

# The Embedded Muse 143

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## Editor's Notes

Did you know it IS possible to create accurate schedules? Or that most projects consume 50% of the development time in debug and test, and that it's not hard to slash that number drastically? Or that we know how to manage the quantitative relationship between complexity and bugs? Learn all this and much more at my Better Firmware Faster class, presented at your facility. See <http://www.ganssle.com/brochure-onsite.pdf>.

Or, come to **Boston May 4**, where I'll present this class at the Sheraton Braintree hotel. Registration and other info here: <http://www.ganssle.com/classes.htm>. You'll earn 0.7 Continuing Education Units, learn a lot, and hopefully have a bit of fun, too.

I will be presenting this seminar in Toronto on April 20 for the local IEEE section. Both IEEE members and non-members are welcome. The details are posted here: <http://toronto.ieee.ca/education/firmware0407>.

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This issue of The Embedded Muse is supported by Micrium.

Think outside the box, and now see inside as well with Micrium. Many embedded systems are black boxes that provide very little information about their activity. That's about to change. Imagine getting visual feedback about your system in real-time. Visit Micrium in Booth 3064 at ESC Silicon Valley, April 3-5. Come see inside the box. <http://www.Micrium.com>.

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## Tools and Tips

Roland Bennett wrote: "This might come across as blatant self-advertisement, but I'm very proud of my first open source contribution: <http://ttracker.sourceforge.net/> .

"It is to aid timesheets without having to do much, the app will check the active window periodically and list time spent on each. Custom tasks can be added, and with the aid of rules, windows can be associated with these tasks.

"So if setup correctly, one would not even have to start/stop manual timers!"

Dave Kellog wrote about an old technique that can still be useful: "In the past 10 years or so, I don't recall seeing anything in the Embedded press or books about Radix-50. This seems a little odd, since it is a beautiful technique for packing 3 almost-ASCII characters into 16-bits. See <http://en.wikipedia.org/wiki/RADIX-50> and <http://www.doc.ic.ac.uk/~asher/ubi/ans/radix50.html> .

"I have not thought about this much, but it seems like the conversion to Radix-50 would be favorable on DSPs or modern processors with a MAC instruction. That would bring Radix-50 from the 1970s into the 21st century."

Dave suggested that I mention Baudot. Baudot was a code that predated ASCII, which used five bits to encode 64 characters. The code was comprised of two sets of 32 characters. The letters were in one group, and punctuation and numbers in another. If sending letters and one wanted to transmit a number, you'd first send the Shift-Up character that invoked the second set. The system continued using the second set till sending a Shift-Down.

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Anyone who remembers seeing movies with noisy press teletypes chattering in the background saw Baudot in action. Sometimes the second character set consisted of special symbols used to send weather information.

Before cheap logic, data communications took place using these marvelously-complex mechanical teletypes which encoded and decoded Baudot serial streams with nothing more than a motor and stacks of levers and gears. They were astonishing to watch. Repair often consisted of a few thoughtful whacks to the right place with a hammer.

In my youth I built a 12 bit computer out of TTL components and a scavenged Model 15 Teletype (picture of a similar machine here: <http://www.railroad-signaling.com/tty/tty.html> ) which made a wonderfully-thunderous noise sure to wake the neighbors. A Baudot machine, the paper-tape reader used metal fingers to sense the tape's holes. The one or zero was converted to a 60 ma current and sent to beefy assembly that looked like a car's distributor. The rotating rotor picked up each of the five bits one after the other, sending the serial stream down a wire at 45 baud. A mechanical UART, in other words.

I have never seen Baudot used in embedded systems, except for a few that were converters between Baudot and ASCII.

## **Software Disaster!**

The VDC survey mentioned in the last Muse, and in the patched version of that Muse, suffered from some software errors. The VDC folks asked me to publish the following:

Dear Embedded Muse readers,

Venture Development Corporation (VDC) would like to formally apologize to subscribers of The Embedded Muse that may have attempted to help us with our research on ESL tools on March 5th and 6th of this month. In his March 5th 2007 newsletter Jack Ganssle kindly included information about VDC's most recent research into the embedded systems market, a study on ESL tools. This research focuses on embedded hardware/processor, software, and system engineering and VDC was eager to hear from these types of engineers working in one or more of these areas.

Unfortunately, we experienced some very severe problems with our survey on March 5th and most of the day of March 6th. Unknowingly, our survey solution partner had recently changed the function of one of the tagging mechanisms we had used many times in the past to tag responses by group (for example in this case we had used "GA" to identify respondents from the Ganssle Group newsletter). However, instead of tagging each survey response, this tagging feature had been changed to uniquely identify a single response! This resulted in all users logged onto the survey sharing a single survey

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session, likely confusing/frustrating those trying to take the survey and leaving VDC with no data and no way of identifying those that had wanted to participate.

While the link has been corrected since the afternoon of March 6th, VDC would like to ensure that all that attempted to participate before this time receive entry into our drawing and a copy of the findings if they are interested. Therefore, if you answered the survey on either March 5th or March 6th:

...and don't have an interest in taking the survey again, please send an e-mail with your contact information to [esl@vdc-corp.com](mailto:esl@vdc-corp.com) by April 20th. Please use "ESL Survey" in the subject line. You will be included in the list of participants and receive a summary of the results and entry into the drawing as promised.

...and would like to take the survey again, you can now visit the survey (that is now working properly.) We would greatly appreciate your insights if you have time to participate again.

Please go to: [www.vdc-corp.com/esl?PID=G2](http://www.vdc-corp.com/esl?PID=G2)

We also continue to welcome participation from anyone that has not yet accessed our survey. As a thanks for participating VDC is offering all respondents who complete the survey a summary of the survey findings, and a chance to win one of three \$100 Amazon.com gift certificates. Anyone interested should visit: [www.vdc-corp.com/esl?PID=G3](http://www.vdc-corp.com/esl?PID=G3)

We deeply regret any inconvenience the failure of the survey may have caused interview respondents. VDC greatly values the input from embedded engineers, and we appreciate your understanding in this matter. We hope to hear from you again on this or future VDC research. Please let us know if you have any questions or concerns.

Sincerely,  
The VDC Embedded Systems Team

## **Communication**

In response to my comments last issue about English, Rick Ilowite wrote: "I find the inability or lack of effort to communicate effectively to be the single most common cause of mistakes, delays, and failed development. And it permeates every layer of the process - from misunderstandings between executives/marketing and engineering, to the design architecting and the communication between project managers and developers, to the communication between the developers themselves, to QA/sales/support, and all the way down to the comments in the code!"

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“Unfortunately, this stuff is usually last on the priority list. How often is code modified, but the comments and spec/design documents never get updated? And if a developer spends any significant time on it, he or she risks the wrath of the boss, who's usually more concerned with getting them cracking on the next project.”

Richard Rogers had some thoughts on this issue, too: “Most software and electrical engineers write egregiously (what a great word!). It's amazing these folks could make it through high school, let alone college, with such a poor command of their own language. As you know, I work for an international company. English serves as our common language, yet many of our overseas engineers for whom English is a second language seem to have better English writing skills than we possess ourselves.

“When I returned to school (the University of Tennessee in Knoxville) in 1981 after my hitch in the Coast Guard, I had my heart set on a degree in electrical engineering. However, the college of electrical engineering refused to give me any credit for my previous 2 years of college, save excusing me from freshman English. I was told me that none of my previous classes appeared on their standard curriculum, nor were they listed under their "required electives". I tried to point out the contradiction in terms here, but they stood their ground. I discussed my dilemma with my advisor; fortunately he found the perfect solution for me: a computer science major.

“Strangely enough, the computer science department had ended up under the college of liberal arts. Without argument, they allowed all my previous college credits and even gave me a few extra credit hours for physical education and military science. Most of the EE classes I was interested in were cross-listed; I couldn't have hoped for a better scenario.

“Years later, I realize just how lucky I was that my school's EE curriculum was so absurdly inflexible. My liberal arts program provided a balanced and well-rounded education that has served me well throughout my career. I studied everything from French literature to logic design. I can speak and write effectively in my own language... something I took for granted at the time. These days however, this skill appears to be quite an accomplishment!

“When I interview a candidate for a firmware position, I try to assess his or her communication skills. A poorly written résumé or cover letter raises an immediate red flag. A firmware engineer's job involves more than simply writing code. In-line comments, header blocks, design documents, technical manuals, project plans, product specifications, and even emails must all be clear and concise.

“Funny you should mention The Elements of Style. My Strunk & White is always within arm's reach. I have promoted this great, little book for years now. In my opinion, the greatest mistake an English teacher can make is to characterize a writing assignment in

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terms of its length. The dreaded "500 word essay" assignment has done much more harm than good. It encourages "fluffy" writing. All that extra verbiage phrases like "in order to" were added to achieve that 500 word balance have absolutely no place in technical literature. Technical writing demands brevity and clarity.

“Active voice rocks! ;-)”

Phil Koopman mentioned that The Elements of Style by Strunk and White is online for free at: <http://www.bartleby.com/141/>.

## Embedded Linux Books

Andy Syms notes that the Linux book I reviewed last issue, named “Embedded Linux Primer” on the cover, is known by “Practical Embedded Linux Systems Programming: A Practical Real-world Approach” on Amazon. I checked, but Amazon knows the correct title... on their US site! Amazon.co.uk does indeed think the book has the alternative title Andy sent along. Another software bug?

Keith Richeson recommends another Linux book: “I saw your book review in the most recent Embedded Muse and wanted to point out another good book on getting started with embedded Linux. The book is “Embedded Linux Hardware, Software, and Interfacing,” Craig Hollabaugh, Ph.D. (ISBN 0-672-32226-9). As happens with just about any Linux book the specifics are related to an older version of the kernel, but the material is still very applicable.

“The book examines a real life distributed embedded system (a ski resort monitoring and control system) using three different hardware architectures. It provides a brief history of Linux and a discussion of the example system including a look at the reasoning behind the choice to use Linux as the OS. On the technical side, the book begins with the basics of selecting a Linux distribution, setting up a development workstation and creating the cross-compiler (build environment). Other topics include debugging tools and techniques, memory interfacing, serial and parallel communication, interfacing with SPI and I2C peripherals, and USB handling.

“In my previous job I used this book primarily to help get our development environment set up and to learn the basics of debugging with embedded Linux. The book was very helpful in those areas. I cannot speak as well to other areas of the book, but the sections I used in depth were very helpful.”

Burned once, I checked. Sure enough, Amazon’s UK site can’t find this book. Try under “Embedded Linux.” It’s fine on their Amazon.com site, though.

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## Jobs!

Let me know if you're hiring firmware or embedded designers. No recruiters please, and I reserve the right to edit ads to fit the format and intents of this newsletter.

Zimmer has two jobs in Warsaw, Indiana. See [www.careers.zimmer.com](http://www.careers.zimmer.com), referencing job codes ortho009 and ortho010. Details:

This position is responsible for developing and supporting the software programming required for the CAS (Computer Assisted Surgery) department. General Functions

- Designing software for manufacturability, inspectibility, and optimum cost
- Coordinating product evaluation with surgeons
- Generating a comprehensive protocol for testing the product
- Generating design assurance documentation for the project
- Serve as a key member on a project team
- Assists the generation of prototype models to evaluate new design concepts

Requirements – B.S. in Computer Science or related field required; Five or more years of experience in a regulated industry (medical, military, etc.) required.

Principal Software Engineer, Development, CAS. Job Summary – This position is responsible for developing and leading the system and software development for the CAS (Computer Assisted Surgery) department. General Functions –

- Develop system and software requirements and features based on design inputs
- Define system requirements and functionality based upon brand management and engineering input.
- Develop all software input documents (SRS, SDS, Storyboards) to be in line with FDA guidelines for medical devices.
- Spec out all robotic and computer architecture.
- Define the electrical schematics for the device
- Generating a comprehensive protocol for testing the a robotic product
- Generating design assurance documentation for the project
- Directs the generation of prototype models to evaluate new design concepts
- Initiates product evaluation with surgeons

Requirements – B.S. in Computer Engineering, Computer Science, or Electrical Engineering or in an engineering discipline with computer science experience required; Eight (8) or more years of experience required.

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## Joke for the Week

Computer Scientist Min-Jen Wang was issued patent 7028023 for the linked list.

Whoops. That's not a joke. That patent was issued by the US last year, for triply-linked lists.

## About The Embedded Muse

The Embedded Muse is an occasional newsletter sent via email by Jack Ganssle. Send complaints, comments, and contributions to him at [jack@ganssle.com](mailto:jack@ganssle.com).

To subscribe, send a message to [majordomo@ganssle.com](mailto:majordomo@ganssle.com), with the words "subscribe embedded *your-email-address*" in the body. To unsubscribe, change the message to "unsubscribe embedded *your-email-address*". ". BUT - please use YOUR email address in place of "email-address".

The Embedded Muse is supported by The Ganssle Group, whose mission is to help embedded folks get better products to market faster. We offer seminars at your site offering hard-hitting ideas - and action - you can take now to ***improve firmware quality and decrease development time***. Contact us at [info@ganssle.com](mailto:info@ganssle.com) for more information.

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