

FSMLabs: The RTLinux™ Company

OPEN SOURCE SOLUTIONS FOR INDUSTRIAL AUTOMATION, COMMUNICATIONS, INSTRUMENTATION AND CONTROL

The Dilemma of Realtime Systems

No one really knows how to make highly complex operating system software reliably meet rigorous timing deadlines. That's right, no one. And this is a serious problem, because modern realtime systems need networking, graphical user interfaces, development tools, standard APIs and all the powerful applications found in today's complex and highly networked computing environments. Unfortunately, the many layers of software in general purpose operating systems cause slow-downs and uncertain timing—unacceptable in a realtime system. Mission-critical realtime systems require absolute dependability and timing guarantees, but the only way to guarantee these things is to make the realtime system simple enough to be fully understood. It seems an inescapable dilemma: On one hand, realtime systems should be as simple as possible. On the other, they need access to the full power of modern hardware and complex operating environments.

RTLinux: Right. On Time.

RTLinux was created to solve this problem. RTLinux is a highly efficient “lean POSIX” threads-based realtime OS that runs a general purpose operating system (Linux) as one of its threads. Using patented technology, the realtime kernel prevents non-realtime applications and operating system tasks from delaying or interfering with the operation of realtime software. The result: an accurate and dependable realtime system with worst-case interrupt latencies of a few microseconds, limited only by hardware constraints. And because RTLinux releases control of the system when it's not needed for realtime tasks, the full power of Linux remains available. By decoupling the realtime tasks from the general purpose OS, RTLinux avoids the problem no one can solve, while providing the performance modern systems require. Created as a research project in 1995, RTLinux has grown into a powerful industrial strength software system.

Power and Flexibility

RTLinux is available in two flavors: **Open RTLinux** contains the realtime kernel, Linux application and a base Linux distribution, all under the GPL and the Open RTLinux Patent License. Open RTLinux is designed to meet the requirements of open source developers and permits free open source

distribution of operating system and realtime applications under the GPL. If applications run under and are distributed with unmodified Open RTLinux from FSMLabs (and if they are provided as distinct modules), they may be distributed outside of the GPL. See the Open RTLinux Patent License for exact terms.

RTLinux/Pro includes the realtime kernel, Linux application and a cross-platform development environment for several architectures. RTLinux/Pro is designed for commercial applications where support and reliability are critical, and where binary distribution of applications is desirable. RTLinux/Pro is provided under the Pro/Source license which allows a binary distribution of 1000 units with a single development seat, with additional seats and binary distribution licenses available at incremental cost.

Supported platforms include IA32 (AMD, Intel and compatible), Alpha and PowerPC. Some MIPS processor support is available (RTLinux/Pro only). Open RTLinux supports SMP in IA32 only.

FSMLabs

RTLinux was originally developed as a blue-sky university research project. Too “risky” a project for major funding organizations, it began life on a couple of discarded PCs in the wilds of New Mexico, at the N.M. Institute of Mining & Technology. Somewhat to our surprise, the advantages of the design were so clear and so striking that people began adopting RTLinux for production projects almost as soon as we began circulating rough code on the Internet. In 1998, we created a company to make RTLinux industrial strength, and to provide the solid level of support and ongoing development needed in the embedded and realtime marketplaces.

As we continue to develop RTLinux into the future, FSMLabs is guided by a powerful lesson from the past, provided by the mathematical construct of the “finite state machine.” When Bell Labs researchers were designing telephone switching systems and early digital circuits in the 1950s, they made extensive use of finite state machines to clarify, simplify and validate designs. In the same spirit, Finite State Machine Labs tries to clarify, simplify and validate realtime software.



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The FSMLabs Development Team

Dr. Victor Yodaiken

President and founder of FSMLabs. Victor is the “father” of RTLinux. He has more than 15 years experience in operating systems, in both industry and academia. Yodaiken's first commercial operating systems experience came in 1981, when he was one of the architects of a fault-tolerant distributed UNIX® system called AUROS.

Cort Dougan

Director of engineering. Began working with Linux in 1995 as one of the primary authors of Linux/PowerPC and of an influential paper on optimizing OS performance on that architecture. Since then, Dougan has consulted for IBM and many other software and hardware companies, and he remains one of two official Linux PowerPC maintainers. Dougan has particular responsibilities for RTLinux on PowerPC and Alpha platforms.

Michael Barabanov

The original implementor of RTLinux (as part of a masters project in 1995-1997) rejoined the project in 1998. Since then he has been instrumental in moving RTLinux towards compliance with the POSIX standard API, and in keeping RTLinux up to date with developments in the Linux kernel.

Nicholas McGuire

The developer of the MiniRTL, a stripped down, flash memory ready, RTLinux system that fits the realtime kernel, an embedded version of Linux and a file system onto a 1.4MB floppy disk. Aside from MiniRTL, McGuire works on control applications and security issues. Additionally, he is one of FSMLabs most requested speakers, due to his “hands-on” introductions to embedded RTLinux development.

Edgar Hilton

The author of RTiC-Lab, a graphical front-end for RTLinux that has been used to control a wide variety of instruments. After completing his doctoral studies at the University of Virginia, Hilton has brought both RTiC-Lab and his years of experience designing industrial controllers to FSMLabs, where he leads factory-automation and instrumentation development.

FSMLabs is an Internet-based company, with developers in three countries. In addition, we can call on the services of a worldwide group of consultants and developers.



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