Alibek Nakhimov

Hardware & Embedded Engineer

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Skills and Interests

Programming Languages: C, C++, Python, JavaScript, Bash

Embedded Systems & Electronics: STM32, Raspberry Pi 4/5, ESP32, NVIDIA Jetson Orin NX, hardware–software co-design, power distribution, ADC/DAC integration, I2C, SPI, UART, CAN, PWM motor control, sensor fusion, real-time data acquisition

PCB Design & Hardware Development: Altium Designer, schematic capture and PCB routing, EMC and signal integrity considerations, embedded power systems, custom controller board design, hardware debugging and validation

IoT & Automation: Node-RED, Firebase, HTTP/REST APIs, MQTT, edge computing, cloud-based control systems, remote firmware deployment and monitoring

Software & Tools: Linux, Git/GitHub, Visual Studio Code, STM32CubeIDE, serial analyzers, network configuration, system-level optimization

Experience

Robotics & Embedded Systems Engineer, Alma Valley   Jan 2023 - Present

- Led the development of Smart Parking Access, an integrated IoT and AI-driven parking control system deployed for university staff parking automation.
- Designed and fabricated a custom ESP32 PCB to control gate mechanisms securely via HTTPS, featuring relay isolation, onboard power regulation, and retrofit compatibility with existing hardware.
- Built a cross-platform mobile app (Flutter) integrated with Firebase Authentication and Realtime Database, providing geolocation-based access control and multi-user management.
- Implemented a computer vision module (Python + YOLOv3) to detect vehicles, analyze motion direction, and automatically log entry/exit events with 90
- Applied full-stack IoT design principles — from PCB design and embedded firmware to cloud backend and user interfaces — resulting in a reliable and scalable smart infrastructure solution.

Embedded Systems Engineer, Jaqsy IT   Sept 2021 – Dec 2023

- Designed and developed a commercial IoT payment and control module enabling laundry machines to operate only after verified customer payment via Kaspi Bank mobile app, deployed across multiple laundromats in Kazakhstan.
- Engineered a custom PCB with ESP8266 (ESP-12F) as the core controller, featuring three optocouplers for 230 V line isolation, and integrated AMS1117-3.3 V regulation for stable low-voltage operation.
- Created the firmware architecture in C++ (Arduino framework), implementing a state machine for payment verification, HTTP-based backend polling, and secure activation control logic.
- Supervised the hardware manufacturing process, including schematic design, PCB layout, CNC fabrication, and assembly validation.

Projects

Autonomous Warehouse Mobile Robot Integration Using TurtleBot3 and OPC U
([Publication ↗](#))

- Collaborated on developing a LIDAR-based navigation and grid-positioning algorithm for the TurtleBot3 Waffle Pi to enable autonomous warehouse operation. Integrated a 3D-printed lifting mechanism and OPC UA connectivity with Wiren Board 7 and Honeywell Experion PKS for seamless industrial communication.

- Tools Used: Python, ROS1 Noetic, Wiren Board, Honeywell Experion PSK, Fusion360

Qt–STM32 Ethernet Control System

- Developed a full-stack embedded system enabling a Qt5-based GUI on Raspberry Pi 5 to control a bare-metal STM32F103 microcontroller over Ethernet via CH9121 bridge.
- Implemented a custom TCP protocol for real-time relay control, with STM32 firmware written in pure C using direct register access (no HAL or CMSIS).
- Tools Used: C, C++, Qt5, STM32F103, CH9121, Raspberry Pi 5, CubeIDE, Fusion 360

Naiza Boxer – Commercial Arcade Strength Tester Machine

- Developed a full-scale arcade boxing machine integrating impact sensing, multi-channel payment (coin, bill, QR), and synchronized LED/audio feedback.
- Designed custom EMI-resistant control and display PCBs and implemented modular C++ firmware for ESP8266 with interrupt-based event handling.
- Tools Used: C++, ESP8266, Altium Designer, DFPlayer Mini, WS2812B, Fusion 360

Smart Laundry Payment Module – IoT Payment Controller

- Created a production-ready ESP8266-based control board enabling washing machines after verified mobile payment via Kaspi Bank app.
- Implemented hardware isolation with PC817 optocouplers and developed secure HTTP-based firmware for backend payment validation.
- Tools Used: C++, ESP8266, Altium Designer, PC817, AMS1117, Fusion 360

Smart Parking Access – Automated Gate Control System

- Designed an IoT-powered parking barrier system with ESP32 custom PCB with relay drivers, Firebase integration, and AI-based vehicle recognition.
- Tools Used: C++, Python, ESP32, Altium Designer, YOLOv3, Qt, Flutter, Firebase

Smart Media Distribution System for Digital Signage

- Implemented a cloud-connected system managing and updating multimedia content across 18 Raspberry Pi-based TV units.
- Automated content synchronization via Firebase triggers and Node-RED backend with local playback resilience.
- Tools Used: Python, Firebase, Raspberry Pi, Node-RED, Qt

Activities and Achievements

KazEnergy Winner: Developed a VTOL Tricopter system for autonomous medical supply delivery in remote and hard-to-reach areas.

University Representative at Robotics Competitions: Evaluated projects and determined full scholarship recipients as an official university representative.

Education

Kazakh-British Technical University, BS in Engineering and Technology   Sept 2020 – May 2024

- **Coursework:** Foundations of Electrical Engineering, Theory of Linear and Non-linear Control Systems, Internet of Things and Embedded Systems, Digital electronics systems design, PLC Programming, Automation Components and Devices, Robotics in Manufacturing

Portfolio

Feel free to check my specific 💼 Portfolio ⬀ entry for more details!
Portfolio: https://alibeknakhimov.github.io/portfolio.github.io