

# GOVERNMENT TECHNOLOGY

SOLUTIONS FOR STATE AND LOCAL GOVERNMENT IN THE INFORMATION AGE



YEARS VOL 20 ISSUE 04

APRIL 2007

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Is regional wireless  
the next big thing?

**Back off:**  
Lidar targets  
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# WONDER SMALL

**Nanotechnology** is on the verge of changing everything — from cancer treatment to water desalination.

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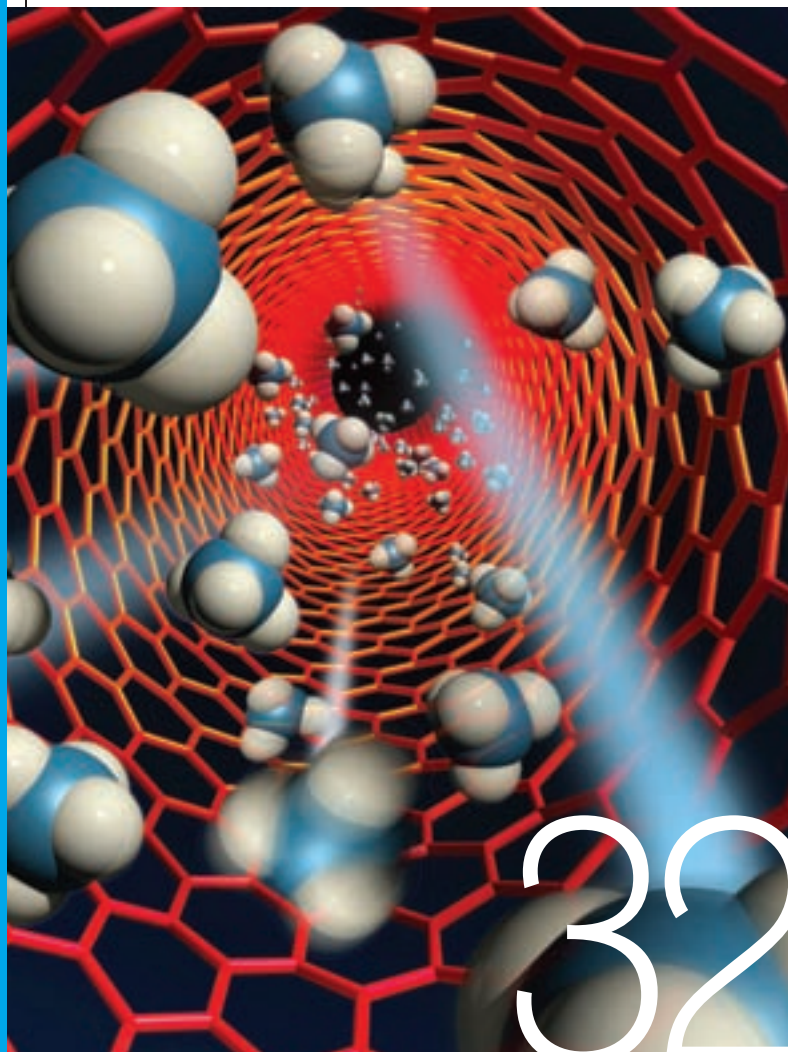
BY SHANE PETERSON



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Nanotechnology is on the verge of changing everything — from how we treat cancer to how we desalinate water.

BY CHAD VANDER VEEN

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*Government Technology* editors and Center for Digital Government analysts comment each week on the issues shaping public-sector IT.

## next month:

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# Reinventing Our Web Site



## Raise Your Voice

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**W**e talk plenty in *Government Technology* magazine about societal and technological forces that are changing government. But the truth is that many of those same forces are reshaping the publishing industry.

Just as your constituents expect to conduct much of their government business electronically, readers now demand a much richer and more relevant experience from publication Web sites. Like many publication home pages, the *Government Technology* Web site began

Just as important, the new site offers sophisticated personalization tools designed to make this potential overload of information relevant to you. For instance, a “My Briefcase” feature lets you compile resources from govtech.com — documents, videos, blogs, conference presentations, etc. — and material from other sites into a single page containing the information you need most.

By the way, you may have noticed I began calling the site “govtech.com” a few paragraphs back. That was no typo. With the redesign also comes a new name — but you’ll still be able

“For **20 years**, we’ve delivered ideas and best practices for **transforming government** through the pages of *Government Technology* magazine.”

as a place to archive magazine articles and present news briefs and other tidbits that didn’t fit in our printed pages. Clearly the stature of electronic media has grown since then, and govtech.net expanded along with it.

Now, after years of incremental change, the site is receiving a complete and badly needed overhaul. The new govtech.com, which launches officially in May, provides a portal into the full resources of *Government Technology* magazine and our corporate parent, e.Republic Inc.


That means you’ll find easily searchable story archives, as well as a wide range of original information and analysis from *Government Technology* writers and editors. But that’s just the start. Our new GTTV service will produce insightful video news segments featuring thought leaders in government and industry. And you’ll have convenient access to presentations from *Government Technology* conferences and events, as well as research and resources compiled by the Center for Digital Government.

to reach the site via the familiar govtech.net address, too.

Our goal isn’t just to bring you more information — although the new site certainly will accomplish that — but to present that material in unique and useful ways. We understand that your responsibilities are growing and, of course, the pace of technological change is greater than ever. That puts a premium on relevant information and quick insight.

Simply put, pressure to reinvent government is leading us to reinvent our Web site.

For 20 years, we’ve delivered ideas and best practices for transforming government through the pages of *Government Technology* magazine. The print magazine isn’t going anywhere — we think it’s better than ever, in fact. But the new govtech.com is the next evolution in fulfilling that mission.

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**STEVE TOWNS**  
EDITOR

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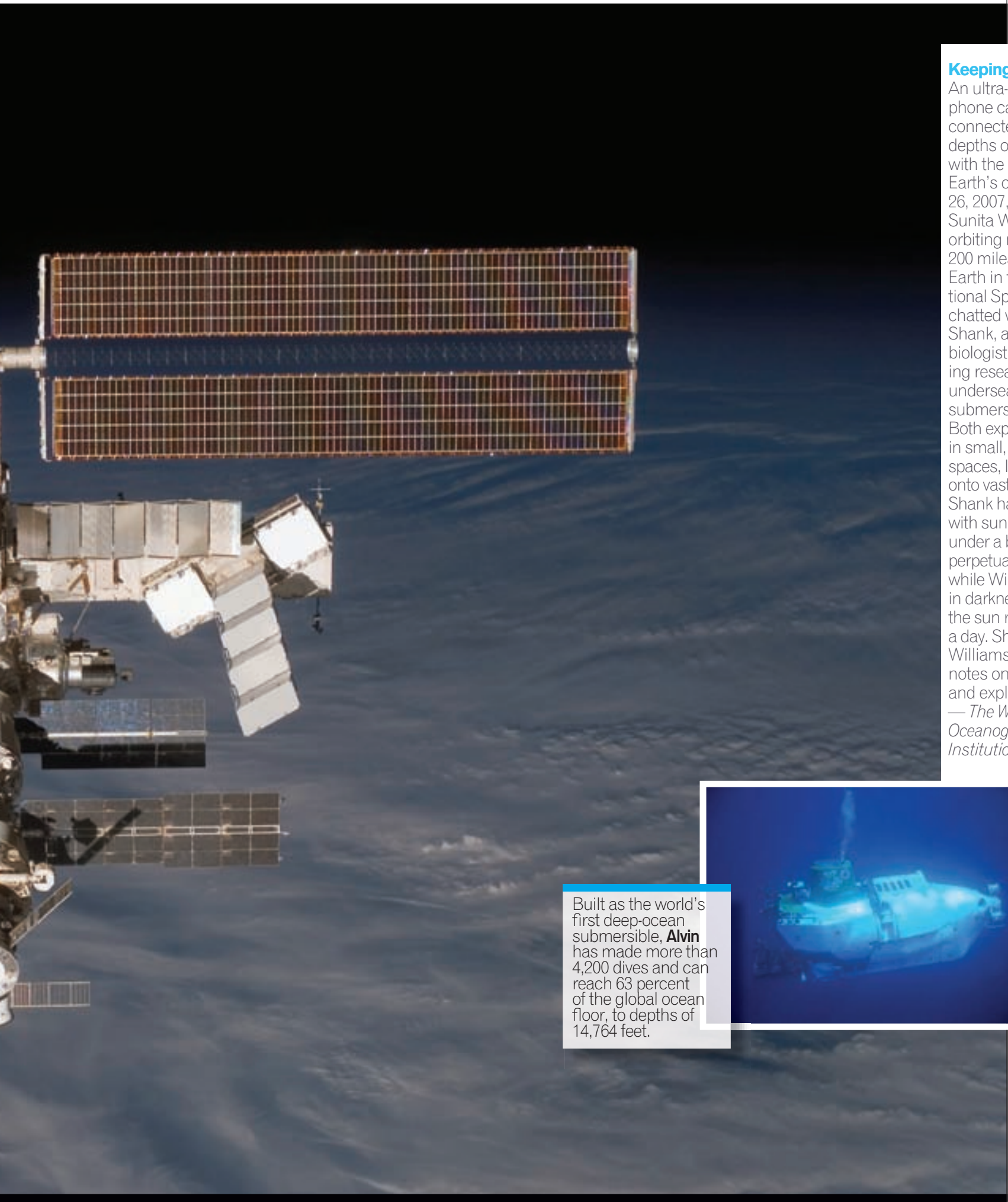
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# big picture

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### Keeping in Touch

An ultra-long distance phone call recently connected the depths of the ocean with the heights of Earth's orbit. On Jan. 26, 2007, astronaut Sunita Williams, orbiting more than 200 miles above the Earth in the International Space Station, chatted with Tim Shank, a marine biologist conducting research 2 miles undersea in the Alvin submersible. Both explorers work in small, confined spaces, looking out onto vast expanses. Shank has no contact with sunlight, buried under a blanket of perpetual darkness, while Williams floats in darkness but sees the sun rise 15 times a day. Shank and Williams compared notes on life, science and exploration. — *The Woods Hole Oceanographic Institution and NASA*

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# Taxes Through Time

It's April, and that means crunch time for tax procrastinators.

In decades past, waiting until April to file one's taxes either meant days of feverishly filling out paperwork, or trying to find a tax preparer who could somehow squeeze in one more customer. Today, anyone can file his or her federal taxes online as the IRS has offered an e-filing service for several years now. Almost every state with a state income tax has made online tax filing available, too.

Egyptian citizens paid their taxes with goods and labor — the labor was in the form of obligatory service, such as completing public works projects or serving in the army. In fact, Egyptians were among the most taxed people in history, and many scholars blame overtaxation for the mysterious collapse of ancient Egypt.

China was another great ancient civilization that relied on taxes in the form of labor. The Great Wall was built by citizens who could

“Instead of **writing** about the latest tax software, I thought we'd take a **journey** through the pages of history.”

Many columns and editorials published this time of year are filled with how-to advice, tips, secrets and other tax-related information — but not this column.

Call it the courage to be different. Call it the fact that I know next to nothing about preparing taxes. Either way, instead of writing about the latest tax software, I thought we'd take a journey through the pages of history for an in-depth look at the evolution of taxes and the various systems man has created for collecting them.


Nearly 8,000 years ago, the Sumerians of Mesopotamia, arguably the most advanced civilization on Earth at the time, thought up two of the greatest inventions of all time — the wheel and beer. Note the absence of taxes on this list of breakthroughs. The Sumerians, in their great wisdom, chose not to burden their people with a system of taxation. As such, Sumerian society flourished (unless, of course, you were a slave or non-Sumerian).

It was not until the rise of the Egyptian dynasties, in the third millennium B.C., that humanity was cruelly saddled with taxes.

not afford to give the government 20 percent of their crops. And what became of those great Chinese dynasties and their magnificent wall? Well, the dynasties vanished and the wall is a tourist trap.

Ancient Rome was also felled by aggressive taxation. Various Caesars funded their far-flung wars by imposing crippling taxes on Roman citizens — eventually levying some of the first recorded examples of property taxes, the most hated tax of all. The ruling elite eventually came to subsist entirely on the taxes paid by the working class, finally leading to Rome's demise.

Then, European civilization was gripped by a millennium and a half of breathtaking stupidity, where taxation remained a constant. Not until the great revolutions of the 18th and 19th centuries did mankind free itself from the tyranny of oppressive and complicated taxation systems, leading to the simple and efficient system we enjoy today.

No, wait, that's not right ... 

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# how **it** works

➤ Turning technology inside out



A passenger on the Front Range Express commuter bus traveling from Colorado Springs to Denver, Colo., connects to a Wi-Fi network inside the bus, allowing him to access the Internet and check e-mails while on his way to work.

## Wireless Express

Wi-Fi gives commuters free, uninterrupted Internet access on the road.

**T**HE FRONT RANGE EXPRESS (FREX) commuter bus with service from Colorado Springs, Colo., to Denver continues to improve its Wi-Fi access for customers, all on a shoestring budget.

### Then

In the Wi-Fi system's first version, the Colorado Springs Transit Services Division placed a laptop and a wireless router on each FREX bus. The laptops contained an AT&T Wireless Edge modem card, and used Windows 2000 Internet

Connection Sharing to access and distribute the Internet connection. The agency obtained surplus laptop computers from a local utility company, purchased the wireless routers for about \$75 apiece, and began paying approximately \$50 per month for the wireless data service.

### Now

In January 2005, the agency switched to a system that is integrated with the automatic vehicle location (AVL) unit installed on the FREX fleet by Verotrak.

Each bus carries a Linux-based vehicle-tracking unit, which includes a GPS receiver and a wireless Sprint cellular modem for data communications. The vehicle-tracking unit is connected to a wireless access point that shares an Internet connection with bus riders.

The AVL unit is hard-wired into the bus' electrical system and is automatically activated, along with the Wi-Fi capability, when the engine starts up. The AVL tracking data is so low-bandwidth that the system still has plenty of room to provide Internet service to bus riders.




Using a wireless cellular modem, the Front Range Express picks up signals from **cellular towers** along the commute for Internet access.



The bus carries a Linux-based vehicle tracking unit, which includes a **GPS receiver** and a **wireless cellular modem**.



A **wireless access point** is connected to the vehicle tracking unit and shares Internet access with bus riders.

By building upon the existing AVL system in each bus, the agency upgraded its Wi-Fi access for travelers at little cost. Verotrak and the Transit Services Division are now looking to improve the AVL and Wi-Fi service by using satellite communications, possibly with cellular backup, and Verotrak software that will maintain link integrity in a mobile environment. 



reports from the IT horizon



## Sex Offender Database

New database technology was donated to the National Center for Missing and Exploited Children (NCMEC) by

MySpace and Sentinel Safe. The national, searchable sex-offender database contains data on an estimated 600,000 registered sex offenders in the United States. It gives the NCMEC an additional resource to assist federal, state and local law enforcement with investigations regarding missing child cases, Internet-facilitated

crimes against children, locating registered sex offenders and potentially identifying fugitives, among others.

The database receives updates from state sex offender registries and is currently used by a MySpace safety team to monitor the MySpace community for convicted sex offenders.

—MISSINGKIDS.COM



## Ready for Take-Off

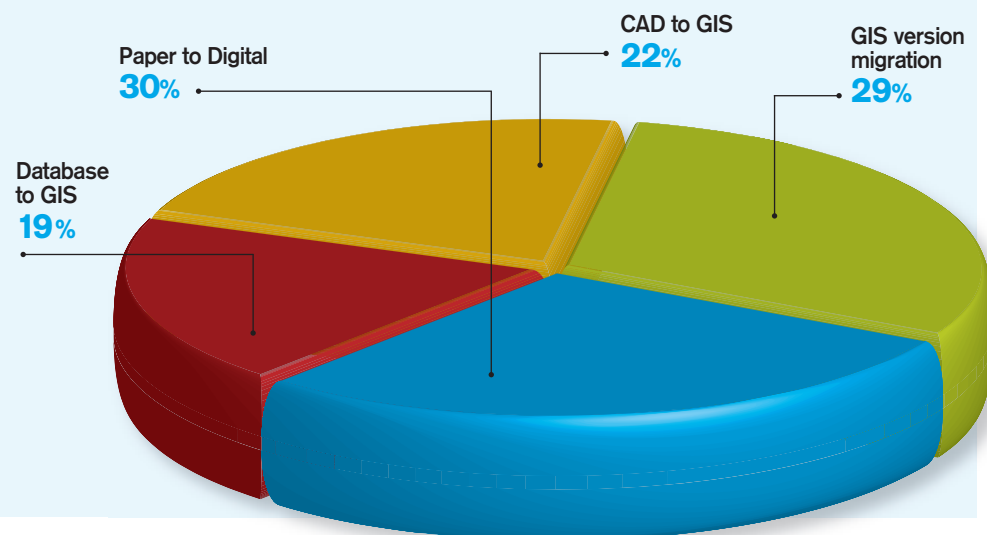
A B-52 Stratofortress powered by a mix of synthetic fuel touched down at North Dakota's Minot Air Force Base Jan. 17 to begin cold-weather testing, the last step in the testing and certification process to help reduce the Air Force's dependence on imported fuel.

The aircraft, permanently assigned to the base's 5th Bomb Wing, underwent ground testing to determine how well the synthetic fuel, made from a 50-50 blend of traditional crude oil-based fuel and a fuel derived from natural gas, performs in extreme weather conditions.

The first B-52 flight using synthetic fuel occurred Sept. 19, 2006, at Edwards Air Force Base in California — an aviation first. Since then, the aircraft has been tested extensively, and has made flights with synthetic fuel in all eight engines. — *Minot Air Force Base Public Affairs Office*

## Conversion Cost

The Geospatial Information and Technology Association's 2006 *Geospatial Technology Report* — an independent survey of government IT users — found that conversion of older services, such as paper to digital, has consumed a large share of funding dollars, shown here as percentages of monies spent overall.



Send spectrum ideas to associate editor **Shane Peterson** <[speterson@govtech.net](mailto:speterson@govtech.net)>

## Open Foundation

The Open Source Development Labs and the Free Standards Group joined forces to create the Linux Foundation, formed to close the gap between open source and proprietary platforms, while sustaining openness and freedom of choice. — *The Linux Foundation*

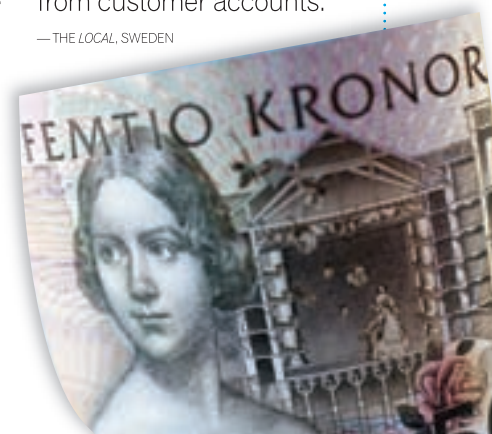
## Online Heist

In what's being called Sweden's "biggest ever" online bank heist, Swedish bank Nordea lost between 7 million and 8 million krona — the equivalent of \$1.1 million USD — in mid-January. Approximately 250 customers are thought to have been affected by the fraud after falling victim to phishing

e-mails. The bank said users were redirected to a false home page, where they were prompted to enter important login information. After entering the information, an error message appeared, informing the user that the site was experiencing technical difficulties. Criminals then used the harvested customer

details on the real Nordea Web site to take money from customer accounts.

—THE LOCAL, SWEDEN





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**Regional clouds** could be the next generation of municipal wireless networks, but governments must collaborate.

BY SHANE PETERSON | ASSOCIATE EDITOR  
PHOTO BY LYLE KRANNICHFELD

rado cities joined to pursue the goal of affordable wireless broadband for the region encompassing the cities. The cloud will improve government efficiency, promote digital inclusion and stimulate economic development.

Fast forward to January 2007; the CWC released an RFP for a “universal, affordable wireless broadband network” to serve an expanded CWC membership of 10 cities sprawling over an area of 197 square miles and playing home to approximately 620,000 people.

Over the course of 2006, the CWC retained Civitium — a consulting firm that specializes in local governments and wireless technologies, especially Wi-Fi zones and clouds — to study the viability of a regional Wi-Fi cloud. The company arranged focus group meetings with 236 participants representing 11 groups of stakeholders from government and outside entities to judge interest and support.

Forty-seven percent of the participants were CWC city employees representing four categories of city agencies; the remaining 57 percent came from 151 community groups, including universities, economic-development entities, the private and nonprofit sectors, health-care organizations, federal agencies and residents.

Thornton, Colo., acted on behalf of the CWC to issue the RFP, said Mark Bennett, Thornton’s IT director, adding that five communities assumed lead roles in the CWC project. “One took charge of the Web site,” he said. “One took charge of putting together a lot of the statistical information and demographics that went into the RFP; one took care of the mapping and so forth; and our role was to facilitate putting the RFP out onto the street.”

The “founding five” CWC communities approached a dozen other communities in the region, five of which agreed to join, Bennett said, adding that the others expressed doubts about having the necessary resources to participate or whether their respective city councils considered a Wi-Fi network a high political priority.

The CWC’s genesis was a series of informal, grass-roots talks in mid-2005 between CIOs of the five founding cities, who discussed the feasibility of a wireless cloud covering the cities. A year later, and after recruiting five more cities, the CWC was formally launched.

“That was when we had the 10 communities sign a memorandum of understanding [MOU], and that MOU loosely bound us all to the project,” Bennett said. The MOU created a framework for the CWC from which the members could issue a joint RFP. In addition, the MOU set forth details about sharing costs,

# Cloudy Forecast

Cities and towns have recently gotten plenty of practice in striking creative deals with the private sector to get citywide wireless networks off the ground. The most recent estimates suggest that 300 municipal wireless projects were under way as of August 2006.

That practice should come in handy as communities turn to regional wireless clouds that will cover hundreds of square miles and provide wireless Internet access to hundreds of thousands of people. Regional clouds represent the next step in municipal wireless networks’ evolution.

To this point, cities and towns created wireless zones in strategic areas — downtown

or tourist destinations — to target specific crowds. These zones covered areas from a couple of blocks to perhaps a square mile.

Now when launching the regional clouds, cities and counties can use their aptitude for compromise in crafting agreements with each other — but these deals might prove more complex as governments negotiate access to infrastructure assets and intergovernmental agreements’ structure and language.

## Colorado Cloud

Ten Colorado communities have already made significant progress on such a partnership, creating the Colorado Wireless Communities (CWC) in April 2006, which formed when Colo-



**Ten Colorado cities** make up the **Colorado Wireless Communities:** Arvada, Boulder, Broomfield, Golden, Lakewood, Louisville, Northglenn, Superior, Thornton and Wheat Ridge.

such as legal and consulting fees, associated with issuing the RFP.

## Assets in Play

The CWC is now taking the next step.

“We’re going through a formal intergovernmental agreement [IGA] process with the 10 communities,” Bennett said. Such an agreement is needed to give the CWC legal standing as a government entity operating as a nonprofit — assuming the 10 communities can come to terms on the IGA’s structure and language.

“Whoever is awarded the bid will actually be in contract negotiations with the CWC, not with 10 individual communities,” he said. “That was really what we were trying to achieve. We felt if we could come up with a single entity that a private-sector carrier would have to negotiate with, it would be a lot more attractive than having to deal with multiple entities that have different needs and agendas.”

Even with the RFP’s release, the CWC must determine how to clear several hurdles — perhaps the most significant of which involves member cities’ infrastructure assets. “Assets are still going to be one challenge of the project because each city has its own constraints as to what it can or can’t offer up,” Bennett said. “There are some legal mechanisms we’re trying to get off to the attorneys to figure out how to deal with some of these constraints.”

The problem stems from the difference between city charters and which permits a private-sector company must obtain from a city to gain access to infrastructure assets, such as rights of way, traffic light poles or street sign poles, he said. The 10 CWC communities will discuss asset issues as part of crafting the IGA.

Another asset issue concerns how a commercial vendor could access the region’s power poles, which are owned by Xcel Energy. “This creates a fairly large challenge,” Bennett said. “In some other initiatives around the country, the cities themselves own the power poles, which make it a lot easier.”

Civitium is negotiating with the energy company about a pole-lease rate, which should help keep the project attractive to vendors replying to the RFP.

## County Wi-Fi

A couple thousand miles away, two New Jersey counties, Camden and Gloucester, announced plans in December 2006 to begin work on a joint Wi-Fi network that would cover their combined 550 square miles, and offer free or low-cost service to 800,000 residents.

It’s early in the process, said Steve Sweeney, director of the Gloucester County Board of Chosen Freeholders, and the counties began 2007 by putting the RFP together and searching for a firm to perform a feasibility study of the proposed Wi-Fi cloud.

The RFP was slated for release in March. At the end of the 90-day response period, Sweeney said, the counties will consider their options, including what proposed business model would work best for the Wi-Fi cloud.

Sweeney said the counties became interested in collaborating on a Wi-Fi cloud because alone they were at a disadvantage with respect to economic development opportunities, and they didn’t already have countywide broadband to speak of. “If we can come up with a Wi-Fi network, it will make our region much more competitive,” he said. “My county has roughly 275,000 residents. Camden County has 500,000 residents. Individually we’re not a big enough market for someone to be really attracted to. Together, we feel we’re more attractive.”

Sweeney, who’s also a state senator, said some towns in his legislative district, which covers southern New Jersey, are so small that residents don’t even have cable TV — a harsh economic reality that he said he understands. “For the cable companies and the Verizons of the world, it’s not profitable to run their technology down there,” he said. “There aren’t enough customers. A Wi-Fi cloud will give these communities the potential to have Internet access at a very affordable price, whether it be free or low cost.”

Neither county assumed a “lead” role, according Sweeney. Both counties’ IT departments pitch in where necessary, and both counties kicked in \$125,000 each to fund the feasibility study. If the cloud gets built, the counties would encourage other, surrounding counties to join the network. And there is precedent for county and municipal collaboration. In 1999, Sweeney said, Gloucester, Camden, Salem and Cumberland counties —



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# Connected Clouds

together with school districts, municipalities and other government agencies — created the South Jersey Power Cooperative. In Gloucester County alone, 17 municipalities and school districts belong to the cooperative.

## Outdoor Wi-Fi

In New York, Suffolk and Nassau counties have launched WiFi Long Island with the goal of providing Wi-Fi access to all 900 square miles of Suffolk County and 300 square miles of Nassau County. The push for the Wi-Fi network came from Steve Levy, county executive of Suffolk County, who created a 15-member Suffolk County Wireless Commission (SCWC) in February 2006 to orchestrate the WiFi Long Island initiative. The SCWC includes representatives from the private and public sectors, higher education and other entities.

WiFi Long Island differs from other municipal Wi-Fi initiatives because the goal isn't to provide service inside every home in the two counties, said Sharon Cates-Williams, CIO and commissioner of Suffolk County's Department of Information Technology. Cates-Williams also serves as co-chair of the SCWC, along with legislator Wayne Horsley.

Just a few miles east of Silicon Valley, the Wireless Sacramento Regional Project (WiSac) is working to plan, fund, develop, select, build and test an interoperable broadband wireless network to cover the Sacramento region's metropolitan and rural areas, said John Ramos, president and CEO of the Smart Capitol Venture (SCV) Network.

The SCV Network manages the WiSac project, Ramos said, and the WiSac network, which was officially announced in September 2006, could ultimately provide wireless services to nine counties and 30 municipalities.

Since then, Ramos said he's met representatives from cities in Placer County — Loomis, Lincoln and Roseville — and Woodland, located in Yolo County. Colusa County has also expressed interest in WiSac. "I've also presented WiSac to Solano County, Vacaville, Benicia and Fairfield."

WiSac is using the RFP from Wireless Silicon Valley as a template because of that RFP's inclusive nature. "Needs should be determined that are common to all of the individual stakeholders," he said. "And there are unique things that need to be accomplished through the RFP process that are unique to each community — whether a municipality or a county."

If the WiSac network is built, he said, it could link to the Wireless Silicon Valley cloud, though not directly. "Conceivably once Wireless Silicon Valley is operational and deployed, and the WiSac regional project has been implemented and deployed, the Capitol Corridor project could bridge the two regions and provide seamless mobility capabilities," he said. "If you put those two regions together, tied with the Capitol Corridor, you're looking at a very large area."

The two counties issued an RFP in January 2007, and set a deadline of March 19, 2007, for interested vendors to submit proposals. Suffolk and Nassau formed a nonprofit entity known as the Wireless Suffolk County Local Development Corporation (LDC) in late 2006 to negotiate with local governments inside the counties for access to assets owned by towns, villages and utility companies.

"The local development corporation would do all the legwork so the responder [to the RFP] won't have to go to every town and village," Cates-Williams said, adding that WiFi Long Island leaders may create a global agreement between the Wireless Suffolk County LDC and the 107 municipalities on Long Island.

"For example, should the provider need to install a wireless node on a facility or street-

light located and owned by a town or village, the global agreement would define the permitting process and ultimately eliminate the need to negotiate on an individual basis," she said. "We don't know if the towns and villages are going to accept it, but we do plan to recommend this method of operation."

The two counties expect a good crop of vendors to vie for the right to build the network, given the level of response to the initial RFI released in July 2006.

Heavyweights such as IBM, Motorola, Verizon and Cablevision replied to the 2006 RFI, as did National Grid Wireless, a U.S.-based subsidiary of National Grid. The parent company delivers electricity and natural gas to the Northeastern United States, and National Grid Wireless provides telecommunications infrastructure and wireless services.

The SCWC's inclusion of representatives from higher education — specifically from the Center for Excellence in Wireless and Information Technology (CEWIT), one of Stony Brook University's three research and development incubators — also sets WiFi Long Island apart from other municipal Wi-Fi initiatives.

When Suffolk's Levy first considered WiFi Long Island, he met with the CEWIT's CEO, who's also the dean of Stony Brook's College of Engineering and Applied Sciences, to discuss the merits of the idea, Cates-Williams said.

"We think the educational institutions on the island are really going to benefit from this wireless initiative," she said, adding that CEWIT is contributing to WiFi Long Island by committing staff expertise to the initiative. "CEWIT is doing some amazing things. It's a new facility. They're going to have incubators, and will be doing all kinds of research. The wireless project fits in with their whole mission."

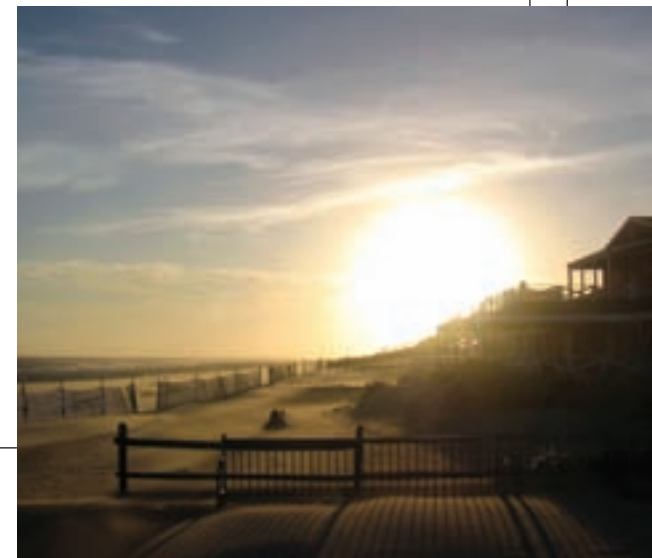
Just south of Seattle, the **Pierce County Wi-Fi network** will cover roughly 1,500 square miles. And in mid-2006, the Rainier Communications Commission, a countywide consortium of municipalities, voted to give the contract to CenturyTel, which will provide Wi-Fi service to Pierce County's 754,000 residents.



PHOTO BY LYLE KRANNICHFELD

"We're talking about an outdoor network," Cates-Williams said. "It's another level of service, because we recognize that, in the future, more work is going to be done outside the home. There's going to be more of a need for a mobile work force. We already have a mobile work force out there, and we want to help them operate more efficiently."

The wireless network would provide a backbone for service providers that, in turn, would offer tiers of wireless connectivity to residential customers. The counties themselves will not own or operate the network.





## Silicon Cloud

With a roster including more than 40 city and county local governments, California's Wireless Silicon Valley is the biggest public-sector partnership created to form a regional wireless cloud. When completed, the Wireless Silicon Valley initiative will create a wireless network covering a 1,500-square-mile region that's home to approximately 2.4 million residents.

Two member cities, Palo Alto and San Carlos, played guinea pig in early February. Their respective city councils became the first to approve two model agreements — one setting the terms of general wireless services for communities and the other stipulating enhanced services that meet public-sector agencies' needs.

The agreements serve as templates for other local governments' use, and will make it simpler for Metro Connect — a coalition including Cisco Systems, IBM, Azulstar and SeaKay — to negotiate with the cities and counties constituting Wireless Silicon Valley. Metro Connect won the RFP in September 2006 to build the wireless network.

By approving the agreements, the two cities became testing grounds for the Metro Connect technology behind Wireless Silicon Valley, said Brian Moura, assistant city manager of San Carlos and co-chair of the Wireless Silicon Valley task force. “[The Metro Connect coalition] wanted to get one city in each of the two main counties,” Moura said. “They also wanted different cities. Palo Alto has its own electric utility so it's a different animal than say, San Carlos. While we own the streetlights in San Carlos, our power comes from PG&E [a private utility company].”

“In one respect, Metro Connect is deploying the technology that they envision using for

**Palo Alto** and San Carlos, Calif., were guinea pigs in the Wireless Silicon Valley public-sector partnership. Each city council approved two agreements — one set the terms of general wireless services; the other stipulated enhanced services.

the whole network in these two communities,” Moura continued. “But they're also testing all of the other processes — how you get a permit or what other cooperative agreement you need.”

The two cities' one-square-mile test zones incorporate a mix of customers — small businesses, schools, residences and parks — to test the load that a diverse blend of wireless users will put on the network, he explained.

Getting to this stage required some creative thinking by the winning vendor team and the participating local governments, Moura said.

Since September 2006, the Wireless Silicon Valley task force has been negotiating three agreement documents with the Metro Connect team, and both sides have made significant progress. Two of the agreements cover service levels, and the governing body of each participating city or county will have to approve the model agreements so Metro Connect can begin installing the necessary equipment.

The other document is a joint powers agreement to define the governance structure for the network, and how that governing entity will work with Metro Connect. “We're in the process of creating a new entity called the Wireless Silicon Valley Authority,” Moura said. “That was an interesting decision. There were mixed feelings about it. We're also thinking we might set up a steering committee to work across the two groups to coordinate the whole project.”

Wireless Silicon Valley is more than just a wireless broadband network, he said. In fact, Wi-Fi compatibility is secondary to what the network is designed to accomplish.

The network will be designed to test public safety applications that ride on specified network frequencies; backhaul technologies, whether fiber, microwave or optical fiber; and services for the private sector on higher network frequencies.

“Really the purpose of this is to provide not only regional broadband wireless coverage, but also to provide a technology platform for not only the cities and counties but also for residents, small businesses and venture capitalists,” Moura said. “We're trying to address a lot of different markets here.” 



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# Stretching Resources

**Synopsis:** Schools use dumb terminal product to turn one PC into four workstations.

**Jurisdictions:** Orangeburg Consolidated School District Four, Orangeburg County, S.C.; Galt Joint Elementary School District, Galt, Calif.

**Technology:** NComputing PC sharing hardware.

**Contact:** Randy Johnson, director of technology, Orangeburg Consolidated School District 4, 803/534-8081, <[randy@orangeburg4.com](mailto:randy@orangeburg4.com)>.

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Schools save money when four students share the assets of one PC.

**T**here's one tiny problem with personal computers: They keep getting better.

New software demands more processing power, hardware developers oblige with new machines, and before you know it, last year's top-of-the-line PC is this year's antique. That's why organizations set up regular cycles for upgrading or replacing PCs.

For cash-strapped public schools, however, that's not necessarily an easy task.

Case in point: Orangeburg Consolidated School District Four in Orangeburg County, S.C. As of last summer, Randy Johnson, the district's director of technology, was responsible for 1,600 PCs used in classrooms and administrative offices across nine buildings. About 1,000 of those machines were too old to run all the software the schools needed.

Normally Johnson would have bought 1,000 new computers. But instead, he bought 250 Xtenda packages, a product that allows one PC to support up to three dumb terminal workstations. He bought 60 new PCs, got rid of more than 400 outdated computers and upgraded some of the others. Today, the district has more workstations than before, including 1,000 that are up to the latest standards.

"All it cost us was the price of the Xtenda cards, which was about \$50,000, and the cost of 60 new computers, which was about \$48,000,"

Johnson said of taking that route instead of buying all new computers. "We probably saved half a million dollars."

The Xtenda is one of several network computing products that NComputing of Redwood City, Calif., markets to schools and other organizations that need numerous computers but aren't swimming in cash.

It consists of a PCI card installed in any personal computer running a Microsoft Windows or Linux operating system, plus three "Xtenda Multi Boxes" that connect to the card via network cables. Each box, about the size of a pack of playing cards, contains ports for connecting a monitor, keyboard and mouse.

## Wasted Power

Software that comes with the package allows a PC to act as a server for three dumb terminals, said Stephen Dukker, chairman and CEO of NComputing, adding that in creating the Xtenda, the company exploited the fact that most applications use only a fraction of a PC's resources.

"For normal usages of computers," Dukker said, "these things have become so immensely powerful that they're being wasted."

A user can install as many as two Xtenda cards in a PC, creating up to six extra worksta-

tions. The dumb terminals must sit within 30 feet of the PC, but that configuration is fine in classrooms or work clusters, Dukker said.

Another product line, the L Series, is based on an Ethernet card that's installed in the PC and runs over a local area network. Though the Xtenda works on low-end PCs available for as little as \$350, the L Series requires a more powerful computer — something in the \$1,000 range, Dukker said. The L Series also costs more — about \$200 per desktop, he said, but it allows one PC to support as many as 30 dumb terminals with no distance limitation.

Dukker said the company has sold 10,000 seats worth of its units to schools in North Carolina. The company specifically targeted smaller, more cost-sensitive schools, and districts that lacked sophisticated IT organizations, he said.

However, more recently the company has pursued larger school districts.

Johnson tested five Xtenda units in summer 2006 before making his purchase. The Xtenda technology saves his district money up front, he said.

"The ongoing saving is going to be tremendous, as long as it continues to perform as it's doing right now," he said. In the future, when the district needs even more computing power, it will have to upgrade only the PCs, not the dumb terminals they serve. "You just upgrade

BY MERRILL DOUGLAS | CONTRIBUTING WRITER

one [computer], and all four are working at the same level.”

Minh Do, technology coordinator of the Galt Joint Elementary School District in Galt, Calif., took a demo Xtenda unit in early 2006 and then, during the summer, ordered and installed approximately 40 to meet the needs of two of the district’s schools. The goal was to standardize one school’s Windows PCs by replacing 50 aging Apple Macintosh computers. The district replaced 50 older computers at a second school.



## Half Life

“We were up against trying to purchase a whole new system for each, a one-to-one replacement,” Do said, explaining that the new systems he had in mind cost \$1,500 apiece, so buying four would have cost \$6,000. But buying one new computer and an Xtenda unit cost about \$1,750.

Do also bought new monitors, mice and keyboards for the Multi Boxes, but the total price tag for four workstations was still less than half the cost of four new computers, he said. Just to be on the safe side, the Galt dis-

trict constantly focusing on corrective maintenance,” Johnson said.

If only one in every four desktops sports an actual computer instead of a dumb terminal, that means fewer opportunities for breakdowns, Do said, also acknowledging that there’s also a flip side of having to rely on the viability of one computer

“If one goes down,” he said, “the other three can’t connect.”

An additional benefit the dumb terminals provide, Dukker said, is that they’re invulnerable to security breaches. Unlike a thin client machine, an Xtenda Multi Box has no central processing unit, no memory and no storage.

“For normal usages of computers, these things have become so **immensely powerful** that they’re **being wasted.**”

Stephen Dukker, chairman and CEO, NComputing

trict bought a separate license for each desktop for the Windows operating system, as well as Microsoft Word.

“I’m not sure if we absolutely had to do it,” Do said, noting that licenses for other applications allow them to run across the district’s entire network.

Orangeburg’s agreement with Microsoft allowed the district to buy remote-station access-licenses for Windows for the dumb terminals, Johnson said. For most of the district’s applications, licenses are based on the number of user seats, rather than the number of CPUs, so it doesn’t matter whether students are sitting at terminals or PCs.

Besides saving money on the hardware, Johnson and Do said the Xtenda units reduce labor since only the host computer needs technical attention — the dumb terminals require no maintenance. In Orangeburg, four technicians work on computer and telecommunications technology across the district.

“Now they can spend more of their time doing preventive maintenance rather than

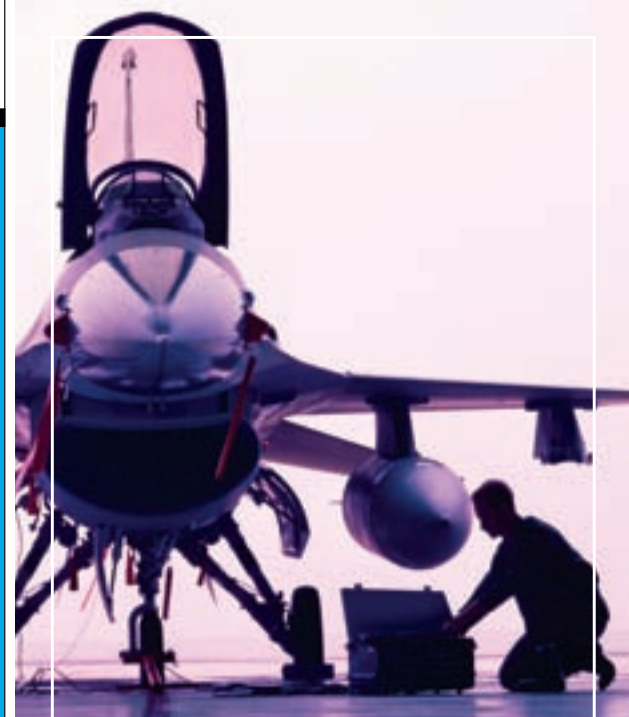
“It’s totally impervious to things like viruses, because you can’t put anything in it,” Dukker said.

Do plans to show the technology to officials at some of the other schools in the Galt Joint Elementary School District to see if they’re interested in using it. He said he hasn’t heard of any other school districts near Galt, which is about 30 miles south of Sacramento, Calif., using NComputing’s technology.

Technology directors in several districts near Orangeburg plan to evaluate the Xtenda units, Johnson said.

“Some want to visit our site and see what we’re doing with them,” he said. “It’s a bold move, and not everyone is comfortable trying to make such a move. I think a number of them are probably going to at least try some this year and see how they function for them, and then move to a larger number.” <sup>GT</sup>

CONTRIBUTING WRITER MERRILL DOUGLAS <MDOUGLAS@STNYRR.COM> IS BASED IN UPSTATE NEW YORK. SHE SPECIALIZES IN APPLICATIONS OF INFORMATION TECHNOLOGY.



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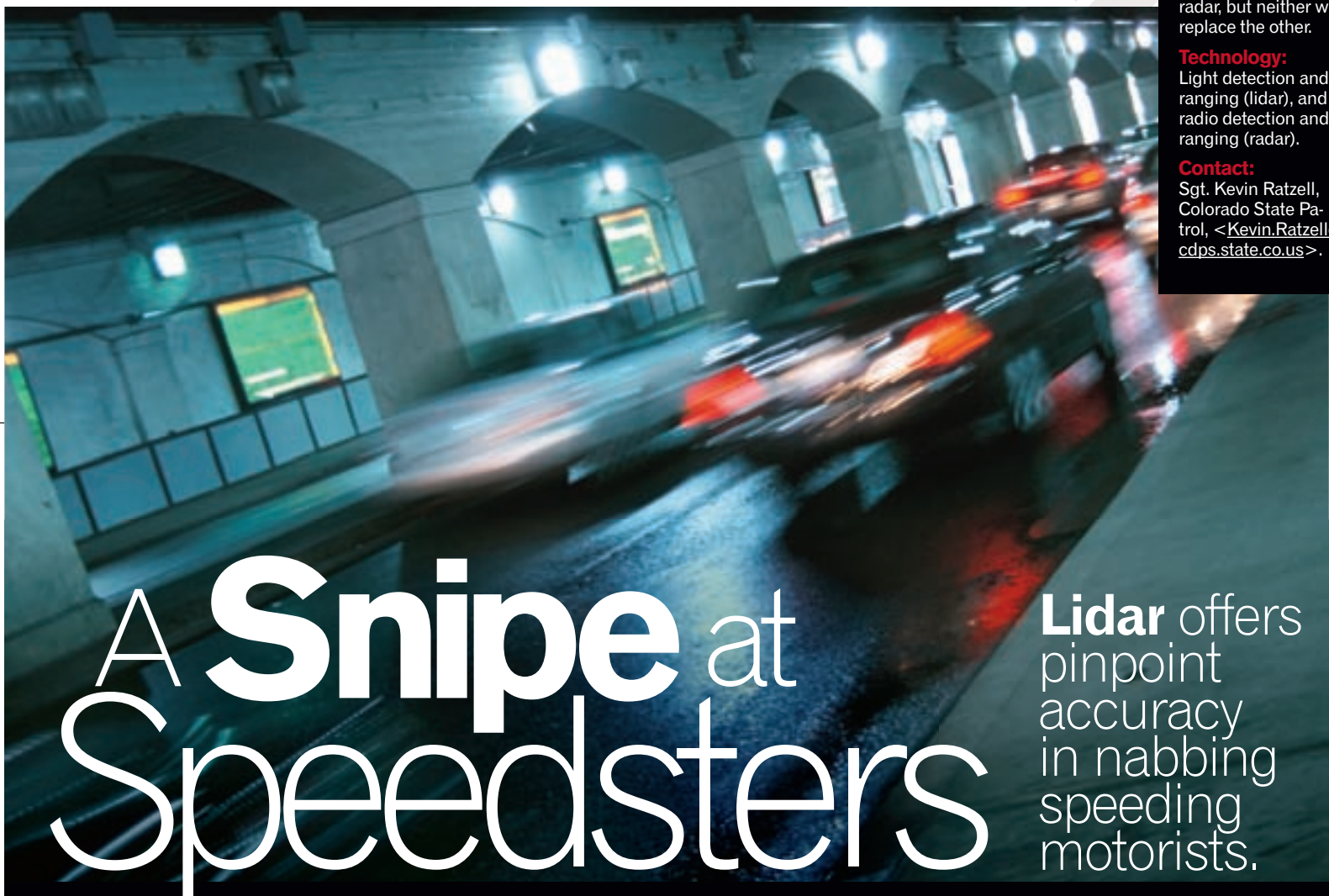


**Synopsis:** Lidar offers various jurisdictions additional benefits compared to radar, but neither will replace the other.

**Technology:** Light detection and ranging (lidar), and radio detection and ranging (radar).

**Contact:** Sgt. Kevin Ratzell, Colorado State Patrol, <Kevin.Ratzell@cdps.state.co.us>.

state  
local  
federal



# A Snipe at Speedsters

Lidar offers pinpoint accuracy in nabbing speeding motorists.

If using radar to catch speeding motorists can be described as throwing a net over a wide area in hopes of catching something, then lidar is a rifle shot, pinpointing the intended quarry. But both have their places in law enforcement, and neither can replace the other.

Radar has been used for decades with more than adequate results, and lidar has come onto the scene in recent years as a viable companion to radar.

Radar — short for radio detection and ranging — sprays a web of high-frequency radio waves in a cone shape, finds an object, and gauges its speed. Radar uses electromagnetic waves, or radio waves, to locate moving or fixed objects. A radar beam used for tracking the speed of motor vehicles is typically 12 feet wide and 100 feet long.

It uses the Doppler principle, which measures frequency change. The radar transmits a microwave frequency that bounces off the vehicle and returns to the initiator. The vehicle's speed is calculated by measuring the difference between the frequency that reached the vehicle and the frequency that returned.

The radar frequency, or beam, is conical in shape and reaches outward until it is reflected,

refracted or absorbed. The range of the beam can be controlled by the operator. Radar disperses its beam and clocks any vehicle that enters that beam.

A benefit of radar is that it can be used in a moving vehicle, whereas a lidar operator must be stationary.

Much like the technology used by surveyors, lidar — short for light detection and ranging — shoots a laser at a target to measure its distance and speed. This laser beam is about 1 foot to 3 feet in diameter, and with its approximate 1,000-foot reach, lidar has a wider range than radar. Another advantage of lidar over radar is that it lets police target a specific vehicle.

## Closing in on Tailgaters

Lidar's ability to measure the distance between moving vehicles is a relatively new feature of the technology that police increasingly use to bust tailgaters.

The officer sets the gun to measure the distance between himself and the center of a traffic lane. When two cars pass by, the gun tracks the speed of both cars and calculates the distance between them.

The Colorado State Patrol uses this function in heavy traffic to target aggressive drivers as well as speedsters.

"Lidar works extremely well in heavy traffic conditions," said Sgt. Kevin Ratzell. "The laser beam allows the officer to individually pick out a violator's vehicle even while in a group of cars."

The Colorado State Patrol also uses lidar to take accurate measurements at accident scenes by measuring skid marks, reference points and so forth. "This is great stuff that radar does not have the capability of doing," Ratzell said.

The Arizona Department of Public Safety recently purchased nine lidar units and uses them primarily to bust speeding motorists. But a side benefit, and one that the department sought when it made the purchase, was the feature that measures the distance between cars.

"That was one of the benefits we were looking for," said Tom Mason, public information officer for the Department of Public Safety. "Lidars are like a blender; they come with different functions within them. You can get upgraded versions. We elected to purchase them with that extra [tailgating] feature on it. People don't think [tailgating] is dangerous. They don't understand why it's illegal,

BY JIM MCKAY | JUSTICE EDITOR

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CONTINUED FROM PAGE

and we've definitely gotten the message out by using those instruments. It's been a really good tool."

About two years ago, the Newark, Del., Police Department had grant money to spend and considered either lidar units or radar units.

"At least with laser you can get the most flagrant offenders."

But Newark, primarily an urban area, has found that there are also disadvantages to lidar.

"In an urban setting it's absolutely horrible, because if a telephone pole gets into the way of



"The Colorado State Patrol found that lidar works **extremely well** in heavy traffic conditions. The reason for this is the laser beam allows the officer to **individually pick out** a violator's vehicle even while in a group of cars."

Sgt. Kevin Ratzell, Colorado State Patrol

"The decision was to give lidar a chance," said Master Cpl. Curtis Davis. "It wasn't a new technology, but it was technology that was just hitting the mainstream at that time."

## Pros and Cons

Newark bought two units then later added five more. Lidar has its place in Newark, but will not replace radar, Davis said.

"In rural environments, open roadways and limited-access roadways, lidar is absolutely fabulous. The range is incredible, and you can zero in on a specific car so that you're not getting the slower vehicle."

The advantage, Davis said, is that if a group of cars is approaching and one is clearly going faster than the others, the officer can target that car.

With radar, any of the cars that come into the stream can trigger a response.

"Laser is different from radar because you're used to throwing it out there, and whoever is going too fast gets stopped," Davis said.

your laser — between you and the car — or a branch or a sign or anything that interrupts the stream, you have nothing," Davis said. "Radar will go around that sort of thing."

Capt. Lisa Solomon of the Paso Robles, Calif., Police Department said her department found both radar and lidar to be valuable.

"We use lidar on a daily basis. The primary benefit is the small bandwidth of the beam as

most frequently where traffic is heavy. Lidar is a handheld device that has no moving mode. For patrol officers who have other beat responsibilities, radar usually works better because it is always on and ready as they are driving around.

"If the officer spots a possible violation, he can consult the dash-mounted radar and get instant results regarding speed of a vehicle coming toward him while moving," Solomon continued. "This is really the key difference and the reason a municipal law enforcement agency would want both."

## You've Come a Long Way

Lidar has come a long way since the Colorado State Police first toyed with it in the early 1990s. The units then were clumsy and costly, even more expensive than the \$4,000 cost of

"People don't think [tailgating] is **dangerous**; they don't understand why it's **illegal**, and we've definitely gotten the message out by using those instruments."

Tom Mason, public information officer, Arizona Department of Public Safety

opposed to radar," she said. "This makes it the best choice for speed-enforcement tools on congested roadways. Our motor officers use it

today's unit — radar units sell for about half the price.

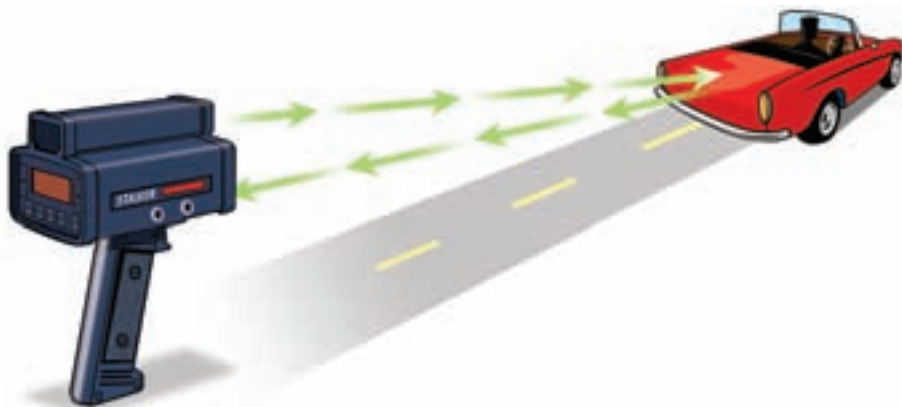
New lidar units are much smaller and easier to handle, and have been likened to a pair of binoculars. Lidar providers are also beginning to produce more options, including digital photo evidence. When the lidar captures a speed violation, it also records a digital picture for evidence. The image shows the vehicle, its speed, the lidar target and a time stamp.

Even with the new options, experts say lidar won't replace radar, but it will be a handy companion that fills a niche, as it does for Ratzell and the Colorado State Patrol.

"We feel lidar will help our efforts to control speed, following too closely, and with the safety of officers at an accident scene," he said. **GT**

## Let There be Light

Lidar shoots a laser beam at a target to measure its distance and speed. Unlike radar, lidar allows police to target individual vehicles.



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have used  
a bigger  
podium.



# NIC salutes its award-winning eGovernment partners in 2006

Sixteen of our eGovernment partners were recognized in competitions and independent surveys last year. NIC congratulates each winner and is proud to be the government partner of choice for the nation's most progressive and honored government Web sites.



## Digital States Survey

- 2- Virginia
- 4- Utah
- 6- Arkansas
- 8- Kentucky
- 10- Tennessee
- 14- Nebraska

## Best of the Web

- 2- Maine
- 3- Utah
- 4- Virginia
- 5- Arkansas
- Finalist – Alabama
- Finalist – Indiana
- Finalist – Rhode Island
- Finalist – Tennessee

## Digital Government

### Achievement Awards

#### Government-to-Business

- » Oklahoma State Treasurer electronic trading system
- » Montana TankHelper service
- » Rhode Island marine no discharge septic compliance system

#### Government-to-Citizen

- » Utah On The Spot vehicle renewals
- » Maine Bureau of Motor Vehicles suite of services

#### Government-to-Government

- » Arkansas state agency IT budget planning system

## Government Customer Support Excellence Awards

- 1- Utah.gov portal

## Brown University eGovernment Survey

- 5- Utah
- 6- Montana
- 9- Indiana
- 11- Tennessee

## E-Gov Pioneer Awards

- » Kansas Highway Patrol online crash logs
- » Maine State Police crash reporting system

## Govmarks Awards

- » Indiana Department of Health INShape Indiana program

## Public Citizen State Medical Board Web Survey

- 2- Virginia
- 8- Idaho
- 12- Tennessee

## National Association of State Purchasing Officials IT Gold Award

Hawaii Compliance Express

## National Policy Research Council eGovernment Report Card

- Idaho – A
- Indiana – A
- Nebraska – A-minus
- Utah – A-minus
- Arkansas – B-plus
- Colorado – B-plus

## International Association of Commercial Administrators Win-Win Award

Hawaii Compliance Express



**NANOTECHNOLOGY** IS ON THE VERGE OF CHANGING EVERYTHING — FROM HOW WE TREAT CANCER TO HOW WE DESALINATE WATER.

# WONDER SMALL



**It's Sunday around 8 a.m.** A regular guy in a typical neighborhood wakes up gently as the bedroom walls — or more specifically, the wall paint — change from a deep blue to a pleasant lemon yellow.

The previous night's festivities have taken their toll, so as he goes to pour himself a cup of coffee, he grabs a small device that resembles a blood-glucose meter. He feeds the machine a blood sample and connects it to the USB port on his computer, which immediately presents a report on his current health.

As the man's pounding head foretold, his blood-alcohol level hovers around 0.05 percent. He also finds his body is creating antibodies to fight off a cold virus. And, as always, he checks to see if his cancer is still in remission — which it is.

If nanotechnology research blossoms the way its advocates promise, such a scenario may be only a few years away, and 2017 might make 2007 look like a technological stone age. Researchers teeter on the edge of breakthroughs that could change virtually every aspect of our existence. Nanotechnology — complicated, fascinating and essentially invisible — is poised to make the frontiers of imagination become everyday realities.

BY CHAD VANDER VEEN | TECHNOLOGY AND POLITICS EDITOR



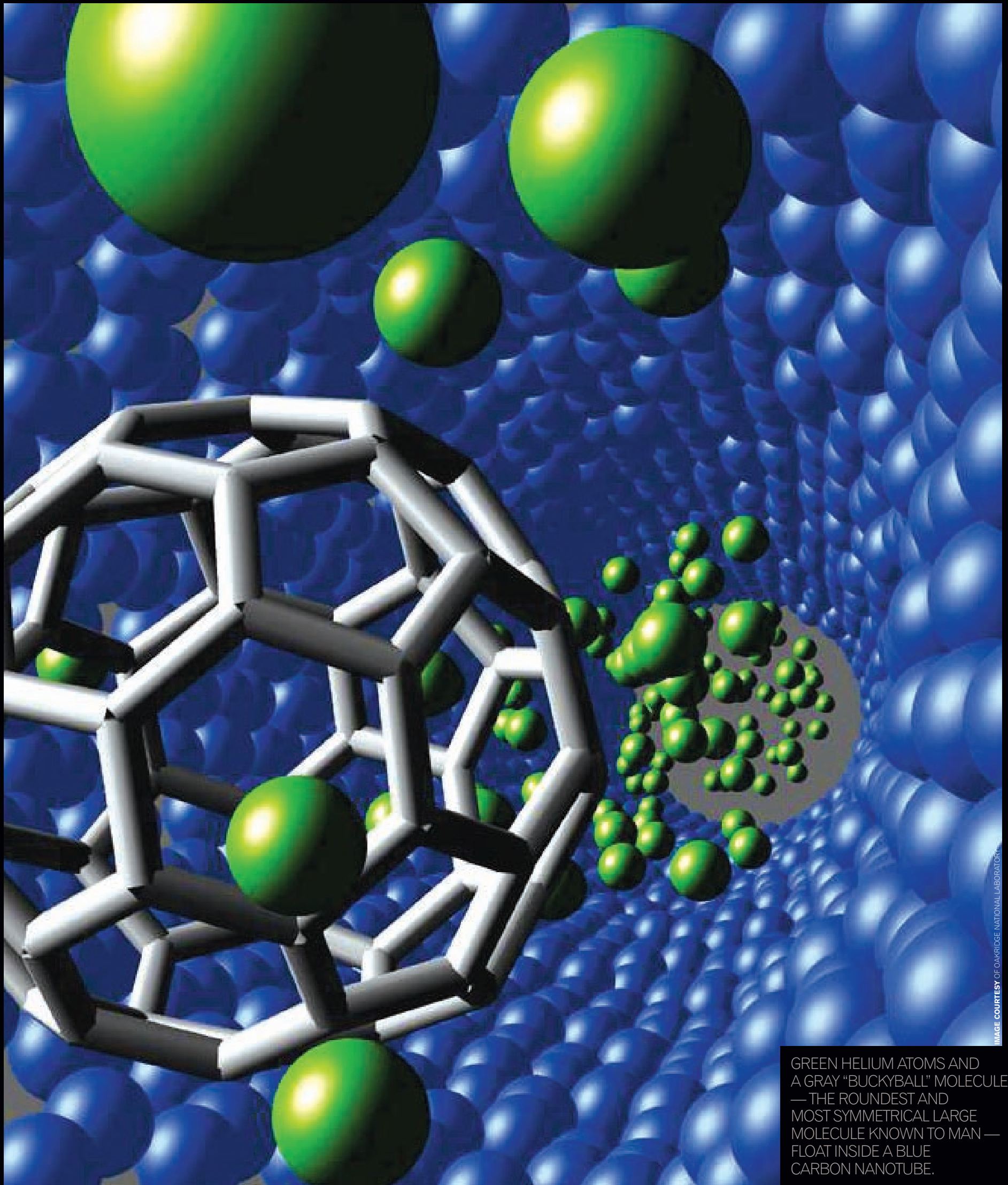


IMAGE COURTESY OF OAKRIDGE NATIONAL LABORATORY

GREEN HELIUM ATOMS AND A GRAY “BUCKYBALL” MOLECULE — THE ROUNDEST AND MOST SYMMETRICAL LARGE MOLECULE KNOWN TO MAN — FLOAT INSIDE A BLUE CARBON NANOTUBE.

## WEIRD SCIENCE

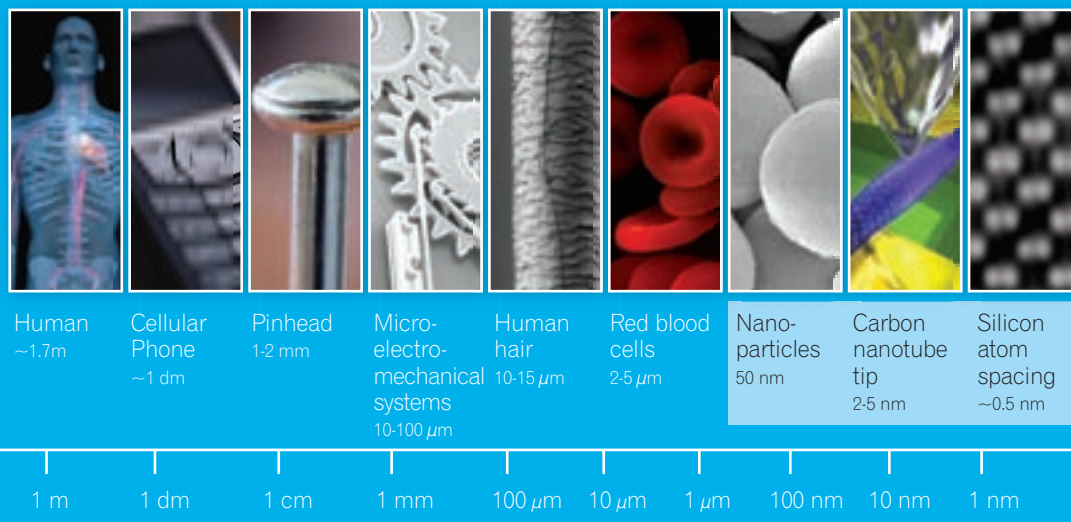
So what exactly is nanotechnology? The term refers to the engineering of materials at remarkably small sizes. One nanometer is one-billionth of a meter, and things that fit on the “nanoscale” include anything smaller than 100 nanometers. For comparison, a human hair is about 75,000 nanometers wide.

John Miller, vice president of business development at Pasadena, Calif.-based Arrowhead Research, is an authority on nanotechnology and co-author of *The Handbook of Nanotechnology: Business, Policy, and Intellectual Property Law*.

On the nanoscale, regular elements behave in highly irregular ways, Miller said, which leads to intriguing and useful possibilities.

Take gold, for example. Everyone is familiar with its properties at the macro scale. But nanoparticles of gold look and act completely different. Vanga Reddy, who finished his Ph.D. thesis in 2006 at the University of Bern in Switzerland, noted in his paper *Gold Nanoparticles: Synthesis and Applications* that gold nanoparticles show colors like ruby red, blue, green and orange, depending on the size and shape. The gold nanoparticles, he wrote, also show remarkable catalytic activity, whereas bulk gold is known to be catalytically inert.

Things at the macro or micro scale have certain properties, and you can do specific, known things with them, Miller said. “When you work with them at the nanoscale, they



**Nanotechnology** focuses on elements smaller than 100 nanometers. This scale shows nanotechnology in relation to other common items — at one end of the spectrum, a human is approximately 1.7 meters (m), or 5 feet 6 inches tall. At the opposite end of the spectrum, silicon atom spacing is 0.5 nanometers (nm). One nanometer consists of about five to 10 atoms placed side by side.

have whole new properties because there are quantum effects. You get whole new materials and you make completely new devices.”

By far the most celebrated example of such unusual behavior was found in the element carbon, one of the most abundant elements in the universe. Diamonds, graphite — even people — wouldn’t exist without carbon. But deep inside its structure, at the atomic scale, the material held a secret first discovered in the 1950s — the carbon nanotube.

A carbon nanotube is a cylinder one nanometer in diameter made of either individual

carbon atom sheets or multiple sheet layers “rolled” into seamless tubes. Two Russian scientists found larger 50-nanometer nanotubes in 1952. Although their work was published, it was largely ignored and eventually forgotten. In 1985, these carbon structures were again observed, only this time as spheres. Then in 1991, the cylinders — or tubes — were rediscovered. Since then, research into nanotechnology has grown exponentially.

When carbon atoms are arranged in this cylindrical structure, they become the strongest materials that will ever be made, Miller

## SPECK OF DUST

**ANOTHER MAJOR PLAYER** in the nanotechnology world is Smart Dust — a network of tiny, wireless microelectromechanical systems of sensors, robots or devices, installed with wireless communications that can detect light, temperature and vibrations, among other things.

Smart Dust inventor Kris Pister, president and CEO of Dust Networks, said in a past issue of *Mobile Government* that with Smart Dust, you can monitor when people or vehicles go by. “You can track things, whether they’re enemy combatants or civilians — there are all sorts of great things you can do if you’ve got the sensors to do it,” he said. “It’s all stuff you can do today if you spent the time and money to wire it all up, but you don’t have that luxury in a battle or in a foreign country you’re about to have a battle in — you just can’t get in there with a wired system.”

Smart Dust has been used extensively for environmental tasks, such as measuring humidity in the planned nuclear waste repository in Yucca Mountain, Nev. The device traditionally used to measure humidity in the repository is large and emits a lot of heat, changing the humidity.



The Smart Dust network didn’t affect the environment.

These networks have now made their way into buildings — BP put the Dust Networks system in a Washington state refinery. When linking the site’s sensors, the company discovered a problem with one machine, and saved \$100,000 in productivity that would otherwise have been lost.

As described in *Sensor Networks in 2010*, the vision of Smart Dust networks was that by 2010:

- Everything you own that is worth more than a few dollars will know that it’s yours, and you’ll be able to find it whenever you want

it. Stealing cars, furniture, stereos or other valuables will be unusual because any of your valuables that leave your house will check in on their way out the door, and scream like a troll’s magic purse if removed without permission (they may scream at 2.4 GHz rather than in audio).

- Your house and office will be aware of your presence, and even orientation, in a given room. Lighting, heating and other comforts will be adjusted accordingly. If you and a colleague are looking for a conference room, you will know which is the nearest available. If you’re in an unfamiliar building, lighting will guide you with a ribbon of arrows on the floor or the walls, annotated with the name of the room they are pointing to, and color coded if there are two lost souls whose paths may cross.
- A speck of dust on each of your fingernails will continuously transmit fingertip motion to your computer. Your computer will understand when you type, point, click, gesture, sculpt or play air guitar.

said. “These materials are stronger than anything anyone thought possible.”

Indeed, carbon nanotubes can be hundreds of times stronger than steel at one-tenth the weight. The manufacturing implications alone are difficult to comprehend. But not only are they incredibly strong and lightweight, carbon nanotubes also are perhaps the most conductive material ever discovered. Some estimates suggest properly configured carbon nanotubes might be 1,000 times more conductive than copper.

If that weren’t enough, numerous researchers are convinced that carbon nanotubes one day will be used to target the delivery of drugs used to treat various illnesses — including the extraordinary process of seeking and destroying cancer cells.

## ONLY THE BEGINNING

Although Miller is excited about the possibilities of nanotechnology, he urged a tempering of expectations. “You can do this amazing stuff, but it’s really complicated and we’re just at the beginning,” he said. “We are now where electronics probably was 50, 60 years ago. Scaling up to mass production at the right cost is no easy task. So far, no one has really been able to come to market with nanotubes that are cheap and work well.”

Currently there are two established processes for manufacturing carbon nanotubes, but neither can cost-effectively produce large amounts of the material.

One method involves growing nanotubes through chemical reaction. Called “arc discharge,” this method requires the heating of certain gases to a point where two carbon electrodes discharge an electrical arc. This arc reacts with the gas vapors, causing nanotubes to self-assemble.

The second process for creating nanotubes, known as “laser ablation,” is akin to ultra high-tech whittling, and involves using high-powered laser lithography tools to reduce large chunks of carbon down to nanotubes. These lithography tools currently are used to etch integrated circuits on semiconductors.

Private venture capital is pouring into firms, which continue working on these and other methods that may result in the mass production of carbon nanotubes at an agreeable market price. Lux Research, a technology-consulting firm, produced a widely circulated report called *The Lux Report* that analyzed just how much is being invested in nanotechnology.

According to the report, from 1995 to 2006, approximately \$3.08 billion was invested in 171 nanotechnology companies worldwide. Electronics and IT garnered the most invest-

ment in 2006, followed closely by health care, life sciences and manufacturing.

The federal government already has awakened to the possibilities. In 2001, the National Nanotechnology Initiative was launched to start coordinating government funding and research of nanotechnology. Indeed, nanotechnology has at least as much appeal to the government — be it NASA, the National Science Foundation, the U.S. Department of Defense or any number of other agencies — as it does to the private sector.

“The government has been investing in nanotechnology research formally since around 2000,” said Celia Merzbacher, assistant director of technology research and development at the U.S. Office of Science and Technology Policy. “Our approach has been to sort of, as they say, let a thousand flowers bloom, to be very broad in the range and types of research that are funded.”

Like Miller, Merzbacher said medicine and electronics generate a lot of excitement, but she too is cautiously optimistic about nanotechnology’s future. The nanotechnology buzz is spreading and tends to generate exaggerated expectations.

“When people say there should be a grand challenge, nanotechnology is not really ready for that,” Merzbacher said. “Those kinds of grand challenges are usually more of an engineering challenge once the science is known. We’re not there yet. We’re still learning a lot about nanotechnology and what happens at the nanoscale.”

But given what is known — and what is being developed — it is easy to get caught up in the tide of nanotech anticipation. What follows is a look at four extraordinary ways nanotechnology is being applied, from practical applications to downright science fiction.

## STUFF OF LIFE

Water is one of our most basic and fundamentally important elements. Like carbon, none of us would exist without it. Yet most of the water on Earth is very nearly poisonous if ingested. For decades, scientists and engineers have struggled to create an efficient process to strip water of impurities — making dirty water clean and seawater fresh.

The most common way to desalinate water today is by reverse osmosis, which is, very simply, forcing a solution through a filter to remove undesirable particles. In reverse osmosis desalination, seawater or wastewater is forced through a membrane filter, which collects pure water on one side while trapping impurities — like salt and bacteria — on the other side.

The trouble with desalinating water is it requires a lot of energy, usually more energy than the resulting water is worth. The solution has been to try to build an ever more efficient system, and specifically, a more efficient membrane.

That’s where nanotechnology and Erik Hoek come in.

Hoek, assistant professor at the University of California, Los Angeles, Henry Samueli School of Engineering and Applied Science, developed a nano-engineered membrane that could potentially slash the cost of desalination.

“As the water moves from the feed side of the membrane, right up to the membrane and passes through it, it brings with it everything else that’s in the water — salt, bacteria, organics,” Hoek explained. “And all that stuff, because it doesn’t pass through the membrane, a lot of sticks to the membrane. It’s like any kind of filter. It eventually gets clogged. You’ve got to clean it out somehow. So the two [aspects] you can really try to target are the resistance by the membrane and the fouling layer build-up — how quickly the membrane gets clogged.”

Hoek said the key to building a better membrane was studying the relationship between the membrane material properties and the speed at which bacteria, organics and

According to *The Lux Report*, approximately **\$3.08 billion was invested in 171 nanotechnology companies** worldwide from 1995 to 2006. And in 2001, the National Nanotechnology Initiative was launched to coordinate government funding and research of nanotechnology.

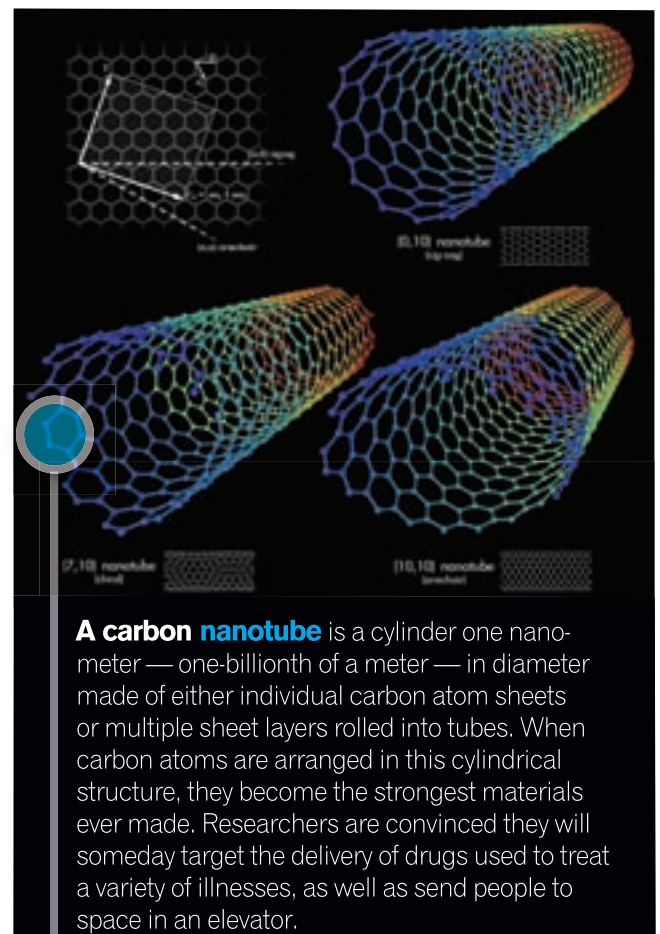


IMAGE COURTESY OF MICHAEL STROCKS

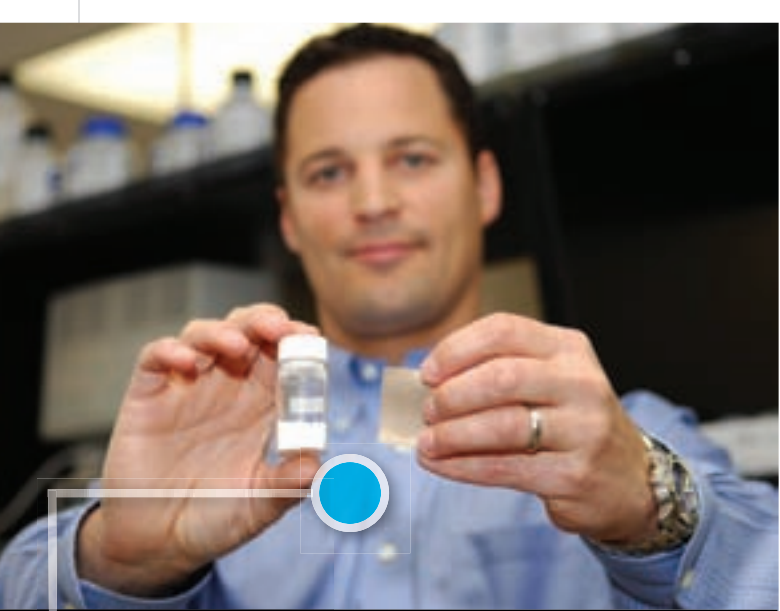


PHOTO COURTESY OF DON LIEBIG, UNIVERSITY OF CALIFORNIA AT LOS ANGELES PHOTOGRAPHY

**Erik Hoek**, assistant professor at the University of California, Los Angeles, Henry Samueli School of Engineering and Applied Science, shows a vial of nanoparticles in one hand, and his nano-engineered membrane used in water desalination in the other. Hoek estimates this membrane may reduce the cost of seawater desalination by 10 percent to 20 percent.

other particles built up on the surface. Hoek and fellow researchers engineered a membrane made of plastic polymers and specially designed nanoparticles, whose material properties are a closely guarded secret, and actually repel the impurities in water.

“They change the surface properties such that organics and bacteria have a harder time sticking to the surface,” Hoek said. “So when the membrane is operating, filtering forward, instead of all these things being slammed up against the membrane and having them stick, they simply get washed away with the water that’s also flowing across the surface of the membrane.”

Furthermore, each nanoparticle is created with tunnels or pores in its structure. When

### Nanomedicine

offers potential for the treatment of human diseases and augmentation of human biological systems. Shown here is a nanorobot in the bloodstream, which may someday provide cell surgery and extreme life prolongation.

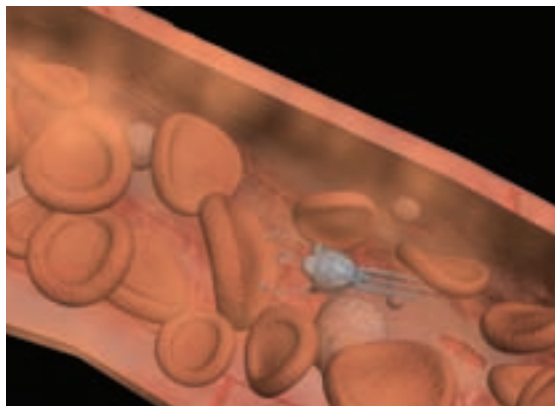


IMAGE COURTESY OF NANOTECHNOLOGY NEWS NETWORK/SVIDINENKO YURIY

placed in water, these tunnels, combined with the nanoparticle’s secret material properties, actually attract water. This attraction makes water “want” to pass through the tunnels while repelling impurities. The result is a membrane that is many times more efficient, but can be manufactured and operated at virtually the same cost as current membranes.

Hoek estimates the membrane may reduce the cost of seawater desalination by 10 percent to 20 percent. In a wastewater application, Hoek said energy consumption might be reduced by 20 percent to 50 percent. But, he cautioned, these are just estimates and the membrane still needs testing.

“It’s very exciting, very promising — particularly because we have the ability to integrate into existing manufacturing infrastructure very quickly — but still it needs to be field tested,” he said. “The goal is to do this kind of field testing in the next year or two.”

## CANCER BOMB

Current chemotherapy is an imprecise way to destroy cancer cells — it kills at least as many, and often more, healthy cells as it does cancerous ones. And patients typically suffer from various harsh side effects. However, Balaji Panchapakesan, assistant professor in the Department of Electrical and Computer Engineering at the University of Delaware, is trying to raise an army that will wage a new kind of war on cancer, where collateral damage is nonexistent and cancer cells meet a violent, explosive end.

Panchapakesan’s strategy involves a battalion of carbon nanotubes armed with cancer-detecting radar and a propensity to detonate. According to Panchapakesan, by identifying proteins and the over-expression of certain molecules in a blood sample, cancer cells can be identified and isolated as they intermingle with healthy cells. Once identified, the cancer cells can be hunted down by Panchapakesan’s specially trained carbon nanotubes.

“We coat the nanotube with a specific antibody,” Panchapakesan said. “These antibodies actually attach to the receptors in the cancer cells. Then the carbon nanotubes are also attached to the cancer cells. Then we shine light onto the nanotubes and the nanotubes start heating up, and they can explode, killing the cancer cells.”

The obvious advantage of carbon nanotubes attaching themselves to, and then detonating, cancer cells is that healthy cells are unaffected. If the cancer cells are near the skin, Panchapakesan said fuse-like light can be shone from outside the body, making a minimally invasive procedure. Even cancer cells hidden deep in the body could be eliminated relatively easily. Using an angioscope — a fiber-optic device that can be inserted into blood vessels — a surgeon could follow the carbon nanotubes to the cancer

cells. Once they’re found, the angioscope could provide the needed light to cause the cancer bombs to explode.

“If you look at chemotherapy, you have to undergo different stages, it’s toxic, brings the immune system down, and you’re prone to a lot of infection and other problems like nausea and hair loss,” Panchapakesan said. “You can do this procedure again and again because it’s noninvasive. Even if 30 percent of [cancer] cells are left behind, you can still have a better quality of life than using chemotherapy, because chemotherapy kills 80 percent or 90 percent of the [healthy] cells and only kills around 10 percent of the cancer cells. I think in about five years, the pace of cancer therapy will change completely.”

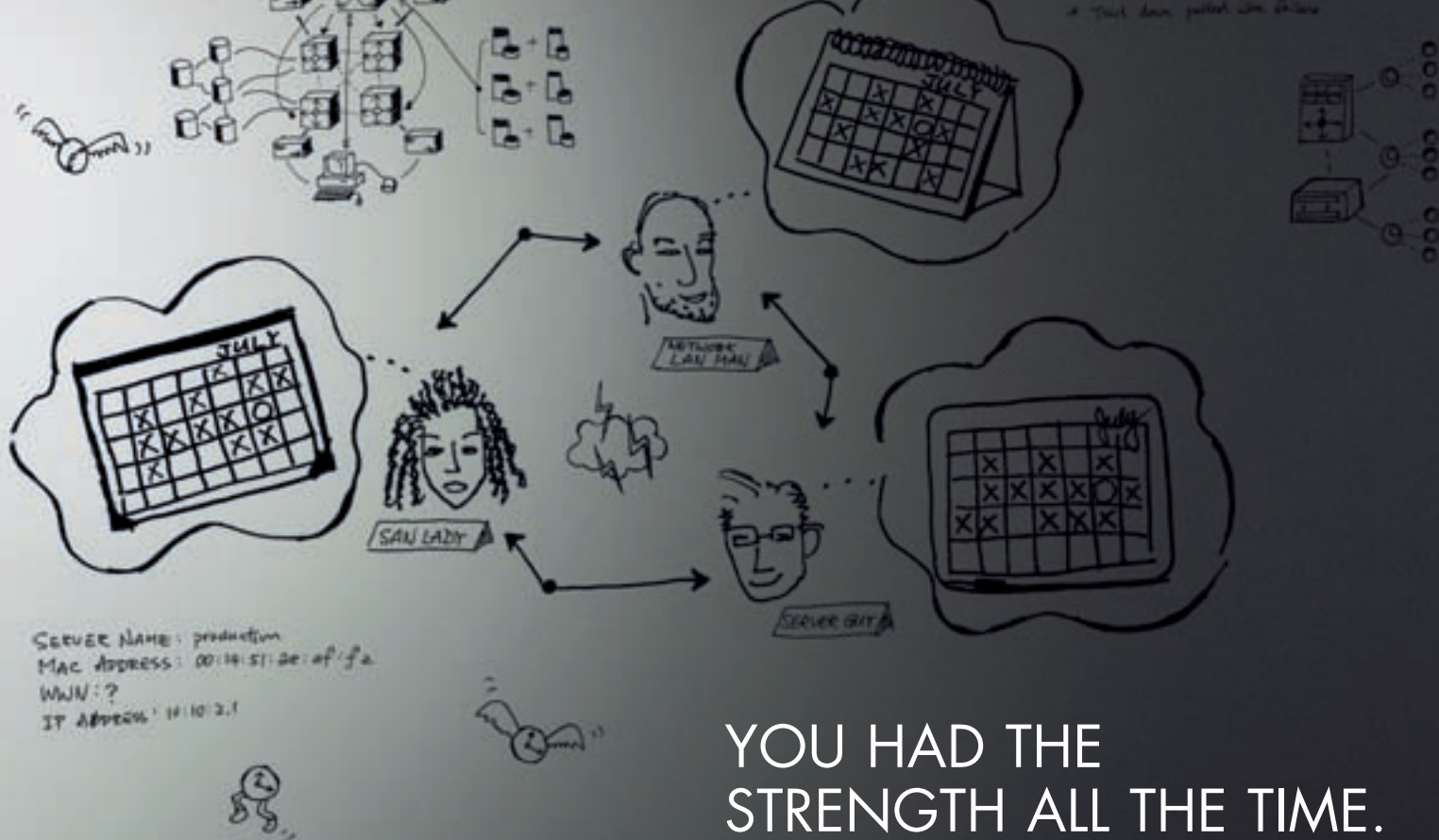
## SOLDIER OF FORTUNE

Being a soldier today means access to incredible technology, advanced medicine and devastating weaponry. But today’s soldiers must still carry heavy loads and an array of equipment, and they are vulnerable to all manner of bullets and bombs.

At the Massachusetts Institute of Technology’s Institute for Soldier Nanotechnologies (ISN), the goal is to design and build a battlesuit for 21st-century combat — a single piece of equipment that not only protects its wearer but enhances his strength, monitors his health, helps him recover from injury, allows seamless communication, and is no heavier or bulkier than a regular uniform. Although it sounds like science fiction, the U.S. Army already has invested \$50 million to make the battlesuit a reality.

“Current technology as it relates to soldier equipment requires that desired capabilities be provided by various, distinct pieces of gear,” said Franklin Hadley, ISN director of outreach. “Ballistic protection, for instance, is provided by the SAPI [small arms protective insert] plate enclosed in body armor, while radio communications are provided by a separate radio unit. As such, the soldier of today is encumbered by a great deal of equipment and weight. The concept of the battlesuit is the antithesis of this. Rather than a multitude of disparate parts providing a variety of functionalities, we envision integrating their functions into a single, sleek uniform.”

The ISN research is divided among seven teams, and each contributes to a particular battlesuit element. These teams are attempting to develop materials that possess a number of fantastic properties. For example, such a battlesuit will consist of energy-absorbing nanomaterials that will defend against ballistics. These nanomaterials will form mechanically active devices



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The Massachusetts Institute of Technology's Institute for Soldier Nanotechnologies is working to build a **battlesuit**, shown above, that not only protects its wearer, but also enhances his strength, monitors his health, helps him recover from injury and allows seamless communication. The U.S. Army has already invested \$50 million to make this suit a reality.

embedded in the battlesuit itself. The fabric would switch between rigidity and flexibility, enabling the battlesuit to act as impenetrable armor when the nanomaterials detect an impact. The battlesuit may also be able to perform CPR on its wearer, as well as stiffen to act as casting material for broken bones.

"In addition to incorporating materials that will help protect a soldier from ballistic threats, we expect that the battlesuit of the future will include mechanisms to protect from chemical and biological weapons, as well as to minimize the risk of injury due to blast waves," Hadley said. "While the goal is certainly to keep a soldier healthy in all circumstances, there is always the risk of illness or injury given, if nothing else, the potentially dangerous environments in which he or she may be asked to operate. As such, we expect that the battlesuit will include technologies to not only monitor health, but also devices to provide emergency medical treatment should an injury occur."

Sensing and counteraction abilities are also in development. As Hadley mentioned, researchers are engineering nanoparticles that will provide soldiers with advanced biological and chemical threat detection without having to rely on separate equipment. In addition, the ISN is trying to develop biodevices and nanomaterials that will act as automatic first aid for wounded soldiers, doing everything from stopping blood loss to cauterizing wounds.

Such a battlesuit may sound like fantasy, but researchers and the military are serious about it. Hadley said one of the project's primary goals is to engineer nanomaterials to create a suit that does more to keep soldiers alive while reducing bulk and weight.

"A number of benefits to nanotechnology make it ideal for developing the battlesuit," he said. "Among them is the potential for dramatically reducing soldier load. A soldier's ... load can average between 60 and 140 pounds. While soldiers are extraordinarily fit, it is logical to expect that such weight could make operations much more difficult. By reducing weight, we make soldiers both more effective and safer."

## OUT OF THIS WORLD

Medicine and materials are probably the most practical applications for nanotechnology. But many consider the holy grail of nanotech to be an elevator.

An elevator and nanotechnology might seem like an odd pairing, and at the very

least, not all that interesting. But imagine an elevator whose ground floor is in the middle of the ocean and the penthouse is on the 31,680,000th floor. This is the basic idea of the space elevator, a concept as old as the space age itself. Only now, thanks to carbon nanotubes, the material exists to actually build it.

"The elevator has been around in research and papers for more than 100 years," said Michael Laine, president and founder of Bremerton, Wash.-based Liftport Inc., a company actively trying to build a space elevator. "The father of the Russian space program, Konstantin Tsiolkovsky, envisioned the elevator right at the beginning of the space age."

Laine is serious about building an elevator to space. The idea was popularized in science fiction, but never approached anything close to reality because no material existed that could be used to build such a thing.

The basic concept for the elevator goes something like this: A paper-thin ribbon of carbon nanotubes — maybe 3 feet wide — would be created at a length of more than 60,000 miles. The ribbon, attached to a counterweight, would be taken into a geosynchronous orbit directly above an equatorial platform somewhere in the ocean.

With everything in position, the ribbon would be lowered from the counterweight down to the platform. Once connected to the platform, the ribbon would be kept taut by the orbiting geosynchronous counterweight.



Thanks to **carbon nanotubes** the material exists to build an elevator that runs from earth up 60,000 miles into space. Shown here is the "ground floor" in the middle of the ocean.

To visualize how this would work, imagine spinning a fully extended yo-yo in a circle. The person spinning the yo-yo is the earth, the end of the yo-yo the counterweight.

With the ribbon in place, robots called "climbers" would be brought to the platform where they would scale the ribbon. These climbers, powered by a platform-based laser targeting a climber's solar panels, would carry payloads with them, and once at the top, would simply let go and the payload would be in space. The space elevator would, once built, make space access far more inexpensive and safer than rocket launches.

Even though the proper materials exist, building a space elevator is an enormous challenge. Liftport has made progress already, however, and has run successful tests of scaled-down versions of the elevator.

"We've built a robot that climbs up and down a string," said Laine. "We've actually built a bunch of them. We've built platforms that have hung as high as a mile in the sky off balloon-based systems. We've had a robot that has climbed 1,500 feet."

Their next test is far more ambitious.

"We're working on a system that will be 30,000 feet," Laine said. "We're probably going to fail."

But like most nanotech projects, the dream of a space elevator suffers from the critical limitation Miller mentioned — no one has been able to mass-produce nanotubes. Laine himself readily admits that Liftport's objective is utter fantasy until mass-production is possible. That's why Liftport operates a laboratory in New Jersey. It is working feverishly to develop an affordable process to manufacture sufficiently large quantities of carbon nanotubes.

"Until you can start getting these things traded on the Chicago Board of Exchange as a commodity, all these wonderful visions of the future are not going to happen," Laine warned. "[Globally people are] only making 100 pounds of this stuff a day. Until you can mass-produce this stuff, it's just science fiction. So our space in New Jersey is not about being a research lab, what we're trying to do is commercialize somebody else's stuff. So we're working with a couple of different labs that look like they have processes that lend themselves to being mass-producible."

Despite the incredible challenges, Laine is optimistic he will build a space elevator. In fact, the company Web site has a counter that shows just how long it will be until the space elevator is open for business. At press time, there were only 24 years, 239 days, 1 hour, 21 minutes and 28 seconds to go. **GT**

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# When No One's Home

state  
**local**  
federal

Technology grant helps communities catalog and manage their vacant properties.

BY MERRILL DOUGLAS | CONTRIBUTING WRITER

**A** vacant property isn't just an eyesore. It can be a haven for prostitutes or drug dealers, a magnet for arsonists or an accident waiting to happen for a group of curious children. Such a property can also be an expense for the government agency that's responsible for barricading entrances and cutting the grass when the owner won't.

Not to mention the fact that a concentration of empty, dilapidated buildings can sabotage economic development, offering businesses the perfect incentive to locate elsewhere.

At one end of the spectrum, some cities have developed sophisticated technology systems for cataloging and tracking vacant properties, giving these municipalities the information they need to manage such properties. At the other end, some cities' methods are a bit more archaic.

"Some cities still have their property information on index cards," said Jennifer Leonard, director of the National Vacant Properties Campaign (NVPC) at Smart Growth America, a nonprofit organization in Washington, D.C.

Paper property records don't get updated often, and when they do, not everyone gets the news. An employee in a property disposition department looking for the owner of an empty four-family building, for example, might not know that a code enforcement officer has already tracked that property owner down, Leonard said.

"Unless you can integrate all that information in one place and one piece, where everyone has access to updated information," she said, "it's not very useful."

This year, 10 communities received help in managing data on their vacant properties, thanks

to the 2006 National Vacant and Abandoned Properties Grant Program, which is co-sponsored by the NVPC, GIS software developer ESRI and GPS technology developer, Magellan. The program provides hardware and software to communities to help develop applications for managing vacant properties.

Each winner received one or more handheld GPS units from Magellan, and ESRI's ArcPad software for mobile GIS and field mapping applications, plus online training in the technology.

The grant is meant to shine a light on the connection between community planning and economic development, and publicize the NVPC.

"We thought that putting together a mobile GIS grant program would be a really good way not only to support the work [NVPC] is doing with many communities and trade associations, but also to promote the upcoming [NVPC] conference," said Milton Ospina, ESRI's economic development and industry manager.

The NVPC will hold its first national conference this spring, and grant recipients are invited to attend and present their applications.

## Data Fuels Strategies

The grant program is one example of the kind of technical assistance the NVPC provides to communities so they can organize their vacant and abandoned property inventories. Once they do, the communities can develop strategies for converting once-vacated real estate into productive uses.

For instance, Leonard said, Baltimore plans to acquire at least 5,000 vacant properties and transfer them to private developers — both for-profit and nonprofit.

With ArcPad running on the Magellan GPS unit, a field worker standing near a building can capture the site's geographic coordinates, and then use a customized onscreen form to record information about it.

"Then you can link it up to a photograph or other GIS records," Ospina said.

Originally 67 communities applied to the grant program, outlining how they would use the technology.

"They have vacant properties that they need not only to identify," Ospina said, "but catalog and inventory and find a way to put them back to proper use."

**Synopsis:** Ten communities receive grants of GPS and GIS technologies to help them catalog and manage their vacant and abandoned properties.

**Technologies:** GIS software, GPS hardware.

**Contact:** Jennifer Leonard, director, National Vacant Properties Campaign at Smart Growth America, <jleonard@smartgrowthamerica.org> 202/207-3355 x23.



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## “Some cities still have their property information on **index cards.**”

Jennifer Leonard, director, National Vacant Properties Campaign, Smart Growth America



Applications came from cities with as many as 350,000 residents and as few as 7,000, and from several regional planning agencies, Ospina said. Although the program was promoted mainly to planning and economic development departments, submissions also came from redevelopment, public works, engineering and environment management departments, and mayors' offices, he said.

One mayor whose application rose to the top was Ronnie Harris of Gretna, La. With the grant money, Gretna — a city of 3.5 square miles and 17,500 residents just across the Mississippi from New Orleans — will use a single Magellan Mobile Mapper unit and the ArcPad software to collect the exact location of its vacant properties.

Whoever conducts the survey will also capture the location of each building's water and sewer lines and other relevant information, and then transfer that data into the city's existing ESRI ArcView GIS system to create a comprehensive map of vacant properties.

### Change is Good

“The first thing we're going to do is identify all of the vacant properties on the map so we can see where the concentration is,”

### Mapping vacant properties

will help Gretna, La., set priorities when targeting buildings for renovation or demolition.



Harris said, explaining that the mapping will help the city set priorities when it targets buildings for demolition or renovation. “We want to go into a neighborhood and make an immediate impact. You take two or three properties closely located, and it can turn around an entire neighborhood.”



Gretna started working on this kind of blight removal in the mid- to late 1990s, and the program has been very successful, Harris said.

“When we tear down a dilapidated house, we find that the neighborhood immediately picks up in appearance as well as pride,” he said, adding that private owners are often inspired by the city's actions to fix up or demolish their own decaying properties.

“When we tear down a **dilapidated** house, we find that the neighborhood immediately picks up in appearance as well as **pride.**”

Ronnie Harris, mayor, Gretna, La.

Harris also expects to use the Mobile Mapper and ArcPad for projects outside the grant's scope — for example, to map the public utilities infrastructure for better management of repairs.

“That will help us in development of various neighborhoods, to bring them up a notch,” he said. City officials have been talking with the U.S. Army Corps of Engineers about possible funding for GIS data collection.



Although Gretna didn't suffer the flooding that overwhelmed neighboring cities after Hurricane Katrina, storm winds caused major damage, and some residents who left their homes apparently aren't coming back. Meanwhile, an influx of people from more devastated communities has created a huge demand for real estate in a city with virtually no undeveloped land.

Harris doesn't know how many properties in Gretna fell vacant because of Katrina, but the new technology will help the city find out, he said. City officials can try to persuade owners to either sell their properties or turn them over to the community so someone else can use them.

“Affordable housing is extremely tight in the New Orleans market,” Harris said.

As new residents in Gretna become active community members, he said, the dynamic of the whole metropolitan area has changed, and city officials feel that change can become an asset for the city.

“We want to be 100 percent occupied and 100 percent fully functional,” Harris said, “and with this blighted housing we're not there yet.” **GI**

**CONTRIBUTING WRITER MERRILL DOUGLAS** <MDOUGLAS@STNY.RR.COM> IS BASED IN UPSTATE NEW YORK. SHE SPECIALIZES IN APPLICATIONS OF INFORMATION TECHNOLOGY.



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**Synopsis:**  
For XML users, XQuery offers an efficient way to query and manage data.

**Technologies:**  
XML, querying languages.

**Contact:** Jonathan Robie, chief scientist, Data Direct Technologies, 800/876-3101, <Jonathan.robie@datadirect.com>.

# X Factor

state  
local  
federal

XQuery (<p> makes <em> processes </em> easier. </p>)

**A**t *Congressional Quarterly*, an online publication that follows the Washington, D.C., legislative process, Senior Software Architect Hank Hoffman has been swimming upstream.

It's one thing to compile hearing dates, vote counts and committee actions, but it's quite something else to make those data points relate meaningfully to one another. A year ago, Hoffman found what he was looking for in the form of XQuery.

XQuery — an XML-native query language produced by the World Wide Web Consortium (W3C), a standards development body — is designed to query and organize XML data.

One of XML's great strengths is its flexibility in representing many different kinds of information from diverse sources, according to the W3C. To make the best use of this flexibility, an XML query language must retrieve and interpret information from these diverse sources.

XQuery is designed to query a broad spectrum of XML information sources, according to the W3C, including both databases and documents. "You can do some very powerful things with just a very few lines of code," Hoffman said, explaining that XQuery makes

interpreting and managing masses of XML data a much simpler proposition.

## Dive into the Data

Betty Harvey coordinates the Washington, D.C., XML Users Group and is president of the IT consultancy Electronic Commerce Connection Inc. She says XQuery's greatest strength lies in the user's ability to dive into XML data in a way that SQL never allowed.

Suppose a government worker is staring down a massive mountain of legislation and wants to pull out just the bills related to global warming. SQL was never meant to read XML data that way, but XQuery can do it.

The best way to describe the capability, Harvey said, is to think of XQuery as having been raised from the beginning to work within the XML framework. It speaks XML, as it were.

The power of that native query is considerable. Think about a vast repository of medications; should a government agency wish to compile and publish a tract specifically on heart medicines, a single XQuery command could do it, while SQL would have demanded pages of code. "XQuery gives government the ability to search and provide data in ways they hadn't really thought of before," Harvey said.

## XML Changes Things

To explain XQuery's role in the realm of data assimilation and interpretation, technologists compare it to SQL, a language used to create and manage data within relational databases. These databases have been the standard means of storing data for years, and SQL is the tool by which that data is manipulated.

Now IT experts say we are moving away from relational databases and migrating to the realm of XML data. For this new era, a new language is needed.

"In the same way that SQL is a very natural language for exploring relational objects, XQuery is a very natural language for querying XML data," said Willie Hardie, vice president of database product marketing at Oracle.

XQuery doesn't necessarily surpass SQL — the new language was designed with different specifications in mind. "If all you have is relational data, and you want to create tables, SQL is a great language. The problem is that the game has changed," said Jonathan Robie, XQuery technology lead and chief scientist at Massachusetts-based DataDirect Technologies, which makes tools for deploying XQuery within an enterprise.

He's referring to the recent rise of XML as the predominant language driving the Internet and data storage in general — an evolution that has pushed demand for tools to query and manage XML data. That's where XQuery comes in. More than a decade in the making, XQuery belongs to no one. It's the product of the W3C, which is responsible for its development. Several companies, including Microsoft, IBM, MarkLogic and Saxonica, have moved to commercialize XQuery with diverse tools aimed at easing its implementation.

Robie said there are more than 45 commercial XQuery implementations, which should hardly come as a surprise. Even longtime backers of relational database technology have conceded that XQuery brings a powerful new tool to the XML data-management arena.

In media coverage of the XML 2006 conference held in Boston in December, Oracle's Principal Architect Roger Bamford was quoted as saying XQuery could allow speedy revisions within databases that would otherwise be slow to adjust to the introduction of new data.

## Programming Made Simple

XQuery is designed to answer fundamental questions about the management of data, Robie explained. "How do you find stuff in XML? How do you combine stuff from different sources? How do you create new results and new structures? Those are all primitives in XQuery — things XQuery does naturally."

This could be good news for government IT workers, many of whom have come to rely on XML-driven data systems, which tend to offer easier and more legible access to information than their relational predecessors.


For those IT professionals, XQuery is a labor-saving mechanism. "It processes XML efficiently, by which I mean efficiently for the programmer, because the programmer doesn't have to spend all his time explaining things to the system," Robie said. "The system already understands what XML is, so the programmer writes a lot less code."

This is a big step forward from the relational model. "If you are a programmer working in SQL, and someone has a new data source for you," Robie said, "you are going to crack open some manuals and start studying."

In XQuery, the language assumes everything is XML and leaps forward to execute.

Users say it's relatively easy to acquire a fluency in XQuery basics. Harvey turned to the language to develop an interactive dictionary, and recalls boarding a train not knowing a thing about it. "By the time I took the train to New York, had a meeting and took the train back," she said, "I had a working product that I could give to my client. If you are familiar with XML and XML technologies, it is not that hard to work with."

But even those programmers with significant XML deployments already in place will need to proceed with some caution, as the worlds of SQL and XQuery still overlap. "You still need the right tool for the right job," said Oracle's Hardie. "There may be very clear cases for one and very clear cases for the other, but that will never stop some people from trying to drive a screw with a hammer."

Though XML and XQuery technologies are on the rise, the relational database world is far from over. "We have at least a decade ahead of us," Robie said. "You've got so much expertise, so many people who know what to do with relational databases — and relational databases still are very efficient at what they do." 

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**W**hen I look at the Gateway E-2600D that sits near my feet, I can't help but think of a Toyota Corolla.

The Corolla, you see, is the automotive version of this computer. It's a safe, reliable car that will get drivers from point A to point B without fuss. The car is by no means flashy, but is equipped with an acceptable number of features. Like the E-2600D, the Corolla has some significant power under the hood that will, for the most part, never be taken advantage of.

The hulking, black tower under my desk came with some notable standard equipment, including a 3.00 GHz Pentium 4 processor, a 305-watt power supply, six USB ports and best of all, a 3.5-inch floppy drive — just in case I have some DOS batch files to run.

The E-2600D base model starts at an attractive \$609, but like all Gateways, to get the good stuff you have to fork over more green, which can be irritating. For example, it'll cost you to get a DVD drive instead of the standard CD-ROM drive — and who in 2007 would ever opt for a basic CD-ROM drive?

Similarly the base model comes equipped with a paltry 256 MB of RAM, albeit DDR2. With applications demanding ever more system resources, that's simply not enough RAM. The model I tested also ran with 256 MB of RAM, and the taxing effects of the multiple applications were apparent. Plus, at 40 GB, the base model hard drive must be some inside joke at Gateway — maybe there's a pool on who will be the first customer to *not* spring for the extra \$10 for the 80 GB version.

On the plus side, the machine is pleasantly quiet and comes with the fairly impressive

integrated ATI Radeon Xpress 200 graphics processor, making for acceptable video and 3-D applications. For most cubicle drones, the ATI processor is plenty, unless your job is playing World of Warcraft.

In addition, the machine comes with four expansion slots, two PCI, one PCI-Express x1 and one PCI-Express x16 — nice touches if you plan on keeping the computer for a while. The rest of the features are pretty ho-hum — nothing exciting, but certainly the kind to tick you off if they weren't included.

Overall, given the price and features, the E-2600D performed well enough to be recommended. And while it's anything but extraordinary, like the Corolla, it's a good blend of practicality, performance and reliability. **GT**

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# The Traf-O-Matic

The democratization of geospatial data and ubiquitous connectivity may be the convergence point in redeeming our love affair with the automobile by helping us navigate through the increasingly congested arteries of America's aging roadways.

The change is perhaps most easily seen on the dash of your car. If the vehicle didn't ship with an onboard navigation system, it may have an aftermarket version. There is a growing number of aftermarket GPS systems vying for the coveted spot just right of the steering wheel.

Most look like variations of a pregnant PDA, but each brings different degrees of smart mapping to the mundane task of driving.

One such unit received positive notice at this year's Consumer Electronics Show.

That said, the distinction among video, data and mapping may become moot if nascent offerings to turn cars into Wi-Fi hotspots on wheels reach critical mass — bringing e-mail, instant messaging, streaming video and audio, real-time data, live mapping and online gaming to a car.

This intersection of a useful service and undeniably cool consumer devices holds the promise of delivering on an interesting idea that people have been working toward for at least three decades. Departments of transportation deserve much credit here, as do public-sector GIS shops in building expert systems that have since been opened to a much larger universe of users that includes all the rest of us.


Computer scientist Jim Gray, best remembered as the father of the online transaction,

The distinction among video, data and mapping **may become moot** if nascent offerings to turn cars into Wi-Fi hotspots on wheels reach **critical mass**.

Touted as the "smartest, most Internet-connected navigation system on the road," it provides the choice of three routes to any destination, and it may be the next step in getting *real* real-time traffic information to where it is needed the most — the car — while giving drivers the option of searching gas station fuel prices en route. If there is a better way to find gas stations, restaurants and theaters, why not use the tool for finding at least a short list of government services on the fly?

While traffic camera video feeds operated by state and city departments of transportation have been a boon to traffic reporters, XML-based feeds of incident, volume, occupancy, speed and flow data are automatically putting the smart in smart mapping services.

engineered a massive and freely available data store of maps and aerial photographs of the United States called TerraServer-USA during his tenure at Microsoft. Subsequent innovations in tying events and things to their geography owe him a debt of gratitude.

Then there were a couple of teenagers who, armed with traffic-counting boxes and some software they wrote themselves, set out to inventory traffic flows in the city in which they lived. It was 1972, and their company was called Traf-O-Data — their names were Bill Gates and Paul Allen. The company later failed after their home state began offering free traffic processing services — which freed them up to do other things. 

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