

Rajveersinh Raol (Raj)

EMBEDDED SYSTEMS LEADER • BATTERY-POWERED INDUSTRIAL SENSING • DEVICE-TO-CLOUD RELIABILITY

✉ rraol@outlook.com | 📍 Waterloo, Ontario | 🌐 rdre.dev | 📄 github.com/rajveersinhraol | 🌐 linkedin.com/in/rdre

About Me

Embedded systems leader with 9+ years shipping industrial devices end to end: electronics, RTOS firmware, on-device DSP, wireless connectivity and the device-to-cloud boundary. As a founding engineer at Pulse Industrial I designed and built a battery-powered LoRaWAN predictive-maintenance sensor platform for industrial valves: 7,000+ units deployed for 3+ years, 8-year documented battery life, LTE-backhaunched gateways, OTA with rollback, secure boot, per-device identity, fleet telemetry, and Class I Div 2 / IP66/IP67 / FCC / ISED certification. Before that, four years shipping real-time DSP firmware for power-system protection relays. Today I lead firmware across all electronics at AlumaPower as engineering manager and product lead, and I still write code, review designs and debug on the bench every week.

Experience

AlumaPower Inc.

Kitchener, ON

FIRMWARE ENGINEERING MANAGER & PRODUCT LEAD

September 2025 – Present

- Own architecture and delivery of high-reliability C firmware across all electronics for energy modules, staying hands-on in code, design reviews and bench debugging.
- Product lead for a new industrial product from prototype through DFMA; authored the PRD, KPIs and 1–5 year productization roadmap (prototype, alpha and beyond), now used as internal templates.
- Moved product KPIs from engineering metrics such as power density to measurable customer use-case outcomes.
- Lead a firmware team of 2–4 engineers and a cross-functional product team of 10 across firmware, hardware and mechanical; helped hire co-op, intermediate and senior hardware and firmware engineers as the team grew, and led the transition to an overseas contract manufacturer.
- Owned a digital twin project, leading the architecture and development of a digital twin of the physical product; primary point of contact for key vendors.
- Built repeatable firmware releases: SemVer and release-candidate workflow, build traceability embedded in every image, and CI/CD across multiple repositories.

AlumaPower Inc.

Kitchener, ON

FIRMWARE ENGINEER LEAD

June 2024 – September 2025

- Architected AlumaPower OS, the team's first POSIX-like OS abstraction on FreeRTOS and ARM Cortex-M, separating application and driver layers behind a defined interface; cut board bring-up and application development on new hardware from days to hours.
- Built remote debugging into the platform: configurable logging at application, RTOS and driver level, stored across RAM, flash and EEPROM, with a pipeline to export and sync all of it for root-cause analysis.
- Architected device-to-cloud telemetry, command and configuration pipelines using MQTT with Azure IoT, including the message formats; defined CAN, UART and serial interfaces for distributed systems and edge gateways, with Python host tooling.
- Mentored many co-op, junior and intermediate engineers into stronger technical contributors.

Pulse Industrial Inc.

Waterloo, ON

FOUNDING ENGINEER, EMBEDDED SYSTEMS

January 2022 – June 2024

- Took a battery-powered LoRaWAN predictive-maintenance platform for industrial valves from first prototype to 7,000+ units deployed with 3+ years of field operation.
- Designed hardware and firmware for low-power ARM sensor nodes with an 8-year documented battery life from duty-cycle and transmission budgeting.
- Implemented the bootloader, secure boot and OTA firmware updates with rollback; provisioned per-device identity during manufacturing.
- Primary interface between the embedded systems team and the data science and analytics team.
- Designed the sensor payload formats and integrated firmware with LoRaWAN network and cloud platforms (AWS IoT, OrbiWise) through LTE-backhaunched gateways; built Python diagnostics and analytics on AWS IoT and MongoDB.
- Primary point of contact for customer issues and installations; performed hands-on installation for every deployment and owned field reliability, using device telemetry, remote diagnostics and lab equipment to root-cause power, RF and environmental failures.
- Led Class I Div 2 (hazardous location), IP66/IP67, FCC and ISED certification, including EMC/ESD pre-compliance and design fixes.
- Built automated hardware-in-the-loop manufacturing test, calibration and provisioning systems with design-for-test, supporting 1,000+ devices in production.
- Performed schematic review, board bring-up, SWD/JTAG debugging and PCB design (KiCad, Altium); raised incoming inspection pass rate from 60% to 97%; moved production to a contract manufacturer and served as its primary point of contact.

ERLPhase Power Technologies Ltd.

Winnipeg, MB

QNX DEVELOPER

September 2021 – December 2021

- Designed and implemented multi-threaded C++ applications on QNX RTOS for industrial power systems.
- Resolved field-reported issues, working across firmware and hardware to isolate root cause.

ERLPhase Power Technologies Ltd.

Winnipeg, MB

DSP DEVELOPER (INTERMEDIATE)

May 2017 – August 2021

- Shipped many production firmware releases of real-time DSP, protection and synchrophasor (IEEE C37.118) algorithms in C/C++ for power-system relays and recorders, where sampling and timing integrity are critical.
- Developed low-level communication stacks (I2C, USB-HID, UART, SPI) and FPGA firmware (VHDL, Vivado HLS) with hardware and FPGA designers.
- Built pytest test automation and supported compliance and hardware-in-the-loop testing; mentored junior engineers.

Skills

Embedded: C/C++, ARM Cortex-M (STM32), FreeRTOS, QNX, bootloaders, low-level drivers
DSP & Power: FFT, filtering, decimation, real-time signal processing, battery-life budgeting
Connectivity: LoRaWAN, LTE gateways, Wi-Fi, MQTT, CAN, USB, UART/I2C/SPI
Fleet: OTA with rollback, secure boot, device identity, telemetry, remote diagnostics
Hardware: Schematics, bring-up, EMC/ESD, DFT, KiCad/Altium, SWD/JTAG, oscilloscopes, logic analyzers
Certification: Class I Div 2, IP66/IP67, FCC, ISED
Cloud & Tools: AWS IoT, Azure IoT, Python, Linux, git, CMake/Make, CI/CD, Docker
Leadership: PRD, KPIs, roadmaps, DFMA, team building, contract manufacturing

Education & Awards

- **B.Sc. Electrical Engineering**, University of Manitoba (2012 – 2017); **Advanced Manufacturing – Digital Transformation**, University of Waterloo (2024)
- **Ted Glass Award**, IEEE Winnipeg (2017)