

Atharv Singh

Embedded Firmware Engineer — CDAC Bangalore — 2.5+ Years Experience

atharvsingh3000@gmail.com — +91-816-023-0106 — linkedin.com/in/atharv-singh-970251195 — Sultanpur, India

PROFESSIONAL SUMMARY

Embedded Firmware Engineer currently working as a Project Associate at CDAC Bangalore, specializing in firmware development for STM32 and Arduino platforms — covering peripheral drivers, interrupt handling, DMA, FreeRTOS task scheduling, low-power optimization, real-time systems, memory management, and firmware lifecycle. Experienced in industrial communication protocols (UART, SPI, I2C, CAN, MODBUS, IEC 104) and sensor-driven IoT system design. Hands-on OT/ICS security experience: virtual environment simulation via GNS3, ELK Stack-based threat detection, and field audits across 9 critical infrastructure sites. Also contributed to power sector web applications (Spring MVC, JSP, SQL) in a supporting capacity. Holds a PG-Diploma in Embedded System Design from C-DAC ACTS, Pune.

TECHNICAL SKILLS

Languages: Embedded C, C, C++, Python, Java, MySQL

Microcontrollers: STM32 (HAL/LL Drivers, STM32CubeIDE), Arduino (AVR), ARM Cortex-M, ESP32, Raspberry Pi

RTOS: FreeRTOS - task scheduling, queues, semaphores, mutexes

Firmware Concepts: Interrupt handling, DMA, GPIO configuration, Timer/PWM, ADC/DAC, bootloader development, low-power modes, board bring-up, peripheral drivers, real-time systems, memory management, system optimization, hardware bring-up, latency reduction, device drivers

Protocols: UART, SPI, I2C, CAN, MODBUS, IEC 104, DNP3

Debugging & Testing: JTAG/SWD, GDB, OpenOCD, oscilloscope, logic analyser, serial monitor (UART)

OT/ICS Tools: GNS3 (OT simulation), Wireshark, Ettercap, Kali Linux, ELK Stack (Elasticsearch, Logstash, Kibana)

Dev Tools: Git, GitHub, VS Code, STM32CubeIDE, NetBeans, Linux CLI

Web/Backend: Spring Boot, Spring MVC, JSP, AJAX, jQuery, SQL/HQL

PROFESSIONAL EXPERIENCE

Project Associate — C-DAC (Centre for Development of Advanced Computing), Bangalore

Oct 2023 - Present (2.5+ yrs) — Bangalore, India

Project 1: CI Protection Framework - Asset Management Tool & SOC (OT Security)

- Developed an Asset Management Tool in C/C++/Python to monitor OT networks for 50+ unauthorized device activities, generating real-time alerts for security incidents.
- Developed RTU-MTU communication in C/Python using Modbus and IEC 60870-5-104 protocols for real-time industrial data exchange, monitoring, and control.
- Built C/Python-based detection mechanisms for malformed packets in IEC-104 and Modbus protocols; reduced false-positive alert rate by 30% through rule tuning.
- Designed and deployed a virtual OT environment using GNS3, simulating PLCs, RTUs, switches, routers, firewalls, and SCADA components for security validation.
- Simulated OT/IT security incidents (DoS, MITM, host scans, port scans) on virtual environment to validate detection capabilities of the Asset Management Tool.
- Built centralized logging pipeline using ELK Stack: parsed and normalized logs from Windows, Linux, RTUs, PLCs, and managed switches via Logstash.
- Developed Kibana detection rules using KQL and EQL for threat hunting and infrastructure observability across OT environments.
- Parsed and modified IEC 104 and MODBUS packets using custom Ettercap filters for protocol vulnerability demonstrations and security research.

Project 2: FTC (First Time Charging) & SAMPADA Web Application - Development & Maintenance

- Developed and maintained mission-critical power sector web applications (FTC-WRLDC, FTC-ERLDC, FTC-NERLDC, SAMPADA-WRLDC) using Spring MVC architecture.

- Designed, optimized, and maintained SQL and HQL queries for efficient database operations; performed schema updates including creation and modification of tables with DAO and POJO implementations.
- Enhanced user interfaces using JSP, jQuery, JavaScript, and AJAX; developed new JSP pages and dynamic reports aligned with evolving business requirements.
- Resolved database issues reported by RLDC clients, ensuring data consistency and integrity across production environments.
- Assisted in application and database server migration; conducted comprehensive post-migration validation and testing to ensure all services and functionalities operated as expected on new servers.

Project 3: OT Security Audits - Oil India Limited & Damodar Valley Corporation

- Conducted comprehensive OT security audits across 9 critical infrastructure sites (4 Oil India Limited + 5 Damodar Valley Corporation).
- Assessed ICS configurations, network segmentation, firewall rules, and physical security controls per industry standards.
- Identified critical vulnerabilities including unpatched firmware, exposed SCADA interfaces, and default credentials in OT devices; recommended mitigations aligned with IEC 62443 and NIST SP 800-82 standards.
- Prepared detailed audit reports with findings, risk ratings, and actionable remediation recommendations delivered to senior stakeholders.

ACADEMIC PROJECTS

IoT-Based Vehicle Accident Detection and Monitoring System

- Designed and developed an STM32-based embedded system for road safety, integrating interrupt-driven multi-sensor fusion for real-time collision detection and GSM-based emergency alert dispatch.
- Implemented firmware in Embedded C by integrating multiple sensors including LIS3DSH accelerometer for collision detection and HC-SR04 ultrasonic sensor for proximity sensing.
- Integrated Neo-6M GPS module for real-time location tracking and SIM800 GSM module to transmit emergency alerts with latitude and longitude to registered mobile numbers.
- Developed a buzzer-based alert mechanism to provide immediate auditory warnings to the driver upon detection of potential collisions.
- Implemented automatic headlight control using LDR sensor to improve visibility in low-light conditions.
- Tools: Arduino, STM32CubeIDE, SIM800 GSM, Neo-6M GPS, LIS3DSH Accelerometer, HC-SR04 Ultrasonic, LDR

IoT-Based Industrial Protection System

- Built an embedded system for industrial hazard detection using gas, temperature, and fire sensors.
- Implemented firmware in Embedded C for continuous environmental monitoring and threshold-based alert triggering.
- Developed real-time data acquisition system to monitor industrial parameters and detect abnormal conditions.
- Integrated WiFi module for wireless communication with IoT Gecko server and web-based dashboard.
- Tools: Arduino (AVR), ESP8266 WiFi Module, IoT Gecko, MQ-2 Gas Sensor, DHT11/DHT22 Temperature Sensor, IR/Flame Sensor

TRAINING & TECHNICAL PROGRAMS

NPIIPC CIISECEX 2025 - National OT/ICS Security Training (Trainer)

- Delivered hands-on lab sessions on MODBUS/IEC 104 protocol analysis using Wireshark for power sector professionals.
- Demonstrated port scanning, host discovery, DoS, and MITM attack techniques using Kali Linux; developed Ettercap filters for real-time industrial protocol packet manipulation.
- Guided professionals in PCAP analysis and OT threat detection across 3 training cohorts.

OWASP Vulnerability Demo Application - NPTI Project

- Built a web application to demonstrate OWASP vulnerabilities including SQLi, XSS, CSRF, SSRF, Command Injection, and Broken Access Control.
- Each feature included both vulnerable and secure modes for side-by-side comparison and learning.
- Key modules: Login, Admin Panel, Password Change, XSS/CSRF Demos, and Credit Card Handling.

- Designed for educational use, enabling hands-on security training for power sector professionals in a controlled environment.
- Technologies used: Spring Boot, MySQL, Apache Tomcat, JDK 17+.

EDUCATION

- PG-Diploma in Embedded System Design 71.85% — 2023
C-DAC ACTS, Pune
Course Modules: Embedded C, Data Structures & Algorithms, IoT, Linux Device Drivers, Embedded OS, Micro-controller Interfacing & Programming, RTOS.
- B.Tech in Electronics & Communication Engineering 68.6% — 2022
Dr. Rammanohar Lohia Avadh University, Ayodhya
- Intermediate (Class XII) 70.3% — 2017
Army Public School, Ahmedabad
- Matriculation (Class X) 85.5% — 2015
Army Public School, Ahmedabad

SOFT SKILLS

Problem Solving — Team Collaboration — Adaptability — Technical Documentation — Client Communication — Training & Mentoring