



## Who you gonna call? Google

**"And who dials 411 anymore, when it's cheaper and faster and you don't have to explain to some headset-wearer in Terre Haute how to spell Worcester?"**

—Neil Swidey,

**"A nation of voyeurs,"**

*The Boston Globe*

*Magazine, Feb 3, 2003*

## Switched fabric eliminates CPU-bus bottlenecks

By Warren Webb

**T**HE NEW C269 Equinox from General Micro Systems is a hot-swappable industrial CompactPCI CPU board based on Intel's new Xeon-LP Pentium IV processor. Featuring dual 3-GHz Xeon-LP CPUs, the C269 includes ServerWorks' new Hub-Link controller, which



**Featuring two Intel 3-GHz Xeon-LP Pentium IV processors, the C269 Equinox includes a four-port switched fabric to eliminate PCI-bus bottlenecks.**

gives the CPUs high-speed access to memory, mass storage, I/O, multimedia, and networking subsystems. The C269's Hub-Link controller uses a four-port switched fabric to eliminate the bottlenecks of traditional PCI-local-bus architectures. Instead of providing arbitrated access to a shared-bus resource, the Hub-Link controller provides dedicated point-to-point connections between the CPUs and the key subsystems, each operating at 2.4 Gbytes/sec.

Equinox also provides a full complement of standard desktop interfaces, including keyboard, mouse, and floppy; two COM ports; and six USB ports. The C269's dual-mode display controller supports

both analog RGB and flat-panel displays. Equinox provides two 10/100/1000 Base-TX Gigabit Ethernet channels, which you can configure as a PICMG 2.16 Ethernet packet-switched backplane. Equinox also provides a third 10/100 Base-TX Ethernet interface for use as an external debugging or controller interface. Software support for the Equinox C269 includes Windows 2000, Solaris x86, Linux, QNX, and VxWorks. The Equinox C269 with a 1.6-GHz Xeon-LP CPU and 256 Mbytes of RAM costs \$2400 (one).

►**General Micro Systems**, 1-909-980-4863, [www.gms4sbc.com](http://www.gms4sbc.com). Enter No. 366 at [www.edn.com/info](http://www.edn.com/info).

## DSP-based wireless analyzer targets 2.5 and 3G networks

DON'T BELIEVE EVERYTHING you've read about the death of telecommunications and wireless communications. In many parts of the world—especially China—the wireless industry is not merely alive and well, but also thriving, in part because of the rollout of 3G (third-generation) and less advanced 2.5G technologies.

Tektronix's new WCA200A series of wireless-communications analyzers has prices starting at \$27,990 and targets design, manufacturing, deployment, maintenance, and repair of 2.5 and 3G equipment. The instruments combine the functions of spectrum analyzers and

vector-signal analyzers. The WCA230A operates to 3 GHz; the WCA280A operates to 8 GHz. Features of the series include the ability to capture as much as 10 seconds of WCDMA (wideband code-division multiple-access) signals, unsurpassed ACLR (adjacent-channel leakage-ratio)-measurement speeds, and the ability to perform both preconfigured, one-button-actuated tests and user-configured, custom-test routines.

—by Dan Strassberg

►**Tektronix Inc**, 1-800-426-2200, [www.tektronix.com](http://www.tektronix.com). Enter No. 367 at [www.edn.com/info](http://www.edn.com/info).



**The WCA200A series of wireless-communications analyzers combines the functions of vector-signal analyzers and 3- and 8-GHz spectrum analyzers into instruments housed in a single, rugged, transportable enclosure.**



# Flash memory anticipates architecture transformation

**T**ODAY'S DOMINANT MEMORY architecture in cell phones and PDAs includes NOR flash memory for code storage and direct execution, along with DRAM or SRAM for data storage. M-Systems

points out, though, that, as mobile electronics' functions increase, the required operating-system and application-memory "footprint" also grows. Users are also storing more data, including e-mails, music, pictures, and video clips, and they expect this data to survive a battery discharge. These trends suggest a possible future migration to a PC-like memory architecture employing a small, directly executing, nonvolatile boot-code partition, analogous to the PC BIOS; a large, non-volatile memory array for both code and file storage, analogous to a PC's disk drive; and volatile memory for data manipulation and code execution.

Is the combination of NAND-flash memory plus RAM less expensive than the directly executing NOR-flash-memory alternative? The answer is currently unclear, because the *entire* operating system must decompress from NAND-flash memory into RAM. Users of the Hewlett-Packard and Viewsonics Pocket PCs employing NAND-flash memory may subsequently become unhappy when they discover that a significant portion of the total RAM in their

PDAs is unavailable for their use. Future variants of Palm, Symbian, Windows CE, and other operating systems are likely to incorporate PC-like on-demand code paging from storage memory to RAM, consequently reducing the amount of RAM required for code. These operating-system enhancements will boost the cost appeal of the NAND-flash-memory-plus-RAM combination.

In an attempt to hurry this architecture migration along, M-Systems couples its media-controller expertise with partner Toshiba's NAND flash-memory-technology prowess in the G3 Mobile DiskOnChip generation. G3 uses MLC (multilevel-cell) flash memory, which holds 2 bits' worth of information within each transistor, to boost per-square-inch silicon-storage capacities and reduce per-megabyte media cost. A 32-bit internal bus and dual-plane array, along with technology-tuned media-management algorithms, boost sustained

read and write speeds, and error-detection and -correction circuitry masks the idiosyncrasies of low-reliability MLC NAND-flash-memory media.

According to M-Systems, although conventional NAND flash memory may exhibit one or two bit errors for every 400 kbytes of information written, MLC NAND-flash memory may generate as many as four bit errors for every 350 bytes written. Mobile DiskOnChip G3, thanks to its built-in EDAC, exhibits approximately 1 bit error for every  $1 \times 10^{13}$  Mbytes' worth of written information. M-Systems will ship samples of its first G3 product, a \$16 (100,000), 512-Mbit device, by the end of the second quarter, and production volumes are scheduled for third-quarter availability. A 256-Mbit variant should also appear in the third quarter,

and M-Systems hopes to ship a 1-Gbit part early next year. For now, you can prototype with today's functionally compatible Mobile DiskOn-Chips, built from conventional NAND-flash memory.

—by Brian Dipert

► **M-Systems**, 1-510-494-2090, [www.m-sys.com](http://www.m-sys.com).

Ⓜ Enter No. 369 at [www.edn.com/info](http://www.edn.com/info).

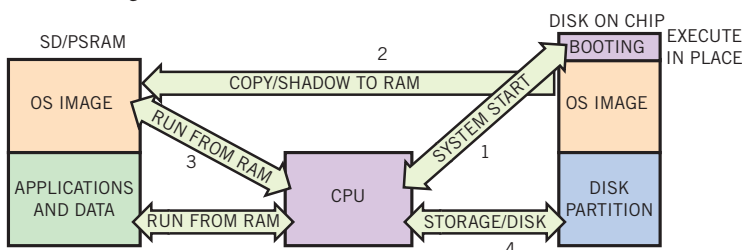
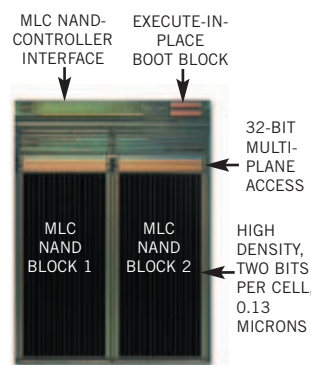
## HARDWARE ACCELERATOR TARGETS COSIMULATION

Emulation and Verification Engineering has introduced a hardware accelerator targeting the cosimulation market. ZeBu, (Zero Bugs), a PCI card, interfaces with a software simulator using hardware, firmware, and software layers. The interface complies with the SCE (Standard Co-Emulation)-API protocol. You typically use it in transaction mode with SystemC testbenches; however, you can also use it—but with lower performance—with more traditional and popular logic simulators, such as ModelSim, VCS, and NC-Sim.

ZeBu also offers increased debugging capabilities, such as register and memory read/write, I/O-pin tracing, internal-state capture and VCD (value-change-dump)-waveform output, to the software simulators it interfaces with. Price starts at \$49,000.—by Gabe Moretti

► **Emulation and Verification Engineering**, +33 1 64 53 27 30, [www.eve-team.com](http://www.eve-team.com).

Ⓜ Enter No. 370 at [www.edn.com/info](http://www.edn.com/info).



**G3 MobileFlash DiskOnChip builds on a NAND-flash-memory foundation (top). Cell phones and PDAs may adopt a PC-like multimemory approach (bottom).**

# Audio acquires the “write” touch

**W**OLFSON Microelectronic’s \$6.64 (1000) WM9712L builds on the foundations of its WM9705 forerunner, which you can find in the latest generation of Dell (www.dell.com) and Toshiba (www.toshiba.com) Pocket PCs. This power-stingy combination of an audio codec and touchscreen-interface controller now comprises a differential or two-channel microphone input with automatic level control, a two-channel audio-line input, a separate monophonic-audio input, a PC-“beep” input, and an audio DAC that connects to the AC’97 Version 2.2 system interface. Whereas the previous generation chip’s audio outputs were unamplified, Wolfson now includes a 45-mW, 16 to 32 $\Omega$ , dual-channel-headset output with presence detection; a monophonic, 300-mW, 8 $\Omega$  speaker driver; a monophonic, 30-mW, 32 $\Omega$  earpiece driver; and an S/PDIF (Sony/Philips-digital-interface) digital-output capability.

Between the audio inputs and outputs, you find a multistage mixer and tone controls, a flexible sample-rate converter operating from the system clock and supporting independent ADC and DAC rates, and bass-boost and surround-sound virtualization-processing circuits. The WM9712L operates at voltages ranging from 1.8 to 3.6V, and the digital core operates as low as 1.42V. The device consumes 10  $\mu$ W in sleep mode and 20 mW in headphone-playback mode. Its touchpad digitizer has 12-bit resolution and pen-down detection even if the chip is in sleep mode; the digitizer also now supports both four- and five-wire

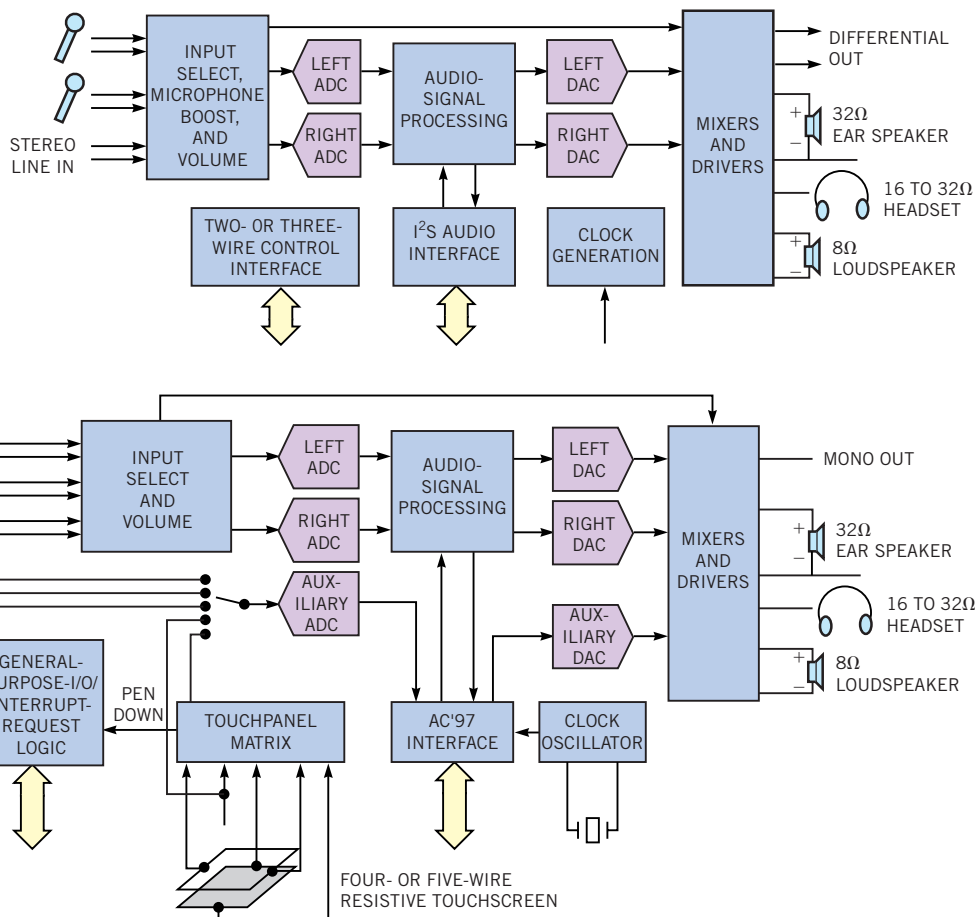
panels. Two analog inputs with comparators and a third analog input and companion ADC, let you monitor battery status and other system parameters, and five general-purpose I/Os, most of which multiplex with other functions, deliver chip-to-chip control and communication. Now available, the WM9712L comes in 7 $\times$ 7-mm QFN and 48-lead TQFP packages.

If your chip needs are audiocentric or your system lacks an AC-Link interface, you might instead consider the company’s \$4.98 (1000) WM8750L. It operates as a master or a slave and supports a variety of clock frequencies, including 12 or 24 MHz for

USB and standard sampling frequencies, such as 12.288 and 24.576 MHz. The integrated DAC delivers a 98-dB, A-weighted SNR with -95 dB THD, and the ADC has a 95-dB SNR and -90-dB THD, all at 3.3V and a 48-kHz sampling rate. Estimated power-consumption is 7 mW for two-channel playback and 14 mW for two-channel simultaneous recording and playback. Also now available, the WM8750L comes in a 5 $\times$ 5-mm QFN package.

—by Brian Dipert

►Wolfson Microelectronics, 1-858-676-5090, www.wolfsonmicro.com. Enter No. 371 at www.edn.com/info.



Audio-only or audio-plus? In either case, Wolfson Microelectronics has a chip for you: the WM8750L (top) or the WM9712L (bottom).