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GeoStor

2003 NASCIO Recognition Awards

Executive Summary

The terrorist attacks of September 11 re-established the need for rapid and accurate access to geographic data concerning critical infrastructure facilities and transportation information. A large impetus to the growth in GIS use came in the late 1990s when governments were mandated to adopt 9-1-1 systems for law enforcement, fire, ambulance services, search and rescue, and disaster management.

GeoStor is the nation's first statewide, publicly-accessible, multi-vendor, enterprise-class geospatial information system. Arkansas is using it for much more than just public safety and emergency response. It is the nucleus of a far-ranging suite of applications and services using software from numerous companies.

Possibly of greatest importance, GeoStor removed significant barriers to adoption of geospatial technology at the rural and county level in Arkansas. The compilation of over 500 publicly accessible geospatial layers allows even the most technically-challenged community to access, search, and retrieve spatial data for use in free map-viewing software.

We live in an information and data driven society. Whether for an industrial prospect asking questions on a state level, or a small community dealing with a commercial developer, we need information now. The old adage "Knowledge is power" has never been more true in our world of split second decision-making and fast paced business development. The ability to respond rapidly with high quality spatial information can make the difference between life and death in the event of a natural disaster or terrorist attack. It can also determine whether a commercial prospect chooses to locate in Arkansas, bringing jobs and commerce to our state.

GeoStor was developed not just for state government use but for global utilization and is available free to the public. Economic development teams can use GIS to quickly locate commercial and industrial properties meeting specific requirements for prospects such as proximity to markets, transportation infrastructure or natural resources. Retail companies might use GIS data to select the best location for a new store. GIS market analysis tools can help businesses decide which products and promotions match the lifestyles and buying patterns of an area. Banks and financial institutions can use GIS technology to gain knowledge of customers' purchasing habits, financial behavior and need for other products or services. They can save money by targeting their best prospects.

GeoStor is the nation's first statewide, publicly accessible, multi-vendor, enterprise class geospatial information system. It currently holds more than two terabytes of geospatial data in an Oracle 9i object relational database and is the nucleus of a wide suite of applications and services using software from numerous companies.

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The quick and easy flow of geographic information ~~is allowing~~ state agencies to utilize and share data ~~for taxpayer benefit.~~ ~~In the past they had been unable to do so due to the lack of resources to process, format, and re-project geospatial data from other agencies with different software.~~ ~~Operationally, in-~~State agencies ~~alone, there is~~ no longer ~~have a requirement~~ to store unnecessary statewide GIS data sets on local and departmental servers. Geospatial data is also passed through GeoStor laterally from public agencies to their private contractors, who may require geospatial data to complete a job on their behalf. Prior to GeoStor, contractors charged increased costs to public agencies in order to prepare geospatial data, whereas now they can simply acquire the spatial data using GeoStor. ~~The public agency is no longer burdened with employee resources spent preparing geospatial data for a contractor as well.~~ All of the spatial data access for GeoStor is driven by Federal Geographic Data Committee standard metadata and this ensures that the user can judge what spatial data set is appropriate for his or her needs at a quick glance.

~~Lastly, and possibly of greatest importance, we believe GeoStor is removing a significant barrier to adoption of geospatial technology at the rural and county level in Arkansas. The compilation of over 500 publicly accessible geospatial layers allows even the most technically challenged community to access, search, and retrieve the spatial data for use in free map viewing software. At the very least, the broadened utilization benefits the community without complex analysis. After all, knowledge begets power and information begets knowledge.~~

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A. Description of project, including length of time

~~In January 2001, the GeoStor system became publicly accessible in January 2001. It is the nation’s first statewide, publicly-accessible, multi-vendor, enterprise-class geospatial information system. GeoStor serves as a single source of geospatial data for many state and local agencies as well as the public, increasing efficiency, ease of access, and reducing redundancy. As a statewide enterprise system, it allows spatial data producing agencies the ability to have direct read/write access to the same geospatial data that can then be made directly accessible to the public via a different interface. GeoStor allows for a single, integrated system to provide all cooperating agencies and the public the ability to utilize different software solutions and spatial data formats best fitted to their uses. For example, large-scale site developers can access spatial data in multiple CAD formats in state-plane survey-feet units. Agencies with statewide mandates can access the same spatial data in a wide range of GIS vendor formats (e.g. ESRI, MapInfo, Intergraph, and etc.) and projections. Multiple levels of security allow elements of the same spatial data to be provided to the public while restricting certain categories to agency users.~~

It currently holds more than two terabytes of vector, image, and grid spatial data in an Oracle 9i object-relational database and is the nucleus of a wide suite of applications and services using software from numerous companies. There are more than 4500 seamless, statewide feature classes (themes) that have been developed from more than 14,000 individual spatial data files. ~~GeoStor serves as a single source of geospatial data for many state and local agencies as well as the public, increasing efficiency, ease of access, and reducing redundancy. As a statewide enterprise system, it allows spatial data producing agencies the ability to have direct read/write access to the same geospatial data that can then be made directly accessible to the public via a different interface. GeoStor allows for a single, integrated system to provide all cooperating agencies and the public the ability to utilize different software solutions and spatial data formats best fitted to their uses. For example, large scale site developers can access spatial data in multiple CAD formats in state plane survey feet units. Agencies with statewide mandates can access the same spatial data in a wide range of GIS vendor formats (e.g. ESRI, MapInfo, Intergraph, and etc.) and projections. Multiple levels of security allow elements of the same spatial data to be provided to the public while restricting certain categories to agency users.~~

B. Significance to the improvement of the operation of government

~~Rapid access to high-quality geospatial data has become a vital component of the activities of most local, regional, and state agencies and the public. Development of this enterprise solution has reduced cost and increased performance and ease of access. In a statewide survey conducted by the Arkansas Geographic Information Office, participant’s characterized access to geospatial data as an essential requirement. Rapid access to high-quality geospatial data has become a vital component of the activities of most local, regional, and state agencies and the public. Development of this enterprise solution has reduced cost and increased performance and ease of access.~~ In addition to developing an accessible source of geospatial data, it is also important that the system serve as an enterprise “back-end” to a wide range of applications. In this way, the initial investment in the system is leveraged to ~~facilitate~~provide multiple applications. This is cost effective and ensures that different applications work from a common database. The spatially enabled database management system structure provides the infrastructure that allows

multiple spatial data providers to locally maintain their own internal information while electronically updating the enterprise system.

GeoStor ~~can~~ reduced the duplication of spatial data across agencies, municipalities, and the public. Because timely spatial data was not previously accessible, each agency developed its own version of various standard spatial data and added agency-specific spatial data. For example, multiple agencies have developed their own versions of the statewide transportation spatial data. With GeoStor, the Arkansas Highway and Transportation Department can immediately post any changes to the state's transportation infrastructure and all other users have direct and instant access. The enterprise architecture is facilitating public / private sector collaboration. In one example, multiple agencies, communities, and private sector firms have collaborated to develop a single street-centerline spatial data structure that will be implemented in GeoStor and will allow all the groups to collaboratively share the highest resolution spatial data.

C. Benefits realized by service recipients, taxpayers, agency or state.

Major users of the spatial data distribution system are state agencies and private sector companies, followed by universities, local communities, schools, and federal agencies. The following vignettes are provided by GeoStor users in their own words.

"Fort Chaffee, Arkansas was one of the military bases decommissioned in the recent past. A Hatfield-McCoy feud brewed between the cities of Fort Smith and Barling regarding the surplus Fort Chaffee lands. During a two-day span, I was required to create some 20 different maps of various land-swap scenarios. This required compiling non-existent base information encompassing the immediate Fort Chaffee area and the City of Barling. In all, we needed twelve square miles of geodata we didn't have. Everything from transportation to hydrography COULD be used as a potential boundary and had to be incorporated to our existing system in a BIG hurry. Utilizing GeoStor, we had everything we needed in our coordinate system and projection in less than two hours. Without GeoStor, we were looking at a week by the time we tracked down the data and converted to our coordinate system and format. It was amazing to everyone, including the legal teams, that the Barling city limits were actually up-to-date and reflected their "annexation" of yet-to-be released Fort Chaffee land. It sure beat COGO-ing 23 pages of legal descriptions. Eventually, we will be replacing the GeoStor information with higher accuracy data. But for now, the GeoStor information is proving invaluable."

Russell Gibson, GIS Coordinator
Department of Information & Technology Systems
City of Fort Smith, Arkansas

"My name is Randy Everett and I serve as the GIS Supervisor for North Arkansas Electric Cooperative. The electric cooperative in which I work has already reaped benefits from GeoStor. The information that is now available on GeoStor is just a small portion of what can and will be offered. As a not-for-profit organization, our resources are somewhat limited and GeoStor is able to offer us information via the Web for free. The aerial photography and USGS topographic maps allow us to do some engineering work in house that was previously contracted by outside engineering firms, which saves the cooperative money, which in turn saves the members money.

Randy Everett, GIS Supervisor
 North Arkansas Electric Cooperative
 Salem, Arkansas

“GeoStor is going to improve the mapping ability of the counties. It gives the assessors a starting point to build on and anyone that doesn’t capitalize on this great tool will be sorry later on when they try [to] start a mapping program. I can see how beneficial a mapping program such as GeoStor would be, not only [to] 911, but [for] the assessors to be able to check soil codes, crops, wet lands, and many other areas. I get excited thinking of the possibilities that come from GeoStor.”

Harley L Bradley, County Assessor
 Mississippi County
 Blytheville, Arkansas

D. Return on investment, short-term/long-term payback

The real payback is in the increase in economic development; saved lives; improved public safety; increased disaster preparedness from the add-on applications. While the search anretrieval information that follows shows a more than 10:1 improvement in speed of access, the real value comes in what is now possible with the use of additional applications accessing information in GeoStor. A quick comparison of the cost difference between the Old Way of acquiring geospatial data as compared to the GeoStor Way reveals a 92% reduction in cost. A quick comparison of the cost difference between the Old Way of distributing geospatial data by employees at AHTD as compared to the GeoStor Way demonstrated a 99.96% reduction in cost.

Our comparative analysis demonstrates a 92% reduction in the time to search, acquire, and utilize geospatial data about Arkansas. The AHTD example represents a 99% reduction in the time to distribute their geospatial data about Arkansas. The barriers to geospatial data are significantly reduced. The result is a huge increase in the adoption and use of geospatial technologies even at the most rural levels.

The following series of tables developed by the Arkansas Geographic Information Office were used to demonstrate the value of GeoStor to the Arkansas Legislature. The benefit calculation are based on 22,349 downloads in 2002. The calculation assumes a fully burdened employee cost of \$20 per hour, an intentionally conservative rate. The download time rate from GeoStor is based on average test times experienced by office staff from GeoStor on a variety of custom geographic extents, on both raster and vector spatial data packages, in a variety of projections and formats.

Table 1.

The Old Way

Agencies Data Search & Acquire Cost

Custom One Layer Search

	Hours	Time Rate	Sub-Total
Time to Search for 1 Layer	2	\$20	\$40.00
Long Distance Fees	.0835	\$0.08	\$0.40

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Time to Wait on Mail Layer Received	16	\$20	\$320.00
Layer Fee			\$0.51
Media Setup Fee			\$9.95
Time to Reformat	0.25	\$20	\$5.00
Time to Reproject	0.25	\$20	\$5.00
Total	23.5		\$375.86

One Year Assumed Request Impact

Search & Acquire Cost Impact

One Layer Search Per Week	Agencies Impact	Per Unit	
22349	1	22349	\$375.86
			\$8,400,095.14

Table 2.

The GeoStor Way

Agencies Data Search & Acquire Cost

Custom One Layer Search

	Hours	Salary Rate	Sub-Total
Time to Search for 1 Layer	0.5	\$20	\$10.00
Time to Wait on Download	1	\$20	\$20.00
Layer Received			
Time to Transfer from media to GIS	0	\$20	\$0.00
Time to Reformat	0	\$20	\$0.00
Time to Reproject	0	\$20	\$0.00
Total	1.5		\$30.00

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One Year Assumed Request Impact

Search & Acquire Cost Impact

One Layer Search	Agencies Impact	Per Unit	
22349	4	22349	\$30.00
			\$670,470.00

Table 3.

Search & Acquire	Old Way		GeoStor Way	
	Time/Hours	Money	Time/Hours	Money
	525,201.5	\$2,142,375.14	33,523.5	\$670,470.00

A quick comparison of the cost difference between the Old Way of acquiring geospatial data as compared to the GeoStor Way is \$7,729,625.14 for a 92% reduction in cost. Again, a point of reminder: although the information above is based on actual download

statistics; that calculations do not take into account the time savings for delivery of a custom geographic extent. In simplistic terms, prior to GeoStor, a user would be required to acquire spatial data for three counties in order to have the files needed for a study area where the three counties share boundaries. Using GeoStor, the user only needs to select the geographic extent of the study area; if the user simply decides that he or she needs the geographic extent of the entire state, this option is available.

A secondary comparison of agency savings for spatial data distribution is provided below in Tables 4, 5 and 6. This analysis is based on the Top 25 total number of downloads from the list above for spatial data developed by the Arkansas Highway and Transportation Department (AHTD). During the time period presented, spatial data from AHTD was downloaded 2,767 times.

Table 4.

The Old Way

State Agency Spatial Data Distribution Costs

Custom One Layer Request

	Hours	Salary Rate	Sub-Total
Time to Take Request	0.15	\$20	\$3.00
Time to Search for 1 Layer	0.25	\$20	\$5.00
Time to Organize 1 Layer	0.5	\$20	\$10.00
Time to Media Transfer	0.25	\$20	\$5.00
Time to Reformat	0.25	\$20	\$5.00
Time to Reproject	0.25	\$20	\$5.00
Materials Cost			\$0.10
Mailing Cost			\$0.68
Total	1.5		\$33.78

One Year Assumed Request Impact

Custom Request	Agencies Impact	Per Unit
2767	1	2767

Distribution Cost Impact

\$93,469.26

Table 5.

The GeoStor Way
Custom One Layer Load to GeoStor

	Hours	Salary Rate	Sub-Total
Time to Search for 1 Layer	0.25	\$20	\$5.00
Time to Organize 1 Layer	0.5	\$20	\$10.00
Time to Media Transfer	0.25	\$20	\$5.00
Time to Reformat	0.25	\$20	\$5.00
Time to Reproject	0.25	\$20	\$5.00
Materials Cost			\$0.10
Mailing Cost			\$0.68
Total	1.5		\$30.78

Custom Load	Agencies Impact	Per Unit	Distribution Cost Impact
1	1	1	\$30.78
			\$30.78

Table 6.

	Old Way		GeoStor Way	
	Time/Hours	Money	Time/Hours	Money
Distribution	4150.5	\$93,469.26	1.5	\$30.78

A quick comparison of the cost difference between the Old Way of distributing geospatial data by employees at AHTD as compared to the GeoStor Way is \$ 93,438.48 for a 99.96% reduction in cost. Our comparative analysis demonstrates a 92% reduction in the time to search, acquire, and utilize geospatial data about Arkansas. The AHTD example represents a 99% reduction in the time to distribute their geospatial data about Arkansas. The barrier to geospatial data has been significantly reduced. The result is an increase in the adoption and use of geospatial technologies even at the most rural levels.