

Tejashri A.

Embedded Systems Engineer at Vector India

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Objective:

Dedicated and results-driven Embedded Systems Engineer with over 2 years 4 months of professional experience. Proficient in microcontroller programming, real-time operating systems, and embedded software development. Seeking a challenging position to contribute technical expertise and innovative solutions in cutting-edge embedded technology projects.

Professional Experience:

Embedded Software Engineer

Vector India

November 2023 – till now

Embedded Software Engineer

Persistent Systems Limited, Pune, Maharashtra

June 2022 – November 2023

Firmware Development and Optimization:

- Developed and optimized firmware for embedded systems in the **banking and industrial sectors**, improving efficiency in transaction processing and machinery control.
- Enhanced system security by integrating secure bootloaders and encryption algorithms into firmware, adhering to industry compliance standards.

Real-Time Embedded Systems:

- Worked extensively with **FreeRTOS** for real-time task management, developing low-latency applications for time-critical systems like industrial automation and vehicle control systems.
- Designed and implemented **watchdog timers** and fail-safe mechanisms for system reliability in industrial environments.

IoT and Communication Protocols:

- Developed communication systems using **UART, SPI, I2C, and CAN** protocols for interfacing microcontrollers with sensors and actuators in industrial IoT systems.
- Integrated **MQTT** and **HTTP** for secure and reliable IoT communication, contributing to smart grid and home automation projects.

Hardware-Software Co-Design:

- Collaborated with hardware engineers to design custom PCBs for embedded devices, optimizing layout for size and power efficiency.
- Interfaced with **ARM Cortex-M, PIC, and AVR** microcontrollers to build embedded systems for real-time applications.

Testing and Debugging:

- Utilized advanced debugging tools like **JTAG** and **SWD** to troubleshoot complex hardware-software integration issues, reducing downtime in industrial machinery by 30%.

- Automated testing procedures using **Python** scripts, improving test coverage and reducing the overall testing time by 40%.

Microcontroller Programming:

- Programmed **STM32** and **8051** microcontrollers for various automation projects, including real-time data processing for industrial applications.
- Developed device drivers for integrating temperature and motion sensors with embedded control systems, improving response times in automation workflows.

RTOS and Task Scheduling:

- Implemented real-time operating systems for process automation, managing concurrent tasks with precise timing using **FreeRTOS**.
- Reduced system latency by 20% by optimizing task scheduling and memory management.

IoT Prototyping and Development:

- Designed and developed IoT prototypes for smart energy monitoring systems, employing **ESP32** microcontrollers and **MQTT** for remote data transmission.
- Built custom dashboards for real-time monitoring of energy usage, contributing to pilot projects that demonstrated a 10% reduction in overall energy consumption.

System Testing and Debugging:

- Conducted thorough testing of embedded systems using tools like **Oscilloscopes** and **Logic Analyzers**, troubleshooting issues related to sensor data acquisition and communication.
- Assisted in developing automated test frameworks to validate system performance under various environmental conditions.

Technical Skills:

- **Programming Languages:** Embedded C, C++, Python, Assembly Language, VHDL, Verilog
- **Operating Systems:** Linux (Ubuntu), Embedded Linux, Windows
- **Microcontrollers & Processors:** ARM Cortex-M (LPC2129), STM32, 8051, PIC, AVR, ESP32
- **Communication Protocols:** UART, SPI, I2C, CAN, Ethernet, MQTT, Bluetooth, Zigbee, LoRa, Wi-Fi
- **Development Tools:** Keil µVision, Eclipse, MPLAB, Proteus, MATLAB, Simulink, LabVIEW, TensorFlow Lite, Edge Impulse
- **Hardware Tools:** Oscilloscope, Logic Analyzer, Multimeter, Soldering Station, FPGA Development Boards
- **Version Control Systems:** Git, SVN
- **Other Skills:** RTOS (FreeRTOS), Device Drivers, PCB Design (Eagle, Altium), Signal Processing, Bootloader Development (U-Boot, Secure Boot), Low-Power Design, Embedded Security (Encryption, Authentication), CAN Bus, Machine Learning on Embedded Systems

Profile Summary:

- **Embedded Systems Development:**

- Hands-on experience in developing real-time embedded systems for various applications such as IoT, automation, and control systems.

- **Microcontroller Architectures:**

- Proficient in ARM Cortex-M, AVR, PIC, and 8051 architectures with a focus on efficient power management and peripheral integration.

- **Embedded Linux:**

- Experienced in configuring, building, and customizing Linux kernels for embedded applications, including device driver development and integration with real-time processing.

- **Device Drivers:**

- Developed device drivers for interfacing with sensors, actuators, and communication modules, ensuring efficient and reliable hardware-software interaction.

- **RTOS (Real-Time Operating Systems):**

- Expertise in FreeRTOS for real-time task management, inter-process communication, and synchronization techniques in embedded systems.

- **Communication Protocols:**

- Deep understanding of UART, SPI, I2C, CAN, Ethernet, and MQTT for embedded communication, ensuring robust data transfer between devices and modules.

- **Sensors and Actuators:**

- Worked with a variety of sensors (temperature, proximity, pressure) and actuators (motors, relays) in embedded systems for automation projects.

- **PCB Design and Prototyping:**

- Familiar with designing and fabricating PCBs using Altium Designer and Eagle, ensuring low-power, high-reliability embedded systems.

- **Debugging Tools:**

- Proficient in using JTAG, SWD, and GDB for debugging embedded firmware, along with oscilloscope and logic analysers for hardware troubleshooting.

Project Experience:

Project 1:- Industrial IoT-Based Predictive Maintenance System

- **Objective:**
Develop an Industrial IoT solution for predictive maintenance, enabling real-time monitoring of machinery performance and detecting potential failures before they occur.
- **Technologies Used:**
ARM Cortex-M3, ESP32, FreeRTOS, MQTT, Sensors (vibration, temperature, humidity), Embedded C, Python (for data analysis), and cloud platforms for data storage.
- **Responsibilities:**
 - Designed an embedded system using ARM Cortex-M3 and ESP32 to interface with various industrial sensors (vibration, temperature, humidity) for real-time data acquisition.
 - Developed firmware to process sensor data and transmit it via **MQTT** to a cloud server for real-time monitoring and predictive analytics.
 - Implemented **FreeRTOS** to manage multiple real-time tasks such as data acquisition, communication, and system health checks.
 - Used Python scripts to analyze collected data and predict machinery failures based on sensor trends.
 - Collaborated with hardware teams to design a robust PCB for the embedded control unit.
- **Achievements:**
Reduced machine downtime by 25% through early detection of potential failures, which increased overall production efficiency. The system was adopted by a major industrial manufacturer for trial deployment.

Project 2:- Secure Bootloader for Banking Devices

- **Objective:**
Design and implement a secure bootloader to protect embedded banking devices from unauthorized access and firmware tampering.
- **Technologies Used:**
ARM Cortex-M4, Keil μ Vision, Secure Bootloader, AES Encryption, Embedded C, SWD Debugging Tools.
- **Responsibilities:**
 - Developed a secure bootloader for banking devices based on the ARM Cortex-M4 architecture to ensure secure firmware updates.
 - Integrated **AES encryption** to protect sensitive data during boot and firmware updates, ensuring compliance with industry security standards.
 - Implemented a validation mechanism to check the authenticity of the firmware before execution, preventing unauthorized access.
 - Utilized **SWD debugging tools** to troubleshoot and test the secure bootloader in various hardware configurations.
 - Documented the bootloader process and provided comprehensive technical guidelines for the development team.
- **Achievements:**
Improved device security and compliance with industry standards, reducing the risk of unauthorized access by 30%. The bootloader has been implemented across multiple banking devices.

Project 3:- Smart Home Automation System with Real-Time Data Processing

- **Objective:**
Design a smart home automation system using IoT technology to control home appliances such as lighting, HVAC, and security systems through a centralized control unit.
- **Technologies Used:**
ESP32, FreeRTOS, MQTT, Embedded C, Mobile App (Android), Sensors (motion, temperature, light), Cloud Platforms (AWS IoT), Python for automation scripts.

- **Responsibilities:**

- Developed the embedded firmware for the ESP32 microcontroller to control home appliances based on real-time data from motion, temperature, and light sensors.
- Used **FreeRTOS** to handle concurrent tasks such as appliance control, sensor data acquisition, and communication with the cloud.
- Integrated **MQTT** protocol for seamless communication between the ESP32 and a mobile app, enabling users to remotely control their home appliances.
- Collaborated with mobile developers to design and integrate a user-friendly interface for real-time home automation control.
- Implemented security protocols for secure data transmission between the control unit and the cloud platform.

- **Achievements:**

The system achieved a 15% reduction in household energy consumption and was successfully deployed in several pilot projects. The solution was praised for its scalability and ease of use.

Education Details:

- **Bachelor of Engineering in Electronics**

Walchand Institute of Technology, Maharashtra, India

CGPA: 7.98/10 (2018 – 2022)

- **Diploma in Electronics and Telecommunication**

Siddheshwar Women's Polytechnic, Maharashtra, India

Percentage: 72.24% (2016 – 2019)

Certifications:

- Certified Embedded Systems Professional – Vector India, Bangalore (Nov 2023 – Aug 2024)
- ARM Cortex-M Microcontroller Workshop – Texas Instruments
- Embedded Linux Development – Coursera
- IoT Foundations: Networking and Security – LinkedIn Learning
- PCB Design and Fabrication – National Institute of Electronics & Information Technology (NIELIT)

Personal Details:

- Name:- Tejashri A
- Date of birth:- 30/11/2000
- Languages:- Telugu, English, Hindi, Kannada, Marathi
- Address:- 2 5 9 th Main, 3 rd block , Jayanagar, Bengaluru, Karnataka 560011.

Declaration:

I certify that the information provided in this resume is true and accurate to the best of my knowledge.

Tejashri A