The Embedded Muse 109

Editor: Jack Ganssle   (jack@ganssle.com)   Jan 26, 2005

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Editor's Notes

There are no current plans to host a public Better Firmware Faster seminar, but I often do this one-day seminar on-site, for companies with a dozen or more embedded folks who'd like to learn awesome ways to build firmware more efficiently. See http://www.ganssle.com/onsite.htm.

We're overwhelmed with jobs this week; let's hope that says something good about an improved business climate in this industry. In fact, I'm releasing the Muse a bit earlier than planned just so these job offerings don't go stale.

Thought for the Week

In the January, 2004 (yes, last year's) IEEE Computer Jesse Poore made a comment that keeps running around in my head. He wrote: "Theoretically, software is the only component that can be perfect, and this should always be our starting point."

Wow.

Hardware can be made incredibly reliable. But it still breaks. Perfection is not only practically unattainable, the Second Law of Thermodynamics guarantees that no amount of effort will result in perfection. So for the most critical of applications we resort to

multiple independent units, and still at best reduce the chance of failure to some non-zero probability.

But software never breaks. It quietly does whatever we told it to do.

It's not easy to get software perfect, and in fact in many cases that goal may be practically impossible. But there's nothing implicit in code that leads to bugs. Imperfect software stems from poor programming practices, insane schedules, and all of the usual well-known factors.

Both hardware and software are human creations, so both suffer from human frailties. But only the circuits and devices are intrinsically flawed. If we do better, we can at least approach perfection with the code.

And that's a happy thought.

The Digital I/O Handbook

The Digital I/O Handbook, by Jon Titus and Tom O'Hanlan, (ISBN: 09759994-0-0) is a 75 page introduction to using digital inputs and outputs with microprocessors.

The book starts with a quick introduction to logic, which emphasizes the electrical, rather than the Boolean, nature of real devices.

A chapter on outputs is equally practical. The authors talk about using buffer chips and transistor circuits to drive relays (solid state and otherwise) and optoisolators. The chapter on inputs talks about real-world problems like bounce and circuit isolation. You'll learn how to compute the values of pull-ups, LED resistors, and the like.

The final chapter on interfacing to sensors walks the reader through using thermal switches, Hall-effect sensors, encoders and more.

What I like most about the book is its mix of hardware and software. Most pages have a bit of code plus a schematic. All code snippets are in C.

This is a great introduction to the tough subject of tying a computer to the real world. It's the sort of quick-start of real value to people with no experience in the field.

I haven't seen it on Amazon, but you can get it from
http://sealevel.com/product_detail.asp?product_id=810&%5F .

Systems Design using the Rabbit 3000 Microprocessor

Systems Design using the Rabbit 3000 Microprocessor, by Kamal Hyder and Bob Perrin, (ISBN: 0750678720) is a complete introduction to programming with this popular microprocessor.

Rabbit Semiconductor (http://rabbitsemiconductor.com/) sells a popular range of 8 bit microprocessors that offer quite high-end performance. My son and I just finished a project for his high school with one, and I've used them for a number of other applications. The R3000 is sort of like a Z80 on steroids, with many new instructions, wider address bus and a wealth of on-board peripherals.

Like any modern high-integration CPU the Rabbit offers so much it's sometimes hard to get a handle on managing all of the I/O. This book will get you started, and is a must-read for developers using the part.

The first few chapters describe the CPU in general and the development environment provided by Rabbit (Dynamic C).

Chapter 5, though, is a description of interfacing to the real world, using all sorts of devices. It's aimed at engineers, not raw newbies, but, for an engineer at least, is an easy and descriptive read.

The chapter on interrupts is one of the best I've seen in any book. It covers the hard stuff, like writing ISRs in C and assembly, with real-world examples. If you're using the R3000 just cut and paste the code into your application.

It seems today that if there's a transistor in a product then it needs an Internet connection. Rabbit has several development kits that include everything needed to connect to the 'net. The authors devote considerable space to networking, but thankfully with only a cursory explanation of protocols. Rather, they give step-by-step instructions on implementing a working network, and conclude with a complete web server for monitoring water sprinklers.

The final chapter covers an alternative toolchain from Softools. Dynamic C is a single-module compile-it-all paradigm that's highly interactive. Softools (http://www.softools.com/) sells a well-supported, reasonably-priced conventional C compiler, assembler and IDE. I only recommend products I've used and like, and the Softools products are first-rate.

Systems Design using the Rabbit 3000 Microprocessor is required reading for users of the R3000, and a pretty darn good introduction to the entire realm of embedded systems development as well.

Jobs!

Let me know if you're hiring firmware or embedded designers. I'll continue to run notices for embedded developers as long as the job situation stays in the dumper. No recruiters please.

KVH in Middletown, RI is looking for a Senior Software Engineer, who will research, design and develop systems-level embedded software, in conjunction with hardware product development, and provide systems support by performing the following duties:
- Design, develop and troubleshoot complex RTOS software programs.
- Consult with other engineering staff to evaluate interface between hardware and software, and operational and performance requirements of overall system.
- Formulate and design embedded software system, using scientific analysis and mathematical models to predict and measure outcome and consequences of design.
- Participate in designing, coding, testing, debugging, configuring, and documenting operating systems and software.
- Recommend selection, approval, and acquisition of hardware, software, networking components, and services.

Successful candidates will have these qualifications:
- BSEE, CE, CS or equivalent, MSEE preferred.
- 5-10 years embedded software experience.
- Solid understanding of systems design methodology, real-time design, multi-tasking systems and 8/16 bit micro-controllers
- Experience with CASE tools, C programming, in-circuit emulators, UML, RTOS, FPGAs, CPLD, RS232/485 data logging products, hardware and firmware for PIC microcontroller, analog and digital signal processing.

Contact Susan Young, syoung@kvh.com.

Corelis, in Los Angeles, a worldwide provider of test software tools, is seeking a highly skilled and experienced software engineer. Must have BSCS or equivalent with GPA 3.5 or higher and 3 years min experience. C and C++ programming and development of software/firmware for embedded applications. Development of GUI-based Windows tools for next generation Corelis Products. Product responsibility from concept through development to production. Custom application software development for special

projects.

This person needs be details oriented, meticulous, well developed in software coding and troubleshooting, advanced skills in Microsoft Visual Studio (Net, MFC, API), excellent verbal and written communication skills.

Send resumes to jobs3@corelis.com

VXI TECHNOLOGY INC, a rapidly growing electronic test equipment manufacturer located in Irvine, CA, seeks a firmware/software engineer for its Cleveland, Ohio design group. The primary responsibilities will involve the design of real-time, embedded firmware and the development of instrument device drivers for the Windows and Linux operating systems.

The ideal candidate will have demonstrated skills in the areas of:
* Linux programming (kernel, device driver, and user)
* Embedded firmware design
* TCP/IP network programming
* C/C++/Assembly programming languages
* Firmware/software architecture definition

Contact Kevin Ballou, kevinb@vxitech.com, 216-447-4059

ATI needs three senior embedded engineers. Either three in the Detroit area or two in the Detroit area and one in the UK. Motorola 68332/PPC, Matlab, & Simulink experience is desirable. Our company's products can be seen at www.accuratetechnologies.com. Any potential candidates can e-mail their resumes to kparrinello@accuratetechnologies.com. We desire candidates that have:

- Bachelors Degree in Electrical Engineering, Computer Engineering, Computer Science; or equivalent experience required.

- Proven track record of executing all phases of software development activities from requirements through final testing.

- Good communication skills, both written and oral. Ability to read and understand circuits, schematics, and data sheets. Experience with real-time embedded systems development.

- Experience with C++ programming language.

- Project management experience.

- Some knowledge of Visual C++ beneficial.

Engim is the first developer of intelligent, wideband chipsets with All Services AP (ASAP) functionality designed from the ground up for a new generation of wireless infrastructure solutions that meet the needs for an increasingly mission-critical wireless network. We are located in Acton, MA, and are looking for the following people:

EMBEDDED SOFTWARE ENGINEER
Position requires BSEE or BSCS (MS/MEng preferred) and at least two years experience with networking protocols, preferably 802.11. The position also requires proficiency with software engineering design principles such as modularity, abstraction, design patterns, and event-driven software systems. Experience with C, TCP and network layer models are all a plus.

FIRMWARE ENGINEER
Candidates require a BSCS or BSEE degree (MS preferred). Requires extensive experience developing high-performance firmware for embedded processors on ASICs. Candidate should be fluent in both C and Verilog, and have experience with memory-mapped architectures, embedded CPUs (ARC preferred), and PCI and DMA interfaces.

DSP ENGINEERS
Multiple positions. Requires PhD or MSEE in DSP Communications (with strong academic record), or at least 2 years relevant experience. Candidate must have significant experience with statistical digital signal processing, and with communications algorithms related to OFDM, MIMO, wireless LAN, and other radio protocols. Position also requires very strong Matlab expertise. C++ and RTL Verilog experience are all a plus. Experience programming commercial DSP chips is not relevant to this position.

To apply, please email resume to jobs1@engim.com. Information on other (non-software) positions is available at http://www.engim.com/careers.html

DISTek Integration has a couple openings for Software/Systems Engineers in our Development Center in Cedar Falls, IA. Candidates can view the job description on our website at www.distek.com

Card Labs Inc. (http://www.CardLabs.com) is looking for an intermediate level embedded programmer with electronics design skills. This is a contract-to-hire position. Card Labs Inc. designs and manufactures OEM equipment that is private labeled for other

companies and also manufactures its own line of data loggers. We're located in Calgary, Alberta.

We are looking for a creative individual that can provide our customers with ideas and work with them to produce an optimal design to take products from concept to manufacturing. The initial projects will be data loggers and data collection devices. The position will use the following skill areas:

Microcontroller based product design and electronics design, embedded programming in C (for Rabbit, AVR, MPS430 and other micros), TCP/IP and serial protocols, mass storage using various memory cards with direct and USB interfaces, RTOS (uC-OS II), PCB layout (PADS), analog electronics, mechanical design and packaging. Optional skill areas include PC programming, low power wireless communications, encryption, design for hazardous areas, and smart cards.

Please send a cover letter and resume to careers@cardlabs.com .In your cover letter please tell us about projects that you have done (either personal or business) and the major influences that have contributed to your ability to design great products (people, books, classes, companies etc.). Long cover letters are acceptable. If you have specific questions about the position please send them to careers@cardlabs.com.

Spellman High Voltage Electronics Corporation, the largest independent manufacturer of high voltage power supplies located in Hauppauge, NY seeks digital/software engineers with 5+ years of hardware and software design expertise with microcontrollers and embedded systems. BSEE or equivalent along with excellent communication and documentation skills are required. The ideal candidate will have experience with microcontrollers, DSP, ADC, DAC, FPGA/CPLD, Visual Basic, Java, C/C++, VHDL/Verilog. Salary commensurate with experience.

Product development includes: CATscan, mammography scanners, telecommunications/PFE, mass spectrometers, genetic sequencers, UV sterilizers, focused ion beam generators, semiconductor manufacturing assemblies, industrial x-ray inspection, x-ray security scanners (luggage), and custom products.

Those interested, can surf to: http://www.spellmanhv.com/news/job_ben_US.asp or contact hr@spellmanhv.com.

Joke for the Week

Thaddeus Badowski sent in this gem:

An ASCII character walks into a bar.

"How are you today?" asks the barman.
"Not too good, I have a parity error" says the AC.
"I thought you looked a bit off" the barman replies.

About The Embedded Muse

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