Ribhu Mukherjee

Senior Embedded Software Engineer | RTOS | Firmware | Boot & Platform Services | C

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SUMMARY

Senior Embedded Software Engineer at **Qualcomm** with **3+ years** building production **C firmware** for **ADSP, MPSS, LPASS and UEFI** on **8+ commercial SoCs**. Shipped **16+ features** from design to silicon with **100% on-time delivery** across three fiscal years. Deep in **RTOS internals**, **watchdog & fault recovery**, **boot sequencing**, **heap debugging** and **on-chip trace**. First responder for **30+ P0/P1** customer escalations, including a **Samsung** fix in **2 hours**. Rated **Expert in all 6 performance dimensions**; built **agentic AI** tools that cut LLM debug-token usage by **40%**.

TECHNICAL SKILLS

Languages: C, C++, Python, ARM Assembly
RTOS & Firmware: Zephyr RTOS, UEFI/EDK2, Secure Boot, ARM TrustZone, XBL Bootloader, Device Drivers, Boot Sequencing
System Services: Timers & Time Sync, HW/SW Watchdog, Interrupts/ISR, Task Management, IPC, SSR, PDR, Fault Recovery
Memory & Security: Heap Allocators, Memory Corruption Analysis, OOB Detection, CVE Remediation, Klocwork
Debug: JTAG, Trace32, QDSS/STM/ETM Trace, Crash Dump Analysis, Runtime Instrumentation, GDB
Hardware: ARM Cortex-A/M, Register-Level Bring-Up, SoC Bring-Up, ADSP, MPSS, LPASS, QCS8550, MDM9205, MDM9607
AI & Tools: Agentic AI, Multi-Agent Systems, RAG, Knowledge Graphs, n8n, Claude Code, Git, Gerrit, CI/CD

EXPERIENCE

Senior Software Engineer (promoted Nov 2026; Software Engineer 2023 – 2026) — 2023 – Present

Qualcomm Technologies, Inc. – IoT BU, Core Platform Services — *Hyderabad, India*

Firmware Features & Architecture

- Shipped **16+ firmware features** end-to-end across **UEFI**, **timer services**, **IPC** and **security** on **8+ SoCs**, owning design through **silicon validation** with **100% on-time delivery** over 3 fiscal years.
- Executed **9 features in parallel** in Year 3 across 8+ SoCs while handling live P0 escalations, keeping **100% of milestones on schedule**.
- Built the **first Zephyr RTOS hardware watchdog driver for QCS8550** from scratch: **register-level init**, **ISR design**, feed/timeout callbacks and test app, validated on silicon, removing **100%** of platform bring-up unknowns for downstream teams.
- Architected **DSP boot from the primary bootloader**, resolving **boot-sequencing**, **inter-processor signaling** and HW resource conflicts across audio, Bluetooth and remote-processor stacks with **zero integration rework**.
- Delivered a **UEFI power-management feature for Samsung** (watchdog/activity-monitor disable in charging mode) **ahead of a pulled-in deadline** with **0 post-release defects**.
- Designed userspace **time & uptime APIs** that sync to **modem firmware** and notify subsystem clients; documentation enabled **100% customer self-integration** with zero support tickets.

Debugging, Memory & Customer Escalations

- First responder for **30+ P0/P1 escalations** from **Samsung**, GNSS, modem-integration and Korea product teams; shipped a validated Samsung critical patch in **2 hours**, earning written customer appreciation.
- Root-caused a **month-long heap corruption on MDM9205** via custom **runtime instrumentation** (periodic integrity checks, isolated heap region), eliminating **8+ candidate causes** and unblocking a stalled customer platform.
- Added **caller-level attribution** to the embedded **heap framework**, logging the call site of **100% of alloc/free calls** to pinpoint corruption sources at runtime.
- Led a **CVE-mandated zlib upgrade** across **modem and boot images**, managing two interdependent build pipelines; delivered **0 regressions** with full security sign-off before the deadline.
- Led a **4-team** debug effort (diagnostics, DSP, trace, processor) to fix an **inter-processor trace** failure; cleared **12+ on-chip debug blockers** on 3 platforms at **50% bandwidth** with **0 escalations dropped**.

AI Developer Tooling (Self-Initiated)

- Built **8 agentic AI developer tools** with **100% org-wide adoption** (none assigned) for **code-readiness audits**, **log triage**, work-item docs and **debug orchestration**.
- Designed a **two-level knowledge graph** for subsystem context filtering, cutting **LLM debug-token consumption by 40%**; published as a reusable org-level skill used by multiple teams.
- Nominated **Tech Domain Agent** for a new chipset's **CI/CD automation**; POC for an **autonomous log-triage pipeline** that removed the human from subsystem log analysis.

PROJECTS

edu-pci-driver | *Linux Kernel 6.6, C, PCI, MSI, DMA, QEMU* github.com/ribhu0908/edu-pci-driver

- Wrote a **Linux PCI kernel driver** with BAR0 **MMIO**, **MSI** interrupts (shared INTx fallback), **28-bit DMA** via coherent buffers and a **char device** (read/write/ioctl); every DMA range validated before programming the device.
- Made unbind **hot-unplug safe** with kref-counted device state (open files get -ENODEV, no use-after-free); QEMU CI boots a **KASAN + lockdep** kernel and passes **66** end-to-end checks (DMA, IRQ, 4-process concurrency, unplug) with a **clean** kernel log.

gpu-channel-sim | *C11, pthreads, ThreadSanitizer, GitHub Actions* github.com/ribhu0908/gpu-channel-sim

- Modeled GPU command submission: **GPFIFO channels**, **pushbuffer methods** and **semaphore fences**, with round-robin scheduling that **context-switches** a channel blocked on an unmet ACQUIRE instead of stalling the engine.
- Built a **watchdog with per-channel fault isolation and recovery**: hangs, invalid methods and out-of-range accesses fault only the offending channel; **61 checks** pass under **TSan**, ASan and clang on Linux and macOS, including **50** repeated race-detector runs.

EDUCATION

International Institute of Information Technology Bangalore (IIIT-B) **2021 – 2023**
Master of Technology, Computer Science **CGPA: 9.02/10**

- Admitted via **GATE CSE 2020** (**99.4 percentile**); also received admission offers from **IIT Madras**, **IIT Bombay** and **IIT BHU**.
- Coursework: Operating Systems, System Software, Data Structures & Algorithms, DBMS.
- Built a multi-client **railway reservation server in C** on **Linux system calls**: file **record locking** for concurrent bookings, **process management**, **IPC** and **TCP sockets**.

Symbiosis Institute of Technology (SIT), Pune **2016 – 2020**
Bachelor of Technology, Computer Science **82%**

- **Academic Excellence Award**: ranked **3rd** in the CSE department (pre-final year).

TEACHING & MENTORSHIP

- **Mentor, Topmate** (Mar 2023 – Present): 1:1 video mentoring on software careers, interview prep and GATE.
- **YouTube Creator & Mentor** (Mar 2021 – Present): Channel on **GATE preparation**, post-GATE counseling, interview strategy and software careers.
- **Long-term Mentor, Preplaced** (Jul 2023 – Dec 2024): Weekly 1:1 sessions, daily mentoring, mock interviews and study plans guiding mentees to offers at **top product companies**.
- **Educator, Newton School** (Jun 2021 – Mar 2023): Built an end-to-end **DSA course** from basics to advanced with assignments and interview problems; mentored **8000+** students and was awarded **No. 1 Educator** (2021).
- **Speaker**: **10+** seminars and keynotes at universities across India, including **Delhi University**.

AWARDS & RECOGNITION

- **Expert rating in all 6 performance dimensions** (Year 3); Manager rating 4 – Consistently Exceeds (Year 2).
- **8 Peer Awards** for DSP boot, TrustZone IPC, security delivery, watchdog RCA, heap RCA, BT heap framework, time APIs and IoT timer bring-up.
- Qualcomm TechFiesta: **2× winner** (Nov 2025, Mar 2026) and **perfect 20/20** score (Jul 2025).
- Written appreciation from **Samsung**, GNSS, Modem Integration and Korea product teams.
- Published in *Qualcomm Innovation Times* (Vol. 6, Issue 2) on DSP boot-up and subsystem restart architecture.