

Dr. Amr Bekhit, PhD

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Summary

- I am a **seasoned embedded systems engineer**, with **over 12 years of industrial experience**, specialising in the design of **reliable microcontroller and embedded Linux systems** for use in **harsh industrial and automotive environments** and **explosive atmospheres (ATEX/IECEX)**.
- I hold a **PhD in Mechatronics and Robotics** from the University of Leeds.
- I have a **wide range of non-engineering experience** gained through working in small companies, such as dealing with customer problems, managing sub-contractors, and organising manufacturing.
- I have a **great ability to quickly learn** new concepts and technologies and implement them into working solutions.

Education

- PhD in Parallel Platform-Based Robot for Operation in Active Water Pipes, University of Leeds, 2015. (<http://etheses.whiterose.ac.uk/12674/>)
- BEng in Mechatronics with Honours Class I, University of Leeds, 2008.

Skills

ATEX/IECEX Intrinsically Safe Design:

- Intrinsically safe circuit design (up to Zone 0)
- EMC, environmental and IP testing
- Producing technical documentation
- Final certification
- Preparing for audits
- Maintaining quality systems

Embedded Linux System Design:

- Bootloader and kernel configuration and compilation
- Devicetree file generation
- Driver modification, debugging and porting
- Root filesystem preparation using Buildroot
- Application development using Python, Go and Node-Red
- Integration of the Mender.io OTA update system

Low-power IoT and LoRaWAN:

- Low-power hardware + firmware design
- Design of LoRa end nodes
- BLE Bluetooth Low Energy
- LoRaWAN gateway selection, configuration and modification
- Loraserver.io LoRaWAN network server setup and maintenance

Embedded Systems Design and Product Development:

- ARM Cortex-M0, M3 M4 (nRF52, STM32, NXP LPC), 8, 16 and 32-bit PIC micros
- RTOS: FreeRTOS, Apache Mynewt
- Wireless: GSM/3G/4G, GPS, antenna transmission line design and matching.
- CAN bus, I2C, SPI, UART, TCP/IP, UDP, MQTT, REST
- SMPS design
- Motors, solenoids, linear actuators, valves...
- SMD and BGA multi-layer PCB design
- Design for EMC, In-house pre-compliance testing
- Programming: Embedded C, Python, Go, .NET, much more...
- Certified Solidworks Professional (certificate: C-63QZ3HPFVD)
- 3D printer: construction, maintenance, slicer software
- Skilled in using lathe, milling machine, metalworking tools

Other

- Fluent in English, Arabic and Turkish
- Full UK driving license
- Dual British/Egyptian nationality

Notable Projects

VisiLevel Mk2 + Mk3 (<https://www.visilevel.co.uk/>)

VisiLevel is an 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.

StockSmart Mk1 + Mk2 + Mk3 (<https://mechtronic.ltd.uk/stocksmart/>)

StockSmart is a vehicle tracker and data logger for use on road fuel tankers. As well as tracking the vehicle position, StockSmart 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. While 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).

Yaşam Teknik Smart Water Meter Network (<http://yasamteknik.com/>)

In conjunction with a local water authority, Yaşam Teknik embarked on a project to replace all existing domestic water meters with LoRa powered ones and provide the necessary infrastructure to communicate with the water meters. After designing our own LoRa gateway and using off-the-shelf water meters, we then started work to develop our own low-power LoRa smart meter.

- Complete Linux software stack on RPi3-based LoRa gateway (u-boot + kernel + devicetree config, driver modification, root file system using Buildroot, app development using Python, integration of Mender.io OTA update system)
- Complete Linux software stack on RK3188-based LoRa gateway (reverse-engineering hardware, driver porting from kernel to u-boot, driver debugging and bug-fixing, u-boot + kernel + devicetree config, Mender.io OTA update system integration, app development using Python + Go)
- Development of a custom LoRaWAN Network Server in Python.
- Installation and maintenance of Loraserver.io LoRaWAN network server.
- Development of an administrative control panel to assist field engineers (Python/Django, Node-red).
- Hardware and firmware design of a low-power LoRa/BLE/NFC smart water meter (nRF52/Telit RE866, Apache Mynewt, communication with Android app over NFC/BLE).

Employment History

Owner at HelmPCB Embedded Systems Consultancy

July 2017 – Present

I currently share my 12 years of industrial experience with customers via my consultancy, HelmPCB, specialising in the design of embedded systems with an emphasis on Embedded Linux, ATEX/IECEX Explosion Proof design, Low Power IoT, BLE and LoRaWAN systems.

Embedded Systems Engineer at Yaşam Teknik

March 2017 – May 2019

I was the lead embedded systems engineer responsible for implementing the company's embedded systems projects.

- Implementation of a complete embedded Linux-based software stack for a custom LoRaWAN gateway.
- Full hardware and firmware design of a LoRa smart water meter.
- Development of tools to help service and admin personal manage product installation and maintenance, training them in their use.
- Arranging contract manufacturing with local companies.
- Discussing our products with foreign customers and acting as a translator at trade shows.

Senior Electronic Engineer at MechTronic Ltd

August 2007 – November 2016

As the company's first electronic engineer, I helped them found their R&D lab and continued to develop a multitude of embedded systems for road fuel tankers.

- Full hardware and firmware development of a multitude of microcontroller-based control systems for use on road fuel tankers.
- Getting products through EMC and IP testing.
- Setting up and running an on-site OATS for in-house EMC testing.
- ATEX and IECEx intrinsically safe design and certification of two major products.

Working in a small company has meant that as well as the engineering work, I also gained experience in the various other aspects of a project including the following:

- Working directly with customers to understand their problem and design the correct solution.
- Project planning and time management.
- Procurement of components and organising contract manufacturing.
- Developing build and test procedures for manufacturing.
- Organising and managing sub-contractors.
- In-field installation and troubleshooting.
- Dealing with customer problems and feedback.
- Talking with customers about my products at trade shows.