SPACE SYSTEMS SYMPOSIUM (D1)
Space Systems Architectures (4)

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THE USE OF THE LUA SCRIPTING ENVIRONMENT FOR RAPID GROUND TESTING AND FLIGHT ACTIVITY DEVELOPMENT IN A CAN BUS BASED SATELLITE.

Abstract

The CAN bus has successfully been used in space for a number of years and it is finding ever more acceptance by the large space agencies like ESA. SumbandilaSat, South-Africa's second orbiting satellite, has been developed from the ground up using a dual-redundant CAN bus as its only on-board command and telemetry bus. An in-house developed protocol running over the CAN link layer provides a standard interface by means of which all electronic equipment – from the bus to the payload – can be controlled. This, in itself, is not new, but it is through the use of a scripting language (LUA) that the CAN bus really comes to its full potential on SumbandilaSat.

LUA is firstly employed as a means to formally specify the interface for each node – known as the node specifications. The node specification captures all commands and responses, with their parameters, in a human readable format. The language was also extended to include support for the SunSpace housekeeping protocol. This is known as the LUA CAN Interface (LCI) and allows full access to all housekeeping commands and telemetry on any node in the network from a simple, powerful scripting environment. A second powerful feature of the LCI environment is the ability to emulate a node using the LUA scripting language. The emulator receives all commands and provides all responses that the actual hardware would have had to. A test setup can contain any number of actual and emulated nodes allowing for sub-system testing and software development before having all the hardware available. As units become available, they replace the emulators and the test can be repeated. LCI provides a testing framework for automating the tedious process of running and documenting tests.

The final, and perhaps most powerful feature of LCI, is that the housekeeping on-board computer also runs the same LUA interpreter, and provides the same LCI environment, as is found on the ground. Complex activities, like the taking of an image, or the downloading of image data, are accomplished using LUA scripts on the satellite. These scripts can be developed and tested on the ground, using a mixture of actual hardware and emulators, and can be used as is on the satellite, without the need to re-code or translate to a different flight execution environment.