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THE NETWORK INFRASTRUCTURE FOR THE ARCHES DEMOMISSION SPACE

Abstract

The Demomission Space of the alliance *Autonomous Robotic Networks to Help Modern Societies* (ARCHES) is an analog campaign on Mt. Etna conducted in summer 2020. The overall aim of the alliance is the development of heterogeneous, autonomous and interconnected robotic systems which are finally tested within the Demomission. Scientific goals of this analog mission include the exploration and mapping of the environment on the selected site by various robotic elements, the acquisition and analysis of samples and the deployment of a radio interferometric array for astronomic observations.

The success of any analog campaign is highly dependent on a reliable communication infrastructure. Like spaceflight missions, when communications is "down", the accomplishment of an analog mission is likely to be endangered. Generally, analog testing allows for the verification and validation of novel and experimental concepts at low cost and risk. When proved in the field, confidence in these novel concepts increases. Conversely, if a new concept does not prove itself, equally valuable insights are gained which are useful for the planning of future space missions. Since analog campaigns are of experimental character, it is beneficial for the communication network to keep some degree of modularity and flexibility. Therefore, and in order to keep costs low, commercial network components are used.

The layout and set-up of the network infrastructure for the ARCHES Demomission Space is supported by DLR's Mobile Rocket Base (MORABA). This network comprises two directional radio links. One radio link connects the simulated ground segment near Catania with the base camp on Mt. Etna (more than 23 km air-line distance), and the other link reaches from the basecamp to a lander mock-up placed at a distance of approximately 300 m. From the lander, the network distributes to various robotic assets including four different rovers, a drone as well as multiple active payload boxes with scientific instruments. Over a virtual private network, the ground segment extends to the European Space Operation Centre located in Darmstadt. Apart from the operational network, further infrastructure is set up in order to prepare the Demomission. This includes internet access and an Uninterruptible Power Supply (UPS) at the base camp allowing for continuous operation of the radio links as well as a TeamSpeak server for voice communication between all project partners including scientists, engineers and operators during the mission.