

# pulse

INNOVATIONS & INNOVATORS

## Protocol analyzer captures traffic between wireless USB MAC and PHY layers

The UWB (ultrawideband) Tracer MPI system helps design engineers solve problems with MAC/PHY (media-access-control/physical)-layer integration and interoperability in WUSB (wireless-USB) systems based on the USB-IF (USB Implementers' Forum) Certified Wireless USB 1.0 standard. The Forum based the standard on the WiMedia Alliance's MB-OFDM (multiband orthogonal-frequency-division multiplexing) UWB shared-bandwidth, short-range wireless-communication proposal. The USB-IF expects Certified WUSB to ultimately deliver data rates of approximately 1 Gbps at distances as great as 20m.

LeCroy Corp's Protocol Solutions Group designed the analyzer. LeCroy formed the group when the company acquired CATC (Computer Access Technology Corp) in the fall of 2004. According to James Wright, director of marketing for the group, CATC provided the first protocol analyzers for both USB and Bluetooth. "This new instrument captures and decodes at both the WiMedia and the WUSB levels," he says. By acquiring the traffic between the MAC and the PHY layers, it can display protocol traffic from systems during the design phase.

The \$55,000 system uses the same Tracer-software structure that Wright says has become the industry's de facto standard for USB-protocol analysis. "By using the CATC Trace display," he says, "engineers can organize and display the protocol hierarchically at the WiMedia and WUSB levels. The software also includes pop-up tool tips, which provide information about the specifications, including packet structure and field usage." The instrument also displays real-time statistics, which provide information on the performance and operation of the unit under test, including the signal strength and number of frame occurrences.—by Dan Strassberg

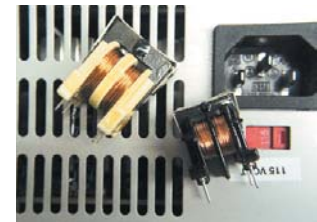
► **LeCroy Corp.**, [www.lecroy.com](http://www.lecroy.com).



The UWB Tracer MPI, which captures and decodes at both the WiMedia and the wireless-USB levels, acquires traffic between the Certified Wireless USB MAC and PHY layers.

## COMMON-MODE INDUCTORS CHOKE OFF CONDUCTIVE EMI

New through-hole inductors from JW Miller Magnetics put high inductance into a small footprint, most commonly for use as part



The Model 7400 inductors provide effective common-mode inductance in a small, through-hole package and suppress power-supply EMI.

of a line filter that suppresses conductive EMI from switched-mode power supplies. Devices in the Model 7400 family measure 19×21 mm; inductance ranges from 0.6 to 45 mH, and dc resistance is 0.025 to 2.68Ω. Operating temperature is -55 to +105°C for these approximately \$1 units.—by Bill Schweber  
► **JW Miller Magnetics**, [www.jwmler.com](http://www.jwmler.com).

**"It is one thing to advocate—perfectly reasonably—for free-market principles and by extension allow a foreign company to purchase a US company. It is quite another to allow an—often hostile—foreign government to purchase the resources of a US company."**

Mark Boyles, in *EDN's* Feedback Loop at [www.edn.com/article/CA629313](http://www.edn.com/article/CA629313). Add your comments.

# Control-networking technology delivers smaller, cheaper nodes

**E**chelon, the developer of the LON (local operating network) sold under the LonWorks brand, now has a new technology, Pyxos, that the company claims will be cheap enough to connect sensors and actuators in everyday equipment. Designers have commonly used LonWorks products to automate building control in lighting, HVAC, security, and other systems. But generally, LonWorks would prove too expensive to use in a control network within a product such as an air conditioner or a spa controller. Echelon believes that Pyxos will bring connectivity into such systems.

The benefits include simpler design because a low-cost, free-topology wiring system can connect sensors and actuators in place of traditional wiring harnesses—a benefit similar to what CAN (controller-area-network) technology brings to the automobile. A Pyxos-enabled appliance could also allow a user to perhaps use a cell phone to remotely control a device such as a spa. And manufacturers could enable preventive maintenance on Pyxos-enabled products. Alas, Pyxos doesn't

seem to offer much toward a truly automated home for the broad consumer base because the cheapest Pyxos chips will still sell in the \$2 to \$3 range in low volumes.

From a software perspective, a Pyxos node can operate just as a LonWorks node, and designers can link subnetworks of as many as 32 Pyxos nodes to a LonWorks network through an access point. Alternatively, a designer could use Pyxos chips alone in a network without LonWorks. The Pyxos nodes share the transceiver technology in LonWorks, including RF, powerline, and twisted-pair technology. Twisted-pair cable can carry both the data signal and the power to Pyxos nodes. And designers can connect Pyxos nodes in bus, star, and loop topologies.

In its simplest form, a Pyxos

node requires only a Pyxos chip, a transceiver, and the connection to a sensor or an actuator. The baseline Pyxos chip includes digital I/O to connect to simple sensors and actuators and needs no on-board microcontroller. Instead, vendors can preconfigure Pyxos chips at the factory, and the nodes self-install themselves into workable networks. More complex nodes might include a microcontroller, data converters, and LonWorks links.

Echelon claims that, together with partners, it has deployed more than 50 million LonWorks control devices. Company Chairman Kenneth Oshman projects that the potential Pyxos market is two orders of magnitude greater than the LonWorks market. The company predicts scenarios as wild as a smart carpet that can track traffic patterns so that cleaning crews concentrate on busy areas.

—by Maury Wright

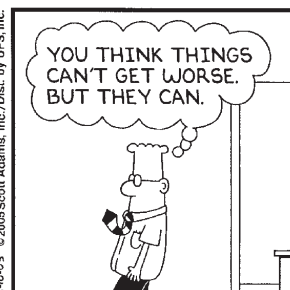
▶ **Echelon Corp.**, [www.echelon.com](http://www.echelon.com).

## ➡ FEEDBACK LOOP

**“Unless NASA has something better to offer, I would rather spend the money on a booster for our kids' education than a booster rocket to launch a space mission of dubious importance.”**

Michael Potash, in *EDN's* Feedback Loop at [www.edn.com/article/CA632662](http://www.edn.com/article/CA632662). Add your comments.

### DILBERT By Scott Adams



## SAW duplexer cuts weight by shifting to plastic package

**Every milligram counts in today's portable-system world; new SAW (surface-acoustic wave) duplexers from NDK (Nihon Dempa Kogyo) make this point by switching from ceramic to plastic packages and cutting weight by 40 to 50%. The WX807C, for US CDMA application, has a nominal transmitter-band center frequency of 836.5 MHz and a receiver-band frequency of 881.5 MHz. The similar WX910A for UMTS applications has transmitter and receiver frequencies of 1950 and 2140 MHz, respectively.**

Maximum insertion loss for these duplexers is just 2 dB in the transmitting path and 2.8 dB in the receiving path, with attenuation of 43 and 55 dB, respectively. The 50Ω duplexers measure 3.8 mm sq and 1.5 mm high. The CDMA WX807C sells for \$1.15, and the UMTS WX910A sells for \$1.62 (10,000).

—by Bill Schweber

▶ **NDK America**, [www.ndk.com](http://www.ndk.com).

## FPGAs become rad-tolerant, rad-hard

Actel recently unveiled the latest device in its radiation-tolerant FPGA family and also announced that it is working on its first fully radiation-hardened FPGAs. The new RTAX4000S radiation-tolerant FPGA has twice the gate count of the company's last rad-tolerant FPGA, the RTAX-S, according to Ken O'Neill, director of military- and aerospace-product marketing. The new device, which has 500,000 ASIC gates, 840 I/Os, and 540 kbits of embed-

ded memory, suits space applications, such as satellite-payload systems and scientific satellites.

Actel has built the device to the same radiation-tolerance standards as its other RTAX-S devices, O'Neill says. The FPGA includes embedded RAM with EDAC (error detection and correction), flip-flops that are practically immune to SEUs (single-event upsets), and memory-upset levels of less than  $1^{-10}$  errors/bit/day.

The devices are immune to

configuration upsets and have a TID (total-ionizing-dose) resistance as high as 300k rads (functional), which exceeds the requirement for most space applications and is more than ample for most space programs, according to O'Neill. Functional prototypes of the device, which aren't rad-tolerant, will be available in the first quarter of 2006, and radiation-tolerant versions will become available at the end of 2006.

In addition to the RTAX-4000S, Actel also announced that it is making progress in the development of its first radiation-hardened FPGAs, which

take reliability one step beyond the radiation tolerance of its RTAX4000S. The upcoming RHAX-S family increases the reliability of the device to QML (qualified materials list) Class V. The projected device family will feature a TID resistance of 1M rad and logic and memory SEU resistance of less than  $1^{-10}$  upset errors/bit/day.

The first device in the RHAX family will be a 250,000-system-gate (30,000-ASIC-gate) FPGA. Actel expects to deliver the prototype by the end of 2006 or early 2007 and production parts in 2008.

—by Michael Santarini

► Actel Inc, www.actel.com.

## Multimode RF transceiver targets WEDGE mobile handsets

As cellular standards evolve toward 3G and beyond, the range of frequency bands and modulation schemes continues to broaden. Handset designers want to support legacy networks and strive to integrate support for next-generation networks. In the GSM (global-system-for-mobile-communications) space, the current state-of-the-art target is WEDGE, which combines WCDMA (wideband CDMA) and EDGE (enhanced data rate for global evolution). The emerging WEDGE phones, however, often use a combination of RF front ends that are glued together to support the new WCDMA standard that will extend data rates to 2 Mbps, whereas EDGE supports 385-kbps rates.

Start-up Sequoia Com-

munications claims to have a SiGe (silicon-germanium)-based transceiver design that can support the full range of GSM-centric standards, including GPRS (General Packet Radio Service), EDGE, and WCDMA.

Sequoia is entering a crowded field seeking a share in the transceiver market. Vice President of Marketing and Business Development Charlie Wilcoxson points out that, although the market is crowded, no player has a dominant share. Wilcoxson shows a pie chart in which no provider of transceivers in the GSM market has a 20% share. And Wilcoxson claims that Sequoia has a technology that the other competitors lack in the new SEQ-5400 chip.

Sequoia is demonstrating

first silicon in the lab transmitting and receiving the full slate of cellular signals in frequency bands of 800 to 2100 MHz. The fully analog implementation also integrates a SAW (surface-acoustic-wave)-receiver filter that other dedicated WCDMA transceivers lack. The company claims that the design will take the RF footprint in a WEDGE phone from 15.2 cm<sup>2</sup> to less than 7 cm<sup>2</sup>. Sequoia also claims to be the first company to use polar modulation in a WCDMA transceiver.

Wilcoxson believes that most competitors realize the benefits in power efficiency of polar modulation but haven't figured out how to apply the technique in WCDMA designs and are therefore using less-efficient linear modulation.

Sequoia claims that its chip will reduce the BOM (bill-of-materials) cost of the RF components in a WEDGE handset by 40 to 60%. The RF BOM cost in such a phone is now probably approximately \$20. Samples are available now with volume slated for the first half of 2006. You could argue that the product is ahead of the market, and WCDMA hasn't taken off in North America. But Wilcoxson claims shipments are ramping in Europe and Asia. The company will also face a challenge with its first product targeting such a cut-throat market. Moreover, the DSP-based software-defined radios are waiting in the wings to support multiple cellular standards and even WiFi (Wireless Fidelity) technology.

—by Maury Wright

► Sequoia Communications, www.sequoia-communications.com.

09.29.05

## Beam-forming WLAN implementation targets audio/visual usage

Yet another company has emerged with an approach to the problem of wirelessly moving digital audio and video around the home. Vendors have proffered one of the many standard or enhanced flavors of 802.11 or WiFi (Wireless Fidelity) WLAN (wireless-LAN) technology as cable replacements, but each has so far met insurmountable obstacles in data rate, range, or cost. The WLAN industry hopes to solve the problem with the 802.11n standard that the IEEE is now developing. Ruckus Wireless (formerly, Video54), meanwhile, claims that its beam-forming-antenna technology can now enable video distribution and later further extend the capabilities of 802.11n.

Ruckus is already shipping the technology in the Netgear RangeMax family of products. The company refers to its beam-forming technique as MIMO (multiple-input multiple-output), but it doesn't include the baseband-resident spatial multiplexing technology that first carried the MIMO label (see "The greed for speed," *EDN*, Feb 19, 2004, pg 26, [www.edn.com/article/CA379885](http://www.edn.com/article/CA379885)). Of late, companies that want to cash in on the popular MIMO label are using the term on any implementation with multiple antennas. Pioneer Airgo Networks has taken to labeling spatial-multiplexing technology as true MIMO, which the 802.11n standard will mandate. Still, the beam-forming offering from Ruckus does boost range, as well.

The latest Ruckus announcement combines the BeamFlex beam-forming ca-



The Ruckus Wireless MF2900 video-capable 802.11g access point and router features a six-element smart antenna in the upper half of the clamshell and dynamic software control that forms signal beams through 63 antenna patterns.

pability with the SmartCast software stack that ensures quality of service for video streams. The company will license both technologies to OEMs, as it did BeamFlex to Netgear. And Ruckus will now supply access points and wireless adapters to service providers. The initial target customers are the major phone companies worldwide that are seeking to deliver IPTV (Internet Protocol television), or video over their phone lines. According to Michelle Abraham, an analyst with In-Stat, there were 1.6 million IPTV subscribers at the end of 2004, although In-Stat projects that market will grow to 32 million subscribers by the end of 2009.

IPTV schemes typically deliver video packets to a broadband modem/router that in turn must send packets to a set-top box in the living room. Most early players in IPTV are simply rolling trucks and installing Ethernet cables between routers and set-top boxes, but Ruckus believes it can

make that connection wireless and user-installable. The company estimates pricing of \$169 for the MF2900 access point/router and \$129 for the MF2501 set-top adapter, although service providers could subsidize such gear.

Ruckus claims that its implementation supports greater range and is less sensitive to interference from nearby wireless networks or other noise sources, such as a microwave ovens. For service providers, the company is offering a product using six antennas in the access point. Software that controls the antenna operation adopts one of 63 antenna con-

figurations for each wireless client and therefore sends a relatively narrow beam of energy that minimizes interference to nearby networks. Moreover, the ability to dynamically adapt signal paths through antenna patterns allows the receiver to adapt for interference. Along with announcing the Ruckus access point and adapter, the company also announced its first customer, PCCW, a Hong-Kong IPTV-service provider.

The Ruckus technology looks promising, although it will be more applicable once 802.11n and data rates in excess of 100 Mbps are prevalent. Ruckus claims it will extend range by two or three times even on those next-generation MIMO systems. Today, the company claims it can reliably support rates of 11 to 25 Mbps using 802.11g chips. It's unlikely that such a system could handle an HDTV stream, although Ruckus claims it can. A live, action-packed program, such as a football game, would need speed at the upper end of that range. And supporting multiple standard-definition streams could also be an issue. And, finally, so many WLAN-video approaches have failed coming to market that all new ones have questionable credibility.—by Maury Wright  
 ▶ Ruckus Wireless, [www.ruckuswireless.com](http://www.ruckuswireless.com).

### FEEDBACK LOOP

**"If the moon were solid gold or if Mars were habitable and had new animals and plants to see, we would probably already be there. But, so far, everything we have found out there is just dirt and rocks, so it is hard to get the public excited."**

Jim Harrison in *EDN's* Feedback Loop at [www.edn.com/article/CA632662](http://www.edn.com/article/CA632662). Add your comments.

## Q&A

# Power plays

Saul Kupferberg, vice president of sales at power-supply vendor Kepco Inc

**S**aul Kupferberg is a second-generation member of the founding family of Kepco, which brothers Jack, Jesse, Max, and Ken Kupferberg founded in 1946. The company grew out of the involvement of three of the four founders in one of World War II's "Big Science" projects—the Manhattan Project. Much of the work they did at Los Alamos remains classified to this day. The work they were involved with required them to help invent and build electronic instruments. They had to build their own instruments because there really were no electronics businesses and no commercially available electronic instruments at that time. Indeed, the word "electronic" had not yet been coined.

### Where do users of products such as yours have the greatest misunderstandings?

**A** People get confused on how to use remote error sensing to compensate for voltage drops. We always find we are re-educating engineers about it. We even publish a nomograph of how to size the wires for the situation. It usually starts with a call from someone saying "Your power supply is not working."

### What's your impression of the state of engineering and science education?

**A** We find that US-educated engineers and others give little attention to analog and power design. Engineering graduates looking for work have never had a hands-on components or circuits experience or ever debugged a circuit. That's a big problem for our own talent needs and for our customers.

The course they take has been simulation only. The general level of education is good, but the courses haven't focused on these aspects. In Europe, the analog-design and hands-on-experience portion of education is stronger.

### What changes in specifications have you seen?

**A** Switching supplies have become more and more dominant, combining low noise, a rise in PFC [power-factor correction], and harmonics regulation. Increasingly, we have to provide switching supplies that meet both conducted- and radiated-noise specifications. We saw the first switchers with PFC about 10 years ago. Now, everything above 50W has PFC and must meet the conducted- and radiated-emissions standards. Aerospace, sensor testing, and sensitive applications still need linear supplies.



### Do you find that customers are increasingly asking you to do more?

**A** Customers are asking us to do more of their work for them, especially in software applications. We want to help them, but at what point do we cross the line and are doing their job, as consultants? And helping them to this extent means there are other customers we can't help.

### Why does the power-supply industry have so many vendors?

**A** About 60 to 75% of the market is custom, so there are always those who do a custom unit and then hope to sell it as a standard product. Also, everybody thinks they can make a power supply, and, to some extent, it's true. It's make-versus-buy: They can make one, but can

they make it over and over? It's an opportunity for companies such as ours. It takes a lot of time and energy to purchase components, and then you have to spend money to get past UL and other approvals. The BOM [bill-of-materials] cost is less than buying from us or others, but the total cost is not. There are so many hidden costs and other things that you could be doing with your engineering time. Lots of good engineers can build one supply, but to build tens or hundreds—that's another story.

### Have any incidents caused a chuckle?

**A** I was at a prestigious educational institution where we had delivered three 0 to 20V, 0 to 20A supplies. The postdoctoral student couldn't understand why he couldn't get 0 to 60V, 0 to 60A from the supply trio at the same time. I had to politely explain to him that he could connect them in series for the higher voltage or in parallel for the higher current—but not at the same time.

—by Bill Schweber

## FEEDBACK LOOP

**"The ability to see, to know, and to say are crucial to our modern lifestyle and sense of freedom. However, it is our power to do that makes for change. At least once a season since the late 1980s, hurricane victims directly benefit from the application of convenient, cordless power tools."**

Chris Walter, in EDN's Feedback Loop at [www.edn.com/article/CA607116](http://www.edn.com/article/CA607116). Add your comments.

GLOBAL DESIGNER

## DVD-recorder processor targets European digital-broadcast reception

LSI Logic recently unveiled a single-chip DVD-recorder-processor platform, which, it claims, reduces system costs to support digital-broadcast reception in Europe and other parts of the world. The company also claims that the device will enable consumer-electronics vendors to design set-top-box/DVD recorders and set-top-box/hard-disk-drive/DVD recorders. According to technology-research company In-Stat, there are approximately 9.5 million digital-television subscribers in England, Germany, France, Italy, and Scandinavia. "This brings the benefits of a combined set-top-box/DVD-recorder platform to the home and is gaining momentum in Europe," says Vijendra Kuroodi, LSI Logic product manager for DVD-recorder products.

The new offerings include the DMN-8623 and DMN-8673 single-chip processors, which the company based on its proprietary DoMiNo architecture, comprising hardware and programmable software. Both of these processors integrate set-top-box-receiving and DVD-recording functions on one chip. "A single-chip approach eliminates a lot of redundancies for consumers and designers," says Kuroodi. Chief among these redundancies are memory systems, MPEG decoders, host processors, and graphics engines, all of which significantly reduce the bill-of-materials costs.

The DMN-8623 targets use in single-drive DVD recorders

and can record and play back a digital-TV channel or video stream. The device has a single optical drive with a DVD-recorder-drive interface that enables digital downstream access. The DMN-8673 focuses on hard-disk-drive/DVD-recorder systems that can encode or decode two digital- or analog-TV streams, which users can record onto a hard drive or DVD in a manner similar to using TiVo.

"The DMN-8673 can connect to a hard-disk drive and enables you to time-shift live



The DMN-8623 and 8673 chips integrate set-top-box and DVD functions.

content more than an optical disk can, as well as make backup recordings, which you can view later," says Kuroodi. "It can simultaneously process two video inputs by encoding video on a hard disk and then

decoding it onto the display." The DMN-8623 and DMN-8673 are available for sampling and cost \$25 and \$30, respectively (high volumes).

—by Jeff Berman

► LSI Logic, [www.lsillogic.com](http://www.lsillogic.com).

## CSIA employs VSIA standards

The VSIA (Virtual Socket Interface Alliance), a SIP (semiconductor-intellectual-property) standards group focusing on design reuse, and the CSIA (China Semiconductor Industry Association) recently inked a deal in which the CSIA will base its SIP standards on VSIA's standards. This arrangement will let the CSIA develop standards in Chinese, leveraging VSIA standards, which the CSIA will distribute throughout China. "This is a major change for China as it pushes to have standards driven by commercial interest [through a combination of companies and universities] and directly through the government," says Larry Rosenberg, VSIA vice president of engineering. "China wants to have standards that are compatible with the rest of the world."

The organizations will also charter a Chinese VSIA SIG (special-interest group), which provides limited access of VSIA standards to a group of 35 Chinese companies, each with annual revenues of less than \$10 million. The group will focus on ways of integrating IP into SOCs (systems on chips) and on IP protection.

A major factor in the CSIA's decision to collaborate with the VSIA and obtain legal rights to create a Chinese derivative of VSIA standards was that the CSIA wanted to change how China acts in IP protection and how the rest of the world perceives the country. Rosenberg notes that officially licensing IP is a significant step toward those goals.

"There is a tremendous amount of sensitivity and interest in doing this," says Rosenberg. "If it wants to be successful in the semiconductor space, it needs access to third-party IP in the West. Otherwise, they are not going to fill fabs. Access to third-party IP is crucial in developing world-class consumer-electronics devices."

—by Jeff Berman

- China Semiconductor Industry Association, [www.csia.net/cn](http://www.csia.net/cn).
- Virtual Socket Interface Alliance, [www.vsia.org](http://www.vsia.org).

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