BIOGRAPHICAL INFORMATION

Kecia Pierce
Geospatial Solutions Product Manager
Intergraph Mapping & Geospatial Solutions

Specific Responsibilities

Mrs. Pierce joined Intergraph in 1990. Now a Product Manager for the Utilities and Communications GIS-related products, Mrs. Pierce evaluates market trends and customer requirements in order to determine and plan product direction.

Past Experience

Formerly as Technical Marketing Manager, Mrs. Pierce targeted select opportunities, not only to increase revenue and customer base, but also to procure customer partnerships for improved product development. She managed a group of seasoned professionals through the assessment, design, implementation, presentation, maintenance, and distribution of prototype and benchmark systems. She planned and directed all aspects of organizational trade show participation. Mrs. Pierce lead, trained, and supported regional marketing organizations, business partners, and distributors worldwide.

As a Customer Application Engineer, Mrs. Pierce was responsible for pre-sales and post-sales support of Intergraph's software, services, and systems. She provided technical leadership and support for sales presentations, product demonstrations, international sales and customer training, user group meetings, and trade shows. She determined customer requirements and established the strategy for successfully converting and loading customer data, customizing and/or configuring systems to meet customer specifications, and preparing presentations.

As a Software Analyst, Mrs. Pierce was responsible for the design, development, implementation, and support of numerous database system applications, written in various Relational Database Management System languages, which provided manufacturing production shops with the capability to record, track, and report on parts, assemblies, and finished hardware products as they passed through the many states of life-cycle management. She was accountable for the security, maintenance, and database administration for servers, user software applications, and their associated systems.

Educational Information

Bachelor of Science in Computer Science and Mathematics, University of Alabama in Huntsville, June 1990

Professional Memberships

GITA

THE BENEFITS OF DATA INTEGRATION – THE DATA, THE TOOLS, AND SEVERAL CASE STUDIES

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ABSTRACT

Experience shows that when companies can creatively aggregate the wealth of data available to them, the benefits they achieve are significantly greater. By integrating a variety of data sources and types, companies have been able to broaden the scope of problems they can tackle and respond to customers more quickly and efficiently. This presentation will provide specific examples of the data integration and the benefits companies are realizing.

INTRODUCTION

There's a wealth of data available – both publicly and locked within your own corporate network – all of which you can mine to advantage. For example, there is census data and other *readily available* data to leverage as well as different data formats, such as dxf, dgn, Oracle, and shape files to deal with. Not all problems can be solved, nor all questions answered, by simply exploiting the geofacilities network data that utilities and communications companies routinely maintain. Utility companies are integrating data in order to provide applications such as coordination of building and digging permits, storm restoration, outage analysis, facility location maps, high consequence area studies, marketing analysis, right-of-way and corridor analysis, regulatory disclosure maps, pipeline replacement programs, cable utilization, as well as general map production and spatial query and analysis. This paper will discuss types of data in the industry, different techniques available for data integration, some real-world applications enabled by this integration, and some of the specific benefits realized by companies who have deployed integration of data from various systems.

TYPES OF DATA

Data comes in many different formats, varies in size, is used for different purposes, and can be attained from a number of different sources. Data can come from a database or a file. Data can be alphanumeric in nature or represent geographical coordinates or both. Data can be categorized in a number of different formats, from a number of different vendors.

But basically you can take just about any type of data and merge it together with other types of data in order to get a broader or more precise picture of what that data represents in terms of the

question you're trying to answer. The bulk of what companies are doing today is not strictly viewing different graphic formats, but rather integrating all forms of data to enable their ability to visualize that data graphically. Below is a brief list of just some of the different data types that companies are bringing together to enable some of their applications:

- Geofacilities or GIS Data
- Outage Statistics
- Customer Information
- Consumption Data
- Compatible Units
- Work Order Information
- Materials Data
- SCADA Information
- Elevation Data
- CAD Files
- Satellite & Photo Images
- Raster Files
- Assessor's Records
- Census Data
- Flood Data
- Postal Codes
- GPS
- Weather Data

There are a whole host of sources out there for accessing data. Some data sources may be internal to your company, such as an Outage Management System or Work Management System, while other sources may be external, such as a government agency or even data depots on the web. While some data may be shared free of charge, other data may carry small to more significant fees for share access. Below are just some of the data depots and web sites that are readily available today for accessing different types of data that may be useful to applications within our industry:

- GeoCommunity's GIS Data Depot: www.gisdatadepot.com
- U.S. Census Bureau: www.census.gov
- National Climatic Data Center: www.ncdc.noaa.gov
- FedStats: www.fedstats.gov
- U.S. Maps and Data: www.geodata.gov

TECHNIQUES FOR DATA INTEGRATION

While there is a difference between data interoperability and application interoperability, both remain critical to information sharing and collaboration, are necessary for streamlining users' workflows, and enable increased productivity. There are a number of different techniques and tools available for integrating data from various systems and different formats. There are tools that convert data from one format to another, there are tools that translate geographic data from one projection to another, there are tools and techniques that integrate data from disparate

sources—such as point-to-point interfaces, application programming interfaces (APIs), messaging brokers and adapters, and web services to name a few, there are techniques for batch updates or ASCII file transmission of data from one system or source to another, and there is the ability to view multiple files simultaneously. Some applications view all types of data, while others are specific to particular formats. Some applications are robust desktop apps, while others are simple viewing seats. Listed below are just some of the applications available in our industry today that provide varying degrees of functionality in support of data integration.

Data Integration/Conversion Applications

- FME from Safe Software
  www.safe.com
- GeoMedia and GeoMedia Professional from Intergraph
  http://imgs.intergraph.com/
- Geomatica® 9 from PCI Geomatics
  www.pcigeomatics.com

Viewers

- GeoMedia Viewer from Intergraph
  http://imgs.intergraph.com/
- FME Universal Viewer from Safe Software
  www.safe.com
- GeoExpress View from LizardTech
  www.lizardtech.com
- GeoHawk from GeoForce
  www.ltc-west.com
- Geomatica® FreeView from PCI Geomatics
  www.pcigeomatics.com

Coordinate Conversion Applications

- Corpscon provided by the U.S. Army Engineer Research and Development Center
  http://crunch.tec.army.mil/software/corpscon/corpscon.html
- ProLat from effective objects
  www.eobj.com
- Coordinate Data Conversion© from SeisSoft Company
  www.connect.net/jbanta/Products.html
- Geographic Calculator from Blue Marble Geographics
  www.bluemarblegeo.com
- GeoMedia and GeoMedia Professional from Intergraph
  http://imgs.intergraph.com/

REAL-WORLD APPLICATIONS ENABLED BY DATA INTEGRATION

Many utilities and communications companies have data integrated in one form or another. Some cases are as simple as geofacilities data overlaid on orthophotography images, while others are quite complex involving many forms of data brought together into one integrated workflow

from numerous disparate systems. This section will discuss a few specific cases where data integration has enabled companies to successfully respond to a wide range of requests.

Kansas City Power & Light

Kansas City Power & Light (KCPL) used data integration in order to produce thematic maps to aid their storm restoration efforts. They integrated their geofacilities data with other corporate data, such as customer calls, crew assignments, customer information, as well as storm evaluation and restoration plan data from one of their reporting systems. The ability to bring this data together to visually display the actual status during the various stages of storm restoration proved key in returning power to approximately 285,000 customers after one of the largest storm restoration efforts in the company's history.

Initially, the customer call data was merged with the geofacilities data in order to visualize the affected service territory based on the number of customer calls by substation for each of their service centers. These maps where then used by the city to support their request for Federal Emergency Funding.

Crews were brought in from a number of surrounding states in order to aid the restoration effort. This inspired another type of thematic map, which depicted the assignments of crews per circuit. This map indicated which crews, whether they were company, contractor, or out-of-state loaner crews, were assigned to which circuits throughout the service territory. The storm evaluation and restoration plan data from their reporting system was used to produce this particular thematic map twice a day, in order to support the management teams' analytical and organizational efforts. In addition, they published these particular status maps on their corporate web site in order to keep the public and other outside agencies, such as various public service agencies across the state, apprised of the restoration progress.

The final restoration efforts were aided by the production of another thematic map, which merged the crew assignment data with CIS data in order to visualize the current crew assignments, as well as the remaining service outages. The integration of all these data types—geofacilities, customer calls, crew assignments, customer information, as well as storm evaluation and restoration plan data—produced map applications that successfully aided KCPL's ability to quickly and effectively restore power to their customers, as well as provide the necessary information to outside agencies.

A Northeast Utility

Another utility relies heavily on data integration for their leaks and pipeline replacement program for distribution and transmission. This particular customer has approximately 20% of their geofacilities data within their corporate GIS in an intelligent vector format, the remaining 80% in raster files, and their leak information is stored in a mainframe leak reporting system. The leaks are not associated to the facility data. They wanted to produce a report that grouped their leaks based on service area, leak type, leak repair status, material type, and facility type. The information presented in this report would then help them to more effectively schedule their leak and pipeline replacement projects. In addition, they wanted to produce another report that grouped leaks based on a different set of criteria in order to identify areas of active corrosion for state regulatory reporting requirements. In order to manually produce these reports using printed maps, it took a college intern approximately three months to complete.

This customer wanted to reduce the time and effort it took to generate these reports. So, by utilizing a GIS application that allows real-time data integration from disparate sources, they were able to deploy a workflow that somewhat automated the process of generating this report. The workflow included spatial queries, attribute queries, and the creation of Access database files. Then, there were more queries and macros that ran inside Access to generate the final report. The workflow not only integrated their existing data, but also generated additional data, such as buffer zones around the leaks, as well as clusters where buffer zones overlapped. This workflow consisted of more than eighty different steps, which were described on approximately 40 pages of instructional documentation, and took about eight hours to complete. In the first year that this customer used this new workflow for their leak and pipeline replacement program, they saved an estimated $5M. For their active corrosion program, they developed a second workflow, based on the data of the previous workflow that grouped the leaks based on an additional set of criteria. This workflow also consisted of approximately eighty steps and took anywhere between eight to twelve hours to complete.

The new workflows were a great success, but after time the customer wished to further reduce the time and effort it took to produce these reports. Through further data integration, with geo-coded customer lists from CIS and patrol zones from IPLOT, as well as additional workflow automation these reports now take about an hour to complete with minimal user intervention. The disparate data can be viewed graphically at the same time and the report can be saved as a snapshot in time. Because the original manual reporting method took so long, this company used to wait for at least a year's worth of data to be collected before compiling these reports. Now they can generate these reports each time data is collected, because the data has become more accessible through integration.

South East Water

South East Water is similar to many others in that it uses an AM/FM/GIS to manage information about its utility network assets, customers, and the underlying property (cadastre). In the past, the company's AM/FM/GIS applications focused on network assets. Today, its business focus has shifted from pipes to customers so that the AM/FM/GIS supports network planning, design and engineering, work management, and facility maintenance across various regional offices. The company has also extended its AM/FM/GIS for use beyond traditional asset-recording applications. They implemented an intranet GIS application in order to deploy interactive view and query capability across the entire corporate intranet for decision support, customer service, and operations. This solution has been subsequently expanded to provide fee-based access to external customers – such as local councils, developers, and even the fire brigades – causing the system to be in high demand. An integral part of their customer service and asset management system, the intranet GIS leverages the web as a low-cost virtual data warehouse. This enables the company to access multiple disparate data sources through a common web-enabled GUI, while maintaining their current operating procedures. South East Water indicated that the cost savings provided by the new system has been substantial, encompassing savings in hardware, software, and network infrastructure, as well as time saved in answering customer queries. The intranet GIS allows staff and external subscribers to access vital planning information–such as existing piping assets on a block of land–within moments, rather than the days it took to manually process this type of request in the past.

The intranet GIS is based on a background map of the region. It includes road networks and cadastre, overlaid by graphical representation of the company's water and sewer facilities, such as pipes and pump stations. Embedded hyperlinks and hotspots link the map's graphical

components with the company's various databases. Data is accessed simply by keying in a street directory or road directory reference or by keying in coordinates. Users retrieve the geographical data for an area once and then click on individual features to get associated information from the database in real time. They benefit by seeing all of the details contained in the GIS, not just crude raster images. In addition, they can zoom in and out, or use a built-in magnifier to read small text and features. Their intranet GIS application's publishing process creates ActiveCGM maps on the fly with no need to pre-translate files. The result is faster response time and higher productivity. Output looks and feels like original GIS data, and the data owner retains full control over what can be published and in what form.

Gastransport Services

Gastransport Services had the desire to build an intranet GIS to locate and display their assets, such as pipelines, equipment and distribution stations, in a certain area based on various inputs. They also wanted to integrate this intranet GIS with their SAP and Pipeline Integrity Management systems. The company brought together landbase and postal code data, which came from external data sources, with their pipeline grid and large-scale topography data, which resides in three regional GIS databases. Gastransport Services needed to present this data in different ways for different types of users, and needed to provide support for a large corporate audience. The resulting intranet GIS application allows users to execute a search using any of the following criteria:

- An overview map
- Address and postal codes
- Coordinates
- Pipeline or equipment ID's.

It also provides the following major functions:

- Automatically converts the GIS features into an Oracle Spatial Database
- Imports & converts selected commercial datasets to intranet GIS features
- Provides basic search and view functions on the defined intranet GIS features
- Provides additional functions (import, search, view) on the intranet GIS features for call handling
- Creates stationing information, which is derived from 2D profile data
- Exports selected intranet GIS features to the Pipeline Integrity Management System

In addition, the intranet GIS application replaced an existing stand-alone desktop application that required distribution and maintenance to all users' desktops, as well as periodic updates of the GIS data. Phase II of their solution will provide extensions to the search functions, as well as an interface to their SAP system for retrieving equipment details based on the engineering company.

Ruhrgas

Ruhrgas realized that the need to manage and operate its assets more efficiently had become critical. The company had been using disparate systems that could not share the most elementary data. Employees spent an unacceptable amount of time obtaining the information they needed to perform daily work. Out-of-date or inaccurate information was sometimes used because time constraints prohibited prolonged searches. Seamless integration was necessary to share and leverage data efficiently among key engineering and operational systems, and employees needed

company-wide access to the enterprise data. Ruhrgas chose to integrate all of their information management systems and their corresponding data: SAP with enterprisewide maintenance information; GIS with geofacilities data; telecommunications data; cathodic protection information; land information management with right-of-way data and contracts; and cadastral data.

Not only does this integrate the company's workflows and processes, it makes geospatial data available to anyone in the corporation, including personnel in the field. The application provides enterprisewide intranet and offline access to the facility model. More than 200 field crews can get the latest and most accurate information for inspection, maintenance, and other technical work. Field crews can also send redline information back to the central office. The ability to access pipeline asset and operational data from many locations and in various conditions has improved the quality of the data, and static workflows are now information flows that help to manage the company's transmission network with optimum efficiency.

Additional Brief Cases

- Portland General Electric integrates two different GIS formats, CAD, Oracle, ACCESS, and MapInfo data in order to perform spatial queries comparing government land to the utility's facility model, wire mileage reports, streetlight reports, as well as right-of-way corridor analysis. The data they import comes from three different counties and the city, each with their own system.

- Hawaiian Electric Company integrates two different GIS formats, CAD, SQLServer, and Access data in their on-going data sharing project with the city and county government. The landbase information comes from the city and county in one GIS format, but is integrated into the geofacilities database, which is in another GIS format. The utility can then export transmission conductors and substations into the appropriate formats to send back to the city and county. This company uses the integrated data to perform spatial queries comparing government land to the utility's facility model, analysis for transmission corridors, and various complex queries—such as "find all owner addresses and parcel addresses within fifty feet of transmission substations" for use in reporting and contact lists.

- Natural Gas Corporation uses data integration in order to make simple maps of their distribution network for customers. These maps simply show where their services are located in relation to property, streets, driveways and other as-built features. The company also makes what they call 'Disclosure maps,' which show details of their assets by component type for evaluation and regulatory purposes. They also utilize their data integration to perform some marketing analysis. A typical study would include their network details and connections from one GIS, polygons of demographic boundaries from another GIS, and demographic data from an external Access file. The study identifies the number of households in each mesh block that is served by gas, as well as the number of connections in each mesh block. They can then calculate the ratio of these to measure their achievement. Next, they look at the demographics, and direct mail those individual properties that don't have a service connection, but have median to high income, and are located in mesh blocks that are served with the company's gas distribution network.

- Enersource Hydro Mississauga integrates two different formats of GIS data with MicroStation data to support simple queries and more advanced analysis. One example is their generation of thematic maps showing asset allocation—such as maps showing poles based on streetlight wattage, pole height or installation date. In addition, they prepare and publish specific use maps showing their provincial boundaries, and the various utility coverages throughout the province. A few other examples are locating all of the poles within five meters of the fiber network to calculate the number of attachment permits, and displaying geofacilities data against external agency data in order to evaluate plant placement accuracy.

BENEFITS OF DATA INTEGRATION

The benefits of data integration are numerous and as varied as the types of data available in the world today. Sometimes the benefits are directly related to the company's original objective for integration itself. Based on the experience of hundreds of companies worldwide, the below list describes many of the benefits realized by companies as a result of their specific data integration efforts.

- Instant access to necessary information for all corporate users
- Reduction in time to diagnose and resolve problems
- Reduction of paper-based processes by providing electronic access to records
- Elimination of process redundancies
- Reduced operating costs due to productivity increase, staff reductions, and expense reduction
- Improved data integrity and currency
- Ability to access asset and operational data from many locations and in various conditions
- Direct and cost-effective support of workflows among all departments
- Seamless integration with other enterprise applications
- Better reflects the complete network configuration or current corporate facility information
- Geospatially enables the entire company
- Provides the information needed to make better and faster management decisions
- Better ability to comply with regulatory mandates
- Improved customer satisfaction

Basically, better data means companies have the ability to make better decisions, which in turn means better business. Sharing data across the enterprise means sharing costs and investments amongst departments and organizations, as well as making the necessary information available to everyone across the corporation.

SUMMARY

As this paper has discussed, there are a number of different types of data out there and companies are integrating this data in a number of different ways in order to better respond to problems and requests. A company's data is its most valuable asset and must be preserved. Data and application integration must exist for a company to reach its full potential. In order for a company to maximize their ROI and benefits, they must integrate geospatial information into their IT infrastructure.