

# NOLAN MCCLEARY

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## SUMMARY

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**Languages:** C, C++, Python, Verilog/SystemVerilog

**Development Tools:** Git, BASH, CMake, Linux, Quartus/Vivado, Modelsim, LTspice, GitLab CI/CD, Docker

**Lab:** On-chip Debugger (GDB), Logic Analyzer, Oscilloscope, Signal Generator

## EXPERIENCE

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### Embedded Software Intern

May 2023 – Aug 2023

*General Dynamics*

*Ottawa, Ontario*

- Developed three separate Linux drivers in C++ to acquire, decode, and stream critical Zynq Ultrascale+ MPSoC (Xilinx) information over TCP through a series of custom JSON-RPC API endpoints. This included real-time monitoring of processor temperatures, Quad SPI (QSPI) partition boot status, and boot binary checksums.
- Engineered an automated build system via Buildroot to allow a consolidated Ultrascale+ firmware core to be built without any external board support package. Key components to be built included an Embedded Linux kernel (PetaLinux), FPGA image, bootloader, the root filesystem, and all relevant baremetal applications. Created a GitLab CI/CD pipeline using this build system to perform static code analysis on the firmware core across all used Xilinx toolchains concurrently, greatly accelerating the new core feature integration process as a result.

### Embedded Systems Intern

May 2022 – Dec 2022

*Teck Resources Limited*

*Sparwood, BC*

- Designed, built, and tested a remote voltage spike suppression and detection system with functionality for high-speed transient capture, Ethernet networking, and dynamic system network parameter reconfiguration over Ethernet. This voltage monitor was deployed across four different sites and helped to successfully suppress and identify the source of previously unidentified transients occurring at operationally critical locations inside heavy equipment, saving up to \$100,000 in previously lost throughput on each mitigated transient occurrence.

## PROJECTS

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### Multicore RC4 Decryption Engine

[Link to source code and documentation](#)

*June 2024*

- Used SystemVerilog to develop a custom decryption engine for implementing the RC4 stream cipher encryption/decryption algorithms on an Altera Cyclone V FPGA.
- Parallelized decryption process across 90 individual decryption cores in order to greatly accelerate system performance and successfully break messages with unknowns keys with key lengths of up to 28 bits.

### Laser Projector

[Link to source code and documentation](#)

*February - April 2024*

- Designed, programmed and tested an ARM MCU based laser drawing robot.
- Utilized hardware timers and interrupts along with digital filtering to facilitate hard real-time PID control of the laser beam via the simultaneous operation of two DC motors.
- Employed direct memory access (DMA) along with hardware buffering to ensure reliable and high-speed acquisition of laser coordinate data over a USART connection. This approach allowed for the real-time streaming of arbitrarily large laser image files to the controller, ensuring scalability by removing any constraints that would otherwise be imposed by storing data directly on the system's flash memory.
- Developed a USART-based laser image preprocessing and streaming application in Python to reduce computational load on the controller and ensure compatibility with any file following the ILDA laser image standard.

## EDUCATION

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### University of British Columbia

*Bachelor of Applied Science in Electrical Engineering*

*Vancouver, BC*

*2020 - 2025*