Charles Aylward
Embedded Systems Engineer

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Versatile engineer with broad experience spanning software, firmware, gateware, and hardware. Experience ranging from low-power embedded systems to HPC distributed systems of thousands of nodes. Significant experience with distributed control systems and sensor networks.

Experienced in mixed-signal board-level design, schematic capture, PCB layout, board bring-up, and bench testing. Familiar with design for manufacture (~10K runs), power and signal integrity for high-speed designs, EMC, and FCC / UL certification. Designed electronics in Altium, KiCad, Eagle, and a handful of other ECAD suites.

Experienced in Linux development in both user- and kernel-space. Experienced in bare-metal firmware development on various platforms including applications, bootstraps, bootloaders, and board support packages. Developed software in C, C++, Scala, Java, Python, Perl, and to a lesser extent, many others.

Famliar with FPGA design, simulation, and verification with Xilinx and Lattice toolchains. At home in any GNU environment.

Experience

Principal Engineer, Freelance
Grizzly Peak Systems
October 2015 – Present

Freelance in the following areas:

- Electronics / embedded systems design ("new space" avionics, consumer electronics, industrial control), concept-to-product
- Sensor network design
- Network protocol design and design for lossy channels
- Firmware, application software, embedded Linux
- Real-time system design and constraint analysis
- Distributed systems

Common projects include:

- Robotics, control systems, industrial control, closed-loop actuator control
- Consumer electronics and IoT devices, WiFi, Bluetooth / BLE connectivity
- Sensor systems, instrumentation, signal conditioning, data logging
- Xilinx Zynq SoC integration
- Integrating high-performance IMUs and GPS receivers
- Low-power design for battery-operated devices
- Motor controllers (BLDC, BDC)
- Hardware prototyping, proof of concepts / rapid prototyping

Principal Flight Software Engineer
Astra Space, Inc.
July 2017 - August 2019

Principal embedded software engineer and designer for first-generation orbital launch vehicle flight control systems (avionics). Helped produce what was very likely an all-time speed record from clean sheet to first launch license. Technical direction for flight SW team.

All principal design and development for:

- Engine controller bare-metal firmware for main booster and upper stage engines
- Engine auto-sequencing and flight mission planning software for fully autonomous launch vehicle control
- Primary launch vehicle command and data handling system, sensor network, and telemetry system
- Integration of guidance, navigation, and control algorithms

Principal electronics design engineer for next-generation vehicle's flight computer:

- Board-level design, schematic capture, and layout.
- Operating system bring-up including FPGA gateware and device drivers
- Software systems engineer of next-generation flight control software.

Additional hats worn would make for a long list.

Embedded Systems Engineer
Whisker Labs, Earth Networks
December 2016 – July 2017

Developed hardware and software systems for innovative easy-to-install residential energy monitoring.

Electronics design engineer responsible for schematic capture and PCB layout for several new board-level designs emphasizing design for manufacturing, test, and assembly. Worked with overseas contract manufacturers on DFM / DFA of PCBAs with multiple enclosure types (plastic injection molded shells, soft plastic overmolding) and wired interconnects. Electronics met UL 60950 and FCC 15B/B certification requirements in test. Designed PCBA test fixtures for automated programming and test ("red light, green light").

Embedded software developer responsible for first article microcontroller firmware and embedded Linux bring-up. Developed the Bluetooth interface for mobile product configuration.

Software Engineer
Twitter, Inc.
January 2012 – August 2015

Developed the infrastructure for monitoring and analysis of the production service stack: application instrumentation libraries, complete metrics pipeline (170M+ metrics per minute at the time), time series databases (petabytes), and query languages. We called it Observability.

Worked on operating systems, kernel drivers, JVM performance analysis, and container standards and related technologies.

Additional Experience
September 1999 – December 2010

Information on additional experience available at http://www.linkedin.com/in/charlesaylward

Other Frequently Used Skills

- Lab / bench testing and debugging with oscilloscopes, logic analyzers, spectrum analyzers, programmable dynamic loads, occasionally a Helmholtz coil, etc.
- Circuit and power deliver network simulation
- SMT PCBA assembly, testing, and rework
- MCAD for the design of electronics test fixtures (bed of nails, flying probes), aluminum enclosures, heat frames, basic sheet metal structures, etc.
- Linux device driver development
- Custom gateware IP development in Verilog (less often, VHDL)
- Technical program planning and management
- Technical writing
- Writing compilers, byte-code interpreters, optimizers, query language parsers

Other Projects and Interests

- Design and fabrication of observation-class ROVs (structural, propulsion, navigation and control, sensor payloads).
- Autonomous systems, artificial intelligence (computational behavior and biomimicry, not ML), anomaly detection, modeling and simulation, space exploration, and cosmology.