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A HOLISTIC APPROACH TO THE OPERATION OF PUS-BASED CUBESAT TECHNOLOGY DEMONSTRATION MISSIONS USING EXISTING OPERATIONS CENTER MISSION CONTROL INFRASTRUCTURE

Abstract

Nowadays, CubeSats have evolved from simple technology demonstrators to important assets for space utilization to fulfill a myriad of complex goals. In contrast to small launching expenses, CubeSat operation costs are often higher due to their limited space-to-ground communication capabilities.

In addition, the recent emergence of PUS-controlled CubeSat platforms allows the use of traditional ground segment infrastructure, rather than adding dedicated mission control software for each new CubeSat. Apart from the idea of saving operation costs, these systems are overloaded with features, many of which are not applicable to proper CubeSat operations.

Therefore, a System is currently under development at DLR Responsive Space Cluster Competence Center (RSC), that allows adequate reconfiguration of established operational technologies and infrastructures to better fit into the active context of state-of-the-art CubeSat mission operations.

In this paper, we propose the design of a holistic CubeSat Control System, developed as a scalable service-based ground segment for the preparation and execution of CubeSat operations using established operation services and ground segment infrastructure in a decentralized fashion that enables multiple operating entities to cooperate on the same mission at the same time.

The proposed Holistic CubeSat Control System will be applied in a simplified setup onto the German CubeSat Technology Demonstration Mission "OTTER", intended to be launched by the end of this year. Three different operations centers will operate this CubeSat: The German Space Operations Center (GSOC); the FH Aachen Space Operations Facility (FHASOF); German Orbital Systems (GOS) on behalf of the RSC3, as the principal investigator. All operation entities will operate within the frame of the proposed Holistic CubeSat Control System from their respective locations.