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Author: Prof. Steve Parkes
University of Dundee, United Kingdom

Dr. Martin Dunstan
University of Dundee, United Kingdom

Mr. Stephen Mudie
STAR Dundee Ltd, United Kingdom

REAL-TIME SPACEWIRE INSTRUMENT SIMULATION IN A DAY

Abstract

SpaceWire is a widely used spacecraft on-board data-handling network technology. Design, integration and test of SpaceWire enabled units often require other SpaceWire units to be simulated. For example, the development of a mass-memory unit will require simulation of all the instruments that are sending it data. The simulation needs to run in real-time resulting in the need for SpaceWire interface devices, a computer running a real-time operating system, and expensive bespoke real-time software development. This paper presents a novel real-time simulator that aims to provide real-time simulation of SpaceWire equipment without the need for designing real-time software.

The SpaceWire Electronic Ground Support Equipment (EGSE) is a test and development unit that simulates instruments or other SpaceWire equipment in real-time. It is configured using a simple yet powerful scripting language designed specifically for SpaceWire applications. Once configured the EGSE operates independent of host software resulting in real-time performance. This can be used to rapidly mimic the behaviour of SpaceWire equipment, vastly reducing traditional development time, risk and cost associated with writing equivalent software in a real-time operating system. It also allows real-time simulation to be introduced earlier on in the development life cycle, reducing project risk.

The SpaceWire EGSE can generate detailed packets in pre-defined sequences at specific times and data rates, controlled by state machines and events. It is an extremely useful tool during equipment development and validation, and spacecraft assembly, integration and test. Using the SpaceWire EGSE and its associated scripting language it is possible to produce a complete real-time SpaceWire instrument simulation in little more than a day.

The full paper will describe the SpaceWire EGSE, including the features and benefits it provides, how it operates, the specially designed SpaceWire scripting language that it uses and the software provided to configure and interact with the unit. It will also give examples of typical real-time instrument simulations that can be developed in a very short time.