PROTOTYPE IMPLEMENTATION OF A ROUTING POLICY USING FLEXRAY FRAMES CONCEPT OVER A SPACEWIRE NETWORK

Session: SpaceWire networks and protocols

Long Paper

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ABSTRACT

The benefit of SpaceWire as an efficient data-link to transmit science data on board spacecraft is now demonstrated through the growing development of SpaceWire in major space science projects such as Bepi-Colombo, Gaia and the James Webb Space Telescope. The efficiency of SpaceWire becomes even more obvious when used in a network configuration. Although not yet really popular onboard spacecraft, a network configuration not only reduces the overall data links mass, it also enables flexible implementation of scalable distributed systems which can be of great interest for future applications. However, state of the art SpaceWire networks cannot offer sufficient levels of communication services quality with the existing protocols which limits their field of application to non critical applications from the dependability or real-time standpoint.

The FlexRay communication concept developed in the automotive industry takes into account dependability and real-time properties to provide guaranteed access to the network for critical data transfers through parallel channels and time slotting. The remaining bandwidth is shared on a best effort basis for non-time critical data transfers. A study performed at Astrium makes an adaptation of FlexRay protocol elements such as communication cycle and routing strategy over a SpaceWire network. This article will present the study outcome which includes the preliminary definition of a real-time communication service protocol, the protocol requirements on SpaceWire nodes and routers, the prototyping on a SpaceWire Network and measurements for evaluation of the achieved performance.