Graphene Use Growing in Transistors and Other Settings

Researchers are increasingly using graphene as a potentially important substitute for silicon in transistors and now in other settings.

Graphene is a conductive sheet of carbon atoms arranged in a honeycomb pattern and bound together with double electron bonds in a film only one atom thick. Scientists consider it a good material for use in some types of transistors and integrated circuits.

IBM researchers recently developed traditional semiconductor-manufacturing techniques to make graphene transistors that operate at 100 GHz. This is much faster than silicon transistors of the same size. The scientists next plan to make the graphene transistors smaller and faster, and use them to build integrated circuits like those employed in microprocessors.

Rice University and University of California, Riverside, researchers have developed analog triple-mode graphene transistors that can amplify silicon transistors. The devices enable the building of simpler, smaller analog circuits. The scientists showed how the graphene devices could be used in simpler phase-shift keying and frequency-shift keying circuitry.

Vorbeck Materials is now selling Vor-ink conductive graphene ink, which a printer can apply to create wiring for various types of devices, including keypads and RFID antennas.

Sony Faces Wave of Cyberattacks

Sony Corp. has suffered a series of attacks on its PlayStation Network and other Internet services in different parts of the world, placing the huge company on the defensive as to the security of its operations.

Sony expects the hack of the PSN alone—which links millions of game players worldwide—to cost the company about $170 million this fiscal year. It has already been hurt by production disruptions and falling demand for its products and services within Japan by the massive earthquake that struck the country on 11 March.

An attacker accessed Sony’s PSN servers by hacking into an application server that sat behind a Web server and two firewalls. The PSN contained personal information for the 77 million users of both the network and the company’s Qriocity service, which streams audio and video to Sony devices. About 10 million of the users had uploaded their credit card information.

Sony shut down PSN for about a month and called in experts to conduct forensic audits and rebuild the network with enhanced security. After reopening the network, Sony said it had to plug another security hole that could have let hackers access PSN and Qriocity accounts again, the company said.

This later vulnerability reportedly was on a webpage customers used to reset passwords for their PSN and Qriocity accounts from their PCs, something they had to do to get back on the network. Hackers with a customer’s birth date and e-mail address—information stolen in the initial break-in—could have reset the user’s password.

Sony also discovered an attack on the Sony Online Entertainment network, which creates multiplayer online games for the PS3 and PlayStation Portable gaming platforms. SOE has 25 million users. Its stolen information included customers’ names, mailing and e-mail addresses, birth dates, phone numbers, login names, and hashed passwords.

Shortly after restarting PSN, Sony shut down some of its Internet services in Canada, Thailand, and Indonesia after detecting intrusions. Hackers stole the names and e-mail addresses of about 2,000 customers at Sony Ericsson Mobile Communications’ Canadian website. A Sony site in Thailand may
A British nonprofit organization is working on a $25 computer that could help young students learn programming and that is affordable for use in the developing world.

The computer developed by the Raspberry Pi Foundation—which promotes the study of computer science and related topics—would cost less than the machines that the better-known One Laptop per Child project is producing for children in less-developed countries. The One Laptop per Child project originally hoped its machines would cost $100, but they reportedly sell for more.

The Raspberry Pi Foundation’s simple computer—created by programmer and game developer David Braben—is about the size of a flash drive and runs a 700-MHz ARM11 processor. It has 128 megabytes of synchronous DRAM, enough for the system to run some Linux OS versions. The current prototype runs Linux Ubuntu. More storage is available via an SD memory-card slot.

Users connect a keyboard and mouse to a USB 2.0 port on the tiny computer. A GPU handles video and graphics. The device could be plugged into a TV or other display. Connecting a display to the computer’s high-definition multimedia interface (HDMI) port lets a user run high-definition video.

The device is powered via an external AC adapter and consumes about 1 watt at full load.

Braben said he expects the devices will be ready for sale within a year.

have been modified to help send fraudulent e-mails used in phishing attacks. The company said intruders also accessed one of its websites in Greece, endangering private information for 8,500 customers.

Meanwhile, hackers broke into the system run by Sony’s So-net ISP. So-net lets consumers earn reward points that they spend on merchandise and services. The attackers stole and redeemed points—worth about $1,200—belonging to 130 consumers.

Many people criticized Sony for not communicating information about its problems in a timely manner. Corporate officials said the problems they experienced were complex and required considerable time to sort out, thereby delaying public notification.

Some experts said the company’s security was lax. For example, Sony reportedly didn’t run a firewall on its PSN servers and used an obsolete version of the Apache Web server software. Also, the company said usernames and passwords weren’t encrypted.

Light Bulbs Connect to the Network

A Dutch semiconductor company has developed a technology that would give light bulbs their own IP addresses. This would let users operate and manage the bulbs from any Internet-connected device, including PCs and smartphones.

Using NXP Semiconductors’ technology, homeowners could turn lights on and off, or make them brighter or dimmer, as desired. In addition, owners of large buildings could remotely implement or change their lighting plans.

The company says this could enhance security and save energy. It would also be part of the so-called Internet of Things, in which an increasing number of machines, appliances, and other objects are connected to the Web and can be controlled online.

NXP designed GreenChip technology along with US lighting vendor TCP Inc. and Danish home-energy-management company GreenWave Reality. GreenWave provided an IP-based platform for wirelessly controlling networked bulbs.

GreenChip light bulbs operate on wireless sensor systems, which run via IEEE 802.15.4 personal-area-network technology. NXP’s JenNet-IP mesh-network software enables low-power wireless connectivity.

Study Says Smart Grid Will Entail Huge Costs, Offer Bigger Benefits

The implementation of smart-grid technology in the United States could cost up to half a billion dollars over the next two decades but would generate up to $2 trillion in benefits, based on a recent study by the nonprofit, US-based Electric Power Research Institute.

EPRI estimated deployment costs—for example, for the applications and the equipment and work necessary to build control centers and networks to customer premises—would run between $338 billion and $476 billion.

However, the institute said benefits—such as improved grid reliability and security, as well as reductions in power usage—could range from $1.3 trillion to $2 trillion.

Proponents and utility executives say most current smart-grid investments will be used to upgrade the power system’s efficiency, reliability, and profitability.

Some of the EPRI study’s other key findings were:

- Utility companies would bear most of the implementation costs.
- About 70 percent of new costs would pay for the replacement and upgrading of communications systems, meters, substations, lines, and other infrastructure elements.
- About 20 percent of the costs would pay for high-voltage transmission-grid improvements, including those yielding better security and more efficiency, as well as the implementation of sensors to provide alerts of potential problems.
- About 10 percent would be for smart-grid components going into homes, which would cause monthly electricity bills to increase by an average of $9 to $12.
Consumer adoption of smart-grid applications will occur slowly, with only 10 percent of residential customers having advanced systems by 2030. According to the study, many experts say the smart grid won’t really succeed unless it requires as little consumer participation as possible.

By 2030, less power usage would reduce carbon emissions by 58 percent over 2005 levels.

Obstacles to smart-grid implementation include problems by officials in reaching agreement on technical standards and the reluctance of utility commissions to take steps that would raise customers’ rates before the technology’s value has been shown. Also, smart-grid equipment might not last long before better versions come along. This could discourage utilities used to buying equipment that lasts as long as 40 years.

Researchers Bring New Type of Memory Closer to Fruition

Researchers have recently made significant advances in developing a new type of fast, power-efficient computer memory.

Scientists at the US National Institute of Standards and Technology (NIST) and George Mason University (GMU) are working on nanowire-based charge-trapping memory devices, which they say could enable portable computers and mobile phones to run for days without recharging.

These memory devices store information in elements—trapped deep within silicon-nitride layers—that carry an electrical charge.

Nanowire-based charge-trapping memory uses silicon formed into wires about 20 nanometers in diameter. The memory is nonvolatile and thus retains its data even after power is shut down, as is the case with flash memory.

Such nanowire devices are being studied extensively as the possible basis for next-generation computer memory because they promise to store information quickly and at low voltage. And, researchers say, unlike flash memory, the nanowire approach is so fast, it could be used in CPUs’ local cache memory, which must respond to data requests very quickly.

Several research groups are working on nanowires. However, the NIST and GMU scientists determined an effective way to use them is in charge-trapping memory devices. The NIST and GMU team determined the best structure for their use. For such devices to work well, the nanowires must be surrounded by thin layers of dielectric material, poor conductors of electricity often used as insulators.

Are Bendable Computers on the Horizon?

Canadian researchers have developed a prototype smartphone—complete with a touch-screen display—that is highly flexible.

Scientists at Queens University’s Human Media Lab say their approach could be used in new versions of smartphones, tablets, and other devices.

The PaperPhone prototype does everything a typical smartphone does, including storing reading material and contact information, playing music, and making calls.

The scientists said their technology looks, feels, and operates like a sheet of electronic paper. Users can interact with it like they do with paper by, for example, writing on the surface. They can also bend corners in various ways for different functions such as turning online books’ pages. Thin-film sensors let the phone recognize the way in which the device is bent in order to implement the commands.

The device has a 3.7-inch flexible electrophoretic display, in which charged particles move through a solution under the influence of applied current. The display doesn’t use power when it isn’t refreshed.

The researchers said flexible devices would be able to withstand harsh treatment, such as being dropped, without suffering damage. This could be useful in settings like construction sites. In addition, the machines would be lighter and easier to fold and carry. And they could come in different sizes and shapes.