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RAISIN - RADIO AMATEUR INTERNATIONAL SATELLITE INFORMATION NETWORK

Abstract

Small satellite mission operation capabilities are constrained due to the limitations in the line of sight of the mission ground station. A distributed approach where operators can gain access to community-owned ground stations aims to solve this problem.

Nowadays, radio amateurs worldwide are often encouraged to track the initial orbits after the satellite deployment. If they succeed, they may share the telemetry with the mission control but those initiatives are neither automated nor standardised.

Efforts have been undertaken in the past to create global networks for these types of missions but they did not gain widespread adoption. In the meantime, the world of radio communications has rapidly evolved in the last few years. For example, Software Defined Radios are now popular and affordable. RAISIN is an open source project that is born as the natural evolution of those systems and embraces the new technologies that are available. Additionally, it takes lessons from the world of cloud computing and the Internet of Things.

RAISIN is developed to be compatible with a broad range of commonly available equipment to ensure ground station adoption. Mission operators are offered a self-service space link access solution. Mission communication requirements are matched to the different characteristics of the ground stations involved. The set of compatible ground stations and the orbital parameters of the spacecraft are then used to calculate and provide a communication schedule.

In RAISIN, each ground station runs a light client that controls the station's hardware by leveraging the great work done by the GNU Radio and Hamlib communities. The scheduling, configuration and client user interface are web-based and accessible through a browser.

The performance of the scheduling algorithms is currently being evaluated in a virtual scenario consisting of 17 satellites and 100 ground stations. Live tests with real hardware and spacecrafts are being performed with the UVa ground station. Decoded telemetry data and raw baseband recordings are transferred to a server and made available for mission operators to peruse.