

RAGHU EJJIGIRI

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PROFESSIONAL SUMMARY

Embedded Firmware Engineer with 1+ years building production Zigbee 3.0 Sleepy End Device (SED) battery sensors, mmWave presence sensors, DALI lighting control, and Control4 DriverWorks (Lua / XML) drivers on Silicon Labs EFR32MG21 / MG24. Delivered shipped products with sub-3 μ A sleep current and multi-year battery life through EM2/EM4 low-power design, OTA, and PPK2 current-waveform profiling; comfortable reading schematics and debugging hardware with the HW team.

PROFESSIONAL EXPERIENCE

Embedded Firmware Engineer — CONFIO Technologies Pvt. Ltd., Bengaluru

Aug 2025 – Present

Zigbee SED sensors, mmWave presence, DALI lighting & Control4 integration | EFR32MG21 / MG24 | Simplicity Studio

- Shipped production firmware for a family of Zigbee SED battery sensors achieving **1.4–2.5 μ A sleep current** and **estimated 5.5–9+ year battery life**, verified from measured current waveforms on the Nordic PPK2 and bench DC supply.
- Designed the low-power path so devices sleep in **EM2** and wake $\rightarrow$ detect $\rightarrow$ report $\rightarrow$ sleep in **under 10 ms** ($\sim$ 8 mA active window), staying joined to the parent via Zigbee SED polling on the mesh; EM4 support implemented where required.
- Built Control4 DriverWorks drivers (Lua / XML) with a main / child driver structure and cross-driver event triggers, so sensor events drive scenes, notifications, and alerts across other product drivers via Composer Pro.
- Added OTA updates, user configuration, periodic battery-% reporting, and inclusion/exclusion LED indication across every sensor SKU.
- Debugged firmware and hardware using Network Analyzer packet captures, UART logs, J-Link / SWD, Energy Profiler, and PPK2; read schematics and assisted board bring-up with the hardware team.

TECHNICAL SKILLS

Languages: C, Embedded C, Lua, XML

Microcontrollers: Silicon Labs EFR32MG21 / MG24, ESP32, Arduino Nano

RTOS / OS: FreeRTOS (ESP32), Linux (basic commands), IPC concepts

Wireless IoT: Zigbee 3.0, IEEE 802.15.4 (Sleepy End Device), mesh networking / polling

Wired Protocols: DALI / DALI-2, UART, SPI, I2C, RS-485, CAN

SDK / Platform: Gecko SDK 3.2.x, Simplicity SDK 2025.6.3, Zigbee App Framework, Control4 DriverWorks, Composer Pro

Firmware Focus: Sensor drivers, EM2/EM4 low-power design, OTA & bootloader, ZCL clusters / endpoints, attribute reporting

Tools & IDEs: Simplicity Studio & Commander, VS Code, Energy Profiler, Network Analyzer, Nordic PPK2, Bench DC Supply, Arduino IDE, Git

Debugging & HW: J-Link / SWD, UART logging, packet sniffing / RF analysis, current / power measurement, schematic reading, hardware bring-up & debug

PROJECTS

All products below are shipped, production firmware with Control4 DriverWorks (Lua / XML) integration.

1. Zigbee SED Battery Sensor Platform — Zigbee 3.0 SED, battery-powered — shipped

Technologies: Embedded C, EFR32MG21 / MG24, Zigbee App Framework, ZCL clusters, EM2/EM4, Energy Profiler, Nordic PPK2, OTA bootloader

Common platform:

- Shared SED framework — EM2 sleep, interrupt-driven wake, <10 ms wake-detect-report path ($\sim$ 8 mA active), SED polling to the parent controller, and periodic battery-% reporting.
- Validated join / rejoin, binding, and attribute reporting via Network Analyzer packet captures across all variants.

Sensor variants (measured sleep current $\rightarrow$ estimated battery life):

- Motion — ceiling / wall / curtain (PIR):** 2.5 μ A sleep, CR2 $\rightarrow$ $\sim$ 9+ years; integrated lux sensor for ambient-light reporting to enable daylight-aware lighting.
- Door / Window:** reed / magnetic open-close with debounce; 1.5 μ A sleep, CR2032 $\rightarrow$ $\sim$ 5.5 years.
- Water Leak:** conductivity-probe leak detect / clear alarms; 1.5 μ A sleep, 2 $\times$ AAA $\rightarrow$ $\sim$ 5.5 years.
- Garage Tilt:** I2C tilt-module command parse (TX/RX) $\rightarrow$ open-close state; 1.4 μ A sleep, AAA $\rightarrow$ $\sim$ 5.5 years.

2. mmWave Presence Sensor — RF radio-frequency sensing, powered — shipped

Technologies: Embedded C, EFR32MG21, mmWave radar module, UART frame parsing & command configuration, Zigbee reporting

- Detected motion, stationary, and moving targets with target-distance reporting, parsing radar frames over UART and configuring the module through UART commands.
- Implemented gate-based detection with per-gate / per-distance sensitivity tuning, plus pet avoidance and SNR-based noise rejection for reliable presence detection.

3. DALI Lighting Control — AC-powered — shipped

Technologies: Embedded C, EFR32MG21, DALI / DALI-2 protocol (incl. DT8), UART logging, Control4 DriverWorks (Lua / XML)

- Identified and addressed up to 16 DALI ballasts / gears — assigning short addresses and supporting individual, group (up to 4 groups), and broadcast control, with full commissioning in $\sim$ 3 minutes.
- DT8 colour control:** implemented arc-level dimming, colour-temperature, and colour-changing control for DT8 LED drivers.
- DALI 4R & DALI Motion:** relay-module firmware switching a lighting load via a GPIO-driven relay (addressable as a DALI gear with fault handling); plus a DALI-bus occupancy sensor for automatic lighting.

EDUCATION

Kamala Institute of Technology and Science — B.Tech, ECE

2024 | CGPA: 6.34

Kakatiya Junior College — Intermediate (MPC)

2020 | 68%

Zilla Parishad School — SSC

2018 | CGPA: 9.2

TRAINING

Radar Institute — Advance Diploma in Embedded Systems (6 Months)

- Embedded C, RTOS, LPC2148, NodeMCU / Arduino Nano / ESP32; device interfacing (SPI, I2C, UART), real-time debugging, Linux commands, and sensor integration.