	INTERNATIONAL TELECOMMUNICATION UNION	**SG20-C-xxx**
	TELECOMMUNICATION STANDARDIZATION SECTOR	**Study Group 20**
	STUDY PERIOD 2022-2024	**English only**

Question: xx/20

<div align="center">

CONTRIBUTION

</div>

Source:	ITU-APT Foundation of India (IAFI)[1]	
Title:	**Proposed new work item - use of Low Bit Rate Data Application through Satellite for connecting IoT devices, to be used in remote area.**	
Contact:	Shri Bharat Bhatia ITU-APT Foundation of India (IAFI) India	Tel:+91 9810173737 E-mail: Bharat.bhatia@itu-apt.org
Contact:	Mr. Misha Bajpai ITU-APT Foundation of India (IAFI) India	Tel: + 91 9868136066 E-mail: mishabajpai@yahoo.co.in

Abstract:

Use of IoT devices in remote areas is necessary to extend the wide range of benefits to sparse population and other establishments, in improving efficiency, increased safety, reducing the costs, and improved communication. Satellite technologies can play a vital role in IoT connectivity, especially the devices placed in remote area.

ITU-T SG20 Regional Group for Asia and the Pacific (SG20RG-AP) is invited to study and develop necessary reports and recommendations for guidance of the Asia pacific administrations on the use of IoT devices in remote areas and extending the wide ranges of benefits including improved efficiency, increased safety, reduced costs, and improved communication, for necessary action in development of satellite infrastructure in remote area, adoption of open sky policies for satellite, allowing satellite service providers for using all types of satellite orbits (LEO/MEO/GEO) and all frequency bands (L, S, C, Ku and Ka etc)

Use of satellite communication to connect IoT devices in remote area

Satellite connectivity is the best available connectivity option for providing internet in the unserved and underserved areas of the world. Following features of the satellite-based solutions are ideal for IoT traffic.

(i)   Satellite networks can have global coverage allowing the IoT to be connected to remote locations, where terrestrial connectivity is not available or cannot be extended due to cost or terrain constraints.

[1] ITU-APT Foundation of India is a sector member of ITU-T. For more details, please visit https://itu-apt.org

(ii) The IoT ecosystem needs ubiquitous, resilient and seamless connectivity for the devices to run efficiently. Satellites, in conjunction with terrestrial services, have a proven track record of resilient services.

(iii) Satellite communications have broadband, narrowband and broadcast capabilities. Accordingly, the global network of satellite operations can support the needs of IoT devices with different bandwidth and capabilities.

IoT Low-Bit-Rate applications require low power, low cost and small size terminals, so task of data transfer in remote area can be effectively perform using satellite. IoT based applications through satellite connectivity can provide enterprises with newer opportunities to increase operational efficiency, reduce costs and simultaneously secure goods, personnel and assets.

Satellite Connectivity Models for Low-Bit-Rate Applications:

Two models are developed for provision of satellite-based connectivity for IoT and low-bit-rate applications.

(i)   Hybrid model consisting of LPWAN and Satellite.
(ii)   Direct to satellite connectivity.
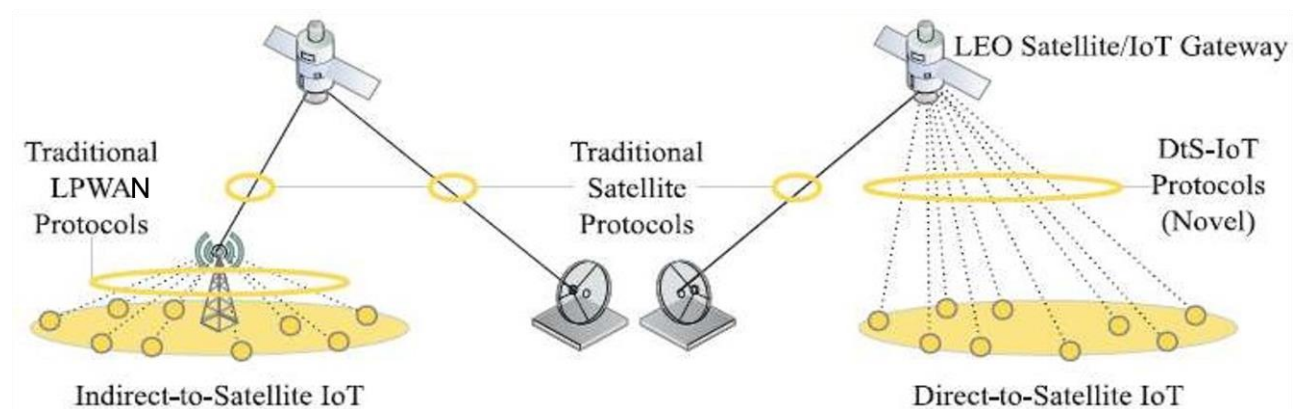
a. In **Hybrid (LPWAN + Satellite) or Indirect Model**, each sensor and actuator in a network may communicate with the satellite through an intermediate sink node, i.e., Low Power Wide-Area Network (LPWAN) or LPWAN gateway. In LPWAN, a network server coordinates several gateways through a reliable backhaul and in turn gateways interact through wireless links with potentially billions of low-power devices.

The LPWAN technologies have been standardized by 3GPP. The LPWAN technologies possess several characteristics that make them particularly attractive for applications requiring low mobility and low levels of data transfer (100s of bps to several 100s of kbps). Their main characteristics are:

- Low power consumption (to the range of nanoamp) that enable devices to last for 10 years on a single charge,

- Optimized data transfer (supports small, intermittent blocks of data),

- Low unit device cost,

- Simplified network topology and deployment,

- Improved outdoor and indoor penetration coverage compared with existing wide-area technologies,

- Secured connectivity and strong authentication,

- Integrated into a unified/horizontal IoT/M2M platform, where operators have this in place,

- Network scalability for capacity upgrade.

b. In **Direct-to-Satellite Model**, devices directly communicate with the satellite without the need of any intermediate ground gateway. The satellite receives data from IoT devices and transmits the data to the ground station nearest to the device and the data gets stored in the application server for further processing. This model can be used for wide area sensor network with sensors spread over wide geographical territory to provide low-cost, low-power, secured direct-to-orbit satellite connectivity for the Internet of Things.

Direct-to-satellite is a more preferred solution in challenging scenarios such as:

(i)   During disaster or natural calamities in areas where fast deployments are required and not much hardware is available or possible to arrange
(ii)   In areas where the devices are on the move, placement of a LPWAN node would not be economically viable and preferred.
(iii)   In areas where only a few devices are to be connected and therefore, a LPWAN node is not economically viable.

However, many of the existing satellite networks are not commercially suitable for supporting millions of direct connections, which are required in IoT applications.

Use of various satellite orbits:

IoT applications being Low-Bit-Rate, require low power, low cost and small size terminals that can effectively perform the task of signal transfer with minimum loss. The selection of satellite orbit depends on the requirements of the IoT application. GEO satellites provide high density coverage and higher speeds of communication. They can also accommodate larger onboard antennas that can help reduce the size of terminals. On the other hand LEO/MEO satellites can provide wider coverage and lower latency that is suitable for real time communications. Depending on the orbit chosen, the satellites can target a set of applications that is most suitable for the GEO/LEO or MEO orbits.

Proposal

Use of IoT devices in remote areas is necessary to extend the wide range of benefits to sparse population and other establishments, in improving efficiency, increased safety, reducing the costs, and improved communication. Satellite technologies can play a vital role in IoT connectivity, especially the devices placed in remote area.

ITU-T SG20 Regional Group for Asia and the Pacific (SG20RG-AP) is invited to study and develop necessary reports and recommendations on the use of IoT devices in remote areas and extending the wide ranges of benefits including improved efficiency, increased safety, reduced costs, and improved communication, for necessary action in development of satellite infrastructure in remote area, adoption of open sky policies for satellite, allowing satellite service providers for using all types of satellite orbits (LEO/MEO/GEO) and all frequency bands (L, S, C, Ku and Ka etc)

****