Vrushabh Chandanshive

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EMBEDDED SOFTWARE ENGINEER

Professional Summary

Embedded Firmware Engineer with 3+ years of hands-on experience in RTOS optimization, secure communication protocols, and bootloader development. Skilled in Modbus RTU stack design, flow control systems, and hardware validation with strong expertise in STM32 microcontrollers, FreeRTOS, and MISRA C compliance. Proven track record in enhancing system reliability, implementing field-grade security features, and delivering production-ready firmware backed by unit testing and complete technical documentation.

Technical Skills

Microcontrollers: STM32 (G0/H5/U5), ARM Cortex-M4/M33, PIC16F877A
Communication Protocols: Modbus RTU, UART, SPI, I2C, RS-485, HART
Firmware Development: Embedded C, C++, RTOS (FreeRTOS), Bootloaders, HAL, Bare Metal
Tools & Environment: STM32CubeIDE, MPLAB X, MCUXpresso, VS Code, J-Link, Logic Analyzers
Testing & Quality: CuTest Framework, Unit/Integration Testing, MISRA C, CRC Verification

Professional Experience

Emerson Innovation Centre Pune, India
Associate Firmware Engineer Aug 2024 – Present

- Project: Code Enhancement in Existing Product
  - Enhanced system reliability and performance by eliminating race conditions with atomic operations, optimizing RTOS heap management, and defining deterministic timeouts.
  - Improved signal accuracy and control stability through debouncing logic and Anti-Windup techniques in system loops.
  - Boosted runtime efficiency by replacing costly modulus operations with bitwise methods, significantly reducing MCU cycles. techniques.
- Project: Modbus RTU Security Feature Development
  - Designed and implemented security protocols for Modbus RTU, including register partitioning and automatic deactivation to prevent unauthorized access.
  - Enhanced usability and transparency by providing real-time user indications and feedback at the application level.
- Project: Bootloader Design and Development
  - Designed and documented bootloader architecture (HLD, SDD, memory maps) and developed a secure firmware upgrade protocol with command-based retry logic.
  - Strengthened system security by implementing CRC validation, size boundary checks, and version control verification.
  - Built custom metadata utilities to embed target parameters seamlessly into firmware images, ensuring robust and reliable upgrades.
- Project: Firmware Development for Flow Control
  - Developed a production-ready Modbus RTU stack with native function and exception codes, enabling accurate real-time flow control using sensor data and PWM-driven solenoid valves.
  - Built low-level EEPROM/Flash routines and enforced MISRA C:2004 compliance with static analysis, ensuring robust and maintainable firmware.
  - Validated edge cases through exhaustive unit testing with CuTest, delivering reliable and production-quality firmware.

Emerson Innovation Centre Pune, India
Graduate Engineer Trainee Aug-23 Aug-24

- Project: Hardware Validation & Image Transfer Stack
  - Conducted hardware validation across UART, Profichip, Digital I/O, and watchdogs, ensuring reliable system performance.
  - Designed an asynchronous Master–Slave firmware image transfer system with CRC-based integrity checks and intuitive DIP switch/LED indicators.
  - Authored comprehensive technical documentation (HLD, DLD, sequence diagrams, test reports) to support development and validation.

Emerson Innovation Centre Pune, India
Project Intern Feb 2023 – Aug 2023

- Project: Battery Management System
  - Executed unit, system, build verification, and environmental chamber testing; identified and resolved embedded code bugs in legacy firmware.
  - Analyzed battery consumption profiles and delivered actionable performance reports to optimize efficiency.

Education

B.Tech in Electronics Engineering Walchand College of Engineering, Sangli, India
2019 – 2023 **CGPA:** 7.5 / 10.0