The MetaWare SeeCode Debugger from MQX Embedded provides maximum programmer productivity with advanced features and unmatched flexibility. Ready for single-processor designs or complex, heterogenous multiprocessor projects, and shipped with an advanced Instruction Set Simulator, SeeCode is the right debugger for today’s smarter devices.

Introduction

The MetaWare® SeeCode™ debugger from MQX Embedded is an advanced and user-configurable debugger for professional software developers working on high-performance applications. SeeCode delivers a full set of traditional native and embedded application debugging features, including source- and assembly-code display, conditional breakpoints and watchpoints, register/variable queries, and value setting of memory and registers.

SeeCode is built using an object-oriented architecture, providing users the modularity and flexibility to tune SeeCode to their environment and way of working. SeeCode’s APIs, for example, are all object-oriented. This allows multiple instances of each API, indispensable in debugging multi-CPU applications, simulating multiple peripherals of the same type on a single chip (for example, two UARTs), or in adding more than one copy of a feature (such as signal visualization) to the debugger.

Features & Benefits

**Powerful**

- C/C++ Source Level Debugger, including mixed source-and assembly-code debugging, with a full feature set for maximum developer productivity
- Includes an advanced Instruction Set Simulator (ISS) with instruction and data cache simulation, instruction and cache miss counts, and instruction history with forward and reverse stepping
- Co-ordinated Multi-Processor Debugging extensions support debugging up to 256 processors simultaneously (up to 3 standard)

**Tightly Integrated**

- RTOS-Aware Debugging with MQX RTOS and other leading RTOS products

The Coordinated Multi-Processor Debugging (CMPD) facility for SeeCode allows debugging multi-processor applications of up to 256 processors in a single debugging session.

SeeCode also allows you to conveniently track multiple views of the current and past states of the system. This feature allows you to understand quickly the internal dynamics of your software by displaying important information, such as what has changed and how it has changed.

The SeeCode debugger is available separately, or as part of the MQX Embedded™ MetaWare Tool Suite. SeeCode is available for ARC™, ARM®, MIPS®, PowerPC™, VideoCore® and XScale™ processors. SeeCode is fully RTOS-aware for the MQX™ RTOS and other RTOSes on each of these platforms.

For current information, please visit www.MQXembedded.com or email MQX-info@MQXembedded.com.
SeeCode RTOS-Aware Debugging

**RTOS-Awareness**

With its RTOS API, SeeCode can be made RTOS-aware. In the above example, SeeCode displays its RTOS state and Threads windows, as well as the source and disassembly windows. The RTOS state window displays all the RTOS resources in a single, compact location, including tasks, task queues, semaphores, mutexes, events, message queues, message pools, partitions, user memory blocks, system memory blocks, names, kernel data structure, RTOS init structure, interrupt handlers, and the kernel log.

Each RTOS resource has one line listing the information most often sought for that resource; for example, each task’s state is shown—ready, mutex blocked, etc. If a resource has additional information, there is a clickable “+” at the left for additional information. In particular, for semaphores, all tasks waiting on the semaphore are shown, and a few details about the semaphore’s policy are shown. Double-clicking on a resource brings up the Data Examine display with full information from the actual RTOS data variable that represents the resource.

The Threads window shows the list of current threads with the thread number and name. The current thread is marked. The Disassembly and Source windows display program instructions at the assembly and source level, respectively.

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**Advantages**

**High Productivity**

- Snapshots track multiple views of current and past system states
- Assembly listing is annotated with relevant memory dereferences and symbolic names

**Flexible**

- Windows, Solaris* and Linux* hosts available (*Command line only)
- Supports ELF object module and DWARF debug record formats

**JTAG Hardware Compatibility**

- Compatible with a growing list of hardware debugging tools, including products from Agilent, Abatron, Corelis, EPI, Macraigor Systems, and others.

For current information, visit www.MQXembedded.com or contact MQX-info@MQXembedded.com.
**Multiple Processor Debugging via CPMD**

The Coordinated Multi-Processor Debugging (CPMD) extension enables SeeCode to simultaneously debug up to 256 target processors. SeeCode comes standard with CPMD extensions to support up to 3 processors simultaneously; CPMD capabilities for 4 or more processors are optional, available separately.

The CPMD example screenshot on the preceding page shows a debugging session with three different processors with two different instruction set architectures running three threaded RTOSes — MQX™ RTOS on an ARM® processor and two different RTOS products on two ARC™ processors. Each RTOS state window displays the state of the resources for each respective RTOS. You can click on the various resources in the RTOS-specific windows to see more information on those resources.

The disassembly window displays program instructions for the process shown in the upper right hand corner. For example, the disassembly window is displaying instructions for an RTOS process on one of the ARC processors. You can click on it to see all the processes in turn.

The Processes window displays all of the processes and their status and whether they are in the current focus set. The pair of blue eyeglasses next to the process in the upper left window indicates this process is in focus. Clicking on the eyeglasses or the + expands the entry to list its respective threads/tasks. For example, the MQX RTOS process entry has been expanded showing its tasks.

**SeeCode’s Semantic Inspection Interface**

Using the SeeCode Semantic Inspection Interface (SII) API, you can inspect the state of the program and generate results in many forms, such as summary data about the state of the program, data you sent to another process for graphical display, etc. You can also specify menu additions to the command window; when the menu item is selected, you are notified and you can take the appropriate action.

The interface is object-oriented so that it can support multiple instances; all data relevant to the implementation of this interface can be kept in the object. This is important for debugging multi-CPU systems where one may have different instances of a program running on different CPUs, or different programs, each subject to different semantic inspection.

As an example of how SII can be used, the screen below shows an SII API connection to a signal visualization tool (SVT) that uses the extensive graphing facilities of the PC MATLAB® graphics library.

When the SVT SII is loaded, it starts the SVT in another process and establishes a shared-memory connection to it. If MATLAB is present, the SVT SII also starts up a MATLAB session. The SVT GUI allows you to select arrays or sequences of values within the program being debugged and set options for data graphing.

The SVT SII accesses the program data and transmits the data to the SVT upon request. Using SVT, you can get a real-time picture of your data as your program is computing it. For example, you can watch a waveform develop as it is being computed, or notify the SVT SII to transmit array data to the SVT when the debugged program hits a breakpoint.
About MQX Embedded

The MQX Embedded Division of ARC International focuses entirely on the software needs of the embedded system developer, carrying forward the excellent products, the many years of embedded software expertise, and the proud traditions of both MetaWare and Precise Software within the ARC International family.

MQX Embedded provides state-of-the-art tools, platforms, operating systems, networking software and platform enhancements for leading companies worldwide such as IBM, NASA, Xerox, General Electric, Tektronix, Fujitsu, Agilent, Canon, Cisco, Panasonic, Alphamosaic/Broadcom, Siemens, Infineon, Toshiba, NCR, Hitachi, NEC, Hyundai, Samsung, Bauch & Lomb, SanDisk, Mitel and DIRECTV, among many, many others.

Blending decades of experience in embedded software with intimate knowledge of today’s cutting-edge silicon, MQX Embedded helps embedded system developers get to market quickly with advanced products on a wide variety of the leading embedded hardware architectures.

MQX Embedded has helped customers introduce a breathtaking array of products in realms as diverse as:

- Building and Environmental Automation
- Consumer Electronics
- Energy Production/Storage/Distribution Systems
- Financial Back-office and Infrastructure
- Industrial Automation
- Instrumentation
- Medical/Biomedical
- Military/Aerospace/Avionics
- Printers and Output Devices
- Retail Automation
- Semiconductors
- Server Computing
- Supercomputing
- Storage Components & Subsystems
- Telecom/Datacom
- Transportation/Automotive Controls
- Video and Image Processing

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