Jakub Jan **Duchniewicz**

Senior Embedded and Software Engineer · Team Leader

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Summary

I am a Senior Embedded Engineer and (sometimes) a team leader at Tietoevry, specializing in developing L1 features for 5G NR on custom ASICs and designing complex systems. With an MSc in Embedded Systems and a minor in Innovation and Entrepreneurship, I bring a strong technical background and innovative mindset to my work.

My expertise spans embedded systems, FPGA, Linux, audio/video processing, game engine development, and machine learning. Proficient in C, C++, and Rust, I focus on embedded machine learning, security, and reverse engineering.

As a co-founder of Sticky Piston Studios, I innovate at the intersection of technology and creativity. I've presented at conferences such as the Embedded Open Source Summit, FOSDEM or State of Open Con, discussing AI-powered wearable health monitors and hardware acceleration using FPGAs, showcasing my frequent engagement with the tech community.

Mentoring is a passion, and I regularly share my knowledge through blog posts on my personal website. Additionally, I am an avid game jammer, consistently winning prizes for my creative and technical contributions.

Experience

Tietoevry

Remote - Wrocław, Poland

Senior Embedded and Software Engineer

Dec. 2021 - Present

- Leading, supporting and coaching a team of engineers.
- Implementing 5G features on a custom ASIC modem.
- Debugging RTL and C code in Simvision.
- Converting 3GPP specification algorithms to C code.
- Development and maintenance of ORAN compliant FlexRAN fork.
- Implementation of novel ORAN features in translation module between IAPI and FAPI.
- Architected, planned and implemented L2 ORAN compliant application in C++.
- Ported FlexRAN project from icc to icx compiler.
- Fuzzing of L1-L2 interface in FlexRAN with libfuzzer.
- Debugging and fixing issues found in DPDK drivers.

Intel Corporation

Remote - Wrocław, Poland

Senior Embedded and Software Engineer

Jun. 2022 - Oct. 2023

- Leading, supporting, and coaching a team of developers and managing projects.
- Recruiting engineers of all levels of expertise.
- Co-leading the ORAN M-Plane project.
- Developing the FlexRAN 5G solution.
- Implementing L1 related features.
- Implementing L2 related features.
- Conducting fuzz testing using libfuzzer and radamsa.
- Performing low-level optimization of L1 functionality.

Sticky Piston Studios

Remote

Software Engineer

Dec. 2020 - Present

- Developing web applications, including frontend, backend, databases, and dev ops.
- Designing UX and UI for digital products.
- Attending and participating in game jams and hackathons.

Google Summer of Code, beagleboard.org

Remote

Embedded Software Engineer

May. 2021 - Aug. 2021

- Using OpenGL ES 2.0 and EGL for GPGPU computation accelerations on BeagleBone Black with SGX 5xx GPU's.
- Wrote library in C which makes these computations easier.
- Implemented most popular computations (scalar operators, array operations, 2D convolution).
- Wrote both single-shot and chain API (for combining computations).
- Benchmarked the library on various data sizes.
- Documented the project on a blog.

Samsung Electronics

Warsaw, Poland - Suwon, South Korea

Junior Software Engineer

Feb. 2018 - Mar. 2020

- Improved Tizen Operating System Broadcast middleware (C++/C/Arm assembly).
- Managed performance in an embedded system, through code restructurization and thread-wise code improvement.
- Improved performance of code in major broadcasting pipelining module by aware refactorization and smart usage of C++17 STL and Boost library.
- Improved overall health of code, by analysis of coredumps and various system logs. When deemed necessary provided other teams with ready solution.
- Developed from scratch a multithreaded C and C compliant middleware process, with custom threaded work queue implementation.
- Worked with version control tools (git, p4) and in an agile environment (scrum).
- Developed bash and python scripts aiding development and analysis of problems.
- Developed python utility program for automation of defect analysis.
- Traveled to South Korea to aid with defects management during commercialization and to offer quick support.
- Worked in a diverse multi-cultural environment (directly with a group of 30 people), giving helping hand those who needed it.

Samsung Electronics

Warsaw, Poland

Intern

Dec. 2017 - Feb. 2018

- Supported in project management and knowledge transfer from other R&D Institute.
- Based on good performance and analytical skills got an offer for full-time work.

BoSport/Beskid Ski Arena

Chałupy/Szczyrk, Poland

Kite/Wind/Ski Instructor

Jun. 2014 - Sep. 2017

- Worked with all kinds of people, teaching them and maintaining good relations througout the years following.
- Taught in various changing conditions, always taking responsibility for life of others.
- Taught in both Polish and English in groups up to 10 people.

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Education

EIT Digital Master School

Europe

M.Sc. in Embedded Systems

Sept. 2020 - Nov. 2022

- Holder of EIT Excellence Scholarship
- Winner of Digital Health Summer School with "Medpipe" - personalized tracker for recovery in endoprosthetic surgeries.

KTH Royal Institute of Technology

Stockholm, Sweden

M.Sc. in Embedded Systems

Sept. 2021 - Nov. 2022

FPGA accelerated packet capture with eBPF.

- Implemented packet capturing offload from Linux network stack to FPGA.
- Implemented Avalon MM host and target with bursting and stalling capabilities.
- Patched stmmac Ethernet driver to accelerate ingress packets on FPGA.
- Wrote userspace .pcap capturing and testing programs.
- Tested the solution using ModelSIM and SignalTap simulators.
- Achieved performance gains while maintaining power consumption.

University of Turku

Turku, Finland

M.Sc. in Embedded Systems

Sept. 2020 - Aug. 2021

Warsaw University Of Technology

Warsaw, Poland

B.Sc. in Computer Science and Networks

Oct. 2016 - Aug. 2020

FPGA based hardware accelerator for musical synthesis for Linux system.

- Nomination to IEEE Polish Diploma Contest
- Implemented DDS sythesis, filtering and sample accumulation in Verilog in a streamlined fashion.
- Implemented polyphony and various waveform shapes.
- Synchronized the programmable logic with the MCU.
- Deployed the solution in the De0 Nano SoC FPGA.
- Implemented Linux kernel drivers for communication with the FPGA and ALSA subsystem.
- Implemented the ALSA soundcard driver.
- Wrote userspace application for communicating MIDI commands to the FPGA via a kernel driver.
- Tested the solution to ensure smooth and high-fidelity sound.

Extracurricular Activity

BIBoP

Warsaw - Poland

Programming and Electronics Lead

Mar. 2021 - Jun. 2021

- Wrote project architecture and data collection from sensors.
- Created a ML model for Blood Pressure predictions from PPG.
- Deployed the model on AWS Lambda with custom hooks.
- Implemented networking over MQTT protocol.
- Soldered and assembled the prototype.
- Designed and soldered analog Galvanometer.

Envidrawer

Warsaw - Poland

Programming and Electronics Lead

Sept. 2020 - Jan. 2021

- Designed a sustainable, automated plant growing solution working in varying climate conditions.
- Programmed a sensor-monitoring system and a visualisation web-based service.
- Designed and implemented an analog control ciruit as well as 12 V powering circuit.
- Nurtured friendly atmosphere and healthy work-life balance during the project with 2 other members.

BEYOND 2030 Challenge

Turku - Finland

Mentor

Oct. 2020 - Nov. 2021

- Guided a group of 2 high-school students in their environmentally sustainable project - Smart bee-hive.
- Provided support in technical and project management matters.
- Gave support where needed, pulling the students instead of pushing.

PolyEngine

Warsaw - Poland

Developer

Oct. 2017 - Present

- Reimplemented Entity Component System systems.
- Refactored code and cleaned architecture of engine.
- Developed various necessary features during gamejams (both gameplay and engine-wise).
- Developed 3 games during Global Game Jam 18/19 and Slavic Game Jam 18.
- Developed efficient data structures for a game engine: string and queue with STL compliance.

KNTG Polygon

Warsaw - Poland

Vice President and Event Organiser

Oct. 2017 - Jun. 2019

- Organised weekly meetings for student game development group Polygon.
- Gave two talks on Modern C++ usage and easily overlooked nuances.
- Planned and realised two 4-meeting editions of Game Dev Fest: invited lecturers and managed sponsorship of both events.
- Managed sponsorship funds and promotion of both events.
- Helped organise game jams (Polyjam 2018/2019).

Presentations

Digital Futures

Warsaw, Poland

Presenter for *Open Source Solutions for Modern Networks*

May. 2024

- Discussed open source solutions for modern telecommunications networks, emphasizing the benefits and challenges of integrating these technologies.

Embedded Open Source Summit 2024 *Seattle, WA, USVirtualA*

PRESENTER FOR *Zephyr on Embedded Systems* *Apr. 2024*

- Delivered a detailed session on using Zephyr OS for embedded systems, including practical examples and case studies.

FOSDEM 2024 *Brussels, Belgium*

PRESENTER FOR *Open Source in the Development of 5G and LTE Networks* *Feb. 2024*

- Delivered a talk on the role of open source in 5G and LTE network development, highlighting the importance of an open ecosystem in telecommunications.

Hackaday Supercon *Pasadena, CA, USA*

PRESENTER FOR *Hackaday Supercon 2023* *Nov. 2023*

- Explored creative uses of Vectorscope badges and other innovative hardware hacks.

Digital Futures *Kosice, Slovakia*

PRESENTER FOR *Telco Trends and 5G Advancements* *Nov. 2023*

- Shared insights on the latest developments in 5G and their impact on daily life, showcasing Tietoevry's innovative approach.
- Provided an in-depth perspective on Telco L1, enhancing the technical discussion.

Embedded Open Source Summit 2023 *Prague, Czech Republic*

PRESENTER FOR *Porting an AI Powered Wearable Health Monitor to Zephyr on Open Hardware* *June 2023*

- Discussed challenges and solutions in porting AI-powered health monitors to Zephyr OS, showcasing practical insights and technical tips.

State of Open Con 2023 *London, United Kingdom*

PRESENTER FOR *Hardware Acceleration Using FPGAs in Embedded Linux* *March 2023*

- Presented a custom Linux distribution for FPGA-based hardware acceleration, focusing on performance metrics and optimization techniques.

Skills

Programming	C++{98,11,14,17,20}, C{89,99,11,17}, C#, Rust, ARM/x86 assembly, AVX2/512, Python, Bash, Verilog, SystemVerilog, VHDL, OpenGL ES, Make, CMake, LaTeX
Technical	FPGA, Electronics, Microcontrollers, Bootloaders, SoC, RTOS, Linux Kernel, DSP, ROS, CUDA, PyTorch, Deep Learning, DSP, Hardware Accelerators, GPGPU, Network Stack, 5G L1/L2, DPDK, Fuzzing, IoT, Compilers, Game Engine Architectures
Languages	Polish, English, German, Spanish

Honors & Awards

Dec. 2023 **Award in Data for City Hackathon 2023,** Urząd m.st. Warszawy *Warsaw, Poland*

Nov. 2022 **Winner - Game Development Challenge**, HackYeah *Kraków, Poland*

2021 **Winner - Best Enterpreneurial Team,** EIT Digital Summer Health SChool 2021 *Talinn, Estonia*
"Medpipe" - an application that will help people managing their treatment timeline and supporting materials (diet, exercises, lifestyle) before and after surgery.

2019 **Honorable mention**, Warsaw Film School Game Jam VI *Warsaw, Poland*
"Eternal Feud" - Low-poly, competitive co-op, made in a duo team.

2018 **Honorable mention**, Static Code Analysis Competition - Samsung Electronics *Global*

2017 **2nd Place Overall, 2nd Place in Innovation**, Polyjam, Global Game Jam 2017 *Warsaw, Poland*
"Ommm" - Controlling a monk with the power of your voice.