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20TH ANNIVERSARY VOLUME 20 » ISSUE 2

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

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A New View

By now, you've probably noticed that this issue of *Government Technology* looks different. Thanks to an extensive redesign led by Art Director Kelly Martinelli, your trusty GT mag has a fresh and vibrant new appearance. But that's merely the tip of the iceberg.

Inside you'll find the first of several new features we plan to unveil in the coming months. *The Big Picture*, making its debut on pages 10 and 11, is a monthly photo essay covering issues that impact how you work. And our new *Up Close* section on pages 14 and 15 will regularly examine emerging technologies and applications.

of Internet users who populate and contribute to the World Wide Web. Some of those individual contributions may be questionable — a cursory search of YouTube's homemade videos turns up more than a dozen mock battles between Godzilla and various robots — but collectively, they're changing society.

Obviously these forces impact government. As citizens learn, communicate and organize in new ways, public institutions must keep pace. Public officials have done tremendous work in moving government information and transactions online. But their task becomes tougher as the Web 2.0 generation comes of age. What do you say when young adults

> Essentially we're **redefining the scope** of a *Government Technology* story — just as technology itself is changing how citizens interact with each other and public institutions.

In addition, we intend to devote more space to technological issues that are reshaping both government and society at large. Essentially we're redefining the scope of a *Government Technology* story — just as technology itself is changing how citizens interact with each other and public institutions.

Evidence of change is all around us. MySpace and other social networking sites have dramatically altered how large segments of our population communicate. EBay and its imitators permanently changed the buyer-seller relationship. Now blogs and YouTube are tearing up longstanding conventions of how citizens obtain and share information.

Time magazine went so far as to dedicate its 2006 Person of the Year issue to the millions

ask why they can't text a vote for governor from their cell phone like they do for *American Idol?*

Government Technology's New Year's resolution is to help our readers make sense of these trends and their impact on government operations and institutions.

As I promised in this column a few months back, we'll continue to cover current uses of digital applications to transform government. But we'll also pay more attention to unconventional and emerging interpretations of "government technology." GT

STEVE TOWNS
EDITOR

AN
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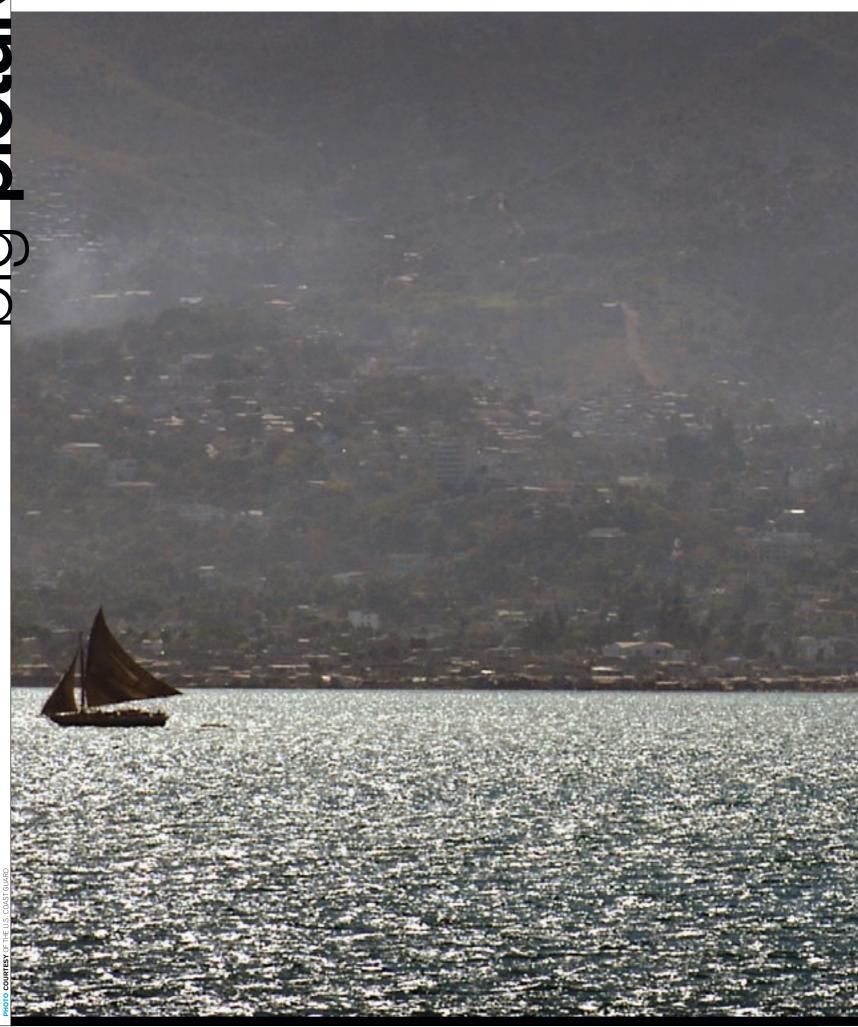PUBLICATION

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The Coast Guard cutter Key Biscayne keeps a watchful eye over Port-au-Prince, Haiti, to ensure migrants aren't taking to the seas in an attempt to reach the United States illegally. In November 2006, the U.S. Department of Homeland Security started a pilot program to collect biometric information from illegal migrants attempting entry into U.S. territory through the Mona Passage, the body of water between the Dominican Republic and Puerto Rico. The Coast Guard compares digital fingerprints and photographs of illegal migrants against the US-VISIT database, which includes information about wanted criminals, immigration violators and those who previously encountered government authorities.

the last mile

BY CHAD VANDER VEEN
TECHNOLOGY AND POLITICS EDITOR

Predicting the Future

It's 2007 and my flying car has yet to materialize. In fact, almost everything futurists promised would be here by now isn't, and everything that *is* here was never imagined in the first place.

An MP3 player the size of a postage stamp? I'd trade that for a Pan Am space plane ride to a big, spinning space station. Wireless broadband Internet? It's pretty cool, but no cooler than a fleet of robots doing my bidding.

Since everyone seems to predict the future wrong, I feel it's my duty as a columnist to present my own predictions for the year — predictions I can easily explain away when it becomes clear I was way, way off. After all, what columnist worth his salt doesn't look

> ## "It's 2007 and my **flying car** has yet to materialize."

forward to the New Year when thoughtful commentary can be replaced with wacky guesses about what the future has in store?

Therefore, prepare yourselves, as we rocket through time and space to arrive at the fantastically distant year 2007 and peer into the mysteries that await our future selves.

Prediction One: Public safety agencies nationwide will solve the interdepartmental communication and collaboration problem. Suddenly every law enforcement and emergency response organization will work together seamlessly — only to realize that working as one giant pseudo-entity is actually less efficient than working as many small ones.

Prediction Two: 2007 will be the year of the acronym as new multiword organizations and projects are slapped with lengthy, pointless initials. The trend will become so popular, sentences will be reduced to incomprehensible collections of capital letters — drastically diminishing readability of our magazine.

Prediction Three: Cities and counties countrywide will deploy large-scale municipal Wi-Fi systems. Hopes for increased productivity, tourism and revenue will be dashed, however, as millions of Americans previously unable to access broadband will become hooked on YouTube videos, resulting in massive unemployment and a crippling economic downturn.

Prediction Four: In 2007, everything will be mapped using GIS. Where are the Cheetos at the grocery store? Just go to Google Grocer. Can't find your car keys? Microsoft Virtual Keys can tell you. Has your dog run away? Yahoo! Pets will find him and give you alternate routes to go retrieve him!

Prediction Five: In late 2006, a number of pilots and other airline employees reportedly spotted a UFO over Chicago O'Hare. I predict 2007 will be the year the public is finally told the truth about extraterrestrials — they're real and already among us. This revelation will lead to a giant headache for government IT workers who will be asked to modernize the legacy, paper-based alien registration system used since the 1950s. Look for an online alien-registration application rollout in early 2009 — and a specialized mouse for their weird, three-fingered hands.

I've given you my five predictions, dear readers. Now it is up to you! Work under the assumption that each of these will come to pass. Then, as sure as the sun sets in the west, 2007 will be the greatest year the public sector has ever witnessed.

You can thank me later. GT

Up Close

The **San Diego Metropolitan Transit System** implemented new video camera technology in its trolleys that allows agency personnel to monitor the entire rail system without sitting in the video control booth. Perceptrak software by Cernium Corp. provides security staff with real-time information about potentially dangerous activities occurring anywhere on the light rail system — even if no one is watching the video screen. Security cameras on San Diego's trolley network scan and identify "suspect" behaviors, such as a person lurking, a crowd forming, a person falling or even a package left behind. When these behavioral patterns are found, the software flags the footage for review and alerts security personnel to the activity via text message or e-mail. This allows for swift response to suspicious incidents, possibly even stopping crimes in progress — and in the event that a crime does occur, it allows for a forensic review of the video footage.

The San Diego Trolley began service on in **July 1981,** making it the first modern light-rail system in California. It is the fifth most-ridden light-rail system in the country.

Real-Time Alerts
The four boxes on the left side of the console show real-time video of suspicious behavior detected by the system. If there are no alerts, the boxes remain dark. In the upper left corner, a person moves erratically through a parking garage. This type of movement has been pre-established by the user as suspicious behavior for this scenario. The middle lower portion of the screen depicts a lurking person — again, a user-established suspicious behavior.

Instant Replay
Events that have already occurred can be reviewed in the instant replay box, located in the upper right corner of the console.

Scrolling Events
Events available as instant replays are easily selected from the rolling event list below the replay box with a click of a mouse.

The alert monitor console is the primary interface for an operator using Perceptrak video analytics. By way of the console, users can review, manage and respond to potential security violations detected by the software in real time.

Predicting Osteoporosis

A new twist on an old technology may provide cheaper and simpler detection of osteoporosis, a disease that causes bones to become fragile and more likely to break.

Researchers of the University of Manchester's School of Dentistry pioneered use of X-rays to measure the thickness of patients' lower jaws in conjunction with "active shape modeling" software. A key indicator of osteoporosis is the width of a patient's jaw cortex, and if the software detects a measurement of less than three millimeters, the dentist is alerted.

This method works automatically during routine dental X-rays and reduces costs involved with current screening technology.

— UNIVERSITY OF MANCHESTER'S SCHOOL OF DENTISTRY

IT Spending Increase

Worldwide technology spending varies by industry, and the following shows the percentage increase or decrease by industry from 2006 to 2007.

Industry	Percentage
Media	6.9%
Health care	5.6%
Transportation	3.6%
IT	3.6%
Energy	3.0%
Telecommunications	2.8%
Education	2.7%
Electronics	2.1%
Utilities	1.5%
Government	1.3%

SOURCE: GARTNER

VoIP on the Rise

Voice over Internet protocol (VoIP) continues to gain users in the residential telephone service market, according to In-Stat. The market research firm's newly launched Residential VoIP Tracker Service, shows that more than 9 million U.S. households have at least one active VoIP user, with many households reporting the use of more than one VoIP service.

Trawling Antartica's Depths

A new robot vessel capable of plunging 6.5 kilometers will probe the Antarctic deep, according to the BBC. Isis, the UK's first deep-diving remotely operated vehicle (ROV), will comb the Antarctic seabed in its inaugural science mission.

Researchers hope to uncover new information about the effects of glaciers on the ocean floor and the animals that inhabit these waters. While the scientists and engineers began their long journey to the Antarctic at the start of January 2007, Isis left the UK's shores in November 2006 and arrived at its destination in early January.

Once unpacked from its containers, the ROV will be placed aboard the British Antarctic Survey's ship — the RSS James Clark Ross — ready to explore the Marguerite Bay area on the west side of the Antarctic Peninsula.

— *Mercopress.com*

Majority Lurks

Less than 2 percent of all Internet users are frequent content contributors via Weblogs, between 10 percent and 15 percent contribute occasionally, and more than 50 percent read or watch the discussions of online communities. — *Gartner*

Pass the Peas

Soon, you could eat a Philly cheese steak in Atlanta while your sister in Oregon eats her California roll … all while discussing international politics over the same virtual dinner table. Accenture is developing "The Virtual Family Dinner" — technology allowing families to dine at the same "table" regardless of their locations.

A system of cameras and microphones captures the image of one diner and sends it to the other, and vice versa, displaying the audio and visual on a TV or computer screen.

The system could incorporate computers, TV sets and broadband already present in many homes, so customers could have the technology installed much the same as they do cable TV.

— TECHJOURNAL SOUTH

FAMILY MATTER

By Shane Peterson
Associate Editor

I t's been 13 years since *SACWIS* entered the lexicon of administrators of state social services programs, yet a statewide automated child welfare information system that's fully compliant with federal standards still eludes many state governments.

Even with funding help from the federal government, states found themselves far behind estimated completion dates for building SACWIS-compliant systems — some states reported eight-year delays, according to a 2003 SACWIS study from the then-General Accounting Office (GAO).

The GAO examined state child welfare information systems, at Congress' request, after a series of tragedies involving children under the supervision of state child welfare agencies across the country.

As of November 2006, three states had achieved SACWIS compliance, and two others were enhancing their systems to maintain compliance, according to the U.S. Department of Health and Human Services' (HHS) Administration for Children and Families (ACF), which oversees SACWIS compliance.

The 13-year implementation lag is perhaps not the timeframe the federal government envisioned for states making the SACWIS transition. States face significant barriers to execute a successful SACWIS, however, including the complexity of the giant information systems and the cultural shift to information sharing between social services agencies forced by the SACWIS rollout.
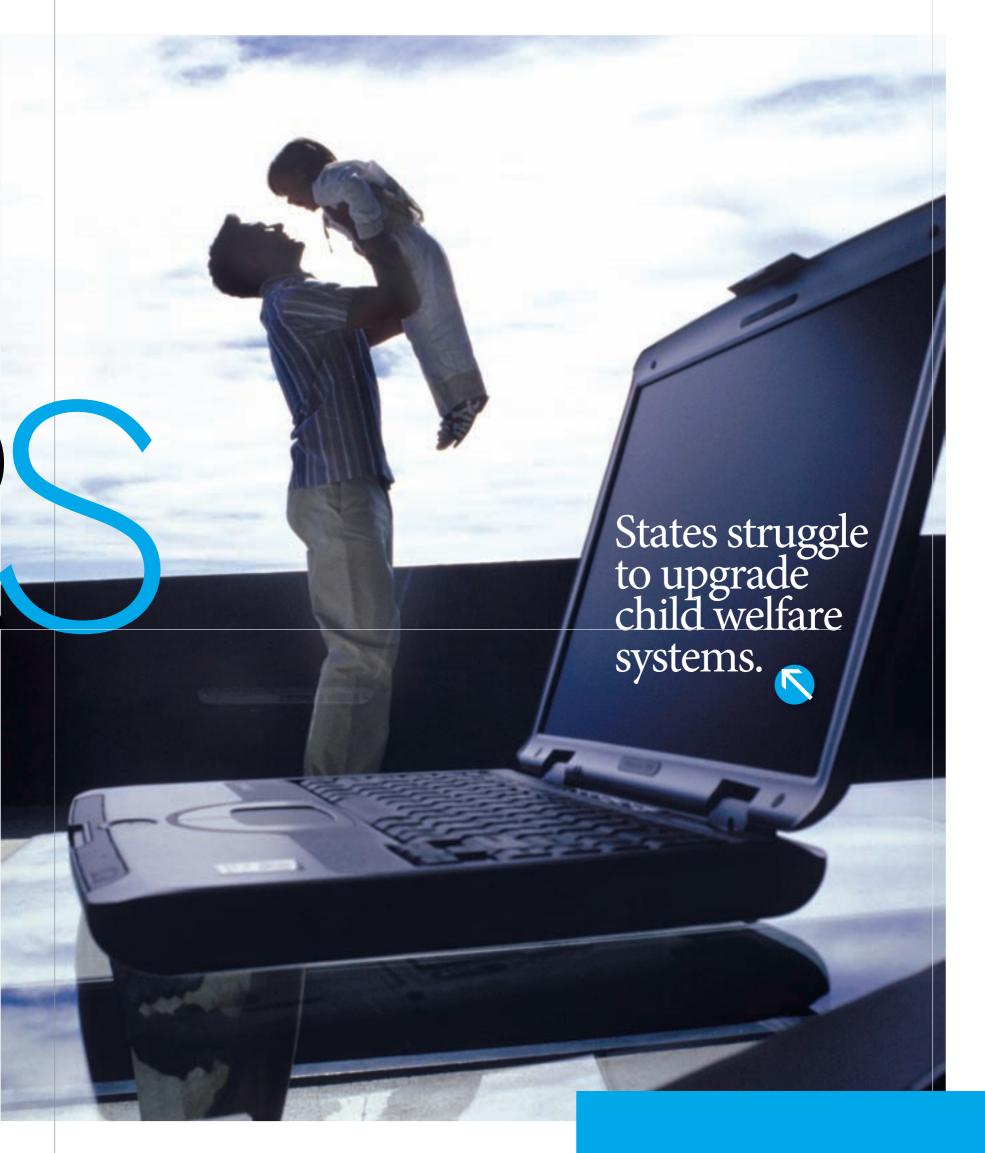
Finding Fault?

States' slow SACWIS pace can be traced to several intertwined causes.

Funding is always an issue in big IT modernization projects, and SACWIS funding presents additional headaches. System design is another common problem in large projects, and SACWIS design adds an additional layer of complexity. Finally, bringing cohesion to differing data definitions among local, state and federal governments is proving difficult.

The federal government has offered states funding since 1994 to support SACWIS compliance initiatives. Of course, federal dollars always come with strings attached, and SACWIS funding is no exception.

States must submit planning documents to the HHS that specify how their systems will be designed, built, deployed and maintained. Also, states must include performance goals in the planning documents. Furthermore, HHS examines states' information systems through formal SACWIS assessment reviews, and a separate federal review process to evaluate compliance with child welfare laws and outcome measurements set by the federal government.

Timing was one problem associated with the federal SACWIS funding, according to the GAO's report. In 1994, the federal government matched state funding for SACWIS at an enhanced rate of 75 percent, but the GAO discovered that many states didn't apply for federal funding or begin SACWIS development until 1996 and 1997 — when the bulk of federal funds had already been allocated.

States struggle to upgrade child welfare systems.

Also, the enhanced funding rate expired in 1997, dropping to 50 percent, which meant states had to come up with more of their own money. Forty-two of the 46 states surveyed told the GAO they experienced varying degrees of difficulty securing state funding for SACWIS development.

States have other worries tied to federal funding, including how much money they need to pay back if a project fails.

Citing figures from the HHS, the GAO's report said North Carolina received approximately $9.6 million in developmental funds for its SACWIS. North Dakota received approximately $2.4 million in developmental funds and $245,000 in operational funds for its SACWIS. Unfortunately both states ran into difficulties and did not complete their systems, the GAO's report said, forcing the states to negotiate with the HHS to determine how much money to return to the federal government.

Wade Horn, assistant secretary for Children and Families, said the goal of SACWIS is to give caseworkers a tool for managing their case loads.

Federal Satisfaction

Despite the setbacks, the ACF is pleased with states' progress, said Wade Horn, assistant secretary for Children and Families.

"We have 43 states and the District of Columbia that are in some stage of SACWIS planning, development or actual operations," Horn said. "For a system which is voluntary for the states, I think that's a pretty good measure of compliance."

Though rolling out a SACWIS is a complex undertaking for states, Horn said the HHS's overarching goal is straightforward — to give state and local health and human services agencies the resources to build a tool that helps caseworkers manage their case loads. The HHS also stands to benefit from improved case-management practices.

Horn explained that more states successfully rolling out SACWIS means federal policy makers can rely on data from local, state, regional and national levels that's collected in nearly real time.

"We can make policy decisions based upon good information, rather than on mere supposition as to what's going on in the child welfare system," he said.

HHS officials aren't concerned about how long it has taken states to implement SACWIS, he said, partly because federal officials understand the process foists cultural change on agencies that may not welcome it.

"A truly integrated SACWIS can help to facilitate — and maybe even force — coordination across different silos of social services delivery systems," Horn said.

Historically HHS officials have focused on individual social programs, such as child welfare systems, the Temporary Assistance for Needy Families (TANF), child-care subsidies or even juvenile justice. This tunnel vision has led to information systems that only serve specific agencies with no capacity for information sharing.

"While they're not exactly the same population, they're overlapping populations," Horn said. "The TANF program doesn't coordinate with the child welfare program. The child welfare program doesn't coordinate with the child-care program. We act as if the only system that this child interacts with is the one we're involved in.

"The big, grand vision in social service delivery to children and families has always been integrated services. This technology has the ability to facilitate that integrated service delivery we've all been talking about for 30 years."

Besides the technology solutions to eliminating information silos, the HHS is presenting a legislative solution to Congress to address a primary culprit in information-silo making — federal funding by category.

"We have a proposal before Congress to break down the categorical walls of the funding streams within the child welfare system," Horn said. "One of our proposals is to provide federal money much more flexibly to states so they don't just spend it on child welfare, but they have a lot more flexibility in determining exactly how they spend the money."

Data Differences

States' struggles with designing a SACWIS don't fall into clear-cut categories, but one particular issue tends to plague large IT projects that impact multiple branches of government — getting a diverse collection of state and local agencies to agree on system design.

The GAO studied New York state's SACWIS effort and found a cross-government bottleneck. The state's counties administer child welfare services, and the GAO learned that SACWIS development ground to a halt when commissioners from five large counties and New York City expressed frustration with the proposed SACWIS design.

That frustration led local government officials to ask the state to stop SACWIS development, according to the GAO, until the state reassessed the SACWIS design and implementation plans.

After that reassessment, state officials altered the project plan and created statewide work groups to bring all counties into agreement on the system design, the GAO said, and the state hired a contractor to monitor SACWIS development and ensure all users' requirements received serious consideration.

States also told the GAO that another design challenge is creating a SACWIS that reflects child welfare work processes and is user-friendly, a problem also identified in the HHS's reviews of states' systems.

In the federal SACWIS review, one state explained that it designed its SACWIS to meet

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caseworker needs and mirror child welfare work processes by developing a system that required events to be documented as they occurred, the GAO said. The state explained that caseworkers provide services to the children and families, and then record the information in the system.

Unfortunately the design limited the SACWIS's functionality because caseworkers could not enter information into the system after an event happened, the GAO said, and the state had to redesign the system to correct the design flaw.

Finally, designing a system that earns SACWIS compliance from the HHS entails overcoming troubling technical challenges. The GAO said 36 of the 50 states responding to its survey encountered technical issues, including matching state data element definitions to HHS's data categories.

North Carolina officials told the GAO that state policy requires every location where a child resides to be counted, including hospital stays, but one set of federal regulations stipulated that hospital stays and other short-term placements should not be included when counting foster care placements.

In cases where state and federal policies differ, states must carefully reformat their data to meet federal reporting requirements. Texas officials, for example, told the GAO that although a federal review of Texas' SACWIS instructed the state to modify its system to

Kathleen Perras,
vice president and general manager, State and Local Programs, Dynamics Research Corp.

collect, map and extract data on guardianship placements, the state itself does not support guardianship arrangements.

This puts states in an awkward position, the GAO said. They must make sure they're reporting accurate data to the federal government but not contradicting state policies.

Short List

The dearth of states with a fully compliant SACWIS is somewhat surprising, said Lynda Arnold, director of the National Resource Center for Child Welfare Data and Technology (NRC-CWDT), but not completely unexpected because of the complicated nature of such systems.

"The issue with achieving tier-one status is just more complex than people had thought," said Arnold, who served as Child Welfare director in the Oklahoma Department of Human Services prior to joining the NRC-CWDT. During her tenure, Oklahoma became the first state to implement a federally compliant SACWIS.

The NRC-CWDT spends most of its time helping states with SACWIS data issues.

"Our main requests [from states] have been about converting data from their old system to their new system and not losing data quality in that process," she said. "A lot of our emphasis has been on mapping the data to meet federal requirements."

Perhaps the most misunderstood aspect of a SACWIS is that it's a child welfare management system, she said, not an information system.

"You've got to have that involvement from child welfare staff and from the leadership in child welfare," Arnold said. "Sometimes, getting the buy-in from the child welfare staff — and getting that priority within the child welfare system when they're dealing with so many other issues — is very difficult."

Early SACWIS development efforts appeared to be driven by the IT piece alone, she said, which is one reason why states ran into trouble designing systems that worked well while capturing and reporting data in ways that met federal guidelines.

One SACWIS development model that produced positive results *and* pleased the federal government was used by Dynamics Research Corp. (DRC) to design, develop and roll out a SACWIS for New Hampshire in 1997 and for Colorado in 2001.

DRC and New Hampshire rolled out New Hampshire Bridges, a system modeled on an earlier SACWIS originally developed in Oklahoma. DRC took the Oklahoma system from the public domain and adapted it to fit

New Hampshire's organizational and operational needs, said Kathleen Perras, DRC's vice president and general manager of State and Local Programs.

"New Hampshire was one of the early states to adopt a SACWIS," Perras said. "The state wanted to take advantage of the 75 percent federal matching funds. A few states had gone after brand-new systems, but the federal government, at that time, was promoting reuse and transfer systems — it was really encouraging states to take another state's system and adapt it, rather than paying for 50 brand-new systems."

Perras said New Hampshire officials had seen Oklahoma's system in operation, liked it and wanted it for their state. In an odd twist, Perras said DRC wound up competing against the company that produced Oklahoma's system for the New Hampshire SACWIS contract.

"We chose to go to the federal government to take it up on its word that the Oklahoma system was part of the public domain, that we could get a copy of it and compete against the original developer in a fair competition," Perras recalled.

A few years later, New Hampshire Bridges was adapted to fit Colorado's needs, Perras said, adding that Colorado officials liked New Hampshire Bridges due to the two states' similarity in business processes for child welfare services. The Colorado Trails SACWIS went live in 2001.

DRC is now busy in Ohio. The company won a contract, and after a two-year development effort, a SACWIS pilot kicked off in Ohio's Muskingum County in August 2006. Perras said the target date for rolling out the SACWIS to Ohio's remaining 87 counties is mid-2007.

Other SACWIS Success

In 1998, Oklahoma was the first state to achieve full federal tier-one compliance with its SACWIS, according to the GAO. Other states have since followed Oklahoma's lead.

Kentucky started its SACWIS — called The Worker's Information SysTem (TWIST) — in the early '90s, said Lorna Jones, CIO of the Kentucky Cabinet for Health and Family Services.

TWIST went live in 1996 and serves 129 locations throughout the state. In 1997, Kentucky won an award for TWIST from the then-National Association of State Information Resource Executives for "Innovative Use of Technology."

"TWIST was one of the first client/server applications that Kentucky rolled out," Jones

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said, noting that the state attempted to adhere to federal SACWIS guidelines from TWIST's beginning. "Our first federal review came in 1999, and we worked closely with the feds over the years. It wasn't until July 2005 that we received tier-one SACWIS compliance. It's been a long, evolving process focused mainly on meeting those many SACWIS requirements, as well as trying to get a system in place for workers to use in the field."

Besides the burden of meeting various federal requirements, Jones said the health and human services setting itself makes it hard for states to build a SACWIS.

"Health and human services is a very dynamic environment to try to automate. When you're dealing with human services, every day is a different day," she said. "It's like changing a tire on the bus as you're driving down the road. Once you're operational, from a technology standpoint, you've got to focus on maintaining the system, making sure the payments go out the door, and at the same time, making those changes toward meeting all the federal requirements."

It's a huge challenge, Jones said, and one that states seem slow to respond to. But there's a reason for the slow pace, Jones said: States realize there's no room for error; people depend on human services agencies to be on time with benefit payments and related assistance.

"We are dealing with human services," she said. "What we roll out has to be right because you're dealing with people's lives."

Kentucky is now moving TWIST to a new, Web-based platform to create a second-generation SACWIS. Jones said the state is planning a two- to three-year transition, and the hope is that the conversion will be easier, since Kentucky already built its SACWIS.

Still, moving to a second-generation SACWIS presents its own challenges.

"We have to make sure we stay SACWIS-compliant," she said. "We still have to meet all those requirements, but we're also going to focus on improving some of the functionality in the system — making the system a little more user-friendly."

SACWIS Vacuum

Viola Miller is also quite familiar with Kentucky's SACWIS experience.

Miller served as secretary of Families and Children in Kentucky prior to being appointed commissioner of the Tennessee Department of Children's Services in late 2003. Tennessee plans to release an RFP in early 2007 to upgrade its existing SACWIS to a second-generation SACWIS built on Web services.

Miller said she remembers well the difficulty Kentucky encountered during its search for the technology to create the state's SACWIS.

"As I began to search, it just didn't seem to me that this should be as hard as it was — that there ought to be some product, market or base to build around," Miller recalled. "But the market is too small. There are only 50 states, so there's not enough market there for private industry to really develop a product that's going to help states."

States fended for themselves in solving the SACWIS puzzle, she said, and those individual efforts did little to create critical mass for a SACWIS market. Those efforts had to be individual because every state administers health and human services differently, Miller continued, forcing states to reinvent the SACWIS wheel.

Miller cites such individuality as the chief barrier to creating an off-the-shelf SACWIS application that any state can purchase and simply plug into its health and human services technology architecture. The nature of a SACWIS makes it completely different from, say, a business system such as an enterprise resource planning application.

"If this was a *business* application, writ large, there would then be a market for it," she said.

Along with the decidedly nonbusiness nature of social services agencies' work, the culture of these agencies creates another complication when building IT systems such as SACWIS. Social services agencies take a humanistic approach to their work, Miller explained, instead of an organizational, management-driven perspective — which makes building a SACWIS that much slower.

"It's not a good/bad judgment. It's just the nature of the work we do," she said. "Social workers would rather spend their time with [client] families and kids, instead of entering information into a case-management system." **GT**
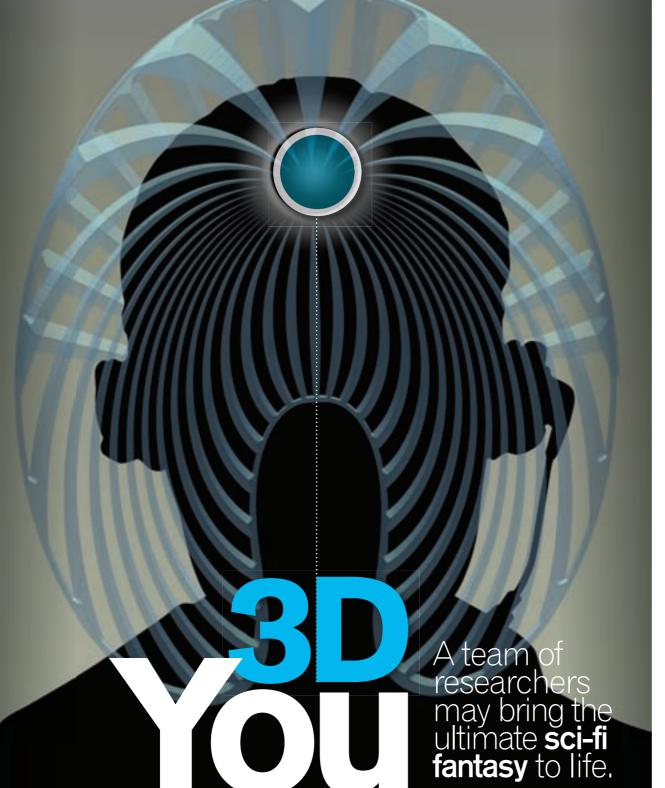
"Health and human services is a very dynamic environment to try to automate. When you're dealing with human services, every day is a different day. **It's like changing a tire on the bus as you're driving down the road.**"

Lorna Jones, *CIO, Kentucky Cabinet for Health and Human Services*

3D You

A team of researchers may bring the ultimate sci-fi fantasy to life.

BY CHAD VANDER VEEN
TECHNOLOGY AND POLITICS EDITOR

Carnegie Mellon University (CMU), science fiction becoming science fact may be far closer to happening than anyone imagined.

Taking Shape

Just over three years ago, a couple of computer science/engineer types found themselves at a brainstorming session and wound up coming up with the next big idea.

> ## "In terms of the hardware side, we're starting to build **prototypes** at a couple of different scales."
>
> **Todd Mowry,** *associate professor of computer science, Carnegie Mellon University*

Todd Mowry and Seth Goldstein, both associate professors of computer science at CMU, hit on an idea that could fundamentally change the world.

Mowry imagined a technology that would let people project what he calls a "telepresence" — a remote, three-dimensional representation of a human being. The representation would not be merely an image, but a physical duplication or model. The technology would, for example, replace telephone and Web conferencing by creating lifelike replications of the conference participants, all in the same room.

"Seth and I came up with the idea for the project," Mowry recalled. "We were at a workshop sponsored by the National Science Foundation (NSF) and Computing Research Association, where we were supposed to be brainstorming about big, grand challenge-types of ideas.

"Seth had a proposal for using possibly nanotechnology, but not necessarily that, to build little objects like robots that could form into shapes. We sort of realized the best way to build what I had in mind [with telepresence] was through Seth's idea of having things form into physical shapes — to have something that is physically there, rather than the illusion."

Mowry and Goldstein were convinced they were on to something, and believed the technology existed to build something they called a "claytronics atom" or "catom."

At the scene of an automobile accident, several vehicles are engulfed in a raging inferno. Firefighters and other rescue personnel arrive on scene and receive a report that multiple victims are trapped in the flaming wreckage. Hundreds of gallons of water are quickly expelled to extinguish the blaze. In all likelihood, the vehicles' occupants are dead. Nevertheless, firefighters examine each smoldering heap and find one person with faint vital signs.

Rescuers begin prying the car doors, breaking them free from their chassis. Then, in what seems like a magician's sleight of hand, the firefighers' tools evaporate only to re-form moments later into a stretcher. The victim is loaded onto a spec-tral, makeshift bed and rushed from the scene to a waiting ambulance.

The captain barks an order — the drill is over. The firefighters breathe a sigh of relief, and drop the stretcher and its occupant to the ground, where they appear to shatter into a billion tiny pieces.

Welcome to the world of 3-D holograms. But these holograms, officially known as "dynamic physical renderings," are not merely figments of light and color — they have mass, weight and texture. They move in real time and interact as if they were actual physical objects — even actual people.

If it seems like science fiction, it is. But for a team of researchers at Intel and

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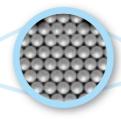As Michigan's economic powerhouse, Oakland County needed a long-term strategy to promote financial stability and growth as its economy transitions from manufacturing to knowledge based. CA's software solutions helped them to improve IT Governance to better support a growth strategy that would allow them to create a recession-resistant economy. With transparency throughout the organization, reduced IT costs and increased efficiency, there are no barriers to Oakland County's continued growth. Learn how CA software solutions help governments around the world like Oakland County's realize the full Power of IT at **ca.com/customers**.
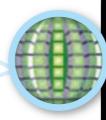
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Double Vision

Original → **Replica** → **Ensemble of Catoms** → **Single Catoms**

When one very small catom is combined with billions of others — along with some powerful software — this amalgam could be programmed to take the physical shape of whatever a user wanted.

CMU provided initial funding to investigate the idea's feasibility. The notion soon attracted others who saw the potential.

Jason Campbell, a senior researcher at Intel Research Pittsburgh, joined Mowry and Goldstein on the project. Additional funding now comes from Intel, the NSF and the Defense Advanced Research Projects Agency. As research progressed from idea to prototype, Mowry took a leave of absence from CMU to serve as director of research at Intel Research Pittsburgh.

After three years of work, the team has produced several simulations and larger-scale prototypes of catoms. A catom is an individual unit, much like an organic cell, that when combined with others, forms an object. Also like a cell, it needs power, programming and a cohesive force. The human cells use energy, are programmed by the brain and bound together by various forces, such as electromagnetism or chemical bonds.

"In terms of the hardware side, we're starting to build prototypes at a couple of different scales — some very large prototypes that replicate all the computational and other components we want. Those are about two inches across," Mowry said. "And some very small prototypes in the submillimeter realm that are just starting to replicate geometry. We expect, in the coming year, to start to put transistors on those as well, which would give us the computation we need."

If all goes as planned, the team says, one of the earliest applications might be only a few years away. They call it the 3-D fax machine.

Using catoms Goldstein predicts would be a millimeter in diameter — still very large but functional — users could capture and reproduce any arbitrary object using a new breed of fax machine, much like a sci-fi teleportation device.

Unlike teleportation, however, the machine would merely duplicate an object as opposed to actually sending it to another locale. Ideally if the technology is perfected, the catoms would be so small they could emulate any texture. But Goldstein is optimistic about the 3-D fax machine, despite its bulkier catoms.

"We have looked at a lot of other applications, and probably the most convincing one to me in terms of both how close it is and also how much work we've done on it, is this idea of a 3-D fax machine," Goldstein said. "The reason that seems so close to me is that you don't actually need to have the thing moving dynamically in real time. The hardware mechanisms you need to build that are fairly simple."

By "dynamic movement," Goldstein means that this 3-D fax machine would not have to worry about duplicating objects that move independently — instead the replications would be stationary, inanimate things.

The catoms — the hardware — are one of the two primary challenges of making dynamic physical rendering a reality. The team believes that building the catoms is, while certainly a tremendous engineering challenge, "eminently doable." In fact, Campbell recalled, the first great leap forward from mere idea toward physical rendering a reality was when they got a prototype to move.

"It took off dramatically when the very first prototype wiggled — which was still very far away from a working catom — and we were able to show that to people. We then got the interest of a lot of faculty. Then suddenly the project grew significantly in terms of the number of CMU people involved. Another big leap was when the project became not just a CMU project, but an Intel project as well. In the last year, we've made a fairly huge amount of progress."

The team has made some advances on the hardware side, experimenting with various

> "We have looked at a lot of other applications, and probably the most convincing one to me in terms of both how close it is and also how much work we've done on it, is this idea of **a 3-D fax machine**."

Seth Goldstein, *associate professor of computer science, Carnegie Mellon University*

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"The software is a **key** challenge. In fact, the software is more difficult than the hardware."

Todd Mowry, *associate professor of computer science, Carnegie Mellon University*

adhesive forces such as electric fields and electromagnetism. Currently the researchers say that electric fields hold the most promise on the scale of microscopically rendered objects. The challenge is conducting experiments on a microscopic level to confirm their suspicion. Such experiments are difficult and costly.

Regardless, the team is quite confident that, with the "proper investment," the

The perimeters of these prototypes of catoms of **programmable matter** are covered with electromagnets, which enable catoms to attract one another and move throughout the ensemble.

catoms can be built. If anything derails the project, it won't be building the catoms, it will be designing the software. The software will be the brains of an object, telling each catom how to move, what color light to emit, what arrangement will result in the proper texture, among other variables.
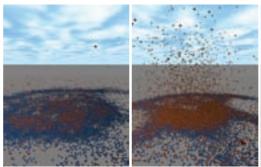
If the object were a human replica, the number of catoms the software would command would be in the hundreds of billions.

"On the software front, we've made great strides in the last year and a half or so — identifying ways to form shapes and route power and start to control some of these devices — but we have a long way left to go," Mowry said. "The software is a key challenge. In fact, the software is more difficult than the hardware."

Trek Tech

For fans of *Star Trek: The Next Generation,* catoms, 3-D fax machines and dynamic physical rendering sound a lot like the grand fantasy playground that is the starship Enterprise.

On the TV series, crewmembers frequented what they called the Holodeck, a room where lifelike holograms engaged users in whatever scenario they imagined.

Star Trek fans are known to pine for the gadgets and gizmos imagined by the show's writers — none more so than the Holodeck.

"It's not far off," Mowry said. "In the case of the Holodeck, you'd imagine constructing an entire interactive environ-

ment. At least initially we think of having similar environments in multiple places, and then constructing a replica of the person with whom you are having a conversation. Ultimately it's along the right lines."

As the researchers continue working, they must figure out pesky issues, like how to power the things, how to get the hardware down to the desired size, and a million other details. Fortunately they have ideas about how to solve most of the problems. A solution currently in play is to power a vat in which the catoms are stored, with a direct connection between the vat and the finished object.

Since the beginning, they've referred to the rendering of catoms as claytronics — essentially the molding of electronic "clay" into the most realistic artificial replication possible. Although the final product is a long way off, the name is especially apt considering Mowry says all it will take to reach the next level is molding a simple geometric shape.
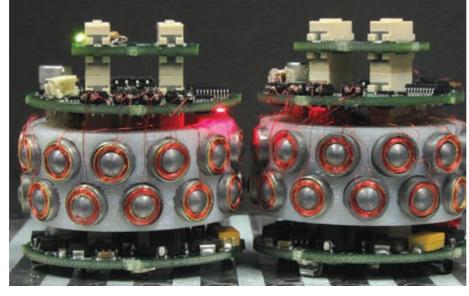
"Once we have four real units, and one of them can crawl on top of the other one and form a pyramid, I think you'll see a tremendous number of groups want to get involved," Mowry predicted. "I think our expectation is there isn't one group that is going to solve this problem, but rather we are starting an area in which many people will get onboard once they realize it's as doable as we think it is." **GT**

The DPR simulator (DPRSim) — a tool for use in the Dynamic Physical Rendering project — is a multi-threaded platform on which researchers can develop and test new distributed algorithms for large ensembles of catoms. In addition to being a programming platform, DPRSim provides a **physics engine** (for power, magnetics, gravity, and friction) and a **graphics engine** (for real-time visualization and movie generation). Here, DPRSim is used to form millions of catoms into the head of **Shrek**.

BY ANDY OPSAHL | STAFF WRITER

Split Decision

E-voting machines perform well in November election, but glitches remain.

The 2000 presidential election crisis sent states scrambling to buy direct-recording electronic (DRE) voting machines to eliminate hanging chads and other paper ballot hazards.

Yet several states endured a recent barrage of bad publicity from DRE voting malfunctions and security vulnerabilities. DRE voting typically allows a citizen to vote by touchscreen. The machine records and counts the votes electronically, which, according to advocates, makes it stunningly accurate and eliminates most voter errors.

DREs potentially resolve common paper-ballot errors, such as voters not voting in a particular race, or voters selecting numerous candidates for one position. However, before the 2006 midterm elections, poll workers in several states had trouble running the machines and often reported voting irregularities.

These difficulties lowered expectations or DRE voting in some communities, but the midterm elections passed without major problems.

DRE machines performed admirably across the nation in most cases, said Doug Lewis, director of the National Association of State Election Directors. Local election managers declared the machines a triumph, and the topic disappeared from most news pages.

Polls nationwide appear to have seen the worst of the DRE transition, but some observers say election officials may be resting too easily now.

Maryland's 2006 primary in September endured so many technical failures with its Diebold voting machines that Gov. Robert Ehrlich Jr. announced he'd vote absentee in the November general election. Thousands of voters followed suit. And in Sarasota County, Fla., polls reported glaring irregularities with a high-profile congressional race.

Numerous computer scientists continue to warn against the vulnerability of DRE machines to malicious software that could fix elections.

Eliminating Errors

A vote people can't see or touch still makes many nervous. Much criticism of DRE machines revolves around the lack of a paper trail or tangible documentation. But inaccuracy and fraud have plagued paper ballot tabulation for ages. Problems typically grab voters' attention after close or controversial elections.

The federal Help America Vote Act of 2002 (HAVA) gave states funding to update their voting equipment. The law sent states scrambling to buy DRE machines. The concept wasn't exactly new, however. Some voters have used certain forms of e-voting machines since 1979, said Michael Shamos, computer science professor at Carnegie Mellon University.

"We've been using them in Pennsylvania since 1984," Shamos said. "The advocates who argue against DRE voting make it sound as if it's a brand new thing that we rushed into because of HAVA. They don't tell you that we've been using them for a very long time."

Fairfax County, Va., introduced the Shouptronic voting machine in 1981 and used it until 2002. This early DRE system looked like a traditional lever machine except voters pushed a button next to a candidate's name on a backlit screen. The machine then recorded the choice to a computer hard drive. The machines used memory cartridges, backup batteries and they printed paper tallies to protect the votes.

Most say a DRE voting machine's primary selling point is that it drastically reduces voter error — the source of the 2000 Florida crisis.

"Electronic voting machines provide a tremendous amount more guidance through the ballot," Shamos said. "They can warn you that you haven't voted for a sufficient number of candidates by giving you a message flashing things in red. They give you a chance in the end to review your whole ballot and alert you that you've made a mistake. They can present the ballot in very large type for people who are visually impaired. They can display the ballot in multiple foreign languages — all kinds of things just not possible with paper."
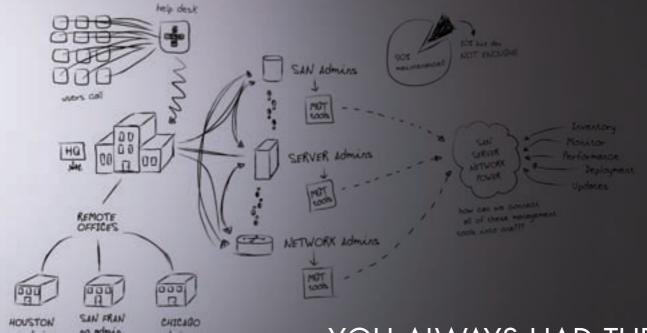
Florida … Again

Still, some counties reported irregularities with DRE voting machines after both the 2004 and 2006 elections. Observers emphatically profess the need to identify the remaining weaknesses before election officials get too comfortable and those weaknesses become accepted as par for the course.

Lucky No. 13
Voting irregularities sparked controversy in Florida's 13th Congressional District. The district encompasses all of Sarasota, DeSoto and Hardee counties, and most of Manatee County. It also includes a small section of Charlotte County.

Sarasota County, Fla., voters challenged the results of a congressional race between Democrat Christine Jennings and Republican Vern Buchanan in the November election. Buchanan won by a paper-thin margin, but voting irregularities were reported in the county, which uses DRE machines.

The Florida Elections Canvassing Commission certified Buchanan the winner of the 13th Congressional District race by 363 votes. But the county's DRE machines tallied a surprising 18,000 undervotes — a term used to describe when a voter selects neither candidate on the ballot.

The Electronic Frontier Foundation (EFF), a nonprofit freedom of speech advocacy group, said the undervote rate in Sarasota County was 16 percent, compared to 2.5 percent for the same election's paper absentee ballots and 1 percent in the U.S. Senate race on the same electronic ballot.

The American Civil Liberties Union, EFF and other organizations are representing Sarasota County voters in a lawsuit for a revote. The suit hinges on whether the legal team can prove the machines were defective.

"The circumstantial evidence is very strong that something happened with the machines or with the procedure surrounding the machines. The first task is to look inside the machines, inside the procedures and figure out what happened," said Matthew Zimmerman, attorney for the EFF, explaining that the e-voting process suffers from a lack of transparency.

"The technology and procedures are so closed that it's hard for anyone on the outside to tell what happened," Zimmerman continued. "If there was a problem with the machines, the thousands of votes that weren't cast are not going to be recoverable. At the end of the day, as we said in the complaint, it may lead to a requirement for the election to be rerun. It's hard to know what that would look like."

Zimmerman said his clients would request for the revote to happen on optical scan machines, which they consider more accurate. He said asking voters to revote on the same machines that failed them in the first

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ELECTORS.

The first use of simple paper ballots to conduct an election in the United States was in 1629 to select a pastor for the Salem Church in Massachusetts. Initially paper ballots were pieces of paper marked and supplied by voters. Later on, political parties and candidates provided preprinted ballots for voters to cast. This ballot was used in the 1864 presidential election in Ohio.

election would be bad public relations, even if the possible error were fixed.

"It's going to be hard to go back to the voters in Sarasota and tell them to use the machines over again," Zimmerman said.

With the potential timeframe already shrinking, Zimmerman said the court would need to mandate a certain amount of lead-time to publicize the revote. Election officials would need to publicize instructions particularly clearly because the revote would only include voters who voted in the original 2006 election.

"We're really trying to be as fair as possible," Zimmerman said.

If the presiding state judge gives the EFF's legal team time to examine the machines, all parties involved will need to negotiate over which and how many experts participate, Zimmerman said. That pool is already expanding because the Christine Jennings campaign filed its own lawsuits. At press time, the Jennings campaign had lost all attempts in court at evaluating the machines. House Speaker Nancy Pelosi agreed to seat Buchanan on a provisional basis until the conflict was resolved. Activists are demanding further court proceedings and a congressional investigation before Buchanan is permanently seated.

"The Jennings camp is pushing its own suits. They have their experts. We have our experts. The defendants in the case have either in-house people or experts they will bring in," Zimmerman said. "ES&S [Elections Systems & Software] was just named as a defendant to the Jennings case, so ES&S will have their technicians involved."

Sarasota County used ES&S voting machines in the 2006 election.

Zimmerman said he is pushing for an agreement that limits the number of participating experts. He said the judge already limited the time allocated for discovering defects, which would likely accelerate the process.

"I don't think anyone wants to get to a point where Buchanan is sworn in and is the new congressman," Zimmerman said, "and then we find out later that there was a problem and have to have a new election."

Testing, Testing

Zimmerman said he didn't want to definitively judge the performance of DRE voting machines nationally until more information emerged. Still, he said it certainly wasn't the triumph some claimed. "We saw at least eight or nine states where polling places opened late because of one snafu or another

Optical ballot readers were not developed for voting until 1968. Designed as a stand-alone ballot counter, the **Optech Eagle** was introduced in 1989. The machine has two parts — the head and a ballot sorting box. The head scans the ballots and deposits them into one of the three compartments in the sorting box: one for ballots that cannot be read, another for ballots that have been read and counted, and a third for ballots needing the attention of elections officials, which may have stray marks needing interpretation, or carries a write-in candidate.
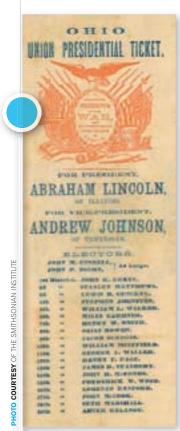
with these machines," he said. "A lot of them appear to have been based on the failure to either deliver passwords or hardware components that would allow the machines to turn on, or some other kind of nonfatal problem. Needless to say, it was still important, and it led to many polling places being closed several hours. That is not insignificant."

Zimmerman said requirements allowing vendors to conceal the machines' proprietary code so other vendors can't copy their work makes holding vendors and election officials accountable difficult. Not allowing outside organizations to analyze the code that records and tabulates votes destroys transparency in government, he added.

"The problems we're really concerned about are what we can't see. The evidence that would allow us to figure out what could happen still isn't generally available to the public for analyzing. It's only by going through public record requests and fighting election officials across the country that we get a better idea of what kind of performance these machines have," Zimmerman said.

In 2006, a research team at Princeton University's Center for Information Technology Policy created and demonstrated Trojan horse software it claimed was capable of altering results on a Diebold machine. The researchers received a Diebold voting machine to experiment on from an undisclosed source.

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Because the machines often get downloaded with updated software from the vendor, the Princeton researchers said a person could use one of those occasions to insert malicious software similar to the software they created.

Edward Felton, professor of computer science and public affairs director of the Center for Information Technology Policy, brought a Diebold machine before Congress. He fed the machine his software, then conducted a fictional election between George Washington and Benedict Arnold. After George Washington received the majority of Felton's votes, the machine named Benedict Arnold the winner. Felton announced that his software was completely undetectable and could erase evidence of its existance in the machine after altering voter results.

But not all agree the software is completely undetectable. "The biggest problem with these allegations is that the premises are dependent on complete and unfettered access to a system, which is not reflective of a real election environment," said David Bear, spokesman for Diebold Election Systems.

He said the allegations ignore the fact that an election fixer would need access to the systems' locked storage locations. He or she would need to break serialized seals on the machines that would leave evidence of tampering to gain the needed information for creating a Trojan horse. And he or she would need to have a clearance code on Election Day to access the closely watched machines.

Bear said Felton's team didn't account for circumventing those kinds of realities that would normally block a felonious programmer from creating malicious software. The researchers simply had a machine dropped in their laps, he said, and got to comfortably take their time creating a virus.

Both Bear and Shamos emphasize that despite numerous "what if" scenarios, there is no documented case of a DRE machine being fixed.

Shamos said fears over similar software invading voter polls are overblown. He said voters and election officials should view similar discoveries as lessons in improving voting machines — not causes to abolish them.

Shamos said Felton merely demonstrated that poll workers could ensure their DRE machines were free of such software by running a simple test before voting started — a test just like Felton did before Congress. They could perform a small test election on the machines, knowing the results beforehand. If any of the machines produced numbers different than what the poll workers entered, they would know the machines had been compromised.

"I don't see what's so frightening about that," Shamos said.

Zimmerman said he believes election officials genuinely care about voting accuracy, but they tend to declare success prematurely.

"There is an instinct to declare victory — to declare that the machines worked perfectly — that there weren't any problems based only on the fact that they didn't notice any machines crashing or some kind of blue screen of death like you see on a Windows machine," Zimmerman said. "The certification that approves these systems is, for the most part, very inadequate. There isn't a very substantive review of the code and the components that go into these systems."

Georgia Turnaround

Georgia's certification process is far from slipshod, insists Chris Riggall, press secretary for the Georgia Secretary of State's Office.

The Georgia General Assembly appropriated funding to create the Center for Elections Systems at Georgia's Kennesaw State University in 2002 — the year the state implemented its Diebold machines.

"The Center for Elections Systems [was] our eyes, ears, expert advisers, auditors, testers and evaluators as we went through the deployment process," Riggall said, adding that the center tests all aspects of any new software Diebold releases for the machines.

"Usually it takes a few months if there's a new release of software where they torture-test things, and they vote [numerous] times on it," Riggall said. "They also developed a hashing program they use when going into all of our counties to make sure the servers are operating a pristine, uncorrupted version of the certified software. They verify the election-management software to verify that it is identical to the version that came through federal and state certification testing. They run the hash on servers. They inspect the physical security of the voting units, county election servers and the chain of custody of the hardware."

Georgia also established voting equipment security regulations that were far more stringent than the existing federal standards.

The Study

Riggall said some Georgia counties suffered larger residual vote rates — where voters left a selection blank, made too many selections or were disqualified by a poll worker — than Florida did in the 2000 election. The General Assembly formed the 21st Century Voting Commission, a bipartisan group of legislators, the League of Women Voters and other similar organizations. The commission conducted a study of Georgia's voting problems and explored potential solutions.

This standard voting machine, manufactured in the late **1890s,** was the first to use a voter-activated mechanism that drew a privacy curtain around the voter, and simultaneously unlocked the machine's levers for voting.

With the **Shouptronic electromechanical voting machine,** which is similar to traditional lever machines, the candidate slate is printed over a backlit grid of illuminated buttons. A green VOTE button records the choices. Votes are recorded to a hard drive. Recording features include a memory cartridge, a backup battery and the means of printing a paper tally. This Shouptronic machine was used in Fairfax County, Va., from 1981 to 2002.

"We did that right off the bat in 2001 and spent the next year looking at what other communities did," Riggall said, noting that 94,000 ballots — 3.5 percent of the ballots cast statewide — in the 2000 presidential race showed no choice for president.

The study broke down each county by precinct and noted the voting method in each one.

He said punch cards were the most common voting machines used, and produced the highest residual vote rate. That didn't surprise anyone. But optical scan machines — which read and store results from paper ballots that are filled in by voters — performed far below expectations in some precincts.

"Some of those counties demonstrated alarmingly high residual vote rates with optical scan, including quite a few precincts showing residual vote rates in the double digits. Some of them were higher than 20 percent in the president's race, if you can believe it. Obviously when you've got a 20 percent undervote rate you've got a problem," Riggall said, later adding, "That led us to DRE."

The 21st Century Voting Commission conducted a pilot to test DRE machines offered by several different vendors in the state's 2001 municipal elections. Riggall said the state needed to pay for the machines because most counties couldn't afford them.

"Most of the major vendors at the time participated in that pilot, brought their equipment in, trained the locals on using it, did some public education about it and actually had voters participate in that process," Rigall said. "We also did exit polling to intercept voters and garner their feedback."

The commission took its findings to the governor and General Assembly, and received authorization to purchase Diebold DRE voting machines for all 159 Georgia counties.

"Funding from HAVA was sort of a promise off on the horizon, but we certainly had no certitude at the time that the feds were going to make good on this discussion. We made our deployment and purchases with bonds," Rigall said. "It was a $54 million investment."

He said after the 2004 presidential election, the Secretary of State's Office reviewed the counties that once showed large residual vote gaps between precincts using optical scan machines. Those gaps nearly disappeared, Riggall said.

"That tells you technology makes a difference," Riggall said. "These were people in the same community voting in a presidential election four years apart. With an optical scan environment there was a difference of 7, 8, 9, 10 and even 15 percent. With a DRE environment they've got .7 and .9 [percent] differences."

The **direct-recording electronic (DRE)** voting system records votes by means of an electronic display and mechanical or electro-optical components that can be activated by the voter. The device processes voter selections using a computer program and records voting data in memory components. DRE systems can produce paper ballot printouts that voters can verify before they cast their ballots.

Those translate into thousands of ballots that are being counted that were formerly not."

Paper Trail

Many advocate DRE machines that produce a paper record of each vote for recounts as a compromise.

The Election Center's Doug Lewis said he favors such machines, but that the existing models need design improvements.

"The current systems by design at this point are not as reliable as you would like for election use. As a result, you're asking poll workers of an advanced age to become voting systems technicians to repair these inexpensive printers that were not designed to carry this kind of load — fixing paper jams with coat hangers or paper clips, or trying to replace paper rolls when [the poll workers] don't know how to do that very well," Lewis said. "Or having ink or ribbon run out. All of those things complicate the process."

Federal standards require DRE machines to have some mechanism for "trapping" a citizen's vote exactly as he or she voted. Lewis said DRE machines usually achieve this by saving the vote to flash memory with triple redundancy.

Many state election laws say that those "trapped" votes must be considered the actual vote, meaning if a trapped version of that vote doesn't exist the vote doesn't count. Here is where the current paper record machines create a serious problem, Lewis said.

"If anything happens to the paper, if it gets destroyed, jammed, the printer sits there and prints 7,500 lines all on the same spot and never advances the paper," he said. "Then you've lost the paper ballots."

Cuyahoga County, Ohio, encountered those problems after its 2006 primary, according to a widely reported study by the California-based Election Science Institute (ESI). ESI reported that in addition to damaged and illegible paper ballots, 87 rolls of paper ballots went missing.

Lewis said printer errors disqualified 10 percent of the votes in that county, but added that he thinks DRE machines with printers will become the common standard in the long term.

"If you give the engineers long enough, they'll figure this out," Lewis said.

The Big Picture

DRE machines already are common in a few other countries, like Canada and India.
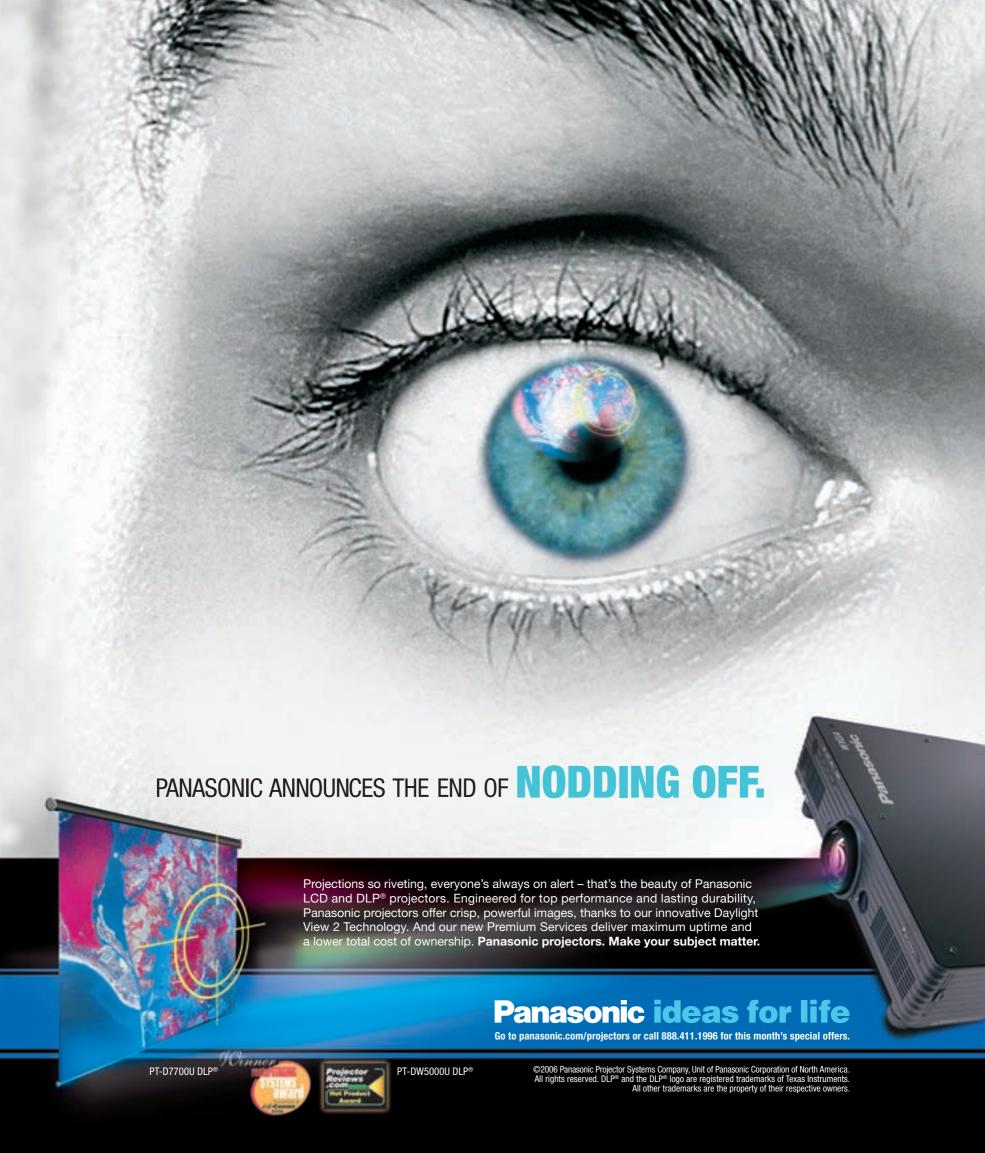
"India is 100 percent e-voting. Typically the number of votes cast in India in an election is about three times the size of the U.S," said Carnegie Mellon University's Shamos, noting that DRE machines are less common in many European countries because their elections are less complicated than those in the U.S. "The U.S. has the most complicated elections in the world. This is historical. It has to do with the nature of our representative democracy, which is different from that of Europe, which is parliamentary. You don't vote for candidates in Italy. You vote for parties. That's an extremely simple ballot."

Shamos said many who panic about DRE machines forget how inaccurate paper ballots can be.

"Even if you counted the Florida election 100 percent accurately, that is, every hole on every punch card was counted exactly right, you would still have an inaccurate election because the setup of the ballot misled voters into voting for the wrong person," Shamos said, adding that paper ballots also are vulnerable to fraud.

"To this day people still get convicted for paper ballot fraud after every election cycle in the United States," Shamos said. "In the 27 years that we've had DRE voting there hasn't been a single verified incident, either of tampering or of an attempt to tamper.

"It's time for everybody to calm down and realize that this is an engineering problem. There are certain requirements for a voting system. It has to be safe. It has to be secret. It has to be usable. It has to be reliable," he continued. "Those are the kinds of things you go and tell an industrial engineer when he goes and signs a product. If we find a vulnerability in a machine, the simple thing to do is fix it. You don't all of a sudden say, 'Aha, the Diebold machine is vulnerable; therefore, we need to outlaw DRE machines all over the United States.'" GT

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How much to Tip?

An online tool to report suspicious activity anonymously in Colorado raises fears of racial or cultural profiling.

BY CHAD VANDER VEEN | TECHNOLOGY AND POLITICS EDITOR

Colorado has a new tool for reporting suspicious activity online — a tool that's raising awareness and eyebrows. Ever since 9/11, the government asked citizens to watch for and report suspicious activities. For the last five years, reporting suspicious activities required, at the very least, picking up the telephone and dialing 911, or in some cases, 311. But on Sept. 11, 2006, a new and little-known agency called the Colorado Information Analysis Center (CIAC) launched an online application to make reporting suspicious activity much easier.

By visiting <www.ciac.co.gov>, residents of Colorado — or anywhere else — can file reports on anything that might go bump in the night. Also available on the Web site is an option to upload audio, video and photographic "evidence," along with a written report.

The application is getting attention because it delivers online filings directly to federal and state analysts regardless of agency or jurisdictional turf. The inability or unwillingness among law enforcement agencies to share information has been roundly criticized. This application was built with such criticism in mind, designed to get the right information to authorities who can act on it, if need be.

However, some say the prospect of the online reporting tool is disturbing, especially considering the site allows for entirely anonymous reporting.

Answering the Call

The CIAC — a fusion center designed to share homeland security information among federal, state and local officials — is an intriguing organization. Trying to figure out who runs it can be a challenge.

On its Web site, the CIAC declares itself part of Colorado's Homeland Security Department, which is actually operated by the Colorado State Patrol, a division of the Colorado Department of Public Safety.

"The way the Colorado Information Analysis Center is organized, it is actually a state function," said State Patrol Sgt. Jack Cowart. "It comes under the Office of Preparedness and Security for the state of Colorado. Currently it is being managed by the Colorado State Patrol, but it's not a state patrol function. It truly is a state function because we realize threats to our security are not necessarily law enforcement threats."

Regardless, the Web site and application are simple. Save for a few news items, a brief frequently asked questions section and a provision to contact 911 for emergencies, the heart of the site is reached by clicking the "Report Suspicious Activity" link.

This takes users to an online form, which first prompts them to note the date, time, location, description and type of incident. Following is a field to attach media files. Suspect and vehicle details are next. Lastly users have the option to fill out a personal information field, or leave it blank if they wish to remain anonymous.

Lance Clem, public information officer of the Colorado Department of Public Safety, said the system responds to citizens who had been getting mixed signals about where to report suspicious activity.

"Ever since 9/11 — and even before that — we have had calls from citizens who wanted to report something suspicious," Clem said. "In the past, we took [tips] down almost wherever they came in. Sometimes they came in on what's called the Governor's Advocate line to the Department of Public Safety. Sometimes they'd go directly to a law enforcement agency — they sort of went a number of different directions. I don't think there was any clear direction to citizens about what they could do with a tip like that."

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"**We had to be creative**. We had to find a way to put these technologies together and do something innovative and capable yet on a shoestring."

Sgt. Jack Cowart, *Colorado State Patrol*

Tip Team

On the surface, there is nothing revolutionary about the application except for what happens when a user clicks "submit." Instead of the tip printing out at the local sheriff's substation, it travels directly to a team of analysts from state, federal and local law enforcement agencies. If a tip comes from a location outside of Colorado, analysts will shepherd it to the appropriate agency. In total, Clem said there are six analysts, with representation from the FBI.

"This gives us the right channel, directly to the analysts, to provide any kind of tip," he continued. "When the analysts get done with it, when they determine it's a credible tip, they have right next door to them representatives from other federal agencies, and other state and local agencies, and they can just transmit that tip directly to them. It was designed to overcome [interoperability] problems."

The application's simplicity makes the Web site an effective, efficient single point of information for multiple law enforcement agencies. As Cowart pointed out, its simplicity meant the CIAC didn't have to shell out a lot of money to build the application.

"We have a very small budget so we could not have done something if it was expensive," he said. "We had to be creative. We had to find a way to put these technologies together and do something innovative and capable yet on a shoestring. It was meant to do two things: to provide a method for our citizenry and our other state and local agencies to communi-

cate with us, to provide us information if they needed to do that. Secondly we needed a management tool within the CIAC to manage what could be a huge load of information."

Neighborhood Watch

Some folks aren't too keen on the idea that anyone can report anything they want — and do so anonymously.

Cathryn Hazouri, executive director of the American Civil Liberties Union of Colorado, expressed concern the reporting application could encourage undesirable behavior.

"I think the problem this encourages is profiling; you see someone you don't think belongs in your neighborhood so you jump online and say, 'There's a Hispanic-looking person who's not carrying a garden tool in the Broadmore area,'" she said. "Or there's driving while black, driving while Middle Eastern. It just encourages people to profile other people."

Hazouri contends that, at the least, using the phone to report suspicious activity requires

a caller to talk to another human being, ensuring a modicum of defense against haphazard or malicious abuse of the system.

Cowart acknowledges that abuses of the system may take place. But, he said, that is the case with reporting tips no matter what the medium.

"Anybody who works in law enforcement realizes an unfortunate downside is you get a lot of crank stuff, it's just the nature of the business," he said. "We take it all seriously to a point. Some of it is obviously not serious. But there are things that could be serious but probably are not. We still take them seriously until we conclude that they are not [a threat]."

But for Hazouri, the worst part is not that the system is vulnerable to abuse; it's the potential for breaking down neighbor relations.

"I think it encourages suspicion, and in its worst form, I think suspicion breeds distrust. It breeds isolation. It breeds those kinds of things that make us less neighborly, that make us less connected with the people around us," she said. "If you have a genuine suspicion, pick up the phone and call somebody." **GT**

Using a Web form to report suspicious activity may encourage suspicion or breed isolation, so reporting a genuine suspicion should require a phone call, said Cathryn Hazouri of the American Civil Liberties Union of Colorado.

New technology helps health department vastly expand its newborn **genetic screening program**.

Synopsis: The California Department of Health Services' (CDHS) new genetic screening information system replaces its antiquated counterpart.

Technologies: Microsoft .Net Framework and Business Objects' Crystal Reports.

Contact: John Sherwin, acting chief, CDHS Genetic Screening Branch, 916/440-7660 <mmus suto@dhs.ca.gov>.

state local federal

BY MERRILL DOUGLAS | CONTRIBUTING WRITER

California Screening

In May 2005, a lab in California performed a genetic screen on blood drawn from a newborn girl. The screen uncovered a metabolic disorder so rare that only 32 other cases had ever been documented.

Had the baby been born one week earlier, the lab wouldn't have screened for that particular condition, and she probably would have died.

As it was, she received the appropriate medical care and lived.

The infant was lucky to be born just as the California Department of Health Services (CDHS) started piloting the Screening Information System (SIS), a computer system developed to replace an obsolete information platform and support the state's newly expanded genetic screening program.

California started using the SIS statewide in July 2005.

Huey, Dewey and Louie

Under California law, all newborns must be screened for genetic diseases, and every pregnant woman must have the opportunity to choose or decline prenatal screening.

Blood samples are processed in one of eight state-contracted labs where computer-supported equipment performs several tests. The labs then transmit the results to a central state lab, where professionals assess the results — examining demographic data along with information from the tests — to determine if the baby suffers from a genetic disease.

If that's the case, the CDHS alerts the child's doctor and parents, and the department follows up until the case is resolved or the baby starts receiving treatment.

Since the early 1980s, the information system that managed this process was a set of three computers — officially mid-tier machines, but they were so bulky they filled an entire room.

"We called them Huey, Dewey and Louie," said Catherine Camacho, deputy director of Primary Care and Family Health at the CDHS.

The problem was that the more the older the information system grew, the less effective it was in supporting the state's genetic screening program.

"It was obsolete technology," said Christy Quinlan, deputy director of the Information Technology Services Division and CIO of the CDHS. "The fear was we couldn't patch it. We couldn't upgrade it."

The hardware and the software were no longer supported by a vendor, and if the system suffered a serious breakdown, there might be no way to get it running again.

"Every time they had a problem with it, it was no joke — they had to go to old computer graveyards," Camacho said. "We ran a fabulous system that everybody knew was very comprehensive and highly respected, but we were duct-taping and rubber-banding it together."

Not only were Huey, Dewey and Louie limping into advanced age, they also performed too slowly, couldn't easily produce the management reports the CDHS required, and couldn't be upgraded to contemporary security standards.

"When you're taking input from external sources," Quinlan said, "you want to ensure that you have the latest security installed."

Retirement Plan

In 2000, officials at the CDHS launched a project to retire the old machines. The original plan was simply to bring in a new system with modern capabilities.

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"We ran a fabulous system that everybody knew was very comprehensive and highly respected, but **we were duct-taping and rubber-banding it together.**"

Catherine Camacho, *deputy director, Primary Care and Family Health, California Department of Health Services*

"It would be more nimble. It would be faster. It would be able to sort."

The project encountered many delays, ranging from political opposition to the Y2K conversion, Camacho said. The holdups seemed like bad news at the time, but they proved to be a stroke of good fortune.

The CDHS was still in the middle of planning a new information system to replace the old one when, in 2004, the California Legislature passed a law that turned the implementation program upside down. The CDHS would have to incorporate a new technology, called tandem mass

In the first year of expanded Screening Information System testing, **105 newborns** were diagnosed with rare genetic disorders that otherwise would not have been discovered in the first days of life.

spectrometry, into its genetic screening regimen. The department would also have to start screening newborns for many more genetic conditions.

"Going to the tandem mass spectrometry was a radical change in the design of the system," Quinlan said. "It needed a completely different technology."

So the CDHS scrapped its program-in-progress and started planning all over again.

The new law came at a perfect time, Camacho said. "Had it come much later, we would have had to backtrack. We were at a point where, ideally, it was a great time to stop and incorporate that piece into it."

The CDHS could have conducted two separate technology projects — one to adopt a modern computer platform, and one to incorporate tandem mass spectrometry and more genetic tests.

"We decided to go for broke," Quinlan said, and department officials determined it would

be much less costly to wrap both upgrades into a single initiative.

It would also be a great deal of work — especially with the Legislature's Aug. 1, 2005, deadline less than a year away.

"We had frank discussions about, once we start, it's a point of no return," Camacho said. "We told staff, 'This will mean people can't take vacations. Around the holidays will be some of our busiest times.' We were going to have to run the marathon at a sprint."

After a couple of small pilots — including the one that saved the baby's life — the department started a statewide pilot implementation in June, running both the new and old systems. Then it started shutting down Huey, Dewey and Louie and relying entirely on the SIS.

"We flipped the switch in mid-July, a couple of weeks early," Quinlan said.

legacy system," said John Sherwin, acting chief of the CDHS's Genetic Disease Branch.

In addition, the SIS has streamlined and improved many processes that are part of the state's genetic screening program.

Unlike the previous system, it supports the entry of demographic data using intelligent character recognition/optical character recognition, Sherwin said. "There are a number of management reports that are much more distributed and more easily available directly to authorized users. It has shortened the time for our staff to identify that patients have gotten into appropriate follow-up care."

In all, the system supports more than 150 reports as well as ad hoc reporting, according to a description published by the CDHS.

The SIS can also match the results of prenatal and newborn genetic screens — a function that was previously unavailable with the old system.

"A portion of our quality assurance program is the ability to identify if the mother of an affected infant had prenatal screening and what was the outcome," Sherwin said. The SIS also tracks data that enhances the value of genetic counseling in later pregnancies, such as whether a woman previously gave birth to a child with a genetic disorder.

The SIS will soon help the CDHS manage a new genetic screening challenge. In Septem-

"Going to the **tandem mass spectrometry** was a radical change in the design of the system. It needed a completely different technology."

Christy Quinlan, *deputy director, Information Technology Services Division, and CIO, California Department of Health Services*

Developed in conjunction with Deloitte Consulting, the SIS is a Web-based system, built on Microsoft .NET technology and running on the CDHS's extranet. It receives data from the labs in batch files and uses Business Objects software to produce reports.

More Screening

The new system supports tandem mass spectrometry and lets the state screen newborns for 75 genetic conditions — up from 39 in the days before the SIS.

"It allows us to evaluate results using newborn birth weight, which was not possible with the

ber 2006, Gov. Arnold Schwarzenegger signed a bill that expands the state's genetic screening program to include two more tests, for cystic fibrosis and biotinidase deficiency.

"We're programming for more screening," Quinlan said.

From the start, the CDHS designed the SIS so it could easily add screens for new conditions, Camacho said. "We didn't want to have to go in and rebuild the system." GT
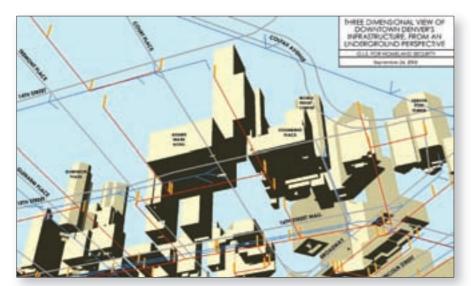
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BY DAVID RATHS | CONTRIBUTING WRITER

In their ongoing battle against the methamphetamine (meth) plague, state governments use all the technology tools at their disposal to track trends and educate the public about meth's impact.

Tennessee and Minnesota, much like they do with sex offenders, created online registries of names of meth offenders. States also struggle to cope with the toxins left behind when meth labs are busted.

Bad Labs

In 2005, the U.S. Drug Enforcement Administration (DEA) seized more than 12,000 domestic meth labs. The residue of the dangerous substances used in the labs could expose families moving into those homes and apartments to long-term health hazards. Complicating matters for states is the fact that there are no official federal regulations on how to clean up a former meth lab.

Some states — including Idaho, Washington, Oregon and Montana — created online registries of meth lab sites to give real estate agents, neighbors and potential homebuyers a centralized place to check on dangerous properties.

Oregon has aggressively addressed meth-related issues, but state officials realize much remains to be done. Although Oregon estimates it shut down about 75 percent of meth labs in the state, the drug killed as many Oregonians as heroin in 2005 — and more people than cocaine.

The state has begun adding meth lab properties to an online database organized by county.

"These properties have not been cleaned up," stressed Brett Sherry, an environmental health specialist at the Drug Lab Cleanup Program for the state's Department of Human Services. "The goal is to inform the public that these properties are unfit for habitation. If anyone is caught there, they can be arrested for trespassing. So prospective homebuyers, housing code officials, public utility people, the fire department — anyone with any reason to go to that property — this listing tells them don't go."

Once a property is cleaned up and inspected by an authorized agent, it gets a certificate of fitness and is removed from the list. Even after a property receives certification, however, a seller must disclose that the property had been used for drug manufacture and cleaned up, Sherry said. There's clear language that a sale is void if this hasn't been disclosed.

Recent state legislation also requires Sherry's office to inform neighbors when a meth lab in their vicinity is busted. "When neighbors see cops arriving in moon suits," he said, "they often don't get the answers they need right away about what is going on."

Anyone living within 300 feet of a meth lab in urban areas, and within a quarter mile in rural settings, is supposed to be notified. Notifying neighbors presented another technical challenge to the three-person staff of the Drug Lab Cleanup Program: How to find all those mailing addresses?

The office initially purchased a subscription to a database of property listings from RealQuest, a property information database. Then in mid-2006, Sherry and his staff found a free tool offered through the Oregon State Library that gathers county assessor data and lets a user mark all the addresses within a certain radius of a property.

Sherry said the notification program has led to people keeping an eye on the abandoned

States create online registries to help the public identify **methamphetamine** labs and users.

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> ## "Landlords were renting to people with **no idea** of who these people were. And with the recidivism rate really high among these offenders, there was a public outcry that something be done."
>
> **Jennifer Johnson,** *spokeswoman, Tennessee Bureau of Investigation*

properties and reporting on any activity there. "The more eyes and ears," he said, "the better."

In comparison to other states, Idaho has a fairly small meth lab problem, with only 21 incidents in 2005, according to the DEA. But the state Legislature was determined to address the problem before it worsened. Since the Legislature mandated the creation of an online registry in spring 2006, Idaho's Clandestine Drug Lab Cleanup Program has added only seven properties, but the extensive informational Web site prompts many calls from the public, said Jim Faust, director of the program.

Although Oregon estimates it shut down about 75 percent of meth labs in the state, the drug killed as many Oregonians as heroin in 2005 — and more people than cocaine.

"People might smell something in a hotel room, or a real estate [agent] might find it and want to know what rules to follow," he said.

Idaho has created guidelines for property owners to follow when a meth lab is found in a house or an apartment to make sure they understand and follow the state's cleanup standards.

Registries of Individuals

In Tennessee, the governor's 2005 Meth-Free Tennessee Act directed the Department of Environment and Conservation (DEC) to keep a registry of meth-contaminated properties. When a Tennessee law enforcement agency quarantines a property, in addition to informing the DEC for listing online, a quarantine notice is added to the chain of title with the Register of Deeds, thus creating a permanent record.

When the property is cleaned, the owner can record that information with the Register of Deeds. Both notifications become part of the property's permanent record to help inform potential buyers or renters.

Tennessee went one step further, creating a registry of individuals convicted of meth offenses. After legislation was passed in spring 2005, Tennessee became the first state with such a registry in September 2005. There are now 541 people on the list, and as of July 2006, the Web site has been accessed half a million times.

State officials say the registry is not meant to be a deterrent.

"It was designed as an informational tool for the people of Tennessee," said Jennifer Johnson, spokeswoman of the Tennessee Bureau of Investigation (TBI). "Landlords were renting to people with no idea of who these people were. With the recidivism rate really high among these offenders, there was a public outcry that something be done."

In addition, someone making meth could be transporting or dumping hazardous chemicals, Johnson said.

Offenders can appeal to have their name removed from the list after seven years if they haven't been convicted again in that time.

The TBI Web site also features a tool called the Tennessee Incident Based Reporting System, which lets citizens create their own crime reports about meth labs and meth-related offenses by whatever variables they'd like to track, such as drug quantity, type of location, region or time of day.

Using Data to Track Trends

In Michigan, which had 341 meth lab incidents in 2005, the state is attempting to gather more data and trying to do a better job of analyzing it. The Michigan State Methamphetamine Task Force's May 2006 report calls for a stronger data collection and reporting system for tracking meth use and related problems.

A task force subcommittee on prevention argued for establishing a central database to continually collect, assess, monitor and report on meth indicators.

"When we went looking for data, we could only find treatment and meth lab data, but use data is difficult to find," said Kori White-Bissot, a prevention coordinator with Lakeshore Coordinating Council in Grand Haven, Mich., who served as chair of the prevention subcommittee.

The state needs data about use rates among the adult population and it needs to share that data systemwide, she added. Michigan meth lab busts are down 50 percent in the last year, but state officials realize they still have a problem with use. "As you see that lab number go down, you might think the problem is going away, but we know it's not," said White-Bissot. "We need better ways to track usage."

Nancy Becker-Bennett, section manager of the Michigan Methamphetamine Task Force, said the state plans to adopt the recommendations about data gathering. She said that by creating a more comprehensive picture of the meth problem, the state could do a better job

> ## "When we went looking for data, we could only find **treatment and meth lab data,** but use data is difficult to find."
>
> **Kori White-Bissot,** *prevention coordinator, Lakeshore Coordinating Council, Grand Haven, Mich.*

of tracking trends, prioritizing spending and allocating its resources regionally.

By establishing baseline data on the extent of the meth problem, including data such as child abuse and neglect due to parents' or guardians' meth use, the state will be taking steps toward increasing public awareness, enhancing treatment options, and creating an early warning system for communities to recognize an emerging meth problem. **GT**

Forty-four states responded to the 2006 *Digital States Survey*. The biennial survey, conducted by the Center for Digital Government, examines state governments' technological progress across three broad areas: (1) online citizen and business self-service; (2) architecture and infrastructure; and (3) planning, policy and structure.

The survey releases rankings for the top 25 states, and compiles a broad array of aggregate statistics on digital government growth and acceptance. In partnership with *Government Technology* magazine, the Center for Digital Government is releasing findings from the 2006 survey online at <www.govtech.net/digitalstates awards>.

Some states shot up the rankings in 2006's *Digital States Survey,* becoming top 10 finishers and strong contenders.

With A Bullet

BY SHANE PETERSON

Though the status quo mostly prevailed in taking the top 10 spots in the 2006 *Digital States Survey,* Ohio and Wisconsin came from way back to claim the third and ninth spots, respectively.

Contrast their strong showing in 2006 to the 2004 *Digital States Survey*, in which Wisconsin ranked 25th and Ohio didn't even crack the top 25, and it's clear the two states got down to brass tacks.

Other states also made big gains in the 2006 survey. Three of the nation's largest states moved from the bottom two-thirds of the rankings in 2004 to the top 25 in 2006. California gained more than 10 spots, ranking 16th; Texas moved up more than nine spots to 17th; and New York climbed to 18th.

Ohio's Rise

Ohio's third-place finish shows that the state takes quite seriously the "behind the curtain" aspects such as information architecture and initiatives to beef up infrastructure, said Paul W. Taylor, chief strategy officer of the Center for Digital Government.

In 2001, Ohio started modernizing, streamlining and re-engineering the way it conducts transactions with businesses. In 2003 and 2005, state lawmakers passed legislation reforming how business taxes are collected by state and local government agencies. The 2001 efforts started with revamping the Ohio Business Gateway (OBG), an online portal that supports a variety of government/business transactions, and the OBG went through further adaptations to reflect the tax-reform legislation passed in 2003 and 2005.

Wisconsin Makes Moves

The Badger State's 2006 performance is a story of historic competencies, Taylor said, especially in telecommunications infrastructure.

"The state's had BadgerNet probably as long as anybody's had a statewide network," Taylor said. "Wisconsin has rebid and rebuilt the whole thing into a converged network over the last two years. It's now an all-digital, converged backbone that supports general government, criminal justice, education and economic development."

Wisconsin's rapid rise in the rankings from 2004 to 2006 actually started years ago when the state began the business case for BadgerNet. The business case was finished in fall 2002, the contract was awarded in March 2005 and pilot tests began in September and October of 2005.

The network is the backbone of Wisconsin's Shared Information Services (SIS) Initiative — consolidation of servers and local area networks, which is part of a larger effort called the Accountability, Consolidation and Efficiency Initiative first announced in early 2005 and spearheaded by Gov. Jim Doyle.

Wisconsin
(scoring goes from 0 to 5, with 5 being the best)

Benefits application and status checking
2004 score 0
2006 score 4

Child support billing and payment
2004 score 0
2006 score 3

Steering to Success

A state government's course is not changed overnight, and a timeframe of months and years is what's usually required — especially with states as big as California, New York and Texas.

"You've got three aircraft carrier-class states," Taylor said. "Even with the intention to move them, it takes a while to start seeing results."

A comparative analysis of the 2004 and 2006 results shows California's accomplishments over two years, such as the creation of online service applications in key areas, especially in the health-care industry.

Unseen Work

Only time will tell if the hard work by states Ohio, Wisconsin and California will keep them in the upper echelons of the *Digital States Survey*. It's clear that many states' hard work has paid off, though the results don't always immediately materialize.

All these "with a bullet" states share executive leadership committed to investing in IT infrastructure. Historically governors have disliked plowing money into technology investments that run the risk of not bearing fruit until the *next* administration is elected.

Thankfully for states, and the public, this 20th-century mindset is changing. GT

California
(scoring goes from 0 to 5, with 5 being the best)

Criminal history and background check
2004 score 0
2006 score 3

Professional credential status look-up
2004 score 0
2006 score 5

Unemployment insurance filing
2004 score 0
2006 score 5

New York
(scoring goes from 0 to 5, with 5 being the best)

Online customer assistance system
2004 score 0
2006 score 4

Sex offender look-up
2004 score 2
2006 score 5

Who has the technology to check the credentials of 13,000 government employees?
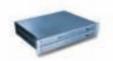
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product news

two cents
our take on the latest technology

When the HP 4730 came into our editorial department, its speed and capabilities increased our productivity. It brought us into the 21st century, leaving our aging HP Laser Jet 5m far behind.

The colors are brilliant, but reaching the end of a toner cartridge always came too soon budget-wise, so office staff attempted to stretch the lives of each cartridge with some success.

Unless one overrides the "supply out" message, the printer will not operate if one toner color is empty. The override process entails going through many menu selections, and may affect the print quality.

The toner cartridges cost $137 for black and $296 for cyan, magenta or yellow — yielding 12,000 pages. For comparison's sake, high-yield 10,000-page cartridges for a comparable IBM multifunction printer — the Infoprint 1664 — cost $157 for black and $292 for color.

The original HP black cartridge lasted for more than 11,000 pages — about five months — before needing replacement. Of the color cartridges, cyan ran out first. It took a year for that to happen. The original cartridge yielded more than 22,000 pages. The replacement has a 12,000-page yield. After printing more than 32,000 pages, we had to replace the magenta and yellow toners.

The printer comes with three paper trays that fit a ream of paper each, plus a manual feed tray. It would have been nice if the unit automatically recognized legal paper when both the original and copy are legal size. Initially, when making legal copies, the unit had trouble taking the paper from the manual feed tray. It was slow to recognize that paper was in that feed tray, and then it tended to take more than one page at a time, creating a paper jam.

This, however, was the only time the printer jammed. For some reason, the printer didn't print properly when all three trays ran out of paper. But turning the print off and on again seemed to get it back on track. The unit also printed as many as 20 envelopes without trouble.

BY MIRIAM JONES | CHIEF COPY EDITOR

The unit prints as many as 30 pages per minute, with a monthly yield of 175,000 pages. It prints 600 x 600 dpi for both color, and black and white. Photos printed from the 4730 had good color and detail. Color copies stayed true to the originals' colors. It also prints duplex copies, and offers reduction and enlargement from 25 percent to 400 percent.

The unit is configurable for e-mail and fax, and faxes black and white at a maximum of 300 x 300 dpi.

Overall, this printer performed magnificently. Though there were a couple oddities, such as the unit cleaning itself in the middle of a print job, it did everything we asked of it and required no technical assistance or help desk relief. **GT**

specs

- Flatbed ADF scanner with 50-sheet standard capacity
- Four paper trays (including the manual feed tray), standard, maximum
- Standard/maximum input capacity: up to 1,600 sheets
- Standard output capacity: up to 500 sheets
- Maximum output capacity: up to 700 sheets (with three-bin mailbox), up to 500 sheets (with stapler/stacker)
- Standard envelope capacity: up to 20 envelopes

rating: ●●●●◐

price: $4,959.99

product news

Tough Enough

The **Intermec CN3** features integrated GPS and Bluetooth capabilities, as well as onscreen and hands-free turn-by-turn voice navigation. The device has 128 MB RAM and offers WAN voice and data services (including 3G EV-DO or GSM/EDGE), as well as an optional 1.3 megapixel color camera with flash. The computer measures 6.3 x 3.4 x 1.2 inches, and is rain and dust resistant. The CN3 comes with a QWERTY keyboard or an optional numeric keypad.
<www.intermec.com>

Long Lasting

Tangent's rechargeable Rugged Mini PC has a 40 GB hard drive, measures 9 x 7 x 2 inches and weighs less than 4 pounds. It includes either an Intel Pentium M 1.70 GHz or Celeron M 1.50 GHz processor with 512 MB RAM, expandable to 1 GB. The PC provides 802.11 a, b, g wireless LAN, and consumes 37 watts at 100 percent utilization, compared to a typical PC using 75-125 watts.
<www.tangent.com>

Blu-Ray Laptop

The **Dell XPS M1710** notebook computer offers the optional Blu-ray optical disc format, which supports playback of high-definition feature-length films and offers up to 50GBdisc capacity, or more than five times the capacity of a dual-layer DVD. The XPS M1710 supports read/write capabilities across CD, DVD and Blu-ray Disc media. The notebook features either an Intel Core 2 Duo T7600 or Intel Core 2 Duo T7600G processor.
<www.dell.com>

Send **product review** ideas
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Kiosk Friendly

Mitsubishi's LDT321V 32-inch LCD monitor is designed for video displays and moving text in various public venues. The monitor's 1200:1 contrast ratio and native 1366 x 768 resolution are designed for great detail and depth of image. The monitor comes with scheduling controls for planning of on/off, presentation timing, image changeovers and more, and video displays can be seen through windows with minimal glare. **<www.mitsubishi-presentations.com>**

Public Records Dance

The modern understanding of open government at the state level was defined, in large measure, with the passage of Florida's Government-in-the-Sunshine Law in 1967. The law's core tenets spread in the decade that followed through citizen initiatives in what are now known as "open records states."

Since then, state legislatures regularly revisited the definition of public record and adjusted the threshold for public access to information. The near constant changes — combined with a bureaucratic preference for the opaque — have created confusion at both ends of public records requests.

To help clear things up, two governors — Florida's Charlie Crist on his way in and Ohio's Bob Taft on his way out — took mea-

While 300 is a big number, not all exemptions were created equal. Recent prohibitions on the release of credit card numbers and the results of information security audits are clearly in the public interest — without them, the state risked creating a feeding frenzy for identity thieves and hackers.

At the local level, where title deeds, tax records and court documents are peppered with date of birth, Social Security numbers and banking information, a growing number of county governments are confronting the opposite side of the coin — that is, disclosing personally identifiable information that is specifically exempted under their respective state laws. The most instructive case may be that of the comptroller's office in Orange County, Fla., which found that

> Near constant changes — combined with a bureaucratic preference for the opaque — **have created** confusion at both ends of public records requests.

sures to better train public employees on the laws' requirements, increase compliance and strengthen penalties when public entities fail to disclose in ways that are both timely and full.

For his part, Washington state Attorney General Rob McKenna is asking the Legislature to create a permanent check on the proliferation of exemptions to the Public Disclosure Act, which have grown from only 10 three decades ago to approximately 300 today, and made it unwieldy to administer. As described in the bill, a new exemptions accountability committee — which does not include, curiously enough, a member of the public — would review exemptions and make recommendations for the repeal or amendment of those that, in its view, unnecessarily impede public access.

2.6 percent of the public records on its Web site improperly contained personally identifiable information. Not an alarming number, until you consider that it took 18 months of manual and automated reviews, and about one dollar a page to find the three-quarters of a million suspect pages.

Four decades later, it appears that — for all their trying — governments do not have 40 years of experience as stewards of the public records as much as they have one year of experience 40 times. They remain vexed by an apparent misunderstanding or misapplication of the law coupled with a growing recognition that redaction technologies need human scrutiny *and vice versa.* GT

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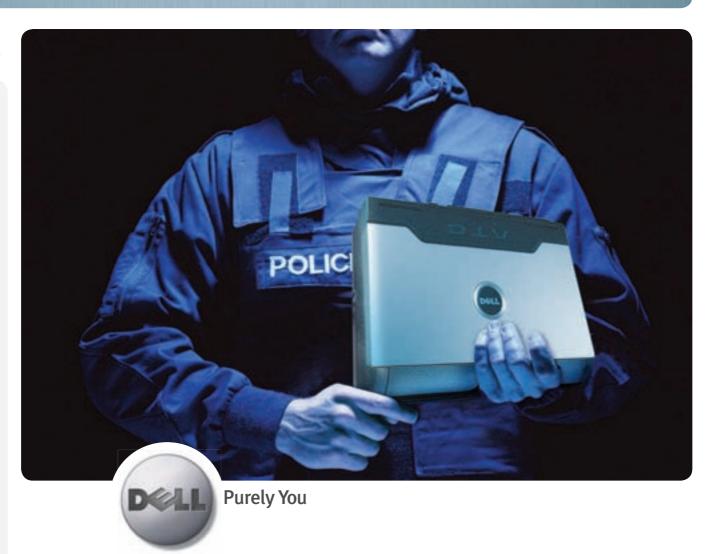
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How digital technology will redefine the way you live.

BY PAUL W. TAYLOR | CHIEF STRATEGY OFFICER, CENTER FOR DIGITAL GOVERNMENT

A Community Built for 'You'
Why your town will never be the same.

Digital communities are where you live — that's "you" as in *Time* magazine's Person of the Year for 2006, which recognizes and celebrates "the small contributions of millions of people and making them matter." In beating out an impressive list of villains and heroes for the distinction, the magazine's editors contend that "you" — by which they mean the 120 million Americans who are active online as users and creators of content and services — are changing the world by redefining it around your preferences and predilections, and by the technologies you use and the way you use them. The magazine contends its choice just scratches the surface of "a story about community and collaboration on a scale never seen before." The choice was celebrated in some quarters, left others scratching their heads and prompted one humorist to call you by your full name, "YouWikipedicYouTubingMySpacers."

A study by ABI Research reports a surge of social media activity via mobile handsets. The number of wireless users engaged in virtual communities is approaching 50 million worldwide and is projected to reach 174 million in 2011. The study's author, ABI Vice President of Research Clint Wheelock, observes, "The rapid rise of online social communities — gathering places such as MySpace and Facebook — has done more than bring the 'pen pal' concept into the 21st century."

Indeed, "you" live, work and play in mobile social communities and are increasingly untethered from home. In another study, the Pew Research Center reported last spring that 9 percent of Americans do not have home phones

and use their mobile phones as their primary phones.

This suggests that people still love what they can do with their phones — and they do more with a full range of text, data, photo and video features — but don't want to be tied down by a cable. It is reminiscent of the experimentation that came with the introduction of the commodity Internet in the mid-1990s, during which the unique interactive qualities of the network were commingled with content and conventions that were familiar to creators and users alike. Everything of value from earlier media and ways of doing business was carried forward while eliminating much of the physical burden that weighed them down — whether paper, brick and mortar, or the now anachronistic notion of "regular business hours."

The people immersed in social networking and consumer-generated media have much to teach public servants as they extend everything of value from the first decade of digital government into a world that's connected but untethered. To the degree digital government has been perfected (and there is still much to be done), it has been perfected to the desktop PC — delivering information, services and transactions on a 17-inch screen from about 26 inches away. The challenge and opportunity in dealing with all of "you" in a wireless world is adapting to the "third screen" — one that is

a fraction of the size and used in uncontrolled environments, but whose users expect the same quality of experience (and functionality) as any available on a connected PC.

The new season of experimentation has taken root all over. In Franklin, a town of 30,000 in southeast Massachusetts, the Police Department received positive notice for launching a series of public safety podcasts in 2005. In 2006, it began using YouTube to post surveillance video from convenience stores and patrol cars, annotated with a case file number, to show "you" suspects in any number of investigations.

In Nebraska, a group of government, education, community and industry groups created a mobile platform for training and community outreach. One key initiative is a podcasting pilot through which community and regional groups can learn how to tell stories that are important to them, with a view to sharing them the way "you" would expect.

For its part, Wyoming is working out the details for podcasts that would allow visitors to "relive" and share their experience at Yellowstone National Park or any other attractions in the state by repurposing a growing library of video and audio content. State park systems in other states are taking "you" seriously by streaming live video from Web cameras in scenic spots within the parks. Cameras in Arkansas state parks — including those at White River, Bull Shoals, Mount Magazine and Cossalot Bridge — can be controlled remotely by anyone with a Web browser anywhere in the world, putting users in control with the ability to pan, tilt and zoom.

Who Are You?
- ✓ **80 million** MySpacers
- ✓ **40 million** bloggers
- ✓ **1 million** amateur encyclopedians

Source: Wired, Issue 14.07, July 2006

Contents

It is worth noting that the video rides on the same wireless networks that support weather stations and park management systems. Once in place, the wireless networks will be used to provide a Wi-Fi canopy over select state parks in Utah and Arkansas to make "you" feel at home by providing broadband access to the campsite and beyond — a move intended to keep state parks competitive with resorts and commercial tourist attractions.

Back in town, and most places in between, wireless technologies are catching up with a long-held vision to untether public servants, keeping them connected while ensuring they are working when and where they are needed. South Dakota is outfitting its social workers who have tablet PCs with wireless connectivity to help redeem downtime while waiting for court proceedings and ensure they have all the information they need while making home visits.

In communities across the country, wireless connectivity is being used by local governments to monitor, detect and respond to public health threats, such as:

- Mosquito-borne diseases
- Radiation and environmental toxins
- Restaurant inspections

At the same time, wireless technologies are being integrated into the management of:

- Fleets of police, fire and animal control vehicles, plus street cleaners, garbage trucks and the like
- Train stations and airports
- Water and waste water infrastructure
- Illegal dumping
- Fire hydrants
- Road signs
- Electrical sub stations
- Weed abatement

To do all this, and the many things not yet deployed or even imagined, communities need the underlying wireless infrastructure. To that end, municipal wireless initiatives have been pursued in cities of all shapes and sizes — Philadelphia; San Francisco and Mountain View, Calif.; Tempe, Ariz.; St. Cloud, Fla.; Anaheim, Calif.; New Orleans; Annapolis, Md.; and Walla Walla, Wash.

In *Untethered Nation*, a series of strategic planning guides from the Center for Digital Government, we identified three choices for getting wireless services and the underlying infrastructure:

Build — An entity owns and builds the infrastructure, and delivers wireless services across the network.

Buy — These governments mainly consume services from third parties for their own internal operations but essentially leave citizen provision of wireless broadband to the myriad private-sector providers that decide where, when and if they will offer services within various geographic subregions.

Broker — Other governments have assumed the role of broker. Brokers may enter into agreements or contracts with one or more wireless service providers to ensure service provision within their jurisdiction. These may also be referred to as public-private partnerships.

The results of the 2006 *Digital Cities Survey* from the Center for Digital Government demonstrate the multiple hybrids being cobbled together to build out civic wireless infrastructure. Almost all (97 percent) of responding cities are pursuing wireless infrastructure through multiple hybrids. Cities reported doing Wi-Fi (78 percent), broadband cellular (65 percent), mesh (58 percent) and WiMAX/WiWAN (49 percent). If cities were not pursuing a multi-pronged wireless strategy, those numbers would add up to something around 100 percent. The overlap in responses, however, points to the level of hybridity among formerly discrete wireless approaches.

Wireless broadband can make a community more attractive to new industries and new residents, both of whom assume wireless connectivity is part of a community's infrastructure and every bit as necessary as electricity, running water and the like.

It is important not to get stuck in what we thought we knew. Early on, wireless was pitched as a key differentiator. That is, if a jurisdiction was lit up, it was among a relatively small number of progressive places to live, work and raise a family. Now, wireless infrastructure is expected — having it is a cost of doing business; not having it is a liability. But don't take my word for it — just ask "you."

It's Happening

Citywide Wi-Fi initiatives spread like wildfire as local governments choose from the expanding crop of business models.

BY ANDY OPSAHL | **STAFF WRITER**

THE NEXT STEP in our infrastructural evolution is upon us. Wireless Internet networks are poised to join roads, bridges, sewer systems, running water and electricity as essential ingredients for economic growth.

Thanks to wireless laptops, working professionals are abandoning offices and taking their work wherever they want. They now expect that freedom wherever they travel, and local governments seeking more economic activity are scrambling to accommodate that expectation.

Proponents of citywide Wi-Fi networks promise increased economic development, mobile applications that improve agency efficiency, as well as citizen access to wireless Internet service.

These wireless network infrastructures also serve as catalysts for digital inclusion programs. Many medium and large cities with a Wi-Fi network fund free Internet service coverage for select public school students. The service typically includes a free laptop and training. City officials figure the best way to bring every low-income household online is to begin with the children.

Citywide Wi-Fi networks are breaking out of their infancy with imminent completions in Philadelphia; Portland Ore.; Anaheim, Calif.; and elsewhere. Corpus Christi, Texas, completed its network in summer 2006 and already boasts successful mobile applications.

Other cities are still examining the various business models. No commonly accepted set of best practices exists yet, and experimental models are still emerging.

Local governments and some Wi-Fi providers are learning this business together, occasionally hitting unforeseen obstacles that are measured in millions of dollars. Sometimes a "We want what they got" attitude fouls up contracts later as cities notice new and improved contract features other cities get from their vendors.

Large Internet service providers (ISPs) entice densely populated cities with offers of covering the costs of these wireless network infrastructures. A provider attaches the necessary antennas to the city's streetlights and becomes the sole Wi-Fi provider on that network. The model is a seemingly free lunch, allowing cities to tout citywide Wi-Fi access while barely doing any of the legwork.

Smaller cities typically must pay for the infrastructures themselves and find creative ways to earn back their investments. Leasing broadband not used by agencies to local ISPs is the most popular solution.

Some cities are staying out of public broadband altogether, purchasing the bandwidth they need for internal operations from a private provider and leaving public-use networks to the private sector.

Many metropolitan areas — like Detroit; Orange County, Calif.; Johnson County, N.C.; and Tempe, Ariz. — embrace an incremental deployment as an affordable implementation. These networks typically start out only serving a community's select high-traffic areas. Oftentimes, certain agency staffs are the only authorized users on a network. Local officials then expand the networks as increased funding and demand emerge.

Funding Communitywide Wireless Networks

Funding Approach Best Described As	Cities	Counties
	(Percentage of respondents)	
None	22	49
Advertising (directly or through third party)	2	1
Public appropriation	18	23
Subscriber fees/ charge backs	17	13
Hybrid	32	15

Source: Center for Digital Government

The Do It Yourself Model

Corpus Christi, Texas, adopted a publicly funded model for its widely admired city-wide Wi-Fi network. The city's smaller size forced it to pay the infrastructure costs, requiring $7.1 million on top of nearly half a million dollars in annual maintenance costs. Naturally the advantage is that Corpus Christi owns the network and completely controls the network's direction.

After setting aside 40 percent of the bandwidth for mobile applications designed to streamline agency functions, the city chose to lease the remaining 60 percent to ISPs. The resulting revenue will pay for the network's startup and maintenance costs, and possibly turn a profit that could pay for the city's other technology needs, according to Leonard Scott, program manager of the Corpus Christi Wi-Fi network.

The recently finished network will power several mobile applications, one of which is already succeeding, according to Scott.

Corpus Christi implemented a home building inspection application long before finishing the network. Verizon, Cingular and Sprint installed their own medium-speed cellular equipment at various spots throughout the city where the main Wi-Fi network hadn't yet been installed.

Before the new inspection application, the city's roughly seven home building inspection processes took at least five days each to complete from the time a builder requested an inspection to the time the county approved it.

"Each one of those steps took a minimum of five days — to have the developer make the request, get it on somebody's schedule, bring them into the office, get them the copies of the drawings, get them the copies of the regulations and code, put them in a truck, get them out to that site, survey it, come back, fill out the paperwork, route the paperwork to the supervisor for approval, get the paperwork down to the service center, have somebody notify the developer that the paperwork's ready to pick up, send somebody back to the site and post the notice on that board," said Jeffrey King, director of the utilities business unit at Northrop Grumman, the city's Wi-Fi vendor.

Now inspectors receive their work orders on Wi-Fi-enabled laptops in the morning and drive directly to their first inspection site without stopping at the office. Their laptops are equipped with all necessary documents, a digital camera and Internet access for reference materials.

Inspectors go to inspection sites, complete their inspections, take photos, fill out forms, capture signatures from various city approvers and send the information via e-mail to their supervisor, who approves it and posts it to the building division's Web site the same day, King explained.

He said the application cut 35 days to 40 days out of the time it took to build a house in Corpus Christi.

Scott said the city is introducing a new mobile application that would let engineers inspect repairs of city property from their desks. On-site workers would use a Wi-Fi-enabled video camera to send footage back to engineers in real time. Scott said the application would raise everybody's productivity by eliminating engineers' travel time to and from repair sites.

He also noted that the citywide network gives local dial-up providers a chance to offer Wi-Fi-based services at a time when dial-up demand is vanishing. Since the network already exists, any provider wanting to transition to offering Wi-Fi-delivered Internet services would bypass the expensive network infrastructure costs normally involved.

"Estimates are, in the next three to five years, those folks will be out of business if they don't find some other technology," Scott said. The providers can sell Wi-Fi Internet services and make a better profit. "There is no overhead," he added. "They buy it. They resell it. All they've got to do is support their customers because they didn't have to build an infrastructure first."

Boston is densely populated enough to attract a privately funded Wi-Fi network but recently opted for the public model. Beantown preferred a model that would let several providers share the network and compete against each other.

The Boston Wireless Initiative will likely form a nonprofit organization, separate from city government to fund the project, said Mark Horan, consultant to the initiative. Community organizations and corporations would supply most of the funding rather than taxpayers.

Horan said Boston doesn't plan to subsidize Wi-Fi access for low-income citizens. The city's Wi-Fi nonprofit couldn't afford to fund a service speed that was worthwhile for low-income citizens, he explained, and offering substandard services to those citizens would certainly not close the digital divide.

Horan added that subsidies would ultimately raise prices for paying users. He said an inexpensive rate for a desirable speed generated by the market would be a more practical way to bridge the digital divide than politically and financially treacherous subsidies.
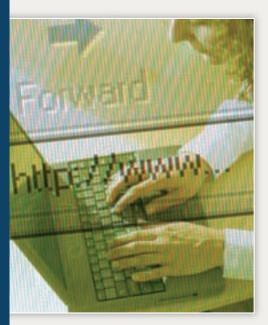
The Ad Experiment

Model: Ad Revenue/Free Service Model

Advantages: The city gets a head start on closing the digital divide with free service for everyone in the city. The provider funds, builds and runs the network while the city boasts of citywide free access.

Drawbacks: The model is in its infancy. Many doubt advertising dollars could support such a network. Little technical support available to users.

Some cities are embracing an experimental advertising model for free citywide Wi-Fi access. In this case, the vendor offers free Wi-Fi to anyone in the city willing to endure a 1-inch advertising banner constantly at the bottom of the screen. Some vendors claim the resulting ad revenue will recoup their infrastructure costs and produce a profit. They boast of guaranteeing online visibility for ad clients because the user looks at those ads no matter where he or she travels on the Internet.

San Francisco accepted an offer from Google and EarthLink to install and pay for a citywide Wi-Fi infrastructure. Google would provide the free ad-funded service, while EarthLink would contribute the infrastructure and regular fee-based services for those wanting to skip the ads and have a faster connection.

Portland, Ore., released an RFP for its Wi-Fi network in 2005, expecting the winning vendor to offer free Internet service in just a few select spots in the city. Portland also asked for a "walled garden" arrangement, which would allow all citizens free Wi-Fi access to 20 Web sites of the city's choice.

MetroFi, a venture capital-backed ISP, offered Portland the citywide advertising-funded model and won the contract. Construction is under way, and the vendor will complete two square miles for testing by early 2007, said Logan Kleier, project manager for the Portland Wireless Initiative.

"Once that's finished, tested and approved by the city, then MetroFi will build out to the rest of the city, finishing by mid-2008," Kleier said. "MetroFi thinks it will finish sooner."

The free service, advertising model may sound enticing, but "free" often comes at a price. Normally when you lose your Internet connection, you call technical support.

Building Communitywide Wireless Networks

Build-Out Approach Best Described As	Cities	Counties
(As a percentage of respondents)		
None	17	43
Public Utility	8	6
Private Provider	32	32
Hybrid	36	19

Source: Center for Digital Government

MetroFi's free Wi-Fi services don't include phone support. Kleier said the company would set up an online forum for users to trade advice on how to fix connection difficulties and other service problems. It seems fair to note, however, that users might have trouble participating in this online forum while disconnected.

Portland users wanting to bypass the advertising banner and help forum can purchase services from MetroFi for $20 per month, a deal that includes telephone technical support.

The Portland Wi-Fi deployment faced a few major difficulties however. The city does not own its public utility, and MetroFi had to negotiate power rates with Portland General Electric (PGE).

PGE had a minimum rate that would have charged MetroFi for far more power than its antennas used, Kleier said. The utility eventually agreed to file a new tariff

that would bill the city at a rate closer to the antennas' power usage. MetroFi would then reimburse the city for paying that bill.

Sacramento, Calif., is on its second attempt at an advertising-based, citywide Wi-Fi network. Before Portland's MetroFi contract, Sacramento accepted a proposal in 2005 from MobilePro, an ISP offering Wi-Fi at 56 Kbps and free service for two hours a day. Later, the vendor rescinded its offer when Sacramento officials demanded additional terms and conditions they began seeing in other citywide advertising-funded Wi-Fi contracts.

MobilePro said it couldn't do a financially viable advertising model under those demands, according to Sacramento CIO Stephen Ferguson, who added that MobilePro tried saving the deal by requesting that Sacramento commit to buying more than $1 million in Wi-Fi services annually, but the City Council declined.

"As time went on, and we saw other deals happening, the City Council got a clearer picture of what they really wanted," Ferguson said. "When we issued the new RFP after MobilePro withdrew, we were very specific, unlike the first time where we

just said, 'We want Wi-Fi. Tell us what you can do.'"

Craig Settles, an IT analyst based in Oakland, Calif., opposes the advertising model, doubting its business viability. Publicity expenses, he said, and network-related building and maintenance costs create too much overhead.

"You have to build a $7 [million] to $10 million network," Settles said. "That requires a lot of ad money to generate that kind of revenue. Then you have to support and sustain the network, which runs you about 10 to 20 percent of the cost of building it out. If you build out a network for $10 million, you've got to raise $1 million a year for ongoing support and upgrades."

Power Struggle

Sacramento, Calif., learned the hard way that a city should first check whether it has gang-switched streetlights or streetlights using light-level sensor technology before releasing an RFP, said Stephen Ferguson, the city's CIO.

Light-level sensors individually power streetlights, keeping electricity in the poles 24 hours a day. Gang-switched streetlights — thus called because a single switch controls several lights — are only powered at night.

Wi-Fi antennas can't operate on a gang-switched streetlight during the day without expensive alterations to the pole or antenna. Sacramento officials didn't know most of the city's streetlights were gang-switched, Ferguson said.

"We didn't ask the Street Department because I didn't know the difference between gang-switched and light-level sensor-switched," Ferguson said. "We basically said it was up to the vendor to determine any issues with using the city streetlight poles."

Tempe, Ariz. — MobilePro's last city Wi-Fi client — used light-level sensor streetlights, Ferguson said, and MobilePro assumed Sacramento used them too.

"When MobilePro didn't do their research and submitted their bid, we then told them, 'Well, tough luck guys. You were responsible for determining that, and you made assumptions that were inappropriate. You're stuck with it,'" Ferguson said.

The oversight added roughly $2 million to MobilePro's infrastructure costs. Ferguson said MobilePro indicated it was willing to swallow those costs before negotiations dissolved.

Portland, Ore., used the potential for a Wi-Fi powered automated meter reading system to help sell the wireless initiative to citizens. Later, city officials learned that the technology wasn't mature enough, said Logan Kleier, project manager for the Portland Wireless Initiative.

"They take too much power and drain the battery down from our wireless parking meters," Kleier said. "That's really a technological issue that has to be overcome. The city's not a research and development lab, so we can't hurry that process along."
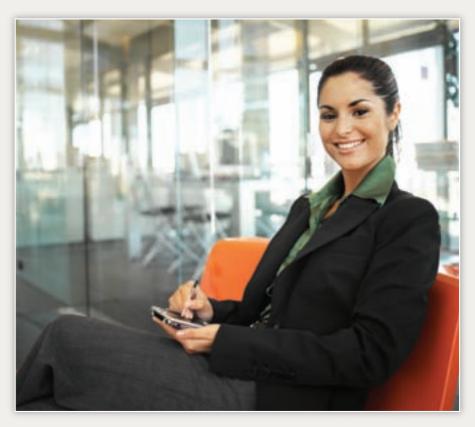
Free Ride

Philadelphia was the first large metropolis to pursue a citywide Wi-Fi network. Wireless Philadelphia, the city-created nonprofit organization charged with implementing the network, accepted an offer from EarthLink to build the infrastructure for free. EarthLink will be the sole ISP on the network.

"We've got a pretty good arrangement that shifts the financial burden and the risk to a private company, but ensures through strong agreements and the presence of a nonprofit partner that we achieve our civic, public and social mission," said Greg Goldman, CEO of Wireless Philadelphia.

EarthLink agreed to start paying Wireless Philadelphia 5 percent of its profits after the third year of the project's life. The company will also offer below market price Internet service accounts to qualifying low-income users. Regular users will pay $20.95 per month while select low-income users pay $9.95 for the same quality of service, Goldman said.

IT analyst Craig Settles derides the private model as a municipal copout. He argues that a city can only ensure a Wi-Fi network fully benefits citizens if the city itself controls the network. A private-sector ISP would prioritize its shareholders' well-being before that of the city as a whole, Settles explained.

Goldman said he couldn't deny the benefits of a city-owned network, but he countered that the Philadelphia arrangement has mechanisms to protect city interests.

"It's not like Philadelphia just went forward and said, 'Here, EarthLink; here are the keys to the city — have at it,'" Goldman said. "There is a very strict network agreement and series of agreements between Philadelphia, its agents, Wireless Philadelphia and EarthLink to ensure that this network meets the objectives of the city."

Settles said the potential for agency mobile applications, citywide Wi-Fi access and the likely economic development ought to justify a city funding the network independently. Many municipal officials reject that option, he added, saying it constitutes the city exceeding its boundaries and entering the telecommunications business.

"In Springdale, Ark., they levied a sales tax, raising $33 million to pay for a minor league baseball stadium. No one ever says, 'The city is getting into the sports management business,' or, 'The city is going to own a baseball team,'" Settles said. "All of these arguments you hear against municipal wire-less, you don't hear in the sports stadium scenario, yet it's the same basic thing."

He added that cities pursuing the private model are misguided to think citizens won't blame city government instead of the provider if problems occur. Perception is reality, Settles said, and users will perceive the city as responsible for the network's success or failure.

"If something goes wrong [the average citizen] is going to city hall," Settles said. "If [he or she] is unhappy, it's going to show at the voting booth. There is going to be a price to pay for failure, and if it's not dollars, it will be in political fallout."

As a middle ground, Milwaukee is combining elements of the Philadelphia plan with aspects of the Corpus Christi model. Midwest Fiber, a private broadband provider, is paying to build Milwaukee's network, but only to lease it to several competing ISPs. Milwaukeeans won't pay a dime to build the infrastructure but will still get a slew of competing service provider choices.

Toward a Wireless World

A look at wireless trends and innovations in local governments.

BY EMILY MONTANDON | EDITOR, SPECIAL PROJECTS

EVERY YEAR, THE CENTER for Digital Government conducts the *Digital Cities* and *Digital Counties* surveys. The 2006 surveys polled more than 300 local governments about everything from organizational arrangements to infrastructure to services.

The surveys show that local governments deploy wireless networks to solve a number of challenges — often simultaneously — including economic development, digital inclusion, increasing government efficiency and improving constituent services.

The dominant technology currently in use is Wi-Fi/mesh. But for some jurisdictions, broadband cellular cards have proven more advantageous for mobile staff. Though microwave access appears somewhat common for nonpublic government networks, such as mobile police networks and fixed WANs used by government staff, at least one WiMAX-standard deployment for public access has cropped up in Manchester, Conn., where the city is deploying a small test network for webcam video surveillance, and the city plans to cover the entire city in the future.

Broadband Plan

Broadband deployment strategies are diverse. The majority of local governments are relying to some degree on private providers for community wireless broadband deployments, with less than 10 percent of jurisdictions using a public utility or government-owned network model.

Regional collaboration has also come to light in a few places, often with a county and the cities within it collaboratively developing a broadband strategy. In one of the largest regional collaborative initiatives, 10 cities in the Denver metro area banded together, forming a consortium, known as Colorado Wireless Communities (CWC), to attract a private-sector partner to cover approximately 200 square miles area with wireless access.

There is much to be learned from the aggregated data collected by the Center for Digital Government's local government surveys, and plenty of inspiration to be found in the innovative projects brought to light. The following pages highlight emerging wireless trends in government as well as some of the innovations reported in 2006.

Types of Wireless Infrastructures Present in Jurisdictions

	Cities	Counties
	(Percentage of respondents)	
None	3	10
Public Safety 700/800 MHz Radio	81	62
Broadband Cellular	65	47
IEEE-based Broadband Wireless Access Point (Wi-Fi)	78	62
IEEE-based Broadband Metropolitan Wireless Access (WiMAX, WiWAN, etc.)	49	28
Mesh	58	26

Source: Center for Digital Government

The Multiplier Effect

Communities of the 21st century take a different approach to economic development than communities of the past. In today's globalized world, telecommunications infrastructure is key to successfully stimulating a community's economic environment.

As a result, today's leaders have actively invested in network infrastructure, such as fiber optics or citywide Wi-Fi, to create the backbone necessary for 21st-century commerce.

Stimulus

In 2002, Tallahassee, Fla., leaders authorized spending for a "Digital Canopy" project that provides free wireless access to the Internet for the city's airport and a large downtown area. City officials said the Digital Canopy is a crucial component to projecting the tech-friendly environment that IT companies look for in a community when considering relocating offices or opening up new ones.

Colorado cities too recognize the economic development benefits of telecommunications infrastructure. Boulder, Colo., IT staff began an initiative in April 2006 to evaluate the feasibility of a communitywide wireless broadband network to, in part, stimulate economic development.

Nine other cities in the Denver metropolitan area partnered with Boulder, creating the Colorado Wireless Communities (CWC). The CWC planned to release an RFP in January 2007 for private-sector investment in wireless Internet connectivity that would blanket approximately 200 square miles and serve about 630,000 people in those 10 communities.

Economic development isn't just about bringing new companies to a community. Revitalizing an existing neighborhood can create grass-roots growth in a community's economy. The Hollywood, Fla., Community Redevelopment Agency sponsored a similar project that offers free Wi-Fi Internet access in the city's downtown and beachfront areas for residents and tourists.

Looking Forward

Some economic development efforts look to the long haul. These efforts often take the form of "digital inclusion" programs, which use information technologies to foster education and improve a community's quality of life.

City leaders in Riverside, Calif., created SmartRiverside to attract and retain high-tech companies. The initiative aims to increase the city's technology literacy through digital inclusion and build a smarter community through free citywide wireless Internet access. SmartRiverside also endeavors to identify new programs that encourage technology innovation and use in Riverside, and attract high-tech companies to the city's Technology Park.

The city's mayor serves as chairman of SmartRiverside, and the city's CIO serves as the nonprofit's executive director. City officials use incentive programs, such as tenant-improvement assistance for as much as $30,000, and employee-relocation programs for as much as $5,000 per employee, to attract high-tech firms to the city.

Such efforts aren't limited to cities. Counties too realize that the cities within their boundaries depend, in part, on county government's willingness to institute economic development programs.

Oakland County, Mich., is behind the Wireless Oakland initiative — a planned wireless cloud that will provide Internet access to a 950-square-mile area. The county is also developing a Telecommunication and Technology Planning Toolkit for Local Governments to help those governments plan for the future and devise their own programs to stimulate economic development efforts.

Similarly Richland County, S.C., participates in community development conferences on broadband access, both wired and wireless, with leaders from economic development agencies, local government, education, business, public housing, community development corporations and technology companies. The goal is to spur, support and sustain economic development in low-income neighborhoods.

— *Shane Peterson, Associate Editor, Government Technology*

Percentage of Jurisdictions with Wireline Broadband

	Public Facilities		Business Districts/ Commercial Areas		Residential Areas	
	Cities	Counties	Cities	Counties	Cities	Counties
None	8	31	24	55	29	57
1/3 or less of facilities	7	10	8	9	5	9
1/3-2/3 of facilities	13	9	10	9	14	9
2/3 or more of facilities	65	49	50	24	44	20

Source: Center for Digital Government

Building Bridges

Still important in the public sector is digital inclusion — or bridging the digital divide. Many counties nationwide are working toward access for all citizens — urban and rural, wealthy and poor — and pursue these goals in diverse ways. Key trends include public-private partnerships, providing Internet access at libraries and other public facilities, and offering these services at low or no cost.

Reaching Rural Locales

Some rural localities have partnered with the private sector to bring wireless mesh broadband to previously unreachable areas. In 2005, Franklin County, Va., conducted a Broadband Assessment Study to document the current state of service nationwide. After issuing an RFP and partnering with a vendor, work to link outlying local government offices and provide broadband to rural areas of the county is well under way.

Another county partnering with the private sector — as well as other local units of government — to expand broadband in the region is Kent County, Mich., which is currently pursuing a Wi-Fi-based approach, since the wired approach is economically impractical.

Percentage of Jurisdictions with Broadband Wireless Deployments

| | Public Facilities | | Business Districts/ Commercial Areas | | Residential Areas | |
	Cities	Counties	Cities	Counties	Cities	Counties
None	9	38	25	59	39	63
1/3 or less of facilities	35	33	38	24	32	24
1/3-2/3 of facilities	27	33	15	24	8	7
2/3 or more of facilities	21	13	14	7	13	6

Source: Center for Digital Government

In both Franklin and Kent counties, extending wireless broadband to rural areas will also help improve public safety by increasing flexibility and information capabilities.

Public Access

Many communities offer broadband access in public facilities. In Palm Beach County, Fla., Wi-Fi access is available to the public in the airport, the library and county courthouses.

Palm Beach County fully funded its wireless initiative and is in the early stages of planning a broader deployment of public Wi-Fi that will create hotspots in the downtown areas of several municipalities.

In Roanoke County, Va., private ISPs deliver wired and wireless access to citizens through subscriptions. Without competing with these vendors, the county hopes to enhance the lives of citizens who live in areas where broadband is unavailable. With tax dollars, the county built limited wireless broadband access in many county administrative buildings, and usage is free to visitors. The county library system also offers publicly funded broadband access at all its annexes.

Universities, convention centers and public schools are also common sites for public Wi-Fi networks.

Forsyth County, N.C., is working through WinstonNet, a nonprofit initiative established in 2001 to bring broadband access to underserved communities in the county. The organization — whose members include the city of Winston-Salem, Forsyth County, and local schools, libraries and other organizations — is working to bridge the digital divide by providing computer labs throughout the county in churches, libraries, parks and other public locations. The group is now planning a community-wide wireless initiative that would provide free wireless in all computer labs, and free or low-cost service in Winston-Salem. WinstonNet is also establishing a mechanism to provide equipment for low- to middle-income households.

Low-Cost Wireless

Many counties and municipalities are working with wireless providers to deploy low-cost broadband access.

In Philadelphia, Wireless Philadelphia worked with a private ISP to launch a citywide Wi-Fi network. Low-income residents can obtain broadband access by visiting several free hotspots throughout the city or by subscribing for a reduced rate.

Montgomery County, Md., initiated a program that provides free Wi-Fi to the general public. The Silver Spring Wireless Fidelity project provides wireless access in open-air public spaces in downtown Silver Spring, Md.

Also working to provide free wireless Internet access is Oakland County, Mich., whose Wireless Oakland initiative will provide free high-speed Internet access to every county resident, business and visitor. The project will be accomplished through a unique public-private partnership, leveraging technology investments already funded by Oakland County residents to create a blend of free and for-fee services. The initiative also aims to provide computing devices and technical training to residents who normally would not have access to the technology.

— *Jessica Jones, Editor,*
Emergency Management

Enhancing Efficiency

Government efficiency is on the rise as more municipalities adopt wireless technologies and mobile applications. This increased efficiency is being realized in such areas as field inspections, law enforcement, internal communications, disaster recovery and security.

For example, one-third of counties responding to the Center for Digital Government's 2006 *Digital Counties Survey* said wireless broadband is available in certain public facilities, such as government offices, schools, airports and libraries, though wireless broadband connectivity isn't as prevalent as traditional broadband.

These broadband strategies enhance efficiency in various ways. Typical examples include connecting field employees to the office, improving law enforcement communications and enhancing first response.

Mobile applications, such as meter reading, permitting and inspections, are changing the fundamental nature of government business by decreasing paperwork, reducing costs and improving service delivery — all of which come under the umbrella of improving government efficiency.

Field Operations Streamlined

Field inspections have been significantly enhanced as many counties adopt cellular broadband capabilities. For example, Loudon County, Va., has an e-permitting project under way that is helping to transform both internal and external operations. Contractors, builders and other customers are witnessing their wait times for permits slashed from days to minutes as wireless connectivity allows for on-site permitting. Inspectors are no longer tethered to the office as jurisdictions embracing a wireless strategy realize the potential of mobile telecommuting. Furthermore, worker productivity increases have cut the need for hiring additional staff.

Public safety is experiencing a revolution as wireless and other technologies change the way police officers, firefighters and other first responders do their jobs. Yakima County, Wash., for example, claims to have the nation's largest 802.x wireless public safety network, covering approximately 700 square miles with high-speed data access that is available to law enforcement agencies. Additionally this wireless network is being adapted to serve multiple purposes such as courthouses, county offices and libraries.

There are a number of other wireless broadband applications for public safety being deployed. Wi-Fi hotspots at police and fire stations, for example, allow for the rapid exchange of mission-critical information. Mobile computers in patrol cars let officers perform tasks such as querying the National Crime Information Center and filing paperless police reports. GIS tools also help first responders locate and navigate to emergency scenes.

Testing Positive

Results from the survey are encouraging. Many responding law enforcement agencies don't rely exclusively on traditional communications technology, such as two-way radios. In fact, nearly 60 percent of respondents said local law enforcement is connected to a digital communications network that affords them access to license plate data, drivers' licenses, mug shots and criminal histories. In addition, those same respondents are fully integrated with federal and state criminal databases, local courts and corrections facilities. A majority of respondents have also deployed citizen-facing Web sites for those seeking information regarding convicted sex offenders' whereabouts.

Another strategy for effecting change are city and county approaches that link outlying facilities and employees. Clay County, Iowa, for example, worked with a private ISP to deploy a wireless network to connect distant county offices.

Survey respondents who are actively working to strengthen their overall IT infrastructure make possible these gains in efficiency. According to the survey, a majority of responding counties said they have taken an enterprise approach to their technology infrastructure, with many or all operating departments and agencies using a common network computing infrastructure.

— *Chad Vander Veen, Technology and Politics Editor, Government Technology*

Crossing the Line

Constituent service is, or at least should be, the core reason for government's existence. Findings from the Center for Digital Government's 2006 *Digital Cities* and *Digital Counties* surveys indicate that communities nationwide are implementing technology strategies to enhance the citizen-government relationship. The aging yet relevant axiom of "online, not in line" continues to drive the efforts of governments large and small. Today there are more online applications available to citizens than ever before, meaning the ability for people to conduct their business with government is becoming more efficient.

Giving citizens the opportunity to complete online transactions that in the past required them to visit one or more government offices is the most common and most compelling way to apply technology to constituent service. As the survey details, cities and counties offer an increasingly diverse suite of electronic services. Most provide commonly used forms online — with a growing number of jurisdictions allowing users to submit those forms electronically as well.

Survey Says

For example, 73 percent of survey respondents have property assessment and tax forms available online, with 56 percent reporting such forms can be submitted electronically. Forms for jury duty and other court services are available online in 38 percent of responding counties, with 33 percent affording citizens the ability to submit forms electronically. Almost half of responding counties offer county records searches online, approximately one-third of respondents allow citizens to submit forms for building permits and recreation services, while fewer than a quarter accept online submissions for child support and services or occupational license renewal.

These numbers indicate local governments are stepping up in terms of service delivery. Yet it is also clear there's still a long way to go.

Returning to the occupational license renewal example, only 12 percent of responding cities say their citizens can complete and submit forms online. Online license renewal could therefore be considered one of the key services cities and counties might choose to focus on in their drive to improve constituent service.

There are a number of excellent examples of the efforts of cities and counties committed to enhancing their ability to deliver the kind of quality, in-demand service their citizens want. Tucson, Ariz., is one such example. The city designated its business licensing for a significant upgrade. After the upgrade is implemented, most tax and license transactions will be available online to city residents. In Contra Costa County, Calif., an online application for accessing and paying taxes is being implemented in conjunction with an interactive voice response system that will provide telephone access and payment services for those citizens unable or unwilling to use the online application.

Practical Application

Effectively improving constituent service is more than providing online transaction, permit and payment applications. CRM and 311 systems have also emerged as technologies vital to the local government strategy. In a related question, the survey asked counties whether there is a single online citizen service area where constituents could request services, report problems or lodge complaints, and complete citizen satisfaction surveys. The results were mixed. Thirty-eight percent of respondents said they had a citizen service area on the county Web site. Ten percent of county respondents also reported having a database consolidated between the Web application and a telephone call center. Forty-five percent, however, do not have an online citizen service area — meaning ample room for improvement exists.

Looking at Chicago, one will find some innovative applications for CRM and 311 systems. Chicago is using CRM, 311 and GIS technologies to provide mobile "one-stop shopping" for families in need of social services. The system is available during emergencies — such as Chicago's handling of Katrina evacuees — as well as nonemergency events and ongoing service delivery. The one-stop combination of relevant services from multiple levels of government can be customized to meet individual citizen needs.

Many cities and counties across the nation continue to adopt CRM and 311 strategies. Many are also deploying innovative services like citywide Wi-Fi, public GIS applications and all sorts of online permitting applications. In terms of constituent service, the survey shows that much has been accomplished, and yet much remains to be done.

— Chad Vander Veen, Technology and Politics Editor, Government Technology

Digital Pioneers

Local governments are experimenting with a broad range of wired and wireless services aimed at streamlining government operations and improving the quality of life for community residents.

An examination of the 2006 *Digital Cities* and *Digital Counties* survey results shows that local governments are using innovative technology to enhance city libraries and parks, boost public transit use, deter crime, and even compete for scarce employees.

Smart Libraries

Public libraries often are an early target for municipal wireless initiatives. These are among the first facilities to receive wireless network infrastructure, usually in an effort to improve citizen satisfaction, enhance education and serve residents who lack home Internet access.

Communities also have done a significant amount of work in making transactions, such as renewing library cards, available online. Approximately 40 percent of counties responding to the 2006 *Digital Counties Survey* provided such services via the Web.

Now some forward-looking library systems are using wireless technology to boost citizen convenience and reduce library staffing requirements. Carlsbad, Calif., and Lewisville, Texas, are among several communities using RFID technology to automate and simplify the process of checking out books, CDs, videos and other library materials. Advances such as this contribute to the Carlsbad library's consistently high ranking in the city's annual citizen satisfaction survey. More than 97 percent of Carlsbad residents ranked library services as good or excellent in the 2006 citizen survey.

Enhanced Recreation

Communities also are experimenting with wireless applications to boost the popularity and usability of parks and recreational facilities.

In summer 2006, New York City announced that free Wi-Fi networks would be installed in 10 major city parks, including Central Park, Union Square Park and Corona Flushing Meadows. The project is a partnership between the New York City Department of Parks and Recreation, New York-based WiFi Salon and Nokia.

Mecklenburg County, N.C., installed its own wireless network in Freedom Park more than a year ago, using seven wireless access points to blanket the 98-acre facility with free Wi-Fi service. The county intends to add wireless access to other parks and greenways in the future.

Meanwhile, Lincoln, Neb., plans to add RFID tags to public swimming pool passes sold by the city Parks and Recreation Department for the summer 2007 swimming season. The city expects RFID to reduce fraud by making it harder for people to share pool passes. RFID-equipped passes also could incorporate medical alert information and emergency contacts for pool patrons. Furthermore, the technology will let the city track when visitors enter and leave pool facilities, a boon to parents trying to keep tabs on their kids during the summer.
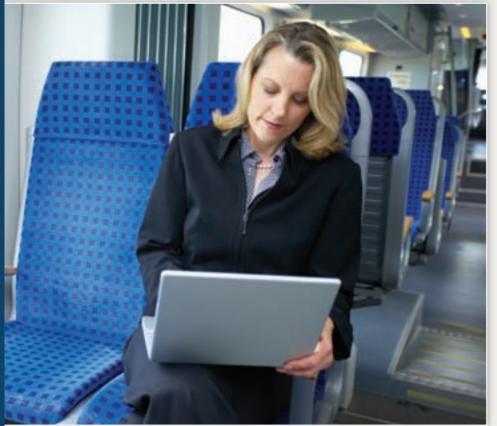
Public Transit

A growing number of communities are developing technological amenities designed to attract more riders to public transportation systems. These applications are aimed at making waiting for a bus more tolerable and improving the rider experience once citizens are aboard.

Lafayette, La., plans to use GPS technology to perform real-time tracking of its transit bus fleet. The system will deliver the information to bus terminal displays and Web-enabled handheld devices, giving riders up-to-the-minute data on arrival times.

Bus terminals will display a large projection of a map showing designated bus routes. Buses will appear as unique icons along these routes, providing a spatial view of their current locations. Tracking information will be updated twice per minute. Any rider with an Internet-capable device will be able to link to the transit bus Web site, and view the same location and status information provided in the terminals.

Besides improving rider satisfaction, Lafayette expects tracking technology to

improve management of the bus system. The new technology will automatically collect timeliness and performance data. It also will warn dispatchers if a bus leaves its designated route and alert the appropriate responders if an onboard emergency alarm is sounded.

Tempe, Ariz., will offer Wi-Fi service at city bus stops, giving riders something to do while they wait.

And Colorado Springs, Colo., has equipped some of its transit buses with free wireless service since late 2004. Colorado Springs officials say it costs about $50 to equip a bus with wireless connectivity, using a broadband cellular connection that's linked to a wireless router in the vehicle. The low-cost technology has proven popular with bus riders. Offering free wireless service on the 75-minute commute between Colorado Springs and Denver helped boost sales of monthly bus passes by more than 82 percent, according to the city.

Safer Communities

Of course, public safety agencies are long-standing users of wireless technologies. But communities still are finding opportunities for innovations that improve the health and safety of residents.

Virginia's Roanoke County equipped its fire and rescue stations with wireless broad-

band access points that work in conjunction with local hospitals to quickly transfer secure patient data to health-care professionals.

Similarly Richardson, Texas, expects its citywide Wi-Fi project to greatly benefit emergency response. The city Fire Department hopes to provide real-time video from the back of an ambulance to a doctor waiting at the hospital. And the Richardson Police Department expects wireless broadband to complement its shift from analog to digital video for in-vehicle cameras. Officials say the increased bandwidth offered by Wi-Fi may allow dispatchers to view live digital video from in-car cameras, improving both communications and officer safety.

Other communities will use wireless video to extend the reach of law enforcement agencies even further.

Roanoke, Va., is working with Nortel to build a wireless mesh network along its downtown corridor that will support digital video cameras at heavy traffic intersections. Data will be fed to the city's police, fire and traffic engineering departments.

And two Florida cities — Delray Beach and West Palm Beach — said they're contemplating the use of wireless surveillance cameras to tame high-crime areas. West Palm Beach officials said the technology could deter criminal activity and aid in

prosecuting individuals caught breaking the law. The city already has selected appropriate camera locations and expects to begin deployment in early 2007.

Automated Recruitment

Although not a wireless service, several local governments say they're using Web technology to streamline the recruiting and hiring of new employees. Widespread availability and popularity of commercial employment Web sites have prompted local governments to move a growing number of public employment resources online.

For instance, it's now fairly routine to find job openings posted on city and county Web sites. But some jurisdictions are going several steps further.

Vacaville, Calif., intends to implement an applicant tracking system that will let job seekers apply for city jobs online, then track their applications electronically throughout the hiring process.

Business rules will be built into the process, and tasks such as prescreening and progress monitoring will be automated, allowing the city to handle job applications more effectively and efficiently. Furthermore, job seekers will get a quicker response and better information about the status of their applications. Beyond the fact that it will streamline internal operations, Vacaville views the new system — expected to be deployed within the next several years — as a competitive edge for recruiting talented workers.

Tip of the Iceberg

Given the fact that municipal-scale wireless infrastructure development remains in its infancy, the deployment of innovative mobile services is poised to grow dramatically in the coming years. Much like the public sector's first foray into "e-government" a decade ago with the emergence of Web-based services and information, it'll likely take a while to arrive at definite uses for the emerging wireless channel.

In the meantime, these forward-thinking jurisdictions are helping pioneer the evolution of digital communities.

— *Steve Towns, Editor,*
  Government Technology

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