Paper ID: 37955
student

SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)
Near-Earth and Interplanetary Communications (6)

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LOCAL AND DEEP NETWORK COMMUNICATION TO SUPPORT ESA'S MOON VILLAGE VISION

Abstract

The ESA's Moon Village Vision seeks to transform the traditional space paradigm into a set of actions to create an environment where both international cooperation and the commercialization of outer space can thrive. Communication is one of the key factors for the Moon Village development. Robots will predominate during the first missions and interact with each other. This interaction includes communication between them and with Earth scientific and general purpose consumers. It will evolve later for the coming manned missions.

The aim of this paper is to describe the network architecture required by a multiple mobile robots mission on the Moon and their connection with Earth. The network architecture proposed is a combination of a mesh network topology for on-surface-communications and a star type for the Earth path. There are some challenges to overcome. One is the local high data rate for media payload (high resolution images and videos) including telemetry and tele-command between the robots on the surface and another challenge is a high data rate communication link with Earth ground stations. The on surface network is linked to Earth ground stations through a gateway. The mission under analysis is based on a rover colony with full mobility, requiring the complete rover village relocation. The gateway is carried by a main mobile platform, which enables the Earth communication and operation command. These network architectures are designed to be scalable and compatible with a Delay & Disruption Tolerant Networking (DTN). The DTN capability improves the Earth-Rovers communication and it will be ready to support future missions integration.

The main achievement of this study is to analyze the feasibility of the Commercial off-the-shelf (COTS) components to build an on-surface-network based on radio, the use of optical communication for the Earth connection and the design for the future evolution.