

# FLEXIBILITY OF INTERFACES WITHIN AN SRAM-BASED DYNAMIC RECONFIGURABLE PROCESSING MODULE

**Session: SpaceWire onboard equipment and software**

## **Long Paper**

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## **ABSTRACT**

The paper describes the outputs from the architectural design phase of the ESA-funded project *Dynamic Reconfigurable Processing Module (DRPM) Demonstrator*, highlighting the interfaces point of view. The project's aim is to design, develop and test a demonstrator to exploit the entire capabilities of SRAM-based FPGAs for future space missions, including run-time adaptability. During the activity, benefits and challenges of integrating reconfigurable devices as (additional or compensating) units for on-board processing are demonstrated. Concerning the harsh space requirements, mitigation of radiation effects and recovery in case of failure are emphasized.

In general, the DRPM demonstrator concept is a flexible modular processing system that is interconnected by a SpaceWire network. Instruments can be attached to the DRPM via SpaceWire, CAN bus, WizardLink, and flexible GPIOs. Higher levels of protocols are implemented in a dynamically reconfigurable core, enabling run-time adaptation of the interface specification. Moreover, the reconfigurable core allows for high performance data processing algorithms to be implemented and reconfigured at run-time to cope with changing application requirements. The DRPM will feature SpaceWire RMAP which may be used to remotely update SW application memories or configuration registers. A key feature of the DRPM, foreseen implemented with applicable PUS services, is to cater for uploading of new configuration files for the FPGAs or system controller SW from ground station. As part of the global fault-tolerance concept of the DRPM, dynamic reconfiguration is used to mitigate radiation effects during a mission.

The system controller of the DRPM demonstrator will be realized on an interface daughterboard for the RAPTOR prototyping system using the ATMEL SpaceWire – Remote Terminal Controller AT7913E. In addition to the built-in interfaces, MIL-Std-1553B, WizardLink and additional SpaceWire ports are connected via an interface FPGA, adding to the overall flexibility given by the DRPM.