

Master thesis projects

Error Injection IP

Single Event Upsets (SEUs) are radiation effects that can lead to catastrophic malfunctioning in the space environment. The goal of this thesis is to develop a VHDL/Verilog IP that performs error injection to model SEUs in an FPGA design directly in hardware.

Programmable protocol built on top of WizardLink interfaces

WizardLink is a family of transceivers used to send data over high-speed serial links. WizardLink has been commonly used in space missions as a simpler alternative to SpaceFibre. The goal of this thesis is to build an existing or a custom protocol using the existing WizardLink IP core and compare the performance with similar protocols such as SpaceFibre, both in terms of speed and packet loss rate.

A potential application of AI in RISC-V System-on-Chips

Using AI for FDIR (Fault Detection, Isolation and Recovery) is a hot topic in the aerospace community. This thesis will explore simple FDIR algorithms in a SoC based on the NOEL-V RISC-V processor.

Benchmarking the LEON5 & NOEL-V processors against on-board data handling benchmarks

OBPMark (On-Board Processing Benchmarks) is a set of computational performance benchmarks developed specifically for spacecraft on-board data processing applications. The thesis will explore the performance of the LEON5 & NOEL-V against the OBPMark benchmarks, also measuring the performance impacts of the fault tolerant features of the two processors.

Design and evaluate new tool for WCET and/or processor interference analysis using new simulation technology

TSIM instruction simulator has been used widely in Space application software design for analyzing software behavior and generating evidence of correctness required for flight software qualification. With the new 8-core LEON5 GR765 SoC a new simulator architecture is being designed. The thesis will design and evaluate a new tool for analyzing simulated instruction sequences and/or AHB bus access sequences. The objective of the tool will be evaluated in the beginning of the project to focus on one or more of the following topics WCET, processor bus interference, L2 cache usage statistics, branching or memory utilization. Depending on focus, it can be a one- or two-persons project.

Port GRLIB to Efinix FPGA

The GRLIB IP library has integrated support for all major FPGA vendors. The thesis will extend the support to the Efinix FPGAs and implement a template design for the Trion T120 BGA576 Development Kit to demonstrate the performance of the IP library in the FPGA and serve as a basis for new users.

Sensor interface investigation

JESD204B is a standard for high-speed data converters that defines the interface between data converters and data-acquisition systems. The standard is used in a variety of applications, including telecommunications, aerospace, and industrial automation. The thesis will look into how to support a JESD204B/C interface.

Add CHI support to the open-source L2C-Lite IP core

Coherency is an important feature of a cache hierarchy and to allow a system with multiple caches, hardware support for coherency is a must to offload software. A coherency concept based on AMBA CHI is currently under development and evaluation. The thesis will extend the open-source L2C-Lite core with support for the CHI transactions needed to support the coherency protocol and demonstrate the performance in a multi-cache system.

Processor Power Estimation Method

The goal of the thesis is to implement a method to estimate power consumption on a real processor device using a synthetic testcase approach. A hardware setup to measure power consumption is already available from an earlier activity. The core idea is to develop small software test cases (loops) that cause as much activity as possible inside the device, run these on the processor and measure the resulting power consumption.

Bachelor thesis projects

Development of a Python GUI for test data analysis

The work aims to build a Python GUI capable of processing, analyzing, plotting, and then saving in a tabulated format raw outputs from a radiation effects test software in real-time. The work aims at addressing concepts like object-oriented programming, data analysis methods, the use of different Python libraries, etc.

Other topics

Didn't find what you were looking for? In addition to the listed topics, we continuously add thesis projects within embedded software and ASIC/FPGA development. Do not hesitate to contact us at career@gaisler.com for further discussions.