

## GIS Centric Approach to Enterprise GIS HCG Case Study

GIS, as a part of local government has taken deep root globally. As systems mature beyond the point of creation and maintenance, a new evolution is taking place. Local governments that have spent hundreds of thousands of dollars on developing and maintaining extensive datasets, are looking to leverage GIS throughout their enterprise. For every entity "enterprise" represents something different. The vision to accomplish it will take different paths. Leveraging GIS investments utilizing common datasets and structures is becoming a complex and sometimes daunting challenge when trying to marry GIS to standard enterprise applications. Even more of a challenge is the identification of software solutions with GIS capabilities inherently designed into the software, rather than connected to the software.

Horry County, SC (pronounced O-REE) is best known for its beaches and golf courses. Horry County is home to Myrtle Beach, a top ten family vacation destination sometimes called the Grand Strand and a favorite for golfers winter, spring, summer or fall. Horry County is also one of the fastest growing counties on the east coast, 1100+ square miles, 180,000+ parcels, 200,000+ year round residents and close to 1.2 million visitors annually. GIS has become a mainstay for Public Safety issues, development issues and every aspect of county and city government.

The vision for Horry County, South Carolina – often referred to as Horry County Government (HCG), may be considered as "next generation". HCG is no longer dreaming about leveraging its substantial GIS investment, it is becoming a reality. Behind the vision for the county is HCG's IT/GIS philosophy that there are only two kinds of data spatial and financial, and even they relate at times. The scope of HCG's enterprise (countywide/cross jurisdictional) and GIS centric approach to deployment will make HCG unique in many aspects. The vision is that ALL public entities will access a single data source for all countywide datasets (streets, parcels, site address points, hydrology, imagery) stored in ArcSDE for SQL Server. Jurisdiction specific datasets with common interest (zoning, land use, etc.) would be maintained in the common SDE datasets, but would be edited by the responsible jurisdiction, all via a common WAN. Secondly, ALL new software solutions deployed by the County MUST be GIS centric. GIS centric in that a common SDE dataset, and GIS data models form the foundation for these new applications. Software solutions should have the flexibility to conform to the existing data structures designed and maintained in the existing systems without completely recreating or replicating to a solution specific format or schema.

### **GIS History**

Horry County began its' GIS initiative back in the mid 1990's. Like many other county governments, the importance of an up-to-date land base was realized and the goal to develop and maintain such was begun. While partnering with other entities was attempted, the attitude was "Let them fund the project and then we'll benefit from there efforts, IF they ever get it done." The County began its' project and funded it with an 8

million dollar bond issue to obtain the hardware, software and data necessary to develop the system.

The first step in the process was to send out an RFP for qualified vendors to begin the project. A vendor was selected, by a divided selection team (ESRI came in second). Soon after the unofficial vendor selection, hurricane Hugo chose Horry County as its target. The selected vendor was asked for assistance and was more than happy to assist, for a price to assist in the disaster recovery. ESRI to the rescue. While not the selected vendor, ESRI came with hardware and software in hand, at no charge, to assist in the recovery. The attitude of ESRI and the capabilities of the software, changed the selection to an ESRI solution and team. That was in 1997. The project began with the collection of aerial imagery and development of the planimetric datasets, followed by conversion of the parcels into ESRI formats.

The data began to be utilized but needed much local updating and QA/QC due to the large amounts of development and growth the county was experiencing. During this process the GIS Department was merged with the IT Department. Staff changes within the department, and construction of new facilities enabled the Department to envision new directions for the GIS. It was realized that for County staff to even begin to utilize the GIS the existing dumb terminal, coax environment needed to go away. Construction and remodeling of numerous buildings allowed for the infrastructure to be upgraded to support new technology and over a 3 year period a plan to replace all dumb terminals with PC based technology was instituted. As part of the QA/QC process, field verification of streets, address ranges and site address points was initiated to provide the necessary reliability for planned new Public Software solutions.

### **The Enterprise**

HCG's vision of the enterprise had three distinct elements. The first element was County staff and offices, being able to access the GIS data. This, in itself, was a major undertaking since county offices are spread over the 1,100+ square miles with some 21 buildings on the network. One of the biggest issues in the beginning of the undertaking was that the Public Safety facility and the Public Works facility both were connected to the County's data center via a B1. Data transfer was slow, let alone trying to move GIS data across the network. Duplicate copies of the GIS data were being maintained in all 3 areas. The second element was the municipal governments needing to house copies of the datasets. While they are primarily interested in jurisdiction specific information, for planning purposes they also need surrounding areas of the county. For the primary cities, they were maintaining complete sets of county data. The third element was public access via the Internet. The demand for access to the GIS data along with assessment data in a growing community required that ArcIMS applications be developed to deploy browser based access to some portions of the data.

A number of infrastructure issues needed to be addressed to meet the goal of a single data source for all users. This involved two specific undertakings to provide a high speed network and the server configuration to support all the demands on the system. The high speed network delivering GIS data to all of the county and municipal users proved to be

the most critical. About this time the county also began the process of identifying a funding mechanism to support a new CAD/RMS, Fire/Rescue, jail management software solution and to provide (if desired) access to the system to all municipalities in the County. From a public safety standpoint it was felt that all entities working off the same system would greatly enhance service to the citizens, especially from a first responders perspective. For a public safety, especially CAD to work, a high speed, reliable data infrastructure needed to exist, not only between county offices, but also connecting to city facilities. The funding source was identified. A countywide host fee was instituted at the county owned landfill. All of the funding from the host fee would be dedicated to the public safety initiative. Revenue projections from the host fee, provided the funding necessary to not only address the software needs of the communities, but also to address the infrastructure needs to accomplish the task.

The decision was made to install county owned fiber from the County data center to all county buildings and also to all city facilities. This project entailed three phases.

**Phase I**-Completed in 2004. Phase I connected the city of Conway, the county's public safety facility, procurement, detention center, public works and fleet buildings (along with any other county facility along the route). This route consisted of 13 miles of fiber installation and has significantly improved communication between the data center and these outlying facilities.

**Phase II**-Completed May 2005. Phase II is currently being tested. This phase connects all cities (Myrtle Beach, N. Myrtle Beach and Surfside Beach) along with additional county facilities and all of the hospitals along the route. This route consisted of 73 miles of fiber installation.

**Phase III**-In the planning stage. Phase III will actually close the route between Myrtle Beach and North Myrtle Beach providing a truly redundant fiber network. Funding for this phase is currently being investigated.

The second undertaking was to design and configure a data repository and server "network" that would balance the load between all of the varying needs of the County and provide necessary redundancy. The existing network security requirements must be incorporated into the new design. A primary concern in the ArcSDE/SQL environment for the County is to make sure that the production environment is not affected by all of the additional load placed on the datasets due to query and analysis functionalities (The County has experienced numerous problems with ArcIMS connections to SDE causing performance issues unless using direct connects). The County's network consists of a DMZ for Webserver and Internet applications, an Intranet for internal applications and a production segment where day to day editing occurs. Another issue taken into consideration was the large amount of imagery the county currently has, and the fact that new color digital imagery (0.5 foot pixel) from a countywide flight will be delivered beginning in July (since the contract signing, the County has also agreed to purchase the infrared imagery as well).

The decision was made to isolate the production environment and configure the ArcSDE/SQL server on a Dell Sans storage unit as a failover cluster server. Then replicate the GIS data to a second ArcSDE/SQL server for Intranet applications and a

third for Internet applications. A fourth ArcSDE/SQL server was setup as the image server. This unit will only house all of the imagery maintained by the County. A significant increase in speed in both the editing environment and viewing environment has been noticed since the reconfiguration has been completed (It should be noted though—that we have had issues with the replication process. There seems to be no easy way to configure the replication process, especially when a firewall is involved and when indexes are rebuilt on a regular basis, which is done because of the amount of editing currently underway). The County plans to expand the ArcSDE/SQL environment by 2 additional servers to contain the GIS data for the mapping component of the CAD system, so that the Public Safety server has no competition and the second public safety server will reside in the backup E911 center as a failover for the backup E911 dispatch center.

The County has a number of both internal and external ArcIMS websites for providing view and query capabilities to users. As more applications are deployed, the County is looking at options to implement editing capabilities to its user base, without having to provide extensive numbers of editor or info licenses. The County is developing new ArcSERVER applications to test the functionality of ArcServer. The first of these provides a comprehensive buffering application. The user will be able to buffer a selected point, line or polygon, and export the mailing address information to a mail merge file. The second application will be a mechanism for non-technical users to edit the attribute information to street addresses and site address points. This will be used by the cities who will be responsible for maintaining jurisdiction specific attributes.

The ultimate goal of this enterprise is to provide a single source for all GIS data with the most up-to-date information available.

### **GIS Centric Approach**

Horry County also finds itself in another unique situation. The IT/GIS Department is on a mission to update all of its legacy systems with new commercial off the shelf applications. The County's existing legacy systems reside on an AS400 with all custom programming. Contract programmers have been retained on a yearly basis to modify and debug existing applications. County staff must request reports that need be run, rather than having the power to create the reports at will. The unique situation is that council has approved funding to replace not only the Public Safety suite of software—CAD/RMS, Jail management, Fire Rescue, EMS, mobile units. They have also funded new Call Center/Work Order management (Azteca Cityworks implementation began 2005), Land Development software for Code Enforcement, Planning and Zoning (Novalis LDO solution vendor selected May 2005), CAMA software (Proposals currently under review) and Register of Deeds Software (RFP currently issued May 2005).

The IT/GIS philosophy of only two kinds of data spatial and financial, has laid the foundation for requirements for all new applications. A requirement for all new applications is that they must be GIS centric. The County has begun including GIS-

Centric requirements in all RFP's for software solutions which may have a geographic component.

GIS Centric software requirements that have been included in Horry County RFP's include the following:

1. The GIS Geodatabase is the feature database.
2. Non-redundant feature data storage.
3. Feature data model is fully user-definable and customizable without vendor support.
4. Non-proprietary feature data model format, including data names, fields, tables, relationships, and other data design elements.
5. Interoperable, providing maximum compatibility with any other GIS-centric application, including concurrent use of the feature geodatabase.
6. Feature data coordinate location and connectivity is inherent in the feature data model, enabling full utilization of the spatial analysis capabilities of the GIS, including linear referencing, events and other GIS functionality.
7. Feature data is created and maintained using the GIS tools for editing, including data error identification and correction methods.

WHY is being GIS-Centric such a critical requirement for HCG? Every application that the County (and all local governments for that matter) is deploying relates in some way to the geography. Public safety addresses, assessment for tax collection, planning, zoning and code enforcement for land use and compliance, emergency management for incident response, register of deeds responsible for land transfer documents, all relate to either an address or a parcel of land. The current legacy systems maintained by the County and municipalities all have **different** data sets for addresses, parcels, street names, ownership information, etc. Which one is right? Example is streets (probably no different than any other local or state government), the County alone, had at least 6 different streets datasets, none of which agreed. Storage is not the issue, but efficiency and accuracy is the primary issue, especially when budgets need to be tightened. No one was working from the same sheet of paper, not only with regard to streets, but addressing or parcel information.

The County is making multi-million dollar investments in software solutions that need to share the same information, entered **once and only once, and not replicated to some proprietary format**. The County's requirement is that it has spent millions of dollars to develop and maintain an extensive land base dataset. All new applications **must** have the capability to read (and where necessary **write** to) the County's ArcSDE datasets. This requirement is critical to the success of new application deployment. The County has also adopted and deployed a number of data models for its GIS. GIS-centric applications should be able to accept the data model structure and not require duplicate data sets nor a reconfiguration of extensive data models.

As the County's enterprise expands to include the cities via the fiber WAN, this GIS-Centric requirement will become even more important. The Cities will be accessing the

GIS and in some cases maintaining jurisdiction specific data on the Counties ArcSDE server. As the cities deploy new applications, the ability to reconfigure the datasets will not exist. A great deal of effort and pain is associated with changing data models or datasets in a large organization, therefore, new applications must conform to the model rather than requiring the model to conform to **their** specifications.

An example of this is the implementation of Azteca's Cityworks for HCG. The County sent out a RFP for a work order management, call center application with GIS Centric requirements. The only proposal meeting the GIS Centric requirements, was submitted by Woolpert, which recommended the Cityworks solution. Midway through the implementation the City of North Myrtle Beach mentioned that they too were looking at Cityworks as a solution. Realizing the possibilities because of the fiber connectivity, meetings were held and it was soon decided that the best course of action would be for the City to benefit from not only the data model and configuration work already completed by the County, but also to see if benefits could be achieved due to the County's site license. Agreements have been reached with Azteca, North Myrtle Beach, and Horry County to allow the County to be the Master License holder for Cityworks and all of the associated modules, and for North Myrtle Beach to use the County's ArcSDE as the foundation for its deployment of Cityworks (Similar agreements are being worked out with all cities in Horry County). A major benefit to all concerned will be the ability to create service requests **across** jurisdictions. Customer service will no longer be a motto but will be a result of a true GIS-Centric cross jurisdiction enterprise. This model is also being used for the County's implementation of its' new Public Safety solution for CAD and Records Management.

### **Vision to Reality**

HCG's commitment to a GIS-Centric Enterprise is solid. The talented team working on the implementation and deployment has the determination, talent and vision to make it a reality. It takes commitment from everyone involved to accomplish what some may say is impossible. The realization is that any organization, no matter the size, political inner workings, or budget constraints can attain the vision. The philosophy that the value of GIS is critical to the success of an organization must be demonstrated over and over. Demonstrating to everyone from staff level to decision maker the benefits of increased efficiency, elimination of redundancy and actual ability to save budgeting dollars over the long haul, are reasons to adopt a GIS centric, enterprise philosophy.

One thing is apparent in the industry. Many companies talk the talk, but few can walk the walk when it comes to being GIS-Centric. Local governments have spent a number of years developing extensive GIS datasets. As many more move to the ArcSDE environments and begin adopting datamodels, software solution providers **must** step up to the plate and provide solutions that take advantage of the existing data. No longer should organizations be required to duplicate data or maintain department specific datasets just to make an application work. GIS-Centric applications making use of the data models and ArcSDE should be the norm not the one and only.