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A SHARED CUBESAT AND LEO CONSTELLATION FOR QUANTUM KEY DISTRIBUTION
SERVICE AND 5G IOT SERVICE: QUANGO PROJECT OVERVIEW AND DESIGN
CONSIDERATIONS

Abstract

Secure and reliable exchange of data and information plays a crucial role in our society, for example protecting money transfers, commercial transactions, medical data, remote control of sensible infrastructures, etc. Efforts are striving towards achieving a global network coverage even in remote geographical areas.

In this context, the QUANGO (cubesat for QUANTum and 5G cOMmunication) project, started in January 2021 under the EU Horizon 2020 Research and Innovation program, is aimed at designing and prototyping the key elements of a satellite mission that targets the delivery of both IoT services and Quantum Key Distribution (QKD) services, implemented by means of a constellation of CubeSats that operate in LEO. The rationale behind this vision is to address the growing need for the safe, reliable, and ubiquitous exchange of data in our society that is becoming of paramount importance for a plethora of activities. The implementation of this project can provide a new paradigm to share the satellite infrastructure required for secure communication based on quantum technologies and for 5G communication. The spacecraft will carry two interconnected payloads:

- A 5G IoT radio, called access network payload, based on a flexible software-defined radio (SDR).
- A secure communication system based on a quantum link to distribute quantum keys to the ground.

The combination of these two payloads allows for the implementation of a QKD service where the 5G IoT link, in addition to the delivery of IoT services, is used as an integral part of the envisioned QKD solution. Moreover, the combination of these two payloads will contribute to reduce the cost of both services by sharing the satellite platform needed for both. QUANGO will therefore both provide connectivity to all sorts of devices and encryption services with unprecedented safety. In addition, it is studied how these two technologies can further improve synergically, getting benefits from each other's ecosystem. The project is being developed by a consortium of European universities, research centres and SME with a strong heritage in areas such as quantum cryptography, optical communication, microsatellites development and 5G networks.

The objective of the paper is to present an overview of the QUANGO project along with preliminary design considerations of the mission and platform to be developed.