

Ravi Kumar

Senior Embedded Systems Engineer | Firmware & IoT | Automotive & EV | 10+ Years
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PROFESSIONAL SUMMARY

Senior Embedded Systems Engineer with 10+ years of hands-on experience delivering production-grade firmware for automotive ECUs, EV Battery Management Systems, industrial IoT devices, and consumer electronics. Specialized in bare-metal and RTOS-based firmware development using C/C++ on STM32, NXP, TI, and Microchip platforms. Proven track record with Tier-1 clients including HCL, Harman, ASML, UD Trucks, Verizon, HP, JBL, and Sun Mobility. Adept at full-cycle embedded development — from low-level driver implementation and protocol integration (CAN/SPI/I2C/UART) to OTA updates, HIL testing, and production deployment. Available for US-based remote freelance and contract engagements.

TECHNICAL SKILLS

Languages	C, Embedded C, C++ (C++11/14/17), Python
Platforms / MCUs	STM32, ESP32, NXP, TI, Microchip dsPIC, PIC, Renesas, Raspberry Pi, Beaglebone
OS & Environments	Ubuntu Linux, Embedded Linux, Yocto, Buildroot, FreeRTOS, Windows
Protocols	NVMe, PCIe, NAND Flash Memory, Flash Translation Layer (FTL), CAN, UART, SPI, I2C, RS485, BLE (GATT), WiFi, MQTT, LAN/WAN, Modbus, HTTPS/REST APIs, WebSocket
Tools & IDEs	VS Code, Eclipse, IAR Workbench, MPLab X, Atmel Studio, CANoe, CANalyzer, Busmaster, Git, Jira, Confluence, GDB, GCC Toolchain, CMake, GitLab, Bitbucket, SVN, MobaXterm, PuTTY
Testing & Debugging	Storage Debugging, Performance Profiling, Unit Testing, Integration Testing, Hardware Bring-up, Firmware Debugging, JTAG/SWD Debugging, Oscilloscope, Logic Analyzer, Protocol Analysis, Root Cause, Analysis, Static Code Analysis
Standards	MISRA C, ISO 26262 Functional Safety, Agile/Scrum, Requirements Traceability, FMEA, Functional Safety Concepts
Cloud / IoT	AWS IoT Core, OTA Firmware Updates, MQTT Broker, BLE Asset Tracking, IoT Device Provisioning
Specialties	SSD Firmware Development, NAND Flash Management, Storage Firmware Debugging, Firmware Architecture, Battery Management Systems (BMS), IoT Gateway Development, Embedded System Design, Bare-metal Programming, RTOS, BMS Firmware, Cross-Compilation Toolchains, Technical Leadership

PROFESSIONAL EXPERIENCE

Technical Lead — Embedded Systems | [HCL Technologies Ltd.](#) Jan 2022 – Present

- NVMe SSD Firmware Development (**Solidigm**):
- Developed and debugged firmware features for high-performance NVMe SSD storage devices.
- Worked on NAND Flash management, Flash Translation Layer (FTL), and storage optimization algorithms.
- Investigated firmware issues using trace analysis, logs, and debugger tools to identify root causes and improve system reliability.

- Collaborated with cross-functional teams for feature development, validation, and production issue resolution.
- Led embedded firmware development for **UD Trucks**, **Verizon**, and **HP** — delivering production-ready storage, provisioning, and connectivity solutions
- Reduced OTA firmware update failure rate by 40% through robust error handling, rollback logic, and update verification mechanisms
- Developed BLE + RFID-based warehouse inventory tracking solution, improving asset visibility and reducing manual audit time
- Delivered cross-platform embedded provisioning tools that improved device setup speed by 30%
- Drove flash memory optimization and error management, significantly reducing field failures in deployed embedded storage systems

Stack: C, C++, Python, Linux, BLE, RFID, AWS IoT Core, Git, Jira

Embedded Developer | Harman Connected Services

Dec 2019 – Jan 2022

- Developed embedded firmware for JBL smart speakers (Google Home & Amazon Alexa integration) — handling audio pipeline, BLE pairing, and OTA updates
- Contributed to firmware for Landis+Gyr smart meters — implementing secure communication and power monitoring
- Built firmware module for ASML TWINSCAN lithography machine — coordinating multi-computer synchronization for 300mm wafer processing at advanced nodes
- Optimized low-power modes and security modules, achieving ~25% reduction in energy consumption

Stack: Embedded C, Eclipse, Linux, Windows, Confluence, Jira

Test Engineer | Magneti Marelli (Automotive)

Feb 2019 – Dec 2019

- Executed unit, regression, and system-level testing for cluster infotainment ECUs for Maruti and Jeep platforms
- Detected and resolved 150+ software defects across ECU modules, improving system stability before production release
- Validated Peugeot eCall emergency system — ensuring reliable manual/automatic emergency call triggering per regulatory requirements

Stack: NI Test Bench, CANoe, CANalyzer, Jira

Embedded Developer — EV & BMS | Sun Mobility

May 2018 – Jan 2019

- Developed telematics and BMS firmware for EV battery modules — covering SOC estimation, contactor control, and fault protection
- Built battery swapping station firmware for light vehicles and buses — enabling rapid hot-swap with safety interlocks
- Handled vehicle integration and designed hardware debug jigs for real-time hardware-software validation

Stack: Embedded C, CAN, Microchip, CANalyzer

Embedded Developer — EV Scooters | Twenty Two Motors

Sep 2016 – Apr 2018

- Built complete embedded solution for electric scooters integrating BMS, motor controller, and CAN-based vehicle network
- Developed real-time BMS for two-wheelers with cell balancing, temperature monitoring, and fault management
- Implemented remote vehicle control module — supporting remote start/stop, geofencing, and live GPS tracking via cellular

Stack: Atmel Studio, Embedded C, CAN, GSM

Embedded Developer | HBeon Labs

Apr 2014 – Dec 2015

- Developed package tracking device using GSM technology — handling real-time location updates and event-based reporting
- Built article tracking systems on Raspberry Pi and Beaglebone platforms for logistics automation
- Set up cross-compilation infrastructure for custom Linux boards including Xilinx FPGA targets
- Maintained binary deployments, developed PAM modules, and managed embedded Linux application lifecycle

KEY PROJECT HIGHLIGHTS

NVMe SSD Firmware Development & Debugging

- Developed and maintained NVMe SSD firmware features for enterprise storage products.
- Designed and debugged Band Management, Band Journal, and Defragmentation modules.
- Performed root cause analysis of storage firmware defects affecting performance and reliability.
- Worked on FTL, NAND Flash management, wear leveling, garbage collection, and metadata recovery.
- Improved storage efficiency and system stability through firmware optimizations and extensive debugging.

BMS Firmware — Electric Vehicles (Sun Mobility & Twenty Two Motors)

- Designed and delivered BMS firmware covering SOC estimation, cell balancing, temperature monitoring, contactor control, and fault management
- Integrated BMS with HIL test systems to validate real-time charge/discharge safety under simulated fault conditions
- Reduced system-level failures through software architecture improvements and automated regression testing

Tools: Microchip dsPIC, CANalyzer, Busmaster, Embedded C, MPLab X

BLE Asset Tracking System (HCL Technologies)

- Designed BLE-based asset tracking solution for warehouse inventory management using KKM BLE beacon tags
- Built firmware and backend pipeline to publish location events via MQTT to AWS IoT Core for real-time dashboard visibility

Tools: STM32, KKM BLE Tags, MQTT, AWS IoT Core, GATT, Linux, C/C++

JBL Smart Speaker Firmware (Harman)

- Developed embedded firmware for JBL speakers with Google Home and Amazon Alexa voice assistant integration
- Implemented BLE pairing, audio pipeline management, and OTA firmware update support

Tools: Embedded C, Linux, BLE, OTA, Eclipse

EDUCATION

PG Diploma in Embedded System Design —

C-DAC Noida 2016

B.Tech in Electronics & Communication Engineering —

UPTU 2014

WHY HIRE ME FOR YOUR PROJECT

- 10+ years of embedded experience across automotive, EV, Storage Domain, IoT, and industrial domains — not just one niche
- Hands-on with the full stack: bare-metal drivers → RTOS → Linux BSP → cloud IoT integration
- Delivered for Tier-1 companies (HCL, Solidigm, Harman, ASML, Verizon) — reliable, documentation-aware, deadline-driven
- Experienced with US client work culture — async communication, milestone-based delivery, clear reporting
- Available for hourly, part-time, or project-based freelance contracts via Upwork / direct engagement