SPACE OPERATIONS SYMPOSIUM (B6)
New Operations Concepts (2)

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DEVELOPMENT, IMPLEMENTATION AND VERIFICATION OF A NOVEL GROUND STATION ARCHITECTURE FOR REAL-TIME APPLICATIONS

Abstract

The CCSDS standards for ground communication are developed for robust and safe operations, but are not optimized for low latencies. There are, however, some applications such as real-time earth observation or closed loop control scenarios, where time critical processes are essential. This paper discusses the design and implementation of a novel system that focuses on fast communication, therefore enabling processes both on the ground and in space to receive data within a defined time frame. Since space missions are always complex undertakings and have individual goals and requirements, a modular architecture saves development time and is able to adapt to changing needs during the development cycle. Moreover, this also enables the integration of a redundant and distributed system design, which is essential for processing mission critical data and running real-time applications. The newly developed concept makes use of powerful technologies such as XML, a markup language that provides maximum flexibility, especially in terms of configuration options. The aspect of redundancy is realized by a cluster of network management nodes. These have a fixed set of rules to be redundant by themselves. Services register at the primary network management node and provide it with detailed information as to what data is being offered after which a classification based on a master/slave system is being done. Using this method, all consuming systems within the infrastructure will always know where to gather their required data from. A standardized, tailored communication protocol ensures fast data transfer between all subsystems and enables the required high grade of modularity in which small subsystems perform individual tasks. Next to presenting the theory, the outcome of various bench-tests and test-setups as well as experiences from the development phase are included. Furthermore, results and observations from the first successful field tests during the REXUS 7 and 8 sounding rocket campaigns are discussed.