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GRAND (GERMAN RESPONSIVE APERTURE NETWORK DEVELOPMENT) – A GROUND STATION NETWORK TO FULFILL RESPONSIVE SPACE REQUIREMENTS

Abstract

The constant increase of spacecraft launches highlights our reliance on satellites in our daily life. But what if suddenly some satellites are not available anymore? Or what if we have a critical situation which requires urgently support from space assets? And in general, how to support rapidly so many spacecrafts? Responsive Space is investigating solutions for deployments, activations and supports of space services within a few days. This includes investigations of space assets themselves and of all technologies required to launch and operate these.

GRAND, the German Responsive Aperture Network Development, is DLR's initiative to study ground station networks which will serve interests of responsive space. GRAND is being developed at GSOC (German Space Operations Center) and focusses first on small satellites missions in LEO orbits, for which it will propose an autonomous, resilient, scalable, sustainable and durable network. To achieve this, each ground station will need to support some, if not all, of these qualities in order to, combined in a network, fulfill the mission requirements.

Thus, one of the first tasks for GRAND is to identify and understand the existing ground stations and ground stations networks. In this paper, we will introduce the needs of responsive space, the typical responsive space missions and the resulting GRAND objectives. We will then propose an analysis of the ground stations technologies where their suitability for responsive space will be detailed. Technical parameters will be compared along with other critical aspects like costs and current licensing processes. Lastly, we will propose specific aperture networks for a set of representative responsive space missions.