

# Companies Develop Nanotech RAM Chips

**A** new company has used nanotechnology to develop tiny, high-capacity memory chips that maintain stored data when a host device's power is shut off. The chips promise to be faster and more energy efficient than many comparable systems.

Nantero has created NRAM—the “N” stands for both nanotechnology and nonvolatile—a high-density RAM chip that saves its contents when a device is turned off or loses external power. The company will make the chips, while LSI Logic, a vendor of custom, high-performance semiconductors, will embed them in application-specific integrated circuits.

Nantero will manufacture its chip with carbon nanotubes, cylindrical structures consisting of hexagonal graphite molecules. Carbon nanotubes are up to 100 times stronger but one-

sixth the weight of a steel object the same size.

Because of nanotubes' strength, NRAM could undergo many more read-write processes than other types of nonvolatile memory, said Nantero CEO Greg Schmergel.

The nanotubes also offer better electrical conductivity than many other materials frequently used in chips and thus enable faster performance. In addition, they are not affected by magnetic fields, which makes them particularly useful in harsh, magnetized environments such as outer space, Schmergel explained.

Nantero's design applies electrical charges to groups of nanotubes suspended over an electrode. Applying the opposite type of charge to the tubes and the electrode causes the tubes to bend down, touch, and bind to the electrode, thereby creating an electrical connection. Applying the same type

of charge to the tubes and electrode causes the tubes to bend upward, thereby creating no electrical connection. The memory system reads these two states as the ones and zeros of binary data.

Because NRAM systems can place nanotubes so closely together, Schmergel said, they can offer high storage density.

NRAM promises to improve the performance of electronic devices that use nonvolatile memory. For example, the technology would be more energy efficient than flash memory—an inexpensive technology commonly used in digital cell phones and cameras, LAN switches, and other devices—because NRAM uses lower voltages and requires very little energy to move the tiny nanotubes.

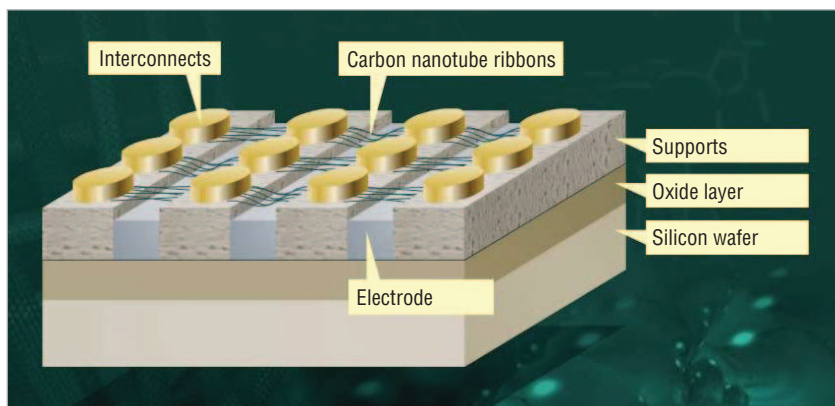
Because it is so much smaller, NRAM would be less expensive than static RAM, commonly used in cache memory and in digital-to-analog converters in video cards' RAM.

To succeed, NRAM must survive stiff market competition, said Richard Gordon, research vice president for Gartner Inc., a market research firm. Besides flash and SRAM, there are about 30 types of memory in varying stages of development and market readiness.

According to Gordon, NRAM is still a research project and won't succeed unless it gets even less expensive and more reliable and offers more features and functions.

Schmergel admitted NRAM needs work, such as reducing the overall chip's size to that of flash memory and increasing manufacturing yield to help lower costs. He said these improvements should occur by late 2005. ■

—Linda Dailey Paulson



**Nantero's nanotech RAM chip applies electrical charges to nanotubes suspended over an electrode. Applying the opposite type of charge to the tubes and the electrode causes the tubes to bend down, touch, and bind to the electrode, creating an electrical connection. Applying the same type of charge to the tubes and electrode causes the tubes to bend upward, creating no electrical connection. The system reads these two states as binary data's ones and zeros. The high-capacity NRAM chip maintains stored data when a host device's power is shut off and promises to be fast and energy efficient.**

# First Smart-Phone Virus is Discovered

**S**ecurity companies have discovered the first virus that targets smart phones. They say the Cabir worm did not contain malicious code but instead was a proof-of-concept program for possible future viruses with harmful content.

Cabir demonstrates that users should begin thinking of their cellular phones as computing devices, with all the potential risks, said Marty Lindner, team leader for the CERT Coordination Center, an Internet security organization.

Vincent Weafer, senior director with vendor Symantec's Security Response Unit, said Cabir is probably an ego-stroking stunt for its authors.

However, said Jimmy Kuo, director of antivirus research for vendor McAfee's Antivirus Emergency Response Team, Cabir could become dangerous when the basic code leaks into the wild, where other virus writers could adapt it.

Smart phones, combinations of cell phones and PDAs, are often used for more than just making calls. This creates multiple paths for malicious-code infection.

Cabir affects Nokia's Series 60 phones running both Symbian, the most popular smart-phone operating system, and Bluetooth, a short-range, wireless connectivity technology.

The virus scans for other phones running Bluetooth within the technology's 10-meter transmission range. The worm arrives on a recipient's phone as a Bluetooth message. Users must respond to a dialog box that asks if they want to accept a file someone is trying to send them. They would then have to download the file to activate it, similar to the steps that have allowed many viruses to spread in desktop systems.

After infecting a phone, the worm writes the word "Caribe" on the host's screen and creates and transmits a file containing the worm and instructions

on how it should replicate. However, Cabir doesn't contain code that would damage a phone or its contents.

Two minor Cabir variants have appeared already, both from Cabir's creators, the 29a Eastern European group, which specializes in creating proof-of-concept viruses such as the recent 64-bit Rugrat. The group sent copies of Cabir to several antivirus firms, which say they have not found the worm in the wild.

According to Weafer, smart phones will become targets for viruses with malicious code in two to five years. Therefore, he said, phone users and service providers should begin upgrading security now.

"We've always known that as the wireless phone became a computing

platform, a virus could happen," said Keith Nowak, spokesperson for Nokia Americas. Thus, he said, Nokia phones display a warning panel telling users they are about to download a file from an unverified source. They thus have the option not to accept the file.

To improve security in phones that use its OS, Symbian has started a Symbian Signed program that would require developers to digitally sign all applications for the platform. According to Symbian, its signature is a tamper-proof certificate that identifies the developer and says a given program is safe to download. Users could then refuse to install unsigned applications.

Experts also say that user education is critical. ■

—Linda Dailey Paulson

## Users Feel Flush with New Digital Toilet

A Japanese firm has taken computer technology into new areas of human activity by developing a complex, computer-controlled toilet system.

The \$5,000 Neorest toilet from Toto automatically raises and lowers the seat as needed, flushes the bowl, deodorizes the air, and cleans itself. The system also provides controls for heating the toilet seat and even replaces toilet paper with a bidet-like water sprayer and dryer, called a *personal cleansing system*.

The toilet is powered by a 128-kilobyte ROM chip with separate RAM chips, offering a total of 512 kilobytes of memory, located in a motherboard in the seat, noted Toto spokesperson Lenora Campos.

When used, she noted, a battery-operated wireless remote system controls all the features by bouncing infrared beams off the bathroom ceiling and onto a receiver on top of the toilet. The toilet also uses infrared technology to enable sensors to detect a user's presence.

"This is the first time technology of this magnitude has been used in a toilet," Campos noted.

The system has a manual override so that in case of a power outage, it can continue to function as a traditional toilet.

While the initial cost seems expensive, Campos said, the system saves money by lowering water use and eliminating the need for toilet paper.

In addition, Neorest utilizes fuzzy logic and past usage patterns to recognize when the toilet hasn't been used for a while and to automatically turn it off, like a PC's energy-saving sleep mode.

Otherwise, she said, the system uses as much energy as a traditional household appliance.

—Linda Dailey Paulson

# Getting Electric Power via Ethernet Cables

Many offices use Ethernet cables for network connections, Internet access, and, with the advent of IP telephony, phone communications. Now, a number of companies are beginning to use the cables for something different: to provide electrical power.

Ethernet cables, using the IEEE 802.3af standard, carry 13 watts of power. This is enough for most battery-operated devices except laptops but considerably less than most household appliances, said Geoffrey O. Thompson, Nortel Networks' manager of standards development and recent vice chair of the IEEE 802 Working Group.

Thus, power over Ethernet (PoE)

will work for low-wattage networked devices such as telephones, wireless network access points, and digital security cameras.

According to Thompson, the technology works with most common flavors of basic 10Base-T Ethernet over twisted-pair copper cabling. However, he added, it remains to be seen whether PoE will work with faster Ethernet versions.

PoE offers several advantages. For example, generic data cabling is considerably less expensive to install than electrical wiring. This is because, for electrical purposes, data cables are considered safety-extra-low-voltage cabling and thus have fewer regulatory

requirements than electrical wiring.

PoE would also help companies avoid the expense of installing multiple electrical outlets just for wireless LAN access points, which require both a wired network connection and a power source.

By using Ethernet networking, PoE would enable improved remote troubleshooting and rebooting. Moreover, in the event of a power failure, networked devices could remain running.

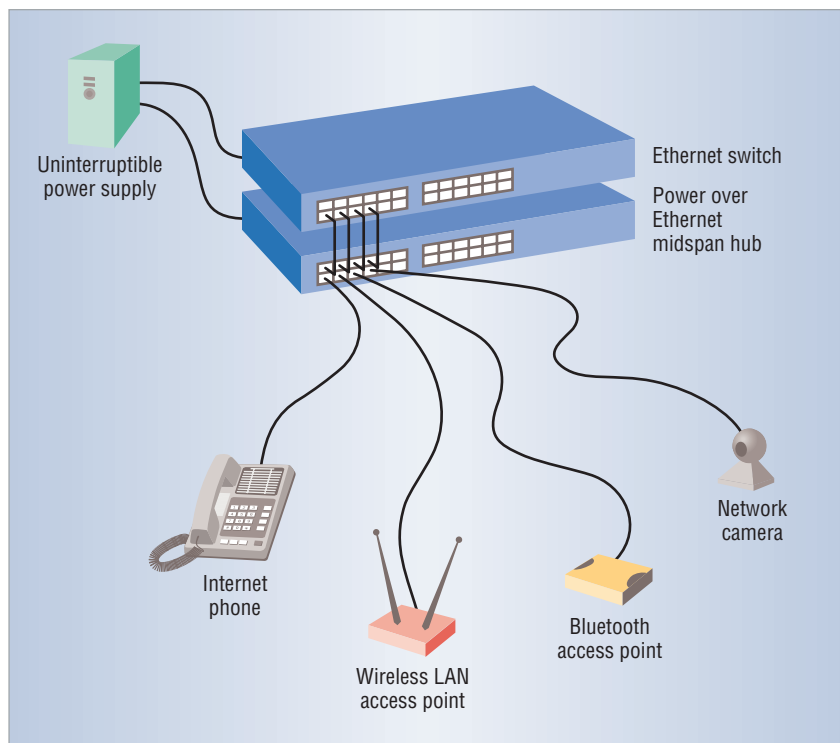
However, PoE switches cost 30 percent more than those used in standard Ethernet networks, noted David Willis, vice president of technology research services for the Meta Group, a market research firm. Users thus must determine whether the extra cost is worth the benefits for the size of network they operate.

Because of the advantages PoE offers, Willis said, companies are particularly interested in using the technology with their deployments of the increasingly popular IP telephony.

Data and electricity can travel over the same wires without interference because they operate at different frequencies. This phenomenon also lets service providers offer broadband Internet service over power lines ("Is Broadband over Power Lines About to Take Off?" *Computer*, June 2004, p. 18).

Devices that need more power than the new technology offers could still connect to PoE networks but get electricity from standard sources. ■

—Linda Dailey Paulson



**Power over Ethernet technology lets users obtain low-wattage electricity directly through their network connections. In a typical implementation, power applied to an Ethernet switch is sent out through a PoE hub to various objects that are connected to the network.**

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