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SPACE PAYLOAD TEST SYSTEM: A FLEXIBLE SOFTWARE SUITE FOR TMTC MANAGEMENT FROM DEVELOPMENT TO INTEGRATION AND OPERATION MISSION PHASES

Abstract

Starting on the practical experience in Ground Support Equipment of a scientific mission, in order to optimize payload implementation, testing and integration process, an effort to bridge the gap between the needs of designers/ scientific users and those of the integrators/ testers, has been made. The idea is to provide a practical tool able to support the development activities at sub-system level, the system interface definition till to the final tests and integration activities. And the small missions are the ones will mostly benefit of such an approach. A SW system, has been designed, implemented and tested in the real mission environment of the Solar Wind Analyser instrument suite, onboard Solar Orbiter (ESA M-class mission 2020). The system is a Payload Test System for space equipment and so it's name **spacePTS**. This SW solution provides a full front-end towards the equipment under test: it actually implements completely the business logic of an EGSE, managing all the HW interfaces towards the equipment and providing these functionalities as a service for the check-out systems. It allows control, monitoring and management of SCOS2000 telecommands and telemetries, power sources, and custom analogical links on top of the HW equipment. Thanks to a plug-in based architecture, it is able to provide an easy integration mechanism to hardware devices, both as a SCOE and withremote (socket and IP based) communications protocols (CCSDS, EDEN, CC. . .). It is anyhow a lightweight SW solution and fits also on embedded systems inside a sort of portable development kit, deliverable to payload developers in order to ease integration activities. Finally, spacePTS also fits to support routine tasks in the ground segment's operational phase. It provides systems monitoring capabilities, with user custom panels highlighting in real time TM reception, parameters change and alarms and also assisted telecommands preparation. The on-going integration with an automated smart telemetries checking module will add further possibilities to system monitoring during operations. This smart system is able to learn from reference telemetries and the automatically evaluate system status, highlighting critical values, trends and un-expected behaviors, for mission operators support. Thus as a final consideration, spacePTS is a tool fitting to needs of different user's roles and different phases in the frame of small (to larger) space missions and allows for costs optimization in design and operations, removing need for double implementations of the same functionalities and of the same procedures, in different SW/HW systems, at different times.