

A GIS Challenge

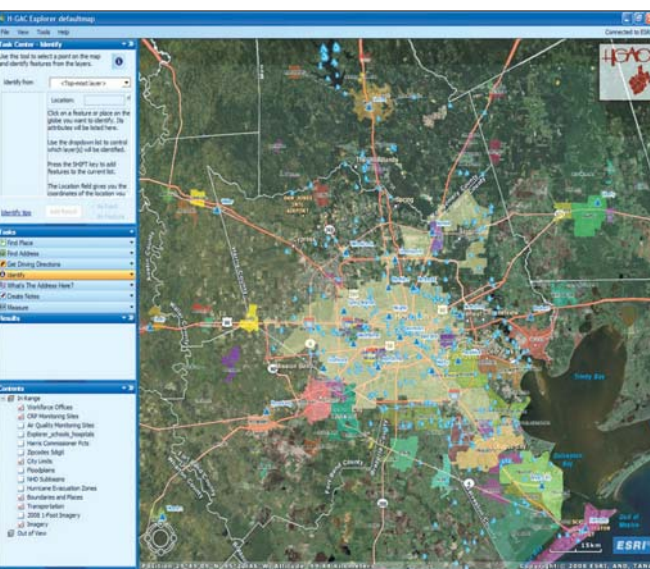
Building an enterprise GIS in challenging economic times.

Times are hard, financially speaking. Local, regional, and state public agencies are either beginning the process of cutting back fiscally or have already begun to slash budgets for the 2009-2010 fiscal year. In fact, many economic forecasts project that America and the world may be in for a prolonged period of economic downturn. So, what does a government agency do when it is strapped fiscally and has to cut back on its consulting budgets? Governments do what they have always done in the past; they rally their troops and try the best that they can to meet their clients' needs without having to spend much, if any, money on outsourcing.

The Houston-Galveston Area Council (H-GAC), the Metropolitan Planning Organization (MPO) for the southeast region of Texas, has a long history of GIS and was one of the first governmental agencies to use ESRI (www.esri.com) products starting back in the early 1990's. Today, H-GAC has established itself as one of the premier GIS technology councils of governments (COG) in Texas. Although it was

much further ahead than many other COGs in the state with regard to GIS, there were still some internal areas for improvement—issues that needed to be addressed and resolved to carry the agency into the 21st century. Among these issues were GIS data accessibility among departments, raster (aerial) imagery to technical and non-technical GIS staff, and availability for outside agencies to download the most popular GIS data sets.

H-GAC's GIS Program Manager, Robert LaBarbera, GISP, who has a background in both GIS and strategic business planning, was hired by H-GAC in the late summer 2007. LaBarbera and his team of GIS analysts and technicians decided to take the task of consultant on themselves to save the agency thousands of dollars and come up with a viable solution to many of the GIS issues that the agency was experiencing.



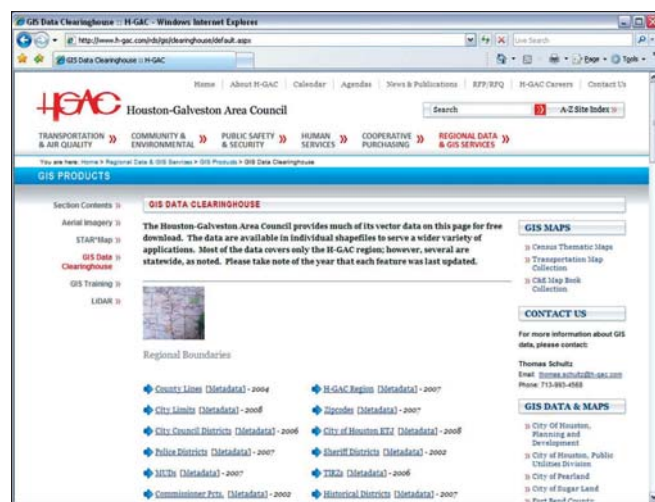
H-GAC's ArcExplorer application.

One key issue identified at the

outset of the project was that any application that they did decide to use for the resolution of these issues needed to be customizable and compatible for future GIS endeavors within and outside of H-GAC. After LaBarbera and his team consulted with the various internal departments, they determined that each of the problems identified could be met with applications currently produced by ESRI and that H-GAC could afford these applications without having to utilize expensive consultants for implementation; these applications and the direction that LaBarbera and his team were headed, pointed towards the implementation of an Enterprise GIS.

What follows is a brief description of what LaBarbera and his team did to resolve issues, implement change, create the backbone of an Enterprise GIS, and make a GIS that is better geared for the 21st century in the Houston-Galveston region.

The H-GAC is the southeast Texas region-wide voluntary association of 132 local governments in the 13 county



H-GAC's GIS data clearinghouse.

Gulf Coast region of Texas. Its service area is 12,500 square miles containing close to 5.4 million people. The mission of H-GAC is to serve as the instrument of local government cooperation, promoting the region's orderly development and the safety and welfare of its citizenry. Essentially, H-GAC is the regional organization through which local governments consider issues and cooperate in solving area-wide problems.

H-GAC has had a long and positive history with the use of GIS. Starting in the early 1990's H-GAC had the foresight to choose the ESRI product line of applications—specifically ArcView and ArcInfo—as the standard-based GIS format for the agency. Due to this fact, many local governments that were under the auspices of H-GAC also adopted the ESRI data format, which made data collaboration and update among agencies much easier and affordable. As time went by, H-GAC's GIS grew and took on a larger role within the agency; no longer was the Data Services department solely using GIS software but the Community and Environmental (C&E), Transportation, and Public Services departments were utilizing the GIS tool to solve current problems as well as plan for the future of the region.

Upon LaBarbera's arrival to H-GAC he was impressed with the how much GIS technology was being utilized within the agency by the various departments, but he immediately came across various issues and problems that if not resolved soon, would bottleneck the effectiveness of the day-to-day GIS tasks of the GIS technicians along with issues that would negatively impact the future of GIS at H-GAC. LaBarbera and his team quickly determined that the problems needed to be identified and solved soon or else bigger problems or issues would arise later. Since H-GAC did not financially have the resources to fund an outside consultant to perform the consulting for the update to the GIS, LaBarbera and his team decided to tackle these issues on their own by meeting with the various departments and coming up with a basic plan of action.

State of the GIS

After meeting with the departments and assessing the immediate issues and concerns about the present state of the GIS, LaBarbera noted the following items, in order of priority:

1. There were numerous GIS vector data sets within the agency, but not all agency staff was accessible to all of them. Many data sets were being stored on local PCs and servers and there was no easy way to find the data quickly.
2. Raster data, in the form of historical imagery and LiDAR data, was not easily and efficiently accessible to GIS staff.
3. Outside agencies had no method by which to quickly download the major regional GIS data sets that H-GAC owned or maintained.
4. Non-GIS technical staff needed an easy-to-use application to make queries on GIS data, find routes, look up addresses, and see GIS data sets that the agency either maintained or had collected over the years.

The first task was to meet with the directors and program managers whose departments currently were using GIS to perform a needs assessment. From these meetings it was agreed that a new and more efficient centralized GIS repository was needed that housed all of the GIS layers.

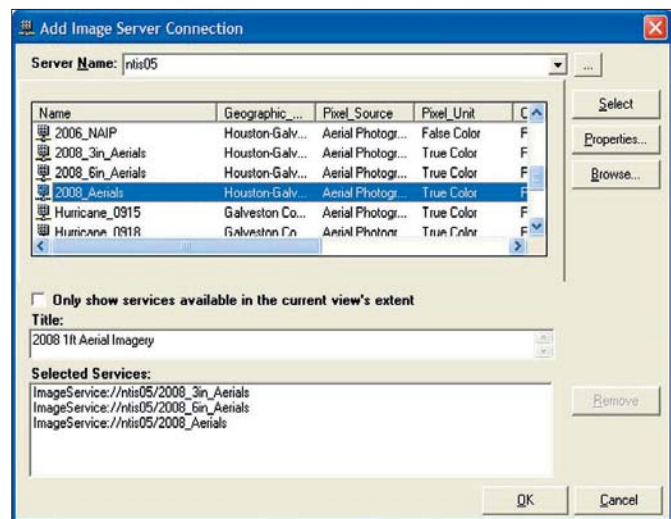
H-GAC currently had an existing Oracle-based ArcSDE database, which contained GIS layers within the agency. But, this database had not been managed adequately and was full of disconnected states and layers that could not be accessed by all users. Also, the Oracle license being used to support the ArcSDE database was

growing ever more expensive every year. Finally, many GIS users within the agency were storing GIS layers on their own PCs, which did not aid in the coordination of projects nor secure these data sets in the event of a failed PC hard drive.

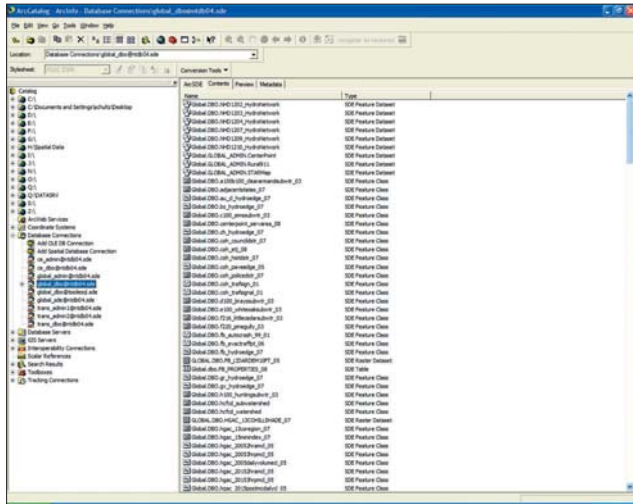
Next, other problems and issues were noted and possible solutions to the problems were brainstormed by the GIS team in their weekly staff meetings. Over time, they decided that the layers within the Oracle database would be extracted, the Oracle database would be deleted (over time), and a new, Microsoft SQL server database, which would be running on ArcGIS Server (SDE technology), would be utilized instead of the old Oracle ArcSDE.

Since each of the major departments that used GIS data wanted a database instance of their own—to keep work in progress and sensitive GIS layers separated from the entire agency's view—it was decided that three instances would be created within SQL Server: 1) Transportation, 2) Community and Environmental, and 3) Global.

Both the Transportation and C&E instances would hold work-in-progress GIS data or data that was not ready for public viewing and the Global instance would hold all completed data layers that the entire agency could view. Next, each department would have a database administrator who would maintain GIS data workflow and ensure that meta-data, or data about the data, was created



H-GAC's image server.



Centralized GIS Data Repository ArcGIS Server-SDE.

for GIS layers contained within their respective database. Finally, each database administrator would share their finalized datasets in the Global Database—if the data was open for agency-wide viewing. At the present time, all GIS layers within the Global instance contain meta-data. This makes it easier for new employees to the agency to know what a data layer is, how up-to-date it is, and who created it. The main point is that data would be stored in one of the three main repositories, which would allow for versioning and workflow processes to take place both within each respective department and throughout the agency.

Another side benefit of centralizing all data sets is if there was any form of emergency event or catastrophe, any and all of the instances could easily be downloaded and removed to off-site locations rather quickly so that there would be no loss of data.

At present, all agency data is now stored in these repositories and is backed up weekly. This was not the case a few years back when GIS staff would save data haphazardly on their local machines or on servers.

One last item to note is that by switching from the Oracle database to the SQL database the agency saved tens of thousands of dollars instantly by not needing to pay the expensive Oracle licensing costs.

The second major task to tackle was serving the historical and present day raster data in the form of aerial imagery

and LiDAR topographical data to all of the various GIS users within the agency. At first, the GIS team considered storing it within ArcGIS Server SDE, but when the large size of the database was calculated and the performance of ArcGIS Server SDE was considered, LaBarbera suggested they try the new ArcGIS Image server application.

Within weeks after acquiring the Image Server application, the Data Services GIS team was testing the results of the application and determined that:

1. Image Server was extremely fast at draw and refresh rates within ArcGIS Desktop and other ESRI applications.
2. Image Server would hold all of the historical raster data that H-GAC owned (over ten years worth).
3. Any or all Image Server data could be easily added to any ArcView (ArcMap) project with a few simple clicks of the button.
4. Most importantly, Image Server raster data could remain in compressed GIS format and not take up terabytes of space on the existing server, saving H-GAC more money by not having to buy more hardware storage space for their storage area network solution.

The third task to tackle in the process involved data distribution. H-GAC had various amounts of GIS data in-house, but had no easy way to provide this data out to the general public as well as other governmental agencies, for free.

LaBarbera proposed that a GIS data clearinghouse be created on the H-GAC's website that would provide all of the region's major GIS data layers out to the public for free. One item that he impressed upon the GIS Analyst and database administrator was that the

information provided to the public needed to incorporate meta-data, which would allow any entity to see where the data came from or how up-to-date the data was. Shortly thereafter, a GIS data clearinghouse was created that provided all of the region's major geographic data sets out for free.

The fourth task that LaBarbera and his team needed to accomplish was a simple yet easy way to distribute GIS data out to the average PC user who was not a technically savvy GIS person. In an agency like H-GAC, many personnel are not GIS technicians, but nevertheless need to make a quick map of an area, calculate the acreage of a park, determine the distance from a liquor store to a church or school, get driving directions both to and from a location, as well as view present and past aerial imagery to detect change over time. The simple solution to these issues was the use of ArcGIS Explorer.

Final Piece of the Puzzle

Since the GIS already had ArcGIS Server SDE, ArcGIS Image Server, as well as the stand-alone ArcGIS ArcView and ArcInfo (ArcMap), all that was needed now was to connect these applications together into one whole system and ArcExplorer would be the final piece of the puzzle that would allow any individual within the agency a way to take advantage of the powerful, centralized GIS that had been "supercharged" for the 21st century, which is what the team proceeded to do.

Yes, times are hard financially, but America and the world, in time, will make it through this period if it stays focused on its goals and objectives and focuses on what has made the country great in the past—perseverance, ingenuity, and governmental fiscal responsibility. During this time of economic uncertainty, governmental agencies are doing the best they can to stay afloat while determining how existing systems or processes can be made better to serve the public. H-GAC has shown that government can save money and still accomplish its goals, and the newly enhanced Enterprise GIS is a testament to this fact.

