FSMLabs Hard Real-Time Software Documentation

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What it is: RTCore is a POSIX hard-real-time kernel offering low microsecond worst case latencies that can run either Linux or BSD UNIX in its spare time. RTLinux is RTCore with Linux and RTCoreBSD is RTCore with either FreeBSD or NetBSD. Additional components include: PSDD for memory protected real-time threads and optional frame scheduler; Lnet for real-time sockets networking on both Ethernet and 1394 Firewire; ControlsKit for XML/RPC access to real-time control and data plus a Java based graphical user console; and the VxIT library emulating VxWorks functions for porting legacy applications.

Features: RTCore offers the POSIX 1003.13 threads API I/O plus a large number of built-in methods for constructing sophisticated real-time control applications including safe methods for communicating with non-real-time processes running under the Linux or BSD client. RTCore supports: SMP multiprocessing, VME, ARM9, PowerPC, x86, Mips, Xscale, and many PC-104 boards. Linux and BSD have an enormous set of features and drivers.

Benefits: The decoupled architecture of RTCore prevents non-real-time software from interfering with the operation of the real-time system and provides a clean, modular environment for control software. The result is reliable low microsecond worst case real-time plus all the sophistication and standard applications and drivers of the Linux/BSD clients.

Successes: A number of projects at NASA Ames are under development. The entire development and test of the Pratt & Whitney JSF F-134 Jet Engine used a machine-in-loop simulator hosted on RTLinux and PSDD. The simulator was used on everything from the original physics model simulation to controlling the test stand. This software is now being used on multiple other projects at United Technologies and UT says it shaved 5% off of the development time. Sandia Labs has used RTCore on several critical projects. Atos-Origin has ported software for the European Space Agency. Other references on request

Contexts in which it is best used: Wherever there is a technical advantage to the combination of a full UNIX system and hard-real-time control.

Compare with alternative known products or technologies.. VxWorks and other traditional real-time operating systems do not have as robust as solution to the interaction of non-real-time and real-time software and cannot provide the non-real-time features and performance of Linux and BSD. "Embedded Linux" vendors don't have a hard real-time solution and have a consumer electronics focus that leads to less rigorous quality assurance. There are fundamental engineering reasons why RTCore costs less, too: primarily, FSMLabs does not need to develop features that are supported on Linux and BSD. FSMLabs licensing is also straightforward and flexible.

What will a successful collaboration look like?

a. **What will you as the technology provider do?** We provide customized, on-site or off-site training, and anything from email/telephone support to on-site development.

b. **What should the development team do?** Write applications software. Take advantage of the UNIX client and also the ability to prototype on PCs and standard reference boards without waiting for specialized hardware.

c. **How will you, as technology provider, work together with the development team to ensure a successful collaboration?** We adjust to the requirements of the project. Many projects need close to zero support. Some need extensive training and design assistance.