

pSOSystem for Integrated Systems

pSOSystem Software has been used for many years as a run-time and development environment for real-time embedded applications. This article describes the new components that add better communication capabilities including network protocols, HTTP Server and CORBA.

Over the past several years there has been a dramatic increase in demand for real-time embedded applications. In addition, embedded applications are increasing in complexity and sophistication: 8- and 16-bit processors are rapidly being replaced by high-function 32- and 64-bit chips. The types of applications available in today's marketplace range from toasters to fax machines and from set top boxes to satellite control systems.

The intensity of consumer and industry demand has resulted in equally dramatic changes in the embedded application development environment. Developers of real-time applications now expect and demand native-quality tools — participating in an open solution — and tailored to the real-time embedded environment.

Integrated Systems, Inc's (ISI) pSO-System (pSOS®) software is a full-featured run-time and development environment for real-time embedded applications. The pSOSystem environment scales to match price/performance requirements of the entire range of embedded applications from simple, stand-alone devices to complex, networked, multiprocessing systems. First shipped in 1984, pSOS has become the industry's fastest growing real-time operating system with millions of devices running pSOS applications worldwide.

COMPACT PSOS KERNEL

The pSOSystem environments run-time options include the fast, efficient pSOS+ single-processor and pSOS+m multiprocessing real-time kernels and the pSOSelect scalable kernel. Extremely compact, the pSOS+ kernel allows multitasking, runs in mainstream VME and custom hardware applications. The pSOS+m kernel allows designers to create multi-processors-based applications with almost no code changes. The pSOSelect kernel lets users "choose what they use" to create an application-specific system in as little as 1.8 Kbytes of memory. Also included in the pSOSystem run-time options are an embedded file system, embedded graphics, and turnkey board support packages (BSPs).

ADVANCED NETWORKING CAPABILITIES

The pSOSystem networking suite offers the industry's most advanced networking capabilities. It supports

all major industry-standard, UNIX-based communications protocols, SNMP network management, Zero-copy TCP/IP, OpEN - an embedded STREAMS environment and STREAMS compliant protocols such as OSI, TCP/IP, ISDN, and X.25.

NEW VERTICAL MARKETS

As the embedded industries largest company, Integrated Systems offers complete solutions for vertical markets. For example, in the multimedia/consumer electronics segment there are reference board support packages for set top box designs and sample drivers for many multimedia type drivers. Also available for the embedded Internet developer is a Java virtual machine port to pSOS and HTTP (HyperText Transfer Protocol) server.

The pSOS/HTTP Server is the newest operating software component to be added to pSOSystem. It gives pSOS-based embedded systems the ability to act as fully-functional servers on the World Wide Web, allowing deeply-embedded computers to be accessed via off-the-shelf, inexpensive desk-top browser software and commonly available Internet hardware.

The pSOS/HTTP Server is the newest operating software component to be added to pSOSystem. It gives pSOS-based embedded systems the ability to act as fully-functional servers on the World Wide Web, allowing deeply-embedded computers to be accessed via off-the-shelf, inexpensive desk-top browser software and commonly available Internet hardware.

pSOS has become the industry's fastest growing real-time operating system with millions of devices running pSOS applications worldwide.



Figure 1. pSOS Embedded JAVA-based Application

The ISI implementation supports the industry standard HTTP/1.0 protocol and serves all HTTP-compatible clients. The pSOS/HTTP Server implementation is also CGI/1.1 compliant, allowing execution of native pSOS tasks via the highly-popular CGI (Common Gateway Interface) protocol, with inputs and outputs to client application code.

"Addition of the HTTP Server components to pSOSystem lets our customers quickly and easily build Internet and intranet functionality in a variety of embedded designs, as well as create new Internet-ready products," said Steven Houtchens, director of new technology at Integrated Systems. "Soon a whole new generation of smart products based on Internet technology will emerge, each with its own Internet IP address, and each with full network and Web server capabilities."

Initial application areas for embedded HTTP server functionality include remote monitoring of office equipment, remote monitoring and control of manufacturing systems, security systems, and home entertainment system remote programming and intercommunications. The HTTP server enables each of these application areas to be accessed via remote Internet/intranet connections. Early adopters of the new ISI offering have already taken advantage of HTTP remote-access capabilities to monitor office equipment and control network switching equipment.

Integrated Systems' implementation of the HTTP Server software component is designed to be simple and easy to integrate with existing pSOS applications. One function call starts up an HTTP Server, another stops the server, and a C data structure is used to contain environment variables that are passed to CGI applications. This implementation architecture was created especially for embedded applications that are memory constrained, requiring, for example, only an additional 25kbytes of memory needed for a Motorola 68k microprocessor-based design. With the ISI pSOS/HTTP Server software component, it is possible to add internet access to virtually all embedded computers within consumer devices.

THE COMMON OBJECT REQUEST BROKER ARCHITECTURE

For the telecommunication segment there is a large selection of networking protocols and support for runtime CORBA (Common Object Request Broker Architecture) while advanced routing capabilities are available for the datacommunication segment.

CORBA was created by the Object Management Group (OMG), an industry consortium consisting of nearly 700 companies, and is generally recognized to be the leading distributed object middleware in terms

of vendor support, cross-platform interoperability and functionality. Recently adopted by Netscape, CORBA defines the ORB specification that allows objects written in different programming languages and running on different platforms to link across a network. By providing CORBA capability on pSOS, ISI has ensured that pSOS-based embedded Internet devices will achieve cross-platform, and cross-network interoperability. pSOS already supports Java scripting and HTTP server functionality, and is the leading RTOS for embedded Internet and intranet applications.

CROSS-DEVELOPMENT ENVIRONMENT

pSOSystem software's rich, complete cross-development environment enables developers to use UNIX workstations or PC-compatible host systems running C and C++ language compilers, source language and target-level debuggers, a pSOS+ application simulator and visual debugging and profiling tools. The ESp intuitive visual debugging and analysis tool graphically displays component configurations, memory stack usage and errors, static and dynamic views of all kernel objects, user specific events and CPU use graphs. With ESp software, developers can quickly and effectively pinpoint code problems undetectable with previous generation tools.

PROCESSORS AND HOST SYSTEMS SUPPORTED

pSOSystem supports a wide variety of processors including Motorola 680x0, 683xx, Coldfire; Intel I960 and 386/486/Pentium; Hitachi SuperH; PowerPC; MIPS, and ARM. Additionally, pSOSystem supports the following host systems: SUN SPARCstations, IBM PC compatibles, IBM RS6000, and the HP 9000 S/700.

pSOSystem, pSOS+, pSOS+m, pSOSelect, OpEN, ESp, and Embedded Internet are trademarks, and pSOS is a registered trademark of Integrated Systems, Inc.

All other brand or product names are trademarks or registered trademarks of their respective holders.

John Hogan is currently Director of Product Marketing for pSOSystem at Integrated Systems. Previous experience includes Business Development Manager for MassComp/Concurrent Computer's Real Time Unix Systems and President of HRK Multisystems, a consulting company specializing in the development of geophysical data acquisition and analysis systems. He has more than 25 years experience in the design, development and deployment of embedded real-time systems.

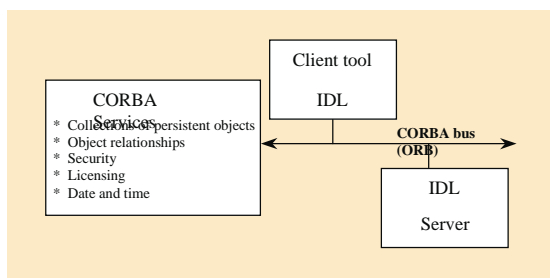


Figure 2. Cobra allows development across diverse platforms