SPACE SYSTEMS SYMPOSIUM (D1)
Innovative and Visionary Space Systems Concepts (1)

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# TOWARDS UNIFIED MONITORING FOR SPACECRAFTS

**Abstract**

Within this paper we present a new philosophy in monitoring spacecrafts: the unification of the various kinds of monitoring techniques used during the different lifecylce phases of a spacecraft.

The challenging requirements being set for this framework to be developed are: - "separation of concerns" as a design principle (dividing the steps of logging from registered sources, sending to connected sinks and displaying of information) - usage during all mission phases - usage by all actors (EGSE engineers, groundstation operators, etc.) - configurable at runtime, especially regarding the level of detail of logging information - very low resource consumption

We first developed a prototype of the monitoring framework as support library for the German Aerospace Center's (DLR) own research real-time operating system RODOS. This prototype was tested on dedicated hardware platforms relevant for space, and also on a satellite demonstrator used for educational purposes.

As a second step, the results and lessons learned from the development and usage of this prototype were transfered to a real space mission: the first satellite of the DLR compact satellite series - a space based platform for DLR's own research activities.

Within this project, the software of the avionic subsystem was supplemented by a powerful logging component, which enhances the traditional housekeeping capabilities and offers extensive filtering and debugging techniques for monitoring and FDIR needs. This logging component is the major part of the flight version of the monitoring framework. It is completed by counterparts running on the development computers and as well as the EGSE hardware in the integration room, making it most valuable already in the earliest stages of traditional spacecraft development.

Future plans in terms of further developments of the monitoring framework are not limited to using it for the next compact satellite project. We aim to include the support from the groundstation as well. This can be achieved (1) by transferring the monitoring messages via the communication chain to ground, and (2) by adding appropriate tools for real-time configuration and display of information to the infrastructure of the control room. If these extensions are accomplished, all prerequisite are fulfilled in order to perform a complete replacement of the traditional housekeeping functionality of a satellite with our new unified monitoring and its realization, the monitoring framework. This would lead us to a seamless integration of the monitoring framework not only into to the spacecraft itself, but into the whole space system.