

THALLAPALLI AJAYKUMAR

Embedded Firmware Engineer

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Professional Summary

Embedded Firmware Engineer with around 3 years of experience in developing STM32-based embedded systems and firmware solutions. Skilled in Embedded C firmware development, board bring-up, low-level system initialization, peripheral driver integration, and communication protocols. Experienced in RTOS concepts, bootloader implementation on Cortex-M0 & Cortex-M4, linker scripts, and low-power firmware design. Passionate about building reliable, efficient, and scalable embedded systems with strong problem-solving and debugging skills.

Professional Experience

Embedded Firmware Engineer

2023 – Present

iLensys Technologies

- Developed and maintained embedded firmware in **C** for **STM32 and Arduino(cpp)** microcontrollers.
- Performed **Board bring-up** on custom STM32 hardware including GPIO, ADC, Timers, Interrupts, and Clock configuration.
- Implemented and debugged communication protocols such as **UART, SPI, I2C, MODBUS** and **CAN**.
- Gained hands-on exposure to **Bootloader concepts on ARM Cortex-M0 and Cortex-M4 CPU's**, including application jump mechanism and memory mapping.
- Supported in firmware validation and debugging for a **customer product**, gaining system-level understanding.
- Interfaced sensors and external peripherals; handled data acquisition and validation.
- Debugged firmware issues using **Docklight**, serial logs, and hardware debugging tools such as **Logic Analyzers, Oscilloscope**.
- Used **STM32CubeIDE** and **STM32CubeProgrammer** for development, flashing, and debugging.
- Used **WinMerge** for code comparison and configuration tracking.
- Gained exposure to interfacing and driving **E-Paper displays**, including display initialization, frame buffer updates, partial/full refresh concepts, and power-efficient display handling.
- Worked on **Low-Level Driver Development**, hardware interfacing, and Register-level programming for STM32 peripherals.

Projects

Project 1: CTRS (Cryogenic Tracking & Reporting System)

Developed embedded firmware for a cryogenic monitoring system to track LN2 level, cryogenic temperature, and vacuum inside the freezer. Implemented application firmware to control a 10-inch display based on user inputs received via UART. Developed low-level drivers for a **Load cell ADC** to measure the weight of LN2 inside the freezer and implemented LN2 usage calculation logic based on real-time weight measurements for monitoring and display purposes. Implemented a **vacuum sensor ADC driver** to continuously monitor the vacuum level between the inner and outer chamber of the freezer for insulation reliability and system safety. Developed a driver for **External NOR flash memory** to store configuration data and firmware update images for future application upgrades. Designed and implemented a digital low-pass filter to minimize noise and stabilize sensor readings under dynamic operating conditions.

Tools Used: STM32CubeIDE, WinMerge.

Project 2: HCHE (High Compact High Efficiency Freezer) – 4–20 mA Add-On Device

Developed an embedded add-on device as part of the HCHE freezer project, designed for long-term medical sample storage. Implemented a custom **bootloader** to enable seamless application flashing and future firmware updates, ensuring maintainability and scalability. Designed and developed a **DAC driver** to generate a 4–20 mA current loop output for industrial-grade monitoring of LN2 levels and temperature. Developed a low-level **RTD sensor driver** for accurate measurement of cryogenic freezer temperatures and integrated temperature acquisition into the monitoring system. Integrated the **Modbus communication protocol** to connect with multiple slave devices, allowing the system to act as an intermediary controller for coordinating freezer units and automating the filling process. This solution enhanced interoperability, enabled remote monitoring, and improved reliability of cryogenic storage systems in medical research facilities.

Tools Used: STM32CubeIDE, WinMerge, Oscilloscope.

Project 3: Modular Electronics:

Contributed to an internal project by developing **driver code for ADC** supporting multiple resolutions and implementing **EEPROM drivers** for non-volatile data storage. Performed **board bring-up activities** for fresh hardware, validating GPIO, clock configuration, and peripheral initialization. Verified and debugged communication protocols including **UART, SPI, and I2C** using different sensors, ensuring reliable data acquisition and system-level functionality. This project strengthened expertise in low-level driver development, hardware validation, and sensor interfacing for embedded platforms.

Tools Used: STM32CubeIDE, Logic Analyzer, Oscilloscope

Technical Skills

Programming Languages

C, Embedded C, Basic Assembly.

Microcontrollers

STM32 (ARM Cortex-M0/M4/M33-series), STM32WB Series, Arduino UNO.

RTOS

ThreadX RTOS, FreeRTOS, Real-Time Multitasking, Task Scheduling, Inter-Task Communication, Synchronization Mechanisms, and Watchdog-Based System Monitoring.

Low Power Firmware Design

STM32 Sleep, Stop, Standby modes, clock and peripheral power control.

Wireless Technologies

Bluetooth Low Energy (BLE), Bluetooth 5.x fundamentals, BLE-enabled STM32WB platform.

BLE Protocols and Features

Familiar with GAP, GATT, L2CAP, SMP concepts, BLE Advertising, Scanning, Connection Management, Pairing and Bonding, Custom Services and Characteristics, Notifications and Indications.

Communication Protocols

UART, SPI, I2C, CAN, MODBUS, MQTT.

Development Tools

STM32CubeIDE, STM32CubeProgrammer, Docklight, SWD, WinMerge, Tera Term, LTspice, nRF Connect.

Education

B.Tech – Electronics & Communication Engineering

2022

Krishna Chaitanya Institute of Technology & Sciences (JNTUK)

CGPA: 7.69.

Diploma – Electronics & Communication Engineering

2019

Bapatla Polytechnic College (SBTET, AP)

Percentage: 86.12.%

SSC

2016

Zilla Parishat High School-Tripuranthakam (Board Of Secondary Education, AP)

CGPA: 8.0

Additional Information

- Strong interest in low-level embedded systems, bootloaders, and power-optimized firmware.
- Comfortable working on both **product development** and **customer-driven projects**.
- Quick learner with a strong foundation in embedded fundamentals.