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Geospatial Technology Used for Real World Challenges

By Ivan DeLoatch, Executive Director, Federal Geographic Data Committee

Governments worldwide are turning to geospatial information as a way to provide more efficient and effective services to their citizens. The articles included here demonstrate the breadth of ways that local, State, and Federal governments use Geographic Information Systems (GIS) for core management tasks and the mundane aspects of keeping a government running.

In This Edition

U.S. General Services Administration
Office of Citizen Services
and Communications
Office of Intergovernmental Solutions

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At the US Geological Survey, we see geospatial resources as the centerpiece of government activity and we are changing the way we do business to better serve the needs of our partners, customers and stakeholders.

Recent studies indicate the prevalence of GIS among local governments and the recognition that the benefits outweigh the costs involved. For example, more than a thousand local governments participated in a survey on GIS use by Public Technology, Inc. (PTI) in 2003. The PTI survey, sponsored by the US Department of the Interior and the Geospatial One-Stop project, found that GIS has found an important niche in local government especially in communities over 100,000 in population. Key local government uses include public works, financial, public safety and economic development, according to the survey responses.

Of course, problems persist. The PTI survey identified funding and technical expertise as the greatest barriers to the use of GIS. A majority of local governments participating in the survey take advantage of intergovernmental cooperative programs to leverage their resources and expand their capability to take advantage of the benefits of the technology. Although not discussed in the PTI survey, the lack of a nationally recognized set of standards to facilitate information sharing is also cited as an obstacle.

At the new National Geospatial Programs Office (NGPO) of the US Geological Survey, we are taking these issues very seriously as we continue to realign our geospatial programs to better address the concerns we have heard from the State and local government community. The PTI study, a collaborative effort of PTI, the National League of Cities, the National Association of Counties and the International City/County Management Association, proposed that the Federal government take a leadership role in promoting GIS use through outreach programs and training for local government officials, accessing GIS tools and resources via the Internet, and promoting best practices. Over the past six months, members of the NGPO staff have been hosting listening sessions and multi-agency study teams, as well as attending conferences, to get input and support that will guide the transformation of separate programs into a single

unit that can lead the community in developing a plan for a national geospatial information system. NGPO will utilize the concepts and the best practices identified by the National Spatial Data Infrastructure (NSDI) to realign our own geospatial programs based on the principles of collaboration and coordination to better serve the Nation. These best practices are based on the premise that the value of geospatial information expands exponentially when shared.

The NGPO leadership intends to move forward with the plan for a national geospatial information system with access to quality, near real-time digital geospatial data and resources in a way that enhances partnerships and collaboration. We are committed to constituencies and matters and places of national importance. While much of the Nation has been well supported by currently available geospatial assets, there are other issues in which the geospatial community can leverage resources, such as rural communities and coastal communities, natural hazards and homeland security. Further, we are committed to adopting a culture that includes project management and embraces best practices employed in the larger information technology community.

The programs of the NGPO include:

- **Geospatial One-Stop:** one-stop resource for finding and accessing geographic information across the Nation

- **The National Map:** reliable base geographic content available across the Nation

- **The National Atlas:** map products and teaching tools

- **Federal Geographic Data Committee (FGDC):** a national network of GIS organizations, expertise, and best practices

In taking a portfolio approach to managing the Nation's geospatial assets, NGPO is also leading the way on a geospatial component for the Federal Enterprise Architecture (FEA) by spearheading an initiative to create a GIS profile to help share information. Geographic information cuts across every agency's line of business. NGPO's FGDC is working on the profile with the CIO Council, Federal, State, and local agencies, and the National Association of State CIOs.

One of the most recent decisions was to create the National Geospatial Technical Operations Center, a consolidated center of expertise that provides our customers with a single center to turn to for their geospatial needs. Plans for the center are still under development.

The Geospatial One-Stop project, begun several years ago as one of OMB's e-government initiatives, helps facilitate the collection and sharing of geographic or spatial data among Federal, State and local governments. Through the geodata.gov portal, Federal, State and local governments can access, share and combine information from multiple sources. Maps can be created from information created by the Federal government, states, local or private sector and shared with decision-makers in different locations. Before beginning a project, you can get a sense of what is already available. When Version 2 of geodata.gov comes online later this spring, over 300,000 records will be available.

One Geospatial One-Stop innovation is its Intergovernmental Board of Directors, representing State, local and tribal organizations. In recent months, the Board was instrumental in developing recommendations for the award of Version 2 of the portal. Since its inception, the Board has played a role in the development of policies that encourage coordination, collaboration and partnerships in the ability to find and share information. Geospatial One-Stop's other important innovation, the Geospatial Marketplace, allows prospective purchasers of geospatial information to find out whether others intend to invest in the same geographic area and hopefully lead to collaborative efforts.

NGPO's other major geospatial program, the National Map, will continue to work collaboratively with partners to provide the Nation with access to current, accurate, and nationally consistent geospatial data content and derived graphic products. The National Map will serve as the foundation for integrating, sharing, and using other data through the Geospatial One-Stop portal under the stewardship of the USGS, and through partnerships with State, local, and tribal governments, other Federal agencies, and private industry.

Through programs such as the USGS state liaison network, the National Map pilot projects, and the Cooperative Assistance Program grants, which provide grants sponsored for many years by FGDC and FGDC's education and training programs, NGPO will continue to encourage partnerships and collaboration as stewards of a national geospatial program. As we move toward our goal of creating "a system of systems" based on a set of best practices developed by the FGDC, we hope to create and take advantage of opportunities to leverage resources and collaborate towards reaching common goals and mutual benefits.

In the first few months of the new NGPO, we have begun the process by co-sponsoring initiatives such as:

- The Amber and All Hazard Alerts consortium, to bring up-to-date communications and information on emergency situations to citizens

- An interagency agreement with the U.S. Forest Service to maintain the USGS topographic maps over Forest Service Lands, which represent about 20 percent of the Nation

- A partnership with the State of Texas which has resulted in updating all 4,400 of the USGS topographic maps of the State

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In creating a national "system of systems" that supports our partners and allows governments to share access and maximize the value of geospatial investments and resources, NGPO depends on our most valuable allies – our partners. We encourage your participation in our programs and value your advice. If you would like to get involved, here are some ways to participate:

• Contribute an example of a geospatial success story (www.fgdc.gov).

• Share your data through the Geospatial One-Stop portal (www.geodata.gov).

• Apply for a CAP grant that promotes organizational support for collaboration and coordination, contributes to the National Map, or provides training on metadata (www.fgdc.gov).

• Become a member of an FGDC subcommittee or working group (www.fgdc.gov).

• Join a committee or organization to get involved in Federal, State or local policy or share experiences with your colleagues. NACo and PTI have GIS committees; URISA, GITA and NSGIC focus on GIS; ICMA and NLC have many technology related initiatives.

• Contact the USGS state liaison in your community or the state GIS coordinator to see what else is going on in your state.

Ivan DeLoatch is the Staff Director of the Federal Geographic Data Committee (FGDC), setting direction and managing the work of a national network of GIS organizations working to develop expertise and best practices for the development and coordination of geospatial activities. For more information contact Leslie Wollack via email at: lwollack@usgs.gov, or go to http://www.usgs.gov/ngpo.

Geospatial Information and Technology Solves Everyday Challenges

*By Denis Gusty, Director
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Government organizations for years have collected geospatial data in multiple formats, conforming to different standards, to serve their specific mission. Geospatial data identify the geographic location and characteristics of natural or man-made features and boundaries on the Earth. The hodgepodge compilation of this wealth of data has made it difficult to locate, access, share, or integrate the information in a timely and efficient manner.

Over the past decade, however, the Federal Government has encouraged and expanded the use of geospatial data through projects funded jointly by government offices from different jurisdictions and/or government and industry. Cooperative funding of digital orthophotos by the U.S. Department of Agriculture, the U.S. Geological Survey and states like Wisconsin is a specific example of this best practice. Regional cooperation between utilities and local governments has also been successful in metropolitan areas such as Indianapolis, IN and Washington, DC and in other localities as well.

Today, geographic information touches upon every aspect of life from planning the delivery of health services to recycling contaminated land. Spatial data and information mapping allows for better management of epidemics, such as the outbreak of foot and mouth disease, and coastal zone and flood defenses; and better monitoring of global warming, pollution control, and land-use.

A typical Geographic Information System (GIS) consists of four basic parts: (1) the needs of the people using the system, (2) data that feed the system, (3) methods for analyzing the data, and (4) tools or technology, such as computer hardware and software, to work with the data. Data input to a GIS may come in the form of cartographic maps, surveys or journals, or demographic reports, all of which have been around for centuries. The methods used in data analysis are rooted in well known fields, such as mathematics, geography, biology, and political science.

Personal computers allow anyone to use geospatial data. A new interface is being developed for citizens who drive cars equipped with Global Positioning Systems and for those who use desktop mapping to locate natural resources. These systems could save billions of gallons of gasoline, thousands of hours, and millions of dollars and make it easier than ever for citizens to find parks and recreation opportunities or to check the water quality in their community.

International Use of Geospatial Information and Technology

The United States is not alone in the effort to make spatial data more readily available to governmental and business leaders in making informed

decisions. Today, governments from around the world are adopting these new ways of interacting with their citizens by creating new infrastructures to and modernize their cities and suburbs.

In Portugal there has been a long tradition of relying upon geographical and cartographic information. From the age of exploration in the 15th Century until modern times, cartography has been a very important method of conveying knowledge, and communication. For centuries, monarchs, travelers, explorers and democratic governments have found it to be a useful decision support tool.

In 1995, Portugal took a giant step in rationalizing the need for geographical information when it became one of the first countries to establish an online National Spatial Data Infrastructure (NSDI) project. The online project is a one-stop shop for data from 117 national and local agencies. The citizen gateway was made available on the Internet in 1999.

The Portuguese Government had to restructure its geospatial agencies in an effort to better serve the market and users of geographical information.

In the United Kingdom, the Environment Agency and Informed Solutions Working Group completed the successful delivery and deployment of a new Property Search System. This system uses geospatial technology in an effort to protect and improve the environment by monitoring flood defenses, water quality, and wildlife preserves. The system was developed using open standards and XML, and took full advantage of the existing improvements in spatial and information technology software. By using open standards and leading edge geospatial technology, members

of the working group were able to move from a passive collection of information to active public participation in environmental decision-making.

Presidential Initiative

President George W. Bush has set a goal for his administration to expand the use of electronic government and find ways to improve how the Federal government provides services internally and to citizens, businesses, and state and local governments. Geospatial One-Stop, one of the Presidential E-government initiatives, is accelerating the development of the United States' NSDI. The mission of the project is to serve various customers, including other Federal agencies, State and local governments, private companies and citizens, by providing a single point of access to map-related data. Sharing data maximizes geospatial investments by leveraging resources and reducing redundancies.

Crisis Management Applications

In the fight against crime, police departments in the Baltimore-Washington area use a Regional Crime Analysis GIS system to map and share crime data across the region, improving the quality of crime analysis and reporting. Through crime mapping, law enforcement agencies are better able to identify the locations where crimes occur, which in turn improves citizen safety. Crime mapping allows law enforcement officials to define areas of concentration of criminal acts, trends and hotspots, thus allowing them to respond quickly by directing patrols to where they are needed most. Crime mapping also has proven useful in communities where citizens want to learn the exact location of convicted sex offenders.

Since the 1940's, the Blue Grass Army

Depot in Kentucky has maintained a stockpile of chemical weapons awaiting destruction. Emergency preparedness officials from the 10 counties that surround the depot once relied on enlarged and laminated county highway maps to prepare for a possible release incident. The Kentucky Chemical Stockpile Emergency Preparedness Program used a phased approach to implement an affordable GIS that enabled law enforcement and emergency personnel to quickly and easily obtain information such as evacuation routes and nearby medical facilities.

GIS was useful in the recovery efforts after the World Trade Center bombings in 1993 and even more so after September 11, 2001. Many of the fears that existed during the aftermath were centered on the thought that the surrounding buildings were or might become unstable and collapse. GIS data, accurate to about 15 centimeters, were used to show if the buildings were shifting dangerously.

Improving Community Services

Recently, the City of Fort Worth, TX, released a new customer service tool that is interactive and can be accessed from the Internet site. By typing in an address, City employees and residents receive customized reports that include maps and other items, such as the name of the City Council representative, school district, police beat, public improvement district, garbage day, neighborhood association and fire station location.

The Department of Public Works in Waterford, MI, piloted a wireless/terminal-server solution to deliver geographic information and related systems into the field where employees needed real time data. Employees use these systems to issue and complete work orders and retrieve and record data related to

infrastructure and engineering drawings.

In Pennsylvania, the Keystone Research Center recently added an interactive GIS map to its website that graphically illustrates the geographic distribution of the State's millions of dollars in economic development grants and loans. This new functionality revealed to public officials and citizens alike how the disproportionate allocation of these funds was leading to accelerated urban sprawl in older communities. The Governor was able to better align the distribution of the state's limited resources to areas that would produce the most public good. The transparency of this information has been important for citizens because it encourages informed public debate. This innovative use of GIS data will help move communities impose "smart growth" practices in the future.

Environmental Improvement

The U.S. Environmental Protection Agency (EPA) Region II Ground Water Compliance Section is using geospatial technology to assist in the implementation of the Underground Injection Control Program in New York, the Virgin Islands, New Jersey and Puerto Rico. With a regional staff of only five inspectors, EPA faced a huge challenge in implementing the program, which regulates all industrial disposal wells including, storm water drywells, motor vehicle disposal wells and large septic systems. EPA's small staff could not address such a large universe without the use of GIS. Fortunately, one of the EPA employees had created a New York State regional groundwater map as part of a Ph.D. dissertation a

few years earlier. This map used hydro geological information to show the statewide dispersion of contaminants in the ground water. Matching the hydrogeology analysis with State/Federal, and Dunn and Bradstreet industrial classification data with USGS land-use information and 1990 community-sewer census data allowed them to determine the areas with highest potential for contamination problems.

Mapping America's Parks

"Mapping the Future of America's National Parks," published by the National Park Service and ESRI Press, illustrates how technology can inform decision making by providing visual data and layers of information about human activities and natural events to document the past and present and the patterns of occurrences that reach into the future. The authors combine storytelling, mapmaking and planning to inform and stimulate the next generation. The publication allows travelers to plot their course for places to visit and things to see. It lets planners search for trails and facilities in a park. It helps resource specialists understand the migratory and land-use habits of particular species, and helps air quality specialists see the effects of fire on a nearby town or mountain range, or how city traffic affects air quality hundreds of miles away.

Real Time Election Results

Hennepin County, MN, used spatial technology to enable citizens to visualize 2004 election results in real time and to provide candidates with a tool for analyzing election results.

The interactive map is simple to use, intuitive and an efficient way for citizens to view the voting results in their communities. Candidates find this tool useful for analyzing and understanding voting patterns and planning strategy in future campaigns.

The articles in this newsletter illustrate some of the many ways geospatial information and technologies are being used to improve civic life in large and small communities around the world. Its applications are numerous and its ability to bring significant benefits to people is extraordinary. These examples illustrate a growing trend of collaboration and information sharing in all of these communities--federal, state and local, public and private. Each contributed to help build the infrastructure, the framework data or metadata, to create a capability to share data to find solutions to their common problems.

Denis Gusty is the Director of the GSA Office of Intergovernmental Solutions, Office of Citizen Services and Communications. The office provides support for the President's E-Gov initiatives by creating intergovernmental partnerships among government officials at all levels, intergovernmental organizations, industry and academia to help make government across the country and around the world more citizen-centric. For more information contact John Clark via email at john.clark@gsa.gov or call 202-501-4362.

Federal News

Improving Environmental Focus Through Geospatial Information Systems

By Rebecca Jamison
US Environmental Protection Agency Region II

U.S. Environmental Protection Agency's (EPA's) Region II http://www.epa.gov/docs/Region2/ Ground Water Compliance Section (GWCS) is directly responsible for implementing the Underground Injection Control Program in New York State, the Virgin Islands and assists New Jersey and Puerto Rico. With a staff of five inspectors, the GWCS faced a huge challenge in implementing the Program, which regulates all industrial disposal wells including, storm water drywells, motor vehicle disposal wells and septic systems that serve more than 20 people. For a summary of this rule and its scope visit: http://www.epa.gov/safewater/uic/classv.html.

This same GWCS Section also has six (6) inspectors assisting in implementation of the Underground Storage Tank program in New York, New Jersey, Puerto Rico and the Virgin Islands. In New York alone there are approximately 12,000 facilities.

So how is this small staff of inspectors operating out of New York City addressing such a large universe and two different programs? Geospatial Information System (GIS) has been part of the answer. In 1999, a member of the GWCS Section, as part of a Ph.D. dissertation created a New York State regional groundwater map. This map evaluated hydro geological information to discern what areas of the State would have a higher rate of contaminant travel from the surface to subsurface, i.e. ground water. Overlaying the hydro geology analysis is state/federal, and Dunn and Bradstreet industrial classification data, land use information from the USGS and 1990 census data on sewered/non-sewered communities. These combined data layers indicate the areas where the highest potential for contamination problems is likely to be found.

UIC Inspection Targeting Methodology

Facilities that typically use large quantities of hazardous substances located in areas:

1) with the fastest surface to groundwater travel rate;
2) with groundwater as the primary source of drinking water; and,
3) without a public waste water (sewer) treatment system, rank as the highest for UIC inspection purposes.

Using this new method of targeting, EPA has increased UIC well identification by 3300%!

UST Inspection Targeting Methodology

For UST purposes, we follow the same methodology outlined earlier but remove the census-sewer layer and the ranked facilities in favor of state UST registration data. Recently the national UST program has put more emphasis on inspecting more frequently in Well Head Areas (500 m areas around public water supply wells) and near Surface Water areas (reservoirs and their drainage basins), which are the sources of drinking water.

Due to the 1999-2002 analysis and GIS tool developed as a part of it, EPA Region II is in the forefront of this initiative.

EPA Region 2's utilization of GIS has improved our identification of environmentally sensitive areas and some of the potential threats to those areas. Overall, EPA planning and efficiency in protecting the environment has been dramatically improved.

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Mapping America's Parks

By Susan Garland
National Park Service

Maps, globes, pictures of places near and far have been part of my life – forever it seems. Maps decorated the walls of the kitchen when I was growing up, and still do in my parent's home. Maps of the United States in my grandfather's den showed long traces of different colored markers indicating where he and my grandmother had been on their last vacation. And while their trips and trips my parents took were documented by the usual family photos, the most vivid reminder of some of those trips was when they were combined with the incredible color and photography of a National Geographic or Arizona Highways magazine. The lines on the map and the vivid color in the pictures made these places come alive.

That same feeling, that same sense of awe and wonder come back to me when I looked through and read, "Mapping the Future of America's National Parks". No longer is a map flat and colorless like those "AAA" trip guides. Now that map is multi-dimensional, full of color – and telling all kinds of stories. And while a book or the technology known as GIS can never replace being in a park, seeing what the landscape or the prehistoric structure look like – it is a place to begin. And for the manager and resource specialist it can take you even further when trying to determine how best to accomplish the mission of the National Park Service.

It's a place for visitors to begin a trip, to decide what to see and where to go. It's a place for planners to begin when looking at options for development of trails and facilities in a park. It's a place for resource specialists to begin to understand the habits of a particular species and how they migrate or use a particular area of a park. It's a place for air quality specialists to see how fire affects a nearby town and range of mountains, or how traffic in a city affects air quality hundreds of miles away.

"Mapping the Future of America's National Parks" shows the layperson and the technician – just what GIS (geographic information systems) can do to enhance and improve your knowledge while enjoying a vacation or doing your job. The book, a cooperative effort between the National Park Service and ESRI Press, shows just what technology can do by providing visual data and layers information about human and natural activity to document what happened, what is happening and what may happen years from now. It is story telling, map making and planning for the next generation. It is gives people the opportunity to use their eyes and minds to find that story and draw conclusions about topics as diverse as fires and wilderness and trails and archeology. Take a look - you just might get hooked!

Susan Garland is the Legislative Specialist for the National Park Service's Intermountain Region. She works with Congress and national parks in eight states on legislative issues affecting those parks. For additional information contact Susan Garland via email at: susan_garland@nps.gov or call 303-969-2839.

ePlanning and Geospatial Information

By Kate Reilly,
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In 2001, the Bureau of Land Management (BLM) embarked on a new era of land use planning that continues today. The Bureau is in the process of updating 162 existing land use plans covering most of the 262 million acres of public land it manages. Accurate land use plans are essential to the work of the BLM. Essential to these plans is geospatial data. Additionally, the BLM has a need to develop more efficient land-use planning practices that foster an open and collaborative process.

To address this need, BLM launched the "eGovernment for Planning and the National Environmental Policy Act of 1969 (NEPA)" project. Dubbed ePlanning, this project allows the public to read and comment on land use plans, without the need for costly printed plans. More importantly, it allows the public to view geospatial data relating to those land use plans on any computer with an Internet connection. Partnering with the industry leader in geospatial technology, BLM has developed this software application for use in its planning efforts. ePlanning delivers planning information with fully integrated text, intelligent and interactive maps, and map layers. The ePlanning system is built using ArcIMS and ArcSDE software from the Environmental Systems and Research Institute (ESRI). It provides users with Web-based documents enabling them to read land-use plans, submit comments and view maps

related to these plans. Interactive Web documents from ePlanning link specific sections of a land-use plan to specific geographic features on the Web-based maps. Users can click on map features to view relevant land use plan text, identify specific land use plan documents, and connect to locations on the landscape where land-use plan text is relevant.

Users of ePlanning are able to use the online mapping tools in much the same way a Geographic Information Systems (GIS) specialist might use ESRI's suite of desktop tools – adding map data, panning over the map and turning map layers on and off. ArcSDE and ArcIMS bring much of the functionality of desktop mapping to the home user. The data itself remains static – a snapshot of the area. The maps remain identical to those produced for the printed version of the document.

In 2003 BLM completed a pilot project that built a common planning data model and core land management tools for the BLM enterprise. This pilot project demonstrates the ePlanning tools and integrated document concept using the Northwest National Petroleum Reserve – Alaska Integrated Activity Plan/Environmental Impact Statement (www.ak.blm.gov/nwnpra). The pilot site features a text area in which to read planning documents, a map mode for viewing associated spatial data, and comment submission tools. Since then, several other pilot

projects have been implemented.

These pilot projects showcase the benefits of ePlanning. In the past, land use planning teams produced many output maps that were printed in several planning documents and presented in public meetings. In the digital realm of ePlanning, these techniques, along with the Geographic Information Systems data, are readily available to anyone with Internet access. As such, ePlanning serves as a community outreach tool, not only for the federal government but also for state and local government; associations; nonprofit organizations and individuals.

ePlanning is part of a bigger BLM E-Government/-Government Paperwork Elimination Act (GPEA) initiative. As a result of this project, public burden hours should be significantly reduced. The public currently must request a printed document (when they are available), request BLM natural resource data for use in their own spatial display and analysis purposes, prepare and submit written comments on the document, etc. Using ePlanning, members of the public can view or download the document on-line, manipulate spatial data on-line, and electronically submit comments. In addition, ePlanning establishes a new process for land use planning that yields an openly participative, collaborative, and community-based land use planning system thus fostering government-to-government

data and services interchange, consistent with the President's Management Agenda.

By bringing land-use planning and NEPA into the digital medium, ePlanning fulfills a critical component of the President's Management Agenda by fostering "government-to-government" and "government-to-citizen" data and services interchange. This approach should change the way BLM uses GIS in support of land use planning.

Users of ePlanning on the government side believe ePlanning will provide a dynamic method for public use and understanding of the approved decisions. Instead of a paper document with maps that are obsolete in days to months, ePlanning maps can be kept current and the public can maintain up to date knowledge of how lands are managed.

The Bureau of Land Management, an agency within the U.S. Department of the Interior, administers 262 million acres of America's public lands, located primarily in 12 western states. The BLM sustains the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.

Kate Reilly is a Planning|Environ-mental Analyst for the U.S. Bureau of Land Management. For more information contact Kate via email at: Kate_Reilly@blm.gov.

Leveraging Geospatial Investments for the DoD Mission:
The Defense Installation Spatial Data Infrastructure

By Colonel Brian Cullis U.S. Air Force (USAF),
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The passage of the Clinger-Cohen Act (CCA) in 1996, also known as the Information Technology Management Reform Act, has served as a cornerstone for new enterprise approaches to information resource management (IRM) for federal agencies. Most importantly, the CCA mandated that each agency appoint a Chief Information Officer to oversee enterprise IRM, to include geospatial information assets. Stories of wasteful mapping investments by federal agencies also prompted a 2002 revision of OMB Circular A-16 and the launching of OMB's Geospatial One-Stop effort, which together stressed the need for heightened accountability through cataloging and sharing of agency's geospatial information resources. Upon closer inspection of their respective enterprise information resources, the Military Services discovered numerous, redundant mapping programs and technologies within installation functional stovepipes. Subsequently, each Service embarked upon new GEOINFORM agendas with similar intents of migrating towards more cost-effective strategies of shared practices and investments. Securing common practical visions such as "one installation, one map" required that each Service devise a unique implementation strategy that most appropriately fits their Service's

information culture. The resulting spectrum of efforts across the Services includes US Army Installation Geospatial Information and Services, the Navy GeoReadiness program, the Marine Corps' GeoFidelis program and the Air Force GeoBase program.

The DoD Base Realignment and Closure (BRAC) planning activities that commenced in 2003 presented a key opportunity for the fledgling Service GEOINFORM programs to demonstrate their practical value. In April 2003, the Under Secretary of Defense for Acquisition, Technology and Logistics recognized that georeferenced imagery and select vector datasets would lend valuable situational awareness for BRAC deliberations. Subsequently, the Service GEOINFORM programs were given 14 months to develop a standards-based DoD Installation Visualization Tool. The greatest challenge faced by the Services was to ensure all georeferenced satellite imagery and vector data, to include installation boundaries, wetlands, 100-year floodplains, explosive safety quantity-distance arcs, air installation compatibility use zones, and noise contours, were collected following one auditable, rigorous protocol across all BRAC-eligible defense installations. The ANSI-approved Spatial Data Standards for Facilities, Infrastructure and Environment were used to ensure

common vector data attribution across the population of more than 330 defense sites. Most importantly, every image and vector data overlay was associated with metadata files built according to the Federal Geographic Data Committee's Content Standard for Digital Geospatial Metadata, detailing its completeness, accuracy, and source. All four Services' were justifiably proud when they delivered on this challenge in June of 2004.

When senior DoD leaders saw the practical value of such visualization, a logical next step was to expand the scope of the effort to address more mission needs. The National Spatial Data Infrastructure outlined by OMB in Circular A-16 served as a convenient construct to "nest" a similar spatial data infrastructure for defense installations and environment. Therefore, in July 2004, the Deputy Under Secretary of Defense for Installations and Environment established the Defense Installation Spatial Data Infrastructure or DISDI Office within the Business Transformation Directorate. The primary task of the DISDI staff is to serve as the DoD focal point for organizing the broad array of military installations and environmental geospatial information resources found across the Departments of the Army, Navy and Air Force in order to meet the

responsibilities of federal agencies outlined in the 2002 revision to OMB Circular A-16, as well as Executive Order 12906 and the Geospatial One-Stop effort outlined in the e-Gov Act of 2002. Furthermore, the DISDI Office will assume responsibility for the Installation Visualization Tool (IVT) investment, compile a broader GEOINFORM strategy for the DoD and more aggressively engage with the larger federal geographic data community.

Today, the DoD continues to discover the value of a disciplined, standards-based GEOINFORM strategy to minimizing redundant geodata acquisition. For example, improved GEOINFORM is now benefiting an increasing number of missions such as homeland defense and critical infrastructure protection. "Acquire once, share many" is a common goal shared by DISDI as well as many federal IT reform efforts. However, the enterprise-wide approach to GEOINFORM practices in the DoD serves as a compelling example for how federal agencies can effectively leverage new legislation to benefit both the Department of Defense and the nation.

Colonel Brian Cullis (USAF) serves as the Executive Manager for the Defense Installation Spatial Data Infrastructure in the Office of the Secretary of Defense. In this role, he coordinates the efforts of the Departments of the Army, Navy (Marine Corps) and Air Force to optimize shared use of Department of Defense installation and environmental geospatial information resources to satisfy mission needs. For more information contact Colonel Cullis via email at: brian.cullis@osd.mil.

Using the National Integrated Land System to Increase Efficiencies

*By Leslie M. Cone,
BLM Land & Resources Project Manager
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The National Integrated Land System (NILS) is a joint project between the Bureau of Land Management (BLM) and the U.S. Department of Agriculture (USDA) Forest Service (USFS) in partnership with states, counties, and private industry. NILS is an integrated land management system that includes a common data model and software tools for the collection, management, and sharing of survey data, cadastral data, and land records information, and it provides the BLM with a true spatial view of all types of land records. NILS provides a complete "field to fabric" technology solution using GIS technology to facilitate cooperative land management and better decision-making among all land managers. This complex environment is made even more challenging when considering that the BLM is responsible for overseeing public land, and the corresponding records which date back over 200 years. The number of records managed by the BLM is in the billions.

NILS was developed incrementally in four modules: Survey Management, Measurement Management, Parcel Management, and GeoCommunicator. The first three modules are fully integrated within a custom workflow management system that works with COTS products such as ESRI's ArcGIS. This has allowed the BLM to standardize and automate many of their land management activities, thereby resulting in a cost savings for the BLM. The cost savings realized by

using these COTS products, which has ultimately led to the development of NILS, has resulted in greatly improved efficiencies throughout our office- the Land & Resources Project Office (L&RPO). Approximately 85% of the project requirements were developed in these products, thereby saving time and money in development and maintenance costs. Tools within the Workflow Manager are designed to standardize specific business processes and the ArcGIS steps required for a job, thereby allowing surveyors, realty specialists, and novice GIS users to quickly and correctly complete complicated GIS activities. In the past, this had been a somewhat long and tedious process, and still not allow the public the data in a spatially-friendly format in which to display their work.

GeoCommunicator (http://www.geocommunicator.gov), the fourth NILS module, is a website for the distribution of NILS products, information for the cadastral community, and contact information for federal land management agencies. GeoCommunicator contains three interactive mapping applications: Land Survey Information System, Land and Mineral Use Records, and Federal Land Stewardship. The Land Survey Information System contains Public Land Survey System (PLSS) data (township, range, section, aliquot, survey corners) from BLM's Geographic Coordinate Database and

the NILS system. U.S. Forest Service data along with data from other sources are also being utilized to help further our goal of having a national multi-purpose cadastre for the U.S. The public realizes a great time and money saver by no longer having to go to their local BLM state office to get PLSS and other survey-based data. They now have one central Internet application that allows a user to browse for data, selectively (by township, state, county, etc.) download the data or integrate the data into a GIS through a streaming Internet mapping service. The Internet map service allows the user to stream the most current PLSS and other survey-based data live to their desktop GIS thereby eliminating the need to store the data locally. With GIS tools, users can easily incorporate PLSS data with other data from the Internet or with their local datasets.

GeoCommunicator's Land and Mineral Use Record application has been used within our agency and by the public as a time and cost saving tool to obtain spatial information on BLM land and mineral use records. Traditionally, anyone seeking land and mineral record data needed to use the BLM's LR2000 system, which is a text-based Records Management System with no mapping capabilities. Now GeoCommunicator can be used to search, locate, and map land and

mineral record data such as leases and mining claims, and allows for quick access to LR2000 for detailed reports. Another tool that has greatly increased our efficiency has been "Cases That Affect Land Status" or CTALS. This is a set of records in GeoCommunicator's Land and Mineral Use Records application that affect land ownership and status. These cases show how the land has gone in or out of public ownership through conveyance actions such as land grants, land exchanges, land withdrawals, mineral patents, land disposals, etc.

The Federal Land Stewardship interactive mapping application displays the federal surface management agency boundaries that we display in many of the GeoCommunicator applications. The surface management agency boundaries can also be streamed live to the users desktop to be used as a base map for their local applications. All of these applications not only helped the BLM improve its efficiencies, but other government agencies have also reported great time and cost savings by utilizing GeoCommunicator. The word is being spread about the merits of these programs by way of BLM Open Houses, webcasts with state and field offices, as well as through various news releases and marketing pieces that have been distributed.

Private industries such as oil and gas companies have been widely utilizing GeoCommunicator to download the PLSS data, access reports and be able to spatially display their oil and gas leases. Having the ability to utilize case data from the LR2000 system and view it spatially has been an enormous time saver for those looking to map leases and agreements. Feedback has been phenomenal from users of the site. Many have reported that they are eagerly awaiting data updates into the system, thereby increasing the amount of information they can find and research. Word has been spreading quickly about the GeoCommunicator site, as the web statistics will warrant- usage has increased by nearly 500% on the site in the most recently completed quarter. Land data records are continually being added to the site, and in addition to new oil and gas and mining claims, information to be added in the near future includes coal leasing, geothermal leasing and potash. All of these new additions will further facilitate increases in productivity, as well as cost and time savings.

Leslie Cone is the Land and Resources Project Manager for the Bureau of Land Management. For more information contact Ms. Leslie Cone via email at: leslie_cone@blm.gov.

Geospatial One-Stop and Hurricane Isabel

Riders on the Storm

By Hank Garie, Executive Director, Geospatial One-Stop

Geospatial One-Stop has adopted and promoted a simple vision: Support decision making by providing easier, faster, and less expensive access to geospatial information for government officials and citizens. The centerpiece of the Geospatial One-Stop strategy is the portal (www.geodata.gov), designed to facilitate publishing and searching of metadata and enable viewing of live Web mapping services. Can the Geospatial One-Stop portal deliver on the promise to support decision-making? The first opportunity to test the premise arrived on September 16, 2003, as Hurricane Isabel approached the outer banks of North Carolina. This article offers some observations and preliminary lessons learned from the experience.

Events unfolded something like this. The annual conference of the National States Geographic Information Council (NISGIC) was underway in Nashville, Tennessee, when it became apparent that Hurricane Isabel's track would impact the East Coast, potentially affecting 50 million people. More than 200 members of the geospatial community from across the nation were gathered in one place when Geospatial One-Stop posed the question: "What do you think we can organize by working together through geodata.gov to support the response to Isabel?" The partnering network began, and over the next 24 hours contacts were made back home to Federal, State, county, and private sector organizations to canvas existing map services relevant to the hurricane planning and response.

ESRI staff, who provide hosting services and development support for the current geodata.gov portal gathered URLs supplied from contributing partner organizations and worked tirelessly to organize the services, maps, and links to relevant Web sites into a new portal channel—Hurricane Isabel. By the time the storm made landfall on September 18, 2003, the site was in production with more than a dozen services available through Geospatial One-Stop. In less than 48 hours the geospatial community responded with useful, real-time services based on data sharing. Participating government organizations included the following Federal agencies:

- Geospatial One-Stop (GOS)/Federal Geographic Data Committee (FGDC),

- National Oceanic and Atmospheric Administration (NOAA),

- National Aeronautics and Space Administration (NASA),

- United States Geological Survey (USGS),

- Department of Homeland Security (DHS),

- Housing and Urban Development (HUD), and the,

- Bureau of the Census and various states (Delaware, New Jersey, North Carolina, and Pennsylvania) that cooperated with local counties.

- Private contributing partners included several news services, ESRI, and Meteorlogix (who offered real-time weather service).

Users of the portal could access storm tracking, modeling, and river condition information from the National Weather Service, satellite images, and regional and local live mapping services as well as news alerts and links to disaster planning Web sites. The integrating power of geodata.gov was apparent through the availability of the National Map as a basemap option and the ability to overlay real-time precipitation and weather data (updated every 10 minutes) through the map services made available by Meteorlogix.

Lessons Learned

Without exception, members of the spatial data community were willing to work together with Geospatial One-Stop and make their information available through the geodata.gov portal in response to Hurricane Isabel. Each participating organization, public and private, were commended for their willingness to set aside other priorities and make a contribution.

State geographic information (GI) coordinators are critical sources of knowledge about local mapping services and are key to establishing data sharing partnerships. An ongoing and trusted network between local, State, and Federal agencies is a key component to the long-term success of geodata.gov.

Federal and state GI organizations use technology to respond quickly to a common goal of sharing data. In the case of Hurricane Isabel, publishing existing agency map services and data was easy through the geodata.gov portal.

There are many existing mapping services that can be accessed easily and quickly to support disaster planning, response, and recovery. The Geospatial One-Stop portal is an effective tool to search and view these services and maps when the services are published in the portal. The technology is reliable and worked well under crisis conditions.

Time is critical to effectively organize content and instructions for users to maximize the utility of services for citizens and decision makers. It is much more effective to publish and organize map services and data before an event occurs.

Next Steps

The experience with Hurricane Isabel demonstrated the utility of Geospatial One-Stop as a source for geospatial information in support of a natural disaster. More importantly, it was apparent that the geodata.gov portal could support additional activities and decision-making processes. The limiting factor is the amount and quality of mapping services and data sets that are searchable through the portal. The geodata.gov portal needs to be populated aggressively with metadata describing mapping services and GIS data sets to fully experience its value. Mapping services are important and strategic assets that can be magnified by sharing their presence with others through the geodata.gov portal. Geospatial One-Stop demonstrates to decsionmakers at all levels of government the power of geospatial information to support their needs.

Become a publisher! Register your GIS data and Web services now at the www.geodata.gov Web site. Click on the login link under the Publish Data heading, then follow the instructions for registering your metadata.

Hank Garie is the Executive Director of Geospatial One Stop, one of 24 electronic government (e-gov) initiatives supporting President Bush's Management Agenda. For more information contact Hank via email at: hgarie@usgs.gov.

National Park Service Uses Real-time 3D Mapping in Planning Chickasaw National Recreation Area

By Kim Burns, Environmental Systems and Research Institute

The Chickasaw National Recreation Area in south-central Oklahoma is one of the oldest units in the national park system. Covering approximately 10,000 acres, Chickasaw contains beautiful natural springs, streams and lakes that attract about 3.4 million visitors per year. In 2002, the National Park Service (NPS) began development of a new General Management Plan (GMP) for the park. This GMP will guide the park's direction and management policies for the next 15-20 years in areas that include resource management, visitor use and interpretation, and facilities development. To assist in the creation of the new GMP, the NPS is using both ESRI's ArcView software and CommunityViz® software extensions to generate public input, develop alternatives, and analyze the impacts of proposed alternatives.

At the start of the GMP development process, planners used the CommunityViz SiteBuilder 3D extension to create a computerized 3D movie of the park that was shown at public meetings. This helped people understand the current state of the park, its resources, and its relationships with surrounding lands and communities. The interactive nature of the presentation also helped generate conversation and excitement about the GMP development process itself.

The CommunityViz Scenario Constructor extension was then used to help develop and summarize four preliminary management alternatives. Each alternative offered a different mix of resource protection, recreational opportunities, and educational and interpretive activities. GIS was used to identify site characteristics of the recreation area appropriate for the range of management practices such as backcountry, front country, preservation, cultural and education uses. For example, prime agricultural lands were identified and summarized to determine the best opportunities for an education management area featuring the region's farming heritage.

The SiteBuilder 3D extension was then used to provide a photo-realistic 3D scene of the four alternatives. Different types of NPS management practices including administrative, backcountry, front country, preservation, cultural, and education, were each given a color designation

and then draped on the 3D landscape so that participants could view the areas and their various management practices in 3D. The real-time, interactive 3D scenes illustrated to the participants the extent and location of alternative plans for the park.

All of this information has been folded into a draft GMP Environmental Impact Statement that is available for public view. The NPS Intermountain Region recently recognized the Chickasaw draft GMP Environmental Impact Statement as an exceptionally innovative application of GIS for planning.

Kim Burns is the Federal Government Coordinator for ESRI. For additional information contact Kim via email at: Kburns@esri.com. Learn more about CommunityViz at www.communityviz.com.

National Guard Bureau Counterdrug (NGB CD) Office's Digital Mapping Server (DMS) Portal

By LtCol Michael L. Thomas, Technical Projects Officer, U.S. Air Force

NGB CD's DMS Portal is based on the Naval Research Laboratory's (NRL) Geospatial Information Database (GIDB) Portal System and is a standards-based portal for geospatial information discovery, access and mapping over the Internet.

DMS accesses the data organized by theme and layer for a user defined area of interest (AOI). This technology has been under development at NRL for the past nine years and provides simple mapping support to Drug Law Enforcement Agencies (DLEAs) nationwide. Since that time, NGB CDX, NRL and the Intelligence Department, HQMC, have worked jointly to incrementally implement requirements common to multiple agencies.

It has matured into a multi-tiered system that provides access to massive amounts of geospatial data from distributed, heterogeneous sources over the Internet and the Secret Internet Protocol Router Network (SIPRNET). The system was developed in Java for platform portability. Its components allow data of any origin to be distributed to the clients. An open source, all Java object-oriented database management system, called Ozone, is also available for deployments requiring custom data storage. Currently, the system connects the user to over 2500 GIS services and over 525 different servers. The entire system is government-owned and requires no licensing. The system can be utilized now at http://ngbcdmaps.org.   DMS is area-of-interest and theme-of-interest driven for ease of use (from a neighborhood-level to CONUS or foreign country-level of resolution).

DMS is currently in use by NGB CD in support of counter drug agents and agencies nationwide, at the local, State and Federal levels. This technology is also in use at NGA's Gateway SIPRNET site (under prototype systems) allowing the dissemination of local file system information at the National Imagery and Mapping Agency (NIMA) Gateway as well as integrating that information with multiple other non-NGA sources via the SIPRNET. These two key transitions have allowed Counter Drug law enforcement on the Internet and all DoD users on the SIPRNET to go to a "Geospatial One-Stop" for integrating data from multiple servers and services.

DMS's technology was transitioned in FY04 as the GIS software identified by DISA as the GIS software for it's Homeland Security Advanced Concept Technology Demonstration (HLS ACTD). Although the system utilizes only public information, the ability to fuse data ad-hoc from so many sources has created a security concern. DISA and NGB CDX have worked to resolve these concerns with a user registration process that was implemented in the Winter of 2003.

LtCol Michael Thomas was the Senior Technical Project Manager for the National Guard Bureau Counterdrug Program. He was the systems architect for the Digital mapping Server until June 2005. He is currently a Geospatial Systems Architect for SPAWAR Europe assigned to HQUSAREUR working geospatial projects for the Joint Community in support of the Global War on Terror. For more information, contact LtCol Thomas via email at: mthomas@eoeml.gtri.gatech.edu.

Data Gathering Made Simpler by HUD and Fedstats Portal Website

By Michael Fluharty
U.S. Department of Housing and Urban Development

Thanks to a partnership between the Department of Housing and Urban Development, FedStats and the U.S. Census Bureau, finding key government-wide statistical data and information about cities, counties, states and the nation just became markedly simpler. The activation of an enhanced MapsStats section of the FedStats website, a one-stop site for community stakeholders, journalists, researchers, students and everyday data users has made all the difference.

MapStats eliminates the need to search multiple sites to get information on births and deaths, income, poverty, housing, crime, employment, retail sales, education levels, travel time to work, minority owned firms, weather and many other community indicators. The website links two award-winning Internet applications to data and other information across federal agencies to provide easy access to the latest government statistics.

MapStats, in conjunction with HUD's State of the Cities Data System, provides users with a powerful tool for accessing detailed demographic and business information for cities. Data from the State of the Cities Data System are available from four decades, enabling users to research trends.

MapStats also provides a number of helpful tools and links. For example, if you don't know a county name but know a place or ZIP Code, MapStats' "place search" function will tell you the county and will link directly to the statistics page for that county, or state or city. Clicking on the "?" to the left of any data item provides an easy to read explanation, documentation and hyperlinks to other resources.

Thematic mapping is also available for some data, and for hard-core data aficionados, Federal Information Processing Standard (FIPS) codes for states, counties and cities are referenced at the bottom of every page. HUD and FedStats officials say future enhancements will be based on user feedback.

Jon Sperling is Manager of Geographic Information Analyst at the U.S. Department of Housing and Urban Development's Office of Policy Development and Research. Dr. Sperling has represented HUD on FedStats, FGDC and the Geospatial One-Stop Initiative and has led many innovative intergovernmental partnerships at the local, state, and federal level. For more information contact Dr. Sperling via email at: jon_sperling@hud.gov.

State and Local News

Successful Regional Implementation of GIS in a Small City

By William Fox, GIS Analyst, City of Clovis,CA

The City of Clovis, located in the Central San Joaquin Valley of California, with a population of over 81,000, is experiencing an unprecedented growth boom. With the building boom, comes the need to use the City's current resources to supply the increasing demand for services.

The Geospatial Information System (GIS) is a cornerstone of the City's resources. The City has successfully used geospatial data for 10 years in coordination with Fresno County and other area agencies. As the City continues to grow, the GIS provides city staff with mapping and analysis tools needed to develop strategies in public safety, urban development, and engineering to accommodate this growth.

Continuing to maintain regional information compatibility and exchange, and to provide staff and the public with information, is paramount to its success. The City has worked very hard, together with the County of Fresno, to maintain GIS data standards, which include the computer hardware components, operating system software, database, data storage, software applications/pro-grams, and training. This continued development of GIS includes its migration to ArcSDE/Oracle (ESRI software & Oracle Relational Database Management System) to facilitate the use of the existing system and enhance integrations with other city systems.

For example, the City's website (www.cityofclovis.com) has a mapping system that provides citizens with a method to determine the zoning for their property and download maps of Clovis. It also has a site selection service that enables users to locate available retail, office, and industrial properties within the City by using a query function to define the search. The user may also extract demographic information within a designated distance from the property of interest.

Some other examples of how city staff uses the GIS are:

• Police Department Crime View – to map and analyze crime trends.

• Fire Department – to create run books and location maps for timing, type of request, and mapping.

• Public Utilities – to generate water and sewer books that provide information on underground infrastructure.

• Front counter applications for general viewing and printing of maps and tabular data.

• Finding ways to eliminate data redundancy and facilitate one-time data entry by the departments responsible for creating and maintaining the data.

Paramount to the success of GIS is the continued support from the top down. Top down support enhances the decision process by integrating GIS methods into the daily work process of city staff. Some of the major milestones along Clovis' journey with GIS include system installations, software configurations, application development, user training, GIS data design, conversion, and creation. Problems were addressed at each juncture but, the process was 'educational capital' in the school of hard knocks - lots of hard knocks, in

such areas as data storage, network access, security, data integrity, application development, printing, training, and balancing quality versus speed.

The migration to the Geodatabase environment is evolutionary, bringing ease of integration and system enhancements such as browser-based front counter applications for intranet and internet approaches. The reasoning for the intranet front counter application is to allow the average city user easily access GIS information not available on a similar internet application (i.e., potable water, sanitary sewers, and property ownership data).

An internet version of the front counter application was developed for public use to view GIS information that citizens would otherwise have to drive to city hall to find. The front counter applications are very successful and all city departments use the applications to help them do their job.

The future of GIS for Clovis includes continued cooperation with all city departments, public agencies, and private industry. This cooperation has significantly reduced the duplication of work between agencies and departments. For example, the front counter application includes an option to print a Fire Department run book page. This run book application includes features such as:

- Storm drain and irrigation layers.
- On-the-fly spatial query to select a sub-set from the potable water layer (Fire Hydrants).
- On-the-fly spatial query to select a sub-set of the address point file (address in this run book page), that is maintained by the Fresno County Elections Department and the City of Clovis.
- On the fly spatial query to select a sub-set of the aerial imagery that covers the run book page.

As far as the future holds, the day will come shortly when all of the above is done even better and with a national, seamless GIS.

Building on successes from regional GIS, a Fresno Regional e-Government Task Force was created that will ensure customer satisfaction with Fresno Regional internet based, government services. This task force provides a unique opportunity to unite local government entities in the common goal of delivering government services with a citizen-centric view and facilitates cooperation and sharing among local government in the deployment of IT assets and information systems, and e-government applications within the region.

Utilizing a region-wide approach enables governments to leverage the investment in technology required to deliver e-government services, provide the customer with a one stop, consistent look and feel through the deployment of common portal services. The portal services will address customer convenience and service by simplifying, streamlining and thereby reducing the steps and points of contact required by the customer.

A comprehensive view of government and its missions should take priority over that of any individual entity. The non-confidential data and internally developed software to which they have a legal right will be shared with all entities of the task force, while private information and confidential communications remain private and secure. This task force will fundamentally change the way that customers interact with government in the Fresno region.

As the pathway to intergovernmental cooperation, the task force cooperates with Federal, State, and other local entities to maximize use of any grant funds and resources, and enhances the effectiveness of the systems, programs, and projects.

The Fresno Regional e-Government initiative will not succeed without the trust of the customers it serves.

Bill Fox is the GIS Analyst for the City of Clovis. In this role, he and the teams he works with are responsible fot the city's GIS infrastructure. For more information contact Mr. William Fox, GIS Analyst, City of Clovis, CA via email at: billf@ci.clovis.ca.us.

Protecting the Past:
ArcView and Cultural Resource Management

By John M. Rutherford,
Archaeologist, Fairfax County Park Authority

The Fairfax County Park Authority Cultural Resource Management and Protection Section updates and analyzes its archaeological site files utilizing ArcView GIS technology. Polygon shape files of site locations, integrated with multiple data sets have allowed the Fairfax County Park Authority archaeologists to manage their cultural resources with cutting edge technology. Individual data sets include information specific to historic sites, Native American sites, Civil War sites, as well as an independent data set that merges site photographs and current site conditions. Through GIS we have access to both topographic maps and many other data layers as well as aerial photography, thus allowing the user to analyze the topography of the property and existing conditions. These data include information specific to historic sites, Native American sites, Civil War sites, as well as an independent database that merges current aerial photographs and current site conditions in order to complete quick cultural resource assessments for specific properties throughout the county. These assessments allows us to assess the amount of disturbance that a particular property has undergone, to show if a particular area contains an existing recorded site, and on occasion allows us to predict potential for sites, using predictive models for site locations, based on topography, geology, hydrology, soil types and proximity to other sites in the vicinity. The Park Authority is negotiating with the National Archives and Records Administration to digitize the negatives for historical aerial photographs of the County. Analysis of early aerial photographs can allow the archaeologist to identify and analyze buildings or anomalies in order to target specific areas for survey, helping to save costs on comprehensive surveys.

ArcView allows for continual updating of site files, which is critical in a county that is continually growing, since site conditions can change rapidly. This paper will attempt to provide insight into managing cultural resources using this digital technology.

For historic preservation and cultural resource management, accurate locational data is key to the success in learning about past building traditions, settlement patterns and past life ways. Identifying and following trends on the landscape requires that we can locate resources on the ground. In addition, for management, conservation, and physical preservation of these resources, we also want to know the environmental and human influences that might pose any adverse effects to specific resources. Locational data associated with features, combined with the power of GIS to integrate different data sources, allows preservationists to take advantage of these technologies in planning and researching cultural resources.

Once resources have been identified as potentially significant through the survey process, the documentation process insures that no information encapsulated within the resource is lost if destruction is imminent or the resource is threatened in some way. Conducted at differing levels of intensity similar to the survey itself, documentation of sites may include a variety of activities ranging from a series of photographs capturing the significant features of the resource, to the creation of measured drawings accurately reproducing the site on paper, to the construction of a detailed history of the property through historical research.

The County Cultural Resources Protection Section has digitized a three dimensional view of the county for use as a predictive model for locating sites for selective surveys of areas within a specified parcel that is undergoing development. While a model can be useful in predicting site location, it is only a model, and further testing will be required. These selected, high potential areas, are tested, along with moderate and low potential areas in order to determine the accuracy of the model.

The current model portrays the county as a three dimensional image with existing sites located on the map. Locating sites based on this model is a combination of distance from water, slope and soil types.

Conclusion

The use of ArcView GIS technology in archaeological assessment, survey and documentation has provided tools for quick evaluation of existing sites and un-surveyed

properties slated for development. We found that we can improve accuracy in the archaeological survey process, and, in fact, produce locational data where surveyors may not have collected this information, even if only a single point is collected. In addition, the process of collecting locational data does not significantly increase the amount of time spent in the field and it greatly reduces the amount of time spent digitizing conventional data collected recreating their paper forms in a digital database after the survey is completed.

By merging the data bases and adding hyperlinked text files and site photographs to the site shape files, the referencing process and the use of a site plan in a GIS, cultural resource managers were able to locate features, determine treatments, and form various hypotheses regarding the spatial relationships between elements of decay or potential threats to features or sites.

The mapping strategies that we present are only a few of the many uses for this technology in the field, and they are only models and need to be perfected and tailored for individual projects. It must also be emphasized that survey methods are only as good as the user. Care must be taken in all aspects, from pre-planning to data collection to post-processing. Using cutting edge modern survey techniques has dramatically reduced errors encountered with less accurate survey instruments.

Based on our experiences with these projects, GIS can make archaeological survey and documentation a more efficient and useful process where preservationists and planners can work together with other cultural resource managers. The methods we used can proactively affect the preservation of sites in addition to enhancing the ability of preservationists to understand and manage their resources. In the future, these technologies will play an increasingly critical role in capturing cultural resource data, maintaining that data, managing the resources themselves, and planning for their proper treatment of these resources. In addition, ArcView becomes a powerful component in not only the beginning planning of surveys but in the interpretations of the sites themselves and the relationship between sites.

John Rutherford works for the Fairfax County Park Authority. He is involved with GIS projects, including implementing Fairfax County Park Authority General Management Plans, utilizing complex GIS models in order to preserve and protect important cultural resources. For more information contact John via email at: John.Rutherford@fairfaxcounty.gov.

Fort Worth, Texas Shares GIS Through the Web

By Elizabeth Young
GIS Lead Programmer|Analyst
City of Fort Worth

Geographic Information Systems (GIS) has become an integral part of the City of Fort Worth's business processes. GIS is used in day-to-day activities ranging from Police and Fire dispatching to tracking incidences of West Nile Virus. With a population of nearly 600,000 residents, the City of Fort Worth is comprised of 26 departments with 18 departments actively participating in the Enterprise GIS.

The City's latest endeavor is to migrate GIS to the Internet/Intranet. In 2003, the City released its first Internet Map Server (IMS) site allowing both employees and citizens to access GIS information without needing to learn GIS software. By utilizing IMS, the City is able to incorporate GIS information in day-to-day operations providing better customer service to Fort Worth citizens and businesses. Some of the City's most recent IMS applications include Address Verify, Tax Foreclosed Property and the Customer Service Tool.

The Address Verify Application provides City employees a tool for collecting owner or occupant information, verifying addresses, and creating bulk addressing for use in City notifications. The City is required to notify owners or occupants within 300 feet of an annexation, zoning change or variance. Users obtain data by selecting a lot, street centerline or other available data layer from the map and creating a buffer. Information available in the buffer area can then be exported to a file for mail merging into documents and labels.

A second example of GIS being integrated into the City's business processes is the Tax Foreclosed Property Application. The City of Fort Worth has roughly 6,800 tax-foreclosed properties at any given time. The City may utilize tax-foreclosed properties itself, sell them through seal bid or direct sale, or convey them to housing non-profit organizations. In order to better manage these properties, an IMS application was developed to assist in tracking the status of tax delinquent properties, reduce the amount of time needed to process the property for sale at auction, and search for tax delinquent properties by various categories, such as Council District or target redevelopment areas.

Most recently, the City of Fort Worth released the Customer Service Tool (http://maps.fortworthgov.org/Customer_Tool). This interactive Internet site allows City employees and residents the ability to type in an address and receive a customized report and map based on the customers location. Upon entering an address or partial address, users are prompted to select the correct address from a list. A report and map are then generated for the specified location. Report information includes items such as City Council representative, school district, police beat, public improvement district, garbage day, neighborhood association and fire station. The Customer Service Tool was released July 28, 2004. During the first two months of availability, the site had a little over 5,500 visitors with over 26,000 actual hits to the website. These numbers are far greater than any other existing Internet mapping application at the City of Fort Worth. These numbers also indicate that the visitors actually took the time to use the tool, with 4.7 page views per visitor. This tool allows citizens to retrieve information on their own while allowing City employees to provide quality customer service by:

- Increasing the efficiency by which calls are answered and directed within the City.

- Allowing universal and user friendly access to data resources currently available through GIS.

- Increasing the accuracy of information given to residents by providing consistent access to the most current data available in GIS.

The use of GIS and IMS has allowed the City of Fort Worth to better share information both internally and externally. City employees have been able to improve business processes and provide quality customer service to citizens and businesses at a reduced cost and in a more efficient manner. Plans are underway to expand the GIS information on both the Intranet and Internet. The City's zoning information will be available on the Internet in spring of 2005.

Elizabeth Young is the Lead Programmer|Analyst for the City of Fort Worth. Her team is responsible for the City of Fort Worth's Enterprise GIS infrastructure. For more information contact Elizabeth via email at: Elizabeth.Young@fortworthgov.org or call 817-392-6785.

Hennepin County Integration of GIS and the 2004 Election Results Web Site

By Scott Simmer,
Hennepin County GIS Coordinator
Hennepin County, Minnesota

The GIS (Geographic Information Systems) Division of Taxpayer Services developed the first data-driven, up-to-the minute map-based election results Web site in the state. Previously, our Web site provided only a drill-down reporting approach that showed results one race at a time. Now, residents can monitor the results as they come in, quickly view all the results in their own precincts, cities, or school districts, and analyze geographic voting patterns within the county and its political subdivisions. The more traditional types of tabular reports (by race or by candidate name) are still available to view specific race results on a one by one basis.

This application was developed to enable citizens to visualize election results as the election progressed and to provide candidates with a tool for analyzing their results. By adding geography to the reporting service we enhanced the ability of users to access the results that pertain directly to them, giving a personalized feeling to the data. The interactive map is an efficient, intuitive and enjoyable way for citizens to identify and understand the myriad of districts and races, as well as the voting results in their communities. A picture is worth a thousand words, and GIS delivers that power to existing technology.

The interactive election results map is very simple to use. Users can select a category of interest, such as precinct reporting, city races, school races, county commissioner races, etc. – or they can select from a list of individual candidates. Their selection determines the interactive map that will be displayed. For example, clicking on "City Races," will generate a map of cities. Clicking on the city map highlights the city and creates a report on the current results for all the races in that city. The same methods apply for county commissioner, school, park, soil and water, legislative, and congressional districts. If the user selects a race for a jurisdiction larger than the county, a report on the countywide results is displayed. An example of the report is shown on the following page.

If the user selects "Precincts Reported" he or she will get a map showing which county precincts have reported their results. As the election judges transmit their precinct data via a cellular encryption process to the Hennepin County Election Office their precincts dynamically change to
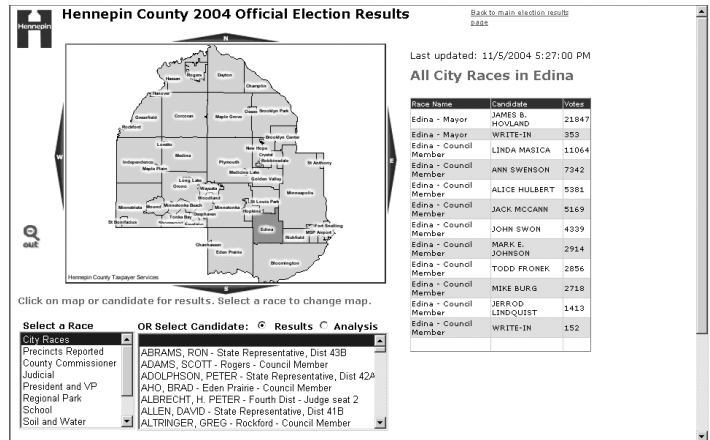
Example of a City Races Report

orange, indicating that their election results have been successfully received. As the election progresses, more of the county changes from gold to orange. Finally, when the last precinct reports, the entire map completes its metamorphosis to orange.

The other selection method for users is a list of individual candidates. Clicking on a candidate's name produces a map of the districts in that candidate's race highlighting the selected candidate's district, and a report on up-to-the-minute results.

Two features become enabled once all the precincts have successfully reported to the Hennepin County Election office. These take advantage of a stored SQL server procedure that populates a final summary table allowing queries to execute more efficiently. The first feature analyzes all the precinct's presidential voting statistics, rendering a countywide map that shades each precinct blue or red depending on which party carried that precinct. The 2004 results show a definite distinction between the urban and rural areas of the county, which would not have been as apparent from a tabular report.

The second feature that becomes available after all of the results are in is an "Analysis" option pertaining to the candidate selection list. This generates a shaded area map that enables candidates and others to see their
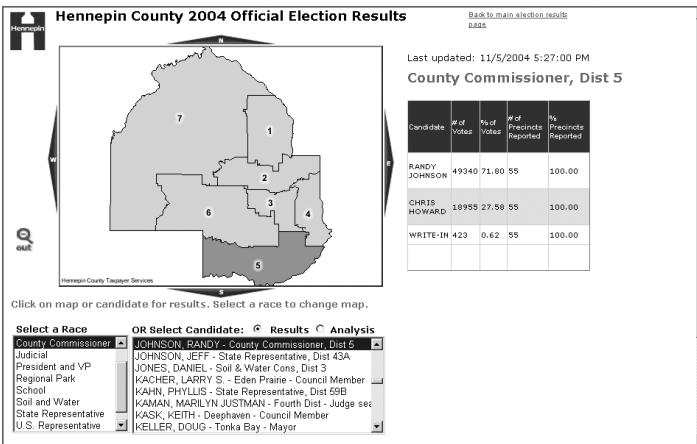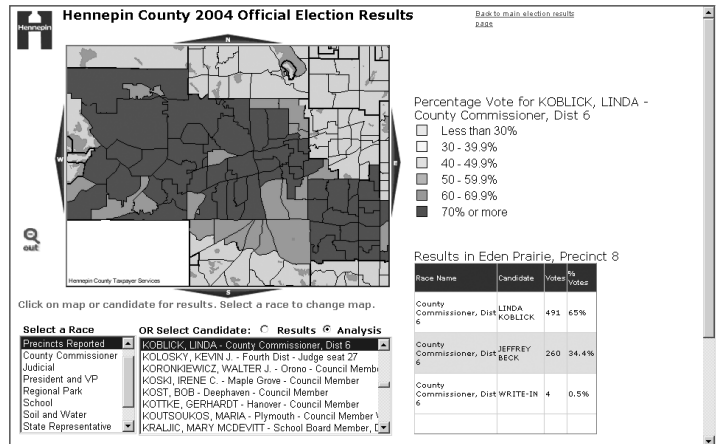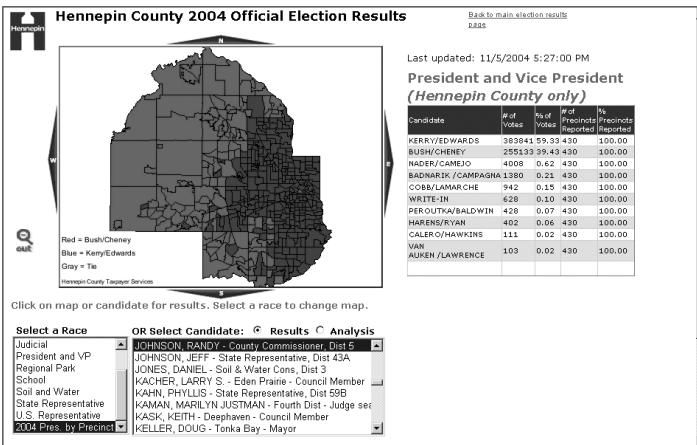
Example of Candidate Selection Report

percentage results precinct by precinct in their districts. After that map is displayed, users can click on individual precincts on the map to see the actual results in the selected precinct. This tool allows candidates and the general public to analyze and understand voting patterns. Candidates feel that this will be helpful for planning strategy in future campaigns.

Example of President|Vice President Report

In the future, we will be able to add the ability to use this tool to analyze past as well as current elections, and include Census data so that we can show voter turnout rates. We hope that this will be used for educational purposes in school civics classes, in addition to being a highly valued resource for candidates and political parties.

The success of an Election Results Internet application is primarily based on a 24 to 36 hour window from the time polling locations close until later the next day. The pre-existing tabular elections results page was used very little once an election is over. With the analysis capabilities we

Example of Analysis Option for Individual Candidate Report

have incorporated into our map-based application, we expect to see continued use throughout the year. Candidates now have a tool at their disposal 24 hours a day to manage and plan their next campaign process. This application also received over 200,000 hits in a 16-hour period; nearly double that of the tabular Election Results Web site during the 2004 General Election. It is very obvious that people prefer a user-friendly graphical interface where they are able to find the election results relevant to them rather than what they found in the report-only interface. The service can be viewed at: http://www13.co.hennepin.mn.us/hcelectionmap.

Scott Simmer is the County of Hennepin's GIS Coordinator. In this role, he and his team are responsible for the County's GIS infrastructure, as well as all Intranet and Internet implementations. For more information contact Scott via email at: scott.simmer@co.hennepin.mn.us

Indiana Mapping Project Exemplifies Intergovernmental Collaboration, Results in Multi-Use Product and Cost-Savings

By Jill Saligoe-Simmel, Ph.D., Executive Director
Indiana Geographic Information Council, Inc.
Indianapolis, Indiana

Planes are flying across Indiana skies this spring taking pictures as part of a statewide project designed to create a detailed digital map to assist agencies at all levels of government. Lt. Governor Becky Skillman announced that the flyovers, beginning in southern Indiana, are part of the state's geographic information systems (GIS) project.

"Some planes Hoosiers see flying overhead may be part of a project helping us create a tool that will be beneficial to all Hoosiers," remarked Lt. Governor Skillman, Chair of the Indiana Counter-Terrorism and Security Council (CTASC), the lead agency in this project. "This digital map will be used in areas from homeland security to economic development. Indiana is following the lead and expanding on what is happening in other states."

The 2005 Statewide Color Orthophotography Project will create a map of Indiana using high quality digital pictures to be taken from seven planes that will fly across the state every day for two months, weather permitting. More than 50,000 pictures will be collected and put into a cutting edge computer mapping system. Once the foundation is laid, information from locations of critical infrastructure, to crime statistics, to boundaries of economic development zones can be layered on top of the base map.

EarthData has signed a contract with CTASC to complete a first-of-its-kind statewide geographic information systems (GIS) base map for the state. "The program is the result of 18 months of hard work and collaboration between the CTASC, the Geographic Information Council, and Indiana's ninety-two counties," explains Jill Saligoe-Simmel, the executive director of Indiana's Geographic Information Council.

The partnership among the State, county and Federal agencies is the first of several unique features in the initiative. The choices for using all-digital technologies to map this large (approximately 36,600 square miles) project area, the high 1'- and 6"-pixel resolutions, and the 12-month delivery schedule combine to make this a landmark program for the mapping and GIS industry. "As we compared state and local needs in areas such as homeland security, natural-resource management, emergency preparedness, and

economic development with our GIS options," says Dr. Saligoe-Simmel, "the high-resolution base map offers more information and provides the greatest return on our investment."

A GIS based on a uniform, current high-resolution image foundation, or base map, can be a boon to users who face a wide range of challenges from multiple State and local agencies. Kent Park, Indiana resident and EarthData's client liaison to the CTASC, has seen the benefits of a high-resolution GIS base map in other states, "Decisions that affect public services are numerous and interdependent. Basing those many decisions on an identical set of data, rather on sources likely to provide inconsistent levels of accuracy and detail, promotes coordination of efforts, speeds responses, improves situation awareness, and increases government operational efficiency."

For homeland security purposes, the new system will be a critical tool used in all stages of emergency management from planning, mitigation, preparedness, response and recovery. It supports the needs of its most demanding users – local government – while providing a consistent high-quality data source for projects such as FEMA Flood Map Modernization and Census TIGER Map Modernization. Whether the issues facing Indiana involve emergency response, urban planning, natural resource management, public works, or other concerns, the choices made for this project support GIS applications that provide answers.

"Our goal is to continuously seek ways to achieve the highest level of preparedness in terms of homeland security," said Earl Morgan, Director of CTASC. "The information garnered from this project will enable us to reach that goal in new ways, in addition to benefiting numerous other endeavors outside of homeland security."

Once the statewide GIS is created, it will enhance similar efforts on local levels and will be available to communities that previously could not afford computer mapping data. Universities, businesses and citizens will also have access to the maps.

The 2005 Orthophotography Project is being paid for primarily through state and local homeland security grants. Aerial data acquisition began in late February 2005; program completion occurs when all geospatial products are delivered by March 2006. In addition to 1'- and 6''-pixel-resolution natural-color digital orthophotography, products will include "true" orthophotography (without distortion caused by feature displacement, such as building lean) over the downtown sections of major metropolitan areas, color-infrared orthophotography, a digital surface model, and a digital elevation model.

Jill Saligoe-Simmel is the Executive Director of the Indiana Geographic Information Council, Inc. (IGIC) and Chair of the Indiana GIS Initiative since 1997. Through IGIC, Jill works with public, private and educational sectors to support GIS and economic development, land|water resources, homeland security and the business of government. For more information contact Dr. Saligoe-Simmel via email at: jsaligoe@iupui.edu.

Enterpise GIS in Utah

*By Matt Peters and Dennis Goreham,
State of Utah*

GIS technology realized tremendous growth within Utah's State and local government agencies over the past two decades. Many levels of government embrace this technology as a tool to be more responsive, efficient, and effective. Yet, without coordination of effort and well-defined, common goals, the potential exists for unnecessary duplication of data, incorrect or incomplete decisions, and lost opportunities for enhancing the quality of government.

The Utah Automated Geographic Reference Center (AGRC) is the agency of the State of Utah responsible for the implementation and promotion of Geographic Information Systems (GIS). AGRC has created and maintains the State Geographic Information Database (SGID). This database contains a variety of geospatial information, comprising over 300 layers, including transportation, hydrology, taxing entities, and land ownership.

There are many participants in the data creation process, including local and county governments, the Federal government, and other State agencies. This cooperation is possible because of a data sharing Memorandum of Understanding, signed by the Governor of the State of Utah and more than 13 Federal agencies, in May of 2004.

SGID data is stored in a Relational Database Management System (RDBMS), utilizing Environmental Systems Research Institute (ESRI), ArcSDE, and is available to the public and other State and local agencies. Utah, designating ESRI products as the standard in 1987, has realized many advantages in its data collection and manipulation efforts.

The realization of cooperative efforts in data acquisition is further evidenced in this passage from the Legislative Budget Brief of the Utah Legislative Fiscal Analyst Office: "The Automated Geographic Reference Center is a true example of an 'enterprise resource.' Its equipment, software, data, and expertise are used across State government. It also works closely with local and Federal entities, leveraging State resources to gain valuable data held at other levels of government."

Utah's strategy for overcoming barriers to using GIS in emergency management mitigation planning, response, and recovery is to develop a community partnership between the local emergency planners, local GIS professionals, and the State. AGRC has partnered with the CIO's Office, the Division of Emergency Services, and Homeland Security (DES), to champion and facilitate the use of GIS in local emergency management planning. Typically, local emergency management coordinators in rural counties do not have GIS expertise and are unaware of GIS resources available in their area. To address this gap, the State involves local GIS professionals in emergency training exercises held throughout the state.

Also, introductory level GIS training is offered to each county for their emergency management coordinators. A team, including local GIS professionals and AGRC staff, presents the training, which is funded through the State's Homeland Security grant. The SGID also provides the platform for sharing data for public safety purposes. Statewide critical infrastructure data layers, developed by AGRC and DES, are available in the SGID. Sensitive data are available to local GIS staff through a secure site.

AGRC receives various grants and monies to enhance data and adherence to Federal data standards.

For example, AGRC received a grant from the Federal Geographic Data Committee (FGDC) to develop metadata for all data layers in the database. Another grant assured that AGRC produced map services adhere to standards set by the Open GIS Consortium (OGC).

The State of Utah has five regional GIS user groups that work together on common goals and data standards. The Utah Geographic Information Council (UGIC) is a vehicle for the dissemination of knowledge throughout the state during an annual conference and other activities.

The Geographic Information Systems Advisory Council (GISAC) has the task of coordinating large data collection activities, developing statewide geospatial policy, and approving standards. This group includes representatives from local, State, and Federal agencies, as well as universities and the private sector.

AGRC works with other State agencies to produce Internet Mapping Services for public use. One such service displays air quality information for the Wasatch Front, an area corresponding to the largest population within the state.

Other efforts involve State agencies with a need to store sensitive data and provide it to specified user groups. The Antiquities Section of

State History is responsible for the delineation of all archeological sites in Utah. AGRC, in a joint effort with the Antiquities Section, has developed an Internet Map Service Site for this purpose.

On the local level, AGRC works with all Utah counties to map rural roads, as well as the roads of each community. This data layer allows each county to develop a transportation network plan for a variety of State and local purposes. Typically, the counties coordinate the E911 efforts within their area. The Public Safety Answering Points (PSAPs) are funded through monthly phone fees collected by the State. One cent per cell phone per month is also dedicated to improving road centerline and address data for GIS needs of the PSAPS. This data is also used to inventory the "B" (county) and "C" (city) road systems to receive federal maintenance funds. This data is also used by the U.S. Census Bureau to modernize TIGER data used for the next decennial census.

Many Utah counties use GIS functionality to promote local recreational opportunities. AGRC works closely with these counties to provide an interactive map on the World Wide Web that offers a standard look and feel.

AGRC is able to provide these goods and services because of its enterprise approach to data collection, storage, and distribution. The State of Utah, working with its 29 counties, made an early commitment to standardize software and a shared clearinghouse for geospatial information. As each year passes the awareness of what a GIS system can do for decision-making becomes larger. AGRC will continue to lead the State of Utah in this effort to facilitate the use of GIS and provide a clearinghouse for knowledge and geospatial data.

Dennis Goreham is the Manager of Utah's Automated Geographic Reference Center. He Chairs Utah's GIS Advisory Committee which creates GIS policy for Utah, Chair of the Western Governor's Association Geographic Information Council, and is a past president of the National States Geographic Information Council. He is also the current Co-Chair of the Federal Geographic Data Committee's Future Directions Governance Team. For more information contact Dennis via email at: dgoreham@utah.gov or call 801-538-3163.

Matt Peters is a GIS analyst for the State of Utah specializing in new technologies and geospatial enterprise architecture for the state. For more information contact Matt via email at: mpeters@utah.gov or call 801-538-3168.

The Northern Shenandoah Valley:
Living Towns, Balanced Growth Counties, Regional Community.
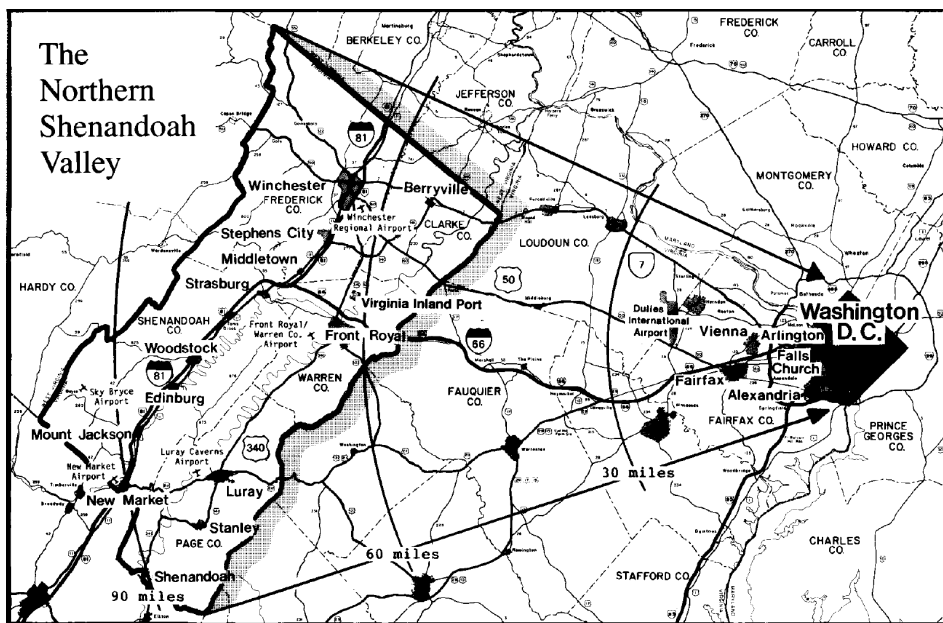
Building a more accessible regional community in the 21st century.

Virginia's Northern Shenandoah Valley's Proposed "Regional Intensive Geo-spatial Training"

By Tom Christoffel, Senior Planner
Northern Shenandoah Valley Regional Commission

The Northern Shenandoah Valley Disability Services Board has been a catalyst in the regional community by proactively networking with agencies and organizations. The following networking strategy outlines the links and relationships that the Board pursues through its limited resources. In conjunction with regionally networked community organizations, benefits are shared in this growing, but still low population density, region.

The networking strategy matrix in **Table 1** has been analyzed to highlight **non-geospatial organizations**, e.g., those that are data users, but are not utilizing geo-referencing in their databases to enable mapping and GIS.

Providing LandView6 data compiled for Virginia Planning District 7 – and relating data of surrounding regions and Mid-Atlantic States would serve these local/regional entities and be examples to their respective national and international organizations. Education in Land View could be conducted through the Community

Need Area	Network with Regional Community Organizations and Agencies
Aging and Disability	Shenandoah Area Agency on Aging
Disability	Department of Rehabilitative Services; Access Independence
Education	Public School Systems; Lord Fairfax Community College, Shenandoah University; Christendom College, Cooperative Extension
Employment	Northern Shenandoah Valley Workforce Investment Board
Handicapped Parking	Department of Motor Vehicles; Local Law Enforcement Agencies; NSV-DSB Parking Committee
Housing	Housing Action - Northern Shenandoah Valley
Isolation of Individuals	Faith In Action - Northern Shenandoah Valley
Mental Health	Northwestern Community Services Board
Personal Assistance	Department of Rehabilitative Services; Access Independence
Physical Accessibility in Communities	Living Towns Program – Northern Shenandoah Valley Regional Commission - Walkable Communities tools; Local Building Inspection Offices
Public Safety	Special Needs Registry; Local Law Enforcement, Fire and Rescue Agencies
Recreation	Local Parks & Recreation Departments, State and Federal facilities
Regional Community Networking	Regional Community Networking Breakfasts – NSV-DSB sponsor with Valley Health System and Faith In Action – Northern Shenandoah Valley
Technology	CAIT - Community Applied Information Technology – Lord Fairfax Community College; Occupational Therapy – Shenandoah University SETNET - Northern Shenandoah Valley Regional Commission
Transportation and Mobility	Northern Shenandoah Valley Public Mobility Project and all participating agencies; Living Towns utilizing Walkable Communities tools

Table 1

Applied Information Technology program at the Community College. The Virginia Geospatial Extension Program (http://www.cnr.vt.edu/gep) is an available partner. Orientation to GIS use raises the issue of database design, use and maintenance. Information sharing among agencies requires common data standards. Getting organizations to use geospatial techniques requires that they have rudimentary knowledge of databases as well as GIS applications and trained users who are networked for maintenance and development of skills. Other educational institutions such as Shenandoah University, James Madison University and the public schools systems are likely partners for this regional program.

This analysis has been expanded to other public, private non-profit and for profit organizations. The Virginia Inland Port, for example, is a quasi-state agency that operates in the region based on the logistics advantages of the I-81/I-66 corridors, as other key elements of the National Highway System. Business and industry in the region are located there for the market relationships. Staff at the Inland Port indicate that there is limited use of GIS in the logistics industry.

Table 2 relates non-geospatial organizations and agencies, which would benefit from greater access to and use of geospatial tools. Each has one or more National Associations which could showcase the benefits of geospatial technologies to small members utilizing GIS in parallel and cross organization in a region located near national headquarters.

Tom Christoffel is Senior Planner for the Northern Shenandoah Valley Regional Commission. The commission supports twenty localities with GIS services. For more information contact Tom via email at: tchrist@shentel.net.

Non-Geospatial in Region	Association – National /International which would learn from Local/Regional Use of Geospatial tools by members
Local Governments	American Planning Association American Society for Public Administration National Association of Counties (NACO) International City/County Management Association (ICMA) International Economic Development Council
Northern Shenandoah Valley Regional Commission – Public Mobility	Association of Metropolitan Planning Organizations (AMPO) Community Transportation Association National Association of Regional Councils (NARC) National Association of Development Organizations (NADO)
Lord Fairfax Community College	Public School Systems; Lord Fairfax Community College, Shenandoah University; Christendom College, Cooperative Extension
Shenandoah University	Northern Shenandoah Valley Workforce Investment Board
Lord Fairfax Small Business Development Center	Department of Motor Vehicles; Local Law Enforcement Agencies; NSV-DSB Parking Committee
Valley Health System – Regional Hospital	Housing Action - Northern Shenandoah Valley
Traffic Club - Virginia Inland Port	Faith In Action - Northern Shenandoah Valley
Access Independence	Northwestern Community Services Board
Area Agency On Aging	Department of Rehabilitative Services; Access Independence
Lord Fairfax Health District	Living Towns Program – Northern Shenandoah Valley Regional Commission - Walkable Communities tools; Local Building Inspection Offices
Cooperative Extension	Special Needs Registry; Local Law Enforcement, Fire and Rescue Agencies
Rotary	Local Parks & Recreation Departments, State and Federal facilities

Table 2

E-government Geospatial Portals
Expanding LouisianaMAP Geospatial Portal

By Kim Burns
Environmental Systems and Research Institute

Geospatial portals provide the GIS component of e-government. These portals are Internet-based mapping applications designed to generate customized maps and deliver advanced geographic data services. At the national level, the U.S. Geological Survey (USGS) hosts the Internet portal for The NationalMAP, which supports Internet access to geodatabase information from many agencies, academia, and private portal stakeholders.

Governments are using GIS-enabled Web portals to leverage the nation's geospatial resources. One such project is the Louisiana I-Team Geospatial Information Initiative (I-Team Initiative). The Louisiana I-Team Initiative works to make it easier for all levels of government and the geospatial community to collaborate in the building of the next generation of geospatial framework data for Louisiana. It is a joint project of local, regional, and federal governments; private organizations; academia; and all levels of the geospatial community.

The I-Team Initiative launched Louisiana's GIS portal,

LouisianaMAP, a single source of geographic information that is both reliable and cost-effective. Geospatial stakeholders and agencies can easily integrate LouisianaMAP functions and data services directly within their own applications, effectively leveraging the state's existing geographic information technologies without having to maintain them.

Federal strategic partners in LouisianaMAP are the U.S. Department of Agriculture—Natural Resources Conservation Service; U.S. Department of Transportation–Federal Highway Administration; U.S. Census Bureau; U.S. Environmental Protection Agency; USGS; and the National Oceanic and Atmospheric Administration.

Louisiana Geographic Information Center (LAGIC), established by the Louisiana GIS Council and the Office of Electronic Services, facilitates the distribution of geographic information, provides technical assistance, and supports GIS data development among state, federal, and local government. LAGIC is responsible for the management and maintenance of the LouisianaMAP geospatial portal.

The LouisianaMAP portal technology supports Open Geospatial Consortium (OGC) interoperability standards that are defined collaboratively by all geospatial data stakeholders. These standards make it possible to integrate geospatial databases. Joshua Kent, data
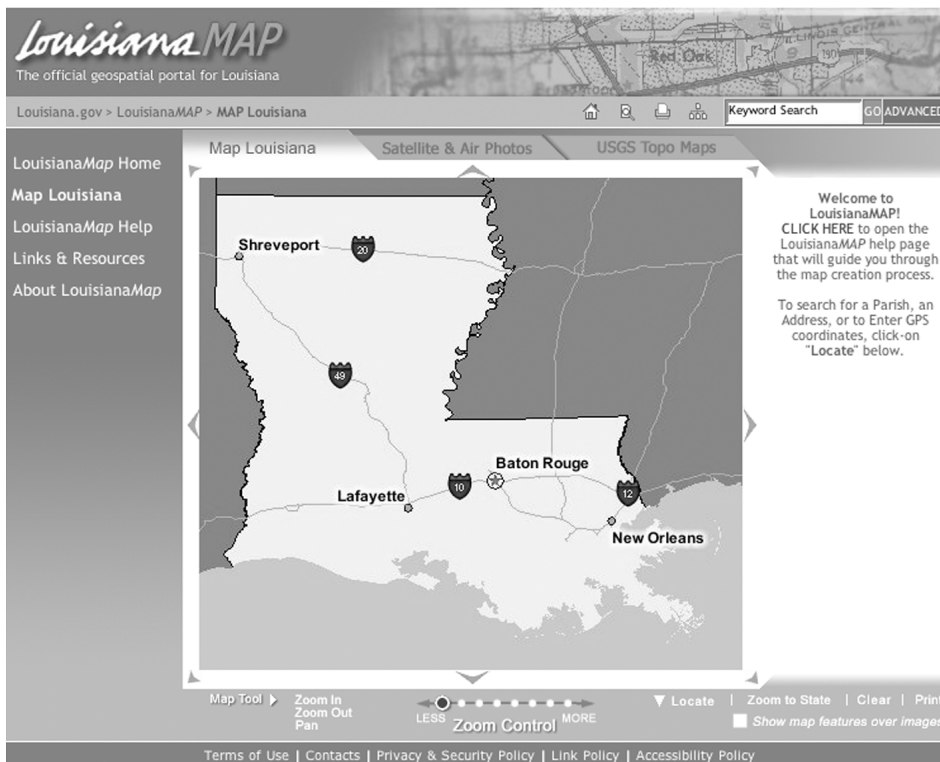
LM USGS Emissions Map.bmp: LouisianaMAP portal displays emission data from Louisiana Department of Environmental Quality.

manager for LAGIC, describes the need for data standards: "We wanted a means to get everyone to use the same framework data layers. Any data sets that are created on that framework layer would be easily integrated with other agencies; therefore, we could share resources more efficiently and more completely than ever before. Thus, a database that social services built could be used by various health services, for instance. If agencies share their resources based on standardized common framework layers, then they can integrate these resources efficiently without having to worry about how to convert a projection or how to get parish boundaries to match."

The LouisianaMAP project integrates all kinds of data resources, but does not manage the data resources. Rather, it accesses other people's resources. Other agencies that are custodians of a particular layer permit access to these resources via LouisianaMAP. A visitor to the portal can generate imagery, such as aerial photography or satellite imagery, that comes from the Department of Environmental Quality (DEQ) server. The portal server sends a request to the DEQ server, then its system server sends the image back. As a result, data is provided without need for duplication or unnecessary redundancy. In the end, public and private sector stakeholders are able to allocate their financial resources more effectively, which saves money by reducing discontinuous implementations of duplicative spending.

LouisianaMAP employs the spatial processing and data management capabilities of ESRI's ArcIMS, ArcSDE, Microsoft SQL Server enterprise database, and other third party technologies in order to provide the mapping and development services for the state's geospatial data assets. ArcIMS and ArcSDE

LM Satellite photo.bmp

work together, providing integrated back office solutions that ensure fast and consistent access to and dissemination of Louisiana's geospatial data assets via the Internet.

Portal site visitors can access both state and federal databases to make their own maps. GIS-enabled Web site applications help the user customize maps to answer specific queries. For example, the Web site hosts an election application that provides voter information such as a Voter District/Precinct/Ward Locator that responds to the question, Where do I vote? Maps of political districts and maps of election results are also available. Another application accesses U.S. Census data for creating maps that show the geography of Louisiana's population demographics. The Louisiana Department of Homeland Security and Emergency Preparedness works with federal geographic information

providers to post hurricane evacuation routes, flood maps, and emergency response centers.

LAGIC is converting data resources into Federal Geographic Data Committee (FGDC) standard data layers. Kent says, "We have to migrate an existing data asset into a federal standard format. When we do that, we can share the data with other portals such as The National Map through our services. This creates the opportunity for other people to access our standardized data sets and integrate their own applications." The task is to adhere to a standard form of data, use those standards to maintain the data, and assure that all fields, entities, and attributes necessary can be integrated with other standardized data layers. In this way, the Louisiana geospatial databases can be used by other states, such as Texas, Arkansas, and Mississippi, and Federal government

agencies such as the EPA, the USGS, and FEMA.

Kent asserts, "We are facilitators for the geospatial community, and the LouisianaMAP portal helps that process. We are establishing relationships between the DEQ and the National Wetlands Research Center (NWRC) so the NWRC can access the DEQ imagery or the high-resolution aerial photography that the DEQ allows to appear on The National Map."

The LouisianaMAP is unique because it is able to efficiently deliver geospatial information within a meaningful context. In effect, the map application determines what type of data is displayed in the map. By employing tools and capabilities specifically designed to meet the needs and skill level of its users, LouisianaMAP is able to quickly deliver the information users want for creating the specific maps they need.

Kim Burns is the Federal Government Coordinator for ESRI. For additional information contact Kim via email at: Kburns@esri.com.

Learn more about the LouisianaMAP at www.louisianamap.gov.

GIS Utility Asset Development and Management Integration:
IT and Geospatial Information Working in Synergy

By Rich Crim, Information Systems Project Coordinator, City of Winston-Salem

Purpose

Winston-Salem Utilities division provides water and sewer services to the city and surrounding communities. A project was started three years ago to implement an integrated system to incorporate a service request management system, a work order management system, an asset management system and cost accounting. The proposed $7 million project included $5 million for field and data collection work to geographically locate and capture all assets that included water lines, water valves, water nodes, water storage, water service connections, sanitary lines, sanitary manholes, sanitary service connections, and fire hydrants.

Without an electronic record of the water and sewer infrastructure, the City staff and the public were forced to accept mapping that was incomplete and inaccurate. The GIS mapping provides much clearer mapping with points and lines coordinated to known features, such as parcels and street center lines. The GIS mapping and associated attribute tables provide a convenient and reliable location for recording information relating to mortality (install dates), capacity (diameter/lengths), and material.

The City of Winston-Salem has established a solid GIS presence during the last several years. The introduction of GIS technology stimulated collaboration between City departments and discussions

concerning GIS functionality, data, and integration with a work order management system. GIS Utility Mapping is an innovative solution that utilizes a team approach for creating and communicating the vision with the users, involving the users in the development process, and enabling awareness and better understanding of GIS technology. User knowledge has been increased through the utilization of a reliable system and appropriate training. This, in turn, builds consensus, synergy, and confidence in the solution and the team members.

Implementation

The Information Systems department used advanced GIS tools to geo-locate the assets including both engineering drawings and parcel data. Preliminary tests indicated acceptable degrees of accuracy. With the assistance of an external agency, all assets were digitized and integrated into a work order management system at a total cost of $200,000. This solution saved the city in excess of $4.5 million. The application system is now in full operation with the tools and procedures to enhance and maintain the accuracy of asset location and manage costs.

This project required enterprise collaboration, strategic research and planning, and a long-term commitment to internal and public customers. A team of individuals from several City departments completed this project.

The team represented experts and users within the Utilities department, the Engineering department, and the Information Systems department. The team works together on a daily basis to administer, configure, and maintain the data. This synergy of the teams is shown in Figure 1.

There are many reasons for performing this work. GIS mapping aids the performance of the work order management system. Proper and appropriate investments in utilities are critical in maintaining, nurturing, and ensuring continued economic development within a community. GIS mapping is essential in carrying out maintenance and developing water and sewer infrastructures.

The City's water and sewer infrastructure impacts many customers and is impacted by many different stakeholder organizations that take part in events that shape an evolving system. A change may simply be adding a new data point, utility line asset or as complex as large land acquisition by the North Carolina Department of Transportation (NCDOT) for a new road project.

Organizational Impact

The following customers and stakeholders have online access to web-accessible Utility maps:

- Private citizens
- Developers
- Contractors
- Real Estate companies
- Surveyors Engineering
- Utilities Administration
- Utilities Construction and Maintenance
- Planning
- Many other City departments

Today, the City creates custom maps using GIS features through ArcGIS/ArcSDE applications to serve these users. The utility assets have been integrated with the City's ArcIMS/ArcSDE application GoSpatial. GoSpatial is a web-enabled application that allows the integration of disparate data and images through a single point of access. This provides access to the utility assets for all City divisions to support their various job assignments and business needs. The City of Winton-Salem's GoSpatial web application received the 2003 Herb Stout Award. The Herb Stout Award was created to honor exemplary use of Geographic Information Systems (GIS) by a N.C. local government. The award has been presented at each North Carolina GIS Conference since 1993.

Summary

In summary, the City of Winston-Salem has digitized all of the paper-based utility maps into GIS geodatabases.

Figure 1

Figure 1
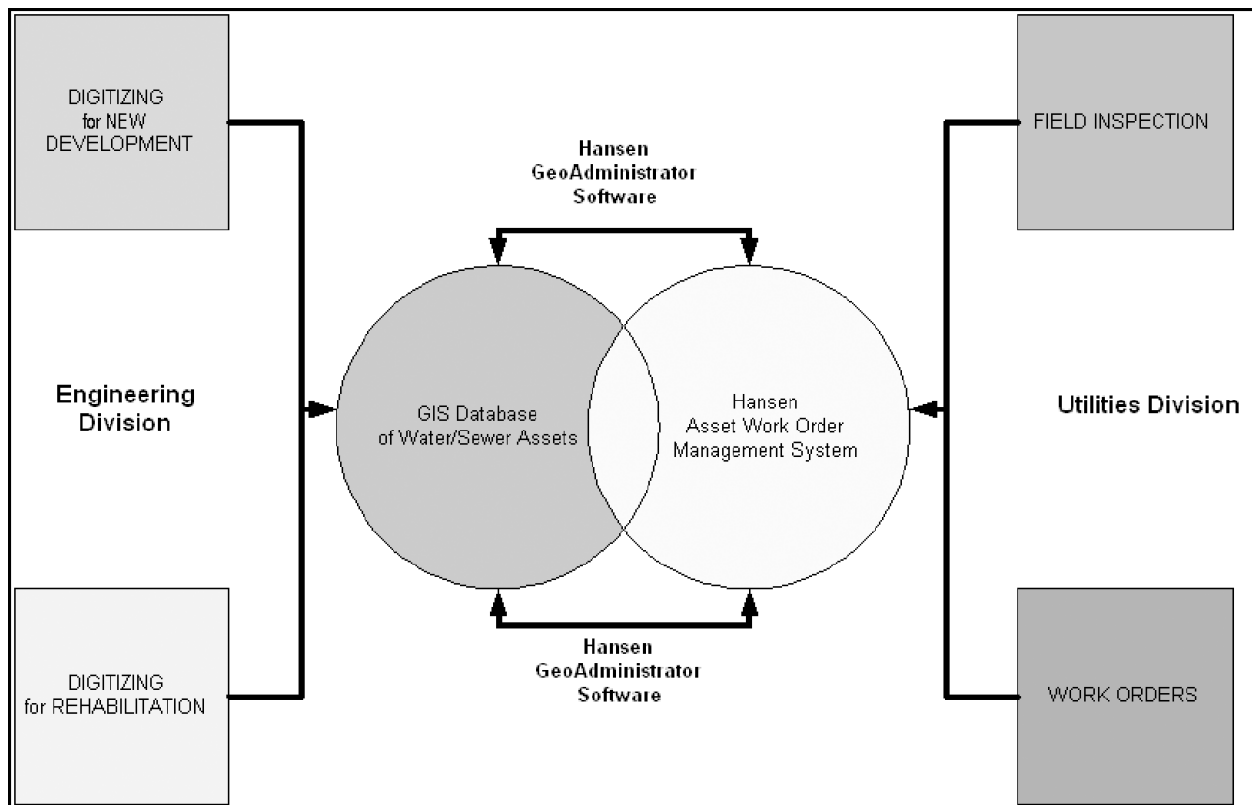
The City has also reused asset information to create GIS layers from other technologies, such as PC-based databases and the utility billing system. All water and sewer data points in GIS geodatabases have been synchronized with the Hansen Work Order system. The GIS data is maintained by the cooperation between the Engineering department, the Utilities department and the Information Systems department. This GIS project has created new opportunities to serve the citizens of Winston-Salem and Forsyth County. These future projects would not have been possible or been very difficult without establishing this base of water and sewer assets in GIS. A few future projects under consideration are listed here:

• Further develop ArcGIS programming to aide in identifying assets in need of repair;

• Incorporate TV inspection, and condition reporting;

• Master Planning for consumption demand;

• Water quality monitoring and mapping;

• Model and forecast usage demand;

• Track and communicate with service trucks via the Internet;

• Analyze capital improvement expenditures;

• Provide mobile utility inspection and maintenance using GIS and related technologies; and,

• Share regional info with public safety, law enforcement, legislators, and public officials.

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City of Philadelphia – Unified Land Records System

*By James L. Querry, Jr, Director of Enterprise GIS, City of Philadelphia, PA
And Michelle Guldalian, GIS Manager, City of Philadelphia, PA*

System Overview

Over the past 3 years, the City of Philadelphia has made a considerable investment in the design, development, and implementation of a Unified Land Records System (ULRS) to, for the first time in its history, aggregate accurate and current land record data from all of the multiple independent databases that now contain property-specific information used by various departments throughout the City.

The initial phase focused on the completion of a layer of real estate parcels. The Mayor's Office of Information Services (MOIS) GIS Services Group (GSG) recognized the need to fully integrate this parcel layer, with other City land records, prompting the development and implementation of the Master Address System, the foundational component of the ULRS Address Integration System.

The Master Address operates side-by-side with the Department of Records (DOR) base parcel layer to accomplish several goals. It puts in place a single, accessible repository for all addresses located within the City of Philadelphia. Each address in this repository is geographically indexed to real estate parcels on the ULRS map layer and each address is stored in a standardized format. Software components are able to accept badly formatted addresses, recognize common street aliases and abbreviations, spell-check against a street dictionary, and reformat addresses into the standardized

format. The system operates on streams of fresh data, actively rebuilding links between addresses and parcels to reflect real world changes.

Building this component for the ULRS Address Integration System met several immediate needs. Built-in reporting tools identify discrepancies in the base parcel layer and allow for a realistic estimation of the level of effort needed to fix them. Likewise, built-in editing tools flag misattributed data and facilitate corrections to the underlying data.

More importantly, the Master Address System component established a robust, accessible infrastructure for providing comprehensive data services. The system anticipates that departments will want to "publish" their own data to the ULRS. By doing so, indexes are automatically created relating departmental account numbers (or other ID) to one of the four standard keys used by the ULRS (address, parcel, tax account, ownership). These indexes reside permanently on the ULRS database server. This means that application developers are able to easily integrate ULRS data directly into specific agency data schemas. Also, a wide range of cross-departmental queries can be posed.

While the initial components of the ULRS Address Integration System focused on building a comprehensive set of tools, databases, and indexes for relating address-based City data to geographic locations as well as a

series of web-based services to utilize, manage and maintain the entire system, the final component concentrated on the development of an infrastructure to leverage the City's earlier accomplishments as well as make them easily available to other City departments.

Services were created that not only integrate but also extend the ULRS to a variety of departmental datasets. In doing so, the City has been able to improve the accuracy in GIS cartographic output; enable an investigation into missing and/or lost revenue; allow for the creation of new web services; and increase the user-friendliness and robustness of the City's exiting web-based client applications.

System Design/Architecture

The end product for the ULRS Master Address System component is a set of tables in a relational database which:

• act as a comprehensive repository of unique standardized addresses for the City of Philadelphia

• index each address to a parcel on the ULRS base map

• index tax accounts and addresses

• index land title records and tax accounts

• index parcels and land title records

• enable the joining of data from other agency datasets by creating indexes based on a shared key attribute (address, tax account, parcel, or land title record).

The Master Address table is created and actively managed by a set of

software components charged with acquiring data from source agencies; parsing and scrubbing addresses into a standardized format; synchronizing relationships between parcels, addresses, tax accounts and land title records; generating and enforcing unique parcel and address identifiers; scheduling tasks; keeping track of actions taken; and reporting errors in a constructive manner. These same software components have the ability to define, generate and store additional relational indexes between other agency datasets and the ULRS.

Although most of the processing methods and spatial operations of the data model are designed to operate autonomously, the system includes a manual-editing interface. The system also includes a web-based reporting service for logging activity and errors. In order to provide an overview of the system, monitor performance and perform batch database operations, the system provides a secure system administration service.

The design of the Master Address System took full advantage of the technical resources, infrastructure, and software licenses that existed at MOIS. The system was designed to run on a single dedicated server located at MOIS, which is not intended for direct access by end-users. The core of the system is a database and application server which uses Microsoft's SQL Server 2000 RDBMS software for storing data and microsoft.net's C# language for the code base. Live production tables are stored in a MOIS database server which operates Oracle 10G RAC and made accessible through Microsoft .Net based web services.

Data processed in SQL Server is shipped periodically to the Oracle database server.

A set of software components running on the same server manages the majority of data processing methods. The software components, used in conjunction with Active Server Pages (ASP) or ASP.NET, enable the editing and system reporting functions. All web-based maps and mapping tools are built upon ESRI ArcIMS, an Internet map server. These tools have been made available over the City's intranet through Microsoft IIS 6.0, and Internet server, and were designed for access through any 4.0 or higher web browser. Finally, a series of XML configuration files allow system-wide parameters to be set and the various software components to communicate with each other.

Jim Querry is the Director of Enterprise GIS for the City of Philadelphia. Philadelphia's enterprise GIS includes oversight responsibility for geospatial technology, projects, budgets, standards, procurement, and strategic direction as well as liaison with local, regional, county, state, and federal government and related organizations. For more information contact Jim via email at: james.querry@phila.gov.

Michelle Guldalian is the manager for the city's enterprise GIS Services Group (GSG) at MOIS (Philadelphia's central IT office). Michelle is responsible for the day-to-day operation of the GSG and is Project Manager for enterprise GIS projects such as the Unified Land Records System and Citywide Basemap Update Project. For more information contact Michelle via email at: michelle.guldalian@phila.gov.

User-Centered Geographic Systems

By James Melzer and Marcy Jacobs
SRA International

The last ten years has brought rapid change to the geographical information (GI) industry. Financial and practical imperatives have driven data interchange standards enabling organizations to license and share data, leveling the playing field for application vendors. Concurrently, geographic information systems (GIS) have grown in scope from desktop applications to enterprise systems. The growth of these systems and the adoption of interchange standards have come together to enable a new generation of GIS tools. These tools are often integrated and distributed over the internet throughout and between organizations. SRA International has been involved in the development of two geospatial portals (Geodata.gov and National Geospatial Intelligence Agency's Geospatial Portal (NGOS)) that have successfully accomplished data integration. Data integration was the great GI problem for the last decade, and that problem has been largely solved.

The User Interface (UI) is the great GI problem for the next decade. The vendor-neutrality of GI data interchange standards and the requirements for interoperability have contributed to a common set of UI elements, partially based on the legacy of stand-alone desktop GIS. This common UI is widely understood by GI experts. However, the user community for GI has grown significantly beyond this core group of experts. Casual users of GIS have become a significant proportion of the user community. Their lack of familiarity with GIS UI conventions should force GIS vendors to strive for simple and intuitive tools. SRA International is providing usability evaluation services to Geodata.gov and NGOS to bridge the gap between data for experts and the needs of common users. Casual GI users are accustomed to the conventions of commercial web mapping tools, such as MapQuest or Yahoo! Maps, which are simple and intuitive. These tools are so simple to use in part because they were built to exactly match common user goals. But it is important not to discount the power behind these tools, which enable usable national search across a number of GI themes. They are the products of user-centered design.

The next generation of GIS tools must be the product of user-centered design. For example, we have found that casual GI users primarily seek to discover relevant data, whereas expert GI users tend to perform complex manipulations on data. This means the casual users spend most of their time interacting with the search UI while expert users spend most of their time with the map UI. And throughout the GI industry, there are few standards and conventions for the search UI. This means the least experienced users are stuck with the least mature interface.

Information discovery is the new challenge for GIS vendors since it is the new challenge for their users. The major problem in this area is the presentation of search results. An effective user interface (UI) is essential to useful search. Unlike the map interface, there are few solid examples of geospatial search interfaces. Part of the problem is there are too many variables – is the user looking for a place, a data theme, a specific layer, an area or a point?

We suggest a framework where specialized task-specific tools serve as a front-end to a central data repository, such as the GOS portal. Each tool would have a UI that was specific to the user's task, making it easier to use and easier to build.

An example of a task-specific interface is a tool for coordinating GI data acquisitions. The central problem of this user's task is identifying the coverage and quality of relevant GI data sets. A good tool would first ascertain from the user what theme or data type was relevant and what location the user was interested in. Then the tool would display the coverage and quality of GI data sets – not their features – on a visual map of the location. This map would enable the user to quickly identify holes in existing data, data sets relevant to their acquisition plans, and the relative quality of overlapping data sets.

Another example of a task-specific interface is a tool for examining environmental data. The central interface problem with this task is enabling a range of data options without over-burdening a casual user – a common problem. The best practice here would be to offer both a default set of map features and a default set of optional layers with an interface that shows both the map and the layer definitions simultaneously. The goal with this kind of interface is not to enable every conceivable user action, but rather to focus the user's attention on the most useful and most common actions.

Obviously, there are dozens of other task-specific tools that would be useful. Rather than attempting to build the ultimate UI to solve every problem, GIS vendors and GI integrators should focus their attention on building more focused tools to solve specific user problems with the help of a user-centered design methodology. This methodology begins with the identification and prioritization of user tasks to drive decisions about product scope and design. Then the interaction between the system and user for each task is designed and tested with real users. The advantage of this methodology is two-fold: first, it catches design problems early in the lifecycle, when they are cheaper and easier to fix; second, it focuses the product on real useful user tasks, which reduces feature bloat, reduces overall project cost, and increases the usability of the final product.

James Melzer is an Information Architect with SRA International. He works with Federal customers to make their information easier to find and use.

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DC's Housing Inspection System:
Taking Processes to New Levels of Efficiency

By Charles Rodgers
OPTIMUS Corporation

Introduction

Except for perhaps the Public Safety and Health Departments, no other department in the District of Columbia has more direct effect on the city's quality of life than the Department of Housing Regulation. Unfortunately, rental properties are often reduced to slums for a variety of reasons. The District needed a new system to improve inspection and enforcement processes to ensure favorable housing conditions.

After discussing the needs with DC Housing officials, OPTIMUS Corporation, developers of the wireless mobile data capture system currently used at Kennedy Space Center for safety inspections of the NASA shuttle, volunteered to assemble a contractor team to create a housing inspection system based on the NASA system's concepts. The team worked with the Department of Housing Regulation to develop the system, entitled RAPIDS (Remote Access Property Inspection and Dispatch System) over a period of eighteen months, during which time the development team rode with housing inspectors to determine their specific requirements and needs for the new enhanced system.

Original Inspection Process

The original inspection and enforcement process was based on outdated, manual processes. It began with a telephone call to the Housing Regulation Department. The resulting complaint had to be entered into a computer which was not linked to the inspection computer system, and printed out complaints had to be reentered before inspectors could be assigned.

Detailed information about the property owner had to be researched from outdated property books or learned from the complainant. The inspector usually would not know if the property had been inspected before or whether the owner had been cited before even though the law provides for escalating fines for repeat offenses. Once they left the office, the department manager had no way to contact or monitor the inspectors.

A staff member input the details from the written inspection form into the computer and before the citation could be printed and mailed, the inspector had to proofread the data entered. It often took several weeks before the entry was correct and the citation could be issued. (High priority violations such as no heat in winter were manually expedited.)

The property often had changed owners since the books were updated so mailing the initial violation notice just delayed the enforcement until it was returned and the real owner could be determined.

Per standard procedures, after successful service of the

citation, a reinspection is scheduled to assure the infractions have been remedied within the allotted time. If the violations were not remedied, the inspection process repeats but with more severe fines. Ultimately, the property can be condemned or seized by the government. However, as recounted above, such enforcement actions historically involved a long, drawn out process that provided numerous opportunities for process delays and errors.

Reengineering the Sub-Processes

The overall goal was to increase the speed, integrity, and effectiveness of the enforcement process, as well as to increase customer (DC citizens and businesses) satisfaction. The goals resulted in the following priorities for reengineering the sub-processes:

• Eliminate data entry redundancies

• Assign inspections for efficiency

• Provide inspectors information on previous citations

• Provide an improved method to research property

• Increase the speed and quality of the documentation of inspections

• Provide a method to give the complainant an inspection receipt

• Provide a method for real-time inspection status determination

• Provide improved inspector and management situation awareness

• Empower management through real-time process metrics.

The RAPIDS system consists of Inspector Mobile Work Stations (IMWs), a Command Center Computer (CCC), and a wireless internet link for communications and information exchange.

The system displays enforcement history of the property and owner, routes maps to each assignment, and shows travel progress. Maps are configured based on the most up-to-date Global Positioning System (GPS) data, with a built in Geographic Information System (GIS) that determines and displays the best route based on mileage, current position, and destination.

In addition, RAPIDS enables the streamlined entry, printing, and storage of electronic inspection forms. Each morning the communication module wirelessly retrieves and stores assignments, files, histories, appointments, and e-mail messages. Information is easily and securely exchanged between field inspectors and the inspection
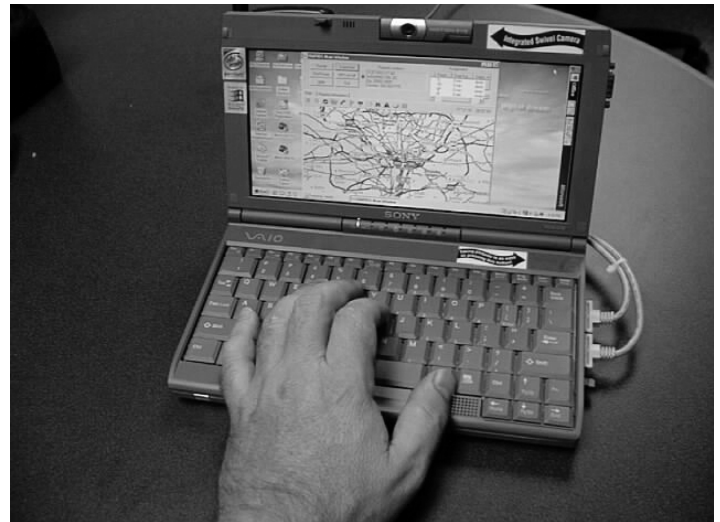
Figure 1 Inspector Mobile Workstation

headquarters and a built in "Panic Button" enables the inspector to quickly alert headquarters of a safety problem. These features help ensure timely, accurate and reliable inspection processes.

The GIS software provides a map display of the District that shows real-time inspector positions, inspector assignments, routes inspectors followed to their present point, and inspected properties – ensuring that the command center is always aware of the most current location information available. In addition, the system enables the user to easily parse, store, and display property enforcement and ownership information with the click of a mouse. Inspector's travel routes can be quickly replayed for any time within the past month, and related information such as mileage can be promptly calculated. Such key metrics as comparisons of inspections by type (time & number), average time for inspection type by inspector, total inspections in period, inspection status states, fines assessed, value of property condemned, etc. Multi-level access security also ensures that data is protected.

Inspection schedules can be manually or automatically updated based on geographical locations, with updated assignments easily retrieved by inspectors each morning. When changes occur, the system can also prepare and disseminate an update to the inspection assignment in a matter of minutes. Using the wireless network, inspectors receive their assignment list and associated files daily at logon from anywhere in the city. The system also displays historical information on properties and owners that can be reviewed upon arrival to enable a full understanding of the situation without additional research. Inspectors can conduct their inspection, and use the electronic form to
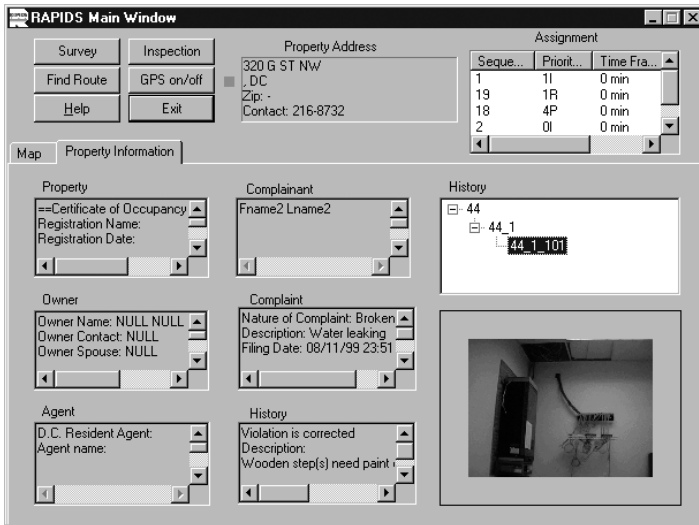
Figure 2 Citation History of Property

quickly capture the information using infraction codes that can be easily annotated with text. Digital pictures can be taken and attached to the inspection form to better document the infractions. When the data entry is complete, these forms as well as the inspection log (start time/end time etc.) are transmitted back to the GIS system.

A thermal printer is used to print inspection receipts and missed appointment receipts for complainants. This, along with the available real-time inspection status, help ensure that citizens are satisfied that their complaint is being addressed in a timely manner.

In addition to clerical level functions, a user with management access is able to exchange instant messages with the inspectors in the field and track them in real-time or in replay. The manager also can change the priority of an inspection or the inspection schedule, and can view and analyze inspection data graphically or in a generated report.

Out of the Stone Age

Although the sub-processes have changed with RAPIDS, RAPIDS technology does not change the inspection process so much as it facilitates efficiency and accountability. Inspectors now have easy access to information and can do their jobs more effectively. Managers can track important trends and ensure the safety of their inspectors – without leaving the office. But, perhaps most importantly, complaints are now processed in an extremely timely manner to ensure fast remediation.

Perhaps Washington DC Mayor Anthony Williams said it best in a press conference launching RAPIDS: "RAPIDS takes DC Government from the Stone Age to the Space Age in one step." The result: a much more responsive and effective government service that can maintain and improve the quality of life for all the city's citizens and businesses.

Chuck Rodgers is the Chief Technology Officer of OPTIMUS Corporation. As CTO, he is responsible for all innovative research and development programs, as well as building the corporation's technical capabilities and intellectual property portfolio. For more information contact Chuck via email at: chuck.rodgers@optimuscorp.com.

Developing a Geospatial Services Oriented Architecture for the Australian Capital Territory (ACT) Planning and Land Authority

Dr Kristin Stock
ACT Planning and Land Authority

The ACT Planning and Land Authority (referred to as the Authority in the remainder of this article) is the agency responsible for planning and administration of land within the Australian Capital Territory (the ACT). It maintains a range of data about land, leasing, planning and land administration within the ACT, and is the custodian for many of the relevant data sets.

The Authority currently maintains two large corporate databases. One of these contains spatial data with related attributes, and includes land parcels, administrative areas, roads, addresses, feature names, survey control marks and land use. The other corporate database contains attribute data about land tenure, development and building applications and land administration. While data duplication between the databases has largely been eliminated, there is some duplication in functionality, particularly in data processing. The Authority is moving towards a Services Oriented Architecture with a view to reducing the duplication in functionality, as well as improving data access both internally and externally. The ACTMAPi web mapping application will form an integral part of the new architecture, providing user-friendly and convenient access to a wide range of data.

Each of the Authority's two corporate databases has its own set of

applications that are used to display and maintain the data in the relevant database, and there is some cross-access between applications in one system and the database in the other system. This allows users to have convenient access to data relevant to their work, without requiring data to be duplicated. Some users predominantly use a Geographic Information System (GIS) (Intergraph's Geomedia with customised applications for maintenance) to access data, while others do most of their work through non-spatial applications (developed using Oracle Forms software).

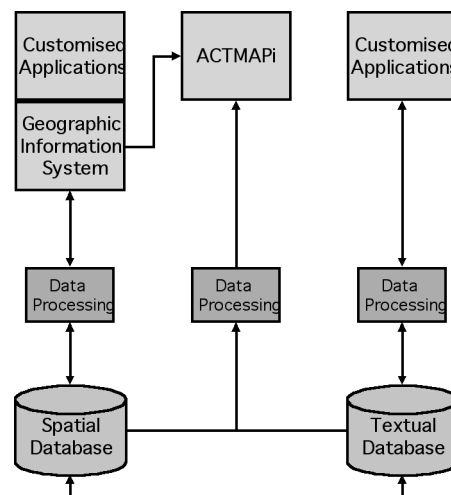In addition to the two main corporate information systems, the ACTMAPi

Diagram 1: Current System Architecture

web mapping application provides user friendly access to the data in both databases, and we plan to expand the data made available through ACTMAPi so that it provides a single point of access to information about planning and land administration for users who do not need the data maintenance capabilities of the main information systems.

Diagram 1 illustrates the current architecture of the Authority's systems. While the current approach is convenient for users, it involves duplication of data processing for those applications that require the data from the database to be modified in some way.

In order to reduce the duplication in data processing across the systems, the Authority is moving towards a Services Oriented Architecture. This will reduce duplication, allowing necessary data processing to be performed only in one location. Diagram 2 shows the architecture of the system for a particular data set after web services have been adopted.

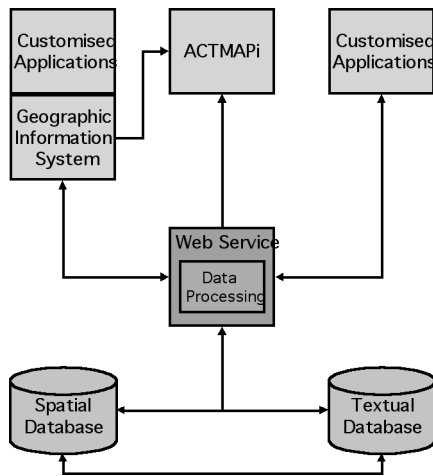For example, we are currently developing a web service to provide

Diagram 2: Current System Architecture

information about the sequence of land parcels through time, returning the predecessors and successors for a particular parcel, with relevant dates. The sequence is determined using a spatial query to identify all parcels that intersect with the parcel of interest, and then ordering the results according to their dates. This requires processing that is currently done using a customised application as an extension to the GIS, and is not available to the non-spatial corporate system because of the lack of spatial processing capability. For this reason, the sequences are stored in a table on the non-spatial system, and the table must be maintained.

The parcel sequences web service will perform the spatial query on demand and provide the results to the querying system, whether spatial,

textual or ACTMAPi. Sequences data will not be stored in any table, but will be calculated as required. Since systems that access the data will receive the results of a query from the web service, they will not need to do any processing themselves, and will not need spatial processing capability. In this way, the web service will reduce maintenance effort on data and code, but still maintain maximum user flexibility in offering a choice of systems with which to access the data.

In addition to the benefits to the Authority in developing a Services Oriented Architecture, the new approach will also provide benefits to the Authority's clients and other government departments. These clients and departments will be able to access the Authority's web services directly, and integrate calls to the web services within their own systems.

This is particularly relevant to the Authority due to its role as the custodian for a number of data sets, and the associated requirement to supply these data sets to clients for their own use. The development of web services has the potential to remove the need for clients to obtain and store their own copy of large data sets, because they will instead be able to use their systems to call the Authority's web services and thus query the relevant data on demand.

Where the move to a Services Oriented Architecture provides solid

architectural foundations for the Authority's future directions, the ACTMAPi web mapping application aims to improve the user experience in the future, and to make use of the architectural developments offered by the new technology.

ACTMAPi currently provides access to the major land information data sets for which the Authority is custodian, and is mainly focussed on a spatial interface. However, it is currently being extended with the view to developing a user-friendly single point of access to planning and land administration data for the ACT.

The ACTMAPi web mapping application will work together with the Services Oriented Architecture to provide a single, user-friendly point of access to data that is relevant for planning and land administration within the ACT. In this way it is hoped that data provision will become more efficient, as well as more convenient and flexible for end users, providing them with a useful tool with which to fulfil their day to day business requirements.

Dr. Kristin Stock works for the Australian Capitol Territory Planning and Land Authority. For more information, contact Dr. Stock via email at: kristin.stock@act.gov.au or via mail at: 16 Challis Street, Dickson, ACT 2602, or call (02) 6253 9836.

Geospatial Data Coordination within the Australian Government

By Dr John R. Busby
General Manager – Office of Spatial Data Management
Australian Government

On 25 September 2001, the Australian Government announced a new Policy for Spatial Data Access and Pricing (http://www.osdm.gov.au/osdm/policy.html). Key aspects of the Policy are:

- Fundamental spatial data will be provided free of charge over the Internet, and at no more than the marginal cost of transfer for packaged products and full cost of transfer for customised services;

- There will be no restrictions on commercial value-adding to the listed fundamental spatial datasets, although each transaction will be subject to a licence setting out the conditions of the transfer;

- An Internet-based public access system will be developed within the framework of the Australian Spatial Data Infrastructure;

- The Australian Government will negotiate a multilateral agreement with the States and Territories for access to spatial datasets required for Australian Government purposes;

- New administrative structures will be established to manage the implementation of the new access and pricing policies.

Non-Australian readers would need to be aware that government data in Australia is not necessarily considered to be freely available in the public domain. Different government jurisdictions, and even individual agencies, have their own data access policies. The above was a significant advance on previous data access arrangements.

The Minister for Industry, Tourism and Resources is responsible for Policy. The administrative arrangements that were established to implement the Policy are roughly equivalent to the U.S. Federal Geographic Data Committee (http://www.fgdc.gov/). They comprise:

- Spatial Data Policy Executive (SDPE) http://www.osdm.gov.au/osdm/sdpe.html - the peak body overseeing implementation of the Policy. It reports to the Minister for Industry, Tourism and Resources;

- Spatial Data Management Group (SDMG) http://www.osdm.gov.au/osdm/sdmg.html – the operational manager of the Policy implementation. The SDMG comprises representatives from (currently) 31 Australian Government departments and agencies. It meets in July and December, and establishes working groups to advise it on difficult or complex issues; and

- Office of Spatial Data Management (OSDM) http://www.osdm.gov.au/osdm/about.html – the very small coordinating body that supports the above committees, the various specialist working groups and executes an approved work plan designed to implement the provisions of the Policy.

The Policy does not necessarily apply to all geospatial data held by government. There is a range of reasons, including national security, privacy, commercial confidentiality and shared intellectual property, why data might not be freely available. The Policy applies only to data listed on a Schedule http://www.osdm.gov.au/osdm/schedule.html, which is maintained by OSDM. Listing of datasets is voluntary, though every effort is made by OSDM to encourage custodians to list 'fundamental' data, where practicable. OSDM conducts regular surveys of Australian Government agencies to identify data priorities.

Recent achievements include:

- Development of an Australian Government Profile (http://www.osdm.gov.au/osdm/docs/resources/mwg_aus_gov_profile.pdf) of the ISO 19115 Spatial Metadata Standard

- Development of a single data licence for datasets on the Schedule

- Development of a web-based Licence Registration Service to facilitate user access to datasets that custodians choose to make available via the Service

Ongoing activities include increasing the number of datasets on the Schedule, improving the quality of both the datasets and their metadata, and raising awareness and building capacity amongst Australian Government agencies.

OSDM organizes seminars and briefings on geospatial data topics, e.g. "Interoperability: Responding to National Drivers," and also produces a newsletter. These and other information items are made available through our Resources service (http://www.osdm.gov.au/osdm/links.html).

OSDM is not an operational body. We don't build portals or deliver geospatial data, information or services. That is the responsibility of line agencies. However, we encourage open-standards-based best-practice acquisition, management, exchange and use of geospatial data. In essence, we seek out opportunities to lower the barriers to access and use of geospatial data, whether they are jurisdictional, organizational, inter-personal or technical.

Geospatial data coordination within the Australian Government is harmonized with equivalent activities in Australian State & Territory governments and New Zealand, through ANZLIC – The Spatial Information Council (http://www.anzlic.org.au/). ANZLIC is facilitating the development of the Australian Spatial Data Infrastructure (ASDI) http://www.anzlic.org.au/infrastructure_ASDI.html. The most tangible implementation within the ASDI, to date, has been the Australian Spatial Data Directory (ASDD) http://www.ga.gov.au/asdd/, a distributed metadata repository comprising 25 nodes around Australia, collectively referencing some 37,000 geospatial datasets.

Broader ICT coordination within the Australian Government is the responsibility of the Australian Government Information Management Office (AGIMO) http://www.agimo.gov.au/index.htm. Initially, geospatial data issues were not prominent in AGIMO's planning and activities. This is gradually changing as the significance of geospatial data is increasingly recognized and it is progressively mainstreamed into broader data management policies, protocols and practices in government.

Dr. John Busby leads the Office of Spatial Data Management, a small team charged with implementing the Australian Government's Policy on Spatial Data Access and Pricing and, more generally, coordinating spatial data infrastructure issues across Australian Government agencies. For more information contact Dr. Busby via e-mail at: John.Busby@osdm.gov.au.

VanMap, *An Innovative Solution to Data Dissemination: City of Vancouver*

Jonathan Mark, GIS Manager, City of Vancouver
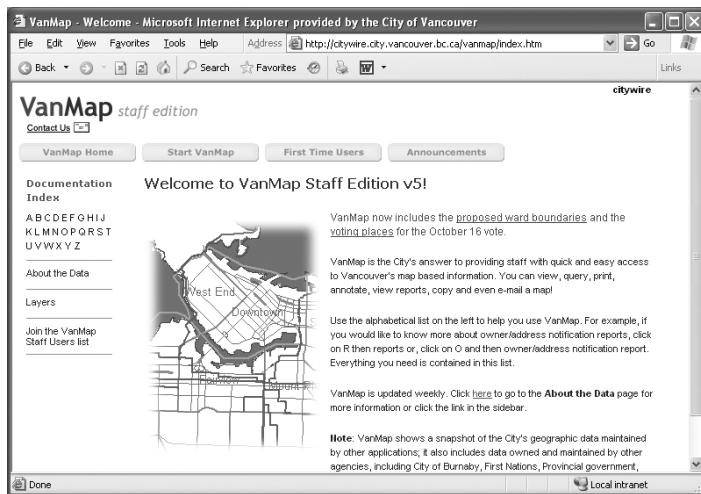
The VanMap Initiative

A municipal government's primary objective is to provide service to its citizens. Services typically include provision and maintenance of streets, parks, water and sewers, garbage collection, police and fire protection, fiscal management, and a host of other services. This variety of services makes the municipal government one of the more complex organizations in existence.

The efficient provision of services requires reliable information on which decisions can be based. Because 80% to 90% of the information maintained by municipal governments is tied to location, the creation, maintenance, analysis, and dissemination of this location-based information has become increasingly important to municipalities.

Like many municipalities, the City of Vancouver has gone through the general process of storing information on paper and in files, then slowly moving much of it to computer-based applications and then employing web technology to make it more accessible. For the location-based information, the City of Vancouver employed automated mapping technology in the early 1980s and geographic information system technology (GIS) in the early to mid 1990s. The City addressed the data dissemination issue head on by introducing VanMap, a web-based GIS, in 1999. VanMap:

- Makes more and better quality information available to both staff and the public more easily.

- Integrates the data into the business and decision-making process.

- Improves the ability of the public to obtain information on a self-service, 24x7x365 basis.

- Improves service to the public directly by providing better information to staff.

- Increases the sharing of data across the organization to reduce redundancy and increase quality.

VanMap

VanMap's front end is an easy-to-use familiar web-based interface using Autodesk MapGuide technology. On the back end is an enterprise Oracle Spatial database with links to other application databases from across the City. As a result, VanMap integrates data from a variety of disparate sources.

VanMap was released to staff in September 1999; significant enhancements have been made on a continuing basis since then. VanMap was released to the public in May 2001 with ongoing enhancements. In October 2002, VanMapLite, using MapGuide LiteView, was made available to the public. It operates on a wider variety of technology platforms but has less data and functionality than its siblings.
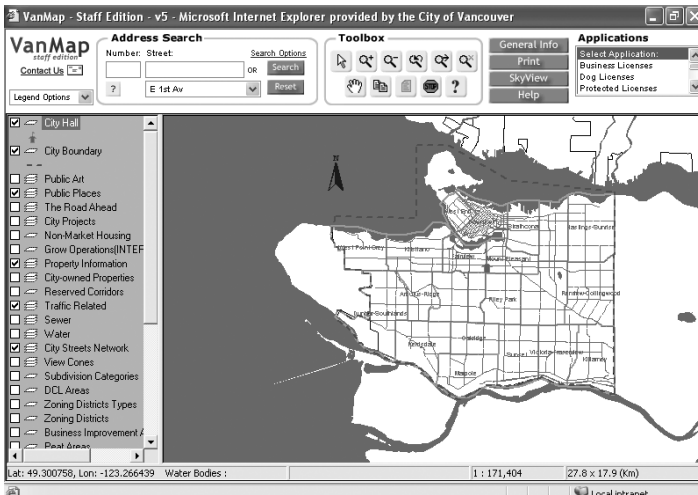
Results Achieved To Date

Both staff and the public have readily embraced VanMap. This is apparent by looking at usage statistics, data layers, functionality, user comments, and recognition.

- When first released in 1999, the staff version of VanMap was accessed from 300 different PCs in the City one or more times during the month. By November 2004, VanMap was being accessed by over 1,000 PCs in the City in the month.

- When first released in 2001, the public version of VanMap was accessed by approximately 1,100 different PCs during the month. By November 2004, this increased to over 6,500; over 53,000 unique users accessed public VanMap in 2004.

- VanMap's public version is being accessed by engineers, architects, real estate agents and the general public in the Vancouver area, across Canada and around the world.

- The first version of staff VanMap in 1999 had 17 layers of data; the current version of VanMap has over 130 layers.

- Functionality has grown from virtually nothing to including fifteen reports, a sophisticated address search tool, and several business applications.

- VanMap has received a variety of positive comments from its users including:

  - "The VanMap site is fantastic!"
  - "I strongly believe that VanMap is the best software tool we have at the City."
  - "It's the best map of a city I've ever seen yet!"
  - "Your implementation of VanMap, using Autodesk's MapGuide application is outstanding. It's exactly the kind of site that I envisioned when we started the development of the MapGuide technology back in 1995" (from the original developer of MapGuide).

- For its work with VanMap, GIS, and CADD, Autodesk nominated the City for the Computerworld Honors Award in 2002 (one of 313 nominations from 33 countries). VanMap has received other awards and recognition including Autodesk Customer Innovation awards, Directions Magazine's Web Mapping Solution of the Week and SpatialNews' Site of the Week.

Among many other uses, VanMap is used:

- as a source of current information needed for many City business processes.

- to notify owners, occupants, or businesses about impending developments in a specific geographic area.

- for tree bylaw enforcement.

- in the development process for context analysis and presentations.

- as a source of evidence in court cases and for crime scene investigation.

- by the public to reduce trips to City Hall.

VanMap-Based Applications

VanMap-based applications for staff include the following:

- Business and Dog License look up application, which is used to report on and display specific types of business and dog licenses.

- View Zones and Areas application, which is used to display specified zoning areas and calculate their areas.

- Custom Mapping application, which is used to create, save, and access marked up maps with symbols and text.

- Legend Manager application, which is used to create a custom legend that includes only the layers that are desired for an individual or work group.

- Notification application, which is used to notify owners, occupants, or business license holders in a designated polygon area.

- Reportal application, which is used to access property-based information including up to 15 reports derived from City applications including tax assessments, ownership, building permits, business licenses, dog licenses, non-market housing and youth organizations.

- View Cone Height Calculator application, which is used to identify the maximum building height for parcels in one or more view cones protected areas.

- Thematic Mapping application, which is used to create maps that are themed based on their attributes.

- Query Builder application, which is used to construct queries of features based on their attributes and provide the results in a report or map.

- Cemetery Viewing application, which is used to search the cemetery's 125,000 records and then zoom to the specific gravesite for the individual.

- Engineering has developed a number of applications on VanMap's MapGuide foundation referred to as ENGIS Web that are customized for various work groups.

VanMap Site References

The public version of VanMap is accessible from the City of Vancouver's web site at www.city.vancouver.bc.ca/vanmap. Staff VanMap is not accessible to the public due to security restrictions but screen captures are included below.

Jonathan Mark is the City of Vancouver's GIS Manager. In this role, he and his teams are responsible for the city's corporate GIS infrastructure, as well as the VanMap implementation. For more information contact Mark via e-mail at: jonathan.mark@vancouver.ca or call 604-873-7987.

Restructuring the Geographical Information Production and Dissemination at National Level – The Experience of Portugal

Prof. Dr. Rui Pedro Julião, Vice-President
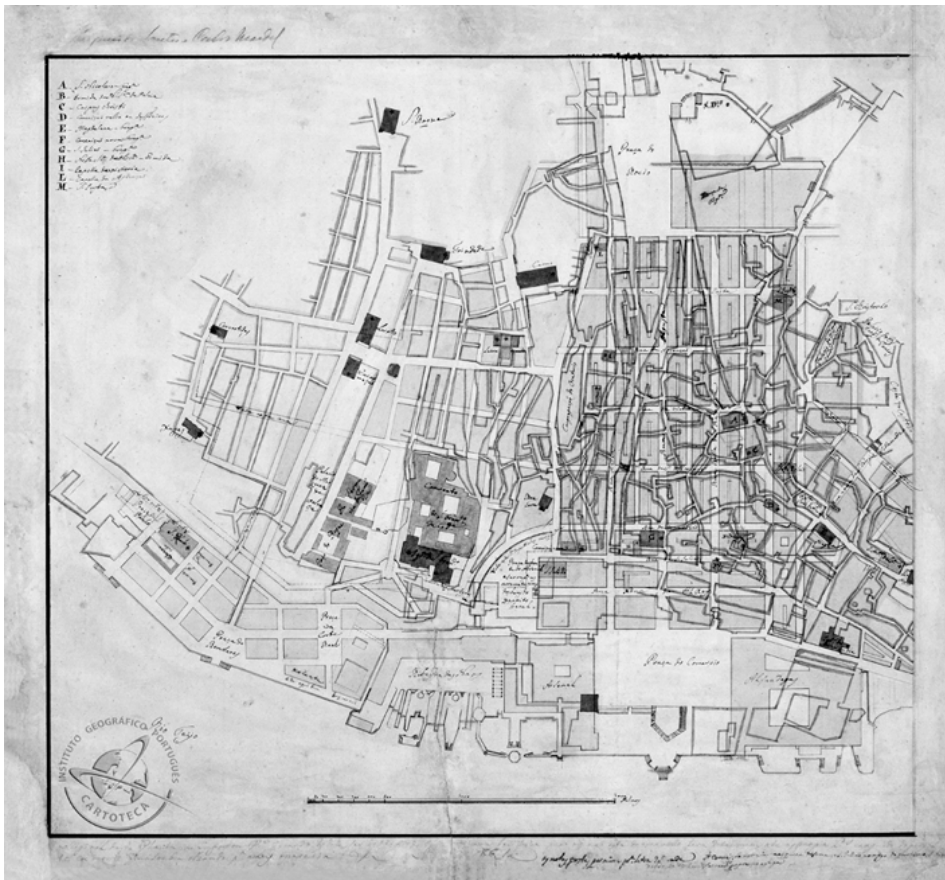*Instituto Geográfico Português*

Figure 1 – Lisbon's Reconstruction Plan

Introduction

Society is always in movement, rapidly changing. Because of this constantly shifting environment, it is necessary to adopt new ways of monitoring processes and providing information that can assist decision-makers. As critical pieces in the development of an Information Society, the production and dissemination of geographical information to organisations and individuals must evolve as well.

In Portugal there is a long tradition of geographical and cartographic information. From the time of explorers in the 15th Century till modern times, cartography has been a very important method of knowledge communication and useful decision support tool. For instance, Figure 1 shows how cartography was used after 1755 Lisbon's earthquake to help the reconstruction process.

More recently in 1995, Portugal made a giant step in geographical information when it established the online National Spatial Data Infrastructure (SNIG) project. In fact, Portugal was one of the first countries to support the development of a SDI and a pioneer in the use of Internet to disseminate data.

Governments must also adopt new ways of interacting with the citizen by creating new infrastructures and modernizing its bodies. The Portuguese Government restructured geospatial agencies in an effort to better serve the market and users of geographical information. The National Mapping Agency (Portuguese Institute of Cartography and Cadastre – IPCC) and the National Centre for Geographical Information (CNIG) were reorganized into a single organization, the Portuguese Geographical Institute (IGP), in 2002.

IGP's mission is to serve as the national authority of cartography, produce official geographical information, develop and coordinate the national system of geographical information, promote research and
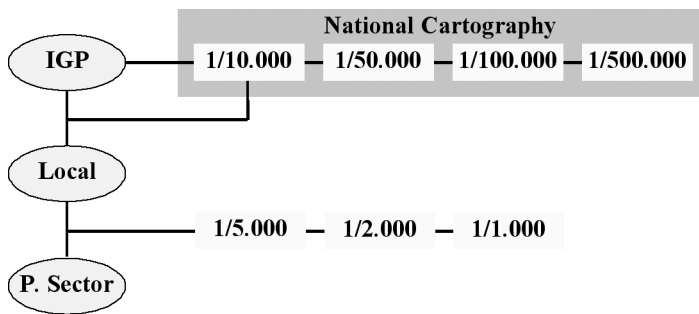
Figure 2 – Approach the Cartographic System

development in the domains of the sciences and geographical information technologies and contribute to the Information Society.

This rest of this paper will focus on three critical issues for an Information Society and major responsibilities of the Institute: Cartography, Cadastre and Spatial Data Infrastructure.

Approaches to the Cartographic and Cadastral Systems
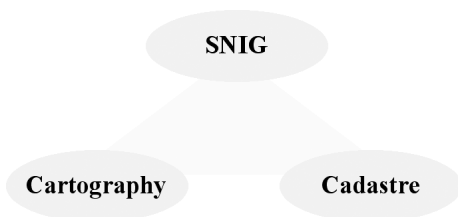
IGP is the official Portuguese agency

Figure 3 – The three systems

responsible for cartographic production and geodetic information.

IGP cartography is being developed in partnerships with local authorities. This is particularly important for the 1/10.000 scale cartography, which is

the first priority concerning geographic information production. The Portuguese government has a strong commitment in this process and is promoting the use and dissemination of this cartographic series as the reference for several public administration services. The cooperation with local authorities and other partners has been very fruitful and, hopefully, during the next two years we will move Portugal from a 50% national coverage to a total coverage.

Regarding the cadastre, the Portuguese situation is, as for other countries using the Napoleonic data structure, not a very good one. In fact, approximately 50% of the territory does not have a land record system registry. At the moment there is a high level of awareness regarding the importance of a good and efficient cadastre system and politicians are working on the necessary legislation for a new system. The cadastre can only be done with a strong commitment of all players, including IGP, local authorities and financial offices.

Approach to the National Spatial Data Infra-structure

The National Spatial Data Infrastructure is the third element of

IGP strategy for geographical information production and dissemination.

The National SDI's role is to disseminate information and this is done through a several components.

The inner components are three systems supported by a data core:

• Metadata system to help locating and characterising the information needed

• Web-based Products and Services for on-line data manipulation and visualization

• Market place for databases of products, services and projects, and also marketing

Surrounding the main components there are the access points:

• SNIG homepage for professional users (http://snig.igeo.pt)

• GEOCID homepage for citizens (http://geocid-snig.igeo.pt)

• Thematic networks for professional users of a specific thematic like Earth Observation (http://snig.igeo.pt/Portugues/RedesTematicas/Rot/) and Risk (http://scrif.igeo.pt/).

Rui Pedro Julião, PhD, is Vice-President of Instituto Geografico Portugues since 2002. He is responsible for the National Spatial Data Infrastructure and the areas of Cadastre, IT and Research. He is also Professor of GIS & Science at the Universidade Nova de Lisboa. For more information contact Prof. Julião via email at: rpj@igeo.pt.

Fifty States and Equivalent Entities Initiative

By Mr. William S. Burgess,
Washington Liaison,
National States Geographic Information Council

The Fifty States and Equivalent Entities initiative outlines a fundamental change in the way governments will work together to build the National Spatial Data Infrastructure. Presidential Executive Order 12906 defines the NSDI as "the technology, policies, standards and human resources necessary to acquire, process, store, distribute and improve utilization of geospatial data." As detailed in Office of Management and Budget (OMB) Circular A-16, the NSDI "assures that spatial data from multiple sources (federal, state, local, and tribal governments, academia, and the private sector) are available and easily integrated to enhance the understanding of our physical and cultural world." The Federal Geographic Data Committee (FGDC) is designated as the coordinating entity responsible for developing and implementing national strategies to advance the goals of the NSDI. (See Circular A-16 at: (http://www.whitehouse.gov/omb/circulars/a016/a016_rev.html).

Instead of the current "build it and they will come" philosophy that relies on a series of random grants and partnerships, a new program emphasizing strategic and business planning with specifically targeted implementation grants, performance measures and incentives will be employed. This initiative is one of twelve planning activities that are either complete or "in development" as a result of the Future Directions strategic planning process being used by the Federal Geographic Data Committee (FGDC - http://www.fgdc.gov)

A team of Federal, state and local government representatives, created the Fifty States and Equivalent Entities action plan. It was approved for implementation by the Board of Directors of the National States Geographic Information Council (NSGIC – http://www.nsgic.org) in December 2004 and by the FGDC Coordination Workgroup in February 2005. It identifies the important criteria, characteristics and activities that will be used to identify and measure effective statewide coordination councils in the future. It also identifies the implementation steps required by the Federal government and states to establish these more formal statewide coordination councils so that they take an active roll in completing the NSDI. You can find the Action Plan at: http://www.fgdc.gov/FutureDirections/action_plans/pdf/FD _PART_Fifty_States_Contributing_NSDI_Final_Action_Pl an_v9.pdf

NSGIC estimates that the geographic data required by state, local, regional, tribal and federal governments would cost in excess of $6.6 billion, not including the on-going maintenance costs. There are over 327 tribal governments, 18,000 municipal governments, 3,141 county governments, and unknown numbers of regional organizations that are all creating geographic data in addition to the states, external entities and the Federal government. Our coordination efforts need dramatic improvement. Otherwise, these organizations will continue creating the same data on a frequent basis. By some estimates, there may be as much as 50% waste. We simply can't tolerate this situation, and it's time for all levels of government to work together to stop the waste. The planned solutions include a series of well thought out performance measures, incentives and rewards.

Bill Burgess is the Washington Liaison for the National States Geographic Information Council (NSGIC). He represents state government interests while working with Federal agencies and other stakeholder groups on geospatial issues. For more information contact Bill via email at: William.burgess@comcast.net.
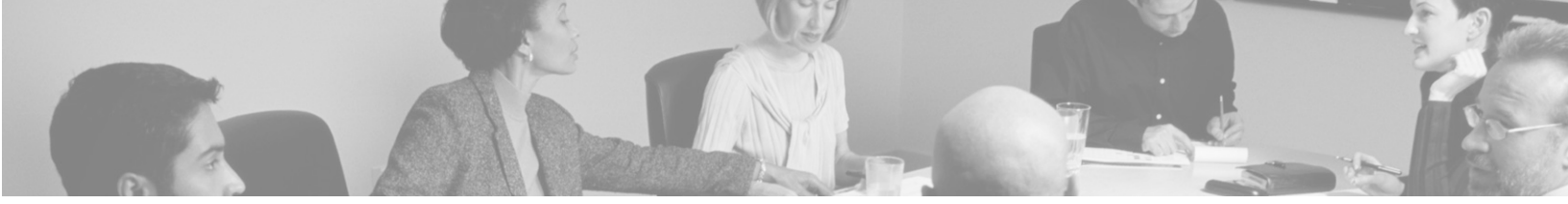
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Office of Intergovernmental Solutions

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