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# SECURE EMBB SERVICE DELIVERY OVER 5G NR NON-TERRESTRIAL NETWORKS

**Abstract**

Fifth-Generation (5G) wireless communications are characterized by growing demands for advanced services with dissimilar features, which depend on the traffic type (i.e., human, machine), requirements (i.e., data rates, power consumption, latency, and others), and recipient devices (i.e., sensors, smartphones) of the transmitted data. Hence, the International Telecommunication Union (ITU) defines three service usage scenarios: enhanced Mobile Broadband (eMBB), massive Machine Type Communications (mMTC), and Ultra-Reliable Low-Latency Communications (URLLC).

The main priority of 5G is to provide any services anywhere and anytime by considering space-to-ground communications with the involvement of Non-Terrestrial Networks (NTN) to reach areas where the terrestrial network coverage is poor or absent.

Since video applications predominantly give the global mobile data traffic due to large data volume and high demand from widely used smart devices, handling numerous requests for different eMBB services represents a challenge in radio resource management and capacity. High-Throughput Satellites (HTS) efficiently exploit the radio spectrum and increase the system capacity by performing transmissions over multiple beams rather than a single beam featuring Fixed Satellite Systems (FSS).

The broadcasting nature of NTN transmissions, the wide-area coverage, and the long propagation path are the main factors that make satellite communications vulnerable in terms of security. The security assurance of both networks and users is considered one of the foremost requirements of a 5G system. With the aim to realize a secure system, some mechanisms should be implemented for the protection of data confidentiality and integrity, entity authentication, and user privacy.

This paper proposes the Security for Satellite Multicast Transmission (S-SMT) scheme for secure eMBB service delivery over 5G NR-enabled NTNs. The proposed S-SMT relies on the RSA (Rivest-Shamir-Adleman) encryption algorithm to cater to the nature of multicast transmissions of serving a set of NTN terminals exploiting the same radio resources. This security measure avoids that data intended for a portion of NTN terminals are received also by malicious entities, not authorized to access such information. This optimizes the energy consumption of NTN terminals, as it avoids the waste of energy caused by receiving data that could be tampered or breached.

Simulation campaigns will be conducted by means of an ad-hoc simulator developed in MATLAB to assess the effectiveness of the proposed S-SMT scheme against the conventional scheme for satellite

communications executed in the absence of security mechanisms. The system-wide performance will be evaluated in terms of wasted energy and satisfaction of NTN terminals.