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# FDIR APPROACH OF A MODULAR SATELLITE PLATFORM ARCHITECTURE

**Abstract**

In recent years, constellations of small satellites have been proposed for a wide variety of applications. Due to the number of satellites in such constellations, there is a growing need for autonomy of the single satellite particularly in handling failures. Here, especially the FDIR approach followed for such systems needs to ensure maximum operation time with minimal interference from ground.

Technische Universität Berlin developed TUBiX20, a modular platform for 20kg satellites to support future missions of the university. The platform's architecture is based on a number of distributed, cold redundant computational nodes, which connect to a central power and data bus system. These nodes provide the necessary processing power for the different subsystems' software and act as interfaces to the system's data bus for devices such as sensors or actuators and even payloads. TechnoSat, the first satellite based on the TUBiX20 platform, is a technology demonstration mission that is scheduled for launch in the second half of 2016.

The TUBiX20 platform implements a hierarchical, four-level FDIR concept. The first FDIR level concerns node internal failures that each node's software can cope with on its own. On the second level, failures of devices connected to a node are handled. Here for example, the node can switch to the redundant device unit and report the problem. If a node experiences a problem which cannot be solved internally, it can trigger its own reset, which marks the third FDIR level. As all nodes of the platform use the same basic hard- and software configuration, their FDIR functionality is also consistent. A special role is fulfilled by the electrical power system node, which is responsible for managing the redundancy of all nodes of the platform. It is therefore implemented in warm redundancy and runs in a worker/monitor configuration. If any of the satellite's nodes fails to deliver a periodic health message or a power consumption outside the nominal operating range is reported, the redundant counterpart of this node is activated. The entire FDIR system is carefully adjusted to the modular platform architecture and developed to support a large degree of autonomy.

This paper gives an overview of the FDIR configuration implemented for the TechnoSat satellite and will furthermore give an insight into future configurations that will allow for largely autonomous failure handling.