

PX4ESC and Sapog

Open source motor controller firmware



Why focus on firmware?

Effort distribution in electric drive design:

- Hardware - 1%
- Firmware - 99%



Brief History of the Project

- Started as PX4ESC, basic BLDC control
- Forked to Sapog when stabilized
- PX4ESC moved on to Field-Oriented Control
- Sapog v1.0 released on April 7, 2016
 - <https://github.com/PX4/Sapog>
- PX4ESC v0.1 released on April 7, 2016
 - https://github.com/Zubax/PX4ESC_FOC



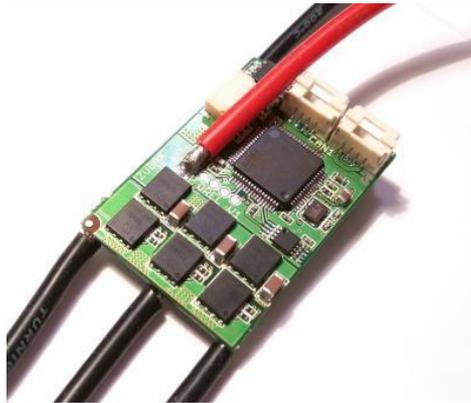
Sapog

- CAN bus interface (optionally redundant)
- Self-diagnostics & status feedback
- Low latency
- Good response characteristics
- Over-the-bus firmware updates
- Fully supported by PX4 and APM
- BSD licensed



Current status of Sapog

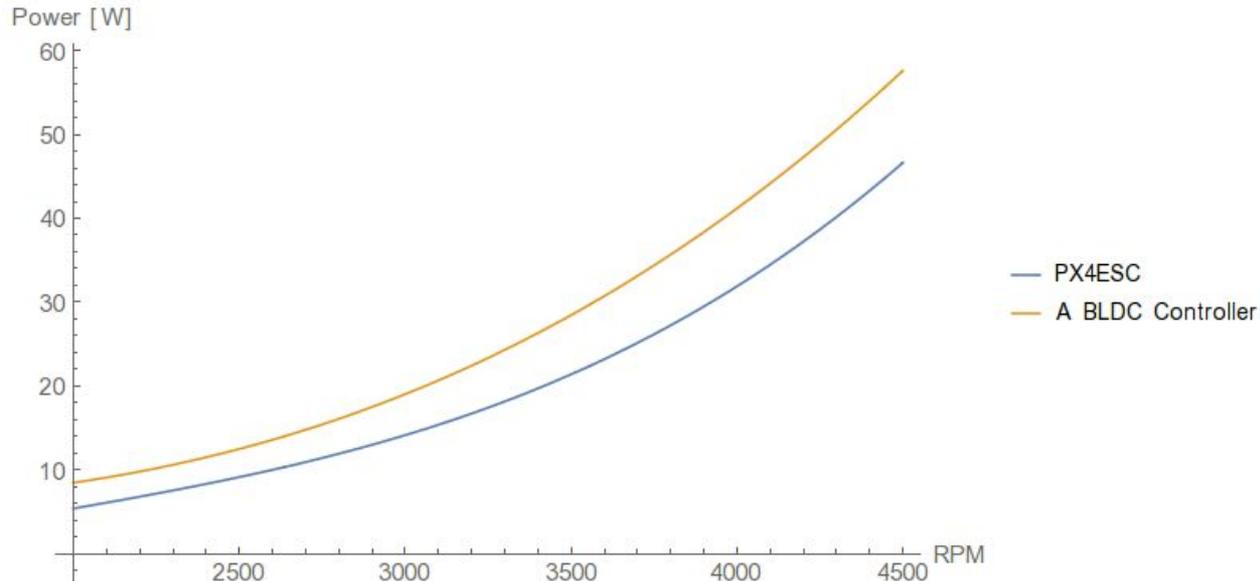
- Version 1.0 released
- Hardware is publicly available - Zubax Orel 20
 - 3~4 S
 - 20 A
 - **Follow the link to order →**



PX4ESC features

Longer missions

- 15% higher efficiency thanks to field-oriented control



PX4ESC features

Higher reliability

- Field-oriented control algorithm
- CAN bus interface (optionally redundant)
- Self-diagnostics
- Extensive status feedback



PX4ESC features

Better response characteristics

- Lower latency
 - Typically 200 microseconds at 1 Mbit/sec CAN
 - Field-oriented control enables full utilization of the drive



PX4ESC features

Affordable

- Low-cost STM32 microcontroller
- Open source development tools (GCC, DroneCode Probe)
- Reference hardware designed in Eagle CAD



PX4ESC features

Better usability

- Vendor-independent CAN bus protocol
- Over-the-bus firmware updates
- Fully supported by PX4 and APM



PX4ESC Technical Details

Refer to “Efficient BLDC controller for critical UAV applications”, IMAV 2015



Current state of PX4ESC

- Field oriented control is working
- Supported motors:
 - T-Motor MT2216 800
 - T-Motor U8
- Automatic motor identification is a WIP
- Hardware is coming soon
- **Follow updates at** →



Thank you

pavel.kirienko@zubax.com

