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SATELLITE NETWORK DESIGN FOR EFFECTIVE INTEGRATION WITH FUTURE 6G TERRESTRIAL MOBILE COMMUNICATION SYSTEMS

Abstract

Terrestrial cellular networks have discerned development to improve user experience by providing higher data rates, lower latency, support for dense networks, and many more. However, there are several domains where a complementary satellite provides an advantage, such as service to maritime and aeronautical platforms, crisis management support, and communication to geographically isolated and sparsely populated areas. As a result, future standards such as 6G are anticipated to include satellites as an integral part of the network, similar to contemporaneous experiments with 5G-satellite integration. The whole scope of this research revolves and evolves around two essential considerations. First of which is the network access algorithm that minimizes the amount of transmissions. Secondly, High data rate services to remote, mobile platforms. Detailed plans for the creation of a test-bed for satellite-6G integrated networks is developed which is aided by Simulink. The proliferation of communication devices, combined with the demand for greater data speeds, has led to a spectrum shortage. As a consequence, satellite and ground systems will invariably share frequencies in adjacent band or co-frequency mode. Physical and network layer design studies were carried out in both cases, keeping smooth interaction with the ground network in mind. Detailed and advanced trials centric to creative incorporation of NOMA with Cognitive Radio aiding the spectrum shortage have been done. By incorporating ML into 6G technology, intelligent base stations will be able to make decisions for themselves, and mobile devices will be able to construct dynamically flexible clusters based on learnt data. Hence, we will be resorting to implementation of unsupervised machine learning algorithms. AI and machine learning are employed here since AI is partially included in 5G, making the system more automated. A machine-learning-based model that interacts with the simulation environment will be created. ML models will be used in the simulation of 6G. The procedure begins with feature extraction for model optimization, followed by the model being sent into the simulation environment. The model will be analysed, its correctness will be confirmed, and it will be optimised depending on the prior simulation environment to improve accuracy. Results for network algorithms will be drawn from Simulink. Inter-satellite communication will be established from a test-bed created on SATSIM. This will help by incubating HSTN (Hybrid Satellite-terrestrial Network) leading

to accomplishment of 6G establishment goals. All this will lead to a paradigm that can be conceived for residential based network integrations.