

Vrushabh Chandanshive

+91 8766747355 ✉ vchandanshive555@gmail.com  [LinkedIn](#)
Pune, Maharashtra, India

Professional Summary

Detail-oriented Embedded Firmware Engineer with 3 years of experience in the full software development life cycle (SDLC) for industrial automation products. Proficient in C/C++ and RTOS architectures for STM32 microcontrollers. Proven track record in designing robust communication stacks, bootloaders, bare-metal applications, and fail-safe firmware while implementing rigorous unit testing frameworks.

Technical Skills

- **Microcontrollers:** STM32 (G0/H5), 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

- Utilized **atomic operations** for shared variables to eliminate race conditions.
- Implemented optimized **heap management** for RTOS to prevent unexpected application crashes.
- Defined deterministic timeouts across operations to boost overall system reliability.
- Added **debouncing logic** for polling-based communication to ensure accurate signal processing.
- Introduced **Anti-Windup control** by clamping the integral sum within system control loops.
- Optimized runtime performance by replacing modulus operations with **bitwise AND operations**, significantly reducing MCU machine cycles.

Project: Modbus RTU Security Feature Development

- Analyzed security requirements and designed protection protocols for the **Modbus RTU protocol**.
- Partitioned registers into local and protected sections based on target product architecture.
- Implemented an **automatic deactivation mechanism** to prevent unauthorized access.
- Provided application-level user indications for real-time visual feedback and usability.

Project: Bootloader Design and Development

- Authored **High-Level Design (HLD)**, Software Design Documents (SDD), and detailed memory maps.
- Developed and deployed a robust firmware upgrade protocol for the system bootloader.
- Created a custom **metadata utility** to seamlessly embed target parameters into firmware images.
- Mitigated vulnerabilities by implementing strict security checks: **CRC validation** for metadata integrity, firmware size boundary checks, and version control verification.
- Implemented a command-based upgrade mechanism featuring built-in retry logic for flash memory writes.

Project: Firmware Development for Flow Control

- Engineered an production-ready **Modbus RTU stack** supporting native function codes and exception codes.
- Configured sensors to sample pressure and temperature media data to dynamically calculate real-time flow rates.
- Configured **high-resolution PWM** signals to achieve precise control over solenoid valves.
- Developed generic low-level routines (read, write, erase) for interfaced **EEPROM** and **external Flash memory**.
- Enforced code quality by performing static analysis matching **MISRA C:2004** guidelines.
- Conducted exhaustive unit testing using the **CuTest framework** to validate firmware edge cases.

Emerson Innovation Centre

Pune, India

Graduate Engineer Trainee

Aug 2023 – Aug 2024

Project: Hardware Validation & Image Transfer Stack

- Performed low-level hardware validation testing covering **UART**, **Profichip**, Digital I/O, and external watchdogs.
- Designed an asynchronous Master-to-Slave firmware image transfer system using custom communication request-response logic.
- Developed robust data integrity checks on incoming slave binaries using **CRC verification**.
- Created intuitive error and progress indicators leveraging hardware DIP switches and LED combinations.
- Generated technical documentation including HLD, DLD, sequence diagrams, and formal test reports.

Emerson Innovation Centre

Pune, India

Project Intern

Feb 2023 – Aug 2023

- Executed comprehensive Unit, System, Build Verification, and environmental Chamber testing.
- Isolated and resolved embedded code bugs within the legacy project codebase during validation cycles.
- Collected, analyzed, and generated actionable performance reports on battery power consumption profiles.

Education

Walchand College of Engineering

Sangli, India

B.Tech in Electronics Engineering

2019 – 2023

CGPA: 7.5/10