

ESC 2011 Update

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At the Embedded Systems Conferences manufacturers talk about their new and improved hardware and software products. I wish space and time let write something about them all. Instead, the short descriptions below give you brief highlights of some standout products.

JTAG Connector Breaks New Ground

Often I find an interesting product that breaks new ground and this year Tag-Connect gets that distinction. The company created a new type of connector for the ubiquitous JTAG headers found on almost every development and embedded-system board. Instead of using a large male header, the company has board designers place from six to 10 small pads on their boards, surrounded by three holes for orientation pins and four larger holes for latching "legs" that hold a connector in place. The connector had spring-loaded pogo pins molded in and connected to cables go to adapters for popular JTAG pods. The orientation pins ensure proper placement of the contacts and prevent reversing connections. You can download PCB templates for the JTAG contacts from the Tag-Connect



Web site and you can purchase cables and adapters there, too. Most have a price under \$US 30. If you plan to design boards that provide access to JTAG signals, the Tag-Connector unit looks like the product to use. Visit: www.tag-connect.com [1].

MPLAB X Unites Microchip Development Software

Microchip Technology has a new open-source integrated development environment (IDE), called MPLAB X, that runs with the Linux, Mac-OS and Windows operating systems and covers all of the company's PIC microcontrollers, dsPIC digital-signal controllers, and memory devices. The free IDE lets you manage several projects, format code as you choose, add bookmarks such as "TODO" and "FIXME," do simultaneous debugging, use an advanced editor, and create call graphs. The MPLAB X software also includes "code completion" that anticipates what you will type next, helps you complete a command, and identifies previously defined variables and function calls. Users can import projects created with earlier tools and Microchip will continue to support the current MPLAB 8 tools. The MPLAB X IDE maintains compatibility with third-party and Microchip tools such as MPLAB ICD 3, PICKit 3, and MPLAB REAL ICE.

The MPLAB X IDE builds on the open-source NetBeans platform, so engineers and designers can take advantage of NetBeans software components and plug-ins. And MPLAB X users can customize the IDE as they wish. For a free download, visit: www.microchip.com/get/D413 [2]. Microchip invites your feedback via the MPLAB X "Users' Forum" at www.microchip.com/get/M6RA [3].

Texas Instruments Graphs MCU Spectrum

During a briefing with people from Texas Instruments I saw a chart that illustrated the spectrum of TI's processors, from the MSP430 through the C5000 family. I've found it hard to distinguish between the TI families, so this chart provides a lot of helpful information. You can find it on the company's Web site at: tinyurl.com/3jn65ke. Nicely done, TI.

Eclipse Plugin for RL78 MCU Family

The new Renesas RL78 family of MCUs give engineers another way to cut power in an embedded system. To help them with their code, IAR Systems now has an Eclipse plugin for Renesas RL78 development tools. This new plugin includes the optimizing IAR C/C++ compiler, assembler and linker, as well as all necessary C/C++ libraries. The plugin lets engineers use Eclipse as their IDE front end. So, engineers can use either Eclipse or the IAR Embedded Workbench, whichever best meets their needs. IAR makes available evaluation versions of IAR Embedded Workbench and the Eclipse plugin for RL78 at: www.iar.com/downloads.

IAR Systems also announced improvements to its Power Debugging technique that measures an MCU's power use and correlates it with code operations. Engineers can now set thresholds for power-monitoring operations and set power breakpoints. Power measurements require an IAR J-Link or an IAR J-Link Ultra debug probe. The latter probe runs at 10k power samples/sec.

Mentor Creates a New Low-Cost IDE

The new Mentor Embedded Sourcery CodeBench IDE incorporates technologies Mentor Graphics acquired from Code Sourcery late in 2010. The new IDE lets engineers develop code for the NetLogic Microsystems XLP multi-core processor, Freescale Kinetis, and Xilinx Zynq. In addition, the GNU-based CodeBench software lets you create software for AMD64, ARM XScale, Freescale ColdFire, Power Architecture, Intel IA32 and EM64T, MIPS, SPARC and Texas Instruments Stellaris processors. And the CodeBench software connects to Mentor Embedded Sourcery probes and third-party probes. Find more information at: www.mentor.com/embedded-software/sourcery-tools/sourcery-codebench/ [4].

The Sourcery CodeBench IDE includes the new Mentor Embedded Sourcery System Analyzer technology that helps engineers visualize and analyze system data so they can find problems and fix them. The tool lets users place trace points anywhere in their application code to identify start, middle, and end points where they want to examine execution details. Hats off to Mentor Graphics for offering a Personal Edition for \$US 199. Prices for the Professional Version with System Analyzer start at \$US 2799.

Tool Suite Keeps You Up to Date

If you need a low-power MCU, Energy Micro's family of EFM32 Gecko chips might fill the bill. The company just released the Simplicity Studio software that provides instant access to all the tools, documentation, software, third-party IDEs, and other resources needed when you create code for the EFM32 MCUs.

The Simplicity Studio tools automatically alert users to new software releases, documentation, and firmware updates and users can access a change log to identify updated information. Simplicity Studio also connects the company's portfolio of free energy-saving tools, including energyAware Commander, which provide a way to control EFM32 development-kit firmware upgrades, microcontroller-program transfer and debug access.

Validate, Test, and Debug FPGA Designs

If you have a design that relies on more than one FPGA, look at the Corus suite of validation and debug software from Veridae Systems. This software gives you a "synchronized view of multi-FPGA systems both on- and off-chip and across devices and timing domains." You have a synchronized view of the entire system, which includes serial I/O, buses, software code, and FPGA hardware. The validation and debug software uses Veridae's Implementor--which helps you design and implement on-chip signal-capture probes--and the Analyzer, which manages the captured data. Investigator software correlates the information with an FPGA design, interpolates the data, and displays a larger signal set. For more information, visit: www.veridae.com/ [5].

An RTOS for AMD Embedded-G Processor Chips

Engineers who plan to use an AMD Embedded G-Series processor in digital signs, set-top boxes, information kiosk, or industrial controllers will likely need a real-time operating system. In such cases, consider the Express Logic ThreadX RTOS which offers hard-real-time response and a scalable OS architecture that lets it fit into as few as 6 kbytes of memory.

Also, the company's TraceX software operates with a G-Series processor to give engineers a wealth of information about the real-time behavior of their system. When application code activates or suspends dozens or hundreds of threads, trying to understand how a system performs presents programmers with a daunting challenge. By examining and displaying software events in a real-time system, TraceX helps designers pinpoint bugs and optimize performance. Express Logic offers royalty-free licenses for ThreadX software. For more information, read the blog entry, "A Real-Time OS (RTOS) for the AMD Embedded G-Series," at: tinyurl.com/4xk9mel. For specific ThreadX information, visit: www.rtos.com/ [6].

Virtual Machine Software for Java 6 Code

When you have an industrial, military, or aerospace software application ahead and need a real-time virtual machine with support for Java Standard Edition, put Aonix Perc Ultra 6 from Atego on your list to research. This software includes support for the Java 6 language and incorporates a new high-performance compiler for higher-speed code execution. It also includes a graphical "console" that will particularly interest programmers and engineers. The PConsole software displays real-time

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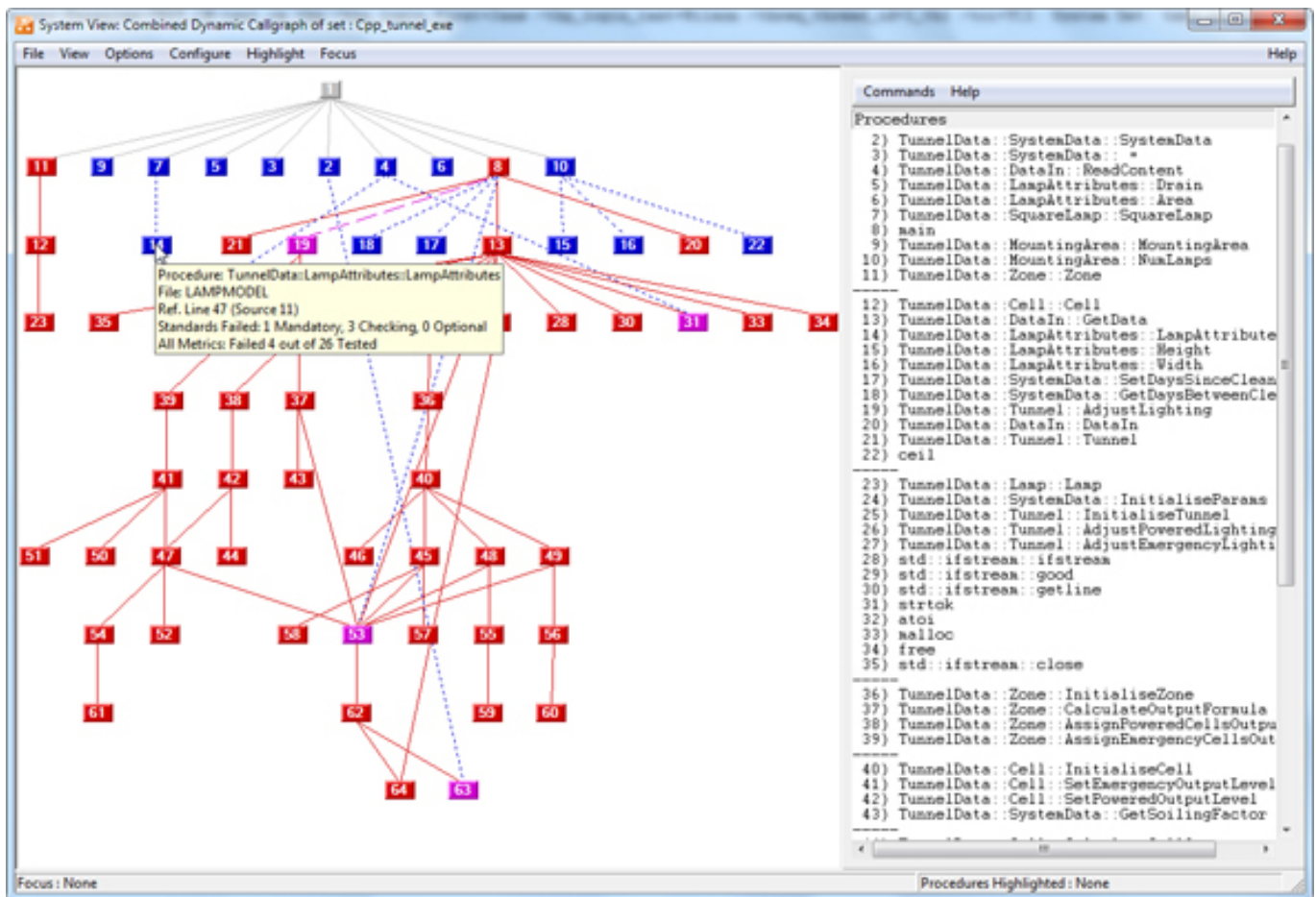
graphic information about performance and resource consumption of the application, information about heap and stack memory, and CPU workload for individual threads.

Real-time graphs show thread states, the stack frame of each thread, and garbage collector activity. PConsole also lets you control thread priority and garbage-collection parameters while an application runs. You can then modify virtual-machine parameters and immediately see how they affect application-software performance. A new Java Virtual Machine Tool Interface provides enhanced debug and profiling information. For more information, visit:

www.atego.com/products/aonix-perc/ [7]

Trace Object Code to System Requirements

Software used in avionic, medical, and automotive equipment must pass stringent tests and manufacturers must certify compliance with industry standards. So, you must use tools that trace object code directly to your source code because a compiler could insert object code that doesn't originate with specific source-code statements. Now, LDRA lets companies trace object code back to their starting requirements rather than just to the intermediate source code. So you can confirm code meets requirements and each section of code pertains to a specific requirement.



The new avionics software standard, DO-178C, will soon mandate this type of testing for the most critical software, and the medical and automotive industries have recognized this verification process as valuable for their software, too.

According to LDRA, "Discrepancies caused by compiler interpretation or program optimization can lead to code verification passing at the source level, but failing at the assembler object-code level. Evidence that all lines of software have been fully tested at the source- and object-code levels is becoming more important for a number of industries." For information about the LDRA's Testbed suite of verification and validation software tools, visit: <http://www.ldra.com/testbed.asp> [8].

Analyze Multicore Code

Multicore designs probably need even more scrutiny and analysis than those that use a single processor. The CodeSonar static-analysis tool from GrammaTech tackles the problem by creating an abstract model of a program and then capturing its syntax, call graphs, and control-flow graphs. Next, in a synthesis phase analogous to linking, CodeSonar generates a program model, which it executes in an analysis engine that uses automated reasoning about feasible paths and data to identify tricky bugs that result from complex interactions among procedures. The latest version of Code Sonar also identifies data-race conditions and other serious concurrency problems.

The CodeSonar software works with many compilers that include ARM RealView, CodeWarrior, GCC, G++, Green Hills, HI-TECH, IAR, Intel C/C++, Microsoft Visual Studio, Renesas, Sun C/C++, and Texas Instruments' CodeComposer Studio. Some run-time environments might require that programmers model synchronization primitives, but GrammaTech designed its tools to simplify this process. For more information, visit: www.grammatech.com [9]. The company has an interesting white paper, "Finding Concurrency Errors with GrammaTech Static Analysis." You must register on the company's Web site to obtain it.

Secure MCU Protects Data

Engineers who want to use a USB device as an authentication token will find the secure AT90SO72 MCU from INSIDE Secure a good candidate for devices such as smart meters and machine-to-machine controllers that must protect sensitive information.

The new AT90SO72 RISC CPU includes a hardware random-number generator, hardware AES, DES, and triple DES as well as the company's Ad-X2 advanced hardware crypto accelerator, which supports the RSA algorithm with as many as 4096 bits. It also provides other cryptography capabilities and can generate keys. The MCU also includes anti-tampering hardware for protection against simple and differential power analysis attacks, advanced protection against physical attacks, light protection, and secure memory-management/access protection. The AT90SO72 is available now in wafers, modules, and standard, SOIC-8 and QFN-20 packages. Visit www.insidesecond.com [10] for more information.

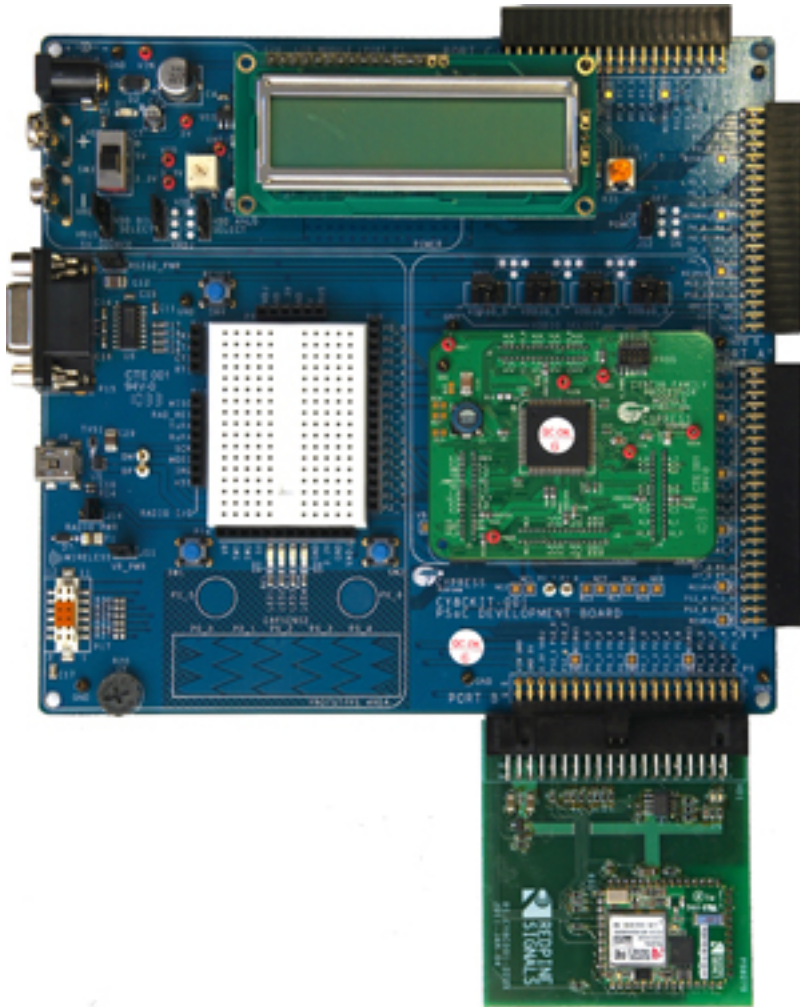
Use SPARK for Secure Programming

A recent update from NIST, "Source Code Security Analysis Tool Functional Specification Version 1.1," shows the SPARK language has fewer vulnerabilities than C/C++ or Java. Because implementation of code can introduce many software-security weaknesses, using a source-code security analyzer will help reduce the number of vulnerabilities. SPARK provides a subset of Ada augmented with

annotations that help other software tools identify security problems. AdaCore supplies SPARK Pro, an open-source set of tools for developers who want to increase the security of their code. By preventing security vulnerability SPARK reduces the time needed to find and correct errors and the time needed to test code to meet top safety and security standards. For information, visit:

www.adacore.com/home/products/sparkpro. For the the NIST paper, visit:

http://samate.nist.gov/docs/source_code_security_analysis_spec_SP500-268_v1.1.pdf [11].



Add WiFi Communications to

PSoC 3 and PSoC 5

Engineers who use the Cypress Semiconductor PSoC 3 or PSoC 5 programmable system-on-a-chip devices can now easily incorporate low-power Redpine Signals' Connect-io-n Wi-Fi modules in a design. The Redpine modules already have certification to FCC USA standards and equivalent certifications in other regions. The Redpine modules employ serial interfaces and provide wireless connectivity as high as 10M bps via an SPI interface or as high as 4M bps via a UART interface. The Cypress PSoC 3 devices provide a high-performance 8-bit 8051 processor and the PSoC 5 devices include a 32-bit ARM Cortex-M3 processor.

An WiFi expansion board (RS-CY8C001-220X) plugs into a Cypress CY8CKIT-001 or CY8CKIT-030 PSoC development board available from Cypress. The nearby image shows the Redpine board attached to a Cypress PSoC board. The Wi-Fi Expansion Board includes an 802.11n Connect-io-n module, example projects, and documentation. Redpine expects to have the kit in stock in June 2011. For Cypress

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PSoC 3 information, visit: www.cypress.com/?id=2232 and for PSoC 5 information, visit: www.cypress.com/?id=2233 [12]. Find information about Redpine Signals WiFi modules at: www.redpinesignals.com/Products/Modules/index.html [13].

RF4CE ZigBee PRO Evaluation Kits

Atmel now has two evaluation kits for engineers and designers who want to investigate ZigBee RF4CE (RF for consumer electronics) communications used in handheld remote controls. The kits support ZigBee application profiles such as Smart Energy, Home and Building Automation, Remote Control, as well as IEEE 802.15.4, or you can create a proprietary protocol. Both kits also provide users the ability to evaluate high data-rate communications. The kits also let engineers evaluate RF performance and measure power consumption.

The kits include reference boards based on the Atmel ATmega128RFA1 and AT86RF231 wireless, low-power transceivers, and the company's ZigBee-compliant software stacks available as from the company's website. You can buy the Atmel RF4CE Remote Control Evaluation Kit from the Atmel store at: <http://store.atmel.com/PartDetail.aspx?q=p:10500270> [14] for \$US 439. The REB231ED-EK kit with antenna diversity support for the Atmel AT86RF231 device costs \$US 239 and should be available soon. For more information about Atmel's ATmega128RFA1, visit: <http://www.atmel.com/wireless/single-chip> [15].

PXI Digitizer Offers 5-GHz Bandwidth

The National Instruments PXIe-5186 modular instrument offers a bandwidth as high as 5-GHz and a sample rate of 12.5 GSample/sec., and the PXIe-5185 modular instrument that offers a 3-GHz bandwidth and 12.5 GSsamples/sec. Both instruments take advantage of a proprietary ASIC developed by Tektronix engineers for Tek's family of performance scopes. This ASIC reduces sampling jitter in the two instruments to 500 fsec (rms), which yields 5.5 effective number of bits (ENOB) for the digitizer at 5 GHz. The digitizers can stream data as fast as 700 MBytes/sec and synchronize channels on separate modules to within 160 psec. These capabilities make the digitizers ideal for automated production test, semiconductor ATE, and high-energy physics measurement systems, and other high-frequency measurement needs.



Both digitizers work with LabVIEW, the LabWindows/CVI ANSI C software development environment, and Microsoft Visual Studio .NET development tools. Engineers also can use the NI-SCOPE instrument driver or the new LabVIEW Jitter Analysis Toolkit to program the digitizers. For more information, visit: www.ni.com/digitizers [16].

Mixed-Signal MCU Tackles High-Precision Measurements

ON Semiconductor designed its Q32M210 MCU specifically for portable electronic equipment that requires accurate analog measurements and low power consumption. The chip comprises an ARM Cortex-M3 processor, two 16-bit ADCs, an accurate voltage reference, and three 10-bit DACs. The low-noise ADCs offer true 16-bit performance unlike typical converters where non-linearity and noise can reduce the number of effective bits.

MCU interfaces including UARTs, dual-SPI/SQI, I2C, I2S, and a full-speed USB 2.0 port. An SQI (serial quad interface) port uses four data pins to increase data-transfer rates four fold. It helps when you have a large, external non-volatile memory connected to an MCU. Q32M210 includes power-supervision, brown-out protection, and low-battery detection circuits that ensure predictable operations. And the device requires less than 400 $\mu\text{A}/\text{MHz}$.

ON Semiconductor plans to offer an evaluation and development board and software that includes firmware libraries and sample code. The kit includes a KickStart edition of the IAR Systems Embedded Workbench. IC price: \$US 4.99 (10K units). For more information, please visit <http://www.onsemi.com/Q32M210> [17].

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- [1] <http://www.tag-connect.com>
- [2] <http://www.microchip.com/get/D413>
- [3] <http://www.microchip.com/get/M6RA>
- [4] <http://www.mentor.com/embedded-software/sourcery-tools/sourcery-codebench/>
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- [16] <http://www.ni.com/digitizers>
- [17] <http://www.onsemi.com/Q32M210>