

Client/Company/Organization: Collins Aerospace

Submitter Name: Matt Weber

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Project Contact: _____

Email: _____

Project Title:

Co-Simulation of a Avionics Interface Device

Project Abstract:

The project will take an existing co-simulation solution which uses a SystemC TLM + QEMU (<https://xilinx-wiki.atlassian.net/wiki/spaces/A/pages/28737647/QEMU+LibSystemCTLM-SOC>) coupled with a product firmware definition. The goal for the team is to implement additional backend SystemC simulations and frontend test software to exercise the new logic. The tooling for the project will use Xilinx QEMU, SystemC 2.3.2 and Xilinx SystemC TLM libraries. An existing architecture will be shared that outlines some proprietary logic and interface behaviors coupled with the Xilinx solution.

Expected Deliverables:

I do have some schedule constraints where I can fund hands on advising of this work in 2021 if the project starts for Spring semester. My plan was to sponsor weekly meetings with a Linux and firmware expert on the call to help the team.

For the 1st semester the goal would be to get an understanding of the concepts and to do some basic additions.

- 1) Extend an existing use case that receives data (simulated firmware -> processor) to also include a transmit (processor -> simulated firmware).
- 2) Build a UDP bridge to send/receive data from the SystemC model (used to support dataflows in the memory map interface model)

The 2nd semester will look into adding additional sensors and protocol definitions in simulated firmware + software.

- 1) A temperature sensor and the development of a Linux driver
- 2) ARINC 717 receiver and basic Linux test application
- 3) Stretch goal of implementing a UART and hooking it into the Linux serial subsystem

Specialized Resources Provided by Client:

None. The technology is completely open and a standard Linux machine can be used for development/run-time. Only specialized item would be ICD definition of a FPGA design used to develop new simulation models.

Anticipated Cost: _____

Financial Resources Provided by Client: I can easily commit \$5k if invoiced in 2020

Preferred Students for the Project:

- Electrical Engineering
- Computer Engineering
- Software Engineering
- Cyber Security Engineering

Other Special Skills: Xilinx Zynq, Linux Apps, Linux Kernel Drivers, QEMU, Cross compiling, Python, C, C++, SystemC

Other:

Anticipated Client Interaction (estimate):

- 1 meeting per week
 - In person, Over the phone, Web / video conferencing
- 1 meeting per month
 - In person, Over the phone, Web / video conferencing
- 2 or more meetings per month
 - In person, Over the phone, Web / video conferencing
- 1 meeting per semester
 - In person, Over the phone, Web / video conferencing

Meeting ABET Criteria

Please rate the following statements as they relate to your proposed project:

0 – Not at all *1 – A Little* *2 – Somewhat* *3 – A Lot* *4 – Completely*

On this project, students will need to apply knowledge of mathematics, science, and engineering 0 1 2 3 4

This project gives students an opportunity to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability 0 1 2 3 4

This project involves students from a variety of programs, i.e., CprE, EE, and SE 0 1 2 3 4

This project requires students to identify, formulate, and solve engineering problems 0 1 2 3 4

This project gives students an opportunity to use the techniques, skills, and modern engineering tools necessary for engineering practice 0 1 2 3 4

Project Approval – for use by ECpE Senior Design Committee

- Approved: sddec21-proj003
- Project Assigned: _____
- Advisor(s) Assigned: _____