

Tuna Girişken

Senior Embedded Software Engineer | Embedded Linux

+90 533 646 0969

tunagrskn@gmail.com

tunagirirken

tunagirirken

tunagirirken.com

SUMMARY

Senior Embedded Software Engineer with over five years of experience in safety-critical defense and automotive systems. At BAYKAR Technology and TÜBİTAK SAGE, architected avionics software for production aerospace platforms and developed safety-critical applications on real-time systems. Built end-to-end embedded Linux solutions across kernel, driver, bootloader, and Device Tree layers on target-specific hardware. Developed bare-metal firmware on TI and NXP platforms, covering full hardware-software integration from peripheral drivers to RTOS application level. Designed cryptographic solutions for secure communication and firmware integrity verification. Developed deterministic TSN architectures achieving sub-microsecond time synchronization using IEEE 1588v2 PTP. Currently leading the end-to-end development of a production-grade Telematics Control Unit for electric vehicles, from embedded Linux to cloud-connected telemetry.

TECHNICAL SKILLS

Application Processors: NXP i.MX93, TI AM64x, TI AM65x, NVIDIA Jetson, PowerPC P4080DS, x86 Xeon D-1700

Microcontrollers: ARM Cortex-M (M4, M33)

Embedded Systems & RTOS: Bare-metal (MCU), Zephyr, PREEMPT_RT

Embedded Linux: Yocto Project, Linux Kernel & Driver Development, U-Boot, Device Tree, QEMU, BusyBox

Programming Languages: C, Modern C++ (11/14/17/20), Bash, QML, SQL

Communication Protocols: CAN/J1939, MIL-STD-1553, I2C, SPI, UART, RS-232, USB

Networking & TSN: TCP/UDP, MQTT, LTE/4G, NMEA 0183, IEEE 802.1Qbv (TAS), IEEE 1588v2 (PTP)

Security & Cryptography: Secure Boot, OpenSSL, Symmetric & Asymmetric Cryptography

Tools & Build Systems: GCC, Clang, GDB, CMake, Meson, Git/GitLab, QT

Coding Standards: MISRA C/C++, JSF AV C++

Test & Analysis: *Static:* Cppcheck, Clang-Tidy, Custom LLVM Checkers | *Dynamic:* GoogleTest, Valgrind, Clang Sanitizers

Documentation & Process: Doxygen, Sphinx, Jira, Confluence, Agile/Scrum

Languages: Turkish (Native), English (Fluent)

EXPERIENCE

•Senior Embedded Linux Development Engineer

Karluna Engineering

Dec. 2024 – Present

İzmir, Turkey

- **Platform Architecture:** Architected the software stack for an NXP i.MX93-based Telematics Control Unit (TCU), featuring a telemetry-driven design with modular separation across vehicle, protocol, and application layers.
- **Embedded Linux Distribution:** Designed and built a custom Yocto-based Linux distribution (Mickledore 4.2) following Automotive Grade Linux architecture principles. Architected a modular layer structure separating BSP, security, and automotive middleware into independent layers for maintainable and scalable builds. Defined ECU-specific production and development image recipes with automated versioning and SDK packaging. Integrated OTA firmware updates via SWUpdate with automatic rollback support.
- **BSP & Driver Development:** Developed the board support layer for the NXP i.MX93-based TCU platform, supporting multiple hardware revisions with revision-specific Device Tree configurations and GPIO mappings. Customized U-Boot for reliable board initialization and peripheral bring-up, integrating CAN bus, GNSS, and storage interfaces. Delivered a complete Quectel EC200U LTE integration spanning power sequencing, regulator control, and kernel driver enablement, ensuring reliable cellular connectivity from first boot. Applied PREEMPT_RT patches to the vendor kernel for deterministic, real-time execution in automotive applications.
- **Telemetry Framework:** Engineered Apex, a production-grade modular C++20 framework for embedded systems, providing abstraction over vehicle communication, data processing, and cloud-connected telemetry through a layered architecture. Delivered as a reusable shared library with CMake integration for cross-platform and aarch64 Yocto targets, adopted as a core internal framework across multiple production applications.
- **Vehicle-Cloud Communication:** Designed and implemented bidirectional vehicle-cloud communication over MQTT. On the vehicle-to-cloud path, built a telemetry pipeline transforming decoded CAN signals into typed JSON payloads with resilient queuing, offline buffering, and automatic state resynchronization on reconnect. On the cloud-to-vehicle, developed a remote command infrastructure handling inbound command validation and execution for functions such as door, horn, light, charge, and geofence control, translating cloud-originated commands into CAN messages with a correlated acknowledgement mechanism and error reporting back to the server.
- **Vehicle Diagnostics:** Implemented an OBD-II diagnostic module compliant with ISO 15765 (UDS over CAN) and SAE J1979, extracting Diagnostic Trouble Codes from J1939 DM1 messages and enabling real-time vehicle health monitoring.
- **Production & Developer Tooling:** Customized NXP's Universal Update Utility into a scripted firmware flashing pipeline for mass-production deployment across eMMC, SD, NVMe, and QSPI targets. Built a CAN traffic recording suite with real-time trace capture, playback, and PCAP conversion; developed an interactive J1939 signal analysis dashboard in Python (Dash/Plotly) for field debugging and post-capture validation.

•Embedded Linux Development Engineer

BAYKAR Technology

Dec 2022 – Nov 2024

Istanbul, Turkey

- **Real-Time Systems:** Contributed to the development of real-time operating systems for next-generation UAV mission computers, enabling deterministic execution and guaranteed response times for mission-critical avionics in production aircraft.
- **Software Framework:** Architected a security-critical software framework providing a standardized application development environment for RTOS platforms, ensuring compliance with JSF and MISRA C/C++ standards for safety-critical aerospace systems.
- **Embedded Architecture:** Developed software across diverse embedded architectures, from bare-metal MCU firmware to Linux-based MPU applications, implementing low-level drivers, bootloaders, and hardware abstraction layers for multi-core SoC platforms.
- **Time-Sensitive Networking:** Developed and validated TSN infrastructure for distributed avionics systems, achieving sub-microsecond time synchronization and deterministic communication using IEEE 1588v2 PTP.
- **Avionics Interfaces:** Built graphical update and test interfaces for avionics computers deployed across multiple UAV platforms, improving software validation and deployment workflows in production environments.
- **Test & Analysis Infrastructure:** Developed automated static and dynamic analysis tooling for safety-critical C++ codebases, including custom LLVM-based checkers to enforce MISRA/JSF compliance and detect runtime errors across the embedded software stack.
- **Embedded Security:** Implemented an embedded security infrastructure utilizing symmetric and asymmetric cryptographic algorithms to guarantee secure communication, authentication, and firmware integrity verification.

•Embedded Software Engineer Intern

TÜBİTAK SAGE

Feb 2022 – May 2022

Ankara, Turkey

- **Embedded Linux:** Contributed to the build, configuration, and integration of defense-grade operating systems using ELDK and Yocto, optimizing system images for target hardware.
- **Driver Development:** Integrated and validated an NVMe storage driver at the bootloader stage for VxWorks RTOS, enabling high-speed data access during early system initialization.

PROJECTS

•Apex — Embedded Telemetry Framework

·C++20 ·ISO 11898 (CAN 2.0B) ·SAE J1939 ·SocketCAN ·PCAN ·MQTT ·NMEA 0183 ·SQLite ·CMake ·GoogleTest ·Cross-platform

- Designed and developed Apex, a production-grade C++20 telemetry framework enabling end-to-end vehicle data collection, processing, and cloud communication for automotive embedded systems.
- Implemented a complete SAE J1939 protocol stack (J1939-21/71/73/81) supporting PGN/SPN decoding, multi-packet transport (BAM/TP), dynamic address claiming, and real-time fault diagnostics (DM1/DTC) over Linux SocketCAN.
- Integrated vehicle-to-cloud connectivity via MQTT 3.1.1 with TLS, exponential-backoff reconnection, and automatic session recovery, alongside GNSS positioning via NMEA 0183 and SQLite-backed telemetry persistence.
- Built nine applications on the Apex framework, including a production TCU with a service-oriented supervisor architecture, an OBD-II diagnostic collector, a J1939 tooling suite (decoder, sender, sniffer), CAN trace utilities (dumper, player, and format converter), and a real-time task runner.
- Expanded a 63,000-line C/C++ codebase (218 source files) targeting x86_64 and aarch64 platforms, maintaining software quality through GoogleTest unit tests, live CAN-bus integration testing, and trace-driven validation.

•NXP P4080DS Custom Linux Distribution and NVMe Driver Development

Yocto-based BSP with NVMe PCIe driver achieving 2.8 GB/s throughput

- Built a production-grade Yocto BSP for the PowerPC P4080DS platform with U-Boot and SPL optimizations.
- Developed and integrated a bootloader-level NVMe PCIe driver with DMA support, reducing data transfer latency by 40% for high-speed logging applications.

•TI Sitara AM65x SBL Development

OSPI Flash-based bootloader with secure boot and image encryption

- Developed an OSPI Flash-based Secondary Boot Loader (SBL) with memory-mapped XIP execution, achieving a boot time of under 2 seconds for embedded Linux-based systems.
- Implemented a secure boot chain with encrypted image verification and configured RTOS bootloader peripherals (UART, GPIO, Watchdog, etc.) for system initialization.

EDUCATION

•Master of Science in Computer Engineering

Ege University

2025 – Present

İzmir, Turkey

•Bachelor of Engineering in Electrical and Electronics Engineering

Hasan Kalyoncu University (100% English Scholarship)

2017 – 2022

Gaziantep, Turkey

- **Capstone Project:** Designed and implemented an RF-based stepper motor control system featuring wireless command transmission and real-time PID position control for precise motor positioning.