IMPLEMENTING THE CCSDS PACKET TRANSFER PROTOCOL FOR ECSS SPACEWIRE LINKS

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Short Paper

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ABSTRACT

Transmission of CCSDS Space Packets over ECSS SpaceWire links is nothing new, but with the draft ECSS *SpaceWire protocols* standard in public review, it is possible to implement telemetry encoders and telecommand decoders offering interoperability.

As stated in the draft ECSS-E-ST-50-11C standard, the *CCSDS Packet Transfer Protocol* (called CPTP hereafter) has been designed to encapsulate a *Space Packet* into a SpaceWire packet, transfer it from an initiator to a target across a SpaceWire network, extract it from the SpaceWire packet and pass it to a target user application.

Aeroflex Gaisler has implemented telemetry encoder and telecommand decoder FPGA devices where the communication is done via SpaceWire links, but by means of the Remote Memory Access Protocol (RMAP). The Space Packet is carried in the Data field of a RMAP write command. The RMAP protocol provides additional protection of the Space Packet by means of the 8-bit Data CRC field, which can be used to discard any packets that have been received with errors. (The Space Packets can themselves include a 16-bit CRC as optional Packet Error Control, but this would require the checking of the Space Packet which is not in line with a layered protocol approach.) The routing is done by means of the addressing capability of the RMAP write command; the address can be used for example to distinguish different Virtual Channels on a telemetry downlink.

The new CPTP protocol has some similarity with what is used in the Single Chip Telemetry and Telecommand part (a.k.a. AT7909E/SCTMTC). The *User Application* field could be seen as a mechanism for routing, as the SCTMTC uses the first byte of the SpaceWire packet header to route Space Packets to different Virtual Channels. The actual Space Packet is carried in the cargo of the SpaceWire packet, and is ended with an EOP. What is new is the introduction of the *Target Logical Address*, *Protocol Identifier* and *Reserved* field, the two former being specified also for RMAP.

Since both RMAP and CPTP adhere to the same SpaceWire protocol identification ECSS standard, there is no problem mixing them in the same implementation. What they have in common is that a SpaceWire packet carries one-and-only-one Space Packet. The CPTP protocol does however neither provides means reporting the delivery of the packet, nor adding data error detection as the RMAP approach (other than parity on the SpaceWire link). Consequently CPTP requires fewer overheads.

The full paper will cover the implementation of a CPTP and RMAP compliant CCSDS / ECSS telemetry and telecommand system, comparing the two approaches, discussing their advantages and disadvantages, and proposing a combined approach.