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Retiring HP exec talks innovation, webOS and cultural imperatives

For Hewlett-Packard, Aug. 18 was a day that has gone on to live in infamy. For Phil McKinney, it was the day he rethought his future, deciding to retire as chief technologist of the company's PC group and resume his career as an innovation guru.

It was no Pearl Harbor, but Leo Apotheker did drop a couple of big bombs that day last August, saying HP would drop its webOS smartphone and tablet business and would consider splitting off its PC division to boot. Weeks later, Apotheker lost his job as chief executive over the decisions, which were widely criticized by observers, including yours truly.

Meg Whitman mentioned Aug. 18 several times late last month in the company's quarterly earnings call—her first as HP's new CEO. "Some people thought we were getting out of hardware entirely," she said of the confusion Apotheker had created.

In her short time at the helm so far, Whitman has ended discussions about splitting off the PC unit (it stays), increased R&D spending by 10 percent and pledged to get the company back on track. Whitman reportedly gave herself until early this month to decide what to do with webOS.

For McKinney, the brouhaha was a cue to segue back into full-time work as a consultant and put the finishing touches on "Beyond the Obvious," his book on innovation due out in February (<http://bit.ly/s3JDgr>).

"With the [Apotheker] announcement and everything going on, and

with the book coming out, I decided now was a good time to think about what was the next thing I wanted to do," McKinney said, speaking in his San Jose home office the day before Thanksgiving.

Many readers interpreted McKinney's Aug. 22 blog post on seven laws of innovation as his veiled take on what was happening at HP. It talked in part about the need for patience to support innovation—a message that resonated with the webOS team members who'd

gotten the axe just weeks after the group's first product launch.

But if McKinney issues any official comment on his nine years at the IT giant, it won't come until after his tenure officially ends Dec. 31, perhaps in a subsequent book. In the meantime, he's offering guarded praise for Whitman, the fourth HP CEO in nine years.

"She is saying the right things; now it's just a matter of execution and walking the talk," McKinney said, citing her moves to rebuild R&D budgets.

He also offered Whitman some unsolicited advice: "Be aware of the power of culture; it can be helpful or a roadblock."

In fact, said McKinney, "Culture eats strategy for lunch. You may think the CEO makes the calls, but culture has at least as huge an influence as any

strategy you come up with."

And HP, of course, "has an incredibly strong culture; Bill and Dave still walk the halls," McKinney said. "It's a heavily engineering-driven organization, fueled on innovation. So when you shortchange innovation—whether through suddenly stopping programs people committed to or reducing budgets—it runs very counter to the culture and builds resistance to anything from the executive suite."

In other words, in the wake of scandals and missteps around Carly Fiorina, Mark Hurd and Apotheker, HP's good people are several times bitten and many more times shy.

Killer questions

McKinney hails from the pragmatist school of innovation. "Some people make innovation sound like a black art [and think innovativeness is a capability] that some people are blessed with and others are not," he said. "My point is, it's a skill anyone can learn. It's not a gift from God; you can learn it and practice it."

Killer questions that make you think out of the box are core tools of innovation, according to McKinney. He created a Twitter feed of such questions and considers his upcoming book the first full compendium of them.

"We get stuck in following rules. We get taught it in school—staying in the lines and putting on blinders," he said. "The best killer questions are ones you can't directly answer. You have to pause and do a discovery process to find new and interesting opportunities."

All the innovation talk these days is more than the latest business fashion; it's a shift of tectonic plates, McKinney said. For example, market valuations used to be based largely on tangible assets like factories and machines, but now they're based on intangibles such as patents and even less quantifiable assets.

"Google and Apple have high market caps related to the market's expectations of their ability to innovate the next big thing," McKinney said. "When executives see this sort of change in stock prices, it changes their values in hiring practices, so this is going to have a huge change in how people think about their businesses and careers."



McKinney's caveat for Whitman: 'Culture eats strategy for lunch'

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As he heads into the next phase of his career, McKinney is taking his HP webOS devices with him and hoping the mobile operating system finds a good home. Rumors suggest Amazon might want it for future Kindles, or maybe China's Baidu could use it in a play similar to Google's Android.

McKinney says he distanced himself from all such discussions after announcing his retirement. But he is quick to praise webOS for being the first mobile operating system based on the emerging HTML5 standard, now being widely touted as a point of convergence.

Personally, I think it's curtains for webOS. It started life as the fourth or fifth most interesting mobile OS—at best—behind Android, iOS and the BlackBerry and Windows Phone OSes.

And it slips further and further down the list with every day it spends as a corporate orphan. ■

By Rick Merritt (rick.merritt@ubm.com), editor at large for *EE Times*.

READERS WEIGH IN

If they can develop webOS to be more Linux-based, it would allow a larger following and more compatibility. The system is fast and easy to use, and battery life for the current units is great. I wouldn't mind a better browser for the current webOS, but for what it's currently worth, it does what I need. ... I like the fact that the most popular game out there has been ported to the platform: Angry Birds! — *Fidolido*

If HP decides to abandon webOS, opening it up to the open-source community may not be a bad idea. — *chanj*

If you cannot be No. 1, 2 or 3 in an industry, then you shouldn't be in it unless you have a secure niche (making military-grade stuff, for example) or a good chance of displacing one of the top guys. IMHO, after the dust settles it will be Android at the top and then iOS, followed by a Windows OS—and no profitable place for a fourth or fifth OS.— *Patk0317*

Patk0317 has it right; in fact it's a basic tenet of marketing. ... However, in the cell phone markets, top players have now receded, and their share has been taken up by others. For example, ZTE just became the No. 4 cell phone maker in the world, and five years ago you would not have counted on them [to achieve] that. Usually, those kinds of shifts are the result of missteps by the market and not of giant leaps in strategy by a former underdog.

If the decision on webOS is to proceed, the task ahead is going to be a lot like farming. There will be a lot of acreage to plow before any crop comes up, and then there's still no guarantee of a viable market once the crop is ready. Oh, and don't forget the weather, er, market-environment changes that might take place during the process. Those tend to be unpredictable. — *kdboyce*

HP might be acting according to the conventional wisdom, but it's weird to see the world's biggest IT company with no clear smartphone or tablet strategy. — *rick.merritt*

With its use of Web technologies for app development, webOS is developers' heaven compared with the low-level environments of Android and iOS.

In my mind, it all comes down to corporate commitment. Without solid commitment from HP, app developers are not going to bother to support it. Without app developers' support, the platform is nowhere.

HP paid a lot of money to get webOS and then killed it by showing lack of commitment. How stupid. — *Patrick Van Oosterwijck*

HP never should have bought webOS in the first place; it was already a day late and about 10 dollars short. The only possible future for webOS is open source or none at all. I say give the open-source community webOS as a Christmas present, and HP may get something in return eventually, albeit not what it envisioned in its original, grandiose delusions. — *ROckstar*

I use a webOs TouchPad every day. My daughter has an iPad2, which she uses every day. The TouchPad is a good product, but I believe HP shot itself in the foot when it initially priced the TouchPad on par with the iPad2. That made a lot of people who were curious about webOS tablets delay their purchasing decisions, in anticipation of the inevitable promotions and rebates. Then Leo [Apotheker] effectively killed the platform after a few weeks in the market—and after months and months of development—because of “poor” sales. Give me a break.

A software platform needs hardware to run in order to evolve. If HP liquidates its stock of TouchPads and smartphones, it now has a stagnant piece of the market. No new hardware for webOS will be available in the foreseeable future.

So, with that, the platform road map reaches a dead end, and there is not much incentive to continue to refine webOS. There is going to be no TouchPad2—unless Meg [Whitman] revives the product line.

To do so, she will need to provide a clear commitment to the market, customers and app developers. — *ronetna*

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To learn more about the role technology plays in Sam's training, follow his journey and talk to him at us.element14.com/sports

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News

OF THE TIMES

Limiting our picks to a set number doesn't do the topic justice, but these innovations are already changing mind-sets, apps and markets

TECH
TRENDS

20 technologies to watch in 2012

By Peter Clarke

SOMETIME BETWEEN finishing off the turkey leftovers and prepping our New Year's toasts, *EE Times'* editors sat down to identify 20 hot technologies we will be tracking during 2012.

Granted, given the pace of technological change, limiting our list to 20 topics doesn't really do the subject justice. Technology does not exist in a vacuum; individual innovations are interconnected conceptually—and sometimes physically—through the efforts and actions of engineers, consumers, companies and markets.

What's more, the significance of a technology can sometimes boil down to a well-turned phrase that captures the essence of an evolving technology sector, such as the way "system-on-chip" replaced "application-specific integrated circuit" a decade ago. For instance, is today's "Internet of things" the same as or different from machine-to-machine communications? Whichever catchphrase we choose, the question is whether the technology will enable products and markets to flourish.

This year, when downturns and natu-

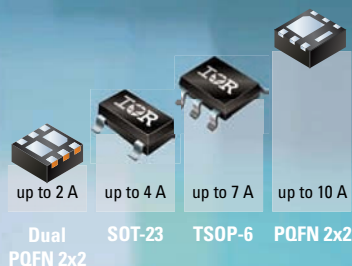
ral disasters disrupted the industry, we were reminded that there have always been areas within electronics that have grown rapidly even when overall market growth has been limited.

And those hot sectors are fueled by hot technologies like these.

1. MICROELECTROMECHANICAL SYSTEMS. MEMS is really six or seven subdomains, many of which have high market growth rates. Categories to watch include environmental sensors, including pressure and humidity

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| | SOT-23 | 54 | 95 | IRLML2244 |
| 20V | PQFN 2x2 | 12 | 16 | IRLHS6242 |
| | SOT-23 | 21 | 27 | IRLML6244 |
| | Dual PQFN 2x2 | 45 | 62 | IRLHS6276 |
| 30V | PQFN 2x2 | 16 | 20 | IRLHS6342 |
| | TSOP-6 | 18 | 22 | IRLTS6342 |
| | SOT-23 | 29 | 37 | IRLML6344 |
| | Dual PQFN 2x2 | 63 | 82 | IRLHS6376 |

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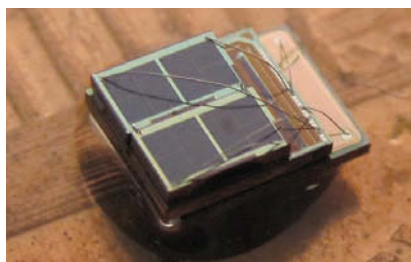
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NEWS OF THE TIMES

sensors; silicon microphones; inertial sensors, including accelerometers and gyroscopes; inkjets and microfluidics; microactuators, such as micromirror devices and displays; RF MEMS devices; micro-optoelectromechanical systems; and bioelectronic probes and substrates.



2. WIRELESS SENSOR NETWORKS.

The combination of sensor, microcontroller, energy source and wireless transceiver could yet transform, and in some cases create, a range of applications.

3. THE INTERNET OF THINGS.

Once trillions of objects have IP addresses to help them serve billions of people, life on our planet will never be the same.

4. PLASTIC ELECTRONICS. Organic materials for electronics hold out the possibility of low-cost and biodegradable circuits. For now, the performance is low—but the possibilities are already being exploited in RFID and near-field communications.

5. NEAR-FIELD COMMUNICATIONS.

NFC is becoming available in many mobile phones, and 2012 could be the year the cell phone also becomes an electronic wallet. Broader applications, such as building access and transport ticketing, have already made NFC a hot topic.



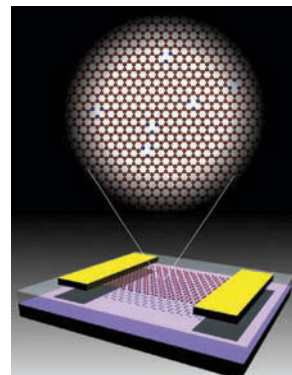
6. PRINTED ELECTRONICS.

This category, particularly with regard to reel-to-reel or inkjet printing, is a

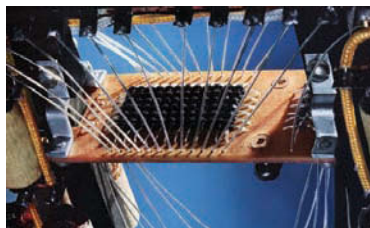
close cousin to plastic electronics. Imagine intelligent food packaging that talks to your fridge, which then restocks your provisions, all without your direct involvement.



7. ENERGY HARVESTING. There are many approaches, but we are nearing the point where some systems can be made sufficiently low power to allow them to run off energy that is scavenged, rather than supplied by some external source. It's a nod to the ethos that energy should not be "wasted."



8. GRAPHENE. Carbon in the form of a monolayer of atoms, organized as a hexagonal sheet, can be deployed in conductive inks and is being considered for the introduction of high-mobility layers in "beyond CMOS" silicon-based processes.



9. NEXT-GENERATION NONVOLATILE MEMORY. There's plenty to watch in this category in 2012. Vertical NAND flash will likely

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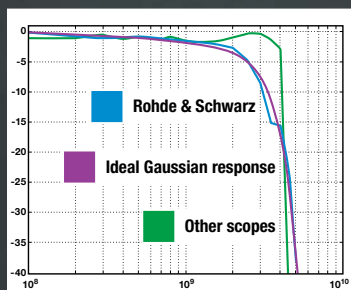

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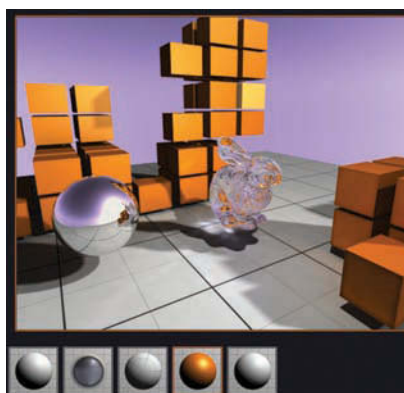
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NEWS OF THE TIMES

get the go-ahead, provided the economics pan out. If not, magnetic MRAM, phase-change memory and resistive RAM are being researched. The term memristor, meanwhile, applies to any two-terminal variable resistance-with-memory effect. Ferroelectric polymer memory is a memristor-type memory.

10. PROCESSORS AND TECHNIQUES RELATED TO MULTICORE AND MANYCORE.

The techniques include the OpenCL open parallel programming standard and the big-little, paired-processor approach of ARM. The Intel vs. ARM low-power battle has replaced the Intel vs. AMD performance battle that was waged over the previous 20 years. Expect more arrows to be shot in 2012.



11. GRAPHICS AND GENERAL-PURPOSE GPUS. It turns out that the look and feel of a product, based on its graphics, can be more important to its success than the CPU performance—and that graphics cores can do more than just graphics. Expect rollouts of general-purpose graphics processing units, probably accompanied by libraries of routines guaranteed to run on vendors' GPUs. Also look for GPGPUs to use parallel processing languages that originally were devised for graphical rendering.

12. EXTREME UV AND OTHER NEXT-GEN LITHOGRAPHY approaches, including multibeam e-beam and imprint, for semiconductor manufacture. A breakthrough beyond immersion optical lithography is necessary if geometry scaling is to continue.

13. SOLAR CONVERSION. The many approaches to this application include various types of silicon, compound semiconductors and organics—each with its associated costs, efficiencies and form factors. As the technological progress continues, the business prospects remain a moving target.



14. WHITE-SPACE RADIO. Technology that makes use of the available spectrum around digital broadcast TV and radio is being proposed as one potential platform for machine-to-machine (M2M) communications.

15. LTE. These days, overzealous marketers might brand any fast wireless network "4G," but only the Long Term Evolution standard is true 4G—and it promises disruptive impact.

LTE will drive a new generation of baseband chips, smartphones and embedded products leveraging maximum data rates. It is already becoming a differentiator for Qualcomm and Nvidia, which will embed it into their 2012 application processors. Chip and IP vendors are competing over how to implement it in silicon.

It's not likely any major new apps will emerge with LTE. But carriers are expected to use the bandwidth to ease congestion on their mobile data networks.

In the back end of carrier nets, LTE is a big step toward all-IP networks. Carriers are getting close to the day when everything from the handset to the core router and switch will be pushing digital packets. Bid farewell to the analog circuit switches that have hosted telephony for a century.



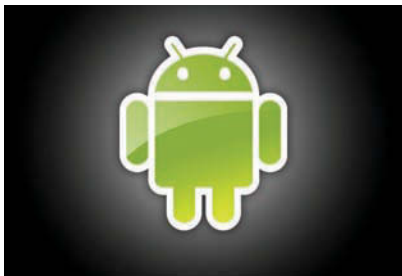
16. 40/100-GBIT/SECOND ETHERNET.

Now that 10G networking is finally making its way down to server motherboards, the next big thing in the wired Internet world is 40/100G Ethernet. Carriers and data centers looking to expand their core backbone networks have been clamoring for the technology.

So far it's still expensive, in part because it requires a lot of power and board space. But 40/100G Ethernet is driving innovation in optical and signaling technologies to lower the costs and space requirements, and those innovations will ripple across the industry over time.

Meanwhile, the industry debates about the next big step are at a fever pitch. Engineers think they are bumping up against the limits of physics. Their view is that a 400G standard could get hammered out over the next few years, but it will need the next turn of the crank in the underlying serializer/deserializer technology.

Beyond that, no one knows what is feasible or when.



17. MOBILE OSes WITH ANDROID.

What's the next feature these operating systems need to enable beyond NFC? Augmented reality? Gesture recognition interfaces? Support for HTML5?

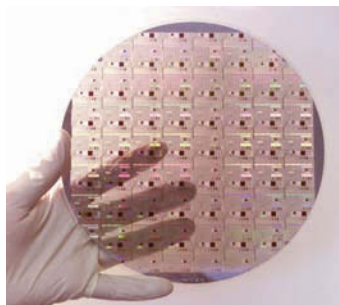
18. AMOLEDs FOR LARGE-SCREEN DISPLAYS, such as 50-inch-class TVs. Smaller screens are already using active-matrix organic LEDs. When will

AMOLEDs get into iPads and iPhones? Or will MEMS-based displays or pico-projectors eclipse the technology?

19. SMART GRID TECHNOLOGIES, including smart power management and architecture system components. The global power utilities are the next mega market to move from analog, standalone systems to digital networked technology. The opportunities are huge in everything from wireless components in smart meters to giant power electronics in transformers and substations, along with vast renewable solar and wind farms, and the energy storage systems that will be built alongside them.

But the opportunities will be slow to materialize. Utilities are regulated and thus inherently slow-moving. Policies at the level of the global Kyoto Treaty on down will influence the pace and direction of the buildout. And many market unknowns are yet ahead, such as how much consumers really want to monitor the energy use of their fridge or dryer.

Forward-looking utilities and vendors such as Cisco Systems have now put business units and plans in place. Over the past two years, some very basic framework standards have also been drafted. But plenty of technical work is also ahead to graft commercial IT technologies onto the power grid in ways that ensure safety and open the door to more-automated operations of a grid that will depend less and less on conventional fuels.

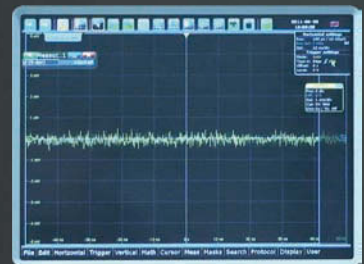


20. 3-D IC DEVELOPMENT AND INTEGRATION within established semiconductor process flows. The use of through-silicon vias and wafer bonding is shifting the manufacturing landscape and presenting opportunities for a new set of players. Winners and losers are still to be determined. ■

Scope Lie #2

Your digital scope's noise specification

Today's digital scopes only provide a 5 or 10mV/division setting and use a digital zoom to "get down to" a 1mV/division setting. This tactic significantly increases noise while lowering the accuracy. As a way to reduce the noise, some oscilloscopes limit bandwidth on low volts per division settings, while others do not offer the 1mV/division setting at all.



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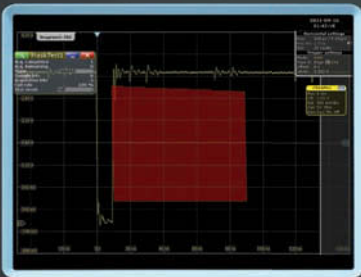


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Scope Lie #3

Your digital scope's update rate

Digital scope manufacturers boast update rates of 1+ million waveforms/sec, but this spec excludes measurements and mask testing. These demanding scope measurement tests slow down the update rate of most digital oscilloscopes. When conducting a mask test at lower update rates, finding an event that occurs once per second could take anywhere from minutes to hours.



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NEWS OF THE TIMES

MARKETS

Space firsts, lasts in 2011

By George Leopold

THIS WAS THE YEAR the American shuttle program ended its 30-year run, with no clear plan for sending future astronauts into Earth orbit and beyond. For now, astronauts are hitching a ride to the International Space Station aboard Russian Soyuz spacecraft.

Despite the hiatus in American manned spaceflight launches, there were also space firsts during 2011 that are advancing our quest for a deeper understanding of the universe. These ranged from the launch of sophisticated U.S. probes to Mars and Jupiter to the precise placement of the first spacecraft into orbit around the innermost planet, the overheated rock we call Mercury.

There were also two launches targeting our nearest neighbor, Mars. A high-profile Russian probe called Phobos-Grunt was to attempt the retrieval and return of dust from the Martian moon Phobos. But at press time the probe remained stranded in orbit around our planet and was expected to fall back to Earth any day. Some observers think the failure may spell the end of Russian planetary exploration.

The Mars Science Laboratory on NASA's SUV-sized Curiosity rover, meanwhile, is headed for a landing near Gale Crater on Mars next August. Launched from Cape Canaveral on Nov. 26, the state-of-the-art Curiosity is so big that it will be lowered to the surface by a rocket-powered sky crane, a never-before-attempted landing technique reminiscent of the U.S. lunar landings. If the \$2.5 billion mission succeeds, the plutonium-powered Curiosity will provide high-definition pictures of the Martian surface, along with near-real-time video (signals from Mars take about 10 minutes to reach Earth).

Besides range and power, Curiosity's biggest enhancement over its little brothers, the plucky Martian rovers Spirit and Opportunity, is its on-board sci-

ence lab, which can zap rocks with a laser to scan samples for signs of organic compounds that are the stuff of life.

If you've looked up at the night sky recently, you've seen the target of NASA's Juno probe, launched in August. "Jupiter is the Rosetta Stone of our solar system," says Scott Bolton, principal Juno investigator at the Southwest Research Institute (San Antonio, Texas). "It is by far the oldest planet; contains more material than all the other planets, asteroids and comets combined; and carries deep inside it the story not only of the solar system, but of us."

Expected to reach Jupiter by mid-2016, Juno will conduct by far the most extensive survey ever of the giant gas ball, including a search for a rocky core. As of Nov. 21, mission controllers reported that Juno was nearly 40 million miles from Earth (about the same distance as Mars) and traveling at a velocity relative to Earth of 31,700 miles per hour.

As NASA figures out how to resume manned spaceflights from Florida's Cape Canaveral, the next big test of a U.S. commercial rocket that could eventually carry humans has been rescheduled for early January. SpaceX has already delayed the next launch of its Falcon 9 rocket several times this year. The rocket is scheduled to lift a Dragon spacecraft to the International Space Station in order to demonstrate the system's ability to ferry supplies to the orbiting laboratory. SpaceX is among several contractors vying to replace the shuttle program.

NASA tipped plans in September to develop a deep-space rocket to send humans beyond Earth orbit. For now, however, the Space Launch System (what ever happened to inspiring names like Apollo?) is only a concept; there are no guarantees SLS will make it to the launch pad.

Here's our list of the most notable space developments of 2011. ■



The space shuttle era ended in July with the 135th and final flight of a U.S. shuttle. Besides helping to build the International Space Station, shuttle astronauts over the years deployed dozens of satellites and the Hubble Space Telescope. One highlight of the program was the 1993 repair of Hubble's faulty optics. Fourteen astronauts were killed during shuttle flights—seven each in the 1986 Challenger explosion and the 2003 breakup of Columbia.



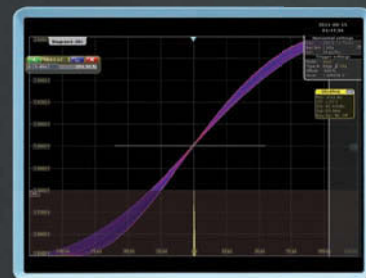
A panoramic view of Earth from the space station's cupola window, installed by shuttle astronauts in February 2010.

Scope Lie #4

Your digital scope's analog trigger

Most analog and digital scopes utilize separate circuits for trigger and waveform acquisition. These circuits have different bandwidths, varying sensitivities and diverse characteristics which can cause trigger jitter.

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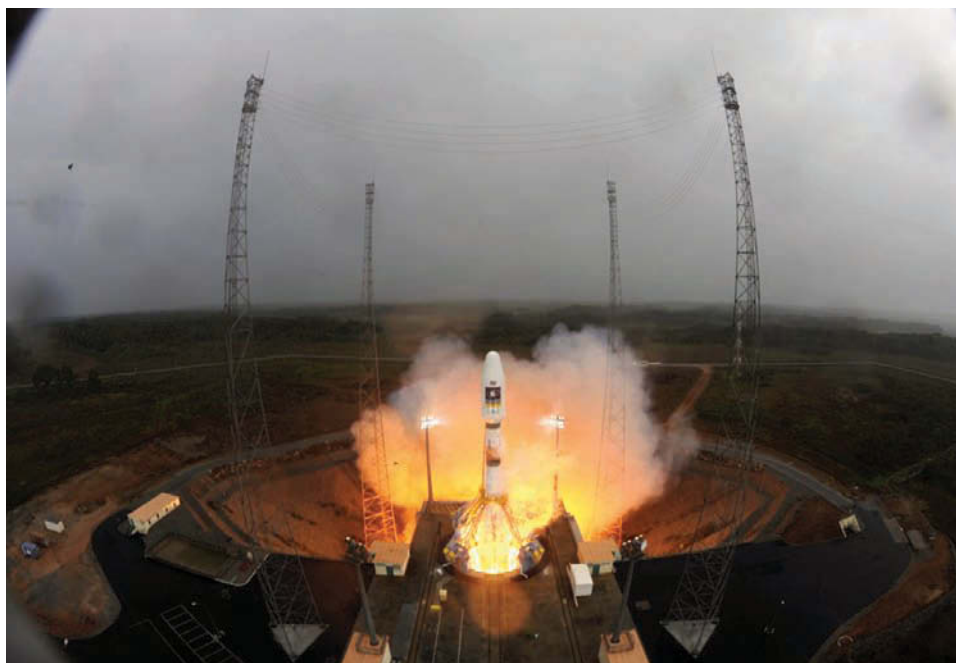
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Using a new ion propulsion system powered by xenon gas, NASA's Dawn spacecraft reached one of our solar systems' unformed planets, the asteroid Vesta, in July. Still in orbit around Vesta, the Dawn expedition seeks to understand the formation of our solar system through extensive investigation of asteroids that failed to become planets.



The European Space Agency launched the first two operational satellites of the Galileo navigation system in October from its spaceport in French Guiana. Galileo is Europe's answer to the U.S. GPS system.

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NEWS OF THE TIMES



The solar-powered Juno spacecraft was launched from Cape Canaveral in August on a five-year voyage to Jupiter. Juno will conduct the most exhaustive survey ever of the giant gas planet, including a search for a rocky core.



The Space Launch System approved by NASA earlier this year would again take humans beyond Earth orbit, but the first launch is still a decade away.



The SUV-size Mars Science Laboratory is shown at its final checkout before beginning its 254-day journey to Gale Crater in November. If a highly risky landing succeeds in August, the Curiosity rover will begin an unprecedented survey of the Martian surface, including a search for organic compounds. Mission controllers said in early December that Curiosity was precisely on course and that planned trajectory maneuvers were not needed.



In March, NASA's Messenger probe became the first spacecraft ever to orbit Mercury. It has since begun an extensive mapping mission of the solar system's innermost planet, surveying Mercury's scorched surface in an attempt to advance the science on how the inner planets formed.

Russia's Phobos-Grunt mission to Mars failed shortly after launch when engines designed to send the probe to Mars failed. Mission controllers attempted to contact the crippled probe but have since given up. The spacecraft is expected to fall out of Earth orbit by early 2012. ■



New Level V-efficient 9W micro USB adapter charges personal electronics

The PSAC09R Series 9W adapter with interchangeable clips is ideal for use with tablets, peripherals, wireless and networking equipment. The charger features a single output of 5V DC with a Micro USB connector and is fully compliant with the Level V Efficiency marking requirements. The adapter's constant current output also complies with USB's Battery Charger Specification Rev. 1.0 making it ideal for charging lithium ion batteries in personal electronics.

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For details on Phihong's PSM03X, visit: www.phihong.com/PSM03X



New 30W Level V Efficient Wall Plug Adapter with Interchangeable Clips

The PSAA30R Series 30W wall plug adapters are available in 12V, 15V, 24V and 56V offerings and are compliant with all worldwide efficiency regulations. The PSAA30R is ideal for applications including POS equipment, network and gaming machines, and peripherals. Interchangeable AC clips are available including a clip with IEC320 C8 input to convert the wall plug into a desktop-style adapter powered by a two-wire line cord.

For details on Phihong's PSAA30R adapter, visit: www.phihong.com/html/psaa30r_30w_level_v_clips.html

CLEANTECH

Japan bets the smart home on embedded

By Junko Yoshida

YOKOHAMA, JAPAN — Embedded Technology 2011 here was a showcase of sorts for a decided shift in the Japanese electronics industry's agenda toward smart home concepts in the months since the March 11 earthquake and tsunami.

The smart house, smart city and smart society are no longer just pie-in-the-sky fodder for academic research grants or trumped-up efforts by Japan's Ministry of Economy, Trade and Industry (METI) to promote Japanese products.

Not that academia and METI have given up on the concept; far from it. But it was clear at the show that technology suppliers are taking the smart home idea far more seriously than ever before. With fresh interest and an unprecedented sense of urgency, they are pursuing embedded technologies that will let people intelligently control, conserve, store and distribute energy within the home or community.

Whereas utility-led smart grid discussions dominate the conversation in the United States, Japan is centering the debate on the home itself, notes Masaya Ishida, publisher of *EE Times Japan*, our sister publication in Tokyo. While the concept includes the continuous flow of energy from utility companies, a smart home in this context might better be described as an energy-independent or sustainable-energy home.

The idea is to embed smart control functions in every device and every system, enabling consumers to achieve desired levels of energy consumption and conservation for every embedded system they use at home and at work.

The energy-independent home concept envisions a day when conserved energy can be stored in electric vehicles' fuel cells for use by other gear. Ishida observed that many city dwellers in Japan drive primarily during weekends, preferring public transportation for the daily commute. That leaves energy stored in the family car—which charges at low-peak hours—to be intelligently

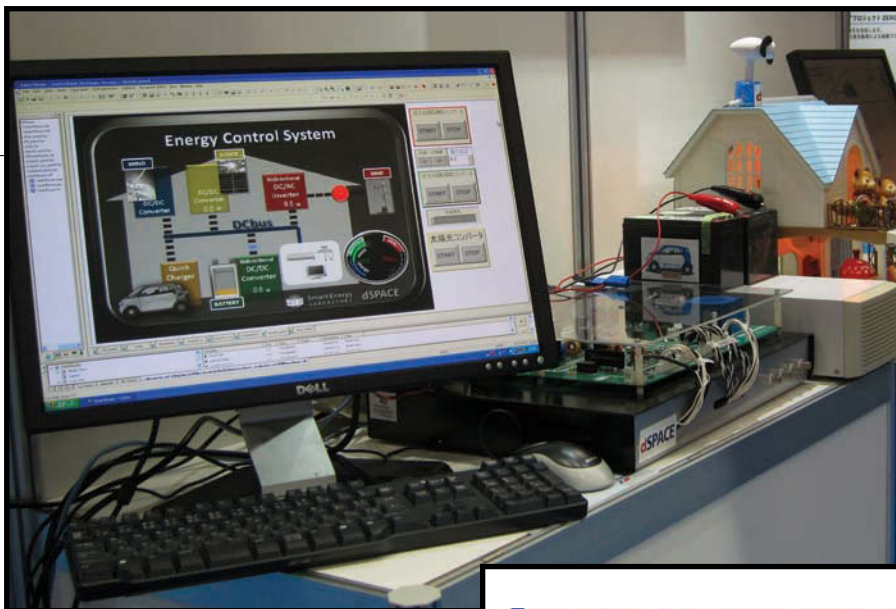
distributed throughout the home to a host of devices during peak usage hours.

Summer's lessons

The rolling blackouts implemented in Japan this summer to help the nation cope with the diminished electrical supply in the wake of the catastrophic nuclear power plant failures in Fukushima taught Japanese companies, factories, retailers and consumers invaluable lessons in perseverance. Citizens limited their energy usage during peak demand hours. Neon street signs went dark, escalators in public spaces were turned off, light fixtures in offices and stores made do with a few less fluorescent tubes, and factories operated on weekends.

Even as the Japanese deservedly congratulate themselves for having met national energy conservation goals this summer, they are bracing for winter, when energy demand is certain to rise. As the cold settles in, Japan's citizens might be called on yet again to prove their perseverance.

Looking further into the future, rather than ask consumers to "persevere," the goal of the industry's new smart home push is to make energy savings effortless for everyone. The key is embedded technology; developers are looking to embed all manner of devices with solutions for smart energy control, smart energy consumption, efficient energy storage and intelligent energy distribution, at home, in the office and out in the community. Some of their ideas were on display at the Yokohama conference.

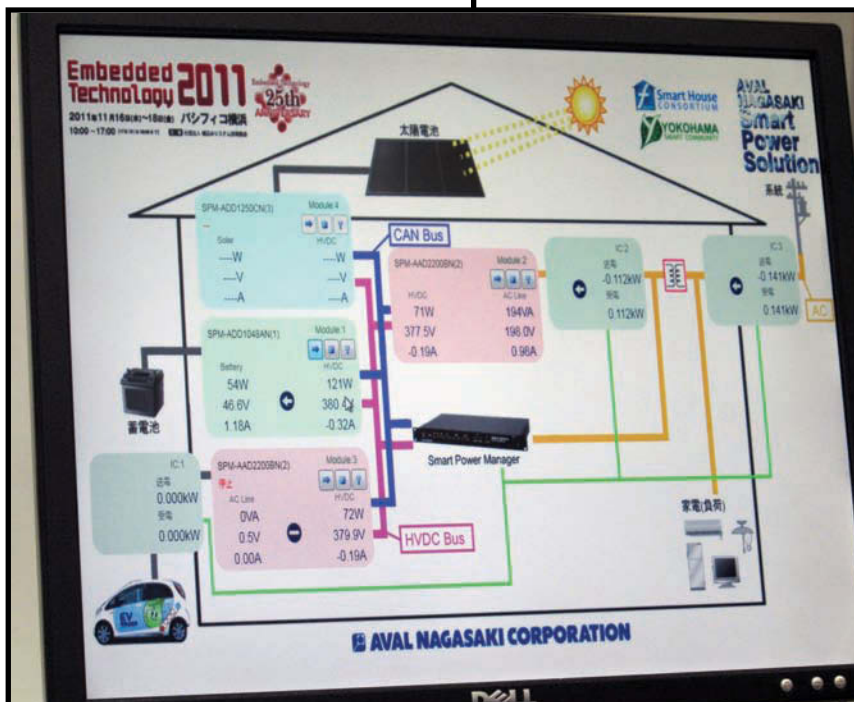
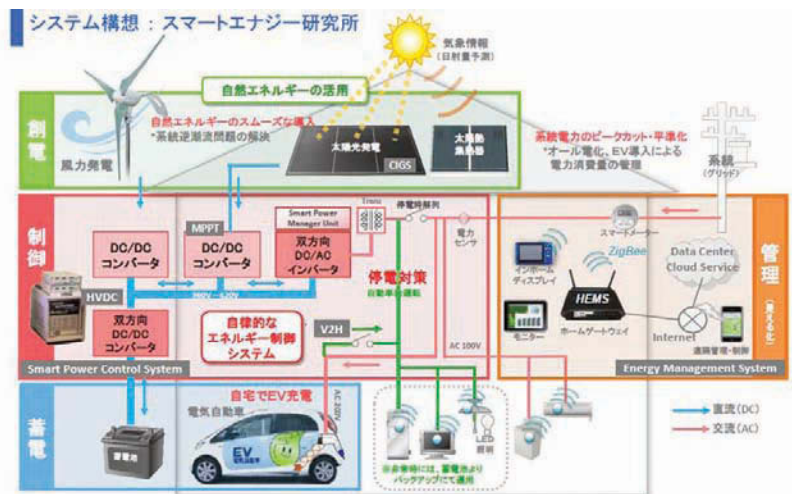


Smart house model

The Fukuoka Smart House Consortium built a smart house complete with solar rooftop panels and a wind turbine. The mockup shown here illustrates how it all ties into the energy control system (displayed on the computer screen) built into the house.

Building blocks for the Fukuoka Smart House

The smart house needs to be supported by key interface standards and technologies, including powerline communications, an open services gateway and vehicle-to-home standards. (The electric vehicle shown in the diagram would store energy for home use.)



Energy usage patterns in the smart home

Aval Nagasaki Corp., a member of the Fukuoka Smart House Consortium, is playing a pivotal role in the effort by offering products such as smart power units, smart power modules and smart power managers.

Asked about the lessons the company has learned from the field trial of the Fukuoka Smart House, Wataru Nishikawa, manager of Aval Nagasaki, said, "Different families and consumers use energy very differently in real life. The variations in their usage patterns can bring unexpected stress to the energy and power management system at home. Things are a lot harder to manage in the real world."



Wireless gateway

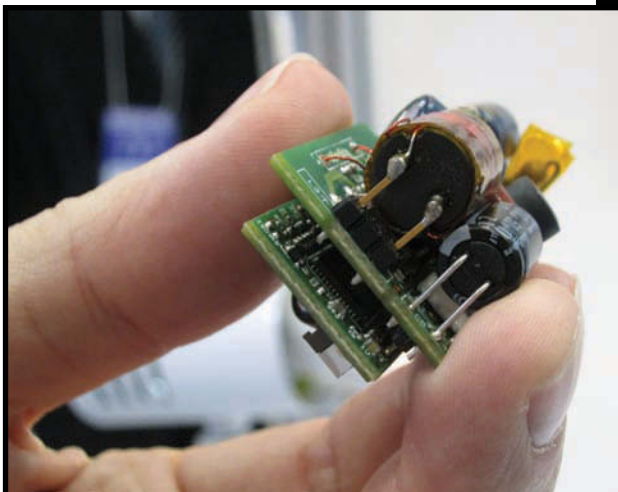
Murata Manufacturing and subsidiary SyChip Electronic Technology (Shanghai) Ltd. have developed a sensor network system for smart homes that supports construction of a home automation and energy management system (EMS).

Murata showed off the concept with a wireless gateway system at its booth. The system gathers information detected by sensors via a ZigBee gateway and transmits the information via Wi-Fi or Ethernet over the Internet or to a tablet terminal. It uses Murata's sensor and communications technology, offering a package consisting of the wireless gateway, ZigBee sensor nodes and an original user interface.

NXP smart lighting

NXP is betting big on smart lighting. The goal is to allow lights to be activated remotely and automatically via wireless controllers. The module shown here includes chip sets that offer highly efficient and dimmable drivers for smart lamps, according NXP.

Features included in the GreenChip module are an ultralow-power standby supply controller with 10-mW no-load capability; an IEEE802.15.4-compatible integrated RF transceiver and wireless microcontroller with a Tx/Rx current below 17 mA; and low-power, Internet Protocol-based wireless connectivity enabled by the open-source JenNet-IP networking software. The module fits in a light bulb socket.



Spin Flow

Star Group of Japan's free-floating Spin Flow bobs on the surface of a river, stream or irrigation ditch to generate power from the water flow. Two Spin Flow modules in water flowing at 1 meter/second can generate 264 watt-hours in 24 hours.

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Embedding visual smarts

In this mockup of Toshiba's FocusNavi IP concept, a tiny camera installed in the first car of a model train leverages a proprietary algorithm to discriminate among the various objects the train encounters as it proceeds along the track.



Beyond surveillance

The monitor in this photo displays what the camera "sees." Toshiba's hardware IP can be dropped into any ASIC, FPGA or SoC to enable the feature, which can be tuned to detect only those objects the system needs to detect, according to Toshiba. Beyond surveillance cameras, FocusNavi IP's most obvious applications are in cameras used in vehicles.



Smart assistant for those who can't feed themselves

One can't walk around any Japanese electronics shows without bumping into warm and fuzzy robots. Although still a prototype (and nowhere near cuddly yet), this robot uses Microsoft Kinect technology to help feed a handicapped person without requiring the person to move toward the food. Core Group (Kyushu, Japan) developed the system.

Motor control

Renesas showed off a motor control microcontroller designed for hybrid- and all-electric vehicles. Using the company's proven SH-2A CPU, capable of running at up to 160 MHz, the Renesas engineering team has integrated a resolver to digital (R/D) converter and EMU motor control unit in the new SH72AY.

The hardware integration helps offload CPU processing, suiting the new chip for use with the high-speed performance control motors in HEVs and EVs. Renesas is sampling the part now. Competitors such as Freescale run R/D converter or EMU functions in software on their MCUs, said a Renesas rep. ■



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Hot gadgets for the new year

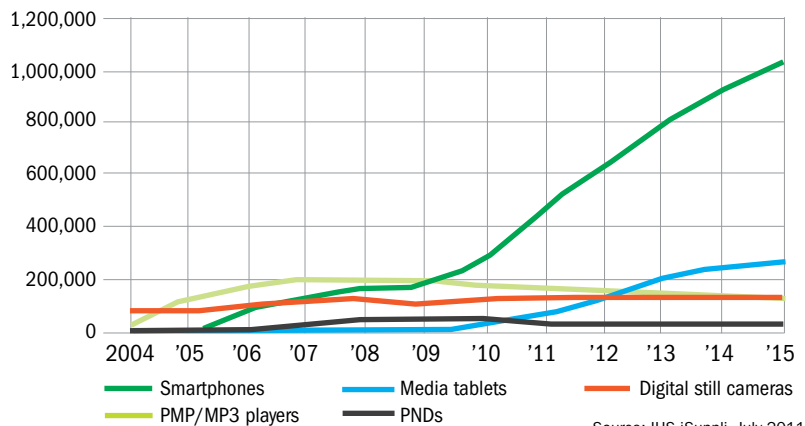
By Dylan McGrath

WITH THE HOLIDAY SEASON UPON US and the Consumer Electronics Show rapidly approaching, it's time to turn our attention to the hot consumer gadgets for 2012. Thing is, they're not that easy to come by; analysts don't expect a lot of must-have CE products to burn up the Amazon sales rankings going into next year.

"I really don't see any CE gear becoming the next Beanie Baby or Tickle Me Elmo," said Jordan Selburn, principal analyst for consumer electronics at IHS iSuppli. "The CE industry goes through cycles of innovation, followed by optimization—better, bigger, faster and, especially, cheaper—and we're in the latter part of the cycle right now. Even 3-D has been widely available for well over a year."

Global electronic equipment unit shipment forecast

Thousands of units



Source: IHS iSuppli, July 2011

According to Selburn, the rapid growth of smart CE devices, including media tablets and smartphones, could mean fewer gadgets under the tree this season, as functions that previously demanded standalone devices get rolled up into tablets, smartphones, TVs and set-top boxes.

In a nutshell, the list of hot gadgets for 2012 will not be dissimilar to the list of hot gadgets for 2011.

But as Selburn noted, in the consumer electronics optimization cycle, everything ultimately gets smaller, faster, better and less expensive.

Back in July, IHS put out a report stating that rapidly growing sales of multifunction products such as tablets and smartphones would contribute to sluggish sales for single-task devices, such as MP3 players and digital still cameras, through at least 2015.

Of course, the rise in smartphones and tablets has contributed to other profound changes in the CE market—particularly the dominance of apps that users buy, download and use on the devices. “A lot of the new gadgets are going to be apps instead of something that you hold in your hand,” Selburn said. But he acknowledged that consumers might have a tough time sticking apps under the tree.



Media tablets

Surprise! The hottest category in 2012 is likely to be the same as it was in 2011: media tablets, particularly Apple's iPad.

“Really, the only ultrahot market this season is likely to be the tablets,” Selburn said. “The ever-popular iPad is being joined by the Kindle Fire and the Nook tablet.”

Selburn said the Kindle Fire, sold by Amazon, and the Nook tablet, sold by Barnes & Noble, won't match the mighty iPad in sales, either in dollar terms or by units. But the new entrants are likely to do quite well and will help to develop the media tablet segment overall, he said.

IHS projects that Apple will ship 44.2 million iPads in 2011, growing to 120.1 million in 2015. The firm expects iPads to account for 74 percent of tablets shipped in 2011, declining to 43.6 percent in 2015. IHS expects iPads to account for the majority of tablets shipped through 2013.



Smartphones

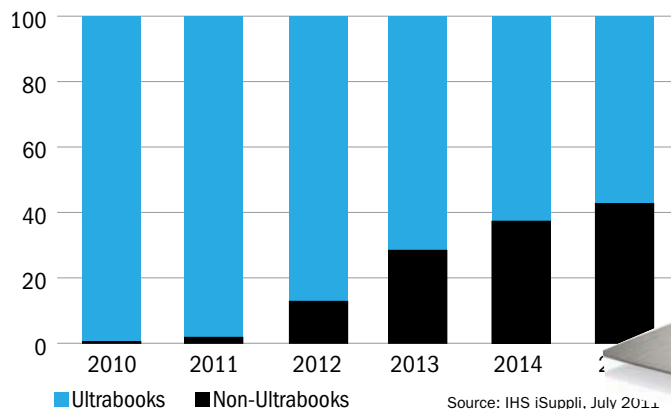
The smartphone's rise to dominance continued in 2011. IHS' latest forecast projects that smartphone shipments will increase from 294.3 million in 2010 to more than 1 billion in 2015. For 2012, the firm forecasts shipments of just over 600 million.

As it does in the tablet market, Apple still leads the smartphone sector in terms of profit and prestige. But this market is at least competitive. According to market research firm Strategy Analytics, the iPhone's share of the smartphone market declined to 17 percent in the third quarter, down from more than 20 percent in the second quarter, though most of the decline was attributed to consumers' waiting for the new iPhone rollout. Many Apple watchers had expected the company to unveil the iPhone 5 in early October, but it threw its fans a curveball, launching the iPhone 4S instead.

Still, compelling handset entries in 2012 from the likes of Samsung, Motorola and HTC could loosen Apple's stranglehold on the smartphone market.

Ultrabooks' share of global notebook shipments

Percentage



Ultrabooks

This one's a bit of a downer. The truth is, after tablets and smartphones, the hot gadgets for 2012 get a lot less hot, not to mention less interesting.

Nonetheless, shipments of Ultrabooks—the lightweight, low-power clamshell PC concept pushed by Intel—are expected to grow at a brisk pace. IHS projects that shipments of Ultrabooks will account for about 13 percent of all notebook PC shipments in 2012, up from just 2 percent in 2011. The trajectory continues impressively from there, according to the forecast, which predicts that Ultrabooks will account for 43 percent of all global notebook shipments by 2015.

PC OEMs including Acer and Asustek are now selling Ultrabooks, and a number of other entries are on the way.

Bottom line: If that special someone already has the latest and greatest tablet and smartphone, then you might have to dig deep and resort to giving the gift of light weight and energy thrift. And dig deep you must, because the price tags on Ultrabooks are around \$1,000.

Maybe a nice sweater would be a better choice.



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Flat-screen TVs

Yawn. Gadget geeks have a saying: If your grandparents have one, it's not that cool. TVs are ubiquitous in the modern world, and these days even most grandparents have flat screens. And still, there is a lot of innovation in the TV sector, including 3-D, video capability, connectivity and so-called smart TV features.

According to IHS, the National Football League season, which kicked off in September, boosted TV prices in the United States by 1.5 percent, reversing a two-month decline. The average price for a flat-panel TV set—a category that includes LCD TVs and plasma displays—hit \$1,153 in October, the highest level in 2011. IHS attributed the uptick largely to a 2 percent increase in the sales of 50-inch and larger flat-panel TVs, which helped compensate for price declines ranging from 0.5 percent to 2 percent for many smaller screen formats, according to the firm.

But IHS said the “football effect” fails to compensate for weak TV sales overall. Sales in the U.S. market have been relatively sluggish this year, and TV makers this fall told IHS they were bracing for what was expected to be a lackluster holiday season.

Well before Black Friday this year, Selburn said, it was possible to buy a brand-new 60-inch LCD TV through normal retail channels such as Best Buy for less than \$1,000. “There are two edges to the sword, of course,” he said. “While the plummeting prices mean a lot of TVs going out the door, they also dampen the revenue generated by those boxes.”

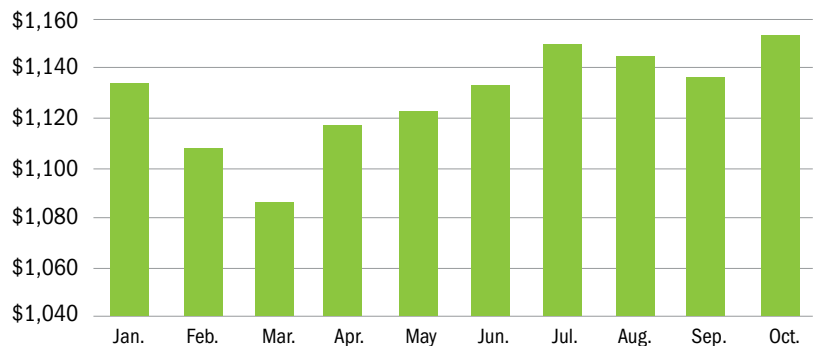
As for 3-D TV, despite scant content and generally low enthusiasm, sales are projected to skyrocket, albeit from a pretty low base. IHS projects that worldwide shipments of 3-D TVs will catapult by a whopping 463 percent, to reach 23.4 million units, in 2011 and grow by 132 percent in 2012, to reach 54.2 million units. The firm expects global shipments of 3-D TVs to breach the 100 million-unit mark in 2014.

Despite scant content and generally low enthusiasm, 3-D TV sales are estimated to have climbed a whopping 463 percent this year



U.S. ASP trends for flat-screen TVs, Jan.-Oct. 2011

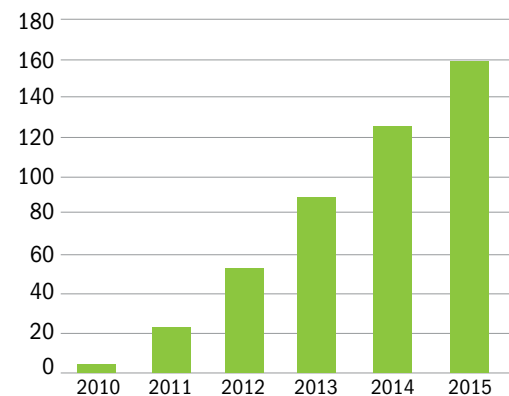
Estimated average prices in \$US



Source: IHS iSuppli Research, July 2011

Worldwide 3-D TV shipment forecast

Millions of units



Source: IHS iSuppli Research, July 2011

Smart energy devices

Try explaining to your eight-year-old that instead of that Xbox he had his eye on, you got him a Wi-Fi-enabled smart thermostat to help him minimize his energy consumption and reduce his carbon footprint. Alas, even the most idealistic youngster is not necessarily interested in saving the world on Christmas morning.

Still, in what figures to be a down year for gadgetry, smart energy thermostats, such as those from Intwine Energy, qualify as hot (no pun intended).

According to Mareca Hatler, an analyst at smart energy technology market research firm ON World, revenues from home energy management equipment and associated services are projected to rise from \$355 million in 2010 to \$2.7 billion by 2015.



iHealth

Here's the must-have gadget for the geriatric set. Brookstone's iHealth blood pressure monitoring system works directly with iPods, iPhones and iPads, and includes a diary for tracking blood pressure measurements taken by the included blood pressure cuff and dock. According to Brookstone, iHealth "makes tracking your blood pressure elegant, simple and—dare we say it—fun." Knock yourself out.



Home networking router

According to Cyberoam, a division of Elitecore Technologies Pvt. Ltd., 2012 will be the year home networking routers such as its NetGenie will take off. That's because the popularity of

the iPad and its competitors, including the new Kindle Fire, will necessitate a way for parents to control their kids' online habits and protect them from unwanted, age-inappropriate sites.

Cyberoam claims its NetGenie is the first Wi-Fi router of its kind to add



parental controls and endpoint security.

Market research firm ABI Research forecasts that Wi-Fi connections in consumer electronics devices will rise from 113 million in 2008 to more than 285 million by 2012.

Dimmer switch

Santa probably won't be tucking too many of these into stockings, but according to lighting solutions provider Lutron Electronics Inc., the company's C.L dimmer will be a hot gadget in 2012. The dimmers are listed by Underwriters Labs for controlling a broad range of dimmable CFL and LED bulbs.

According to Lutron, 2012 marks the first phase of actions mandated under the Energy Independence and Security Act of 2007, which will begin phasing out incandescent light bulbs that do not meet the new standards of energy efficiency. The company claims the C.L dimmer is the only dimmer product on the market that is compatible with both CFLs and LEDs. The dimmers purportedly can save consumers \$50 per year on their energy bills and help extend the life of expensive CFL and LED bulbs by up to three years. Retail prices start at \$19.97.



Parrot AR.Drone

Now we're talking. This baby, also from Brookstone, puts the ability to pilot a drone helicopter in the palm of your hand via a smart-phone or tablet. The Parrot AR.Drone features a built-in Wi-Fi connection, accelerometer and video cameras, and lets pilots fly it using Apple iOS or Android. The suggested retail price is \$299.



Tankbots

Hold your own epic tank battle in the comfort of your living room. Tankbots, also from Brookstone, are mini vehicles that can be driven via Apple iOS or Android devices. They offer infrared obstacle detection and an autonomous personality mode to explore terrain, navigate through mazes and even duel. Available in multiple colors, they start at \$29.99 each.



Explorer Touch Mouse

The Explorer Touch Mouse, the newest member of Microsoft's touch family, is designed for active Mac and PC users. It features an advanced scroll strip that responds to both horizontal and vertical swipes, flicks and clicks, and it can track on virtually any surface with Microsoft's BlueTrack Technology. The mouse offers 18 months of battery life; is available in coal black, storm gray and sangria red; and sells for \$49.95.



Wireless spy tank

Brookstone makes the list yet again, this time with the app-controlled Rover Spy Tank. Like the Parrot AR.Drone, the tank is controlled via an iPod touch, iPhone or iPad. It generates its own Wi-Fi connection, boasts an unobstructed range of about 200 feet and features a built-in microphone that transmits sound in real-time. From Brookstone's Web site: "Whether following friends and family, navigating the office or investigating the activities of your dog, it's all possible with this audio/visual-enabled and photo-taking Rover." Imagine the possibilities. The Rover Spy Tank sells for \$149.99.



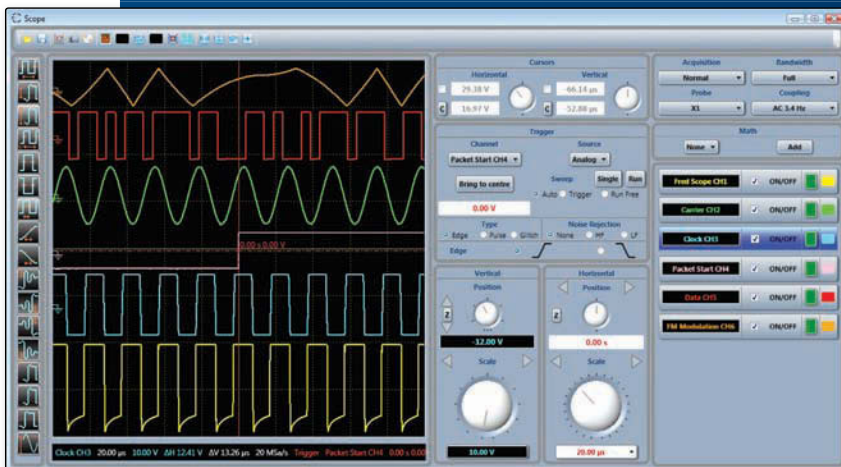
Like its Parrot AR.Drone, Brookstone's spy tank is controlled via an iPod touch, iPhone or iPad



Mobile bodyguard

MyForce is billed as the first personal security service that acts as a mobile bodyguard. The one-touch app sends an alert to a live security monitoring team, which provides the authorities with details to expedite help. MyForce reportedly is the first system to provide a security monitoring team that responds, tracks and follows up with every alert. ■

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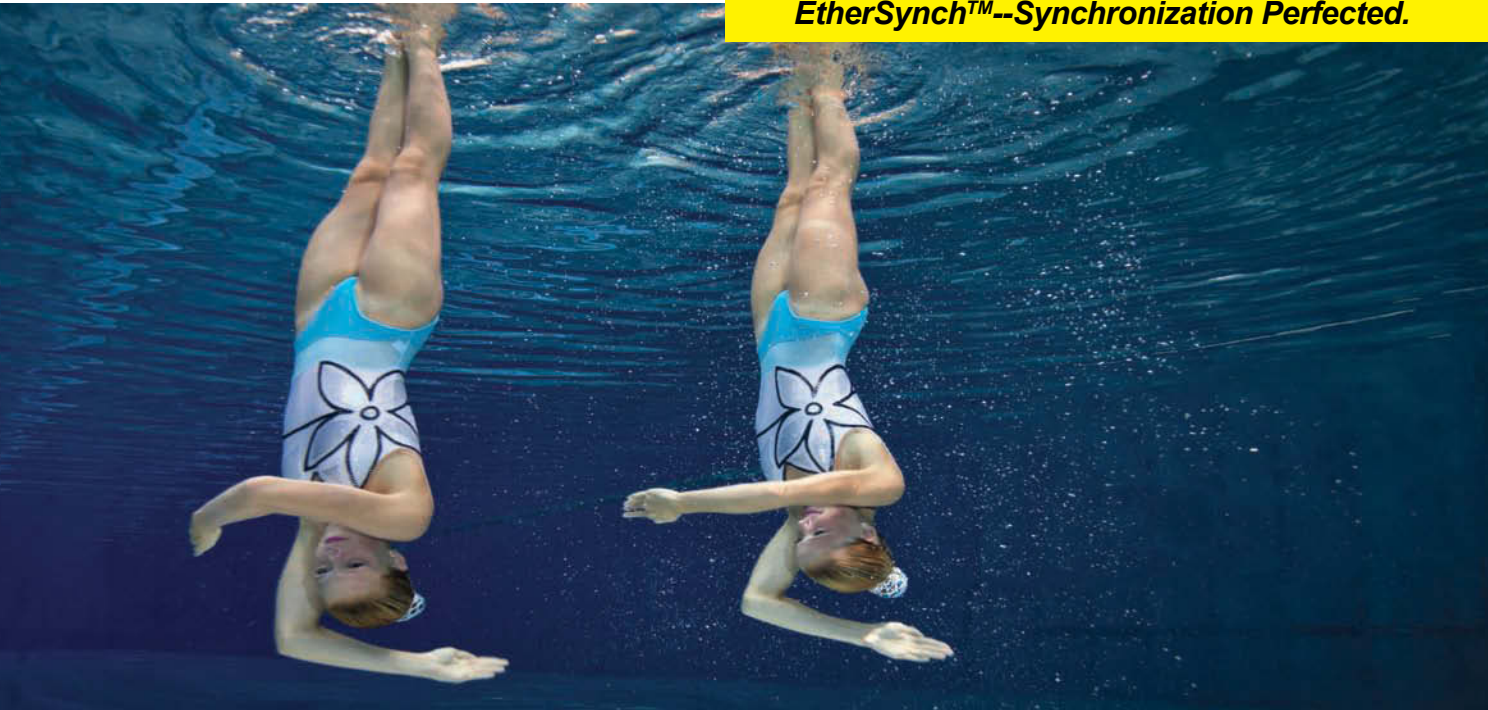
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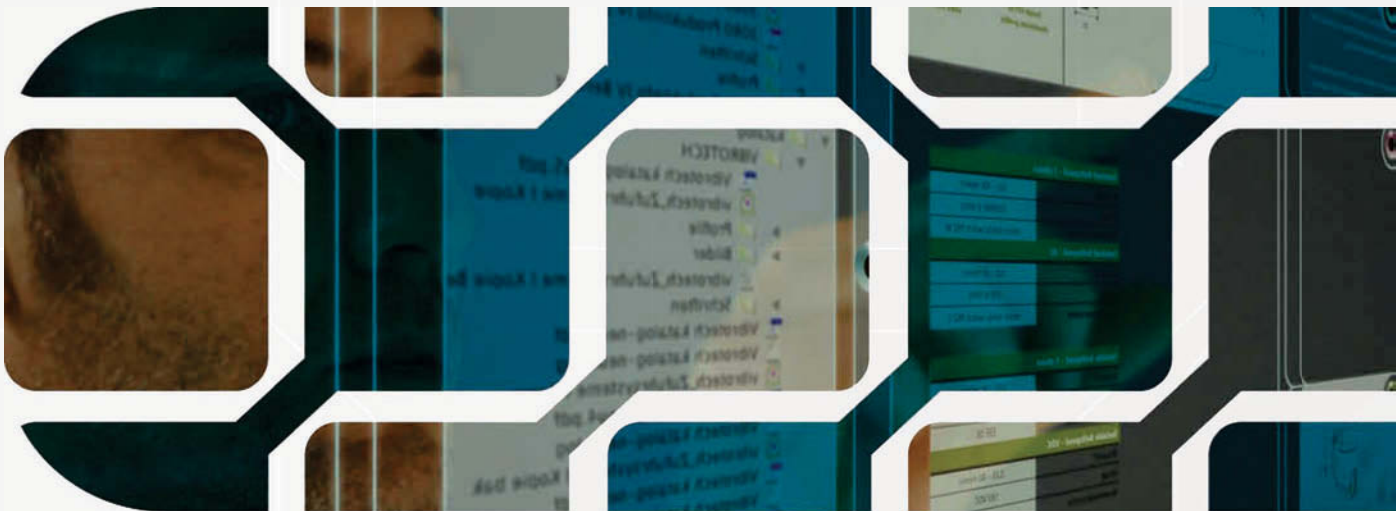


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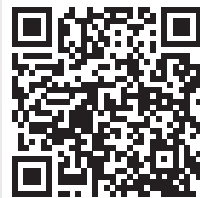
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GLOBAL FEATURE

Mobile architecture combines performance, efficiency

By Peter Greenhalgh

THE RANGE OF PERFORMANCE

being demanded from modern mobile platforms is unprecedented. Users require platforms to be accomplished at high-processing-intensity tasks, such as gaming and Web browsing, while providing long battery life for low-processing-intensity tasks, such as texting, e-mail and audio.

ARM's big.Little architecture concept can meet the requirements of both high-processing and low-processing tasks, pairing a "big" ARM Cortex-A15 processor with a "little" Cortex-A7 to create a system that can accomplish both types of tasks in the most energy-efficient manner possible. By coherently connecting the Cortex-A15 and Cortex-A7 processors via the CCI-400 coherent interconnect, the system is flexible enough to support a variety of big.Little use models, tailored to the processing requirements of the tasks.

The central tenet of big.Little is that the processors are architecturally identical. Both the Cortex-A15 and the Cortex-A7 implement the full ARM v7A architecture, including virtualization and large physical address extensions. Thus, all instructions will execute in an architecturally consistent way on both processors, albeit with different performance.

The implementation-defined feature sets of the Cortex-A15 and Cortex-A7 are also similar. Both processors can be configured to have between one and four cores, and both integrate a Level 2 cache inside the processing cluster. Additionally, each processor implements a single AMBA 4 coherent interface, which can be connected to a coherent interconnect such as CCI-400.

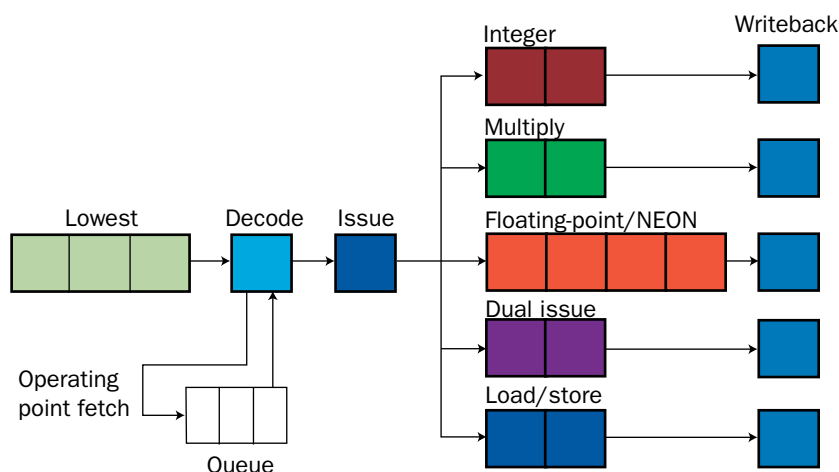


Figure 1. Cortex-A7 pipeline.

It is at the microarchitectural level that the differences between the Cortex-A15 and Cortex-A7 become clear. The Cortex-A7 (Figure 1) is an in-order, non-symmetric dual-issue processor with a pipeline length of between eight and 10 stages. The Cortex-A15 (Figure 2, page 36) is an out-of-order sustained triple-issue processor with a pipeline length of 15 to 24 stages.

Since the energy consumed by the execution of an instruction is partially related to the number of pipeline stages it must traverse, a significant difference in energy between the Cortex-A15 and Cortex-A7 comes from the different pipeline lengths.

In general, there is a different ethos taken in the Cortex-A15 microarchitecture than in the Cortex-A7 microarchitecture. When appropriate to do so, the Cortex-A15 will sacrifice energy efficiency to gain performance, whereas the Cortex-A7 will trade performance for energy efficiency.

A good example of these microarchitectural trade-offs is in the Level 2 cache design. While a more area-optimized approach would have been to share a single L2 cache between the processors, this part of the design can benefit from optimization in favor of either energy efficiency or performance. To allow such optimization, the



Peter Greenhalgh is a consultant engineer at ARM and the technical lead for microprocessor hardware development. During his 10 years at ARM, he has worked on Cortex-A5, Cortex-R4 and Cortex-A8.

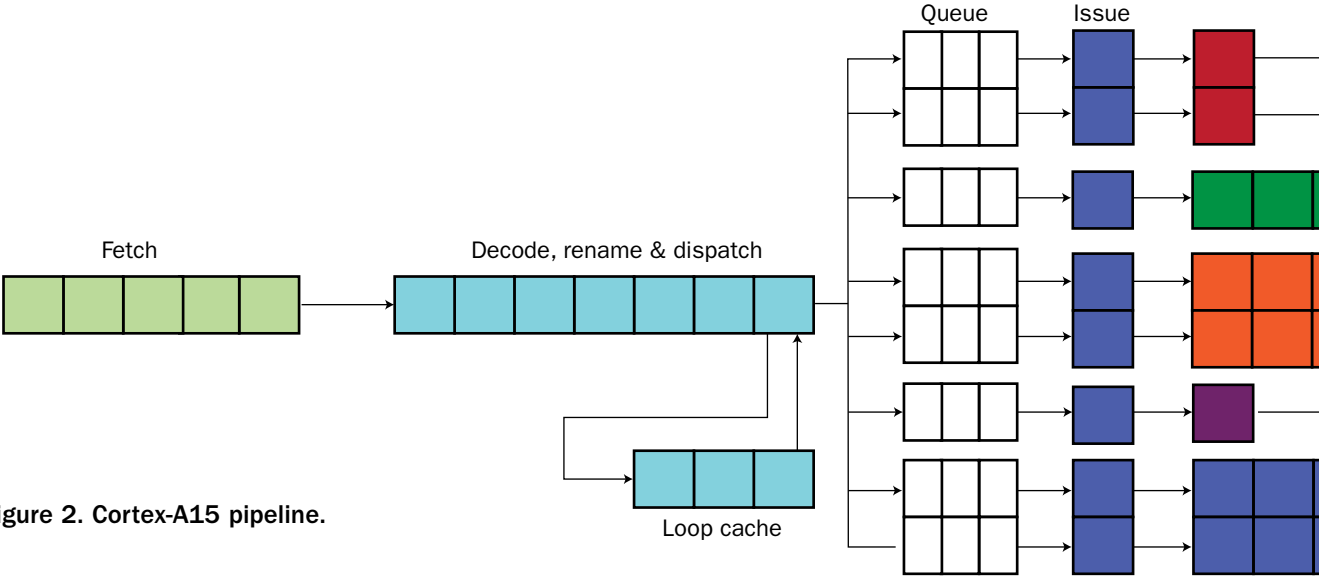


Figure 2. Cortex-A15 pipeline.

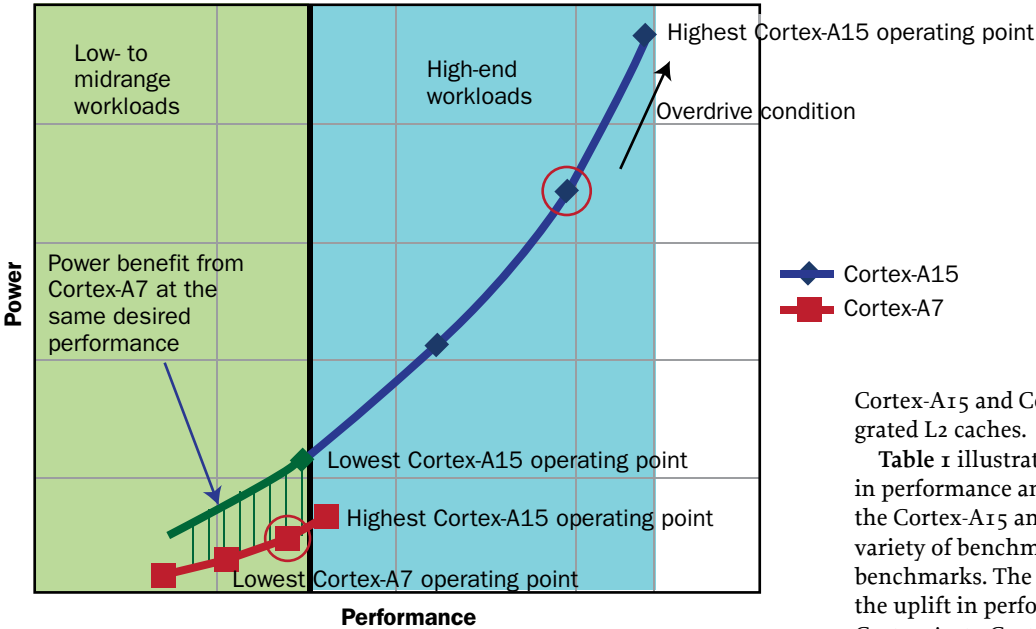


Figure 3. Cortex-A15, -A7 dynamic voltage/frequency scaling curves.

| | Cortex-A15 vs. Cortex-A7 performance | Cortex-A15 vs. Cortex-A7 energy efficiency |
|------------|--------------------------------------|--|
| Dhrystone | 1.9x | 3.5x |
| FDCT | 2.3x | 3.8x |
| IMDCT | 3.0x | 3.0x |
| MemCopy L1 | 1.9x | 2.3x |
| MemCopy L2 | 1.9x | 3.4x |

Table 1. Cortex-A15, -A7 performance/efficiency comparisons.

Cortex-A15 and Cortex-A7 have integrated L2 caches.

Table 1 illustrates the difference in performance and energy between the Cortex-A15 and Cortex-A7 across a variety of benchmarks and micro-benchmarks. The first column describes the uplift in performance from the Cortex-A7 to Cortex-A15, while the second column considers both the performance and power difference to show the improvement in energy efficiency from the Cortex-A15 to the Cortex-A7. All measurements are on complete, frequency-optimized layouts of the Cortex-A15 and Cortex-A7 using the same cell and RAM libraries. All code that is executed on the Cortex-A7 is compiled for the Cortex-A15.

It should be observed from Table 1 that although the Cortex-A7 is labeled the “little” processor, its performance potential is considerable. In fact, because of microarchitectural advances,



The central tenet of the big.Little concept is that the processors are architecturally identical; it is only at the microarchitectural level that the differences between the Cortex-A15 and Cortex-A7 become clear

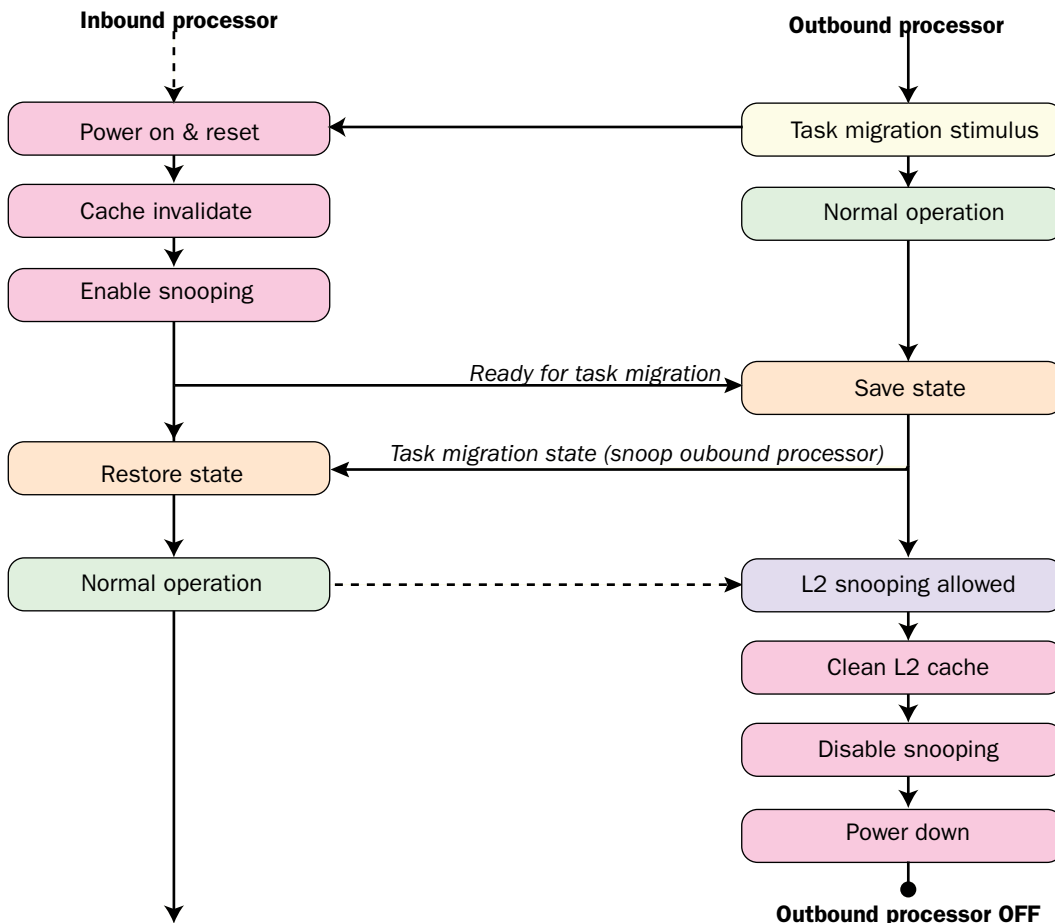


Figure 4: A big.Little switch.

the Cortex-A7 provides higher performance than current Cortex-A8 based implementations, for a fraction of the power. As such, a significant amount of processing can remain on the Cortex-A7 without resorting to the Cortex-A15.

In the big.Little task-migration use model, the OS and applications execute on either the Cortex-A15 or the Cortex-A7 and never on both processors at the same time. This use model is a natural extension to the dynamic voltage and frequency scaling (DVFS) operating points provided by current mobile platforms, with a single application processor to allow the OS to match the performance of the platform to the performance required by the application (Figure 3, page 36).

An important consideration of a big.Little system is the time it takes to migrate a task between the Cortex-A15 and Cortex-A7 clusters. If it takes too long, then the migration may become noticeable to the operating system, and the system power may outweigh the benefit of task migration for some time. Therefore, the Cortex-A15-Cortex-A7

system is designed to migrate in fewer than 20,000 cycles, or 20 microseconds with processors operating at 1 GHz.

Any active interrupts that are being controlled by the GIC-400 generic interrupt controller must be migrated. Fewer than 2,000 instructions are required to achieve save/restore, and because the two processors are architecturally identical there is a one-to-one mapping between state registers in the inbound and outbound processors.

Figure 4 (page 37) describes the task migration process between inbound and outbound processors through a switcher. Coherency is clearly a critical enabler in speeding task migration, as it allows the state that has been saved on the outbound processor to be snooped and restored on the inbound processor rather than via main memory. Further, because the L2 cache of the outbound processor is coherent, it can remain powered up after a task migration to improve the cache warming time of the inbound processor through snooping of data values.

Since the L2 cache of the outbound processor cannot also be allocated,

however, it will eventually need to be cleaned and powered off to save leakage power.

It should also be observed that normal execution of the thread occurs during the task migration process. The only "blackout" period is during the task migration process, when interrupts are disabled and state is transferred from the outbound to the inbound processor.

The switcher enables a big.Little system to be built today with current operating systems. As in the case of the state save/restore code, however, it may be that the small number of programmer's model differences between the Cortex-A15 and Cortex-A7 may tend to be handled by the operating system rather than the switcher. ■

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GLOBAL FEATURE

Radio susceptibility follows laws of physics

By Bill Laumeister

ENGINEERS OFTEN WISH that radio susceptibility (RS) or radio immunity could be solved with a vaccine or some other form of cure-all. Conquering the RS problem is not that easy, however, because the laws of physics apply.

In common terms, an electromagnetic field is a radio signal. Electromagnetic interference and radio-frequency interference are related; indeed, the terms EMI and RFI are often used interchangeably.

RS is a system specification primarily for radio ICs, with a few exceptions. Most of these circuits in most systems are isolated from the external world by the case (shielding) power-supply

decoupling networks, powerline filters and isolation circuits. There are two exceptions to this norm: radio devices that are directly connected to antennas, and other devices connected to system input and output ports.

Adding complexity to enable RS protection for internal system parts is not a cost-effective strategy.

Electrostatic discharge protection is handled on two levels. Internal ESD

protection is addressed during IC handling and assembly; system-level ESD, at the input/output ports, is more robust and requires discrete devices that will not fit inside the IC.

The system connections with the outside world are where RS matters most. Typical examples are when ac power enters the system box and when signals enter a device such as a TV antenna, satellite dish or Ethernet cable.



Bill Laumeister is an engineer in strategic applications with the Precision Control Group at Maxim Integrated Products. He works with customers who use D/A converters, digital potentiometers and voltage references. He has more than 30 years of experience and holds several patents.

Radiated signals come and go through the side of a system container. Plastic boxes are commonly specified because they are inexpensive, can be made in compelling shapes and protect from electric shock hazards. But EMI and RFI propagate directly through the plastic.

As a result, additional shielding must be provided via metal shields or conductive coatings inside the box. Conductive coatings and light sheet

metal provide electrostatic protection, while magnet shields require heavier magnetic materials. In this context, printed-circuit board design and grounding are critical, as are dc power and decoupling.

In fact, any nonlinearity in a circuit will rectify spurious signals. Amplifiers with excellent linearity will rectify less than those with poor linearity. Overloading even a superior amplifier will cause significant distortion and nonlinearity.

tion and nonlinearity.

Three-terminal voltage regulators, such as low-dropout (LDO) regulators and voltage references, comprise an internal voltage reference (typically a bandgap or zener diode), an amplifier and a pass transistor. The amplifier uses feedback to compare the reference voltage with the output voltage and provide an error signal that corrects the output. The wanted output is a stable dc voltage. The regulator needs

Sensors expand functions in mobile devices

By Ian Chen

A NEW CLASS of personal productivity applications is appearing on handheld devices. These apps will consider the user's context, habit and surroundings to infer what that user may need, and then will offer assistance before it is requested.

Mobile device designers today often implement sensor subsystems in ways that limit their utility. To allow application developers to use sensors more effectively and creatively, efforts must be undertaken to:

- reduce or eliminate platform fragmentation due to sensor subsystem variations;
- create intelligent middleware, allowing multiple applications running simultaneously to share a sensor; and
- establish high-level application programming interfaces for sensors.

Platform fragmentation is the biggest limitation to the proliferation of advanced sensor-based applications in mobile devices today. Industry efforts are under way to establish at least some minimum assured performance. But to enable any sophisticated application beyond the lowest common denominator, there needs to be a standard way for applications to query the underlying system on sensor noise, system bandwidth and time stamp uncertainty, in order to ensure accurate and reliable responses.

Operating systems such as Apple's iOS, Google's Android and Microsoft's Windows 8 all provide limited exposure of some sensor data to applications. But not all would allow two or more applications with different sensor configurations to run at the same time.

For example, an ideal pedometer application running on a smartphone should operate in the background so the user can track the number of steps taken in a given day. But throughout the day, the phones would also use the sensors to configure screen orientations or other apps, and those

foreground tasks would likely reconfigure the sensors, thereby ruining the data for the background task.

Allowing two or more sensor applications to run simultaneously requires intelligent middleware that finds a configuration that can satisfy all applications and meter the data to each application according to its requirement. Such middleware can also minimize the use of power-hungry sensor components and limit the processing resources consumed based on users' activities.

Beyond assured platform performances, multitasking and power-conscious operating environments, application developers want higher-level application programming interfaces that distill sensor data into meaningful information. At present, sensor fusion is being adopted to provide orientation and position information synthesized from inertial sensor data. The next steps are to combine such information with data available from other sensors. With advanced heuristics, sensors can provide a glimpse into what the user is doing (for example, running, walking or standing). Such information needs to be presented in an API so that application developers are empowered to do more for the user.

These needed improvements are interrelated. First, we must reduce or eliminate fragmentation to make it easy for app developers to reach a large audience. Then, we can allow creativity to thrive by writing intelligent middleware that lets multiple sensor applications run simultaneously, and by establishing a rich set of high-level APIs so applications understand their users' situations and infer the users' intent. Concerted industry initiatives are focused on these related improvements in new system software and API standards for sensors. ■



Ian Chen is executive vice president at Sensor Platforms Inc. He holds a BSEE, MSEE and MBA from the University of Illinois at Urbana-Champaign.

Most common ICs are not tested for radio susceptibility; radio ICs, which need RF to function, are an exception, and require internal and external bandpass filtering

to operate when the input line voltage changes and if the output load changes, so some correction speed or bandwidth is needed. The correction speed must be limited, however, to ensure smooth control and stability.

Consequently, the typical bandwidth is 200 kHz to 1 MHz maximum. When a high-frequency radio signal of around 800 MHz is applied to any terminal (the input, output or ground), the radio signal will not be attenuated or corrected by the feedback loop. Thus, the radio signal propagates through the regulator.

Thankfully, the regulator requires power supply decoupling to remove such radio signals. The capacitors only work below their self-resonance points.

Most common ICs are not tested for radio susceptibility, because in 99.9 percent of the applications the system is already protected from RFI and EMI (both from intrusion into the system and radiation out of the system). Radio ICs are an exception. Since they need RF to function, these circuits must combine internal and external bandpass filtering so that only the wanted frequencies are allowed into and out of the system. ■

Lithium-imide bests Li-ion in mobile devices

By Marc Juzkow

BATTERY MANUFACTURERS are hard-pressed to pack any more run-time into their products, and the energy density of lithium-ion batteries isn't high enough to power the next generation of super-svelte mobile devices. Worse, Li-ion chemistry lacks durability; energy density declines rapidly as the cells age, especially in the elevated temperatures typical of consumer use. Run-time shortens, and cells can balloon and damage a device.

The cells in today's Li-ion batteries are made of an anode (+) and a cathode (–), with a liquid electrolyte contained between them. The salt most commonly used in the electrolyte—lithium hexafluorophosphate (LiPF₆)—tends to react with residual moisture in the cell to produce hydrofluoric acid, one of the most chemically reactive substances imaginable.

When the hydrofluoric acid corrodes the cathode, cell impedance increases, capacity falls and run-time diminishes. In multicell batteries, the stress of a single degrading cell can disable the entire battery pack and can generate a gas that causes swelling of the cell, which can damage the device and even pose a safety hazard.

The process accelerates as temperature rises. Li-ion cell data sheets generally show results for cells and batteries at “room temperature” of 20°C (68°F), but in-device temperature is much higher. That holds particularly true for today's thinner, tighter enclosures, which typically pack more heat-generating semiconductors than earlier device generations did.

An alternative Li-ion electrolyte chemistry known as lithium imide (Li-imide) clears the energy density and durability hurdles. Li-imide batteries not only provide up to 25 percent more energy for a given battery size, but they also are virtually impervious to temperature and water impurities inside the cell, thereby offering greater durability.

The Li-imide chemistry can offer 500 watt-hours/liter with a cycle life comparable to that of ordinary Li-ion batteries. Using a lower, 80 percent depth of discharge, Li-imide provides 450 or 400 Wh/l, with enormously extended cycle life. Even at temperatures higher than 40°C (104°F), the chemistry enables more than 750 cycles—over 2.5 years of real calendar life with daily recharging.

Li-imide represents a new lease on life for existing devices. The alternative chemistry costs no more than traditional Li-ion, is available in standard formats and can be multisourced.

Greater thermal stability also means greater design flexibility, because device designers need worry less about the juxtaposition of the battery and heat-generating components. ■

The alternative electrolyte chemistry clears conventional Li-ion's energy density and durability hurdles



Marc Juzkow is vice president of R&D and engineering at Leyden Energy. He holds an executive MBA and an MS in chemistry from Simon Fraser University (Vancouver, B.C.).

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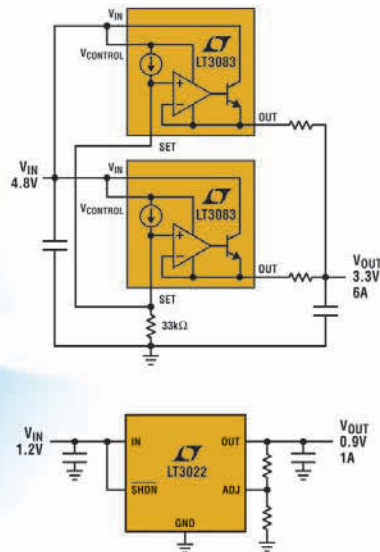
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ARM announces eight-way graphics core

The next core in ARM's Mali line of GPUs is slated to ship in smartphone system chips in 2013. The Mali-T658 design supports up to eight shader cores, compared with the Mali-T604's four, and doubles the arithmetic pipelines per shader core from two to four. ARM claims the result is up to 10 times the graphics performance of the Mali-400 GPUs found in mainstream consumer products today in 40-nm silicon and four times the GPU compute performance of the quad-core Mali-T604 GPU, expected in silicon in 2012. Full story: <http://bit.ly/uqFWyv>
www.arm.com

Kinetis X provides up to 200 MHz

Freescale Semiconductor's new Kinetis MCUs extend the line's operating frequency to 200 MHz. Built on an ARM Cortex-M4 core, with

DSP and floating-point instructions, the X series devices include 1 to 4 Mbytes of flash and 0.5 Mbyte of SRAM, with off-chip memory options available for expansion headroom.

In addition, the X series offers an advanced suite of connectivity, security and HMI peripherals, all accompanied by Freescale's bundled software.

Full story: <http://bit.ly/rpkGgw>
www.freescale.com

TI rolls \$5 Sitara AM335x ARM processors

With pricing starting as low as \$5, Texas Instruments' Sitara AM335x microprocessors target 3-D interactive touchscreens, high-resolution displays and wireless connectivity. Offering developers advanced 3-D graphics capability, touchscreen controller and sophisticated peripherals on one chip reduces pc board real estate requirements

and complexity, and cut bill-of-materials costs by as much as \$40, according to TI.

Application-specific reference designs based on the AM335x ARM Cortex-A8 MPUs will be available going into 2012. Full story: <http://bit.ly/sJq0YM>
www.ti.com

Atmel MCU family sports 2-Mbyte memory

The SAM4S16, the first device in Atmel Corp.'s Cortex-M4 processor-based family, operates at a maximum speed of 120 MHz with 1,024 kbytes of flash and 128 kbytes of SRAM. The device offers full-speed USB; high-speed SDIO/SD/MMC; UARTs; TWIs; SPI; I²S; 12-bit A/D and D/A converters; and an external bus interface supporting PSRAM, LCD modules, and NOR and NAND.

The company says the device offers the best hardware code protection available. The

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SAM4S16 supports Atmel QTouch technology for touchbutton, slider and wheel functionality, targeting the industrial markets.

Full story: <http://bit.ly/uC93bn>
www2.atmel.com

Audio SoC debuts with ARM technology

Nuvoton Technology's ChipCorder ISD9160 system-on-chip optimizes low-power audio in industrial and consumer applications. With a 32-bit ARM Cortex-M0 core (running at up to 50 MHz), power management features, embedded flash and SRAM, real-time clock control, and multiple general-purpose I/Os, the SoC is said to help designers develop systems capable of delivering clear, reliable, easily managed audio recording and playback.

Full story: <http://bit.ly/vphZLc>
www.nuvoton.com

4-Gbyte DDR3 SDRAM for hi-rel apps

Microsemi announced a DDR3 SDRAM packaged in a single plastic BGA and offered as a compact, x64/x72 unregistered dual in-line memory module/small-outline DIMM. The memory provides up to 4 Gbytes to support high-performance processors and chip sets in mission-critical apps. It enables data rates of 800, 1,066 and 1,333 Mb/s and has a footprint compatible with Microsemi 1- and 2-Gbyte devices.

Full story: <http://bit.ly/sVMVWK>
www.microsemi.com

Dual-interface wireless memory

harvests energy for battery-free operation

STMicroelectronics has extended its family of RFID/NFC wireless memory ICs with the M24LR16E, a 16-kbit memory that can harvest enough energy to enable battery-free operation of devices into which it is designed. The dual-interface memory offers a low-power I²C interface and a 13.56-MHz ISO15693 contactless RF interface. The latter can harvest ambient radio waves emitted by RFID reader/writers and convert the waves into a voltage output.

Full story: <http://bit.ly/tJu9uQ>
www.st.com

USB flash drive's crypto capabilities

target banking, military, government apps

Kingston Technology touts Federal Information Processing Standard 140-2 Level 3 validation and 100 percent encryption for its DataTraveler 6000 secure USB flash drive. For financial service organizations and government agencies that need strong mobile storage data protection, the DT6000 meets data-at-rest regulations. The drive uses Secured by Spyros technology, which supports 256-bit AES hardware-based encryption using XTS block cipher mode, and "military grade" elliptic curve cryptography, recommended by the U.S. National Security Agency as part of the NSA Suite B algorithms.

Full story: <http://bit.ly/vaxcr6>
www.kingston.com

Anobit claims best-in-class flash SSDs for enterprise and cloud

Anobit's second generation of Genesis solid-state drives target use in network- and server-attached storage systems, and support enterprise and cloud-based apps.

Using Anobit's proprietary MSP (memory signal processing) technology, the flash SSDs are said to demonstrate endurance of 50,000 program/erase cycles; random read/write performance of up to 70,000/40,000 I/O operations per second (IOmeter 2006, 4k block size); and 510-Mbyte/s sequential read/write with noncompressible data, using 2x-nm multi-level-cell NAND.

Full story: <http://bit.ly/roGUJM>
www.anobit.com

Samsung preps 30-nm LPDDR3 DRAM

Samsung Electronics Co. Ltd. claims to have developed the industry's first monolithic 4-Gbit LPDDR3 low-power double-data-rate memory using 30-nanometer-class technology for mobile applications such as smartphones and tablet PCs.

The LPDDR3 DRAM reportedly can transfer data at up to 1,600 Mb/s. That's approximately 1.5 times faster than the industry's highest-performance LPDDR2, which operates at 1,066 Mb/s, according to Samsung.

Full story: <http://bit.ly/tSMPI2>
www.samsung.com

CAREERS



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CLASSIFIEDS

Acme Packet a worldwide leader in session border controller network infrastructure products seeks Systems Engineers (Level II, Entry Level & Level II, Advanced) (multiple openings) for their Bedford, MA headquarters. Responsibilities include: create and execute test plans for customers' Acme Packet network deployment including installation, configuration and troubleshooting system onsite (or remote) and providing follow up support for open issues; work with Technical Support organization to provide technical transfer knowledge of customers' configuration and network topology as the system goes into live production network; work with the Sales account teams in formulating account strategies; provide post-sales technical support as required; function as the primary technical support person during trial or proof of concept phase either onsite or remotely; provide technical product overview/presentation to customers as needed; track and execute technical activities and milestones throughout the pre-sales process; and provide informal technical training to customer as needed. Occasional travel required. Minimum requirements for both levels: Master's degree in Telecommunications Systems Management, Computer Science or related field (or equivalent); demonstrated knowledge of VoIP protocols; demonstrated ability in the following: data networking and related technologies/protocols, troubleshooting in VoIP environments, voice/data unified communication and IP telephony architectures; and must have background in packet capture tools and must be able to decipher packet traces. Applicants for Level II, Advanced position must also have at least 2 years of experience in data networking/telephony environments. Send cover letter and resume to Susan Anderson Acme Packet 100 Crosby Drive Bedford, MA 01730. All applications must include a tracking code to be considered for these positions: Level II, Entry Level - 2310-102; Level II, Advanced - 2310-103.

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Acme Packet, Inc., a worldwide leader in session border controller network infrastructure products, seeks Software Engineers (Level II) (multiple positions) for their Bedford, MA headquarters. Responsibilities include: Socket/Network programming using IP, TCP, and UDP in a Linux-based environment; analyze customer needs to design/develop software in C/C++ within time/cost constraints; modify existing software/correct software defects to customer satisfaction; develop functional/design specifications on new software development features; support various signaling protocols and/or security protocols as required; and interact directly with end users. Minimum requirements: M.S. (or foreign equivalent) in Computer Science or any related Computer or Engineering field, including Telecommunications, Electrical Engineering, etc. OR Employer will accept a B.S. (or foreign equivalent) in any of these subjects plus 5 years of progressively more responsible experience in the field; proficiency in C/C++ programming languages; prior knowledge designing and developing software in a Linux RTOS based development environment; at least 1 year of software development and/or sustaining experience; and knowledge of signaling and security protocols. Send cover letter and resume to Susan Anderson Acme Packet 100 Crosby Drive Bedford, MA 01730. All applications must include the following tracking code to be considered for this position: #1300-102.

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DRIVE FOR
INNOVATION

Fired up over Volt battery safety

By Brian Fuller

EN ROUTE TO RALEIGH, N.C. — As we cruised toward our next big stop, three fires that might or might not have involved Chevy Volt batteries or charging stations were rekindling an old debate:

- In Connecticut, fire destroyed a garage that housed a Volt and a home-converted Suzuki Samurai EV. The owner, a volunteer firefighter, blogged that the cause was “definitely not the Volt.” No official cause had been determined.

- In Mooresville, N.C., a fire in a garage that housed a Volt spread to and destroyed a luxury home. Initial suggestions identified the 240-V charging station as the cause, though fire officials have since said the fire started away from the vehicles and charging station. No cause had been determined.

- The National Highway Transportation Safety Board crash-tested a Volt, pushing it into a pole at 20 mph. The car performed well and was stored outdoors in the cold; weeks later, it caught fire.

The fire apparently was caused by a short when the punctured coolant system leaked into the Li-ion cells.

We’ve known about Li-ion benefits and hazards since the technology’s introduction; the studies and observations have been unceasing. Small fire sources can cause big problems, as Li-ion cells can quickly fuse and propagate the fire. Some traditional chemical suppressants have been deemed ineffective in combating such fires; water is probably the best way to extinguish them, according to the Fire Protection Research Council.

Given the billions of Li-ion batteries in use, one could argue that failure incidents are marginal. But it’s not a subject to be taken lightly. GM certainly isn’t; it has been sending SWAT-like teams to crash events to de-energize the batteries.

GM EV global chief engineer Jim Federico stands by GM’s EV innovation.

Given what you know, how would you design a Li-ion-powered EV to be safer? Or is it safe enough? ■

EE LIFERS WEIGH IN

Multiple internal-force disconnect switches within the battery pack should be a must, as should some sort of ion-interrupter chemical injected into each cell to render the normal battery chemical process useless. ... I would never park a lithium-ion car in a building. Charging these batteries is also dangerous, as exceeding the voltage on a single cell can cause an explosion or fire. The best bet might be a means to “detach” the battery from the car in future designs for outside charging and storage. — *Stephen Humphries*

Both gasoline and lithium are combustible, but any battery technology brings a spectrum of other dangers into the game.

I would not want it in my garage for at least 10 more years, if ever. — *Robert Czarnek*

JOIN THE CONVERSATION

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EE Life editorial director Brian Fuller’s odyssey continues as he tools about the country in a Chevy Volt, talking to engineers (and anyone else he can find) about innovation. Follow the adventure at driveforinnovation.com:

What’s hot in high-temp instrumentation?

Oil drilling <http://bit.ly/tU41qf>

When the kids leave the lights on

<http://bit.ly/sQxJSA>

The tweeting robot <http://bit.ly/vYnm2F>

The failures arguably are marginal but should not be taken lightly—and GM certainly isn’t

ENGINEERING
INVESTIGATIONS

FDDI built-in test ‘failure’

By Dwight Bues

I WAS WORKING WITH a VMEbus-based system that ran on pSOS and used the FDDI network interface. Because of the unique configuration, we thought it wise to run some sort of built-in test (BIT) on it.

When the manufacturer of the CPU board we’d used decided to replace it with a new model, our FDDI BIT started failing.

This was mighty suspicious to me because the vendor had supplied the BIT, built into the circuit card’s firmware.

The BIT test executive that our company had written would start the test, wait for a period of time and then read the status register to see if the system had passed.

I tested it myself using the “watchful eye” of a VMEbus analyzer. I started the test, saw it “fail,” immediately went to read the status register and saw that the test had passed.

Smelling a rat, I changed the VMEbus analyzer over to asynchronous mode and ran the BIT, swapping the new and the old CPU boards. I noticed that the new CPU executed a VMEbus read in just 60 percent of the time required by the old CPU.

Then I noticed that the BIT test executive was continuously reading the status register.



Smelling a rat, I changed the VMEbus analyzer over to async and ran the BIT

I got my hands on the software and confirmed my suspicions: The BIT test executive was performing a read loop, continuously reading the status register a fixed number of times and then doing a compare of the status bit with a “pass” condition. Since the new CPU was faster, it would complete n reads before the FDDI card had completed its BIT.

You could call it a matter of lazy programming; you have to read the register anyway, so why not just do it n times? A better way to do it would be to “WAIT(TICKS)” using the built-in timing in pSOS, or even to decrement a CPU register—a reliable technique, since the time interval is based on CPU clock speed and not interface speed.

Whichever method you choose, document it, so that those who follow you won't have to waste time figuring out what you did! ■

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ENGINEERING POP CULTURE

No reason for review season

By Bill Schweber

ONCE AGAIN, 'tis the season of holiday gatherings, companywide fur-loughs and performance reviews.

In 2008, *The Wall Street Journal* ran an article by Samuel A. Culbert, professor of management at UCLA's Anderson School of Business, arguing that the annual ritual of the performance assessment should be abolished. The article's headline and subhead said it all, exhorting companies to “Get Rid of the Performance Review: It destroys morale, kills teamwork and hurts the bottom line.” Culbert's piece has since been expanded into a book (see www.performancepreview.com).

The official justification for performance reviews is to help the employee identify opportunities for improvement and professional advancement, and to align the goals of the individual with those of the organization.

Unofficially, companies do reviews to create a “paper trail” and provide the appearance of uniform treatment of all employees—in other words, to protect themselves from litigation.

Unquestionably, the performance review is unpopular. It's not hard to find someone who thinks the boss is a jerk and therefore unqualified to assess anyone's performance. The process also makes many reviewers squirm. And yet some companies aren't content to settle for the annual review. They're doing reviews semiannually or



At some companies, an annual ordeal has gone '360'

quarterly; are asking workers to do self-assessments in addition to being rated by the boss; and, in some cases, are even subjecting the hapless employee to reviews by peers, subordinates and anyone else with whom the person might have contact on the job. It's called the 360 review.

If we do this right, we can spend all our time working on our own reviews and those of others, and thus avoid having to do any actual work! ■

READERS RATE THE REVIEW

One boss told us, “Here is the form; do your own evaluations.” He disappeared in the first round of layoffs. — *zeeglen*

I was once the low woman on a department totem pole, and a coworker kept trying to foist her work off on me. I eventually got wise and began sending the work back, politely pointing out that since she had done the original project, it was, by department agreement, her responsibility to fix any problems.

For this I was marked as “uncooperative” in my next review, and that comment haunted me for years to come. — *Naomi Price*

The best thing you can do is to be proactive. Each year, I would provide my boss with a long list of my accomplishments, including all the times I'd solved a problem that he hadn't had time to handle. If I got an “exceeding expectations” review but an average raise, I would ask what my incentive was for exceeding expectations again next year. Sometimes, that would get me a few extra dollars or a bonus. — *EREBUS*

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<http://bit.ly/u86WqJ>

ENGINEERING
POP CULTURE

Industry survey shows quality crisis

By Brian Fuller

QUALITY IN ELECTRONICS is deteriorating, and suppliers' customer support is woeful, imperiling engineers' ability to complete projects, according to an informal EE Life survey.

More than 100 EE Lifers responded to the survey, which was inspired by reader Don Baechtel and created with reader input. While the poll was not scientific, the results illuminate a growing problem inside both public and private companies that's resulting in widespread engineering frustration. The major culprit? Time-to-market and cost-reduction pressures.

"Everything from my stapler to my laptop fails sooner," commented one respondent. "Lack of proper documentation makes solving problems harder. Support phone calls are usually unproductive."

Nearly 60 percent of respondents

EE Lifers say the problem is impeding their ability to finish their design projects

think product quality is worsening, and a like number believe the problem imperils their ability to finish design projects. "Companies are going overseas to meet a price point rather than a 'qual-

ity' point," wrote a respondent. "Bean counters don't seem to realize consumers and end users *will* pay more for a better product."

Some respondents pegged software or hardware complexity as a key factor in the quality crisis. "Quality, to be addressed properly, requires a holistic perspective. Because no

one person (or small team) can grasp all the design details, quality becomes fragmented," commented one reader.

As for customer service, 64 percent of the respondents said companies don't provide sufficient support. Three-fourths have used a vendor's self-help or peer forum to try to address quality

problems, but more than half said those actions had done little to solve their issues. Wrote one: "I no longer expect real support without at least two levels of morons to go through."

More startling were responses about internal processes and procedures at respondents' companies.

Nearly 60 percent said their companies do not give engineers enough time to put quality into the products and documentation on which they work. Quality initiatives undertaken at electronics companies must show a return within a year or less, according to a little more than half the respondents.

Nearly a third said quality initiatives at their companies are usually approved regardless of return on investment. But 13 percent said such initiatives are usually rejected regardless of ROI. ■

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December contest: Deadline Dec. 31

CIRCLING DANGER

Is our intrepid engineer dead in the water, or does he have a solution up his sleeve? Help our fine fellow by going to <http://bit.ly/sX64zg> and adding your caption to the comments field.

We'll put your submissions to a vote at the end of December, and cartoonist Daniel Guidera will send the winner a color print of the cartoon sporting the triumphant caption.

If it's not an iPad, is Vanity Fair?

Most people in the electronics industry today are aware of the revolutionary job they've done in developing technology that has forever changed the way we live.

Are they proud? You betcha.

Are they ready to take full responsibility?

They should, but there are reasons they might not want to, and not all of them have to do with modesty.

Most of us can't imagine going through an entire day without receiving a single e-mail, or making or taking a cell phone call. Similarly, not a day goes by without getting text messages from the kids, or finding mildly interesting or totally irrelevant tweets from someone we may or may not know well.

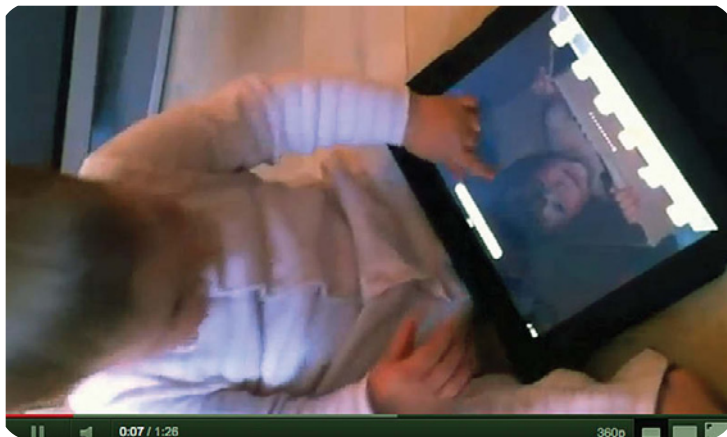
We may make no new entries in Facebook today, but we likely know someone who checks her page first thing in the morning, possibly even before hitting the bathroom.

Even for those of us who trust no one for street directions, GPS has become our mainstay when we drive in unfamiliar territory. We zip through toll booths using our RFID-enabled E-Zpass, and we travel abroad with an RFID-embedded passport.

For better or worse, almost whether or not we choose to be, to some extent we are all connected to—or entangled with—just about everyone, everywhere, and engineers have had a hand in making it all possible.

While we all owe a lot to the engineering community for the “social progress” we've made in recent decades,

the engineers who have done the heavy lifting tend not to brag about their accomplishments. When Texas Instruments tried to honor the innovators with its “Thank an engineer” video series in 2009, it felt odd, even a tad embarrassing, to see these normally



Changing basic social behaviors can bring unintended consequences

anonymous toilers so nakedly exposed.

But the notion of social progress engineered by the engineering community took on a new dimension for me when I came across a video that illustrates how new technology is “reprogramming” the next generation of human beings to change what has been a basic

behavior for centuries.

The video shows a one-year-old girl, clearly accustomed to playing with an iPad and familiar with such actions as pinch-to-zoom, grow frustrated as she explores conventional paper magazines that refuse to respond to her manual commands. The toddler touches, swipes, squeezes and pushes the images on the inert, noninteractive paper pages, glances up at her caretaker in puzzlement and tosses the magazines aside. At the end of the clip, she's handed the iPad and squeals in delight, as if to say, “Ah, *this* one's not broken!”

The video (which, of course, has gone viral—another concept unknown a decade ago) is just one indication that technology is changing human behavior. A source at TI told me there's anecdotal evidence that young people who are accustomed to texting are also inclined to use a thumb, rather than an index finger, to ring a doorbell.

And such behavioral changes aren't new. Nearly 20 years ago, I met an engineer who told me his two-year-old had learned to use the mouse on Daddy's

Mac before she could talk and had spent months double-clicking herself on the chest before figuring out it was easier to get her fellow carbon-based life forms to respond to her if she just told them what she wanted.

That was a little shocking then. Now, we've got a whole generation in danger of thinking that if a Playboy centerfold with a staple in her navel doesn't

stand up and walk off the page on command, “the iPad's broken.”

Changing social behavior is an awesome accomplishment. But it's also fraught with unintended consequences, such as a baby who has unwittingly traded her imagination for a magic finger.

Perhaps it shouldn't surprise us if innovators are sometimes reluctant to step up and claim responsibility for rewiring people. ■

By Junko Yoshida (junko.yoshida@ubmcom), editor in chief of *EE Times*.

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Narendra Kumar, Intel® vPro™ Platform Solution Architect

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