



# Mikkel Kirkgaard Nielsen

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## ○ Profile

Software developer and architect with a hardware background, possessing relaxed attitude, analytical and communicative skills. Always striving for technical perfection but has a well developed commercial sense.

Broad experience within the field of embedded software on numerous hardware platforms, operating systems and programming languages. Core competency lies in the intersection between hardware and software.

Also experienced with development, operation and administration of back-end web-based server applications, solutions and deployments.

Pitches generic, configurable and modular architectures in the pursuit of attaining flexible and reusable system components. Dedicated and fierce solution hunter when faced with a problem that needs to be solved.

Advocating standardisation and cooperation on a technical level wherever possible. Firm believer in open and collaborative development as practiced in the FOSS (Free & Open Source Software) communities.

### Family status

Single

Two daughters born 2001+2005

### Born

1977-01-17

## ○ Education

### **B.Sc. E.E., Bachelor of Science in Electronic and Electrical Engineering Digital Signal Processing (DSP)**

Aalborg Universitet Esbjerg (Esbjerg, Denmark)

1997 – 2001, 1st - 7th semester

### **High school (STX, studentereksamen)**

Esbjerg Gymnasium (Esbjerg, Denmark), Aarhus Akademi (Aarhus, Denmark)

1996 – 1997, 3g, Aarhus

1993 – 1996, 1g - 3g, Esbjerg

### **Primary school**

Blåbjerggårdskolen (Esbjerg, Denmark), Nuussuup Atuarfia (Nuuk, Greenland)

1983 – 1989, 0th–5th grade, Denmark

1989 – 1992, 5th-8th grade, Greenland

1992 – 1993, 9th grade, Denmark

## ○ Skills

### **Embedded software development**

Serial based communication (RS232/RS485/TTL/SPI/I2C/CAN/USB/Modbus RTU)

Device drivers (custom/proprietary/Linux operating systems)

MCU interrupt routines

Concurrent and real-time programming

Generic middleware layers

GUI programming (custom, Ultimate++, Ogre, CEGUI, wxWidget)

### **Hardware platform experience**

m68k based; MC68331 with Xilinx FPGA sidekick

x86 based; daughter boards built on various form factors; SoM STX (Atom+Nvidia GPU on PCI), COM-Express (Atom) and PC/104 (AMD Geode LX800) form factor

ARM based; EFM32HG/Cortex-M0+, STM32F103/Cortex-M3 (Blue/Black Pill),

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EFR32BG1/Cortex-M4, STM32G4/Cortex-M4, EFR32(F+M)G2/Cortex-M33,  
AM3358/Cortex-A8 (BeagleBone Black), i.MX6DL/Cortex-A9  
*AVR based*; ATmega328P (Arduino Uno)

*Other*; ESP8266/Xtensa L106, ESP32/Xtensa LX6, PIC16F184xx

## Software platform experience

Micrium OS real-time kernel (aka. uC/OS before Silicon Labs)  
VRTXmc real-time kernel  
Linux kernel (customisation, patching & building, driver maintenance)  
Das U-Boot bootloader  
GNU user space tools  
Debian/Ubuntu based GNU/Linux distributions  
Yocto embedded GNU/Linux meta-distribution  
POSIX API (ISO/IEC 9945, IEEE Std 1003.1)  
Ultimate++ (C++ GUI framework)

## Embedded tools experience

Lauterbach TRACE32, debugger (m68k)  
MPLAB X, IDE (XC8, PIC16)  
IAR Embedded Workbench  
OpenOCD (Open On-Chip Debugger)

## Back-end platform experience (cloud)

Ubuntu Server  
Apache HTTP server  
REDIS cache  
Mosquitto MQTT broker  
Firebird RDBMS  
VMware based virtual hosting environment  
Microsoft Azure Cloud environment

## Hardware devices experience

Telit GE864/GC864/xE910 (GSM/UMTS/LTE modems, UART/serial interface)  
u-blox M8 (GNSS/GPS receiver, UART/serial interface)  
Microchip maXTouch (touch screen controller, I2C interface)  
SiLabs Si115x (proximity/ambient sensor, I2C interface)  
Microchip MCP2515 (CAN controller, SPI interface)

## Hardware interface experience

UART/serial - TTL/RS-323 (x86, m68k, PIC16, AVR, Exar)  
I2C - m68k, EFR32  
SPI - m68k, EFR32, PIC16  
CAN - Philips/NXP SJA1000 (x86/Linux), Microchip MCP2515 (PIC)

## Communication protocols experience

MQTT - loose coupled lightweight messaging (OASIS, ISO/IEC 20922), TCP/IP  
NMEA - GNSS/GPS geo data (NMEA 0183), serial  
OPC UA - industrial control (IEC 62541), TCP/IP  
MODBUS - industrial control, RTU (serial) and TCP/IP  
ccTalk - money acceptor control, serial  
ID003 - money (note) acceptor control (Japan Cash Machine), serial

## Programming languages

ISO/ANSI C (Microtec m68k, GCC x86, GCC Atmel AVR, GCC Arm, IAR Arm, MPLAB/XC8 PIC16)  
ISO C++ (Microtec m68k, GCC x86)  
POSIX Shell scripting (GNU Bash)  
PHP (server side scripting)  
Javascript (Node.js console application)  
Python (Telit Easy Script in embedded modem, various test and glue scripts)  
Java (JRE desktop / JavaCard smartcard application)  
Interest in various other high level languages (LISP, Go, REBOL, Clojure, Rust, GNU Guile, Erlang/Elixir etc.).

## Preferred tools

POSIX shell (command line)  
Emacs  
Git (Bitbucket, Gitlab, Github, sourcehut.org, SSH based access)  
GCC toolchain (GCC, Binutils, GDB, GLIBC)

## CI/CD experience

ThrowTheSwitch Unity, C unit test framework (ceedling/CMock/CException)  
Jenkins

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GitLab pipelines

## Other experiences, tools and platforms

Subversion

MKS RCS

Redmine project management

Trac issue management

Jira issue management

ThingWorx IoT platform

Eclipse IDE

Telit AppZone IDE (Eclipse IDE based)

CODESYS PLC environment (IEC 61131)

Electronics schematic reading capabilities

Curious, but lacking experience, about various HDL languages (VHDL, Verilog, Chisel etc.).

## Human languages

Danish, native textually and orally

English, near native textually and experienced orally

German, somewhat intelligible orally, not recommended textually

Generally very meticulous about written communication

## ○ Experience

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**2021-05-01 -> now (full time)**

**2007-03-01 -> 2021-04-30 ("on-the-side")**

**Mikini Services, Tjæreborg, Denmark**

**C\*O, embedded and open source consultancy/freelancer**

- **2023-11 -> 2024-01:** *Software review and validation of a RF motor controller prior to production start, high-volume consumer product for a global brand*

Hardware platform utilising a multi-CPU setup of Silicon Labs EFR32 SoCs (Arm Cortex-M33) implementing proprietary RF protocols and an STM32G4 (Cortex-M4) with various peripherals for motor control and user input.

Performed software review after a hardware design inspection from schematics level. Developed tests utilising automated instrumentation control to identify issues on power supply voltage fluctuations. Validated mitigations of power issues.

- **2023-02 -> 2023-05:** *CAN driver and other firmware features for specialised sensor, prototype stage B2B product for startup*

Hardware platform utilising a Microchip PIC16 family MCU with Microchip MCP2515 CAN controller peripheral attached using SPI and various proprietary sensors.

Wrote MCP2515 driver and SPI transaction mechanism from scratch in C using MPLAB X IDE & XC8 toolchain. Hardening to perform well with heavy CAN bus load tested ao. using Vector CANoe residual bus simulation test. Bootloader investigations and experiments. Various firmware feature additions and adjustments to customer requirements.

- **2021-09 -> 2022-12:** *firmware development for tablet form-factor RF remote control, high-volume consumer product for a global brand*

Hardware platform utilising a Silicon Labs EFR32 SoC with main peripherals being E-Ink/EPD display (Pervasive Displays), touch (Microchip maXTouch) & proximity/ambient sensor (SiLabs 1153).

Software platform building upon SiLabs' Micrium RTOS and Gecko-SDK interfacing to in-house proprietary RF protocol. Participated in specification and implementation of a custom GUI framework based on customer's UI/UX requirements.

Using IAR Embedded Workbench (C), Jira, Bitbucket & Jenkins as tooling.

Extensive test harness using ThrowTheSwitch's Unity for unit testing, and in-house tooling for black-box test and verification.

- **2021-02 -> 2021-11:** *firmware maintenance for remote environment monitor, low-volume niche industry product*

Hardware platform based on Telit modems with specialised environment sensors and actuators.

Software in Python and C running directly on the Telit modem. Using Telit AppZone IDE and Python as tooling.

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- **2021-05 -> 2021-06:** *firmware development for middleware of educational product with an array of actuators and sensors, high-volume consumer product for a global brand*

Hardware platform utilising an STM32 SoC.

Bare metal software platform on top of Arm CMSIS.

Worked on device drivers for proprietary protocols and I2C IMU device using VSCode, GCC, Gitlab CI/CD as tooling.

**2013-12-01 -> 2021-04-30**

**Vestergaard Company A/S, Bramming, Denmark**

**Software developer, Data Transmission Systems department**

- Development of software component acting as gateway between OPC UA (industrial standard for process control) and ThingWorx (proprietary IoT platform).
- Definition and building of Yocto platform on i.MX6DL/Cortex-A9 for hosting OPC UA gateway.
- Daily operations of hosted PHP applications (web and M2M APIs) deployed in external datacenter (Linux server setup, management and administration in dedicated VMware vCloud environment and Microsoft Azure Cloud).
- Maintenance and development of embedded firmware for airport Ground Support Equipment (GSE) vehicles for aircraft deicing, water removal and refilling. Primarily in languages Delphi and C++.
- Development of software client using Node.js and MQTT for receiving, enhancing and relaying ADS-B transponder information from embedded devices deployed at airports to backend server for utilisation of flight data in deicing workflow.
- Setup of Ångstrom & Debian GNU/Linux on AM3358/Cortex-A8 (BeagleBone Black) for hosting ADS-B flight data relay. Included U-Boot bootloader patching and hardware reset flaw analysis & debugging.
- Upgrade of embedded Linux system from using standard distribution to using a reconfigurable build process utilising the Yocto meta distribution on STX/AMD Geode LX800.
- General Linux and systems "go-to guy" for the department.

**2001-02-01 -> 2013-11-31**

**CompuGame-DAE A/S (until 2012 Compu-Game A/S), Esbjerg, Denmark**

**Software developer (senior), R&D department**

- Maintenance of firmware for existing AWP (amusement with payout) slot machine gaming platform at system level (ie. not specifically game design). m68k based hardware with a large Xilinx FPGA sharing memory via DMA, VRTXmc microkernel, software mostly C intermixed with a few components in C++.
- Development and maintenance of firmware for an AWP interconnection box, which reports revenue and earnings directly to the Danish tax authorities. m68k based hardware, VRTXmc microkernel, software mostly C intermixed with a few components in C++.
- Member of industry wide standard group coordinating the development and operation of the above mentioned system for tax reporting.
- Key developer (HW specification, SW architecture design and SW implementation) of AWP gaming platform. x86 based hardware, Linux kernel, lower middleware layers in C, higher level application layers in C++.  
Real time requirements for step motor control served by a dedicated Renesas H8 MCU interfacing via CAN bus to the x86 system through NXP SJA1000 CAN controller. Hardware and hardware specific kernel driver provided by subcontractor.
- Release management and tool-chain responsible for the entire department.

## ○ Volunteer Experience

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Member of board in local Esbjerg Danish Society of Engineers (IDA) association.

Co-founder of local makerspace GeekLabs.

Previously active in educational organisation Coding Pirates, Esbjerg.

Active in various open data and open source projects, including:

- Wikipedia, open encyclopedia
- OpenStreetMap, open geographical data
- TED Open Translation project, subtitling of the great TED talks

## ○ Personal Facts

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Man of nature, working to achieve a minimalistic and resource-conscious lifestyle.

Avoids alcohol, bottled water, heavily processed food and programmed television.

Avid runner since 2008 (from 2012 mostly barefooted), completed 3 marathons.

Enjoys driving a Honda NC700XA motorcycle.