

SPACEWIRE-RT

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Long Paper

Steve Parkes¹ and Albert Ferrer¹

¹*School of Computing, University of Dundee, Dundee, DD1 4HN, Scotland, UK.*

Email: sparkes@computing.dundee.ac.uk.

ABSTRACT

SpaceWire is designed to connect together high data-rate sensors, processing units, memory sub-systems and the down link telemetry sub-system. It provides high-speed (2 Mbits/s to 200 Mbits/s), bi-directional, full-duplex, data links which connect together the SpaceWire enabled equipment. Networks can be built to suit particular applications using point-to-point data links and routing switches. The remote memory access protocol (RMAP) was subsequently designed to provide a simple, standard means for one SpaceWire node to write to and read from memory inside another SpaceWire node.

SpaceWire and RMAP operate with a best effort quality of service. While error detection, reporting and recovery techniques are defined in both standards, there is no defined means of recovering any data that was lost or that arrived at its destination in error. Also there is no concept of timeliness in either of these standards. For many SpaceWire applications this is not a problem, but for other applications quality of service is a key issue.

SpaceWire RT (SpaceWire Reliable Timely) is intended to provide a consistent quality of service mechanism for SpaceWire and to support proposed CCSDS sub-network services. Furthermore it is intended to support control applications running over SpaceWire where timely delivery is essential. To achieve this SpaceWire-RT implements quality of service mechanisms over SpaceWire.

The communications model for SpaceWire-RT is one of virtual point-to-point connections across the SpaceWire network each of which connects a source channel buffer in one node to a destination channel buffer in another node. There are two types of system supported:

Asynchronous – where the sending of information over the SpaceWire network is asynchronous and priority is used to provide timeliness of delivery.

Synchronous – where information is sent over the SpaceWire network synchronously with each source channel being assigned one or more time-slots when it is allowed to transmit information. Timeliness of delivery is controlled by a schedule table used to specify which source channel can send information in which time-slot.

A user application writes into an appropriate source channel buffers. This information is then transferred across the SpaceWire network and become available in the corresponding destination channel buffer.

This paper will introduce SpaceWire-RT, outlining the key requirements and describing the proposed quality of service mechanisms.