

JOURNAL

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FROM THE PRESIDENT

New Subcommittee Targets Network Storage

If you're a regular reader of EE Times, Communications Business Daily, Electronics Weekly, or various other publications that cover the network storage industry, chances are you're already aware that EEMBC has formed a new subcommittee that will be developing benchmarks to predict the performance of CPU subsystems in network storage applications. This is exciting news for several reasons. For one thing, the new StorageBench™ suite will fulfill a major need for manufacturers in the network storage space. It will give them the industry's first certifiable benchmarks that can measure items such as raw data movement, peripheral I/O performance, and the effects of core-to-memory latency across a variety of storage-related platforms. These are all useful things to know with respect to network attached storage (NAS), storage area networks (SANs), virtual tape libraries (VTLs), and direct attached storage (DAS) RAID systems.

StorageBench is the 8th or 9th (depending on how you count) application-focused benchmark suite that EEMBC has developed. But it also represents a "first" in several respects, and that's another reason to be excited. For one thing, StorageBench represents the latest step in EEMBC's

StorageBench™

Benchmark Software

progression toward system-level benchmarks. Its kernel benchmark will address the performance of CPUs and specialized engines used in network storage applications, while a second benchmark will measure system-level throughput, running data that has been shaped to be representative of real storage system traffic through the chip and monitoring its performance.

The second respect in which we're making a departure is in the genesis of the EEMBC Network Storage subcommittee that is developing StorageBench. For the first time in the Consortium's history, the impetus to develop a new suite is coming directly from the community of embedded processor customers, and in David Solina of Adaptec we have

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From the lab

Stabilizing Benchmark Scores in EEMBC: Software "Jitter"



Alan R. Weiss, EEMBC Certification Laboratory

There is no such thing as "software jitter" in benchmarking, but the term is a very good description for what you often see when you run benchmarks on a personal computer with an OS such as Linux that does not run in real time. It might as well be called software jitter, though, because the variance in benchmark scores is fairly high, even after you control for the environment. In EEMBC, members often download and run software on an x86 PC under Windows in a

Cygwin environment or under Linux or Solaris before they try porting to an embedded target.

In these cases, what you really observe is non-deterministic variance. There are a number of causes of this variance, each with its own solution:

- Not running the benchmark long enough to take into account the granularity of the OS timers, i.e. a call to `clock()`

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NEWS BRIEFS



Mark Mitchell of CodeSourcery

EEMBC's newest member is **CodeSourcery**, a provider of development tools, software test solutions, and custom software development services for semi-conductor and

operating system vendors. Joining the Consortium in the third-party tool member category, Granite Bay, Calif.-based CodeSourcery's products and services include support and optimization for Sourcery G++, CodeSourcery's version of the GNU Toolchain. "Our customers—many of whom are also EEMBC members—have made it clear that the EEMBC benchmarks are one of the key metrics they use when evaluating compilers," says **Mark Mitchell**, President and Chief Sourcerer of CodeSourcery. "We're very excited to be joining the EEMBC community and look forward to further improving our products and services by using this powerful tool."

EEMBC's **GrinderBench** Web site (www.grinderbench.com), which allows users to test the Java performance of their mobile phones and PDAs, now allows users to automatically calculate their single-number Grindermark scores. The same mechanism allows EEMBC to supplement score data submitted by members with scores from the larger community of mobile phone and PDA users.

"... [B]enchmarking embedded systems has always been difficult. As those simple MPUs of yore have evolved into complex, multitasking systems-on-chip — often with hardware accelerators, shared on-chip memory structures and buses, and intelligent peripherals — the simple question of whether a given chip can do the job has become a huge issue," writes **Ron Wilson** in the December 5 issue of *EE Times*.

"The Embedded Microprocessor Benchmark Consortium (EEMBC) is taking on these challenges. With three major initiatives, the group hopes to create new, open and licensable benchmarks that will be predictive for the multicore SoCs and sophisticated applications that characterize the current market." Read more at www.eetimes.com/showArticle.jhtml?articleID=174900199.

EEMBC is accepting job applications for the full-time position of **Director of Software Engineering**. Responsibilities include benchmark source code development and project management, technical support, maintenance and development of technical documentation, benchmark score certification, and technical conference presentations. Compiler optimization experience very helpful. The successful candidate must have exceptional interpersonal communication and presentation skills. Fluent in several languages is a plus. To apply, send a resume to Markus Levy, EEMBC President, at markus@eembc.org.

EEMBC's academic licensing program has been expanding at unprecedented rate. Latest to join up are faculty at the universities of **Nebraska, Pittsburgh, Singapore, Texas (Austin), and Tubingen (Germany)**. EEMBC President **Markus Levy** reports much interest in the OEM community as well in licensing EEMBC's benchmark software.

Recent speaking appearances by EEMBC President **Markus Levy** included a keynote speech at **HiPEAC 2005**, the International Conference on High Performance Embedded Architectures and Compilers held November 17-18 in Barcelona, a presentation at the **Embedded Systems Show** in Birmingham, England, and a keynote speech at the **Chips and Tools** conference

held October 13 in Sindelfingen, Germany. Between these engagements, Levy and **Greg Crouch of National Instruments** presented "Evaluating and Selecting Processors/Microcontrollers for Real-Time Applications" at the Real-Time Automotive Seminar on November 3 in Dearborn, Mich. Levy is next slated to present at **Embedded World 2006**, being held February 14-16 in Nuremberg, Germany. Topic for this upcoming presentation will be "The Changing Landscape of Microcontroller Selection," an exploration of the performance variations among different ARM7 microcontrollers. www.embedded-world-2006.de

MEMBERS ONLY

The next meeting of the **EEMBC Board of Directors** will take place January 10-11, 2006 at the Wynn Las Vegas. To reserve, call 1-866-770-7555 and identify yourself as a member of the EEMBC Quarterly Meeting group. Further information on the venue is available at www.wynnlasvegas.com. Details of the schedule and agenda are available from the main page on the members-only area of the EEMBC Web site.

A new member resource for information on EEMBC and its benchmarks is "**Conference Presentations for Use by Members**" on the members-only area of the EEMBC Web site. Here you'll find a number of EEMBC Powerpoint presentations from recent conferences, saved to ZIP archives, that you can download to your computer and use to add EEMBC information to your own presentations. Look for the new section under "Marketing and Promotional Resources."

EEMBC Establishes New Subcommittee

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our first subcommittee chair whose company is also an embedded processor customer.

In fact, many of our members have customers in the network storage market, and with this new benchmark suite we aim to give them a powerful tool to analyze and validate new processor architectures and optimize products for storage applications. We are particularly fortunate to have the participation and support of David Solina and his colleague Kimberly Robinson at Adaptec, and all of us are looking forward to maintaining the momentum of this effort and ensuring that the benchmarks we develop are fully relevant to the needs of all storage product manufacturers.

In this regards, I invite any vendor involved in designing some aspect of storage-based platforms to contact me and consider joining our organization to get directly involved in the definition, development, and testing of this interesting benchmark suite.

I wish you a joyous holiday season and look forward to sharing with you many exciting developments in EEMBC in 2006.



Markus Levy

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from the lab

Stabilizing Benchmark Scores in EEMBC: Software “Jitter” (continued from page 1)

- or `gettimeofday()` function

Solution: Since EEMBC’s significant figure of merit is iterations per second, increase the number of iterations for each benchmark so that they execute for at least 3 to 5 seconds. On a 32-bit or 64-bit machine, there is little danger of clock overflow errors. I think you’ll find that variance goes down substantially by doing this.

- OS system services and device drivers are not quiescent

Solution: Make sure you are running the benchmarks with as few other processes and threads running as possible. Judicious use of `top(1)` and `kill(1)` on Linux or Unix machines works wonders here. Kill all non-essential processes and threads and by all means kill X windows system on a Unix or Linux machine.

- The OS is managing memory and processes by swapping or paging (which is what a good OS should do)

Solution: The same as above - kill unnecessary processes, threads, and device drivers. Make the system as quiescent as possible. Do NOT move the mouse! Do not cause external interrupts.

- The `clock()` and `gettimeofday()` functions may be broken, returning incorrect values

Solution: Fix the bug. Some early versions of Linux had all sorts of weird things happening. Some embedded versions of Linux still have incorrect coding of the interface from OS calls to the RTC.

- Inexplicable variances between runs

Solution: When all else fails, it is valid to suspect the BIOS

(firmware) and power management systems that go behind the back of the OS to throttle the processor. Some code-morphing x86 processors seem to do this as part of their strategy to save power, for example. Look for both BIOS settings as well as power management device drivers.

In the end, repeatability relies upon scientific control of all variables, something ECL has vast experience in doing. This is another good reason why your company should submit its materials to ECL for certification. Even if you don’t publish the results publicly, we can still help you in numerous ways, improved repeatability being one of them.