Taipei, Taiwan
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Andrei Petrov

Embedded software engineer

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I am an embedded software engineer with a background in the aerospace industry and electrical engineering. I've been writing flight software for CanSat satellites in C since early high school. Now I design payload electronics for CubeSats.

My interests include embedded systems, network engineering and website development. Be sure to check out my flagship project: a real-time operating system kernel for 8-bit microcontrollers.

Skills

Tools and Languages	C/C++, Assembly (AVR, x86), CppUTest, Doxygen, Python / Django, Git, HTML/CSS/JS, GnuRadio, pfSense, VMware ESXi, LaTeX, TianoCore EDK II
Electrical Engineering	KiCad EDA, Proteus 8, LTSpice/NGSpice
MCU Architectures	AVR8, Cortex-M0 (STM32), Cortex-M3 (SAM3X), Cortex-M4 (STM32)
Communication	English (C1), Russian (Native), Cat 2 Russian Amateur Radio License

Technical Experience

Engineering Lead / YKTSAT-1 CubeSat — **Jul 2020 — Present**
Sakha Aerospace Systems, LLC — *Yakutsk, Russia*

- CubeSat payload module electronics design.
- Flight software development in C.
- Ground station operations, radio communication and satellite control.
- Documentation management and project supervision.
- Network and server maintenance, cloud service operation (Nextcloud, Gitlab, Onlyoffice).
- Fullstack WebDev (Django), GitLab CI/CD, DevOps – `yktaero.space`

Tutor / Yakutsk International Research School — **Aug 2021 — Sep 2021**
Sakha Junior Science Academy — *Yakutsk, Russia*

- Student project supervision.
- Teaching C programming basics, electrical engineering, electronics assembly.
- Aerospace engineering courses for students.

Intern - Junior Software Developer — **Mar 2021 — Jun 2021**
«Sever» Information Security Center, LLC — *Yakutsk, Russia*

- Fullstack website development, Flask/Python.
- Email malware filter development, Python.
- Network engineering, VMware ESXi management.

Intern - Electronics/Embedded Software Engineer — **Jun 2019 — Nov 2020**
Shafer Institute of Cosmophysical Research — *Yakutsk, Russia*

- PCB design, assembly and repair.
- Satellite & radio communication basics.
- High energy particle physics course.

Education

Undergraduate, *Civil Engineering, National Taiwan University @ Taipei, Taiwan* — 2022 — Present
High School, *V.P.Larionov Physics & Technical Lyceum @ Yakutsk, Russia* — 2012 — 2020

Activities

Sakha Junior Science Academy @ Yakutsk – Satellite Ground Station Operator	2021 — Present
MSU Aerospace Engineering School (RosCanSat competition) – Team Leader / Programmer	2018 — 2020
Space-Oriented Learning for Americans and Russians (SOLAR program) – Finalist	Summer 2020
National Taiwan University Science Innovation School – Student, Research Presenter	Summer 2019
«Big Challenges» All-Russian project competition @ Sirius Center – Finalist	Summer 2019
International Science Youth Forum, Hwa Chong Institution @ Singapore – Research Presenter	Winter 2018
WorldSkills Russia Finals in Space Systems Engineering @ Moscow – Participant, Silver award	Winter 2018

Projects

Sakha Aerospace Systems Ground Station Network — **In development**
Link: `https://gsn.yktaero.space` — *Stack: Python, Django, Jinja2, Django REST*

- Provides a public API to query satellite ground station status.
- Visualizes ground station operation by displaying antenna position and satellite passes.
- Receives real-time satellite telemetry data and forwards it to clients.
- Generates satellite pass schedule and manages ground station tracking.
- (Planned) Provides a public satellite imagery repository using ground stations.
- (Planned) Stores past telemetry packets and allows to obtain historic satellite data.

Sakha Aerospace Systems Datasheet website — **In development**
Link: `https://docs.yktaero.space` — *Stack: Python, Django, Jinja2, Django REST*

- Provides users with a list of all published technical documents.
- Search, filtering, reordering supported.
- Stores and displays revision history for all documents, provides file downloads for every revision.
- Allows creating new documents and uploading files via administration panel.
- (Planned) GitLab CI integration for LaTeXdocuments with automated publishing.

YktSat EDU/16 Payload Module — **In development**
Link: `https://yktaero.space/projects/item/ykts-pl-edu16-sptx` — *Stack: KiCad, C/C++, Doxygen*

- Conformant with PC/104, CubeSat, and Sputnix ICD specifications.
- 4-Layer modular PCB, designed from scratch in KiCad.
- Modular firmware written in C & AVR assembly, unit tests with CppUTest, CI/CD supported.
- Single makefile, firmware built and tested with self-hosted GitLab.

Ground Station Controller - stationctl — **Operational**
Internal tool — *Stack: Python, GnuRadio, Skyfield*

- Estimates satellite position in real time using orbital elements.
- Automatically adjusts radio link parameters (data rate, carrier frequency with Doppler shift, etc.).
- Aims antenna rotator to the satellite position.
- Production deployment & usage in Sakha Junior Science Academy.

Sakha Aerospace Systems website — **Operational**
Link: `https://yktaero.space` — *Stack: Python, Django, Jinja2*

- Simple landing page, blog and project overview.
- No front end frameworks, blazing fast (95+ PageSpeed).
- CI/CD with self-hosted GitLab.

Sakha Aerospace Systems development infrastructure — **Operational**
Link: `https://status.yktaero.space` — *Stack: VMware ESXi, pfSense, nginx*

- Various services for team collaboration: Nextcloud, Gitlab, Onlyoffice, Inventree.
- Simple status reporting with GitHub Pages, internal monitoring with Zabbix.
- Single Sign-On for all services using self-hosted Authentik, migration to Keycloak is planned.
- Fully self-hosted & virtualized, proper network isolation with VLANs, secure remote access with OpenVPN.
- Server uses enterprise-grade hardware.

YktSat PL-RTOS kernel — **Production usage**
Internal tool — *Stack: C/C++, Doxygen*

- Fully-featured Real Time Operating System (RTOS) kernel for MCUs.
- Currently supports AVR ATmega128 & ATmega2560, ARM Cortex-M4 support planned.
- Experimental task child–parent relationship with batch task operations.
- Mutex priority inheritance and FIFO locking.
- Built-in heap manager with allocation tracking and double free protection.
- Unit tests with CppUTest, Doxygen for documentation.
- Used in YktSat EDU/16 Payload Module firmware.

UEFI mods — **Production usage**
Personal project — *Stack: TianoCore EDK II, UEFITool*

- DXE module with secret notes, activated with key combo, written in C with EDK II.
- Patched personal workstation EFI image with my custom DXE module, also added support for NVMe boot.
- Customized logos, UI images, backgrounds and DMI information; updated bult-in DXE drivers to latest versions.
- Flashed modded images into hardware, haven't bricked my PC.