



Amr Bekhit, PhD

Embedded Systems Engineer

*Specialising in Embedded Linux/Yocto as well as ATEX
Intrinsically Safe design*

<https://helmpcb.com>

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Summary

I am a seasoned embedded systems engineer with almost 20 years of experience covering all aspects including both hardware and software/firmware design. Over the years, I have specialised heavily in embedded Linux as well as ATEX/IECEX Intrinsically Safe design.

- PhD, BEng in Mechatronics and Robotics, Honours Class I, University of Leeds, UK
- Almost 20 years electronic engineering experience, from hardware design to firmware and software.
- Fluent in English, Arabic and Turkish
- Hold Turkish, UK and Egyptian citizenship
- Turkish driving license.

Skills

Embedded Systems Design

- Schematic design + SMD multilayer PCB layout in KiCAD, Proteus.
- ARM Cortex-M0, M3, M4 (nRF52, STM32, NXP LPC), 8, 16 and 32-bit PIC micros
- Bare metal + RTOS
- Wireless: GSM/3G/4G, GPS, antenna transmission line design and matching.
- CAN bus, I2C, SPI, UART, TCP/IP, UDP, MQTT, REST
- Motors, solenoids, linear actuators, valves...
- Design for EMC, In-house pre-compliance testing
- Embedded firmware development in C

Embedded Linux

- Yocto support, creating custom layers and recipes, customising the build process and debugging issues.
- Customization of the bootloader, kernel and device tree to suit bespoke hardware.
- Implement secure boot and integrate the signing mechanisms into the Yocto build.
- Integration of the open source Mender over-the-air update software, including customizing the U-boot bootloader.
- Development of application software to run on Linux.
- Experience in developing kernel drivers for custom hardware.
- Experience converting manufacturer's non-standard BSPs to Yocto.

ATEX/IECEX Intrinsically Safe Design

- Design of complex embedded systems to comply with the most stringent IIC/Zone 0 requirements
- Preparation of technical file + compliance assessment process
- Provided training, consultation and pre-assessment services to many engineering teams around the world, guiding them from a completely non-ATEX design all the way to the issuing of the ATEX type certificate

Mechanical

- Certified Solidworks Professional (certificate: C-63QZ3HPFVD)

VisiLevel Mk2, Mk3 (Hardware, Firmware, ATEX)

ATEX/IECEX certified Zone 0 liquid level measuring system for road fuel tankers consisting of probes that measure product level, density, temperature and colour; display units and an intrinsically safe power supply and CAN repeater. I have been involved in all stages of the design process from hardware, firmware and mechanical design all the way to testing and certification.

- PCB design of the VisiLevel Mk2 sensor probes (dsPIC, I2C digital pressure sensor).
- PCB and enclosure design of the ICB-400 intrinsically safe SMPS and CAN repeater.
- Mechanical design of the VisiLevel Mk3 probe housing using Solidworks.
- Firmware design for Mk2 (PIC32) and Mk3 screen + probes (NXP Cortex-M3).
- In-house pre-compliance EMC testing.
- VisiLevel Mk2 ATEX, VisiLevel Mk3 ATEX/IECEX certification, including communication with notified body, technical documentation, EMC and IP testing, final certification as well as acting as ATEX representative.

Aixelink Intelligent Device Hub (Embedded Linux)

Smart hub that collects data from various medical devices, handles nurse ID validation and provides voice instructions. Over the course of several years, I have worked with Axelink to develop the Linux OS for all 3 hardware versions of the IDH. This has included:

- Smart use of Yocto to maximise software re-use amongst different hardware platforms.
- Kernel, devicetree and U-boot customisation.
- Mender OTA update system integration.
- Secure boot implementation and integration into build system.
- Development of userspace software in Go.

Yaşam Teknik LoRaWAN Gateway (Embedded Linux)

RPi3-based LoRaWAN Gateway for municipal smart water meter monitoring, with 16-channel LoRa, 4G backhaul and GPS. I developed a custom Linux OS for the gateway using Buildroot which involved the following:

- Replacing the RPi bootloader with U-boot.
Configuring the Linux kernel, adding necessary drivers, customizing devicetree.
- Modifying the I2C expander driver to allow pullups to be specified in the devicetree.
- Modifying U-boot to allow integration with the Mender.io OTA update system.
- Development of a set of secure remote management tools that allow administration via MQTT or SMS.
- Development of a custom LoRa radio manager in Go that allowed multiple independent 8-channel radios to behave as if they were a single multi-channel radio.

StockSmart Mk1, Mk2, Mk3 (Hardware, Firmware, Embedded Linux)

Vehicle tracker and data logger for use on road fuel tankers that also integrates with the various pumping, control and measurement systems on the tanker, giving fleet managers a complete picture of both the vehicle and the contents. Mk1 and Mk2 are based on NXP Cortex-M3 micros, Mk3 is an embedded Linux system. As well as the hardware and firmware development of the tracker unit itself, I also designed the complete StockSmart backend and website.

- Hardware and firmware design of StockSmart Mk1 and Mk2 (Cortex M3, SMPS, Telit GPRS/GPS module, SD card).
- Hardware and complete software design of StockSmart Mk3 (Atmel SAM9, u-boot + kernel + devicetree configuration, root file system using Buildroot, app development using Python).
- Development of the backend and ASP.NET/Javascript website (SQL Server, ASP.NET, Google Maps integration, Windows Service development).