GUC GIS Anywhere and Everywhere
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Abstract

Where most utility companies focus on just one utility, Greenville Utilities Commission is unique, we offer Water, Sewer, Electric and Natural Gas. This positions GUC to implement a total utility GIS. We have supercharged our return on investment by leveraging the newest mobile, consumer and ArcGIS technology advancements to make real-time self-service GIS a reality. We would like to highlight the steps GUC took to start, support, and sustain this initiative. We will explain how a highly organized ArcGIS Server implementation, the ESRI iOS SDK, and an internally focused application store have helped our employees get the value they need from GIS. Our organizational groups now have the information they want, in a form that they like it, on a device they love; all while utilizing skills they are perfecting on their own time!

Purpose

Greenville Utilities Commission is unique in that our consumers of GIS data are not necessarily customers or office personnel, but folks who need real-time asset information on the go. Our employees aren't chained to a desk, nor do they have time to boot computers in their trucks. They want to look at the asset data while standing near the field asset. They also want to be able to communicate effectively about assets.

Our initiative demonstrates that a highly organized ArcGIS Server implementation, the ESRI iOS SDK, and an internally focused application store can be used to create a truly self-service mobile GIS that is available anytime and anywhere. Users build informational maps as the need arises, trade information based upon those maps, and communicate changes to a new group that is ready to correct system-wide issues. No more laptop upgrades or stale information. GUC employees now have the information they want in a form they like on a device they love, all while utilizing skills they perfect on their own time!

Our GIS being utilized anywhere in a self-service manner is an exemplary deployment of GIS and is bringing true business value to the investments made by GUC. From management to field crews, all GUC employees now have unrestricted access to query our GIS and suggest corrections to our system.

Implementation

Motivation

Over the years, GUC IT has deployed multiple web browsers in an effort to provide lightweight and easy access to GIS. These deployments, while successful in their own right, never really hit the mark. Some users needed access to information that was not available and many wanted accessibility outside of the office. Those requests resulted in an increased workload for the IT/GIS staff. Because users were frequently unable to articulate their complex concerns, they would often prefer the assistance of a GIS Analyst.

In late 2010 and early 2011, GUC ventured into the world of mobile electronics. Much like the rest of the world, our company realized the obvious business value and began purchasing these innovative devices. Meanwhile, the GIS staff was in the process of re-organizing the ArcGIS Server instance in order to make self-service GIS available on desktops. With the new technology at our fingertips, the GUC applications and GIS teams quickly recognized the opportunity to solve two problems: self-service GIS and anytime, anywhere access.

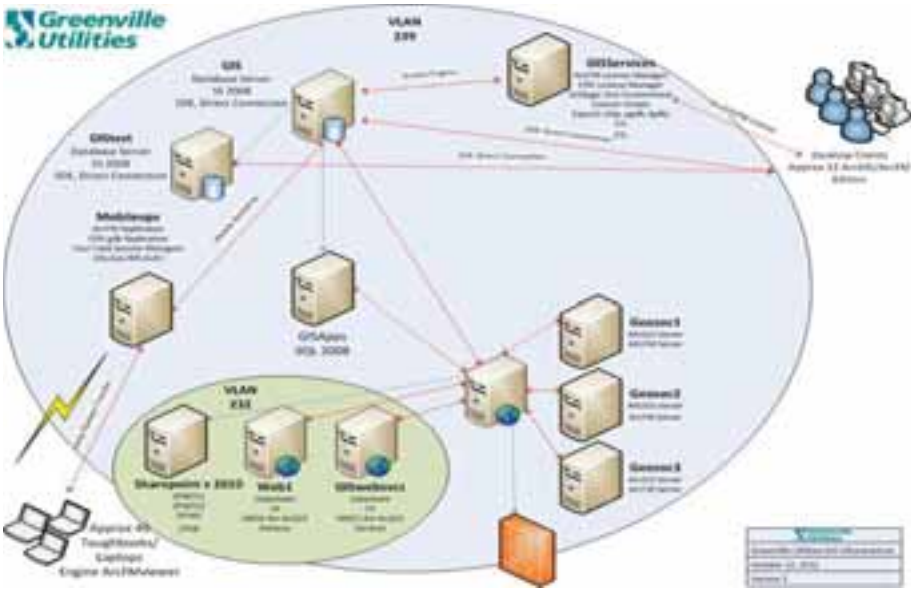
Problem Statement

GUC IT/GIS needed to provide a self-service GIS capable of operation anytime and anywhere with three focus points:

1. Increase usage and therefore obtain value from the GIS
2. Increase awareness about data quality issues
3. Break the cycle and put an end to dirty data: "don't use the data because the data is incorrect → don't correct the data because no one is using the data"

Problems Solved

GIS and IT staff have long fought to increase usage and to have value delivered from the implementation of GIS. The first step towards increasing usage was achieved. For example, in April of 2012 GUC's GIS Server experienced an internal request load of 18,286 requests. After deployment of the first mobile application, the ArcGIS Server load was increased five-fold to approximately 133,498 requests. Since the second month of deployment, we have seen no month under 180,000 requests. This means we have increased usage of our GIS services to a level almost 10 times our original load.



Ridding the company of inaccurate data has always been a pertinent issue. GUC experienced a common problem: a vicious cycle of dirty data. Employees often notice when data is flawed. The problem surfaces when employees pass over the erroneous data, but fail to correct it. Thanks to anywhere, anytime access, all employees can view and suggest corrections to the data. With our Markup application, users can report

errors. Because of the improved visibility of the data, employees feel more responsibility to ensure that dirty data is eliminated. Error correction in the form of a simple sketch can be sent, verified, and added. The cycle has been broken.

We have now successfully corrected all three of the problems we identified. We have a means of alleviating poor data quality, GIS usage has increased dramatically, and our operational crews see the value of location and how it relates to their jobs. This has all been accomplished without a single training class for users.

Phases and Decisions

With the problem statement clearly defined, the applications and GIS staff quickly moved to create an approach that contained not only a wow-factor, but also sustainability. The initial focus was on three areas. The GIS staff concentrated on organizing our ArcGIS Server implementation to create self-service access, while the development staff worked with IT infrastructure to establish mobile device management and to launch an internal application store. The development staff applied an agile project management approach to begin the creation of the first few mobile applications.

Organize ArcGIS Server

GUC decided on the multi-machine deployment strategy for the configuration of ArcGIS Server. We currently have a Service Object Manager (SOM), three Service Object Containers (SOC), and a SQLServer instance all being hosted on independent virtual servers (Image 1). The virtual environment has allowed us to be cost-efficient and timely in adding or removing resources as needed. Our ArcGIS server implementation utilizes an organizational structure and naming convention that lends itself to self-service. All of our organization's geographical information is divided into categories (i.e. CISGIS, Electric, Gas, Landbase, etc.). A category is denoted by a folder with a name that begins with "Layers_." A new category can easily be created by following this naming convention. Beneath each category is a group of individual services, which correspond to a single layer/feature class.

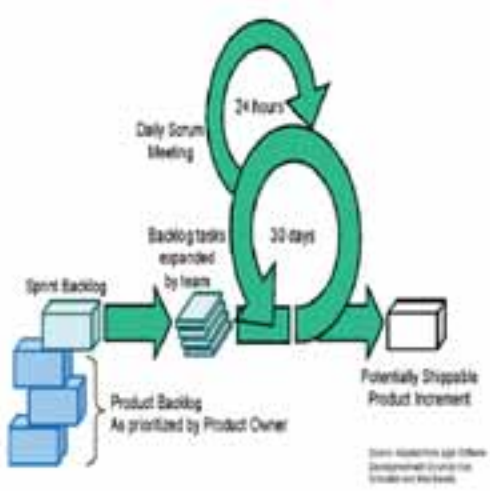
All services start with a carefully developed MXD. The MXDs are stored on a server share that mimics the layout of the ArcGIS Server instance. Each MXD is first placed in a testing environment and is evaluated with the Map Service Publishing Analyze Map. Once published, services are routinely evaluated and pooled as necessary in order to provide users with the best experience possible. This service structure provides our mobile and desktop self-service application suites with the ability to automatically crawl the ArcGIS Server instance. All of this effort leads to a centralized approach to self-service GIS.

Setup Internal Application Store and Mobile Device Management

In order to distribute the technology in a secure manner, GUC had to implement a Mobile Device Management system (MDM). Along with needing to apply system-wide security policies, we also required the convenience of an internal application store. GUC found that solution in AirWatch, a leader in enterprise-grade mobile device management. The infrastructure and security teams sprang into action by setting up these system-wide policies and distributing devices used predominantly for e-mail, browsing, and phone calls. The applications team focused much of their attention on constructing an internal application store. The outcome of our efforts was a simple yet innovative way for users to acquire the applications they needed. Nearly all employees had experience in using either the Apple App Store or the Android Marketplace, but the concept of employing this strategy in the office was foreign and exciting. The GUC App Store follows the same approach as the Apple and Android markets. The store is entered by selecting an icon on a mobile device, where applications can be selected and installed by a simple touch. With valuable tools that are conducive to workplace quality and efficiency literally at employees' fingertips, GUC has quickly evolved into a high-tech environment.

Software Development

From the beginning, it was apparent to our developers that this endeavor would be extremely dissimilar from previous projects. Our team was cognizant of the fact that expectations in the mobile world are constantly changing. This means that in order to consistently demonstrate results, development cycles must be quickly executed. As many standard project management principles are laborious and time-consuming, our team chose to utilize a method that focuses solely on achieving results as quickly as possible throughout the project's lifecycle: the SCRUM framework. In this agile environment, our team placed little emphasis on documentation, concentrating instead on rolling out new prototypes to advisory groups as quickly and efficiently as possible. A pertinent difference in agile development as compared to other project management techniques is that each cycle should deliver a working product.



In agile development, product owners are identified to assist in guiding the product(s) to successful completion. The product owner is responsible for organizing the backlog (features desired) and prioritizing these requirements accordingly. In our case, a product owner was identified from each of our operating departments. They identified two key mobile initiatives: a common self-service viewer (AssetViewer) and a markup tool (GUC Markup) using maps provided by Greenville Utilities' GIS. It was decided that the sprint cycle would be four weeks, and the first few requirements were selected for the sprint. At the end of the first four-week cycle, the development team delivered a simple, functional asset viewer which allowed users to select any layer from our GIS. This outstanding advancement was a direct result of our ArcGIS Server implementation, many years of investment in GIS, and the ESRI iOS SDK. Delivering tangible results made our users ecstatic: they finally had access to the information they required, whenever and wherever they needed it. Moreover, they no longer had to attend tedious training! Our new process guaranteed constant growth

and advancement. The response to our efforts was made evident by the number of requests made for new mobile devices.

The AssetViewer, in its first release, and was a simple viewer providing self-service access to GUC's internal GIS via the MapDrawer. The map drawer lists the service endpoints grouped by logical divisions in our organization and corresponds directly to the way the ArcGIS Server Administrator grouped the services. This

provides for a nice centralized management scheme in which new services can be added or removed at any time, it is even possible for a new group to be created with the same naming scheme. The AssetViewer also provided feature selection and feature searching. Again, the fields that are part of the search and the fields that are shown through on the modal popups are all controlled by the GIS Server Administrator via the underlying service MXD.

The next application developed and released by our team was GUC Markup. While Markup makes use of the GIS as a backdrop, the application is clearly focused on creating and sharing sketches. Markup is tightly integrated with AssetViewer to allow users the ability to make use of AssetViewer's map-building capabilities.

Once in Markup, If users need to change the map's features or change the location they can navigate back to AssetViewer with the simple press of a button. While in Markup, users can freehand draw, draw straight multi-segment lines, draw sqaures or circles, insert text, and draw dimensioned lines (with measurements in feet). Users can also alter the opacity of the drawn features, change the color, and e-mail the drawing as a PDF.

Organizational Impact

The mobile applications, coupled with the organization of our ArcGIS Server instance have been a game changer for GIS use in our organization. As it stands, GUC has currently issued around 200 iDevices to employees. The devices are deployed to all ranges and titles within our organization. From the CEO all the way to our installation and maintenance crews, each GUC employee can have easy access to Greenville Utilities' GIS.

Qualitative and Quantitative Impact

Access to the GIS has been surging. As we stated above the ArcGIS Server instance has sustained increased in usage to a level almost 10 times our original load. We have had no month with less than 180,000 requests since the second month of deployment.

Meanwhile, our Markup application has provided field crews and engineering staff with the ability to utilize our GIS as the informational backdrop to suggest system changes, communicate issues, and even align or schedule repair work within the system. With more eyes on our data than ever, the quality is steadily improving. Our new data services group is receiving markups from field personnel and making updates to the GIS. Because field crews have live data in their hands, they now see how their contributions are taken into account. The vicious cycle of not using the data because the data is incorrect– not correcting the data because no one is using the data, has been broken.

Decisions and Productivity

In addition to a dramatic improvement in our data, processes at GUC have become far more efficient. GUC employees recently used our applications when deployed in the northeast, where they were assisting

residents to restore power after Hurricane Sandy. Our crews were the talk of the area. Our engineers were making design decisions right in the field and communicating those designs and sketches directly to field crews who were ready to perform work. Here in Greenville, crews are able to look at asset information on an iPad while loading their trucks with supplies, allowing them to gain a full understanding of the asset they are going to service before they even arrive on site. Using our GIS as the backdrop, Engineering Assistants are communicating with vendors and subcontractors on the job site. A task of this magnitude wasn't even considered to be a possibility before this endeavor. Most of all, our main goal was accomplished: employees are finally realizing the value of GIS.