communication technologies.

In parallel, the direct to satellite model (**Type-2** IoT systems) is seeing new players that are deploying LEO constellations. They aim at addressing the specific needs of applications requiring ubiquitous connectivity from area not covered by terrestrial networks (such as: Earth's poles, oceans, deserts, rural areas, crop fields, earthquake monitoring, isolated industrial sites, etc.). This model also enables hybridization with terrestrial networks when the satellite connectivity is not the best option, for example in dense urban areas. In that case the end-user will integrate to its devices both satellite and LPWAN/NGAT connectivity that best fit its need. Again, we restate that the choice of a specific system architecture solution is that of finance (business/cost model) and the regulatory authorities should make it possible to allow all technologies to prosper and compete.

Answer (ii):

The other option is to use terrestrial systems, such as 3G/4G technologies, and also 5G is being developed to deploy lots of IoT devices. However, there many areas of the nation where terrestrial mobile networks cannot be deployed and satellite solutions of Type-1 IoT systems or Type 2 IoT systems will be used.

Q2. Satellite-based low-bit-rate connectivity is possible using Geo Stationary, Medium and Low Earth orbit Satellites. Whether all the above type of satellites should be permitted to be used for providing satellite-based low-bit-rate connectivity? Please justify your answer.

TRAI should not propose regulations that would restrict satellite operators to offer their satellite infrastructure for IoT businesses. The choice of the system is that of a business decision and competition. Hence, the TRAI should allow all type of satellite systems both for **Type 1** and **Type 2** requirements to be permitted to offer their capacity for IoT systems, for the

The question above can only be answered from a business and technology perspective, i.e., the use of a particular satellite technology, i.e., GEO, MEO, or LEO is just a matter of application, efficiency of its use and cost to the end user.

While for all satellite types (LEO, MEO and GEO) can be used for **Type 1** IoT systems (we refer to the definition in the previous question/answer), Low Earth orbits are best fit to provide a **Type II** IoT systems

Table below summarizes the features of LEO, MEO and GEO for the **Type 1 IoT** and **Type 2** IoT systems

	LEO	MEO	GEO
Support for IOT	**Suitable for both TYPE 1 and Type 2**	**Suitable for TYPE 1**	**Suitable for TYPE 1**
Altitude	~1000KM	5000-12000 KM	~36000 KM
Satellite size	Small size usually less than ~1000Kg	2000-5000 kg	2000-20000 kg
Capacity	Low, medium and High Capacity	Medium and High Capacity	High Capacity
Latency	Very Low Latency	Low to Medium Latency	High Latency
Uplink power required	~20-40 dBW	50-60 dBW	50-60 dBW

From the above, it is clear that both **GSO** and **NGSO** are very well suited for low-bit-rate connectivity type of applications and are already successfully used to provide these services. However, it may be noted that the LEO constellations that are more suited than those at higher orbit for providing high broadband speed connectivity in case of applications requiring very low latency (or near real-time).

However, as it is the end-user's business choice to choose a **Type 1** (LEO, MEO and GEO) solution versus a **Type 2** solution (LEO ~1000 km), or a combination of both, TRAI should not propose regulations that would restrict satellite operators to offer their infrastructure for IoT businesses.

Q3. There are different frequency bands in which communication satellites operate such as L-band, S-band, C-band, Ku-band, Ka band and other higher bands. Whether any specific band or all the bands should be allowed to be used for providing satellite based IoT connectivity? Please justify your answer.

As we mentioned in our reply to the above Question, Government should not be choosing for the Industry which technical architecture should be allowed or not, and thus which frequencies should be used. Instead the role of the Regulator is to allow all solutions and leave the end users to decide based on the business/cost model.

Satellite Communications have changed from analogue communication in the 1980s to digital communication at present, and the communication speed has evolved from several kbps to over 100 Mbps. Until recently, satellite communications have been using lower frequencies such as L band and C band, but in recent years satellite communications services using Ku and Ka band are becoming the mainstream Frequency bands due to smaller size of the terminal antennae and higher capacity. We therefore believe that Ku and Ka bands, both for the GSO and NGSO satellite systems should be the main bands to provide satellite connectivity for various applications including narrowband and broadband IOT applications.

In this connection, we have recently submitted our proposals for updating of National Frequency Allocations plan. A copy of the same is enclosed for ready reference.

In addition to the use of LEO, MEO and GEO technologies in Ku and Ka frequency bands, UHF MSS frequencies are also being used internationally for Type 2 IOT applications in the frequency bands 399.9-400.05 MHz and 400.15-401 MHz. WRC23 is also considering new allocations for IoT system in the range between 1-3 GHz under Agenda Item 1.18 and necessary studies in this direction are ongoing in the ITU.

Some satellite systems for IOT applications also use frequencies in L and S-band for the Telecommand and Telemetry connectivity to the satellites themselves. Hence, those frequencies are also important and need to be provided for the use of satellite systems.

Dedicated low-bitrate IoT applications from LEO Satellites are also deployed in lower and narrower frequency bands such as VHF due to propagation characteristics enabling large coverage, lower power consumption, with enough capacity to fit low data rate requirements.

Q4 (i) Whether a new licensing framework should be proposed for the provision of Satellite-based connectivity for low-bit-rate applications, or the existing licensing framework may be suitably amended to include the provisioning of such connectivity? Please justify your answer.

(ii) In case you are in favour of a new licensing framework, please suggest suitable entry fee, license fee, bank guarantee, NOCC charges, spectrum usage charges/royalty fee, etc.

Satellites have the potential to cover every point on earth and can bring tremendous benefits to the country and mankind. Both GSO and NGSO networks need the facilitating role of the government, in the form of light touch licensing and low amount of fees and levies, for the operators to

demonstrate their full capabilities and to drive investment in the telecoms sector in India in a big way. In such a scenario, the operators would also be encouraged to develop various innovative approaches to bring down the costs and tariffs further and to compete on service quality, use of leading-edge technology, price, and aggressive market dynamics. The Licensing framework therefore needs to be conducive for meeting the socioeconomic objective of faster upliftment of the overall infrastructure in urban, suburban and the remote areas. Hence there appears to be a strong case for evolving a new licensing framework for increasing satellite connectivity for all types of applications (rather than piecemeal licensing for each application such as IOT or VSAT or GMPCS).

A suitable integrated regulatory and licensing framework for timely deployment of GSO and NGSO satellite systems based on domestic as well as foreign satellites in various frequency bands is urgently needed. This new integrated regulatory and licensing framework should lead to the issue of a single operating license under the UASL framework rather than multiple licenses and approvals under different and multiple legal frameworks. Such a framework should not be exclusively for Low Bit Rate applications for IoT devices but should allow satellite networks to serve India's broadband (and narrowband) connectivity needs for consumers, industry, government agencies, transportation as well as utilities and other use cases. In line with the best international practices, light touch licensing, predictable regulatory policies and timely approvals through single window clearance, is essential. Adequate amount of spectrum is also a prerequisite for the satellite services to be deployed in a cost-effective manner. The proposed new licensing framework for satellite-based connectivity should not be exclusively for Low Bit Rate applications for IoT devices but should allow satellite networks to serve India's broadband capacity needs for consumers, industry, and transportation use cases as well.

As regards the licensing of user devices and terminals, considering that billions of IOT devices will be required to be connected, the correct policy framework that is very well suited for such applications is normally called "class" or "network" authorization (also referred to as "blanket" authorization) – similar to Wi-Fi delicensing regime in India. In other words, a license that authorizes a "family" of user terminals with given characteristics. This is also because, due to the ubiquitous nature of IOT usage, as specific coordination for individual user terminals is neither possible nor necessary. The continued growth of the Earth Stations in Motion (ESIM) service, which also enables IoT on board aircraft, ships, buses, emergency response vehicles etc., will require a similar blanket license, as those stations are in motion around the country. A blanket authorization, while adequately covering and regulating the user terminal operation with appropriate conditions, greatly simplifies the task of administrations and operator/service providers alike. Such a delicensing

for terminals can also be used along with the existing satellite licensing framework.

As regards the licensing of satellite system, development of a suitable regulatory framework for GSO and NGSO systems in Ku and Ka-band is required to allow for a timely introduction of these innovative services. This may include the modification to the DoT TEC Interface Requirement Document[1] on VSAT *based mobility services,* to allow also for land, maritime and aeronautical service provision in India.

Examples of such regulatory framework already exist in other countries/regions, as administrations around the world are in various stages of introducing the above developments in the Satellite Technologies. The terms of the proposed license should consider a nominal entry fee, a performance guarantee and a ratio of revenue sharing from the proposed earnings by the service provider. The earnings could be worked out on the basis of minimum roll out committed by the licensee over near term and medium terms. The initial license period could be of 5 to 7 years period extendable by similar term before expiry subject to the successful compliance of the license terms. Since the scheme envisages providing services in remote and sparsely populated areas, the objective should be to make the process an enabler for covering such remote areas and enhance the economic activity/eco system in the region/area.

Existing Spectrum charges such as the ones in the formula involving the Annual Royalty of Rs. 70 per KHz[2] would lead to potentially exorbitant fees for Satellites.

In general, spectrum costs vary from country to country and depending if its use is for gateway earth stations or user terminals. We have collected some data and will be glad to share it with TRAI, if they so wish. The general trend is, in any case, towards a lowering of spectrum fees. As an example, Australia is currently consulting[3], after prior consultations with the industry, on a drastic reduction of spectrum fees. The newly proposed fees in Ka-band are reported below (reduction of a factor of 10):

Frequency Band (GHz)										17.3 – 31.3
Reduction in Spectrum Fees (AUD per kHz)										90%
Spectrum Location	Australia-wide		High density		Med density		Low density		Remote density	
	Current	Proposed	Current	Proposed	Current	Proposed	Current	Proposed	Current	Proposed
17.3 – 31.3 GHz	0.7350	0.0733	0.1957	0.0195	0.0307	0.0031	0.0033	0.0003	0.000	

As another example, spectrum fees for user terminal operations are generally zero in Europe.

[1] No.: TEC/IR/SS/SCB-109/01/MAR-19

[2] refer formula , *R (in Rs.) = 35000 x Bs (Bs is the Bandwidth factor which is 1 for every 500 KHz band*

Similarly New Zealand has also allowed simpler licensing system for satellite services. Refer to https://www.rsm.govt.nz/licensing/frequencies-for-anyone/satellite-services-gurl.

Q5. The existing authorization of GMPCS service under Unified License permits the licensee for provision of voice and non-voice messages and data services. Whether the scope of GMPCS authorization may be enhanced to permit the licensees to provide satellite-based connectivity for IoT devices within the service area? Please justify your answer.

The existing GMPCS service providers are authorized to provide both voice and data services and are therefore in a position to provide IoT based satellite connectivity within their licensed area. As such no specific changes are needed in their licenses. However, the current GMPCS licensing conditions are very challenging and as such these would not be a cost-effective way of providing satellite connectivity for IOT or broadband connectivity for IOT devices..

Q6. Commercial VSAT CUG Service authorization permits provision of data connectivity using VSAT terminals to CUG users.

(i) Whether the scope of Commercial VSAT CUG Service authorization should be enhanced to permit the use of any technology and any kind of ground terminals to provide the satellite-based low-bit-rate connectivity for IoT devices?

(ii) Whether the condition of CUG nature of user group should be removed for this authorization to permit provision of any kind of satellite-based connectivity within the service area? Please justify your answer.

As explained earlier in other questions/answers these satellite systems Earth stations provide backhaul to **Type-1** IoT systems. Like in the Ku-band, Ka-band cousins, these Earth Stations (e.g., VSATs) should have the same/similar regulatory regimes as those indicated in the previous questions.

For the IoT devices themselves, forming part of the **Type-1** IoT system should be license exempted as provided in the above questions/answers.

Q7. (i) What should be the licensing framework for Captive licensee, in case an entity wishes to obtain captive license for using satellite-based low bit-rate IoT connectivity for its own captive use?

(ii) Whether the scope of Captive VSAT CUG Service license should be modified to include the satellite-based low-bit-rate IoT connectivity for captive use?

(iii) If yes, what should be the charging mechanism for spectrum and license fee, in view of requirement of a large number of ground terminals to connect large number of captive IoT devices?

7(i) to (iii) Scope of the Captive VSAT service Licenses can be modified to enable them to provide Low Bit Rate satellite connectivity for the IoT devices for their captive use.
Onetime lump sum fee should be based on the business plan of an example use case, or otherwise have no fees charged; this is because if the wrong (high) fee is charge it could make the service expensive for the end user. We suggest that an affordable and one-off cost recovery fee could be charged.

Q8. Whether the scope of INSAT MSS-R service authorization should be modified to provide the satellite-based connectivity for IoT devices? Please justify your answer.
The key objective of INSAT MSS-R service perhaps was Vehicle identification and tracking system. In order to maintain the integrity of such a system, it may not be advisable to mix this service with a commercial application. However, since considerable period has elapsed and the service has not been fully operationalized so far even after expiry of 5 to 6 years, there may be a need to have a fresh look into the viability of this service.
Q9. (i) As per the scope mentioned in the Unified License for NLD service Authorization, whether NLD Service providers should be permitted to provide satellite-based connectivity for IoT devices. (ii) What measures should be taken to facilitate such services? Please justify your answer.
(i) The NLD service providers should also be permitted to provide Satellite based connectivity for the IoT devices similar to the Type 1 IOT systems
(ii) With a separate hub for providing the satellite-based connectivity to the IoT devices and using backhaul bandwidth, mechanism should be evolved for cost effective solution. Increased competition by way of private sector participation and advancements in technology should lower the cost of satellite bandwidth to make the service more popular.
Q10. Whether the licensees should be permitted to obtain satellite bandwidth from foreign satellites in order to provide low-bit-rate applications and IoT connectivity? Please justify your answer.
Provision of cost effective, reliable satellite-based connectivity is the need of the hour, as currently there is no such capacity available in the Indian Satellites. Therefore, foreign satellite system should be urgently allowed to meet the country's satellite capacity needs. At the same time, the new licensing regime should also encourage Indian satellite capacity providers both in Government and Private sector domain to create such capacities within the country as early as possible to make them more cost effective.
In order to provide a level playing field for all satellite operators, licensing of satellite services should be on the same level for all Indian and foreign satellites
Q11. In case, the satellite transponder bandwidth has been obtained from foreign satellites, what conditions should be imposed on

licensees, including regarding establishment of downlink Earth station in India? Please justify your answer.

IoT systems usually operate with data from millions of IoT sensors when the satellite passes over the IoT sensors. As such, the regulations should not impose to have an Earth station in India in such cases. However, considering the national security aspects, it is possible to necessitate a mandatory regulatory provision to the foreign satellite operators to return data from the IoT devices in India to a local server within the country.

Q12. The cost of satellite-based services is on the higher side in the country due to which it has not been widely adopted by end users. What measures can be taken to make the satellite-based services affordable in India? Please elaborate your answer with justification.

Free and fair competition is the key to drive the prices down. It may be recalled that before the entry of private players in mobile telephony service in India, the cost of such services was exorbitant and with the opening of the sector, the prices for consumers have become affordable. Same can be said for the airline Industry.

With the entry of private sector participation in fabrication and launching of satellites within the country, especially of the NGSO category, it is a logical conclusion that the increased competition should lower the cost of satellites and their launch which should benefit the service providers and end users. Government should act as an enabler by lowering the administrative and licensing cost of operating satellite services to a bare minimum and allowing free competition in all aspect of the value chain regarding satellite connectivity to the IoT devices.

To achieve this, we suggest that:

- Satellite terminals and devices (both **Type 1** and **Type 2**) should be fully delicensed. (Similar to the present Wi-Fi devices which fully exempts Wi-Fi modems and devices from licensing requirements)
- The terms of the proposed new licenses for private and foreign GSO and NGSO satellite systems under UASL should consider a nominal entry fee, and a revenue sharing arrangement from the proposed earnings of the service provider. The revenue sharing arrangements could be worked out on the basis of minimum roll out committed by the licensee. The initial license period could be of 10 to 15 years period extendable by similar term before expiry subject to the successful compliance of the license terms. Such a licensing system would lead to drastic reduction in cost of services

Q13.Whether the procedures to acquire a license for providing satellite-based services in the existing framework convenient for the applicants? Is there any scope of simplifying the various processes? Please give details and justification.

Under the existing framework, it takes more than two years to get a wireless /operating license from DOT. There is also a dual process where separate licenses are required from different wings of the DOT. This process needs a complete overhaul.

Needless to say, the complete process of licensing should be online. It should be user friendly, and all required approvals should take place in a stipulated time bound manner (e.g. 30 days) through a single portal. Human interaction should be resorted to only in exceptional cases that too with objective of such interaction well defined in advance.

In addition, Type Approval standards and harmonized frequency bands for both the IoT devices and Satellite Terminals based international ITU or FCC or ETSI standards need to be adopted

Q14. If there are any other issues/suggestions relevant to the subject, stakeholders are invited to submit the same with proper explanation and justification

Satellite Connectivity to IoT devices especially in Remote and Sparsely populated areas should come under USO, for which, if need be, necessary funding could be provided by Government. This should accelerate the economic engine in the current difficult COVID 19 Pandemic.