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Quality and Safety, always a beginning! (1)

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IMPROVING FLIGHT SOFTWARE QUALITY WITHIN SMALL SATELLITE PROJECTS UTILIZING AUTOMATED LONG-TERM ENVIRONMENT SIMULATIONS AT THE EXAMPLE OF SALSAT

Abstract

Software quality assurance is a crucial factor for the software development of space applications. The software maintenance and improvements during the operational phase are restricted through available contact times and the upload volume. Government and funding agencies request methods for assuring high software quality. Especially in early development phases. The typically small size of developer teams and tight schedule for small satellite projects can lead to unwanted constraints and limitations with regards to development tests. In some cases, tests are often postponed to the final integration and qualification of the satellite. Consequently, these tests can only detect a subset of possible errors. Logical or design errors, which occur after a couple of days or weeks of operation can often not be detected . Furthermore, test cases such as forced failures of critical hardware components are not accounted for.

Since 2019 a novel approach for space software assurance is developed at the chair of space technology at the Technische Universität (TU) Berlin and has been initially presented at the IAC 2019. The concept is to utilize automated module-in-the-loop tests and consistent long-term simulations already during the development process. The framework is being developed with a focus on easy application to a variety of different projects by decreasing the setup complexity and therefore minimizing the first entry hurdle. A major design philosophy is the applicability to projects with small development resources, such as universities or startups.

In this paper the application of the framework to the Spectrum AnaLysis SATellite (SALSAT), which is scheduled for launch in summer 2020, is being examined. The SALSAT project started in July 2018. The satellite reuses the TUBiX10 nanosatellite bus developed at the TU Berlin within the S-NET project. The primary payload is a spectrum analysis payload, developed in the SALSA project. Additionally, a set of Fluid Dynamic Actuators (FDA) in a novel three axis configuration as well as an iMX7 based embedded SoM are implemented. The Linux single board computer is utilized as an image processing unit for the camera. SALSAT also features a new S band transceiver and direct communication with the SoM for a fast down- and uplink of mission data. Moreover, the entire communication architecture has been reworked and the existing On Board Computer (OBC) software is being improved.

This paper will present the development progress of the framework, the increased coverage of the utilized environment simulation and first results.