Case Study

Alaska Map Science

Alaska, USA

Key Facts:

Industry: Oil and Gas

Problem: Migration of large volumes of CAD data to a GIS-based mapping system

Solutions: FME®

Results: Rapid data conversion with precise data transformation.

"Safe Software's technical team was very quick to respond.... In comparison with other software vendors, Safe's service is one of the best."

Executive Summary

When Enstar Natural Gas Company needed to transition from Autodesk AutoCAD drawings of their natural gas lines to a seamless, GIS-based mapping system, they approached Alaska Map Science GIS consultants for assistance. Safe Software's FME platform provided Alaska Map Science with an excellent spatial ETL tool for managing the complex data transformation and large data volumes, and proved to be the only tool able to extract information from "group" entities in the AutoCAD® files.

The Organizations

Founded in 1961, Enstar Natural Gas Company is one of the oldest energy companies operating in Alaska. Enstar provides natural gas service to approximately 340,000 customers in South Central Alaska via 3,000 miles of natural gas distribution lines and 450 miles of high pressure natural gas transmission lines.

Enstar has historically produced and maintained "As-Built" Autodesk® AutoCAD drawings to map its gas distribution and transmission facilities. Each CAD drawing covers a quarter square mile (quarter section) of Enstar's service area. Since these individual grid sections were not geo-referenced, the CAD drawings could not provide a larger overview of the service network, or be used for geographic analysis.

In 2005, Enstar approached Alaska Map Science GIS consultants, based in Anchorage, for help in transitioning to a GIS-based mapping system that would provide seamless mapping of the entire service area, would support the use of network flow modeling, and could be linked to their customer information database and scanned service line completion reports.

Initially, Enstar required only a proof-of-concept demonstration of the potential benefits of the conversion. At that point, Enstar hadn't selected a GIS vendor or decided whether the data conversion would be a one-time data migration (with subsequent editing done in the GIS), or involve periodic updates (with editing continuing on the existing CAD drawings). Later, in the spring of 2007, Enstar made the decision to use Esri® ArcSDE® Geodatabase as their GIS server and to make a complete transition to Esri GIS software for future editing and updates. With the assistance of Esri and staff from their parent company, Semco Energy, Enstar designed a schema for the database – a slightly modified form of Esri gas distribution and transmission data models.

The Challenge

The proposed data migration presented Alaska Map Science with a number of significant challenges. Foremost among these were the sheer number of source files to be converted (about 5,000 AutoCAD drawings), the lack of geo-referencing, and the unique and undocumented ways in which information was stored in the CAD files. In particular, Enstar's drafters had associated service location numbers and job work-order numbers with groups of entities in the drawing files. Although this data was very important, it initially appeared that this information would be difficult, if not impossible, to capture and load into the GIS.

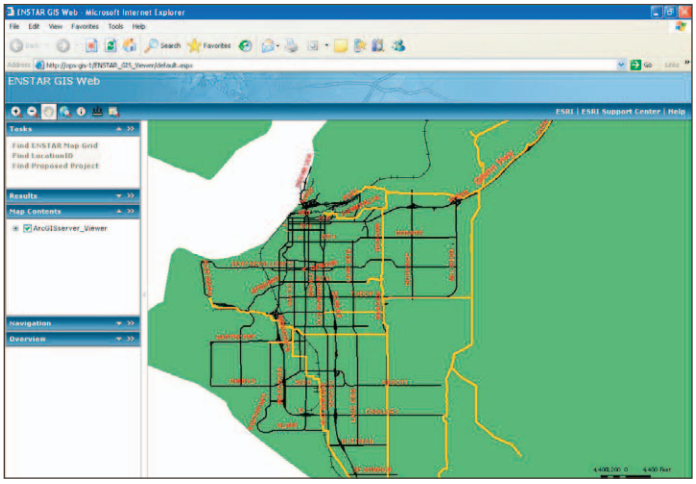
Another challenge for Alaska Map Science was the need to meet a tight deadline. The data conversion from the CAD files to the new SDE data model needed to be completed within the short Alaskan summer; during this time, drafters were no longer editing CAD data, but were at work in the field surveying new construction projects.

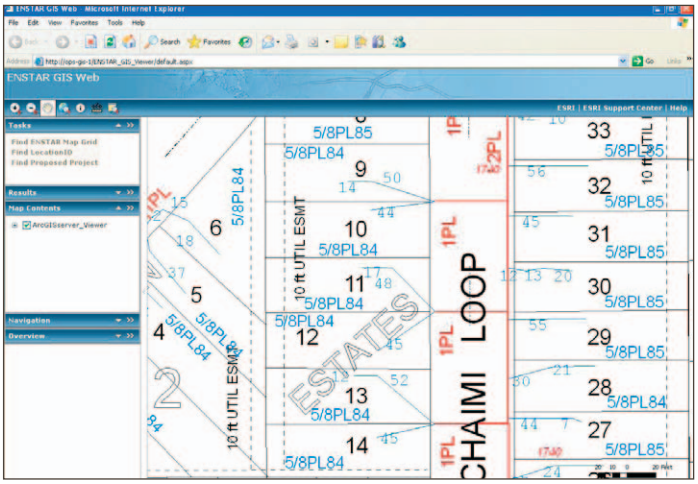
The Solution

From past experience, Alaska Map Science knew that the spatial ETL (extract, transform and load) capabilities provided by Safe Software's FME platform were well suited to many aspects of this type of data conversion. And eventually Alaska Map Science discovered there was no practical alternative: FME was the only tool available that could read and extract information from the "group" entities in the AutoCAD files and load the information into a geodatabase.

The final data conversion process was complex and involved a number of iterations, but FME proved its value all along the way. The first step involved data-mining the 5,000 AutoCAD drawings to identify the full spectrum of layer names, symbology, blocks, and various types of AutoCAD entities. Alaska Map Science created a custom FME mapping file to read all of the source CAD files and to create summary reports describing

the features that were found. Based on this output, Alaska Map Science created a database table that matched AutoCAD layers and blocks to FeatureClasses and their associated attributes in the new data model. This same database table was eventually used in another FME mapping file to drive much of the final data transformation.





Another important aspect of the data conversion was geo-referencing of the features from the AutoCAD files. Each of the source CAD files, representing a single cell of the service area grid, had its origin (0,0) in the lower left corner and extended approximately 2,640 feet in both the x and y directions. Based on the grid's naming convention, Alaska Map Science was able use a TCL script in FME to offset the coordinates of individual files by multiples of the 2,640 grid interval to aggregate the grid sections spatially into Townships. Alaska Map Science computed the geometric transformation parameters to best geo-reference the features within each Township, and used these parameters during the FME translation to perform the geo-referencing. At the edges of Townships, the section lines are irregular (due to shifts to account for the curvature of the earth), so the planimetric tiling could not extend across Township lines.

In the AutoCAD drawings, curved lot lines and streets were drawn as mathematical curves. In seeking to preserve these curves, Alaska Map Science discovered another benefit to using FME: they were able to take advantage of FME's new Rich Geometry architecture to propagate these representations into SDE.

Enstar's AutoCAD drawings didn't contain any "attributes" in the GIS sense, but did contain content that could be used to create attributes during the conversion. The layer naming convention that Enstar had used provided information such as pipe size and material, but other information needed to be parsed from "group" entities in the AutoCAD files. Safe Software helped by implementing an FME function that allowed FME to extract the full content of these entities. Using regular expression parsing in a TCL script that was called within the FME translation, Alaska Map Science was able to extract the content from the group names and descriptions to obtain service location IDs, work order numbers, construction dates and other important information.

The FME data conversion was carried out using a custom FME mapping file that would read a single AutoCAD drawing and write the data to the SDE Geodatabase. FME was called in a batch mode to execute the mapping file for each of the source AutoCAD files. As features were read from a CAD file, the FME mapping file joined them to records in a "matching" database that were used to route the features to the correct output FeatureClass and to assign standard attributes. In all, the primary mapping file used more than 50 FME Factories, more than 125 FME Functions, five database relates, and ten TCL routines. During the project, FME was also used for numerous secondary data conversions for smaller datasets.

To be assured that no CAD features were lost during the translation, Alaska Map Science needed a comprehensive way to log and report any errors that were encountered during the translation. Although FME's built-in logging functionality already provided much of this capability, Alaska Map Science also set up the mapping file for the data conversion to record any features that were not properly matched to an SDE feature class or that failed to be correctly written, into an FME Feature Store. These features could then be reviewed and manually imported later.

The Benefits

Enstar's new GIS system has only recently come into operation, but the benefits are already becoming apparent. As a result of the data conversion, information that was hidden and inaccessible in the CAD files is readily usable and employees are beginning to take advantage of network flow modeling features. The seamless mapping has been easy to transition into a web-based viewer, and over time the mapping will see increasing use.

FME not only allowed Alaska Map Science to extract information that would have been difficult to access with any other solution, but also provided a framework that allowed the data conversion to be executed in a straightforward and repeatable manner. In fact, although the FME data conversion scripts took nearly 20 hours to run on the complete data set, the data conversion was run a number of times.

For more information about Enstar Natural Gas Company, visit **www.enstarnaturalgas.com**

To contact Alaska Map Science, visit **www.alaskamapscience.com**

Learn More

To find out how FME can help address your data interoperability challenge, or to download a free evaluation copy of FME, ***visit*** **www.safe.com**

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