Talha Khalil

tkhalil0703@gmail.com | +1 587-968-4372 | talhakhalil.ca | Github/talhakhalil0703

PROFESSIONAL SUMMARY

Senior Embedded Firmware Engineer with over 5 years of experience architecting and developing high-performance, safety-critical firmware in **C++17** and **C**. Proven expertise in **custom RTOS development**, **bare-metal programming**, and **hardware bring-up** for consumer electronics. Holds a **Master of Science in Computer Science** from the University of Texas at Austin. Adept at delivering robust, production-ready solutions in remote and distributed environments. Passionate about system-level optimization, compiler design, and mentoring high-performance engineering teams.

CORE TECHNICAL SKILLS

- **Languages:** C++17, C, Python, Assembly (various)
- **Embedded Systems:** RTOS (Custom/Zephyr), Bare-metal, Hardware Bring-up, Device Drivers, Power Management (Low Power), I2C/SPI/UART
- **Development Tools:** Git, Gerrit, Jenkins, JTAG, Logic Analyzers, Oscilloscopes, Docker

WORK EXPERIENCE

Senior Software Engineer (Embedded Firmware) | GARMIN, Cochrane, AB *Jan 2022 - Present*

- **Firmware Architecture & Design:** Designed and implemented embedded C++17 firmware on a custom RTOS across multiple MCU platforms (NXP, Ambiq, NRF), ensuring strict real-time performance and safety compliance.
- **Performance Optimization:** Architected a new diagnostic and performance measurement system, increasing CI/CD pipeline stability by **30%** and improving simulator execution speed by **300%**.
- **Hardware Bring-up:** Led the firmware integration for new hardware components from initial board bring-up to mass production, collaborating closely with electrical and mechanical engineering teams to resolve timing and signal integrity issues.
- **Codebase Refactoring:** Spearheaded a major refactor of legacy firmware modules, reducing bug reports by **80%** within six months and significantly improving code maintainability.
- **Control Systems:** Implemented closed-loop feedback control algorithms for power management, optimizing energy efficiency and system stability under varying load conditions.
- **Technical Leadership:** Mentored 9 engineers, providing expert guidance on real-time design patterns, complex debugging, and hardware-software integration best practices.
- **HPC Data Processing:** Developed a high-performance computing tool to process sensor data across multiple nodes, resulting in a **10x speedup** in the processing pipeline.

Software Engineering Intern | GARMIN, Cochrane, AB *Jan 2021 - Dec 2021*

- Developed automated current consumption testing frameworks to validate battery life consistency across embedded devices.
- Created computer vision-based regression testing tools, expanding test coverage and reducing manual validation time.

EDUCATION

Master of Science in Computer Science | University of Texas at Austin *3.90/4.0*

- **Focus:** Distributed Systems, Compilers, Parallel Computing, Machine Learning, Deep Learning, and Generative AI.

Bachelor of Science in Electrical Engineering | University of Calgary *3.85/4.0*

KEY PROJECTS

- **Custom UNIX Kernel:** Developed a functional UNIX kernel from scratch in C, implementing threading, scheduler, system calls, and lazy page allocation.
- **Optimizing Compiler:** Built a compiler to convert subsets of Java into MIPS Assembly, featuring custom lexical analysis, parsing, and code generation optimizations.
- **GPU-Accelerated K-Means:** Implemented a CUDA-based parallel clustering algorithm, demonstrating expertise in high-concurrency programming.
- **Arduino-Android Mesh Network:** Designed a distributed messaging device using LoRa and BLE for off-grid communication.

LEADERSHIP

- **Capstone Advisor at Garmin:** Guided three distinct student teams on embedded sensor projects, including a vocal anomaly tracker, wireless location sensor, and a barbell trajectory sensor.