euros ®

Enhanced Universal Realtime Operating System

Product brief

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EUROS - The Key to Realtime

Our modern world is unimaginable without microprocessors and microcontrollers. In pratically every area of our daily life they perform their tasks reliably and silently. They control and monitor, they switch and protect.

However, these little chips get their intelligence from software: sophisticated applications and powerful operating systems.

EUROS is one of those operating systems and represents the latest development of a family of real-time operating systems for all kinds of microprocessors and microcontrollers.

Because of its modular and hardware-independent concepts EUROS is suited for a wide range of applications:

- Embedded controllers
- Board systems
- Automation equipment
- Personal computers

EUROS at a glance

EUROS is the Enhanced Universal Real-Time Operating System. EUROS is a multitasking real-time operating system suitable for a wide range of applications.

EUROS...

- can be used for a wide range of applications because of its **modular** and **hardware-independent** concepts.

- is characterized by **short response times**, robustness and flexibility.

- allows **customization** of the operating system.

- is ROMable

- is a **hardware-independent software platform**. The base for EUROS versions for different microprocessors is a well-tested implementation in the C language. **EUROS** offers the same set of system services and an identical development environment for various hardware configurations including heterogeneous systems.

- implements a powerful **driver interface** which operates on a hardware abstraction level allowing for the highest possible driver portability. A number of device drivers are available.

- carries your application into the **future**: new developments of hardware are covered by the Microkernel. More powerful chip versions can be used while leaving the application unchanged.

- **hides hardware details** from the software developer. EUROS initializes chips and supports interrupt handling. Access to hardware is performed by **Port Drivers**.

- allows **multitasking** by utilizing the specific characteristics of a certain chip architecture.

- runs on IBM-compatible PCs. The PC is used as a **development system** and as a **test system**. Applications can be developed and tested on the PC. Applica-
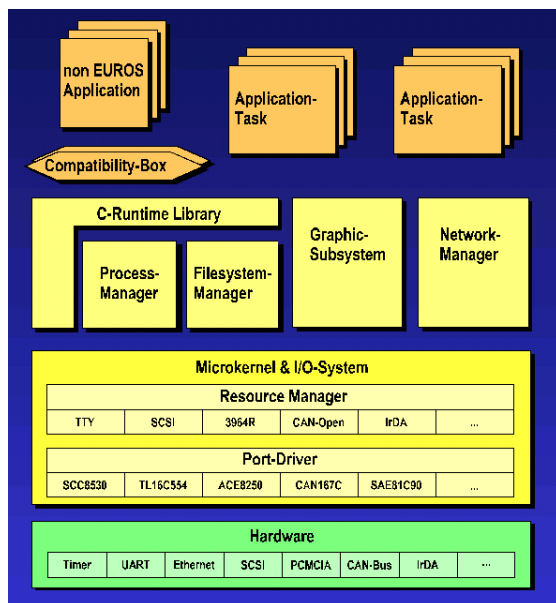
tion development can start even before the actual target hardware is available.

- allows access to the **Internet**. Remote monitoring and remote control can be realized with a **HTTP server**.

- opens up the possibility of **Java** in real-time applications. With the virtual machine **EUROSvm** Java applications can be run directly from ROM or Flash memory.
  EUROSvm is currently available as a pilot implementation on the PowerPC.

- is offered at a **moderate price** normally on buy-out basis. **EUROS** harmonizes the efforts aiming in establishing a uniform operating system.

- is the result of years of research in real-time control and is implemented by experienced software specialists.

- The **EUROS** team offers professional support including hot-line, advice and training by qualified personnel.

EUROS Architecture

EUROS is built around a microkernel architecture which allows for the operating sys-

tem to be ported to a new CPU architecture within very short period of time. This saves time and cost without quality constraints.

- The **Microkernel** contains a collection of routines used by the other EUROS components. The Microkernel is the interface to the hardware.

- The **I/O System** contains the driver interface.

- The **Process Manager** contains a set of system services like task management, memory management etc., satisfying the requirements of a real-time operating system.

- the **C Library** complies with the ANSI-C standard and is reentrant. It's installed once in a system and is used by all tasks simultanously.

- The **Filesystem Manager** manages file systems in MS-DOS format.

- The **Network Manager** implements the TCP/IP protocol stack with BSD sockets.

- The **Graphic Subsystem** offers a hardware-independent API for graphics output on LCD displays and screens.

- Existing real-time applications can be ported to **EUROS** by means of so called "**compatibility boxes**" without any loss of performance and even without having to change the source code.

Integrated development environment

During the development phase the user is supported by a comprehensive cross-development environment, which aims at simplifying the testing of real-time applications. This includes a target monitor and a number of Windows 95/98/NT hosted tools.

- The heart of the development environment is the **EUROScope** debugger. It can download applications to the target system and execute and debug it. The application is displayed as source code or assembly code. Furthermore, global and local variables, memory content, breakpoints, register content and the call stack can be displayed. As a special feature **EUROScope** allows EUROS operating system objects (tasks, mailboxes, ...) and their current state to be displayed.
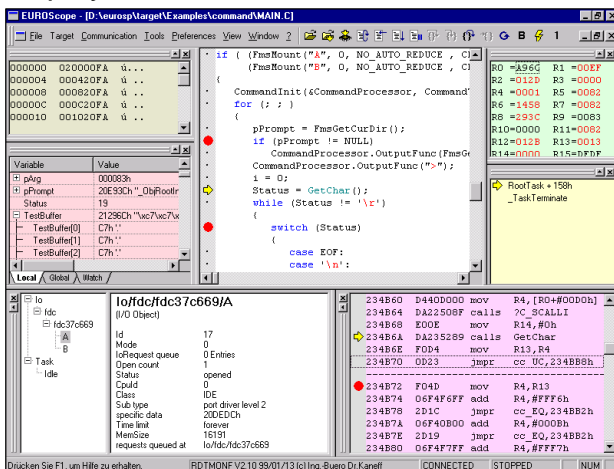
- **EUROScope's** partner in the target system is the **EUROSmon** monitor program. It initializes the target board and then performs communication with the debugger via a serial interface. The monitor can be ported to different CPU architectures and can be adapted to different target boards by the user.

- With **EUROScope** and EUROSmon **Flash** chips on the target board can be erased and re-programmed in a comfortable fashion. They also support the C16x architecture's **bootload** mechanism.

- EUROScope is currently available for C16x processors. The file formats OUT (Tasking) and ABS (Keil) are supported. By adding new modules EUROScope can be enhanced to support new CPU architectures, more file formats and different communication mechanisms. Support for ARM processors and communication via TCP/IP is in development.

Additional EUROS products

File System Manager:
- MS-DOS Format (FAT-12, FAT-16)

Networking Manager:
- TCP/IP,
- UDP,
- PPP,
- SMTP,
- BOOTP,
- DNS,
- FTP,
- Web server, etc.

Field Buses:
- CANopen,
- IrDA,
- Profibus,
- AS-i,
- others by request

Device Drivers:
- IDE,
- Floppy Disk,
- RAM Disk,
- Ethernet,
- PC-Card,
- CAN,
- 3964R,
- ISDN (in development),
- I^2C,
- Arcnet, etc.

EUROS - data sheet

Task Management:
- Number of tasks only restricted by available memory
- Priority-based scheduling (256 priority levels) optionally in combination with time slicing (Round Robin)
- dynamic priority change
- deterministic behaviour
- extremely short task switch times

Task Synchronization and Coordination:
- Semaphores
- Event Flags
- Signals
- Mailboxes
- Pipes

Run-time coordination with the operating system:
- synchronous (wait for completion)
- asynchronous (parallel execution, different types of signaling)
- multiple wait using the cluster concept
- time-out for all system calls while waiting
- time-delayed system calls

Memory Management:
- Megapools
- Memorypools

- Fixed-Sized-Buffers
- Shared Memory

Comprehensive driver interface:
- All services of the I/O system and all coordination mechanisms are available for all drivers without extra effort by the driver implementor.
- Services like task coordination, request queue management and timeout handling are performed by the I/O system. Implementing a driver is reduced to programming the device-dependent functions only.

Code size (scalable operating system):
from 10 kByte (depending on required functionality)

Architectures supported:
EUROS versions for the following CPU architectures exist:
- Infineon **C16x**
- Infineon **TriCore**
- Intel **x86** (16 bit and 32 bit)
- Motorola **68k**
- **ARM**
- Motorola **PowerPC**
- Fujitsu **F16LX**
- other architectures by request