

eCos and Open Source

There has been a lot of hype recently about open source software and Linux. These discussions have been focused on how Linux represents the first major threat to Microsoft's domination of the desktop. However, open source software is also moving into the embedded real-time marketplace. Cygnus Solutions last year unveiled a new open source initiative called eCos (Embedded Cygnus Operating System) which has been downloaded by well over 10,000 developers. This article will describe three of them and their reactions to eCos.

THE OPEN SOURCE BUSINESS MODEL AND CYGNUS

The open source model was clearly described by Eric Raymond in his essay "The Cathedral and the Bazaar". Its best known success stories are Linux, the GNU C compiler (gcc) and Emacs. These and other open source programs run the Internet. Raymond's essay was instrumental in Netscape's decision to make the Netscape browser open source. All are examples of Raymond's bazaar in action.

Open source consists of making source code as well as the executable available to the users. It also provides for a means to fold user contributions back into the source for the benefit of other users.

And fold they do. Emacs is a 15 MB distribution, a very powerful editor for source code, documentation and other uses. Much of that code was written by users who saw a need and contributed back to Emacs for the benefit of others.

The GNU C compiler may be best known as the native compiler of Linux, but that is misleading. The Free Software Foundation's (FSF) Richard Stallman first released the GNU C compiler in mid-1987, and Michael Tiemann, then a research scientist, quickly adopted it. Tiemann's contributions to the GNU C compiler created more demand for code development and support than he (or any of the other gcc hackers) could provide in their spare time. Tiemann bet that this demand was not a fluke and founded Cygnus Solutions to prove it. (See Michael Tiemann, "Future of Cygnus Solutions")

Cygnus was in the real-time business almost from the beginning. When the GNU C compiler acquired a reputation for run time speed and compact code, it came to the attention of real-time developers. Exercising the freedoms uniquely available from the open source bazaar, these savvy developers asked for, and

contributed back, further enhancements to the compiler, making it an even better choice. Cygnus, their customers, and the net community saw the power of the bazaar in action.

Early on, Cygnus identified configuration tools as one of the key technologies for making it possible to support many microprocessors from a single source base. They created the "configure" script (one half of the famous "configure; make" process), opening the doors to a true multiplatform solution.

Many companies that depend on embedded processor projects move rapidly from processor to processor to gain new capabilities or to get the same capabilities in a smaller package. As a result, the GNU C compiler supports some 50 processors today, and there are 125 host-target combinations for cross compilation. In two years Cygnus may see a 90% rollover in the processors it will support with gcc. They may write 24 new processor ports in a year, a tremendous output for a company that doesn't even own the product it is supporting!

ECOS AS THE OPEN SOURCE REAL-TIME ALTERNATIVE

Meanwhile, Cygnus assiduously sought out its customers' wants and wish lists. They had to in order to understand why they were getting – or losing – sales. By 1995, they knew that their customers needed standardized runtime support that integrated completely with the GNU gcc compiler, gdb debugger and other tools on the host. The runtime support needed to include a C library, hardware abstraction layer (HAL), debugger support, and a wide range of RTOS functionality. As with gcc, portability was a key ingredient, as it needed to be available for a wide range of architectures and evaluation boards. This was the beginning of eCos.

VM to eCos. Thus, eCos is a test of their ability to port their virtual machine.

Mark Lummus, president of Appforge Software, LLC, says that what attracted AppForge to eCos was the Cygnus tool set, especially the simulation and debugging tools Cygnus provides with eCos. For a long time, AppForge has used a hodgepodge of tools for different processors on different operating systems. Now, says Lummus, they want one tool set for all their products, and Cygnus has the right mix.

Lummus is intrigued by Cygnus' open source RTOS. He believes the industry is going to open source, so, for AppForge, partnering with Cygnus is a business decision: he simply wants to reach as many developers as he can. He believes that an open source RTOS will level the RTOS playing field. He supports the open source concept, and expects to make donations back to the eCos code base.

Pacific Softworks

Pacific Softworks is best known for its OS-independent TCP/IP stack which is optimized for embedded applications. In addition to core protocols like UDP and IP, their product includes optional management protocols like SNMP, and application protocols like HTTP. They have integrated their stack to eCos and to the Cygnus tool set. Pacific went with eCos because they saw that Cygnus had been in business for ten years and was very favorably reported in the marketplace.

As a result of this port, Cygnus can offer an integrated RTOS and TCP/IP stack solution to their customers with full source code.

Zentek

Zentek provides advanced digital consumer electronics, often on contract to large clients such as Matsushita, which sells under the Panasonic brand name.

Zentek came to eCos for the best of business reasons: their customer, Matsushita, asked them to evaluate and use eCos in a prototype set-top box. Zentek ported eCos to a reference platform, then to a set-top box. They are now busily writing drivers for eCos. While the products have not yet been deployed, the initial work has gone well, reports John Dawson, Zentek's Vice President of Engineering. Dawson emphasizes that they would not have done the work if they had concluded that eCos was not suitable for the project.

Key to Dawson's favorable evaluation is the fact that Cygnus has a stable well known tool set. Dawson points out that 90% of the code in a development environment is the tools, so they must be good. The unique work in embedded applications is in drivers and in the application. Here, at the moment, eCos is a draw compared to other RTOSs.

The GNU style open source model (as with gcc and Emacs) is just beginning with eCos, and Dawson thinks it's only a matter of time until eCos blossoms into an open source development model.

He points out that a typical appliance, say a TV or stereo, has a 32 bit class processor. Much of the development cost is in software development, in drivers and

the application. Most high volume manufacturers are royalty-averse. They want to lower the unit cost. eCos, he says, has an advantage there. R&D pays the costs, not manufacturing. You can lower your R&D costs by buying off the shelf. eCos, being open source, is even better.

CONCLUSION

Cygnus Solutions' eCos RTOS is brand new to the market, but is already winning acceptance. One reason for that acceptance is the excellence of the associated tools, the GNU C compiler, the emulator and the configuration tools. eCos is just starting down the open source road, which is also helping it to win acceptance. ■

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