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# IQ Staff


| | | |
|---|---|---|
| **Publisher:** | Glenn ImObersteg | *glenn@convergencepromotions.com* |
| **Editor-in-Chief:** | Erik Ploof | *erik.ploof@ARM.com* |
| **Editor:** | Desiree Joplin | *desiree.joplin@arm.com* |
| **Advertising:** | Mike Miller | *mike@convergencepromotions.com* |
| **IQ Design:** | Glenn ImObersteg | *glenn@convergencepromotion* |
| **Graphic Design:** | Dave Ramos | *dbyd@garlic.com* |
| **Photographer:** | Bob Smith | *bob@convergencepromotions.com* |
| **Illustration:** | Judy Gosse | *judy@convergencepromotions.com* |
| **Articles:** | Special thanks to all our contributors this issue | |

# Calling All Cars, Calling All Cars.

**By Erik Ploof, ARM**

Silicon Valley, in Northern California, is noted for the highest concentration of high-tech industries in one area, and, it is equally noted for the never-ending mass of commuting engineers that this notoriety creates. Twice a day, engineers wind their way through the corridors of Highway 880, 680 and 101 in a 2-hour grind into positions at Silicon Valley companies. Hundreds of thousands of drivers, while mindful of the news helicopters overhead reporting their lack of forward momentum, don't realize that the solution is at hand, or rather, within their grasp. The old police broadcast, "Calling all Cars" might apply to the rest of us today as we begin to realize the potential of personal GPS-equipped mobile phones to operate as traffic data collection devices.

Last year, GPS-equipped, (and ARM core-based) Nokia phones broadcast traffic information in an experiment to the internet in a program partnered by Nokia, NAVTEQ and University of California in Berkeley. The program and results of the experiment are detailed in a in a special section in this issue titled *Project Millennium* (pages 8-20).

From reducing traffic congestion, this issue smartly moves the reader into household smart meters, all-digital metering devices that precisely track energy usage, and will one day become part of a larger network that includes networking your home appliances to the internet. *Reducing Household Energy Use through Innovative ARM Powered Smart Meters* (page 28) chronicles the move to smart meters and their various applications in daily life.

Daily life is becoming more entertaining, thanks to the ARM Powered products that emerge daily onto our store shelves. The new Nautiz rugged PDA, powered by a Marvel XScale device and running on Microsoft Windows Mobile 6.1, takes all the mystery (and fun) out of being lost in the woods (see *Handheld Explorer*, page 60). For those armchair explorers who prefer their action inside, Rock Band Unplugged brings the music frenzy to a new pitch in the Sony Play Station for the first time in the article *Rock the World* (page 62).

All these unique end-user applications have to start somewhere, and every issue of IQ contains its share of articles that deal with the development phase of various projects. *Developing ARM Cortex-M Class Processor-based Systems* (page 22), evaluates the suitability of using a Microcontroller Prototyping system (MPS) for a Cortex-M class processor-based hardware and software development environment.

Attaining performance improvements and optimizations for mobile multimedia applications is a hot new topic covered in the article *Optimizing H.264 Decoder for Cortex-A8 with ARM NEON OpenMax DL Implementation* (page 32). The title of the article *Leverage the AMBA 3 AXI Protocol Performance While Slashing Area, Power and Routing Congestion* (page 38), pretty much spells out the contents of this article, and *CAN Primer: Creating your own Network* (page 46) premiers a new section for future IQs called Designer's Notebook.

BTW: If you enjoy the special on Project Millennium, you won't want to miss Alexandre Bayen's Keynote at the upcoming ARM TechCon3 (formerly ARM DevCon) in Santa Clara, on October 21. Alexandre is an Asst. Professor of Civil and Environmental Engineering at UC Berkeley, the principal investigator for the Millennium Project, and a great presenter. So get ready to join the hundreds of other engineers who are doing something productive on their mobile phones while sipping their Starbucks on the way to work in the morning!

# MAKING ONE OF THESE?


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## TI Acquires Luminary Micro

Texas Instruments has expanded its microcontroller (MCU) portfolio with the acquisition of Luminary Micro, the market-leading supplier of ARM Cortex-M3-based 32-bit MCUs. The addition of Luminary Micro's Stellaris® family of Cortex-M3 processors will accelerate TI's ability to provide the industry's most complete MCU portfolio. This acquisition means that customers can now enjoy the innovative capabilities of Stellaris MCUs along with the proven experience and technical strength TI brings as a global semiconductor provider.

Stellaris devices will allow TI to address mainstream 32-bit MCU markets, giving customers access to the general-purpose processing power of the industry-standard ARM Cortex-M3 core and the Stellaris family's advanced communication capabilities, including 10/100 Ethernet MAC+PHY, CAN, USB On-The-Go, USB Host/Device, SSI/SPI, UARTs, $I^2S$, and $I^2C$.

The transaction closed on May 14, 2009.

# eSOL Expands Their Software Platform Solutions to Include TI's New TMS320DM365

eCROS, eSOL's complete software platform suite, is now available for Texas Instruments' (TI) new TMS320DM365 digital media processor based on DaVinci™ technology. eCROS seamlessly integrates a real-time operating system (RTOS), middleware and development tools with professional services. The RTOS incorporated in eCROS is ideal for digital media applications.

It boasts highest real-time performance and faster boot time to offer the best end-user experience, and its minimum memory requirement enables lower hardware costs. eCROS is an out-of-the-box software platform with optimal RTOS to help engineers jump-start their application development for HD-capable digital video devices on the DM365, including video doorbells and portable media players. The ARM926EJ-S™-based DM365 features a video-processing subsystem (VPSS) that has built-in image signal processing (ISP) capabilities, including face detection and noise filtering. Additionally, royalty-free, production ready HD codec bundles, including H.264, help decrease design complexity for developers. The DM365 is provided in a single chip set along with other integrated peripherals such as EMAC and USB 2.0 Phy. DM365's distinctive video-processing capability is optimal for security cameras, portable media players and video doorbells that require HD quality. Engineers can leverage existing software programs for the TMS320DM3x line of digital media processors on the DM365.

## LPC1700 with 512KB Flash

# NXP ships industry's highest performance Cortex-M3

The LPC1700 series is the industry's highest performance Cortex-M3 microcontroller, based on results from the Embedded Microprocessor Benchmark Consortium (EEMBC). The EEMBC results show that the LPC1700 executes application code on average 35% faster than the leading Cortex-M3 competitors when running at the same clock speeds. NXP's performance advantage is even greater when the LPC1700 runs at higher clock speeds. The LPC1700 has been certified by EEMBC at 72,100, and 120 MHz. This increased speed and efficiency is due to the intelligent architecture of the microcontroller, its use of flexible direct memory access (DMA) and best-in-market Flash. The LPC1700 series is targeted to operate high-bandwidth communications peripherals such as Ethernet, USB On-The-Go/Host/Device and CAN simultaneously with no bottle-necks. It is designed for use in a wide variety of applications, including eMetering, lighting, industrial networking, alarm systems, white goods and motor control.

"These certified EEMBC results highlight the fact that the design of the microcontroller and its memory interfaces is equally as important as the processor core itself," said Markus Levy, president of EEMBC. NXP is introducing two new members to the popular LPC1700 series. The LPC1768 and LPC1758, available in LQFP100 and LQFP80 packages respectively, extend the maximum Flash size of the LPC1700 series to 512KB. The LPC1700 series is now shipping in volume and free samples are available at www.nxp.com/experience_MCUoptions/.

"Our EEMBC results confirm that the LPC1700 series is now the fastest and most efficient Cortex-M3 available in the market," said Geoff Lees, vice president and general manager, microcontroller product line, NXP Semiconductors. "The immediate availability of this series, along with the new 512KB devices ensures that NXP continues to offer our customers the broadest range of 32-bit MCU options."

# ARM Supports EEMBC CoreMark Benchmark

ARM announced support for the new Embedded Microprocessor Benchmark Consortium's CoreMark processor benchmark. CoreMark is a synthetic benchmark, but carries out meaningful calculations, and is claimed to be a significant improvement on current Dhrystone benchmarks which is overly dependent on the performance of the C library. "ARM has been a board member of EEMBC since its formation in 1997 and welcomes the introduction of the CoreMark benchmark," said Eric Schorn, VP Marketing, Processor Division, ARM.

"We believe that CoreMark represents a significant improvement on the current Dhrystone benchmarks by measuring processor behavior that could more realistically be expected in a real application. Combined with greater access to the results, this new benchmark should enable developers to obtain an unambiguous representation of processor performance enabling comparisons between competing processors to be made." EEMBC was established to develop meaningful performance benchmarks for the hardware and software used in embedded systems.

## Touch Screen Technology

# Melfas Chooses Cortex-M0 For Capacitive Touch Screen Micros

Melfas has chosen the ARM Cortex-M0 processor and ARM physical IP libraries for their future controller ICs for capacitive touch screen solutions. "The ultra low power and gate count of the Cortex-M0 processor, combined with its 32-bit performance efficiency, makes it an ideal choice for mobile touch screen applications supporting increasing panel sizes," said B.W. Lee, CEO, Melfas. "This upgrade from our previous 8051-based solution will enable us to deliver a competitive advantage in the energy efficiency, precision and cost effectiveness of our products."

According to DisplaySearch, the total touch screen module market will grow to $9 billion by 2015, with a CAGR of 14 per cent."Our engineers were already familiar with the Keil software development tools, which support both 8051 and ARM Cortex-M0 processor-based devices," said D.J. Min, VP Engineering, Melfas. "We were able to quickly and easily evaluate the new processor using our existing 8051 code base. The results demonstrated that we could halve the flash memory requirement using the Cortex-M0 processor, and reduce the MHz requirement by 5x, saving power."

## What's the Buzz?

First stop is Massachusetts to catch up with the developers at Kopin, the NanoSemiconductor company, who have created the innovative Golden-I, a three ounce Bluetooth headset providing a 15-inch virtual PC display with hands-free natural speech recognition.

The device has been designed for wireless remote control over an array of host devices including cell phones, PCs, company networks and wireless systems.

Golden-I may be lightweight, but it punches way above its weight, featuring a Texas Instruments' (TI) OMAP dual processor - 600 MHz ARM Cortex[[EP]] -A8, 400MHz DSP - and 10 million polygon/second graphics accelerator with high performance POP (package on package) memory reaching several gigabytes.

Way back in 2007, when the company started developing Golden-I, many said its goals were impossible to achieve, Dr. John C. C. Fan, Kopin's Chief Executive Officer said. Kopin has proved them wrong and rolled out the ultimate device for mobile information snacking!

Next we take a trip to Bangalore, India, to the headquarters of Ittiam Systems, a DSP IP provider which offers complete end-to-end solutions algorithms, codecs, system software and reference hardware designs based on highly integrated SoC architectures.

Ittiam has been working with ARM since 2007 and supports a number of ARM processor families, including ARM9E, ARM11, Cortex-M3, Cortex-A8. The company is also working on the Cortex-A9.

Ittiam's set of high-performance audio and video codecs for the ARM Cortex-A8 processor with ARM NEON technology, for example, have been designed with the power to drive the next generation handheld and mobile applications.

In technology we take a look at the GPS navigation device market. Growing usage in automotive and consumer applications is accelerating the mobile location technologies market, which is forecasted to grow at a CAGR of more than 20% to cross US$ 75 Billion by 2013, according to market research company Research and Markets. ARM Powered products in the personal GPS systems market include Mio, Garmin, Nokia and TomTom.

### Synopsys Introduces Lower Power, High Performance Architecture for AMBA 3 AXI On-Chip Interconnect

Synopsys, Inc., has announced that it has enhanced its DesignWare® IP for the ARM AMBA 3 AXI interconnect with the industry's first hybrid architecture implementation, enabling dedicated high-performance and shared low-performance channels to be combined within a single AMBA 3 AXI on-chip interconnect. This new architecture, available in synthesizable source RTL, allows designers to configure the bus fabric to eliminate unnecessary logic within the design, thereby reducing area, power consumption, and overall routing congestion.

# NVIDIA Tegra-based Devices Revolutionize The 'MID' Market

COMPUTEX 2009-TAIPEI-JUNE 2, 2009 - NVIDIA Corporation and industry partners today unveiled 12 new high-definition mobile Internet devices (MIDs) all powered by the NVIDIA Tegra processor, the world's smallest and lowest power computer-on-a-chip. These new Tegra-based devices, which include netbooks and tablets, deliver desktop-class Internet browsing with Flash video and animation acceleration, and up to 1080p video playback. NVIDIA Tegra processors feature always-on operation for instant access to the Internet, which compares to that of cell phone-class power management, and up to 5x the battery life of current netbooks-making days of HD mobile Internet experiences a reality.

"The mobile computing revolution has arrived," stated Michael Rayfield, general manager of mobile business at NVIDIA. "These new Tegra-based products combine excellent Internet and media capabilities, always-on operation, and wireless connectivity for the un-tethered Internet experience consumers have been craving."

# Netronome Licenses ARM Multiprocessing Technology For Next-Generation Network Flow Processor

Netronome, a leading developer of highly programmable semiconductor products that provide intelligent and secure flow processing for virtualized servers and network equipment, has licensed the ARM11™ MPCore™ multicore processor and a portfolio of ARM® Physical IP for incorporation into its NFP-32xx family of Network Flow Processors™ Netronome's network flow processors (NFPs) incorporate a high-performance, parallel processing architecture to enable wire-speed processing of complex Layer 2-7 algorithms, security processing, deep packet inspection and filtering, traffic management and forwarding applications.

By integrating capabilities that have typically required multiple specialized processors, Netronome NFPs provide a cost-effective, low-power platform for a broad range of emerging applications requiring high-performance packet and content processing with robust security features, including switching and routing, network security, broadband access, test and measurement and wireless markets. The NFP-32xx family of devices extends the performance and application reach of the family of Intel® IXP28xx products licensed by Netronome in November 2007, while preserving the software compatibility with existing IXP28xx devices.