SPACEWIRE DEVICE DRIVER FOR THE REMOTE TERMINAL CONTROLLER

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Short Paper

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ABSTRACT

The SpW Remote Terminal Controller (RTC) ASIC is a single chip embedded system that includes a general purpose LEON2-FT SPARC V8, two SpaceWire (SpW) interfaces, a Controller Area Network (CAN) bus controller and other interfaces for payload data acquisition, such as an ADC/DAC. With this architecture RTC aims to be the back-end solution for a broad range of instruments and can also be used as a central SSMM controller using RMAP protocol.
The RTC benefits from software and tools available for the LEON2-FT SPARC V8 and the CAN bus. SpW interface is the only complex peripheral that requires new onboard software development.

This paper presents an implementation of a SpW device driver for the RTC. The driver provides the necessary interrupt service routines, functions and procedures to handle the SpW interface. It includes the definition of an Application Programming Interface (API) for SpW compliant embedded systems. It has been designed to provide maximum performance and functionality while simplifying the overall operation from the user point of view. Reception scheme is based on early packet identification so a decision can be made if a packet is immediately processed, discarded or saved in the system for further processing. Transmission scheme supports multicasting and send queues. The actual implementation is able to dynamically adapt to incoming data bursts, and enables the RTC to act as a network bridge or gateway using minimum processing power. Other important features of this SpW device driver are:

- Support for sustained bidirectional high data rate transfers.
- Automatic link error recovering and notification.
- Packet length and time stamp information provided.
- Support for generic packet types and native implementation for VCTP and RMAP protocols.
- Provides isolation from hardware resources and interrupt service routines.
- Blocking and non-blocking network operation modes.
- Support for Tx/Rx of Time-Codes.
- Compact memory footprint.

The goal of these drivers was to develop the software required to handle the high data rates that SpW is capable of, with the current processing power available for space applications. The implementation in other SpW compliant devices will also be considered in the final paper.