USING WEB GIS TO COLLECT INFORMATION BEFORE IT RETIRES

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WHAT WE WANT TO COVER

- Who is Tri-State and the role that GIS plays
- Metering project background information
- How we approached the problem
- The technology we used to solve the problem
- How we handled the changing requirements
- Lessons learned
- Where we want to go in the future
Who is Tri-State Generation and Transmission?

- Wholesale electric power supplier founded in 1952
- Owned by 44 electric cooperatives
- 200,000 square mile territory
  - Colorado
  - New Mexico
  - Wyoming
  - Nebraska
- 6,200 Line Miles
  - 14 Generating Stations
  - 1,200 Employees
  - 1.5 million customers
Tri-State Generation and Transmission System Geography

- Disconnected and dispersed Transmission
- Facilities that we only own
- Facilities that we only maintain
- Or Both
- Presents challenges for mapping and data management
Tri-State Geographic Information Systems (GIS) Department

- 4 full-time employees
- Started in 2006
- Originated as a department under Maintenance
- Migrated to a major department under Transmission Business Unit in 2008
- Recognized under the Transmission Business Unit as a department with a enterprise-wide function
- Mission is to develop, manage and maintain a GIS that is designed to support Tri-State’s operations and workflows as an enterprise system.
A meter is a device that monitors electrical energy flow. Most electrical meters can be separated into two groups:
• a meter that records energy flow over a period of time
• a meter that measures instantaneous energy flow.
Project Beginnings

WHY THE PROJECT STARTED

- Because of an error at a metering station, a meter was removed from service due to construction.
  - Tri-State lost a significant amount of revenue

- Metering committee was created for QA/QC

- The primary objective of the metering project was to bring together all of the metering support groups so this wouldn’t happen again.

- Create a single source for the information required to maintain and manage meters

- Started with static maps in the drafting department
  - Labor intensive
  - Not dynamic or database driven
Project Beginnings

➢ Metering Committee came to GIS to answer a question
  “Where are our meters located?”

  • We had no answer because there was never information given to us about
    meter locations.

  • Identified the experts on the subject
    • SME (Subject Matter Experts)
      • Better for them to maintain the data
      • Knows the required data fields
      • GIS was the SME on solving problems

  • New Metering department
    • No archived data except in employees memory
    • Retirement dates were set
    • New manager had no way to get legacy info
    • How to maintain data in the future
      • Workflow
What Metering Had

- Databases were scattered and in many different flavors (Oracle, Access, Excel)
  - Schemas did not match and no link between databases
- Spreadsheets stored locally
  - Out of sync
  - No standard conventions (i.e. Names)
- Multiple departments managing the same information in different places
  - Revenue
  - Maintenance
  - Engineering
- There was no common source to get correct information
  - Looking for a single source
  - Current Information
Challenges

➢ Very limited GIS Knowledge
  • The Metering SME’s had no idea what GIS is, how it works, or how others in our industry use it for their work.
    • Used GIS Day as vehicle to promote GIS awareness
    • esri came to Tri-State and did several demos

➢ Learned to think of things as having a spatial location and the relationship that the location has on other parts of the transmission system.

➢ Issues with other departments and legacy systems
  • Cascade and Asset Suite
    • Our nemeses
    • Archaic – Oracle forms if you are lucky
      • No documentation or in house experts
    • Proprietary schema no APIs
  • IT – Linking of systems
Why GIS?

- GIS offered a dynamic option for displaying the data either graphically or in a tabular format.
- Centralized location to retrieve data and it available enterprise wide.
- GIS is a still emerging technology with almost unlimited growth potential and the ability to further expand the meter project as the technology advances.
  - Other technologies were not growing
- Create our own customizable schema
  - Other software only works with a proprietary database
First take with WinForms
- Built a quick UI and a easy deployment package
- Quickly realized that the web was the place to be
- Other needed access

Moved to ASP.NET
- Built a similar UI to the WinForms app
- First try using web services to save and retrieve data
- Easier to maintain and release updates

Moved to Silverlight at Beta release of esri API for Silverlight
- Added a map to the interface so the original question “Where are my meters?” was answered.
Building a Database

- **ArcSDE (Oracle)**
  - New schema
cascade did not have what they wanted
    - Built 4 feature classes, one for each meter type
    - Built schema
    - Gathered domain values
    - Loaded what we could from other sources into the database
  - Needed to work for required reporting functions

- **ArcGIS Server to expose the data as a resource**
  - Can be used with esri REST API
    - Maps, GP Tools and data access
  - Built custom queries using ODP.NET and RESTful WCF services
  - Server side ArcObjects to edit ArcSDE
Working with the Data

- On the Client
  - Silverlight
  - REST
  - JSON

- Custom Data Types

- On the Server
  - WCF
  - SQL
  - ArcObjects
Building a Web App

- Data is visible to the enterprise via the Tri-State GIS App
- Silverlight is supported by IT
- Reusable tools across GIS application
- Create forms that are easy to use and require little typing
  - Domains and drop downs
  - Default values
Typical user request was to get a set of data in paper format
  • Reports can be put out in many formats (excel, PDF, TIF)
Have a set of reports on the GIS dashboard for all functions
Changing Requirements

- Need to be able to model the future metering system
  - Allow for creating future points and also creating future station features that can be moved into the in-service layer
  - Takes the data maintenance out of GIS and places it on the user.

- Linking to documents on a file share
  - Points list, MDMS report

- Track our renewable resources with check boxes
  - Each meter that is tied to generation is tied to a specific type (Wind, Solar)

- Track meter contacts so that a person or several people are identified as emergency contacts for a meter.
Future

- Allow users to create their own reports on the fly.
  - OBIEE
  - PI\Real Time data feeds
  - SOA
  - Link to images of substations
  - Connecting to electrical drawings (CAD)
  - System support documentation
  - Use NERC mandated LIDAR information

Looking to the future...
Results

- We learned more about how our system looked.
  - People had an idea but seeing more than just the lines made it more real.
  - Other groups that did not think about metering in the past now had it at their fingertips.

- We know where our billing points are located.

- Users don’t need to search for a week to gather information about meters and compile the data into a report.

- Gave GIS a needed example of what is possible and allowed us more opportunities at Tri-State.
Questions?

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