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SATELLITE COMMUNICATIONS IN IOT NETWORKS

Abstract

Connection of IoT devices operating outside the coverage areas of terrestrial networks is becoming an urgent issue. Given the increasing mobility, autonomy and territorial distribution of IoT subscribers, such tasks cannot be solved without satellite communication channels. 3GPP and ESOA have developed requirements for a 5G satellite network determined by a combination of key services, including Advanced Mobile Broadband (eMBB), Mass Internet of Things (mIoT) and Ultra-Reliable Low-Latency Communications (uRLLC). The low maximum service range of the 5G ground segment makes the 5G satellite segment the most important component of such networks in remote areas. However, building a seamless 5G model on a global scale, including ground and satellite segments, may face significant challenges. An analysis shows that the composition of the connected environment for IoT is heterogeneous at present and has all the tendencies to remain so in the future. Comparison of the maximum service range from a base station in various IoT connected environments shows that the topology of IoT solution stirs the choice of a proper communication option. Important factors influencing the choice of satellite communication channel for an IoT solution are perceived including: a stationary or mobile object, data transfer rate required, requirements for continuity of connection, a form factor, data security issues, etc. A comparison of fixed-satellite (FSS) and mobile-satellite (MSS) systems characteristics vs IoT connectivity requirements shows that these two types of satellite systems provide various options due to their composition and topology. For the rapidly increasing mobile IoT subscribers, mobile satellite systems (MSS) are becoming more and more promising. The key advantages of such systems are reviewed. A Russian satellite system "Gonets", created by order of the State Corporation "Roscosmos", has been present in the MSS segment since 2002 (Operator - JSC "Satellite system "Gonets"). A description of the "Gonets" system is given including the ground segment, the communication scheme, the subscriber equipment, the services provided. The most promising segments of satellite IoT in Russia are described and a case study on monitoring deer herds grazing in remote areas using autonomous trackers "Gonets" is given. The growing demand for MSS channels has become an important driver for the development of a next-generation "Gonets" system largely focused on the IoT market. A brief on the next-generation "Gonets" satellite system is provided.