

## Industrial Strength eCos RTOS Distribution

eCos® is the premier open source real-time operating system. A mature and robust system, it has many design wins to its credit in a diverse range of market segments including industrial automation, consumer electronics, telematics, aerospace, multimedia, networking and telecommunications. In the fragmented embedded operating system market eCos is one of the major players, with global market usage of around 5-6% according to multiple embedded market surveys. Products incorporating eCos include the Sony PlayStation 3, Sirius satellite radios, Netgear routers, the Raytheon Patriot missile system, Samsung LCD TVs, Dell SANs, Sennheiser radio microphones, Cisco cable modems, Trimble GPS and Fluke instruments. eCos also powers the control system of the \$1.5 billion Alpha Magnetic Spectrometer particle physics experiment, lofted to its home on the International Space Station on the Space Shuttle's penultimate mission.

eCosPro® Developer's and Starter Kits are industrial strength distributions of eCos that couple a comprehensive set of development tools with a stable and feature-packed set of run-time features, providing a complete solution for embedded application development with eCos.

### eCosPro Host Development Tools

- Eclipse-based integrated development environment – customized to support eCosPro application development. Remote target debugging options include hardware debuggers, serial & Ethernet.
- Complete industry standard GNU compiler toolset including C/C++ compiler, assembler, linker and source level debugger
- Graphical and command line eCos RTOS configuration tools
- Profiling and code coverage tools
- Memory allocation analysis and debugging tool
- Support for a wide range of Windows® and Linux® development environments

### eCosPro Runtime Features

- Completely royalty and product license fee free deployment
- eCosPro RTOS distribution based on eCosCentric's internal stringently tested stable source base
- Includes a comprehensive set of networking, file systems, libraries and other runtime packages with additional features available as add-on middleware packages
- Extensive range of architectures, board ports and device drivers
- SMP support for multi-core processors including full thread affinity control
- Additional or enhanced packages not available in the public source base:
  - USB host and device stacks with MST, CDC ACM, FTDI, CDC EEM and RNDIS classes
  - FAT file system featuring FAT12/16/32, long filenames, internationalization and multi-threaded access on USB mass storage devices and SD/SDHC/MMC media
  - NAND flash library with optional Yaffs NAND flash file system add-on
  - NOR flash library and JFFS2 Journaling Flash File System
  - FlashSafe library for secure flash updates
  - RedBoot firmware - bootloader, debug agent and system updater
  - BootUp firmware - small footprint, customizable, secure in-field updates
  - Y2038 and Y2036 roll-over safe Clock Services and NTP v3 support
  - Small footprint lwIP network stack with IPv4/IPv6, AUTOIP and optional mDNS add on
  - ISO 14882 conformant C++ Standard Template Library (STL) and extended math library
- Device support includes: Ethernet, WiFi, USB host/device/OTG controllers, RS232, I2C, SPI, PCI, NOR/NAND Flash, SD/SDHC/MMC, DataFlash, IDE, GPIO, ADC, CAN, Watchdog, RTC, and framebuffer (individual driver support depends on specific board port)
- eCosCentric middleware includes USB host and device stacks, CAN drivers, Modbus, mDNS/Bonjour, SecureShell (SSH), SecureSockets (SSL) and MultiMedia file system (MMFS).
- Certified third-party middleware includes Aleph One Yaffs NAND flash file system, Skelmir CEE-J JVM, SYS TEC CANopen, McObject ExtremeDB and Swell PEG GUI libraries.

The eCosPro source base is a stabilized and enhanced in-house version of the rapidly evolving public source tree. We use a fully automated 24/7 test farm to rigorously test the GNU toolchains, RedBoot firmware, and eCos RTOS for regressions and new software defects. The extensive eCosPro test suite is coupled with hundreds of different configuration permutations, resulting in over twenty thousand tests being run per test cycle for each target platform.

### Complete Freedom, Complete Support

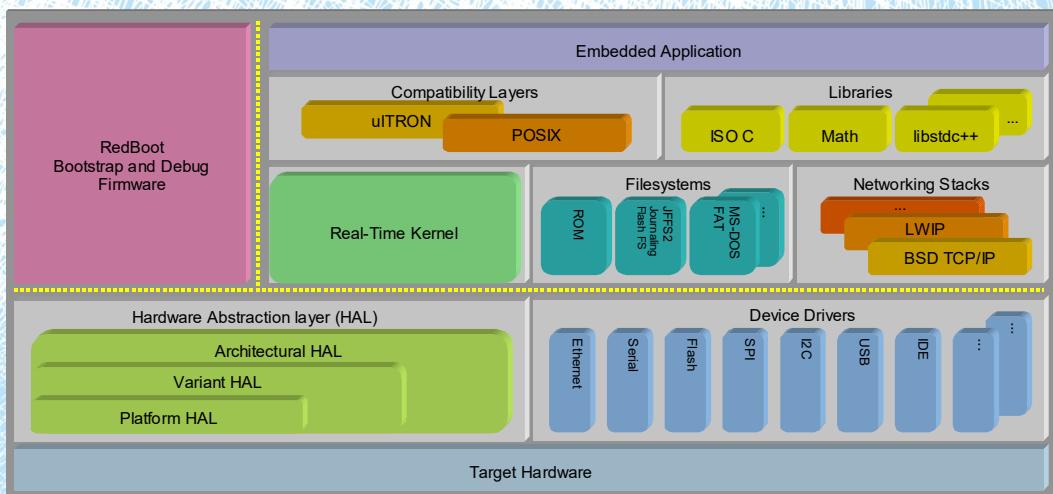
eCosPro teams open source technology with professional levels of testing and QA, and backs it all up with no-nonsense support plans

## eCos RTOS Overview

Designed from the ground up to meet the needs of deeply embedded applications, eCos places an emphasis on minimizing the resource footprint and ensuring real-time responsiveness. The RTOS is configurable at the source code level via a highly intuitive graphical configuration tool, and can easily be tailored to the precise needs of your application, avoiding the bloat of a traditional operating system.

eCos has been engineered to work in situations where many operating systems simply will not fit. It accommodates scaling down to a few tens of kilobytes for deployment in low-cost and SoC based designs with stringent hardware resource constraints and minimal functionality requirements. Equally, it can be easily scaled up, for example, to include full TCP/IP networking, USB and file system functionality. eCos is fully pre-emptible, delivering real-time behaviour with minimal interrupt latencies and a rich set of synchronization primitives for full multi-threading support. SMP is available for multi-core processors and includes CPU thread affinity locking and spinlocks for fast synchronization. The configurability of eCos extends down to the most fundamental levels, providing, for example, a choice of scheduling policies; interrupt handling mechanisms and alternative semantics for dealing with priority inversions.

eCos provides all the drivers, libraries, and services you would expect from an embedded operating system, alongside compatibility layers to comply with industry standards and assist with application code migration.



An elegant and highly portable hardware abstraction layer (HAL) allows for rapid porting of eCos to prototype hardware and deployment in real products. BootUp, RedBoot and eCos share the same HAL infrastructure, making it possible to bring up both bootstrap, debug firmware and operating system on a new board in one painless exercise. eCos supports all the main processor families as well as many less well known architectures and numerous models within each family.

- **ARM 7/9/11**
- **Cortex A5/A7/A9/A53**
- **Cortex M3/M4/M7**
- **ColdFire**
- **Intel x86**
- **microMIPS**
- **MIPS**
- **NIOS II**
- **PowerPC**
- **SPARC**
- **SuperH**
- **TileGX**

eCosPro is currently available for over one hundred development and evaluation boards, as well as commercial modules. These scale from efficient Cortex-M based boards, through FPGA based dual-core Cortex-A9 systems, to massively parallel TileGX designs. Of particular note is the support for the Raspberry Pi range of boards, which can provide an excellent low-cost base for evaluation, prototyping, deployment and educational purposes.

eCos's open source nature confers many benefits. On the commercial side, the absence of any royalty or product licensing fees make it particularly cost effective, especially in high volume designs. On the engineering side, eCos puts the developer in control. The availability of all the source code provides the ultimate in flexibility, aiding the debugging of complex application code, and enabling the customization and enhancement of the system's functionality as required.