REAL-TIME SIGNALING IN SPACEWIRE NETWORKS

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Long Paper

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ABSTRACT

In the paper we present an overview of different low-latency signaling codes in the SpaceWire technology and its further releases: Time-codes of the origin SpaceWire standard, Multiple Time-codes and Interrupt codes that have been proposed for next SpaceWire standard release (generalized hereafter by abbreviation "SpW RT signals").

All the SpW RT signals have an important feature – due to their specification at the low levels of the SpaceWire protocol stack they are distributed by the same cables, channels that data packets are send and switched, but their distribution does not depend on data packets flow intense and can traverse even blocked by data channels and paths. This core feature differs SpaceWire from other high-rate interconnection standards and makes it most appropriate for real-time distributed systems interconnections.

We estimate delay times for distribution of SpW RT signals in its normal operation. In case of errors and faults recovery procedures are run in nodes and switches. Overheads and delays for recovery are estimated, compared with sideband signaling over dedicated wires for every particular service. We analyze two fault-tolerance features of the SpW RT signaling:

- an *integrity* of the service – SpW RT signals reaching destinations in case of faults;
- an *availability* of the service – non-blocking further operation of the service, distribution of RT signals after faults.

Examples of SpW RT signals application for RT signaling and synchronization in distributed systems with SpaceWire interconnections: Global time service, RT signaling service for event-driven software, instruments synchronization (e.g. synchronous data sampling).

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