Biographical Information

Lance E Stafford
Senior Manager
Quorum Business Solutions, Inc.

Specific Responsibilities

Lance Stafford has 13 years experience providing high end software solutions to major Upstream and Midstream energy companies. He has held Project Management, Systems Analyst, web and component based Software Implementation and Developer roles.
Lance holds the position of Product Manager for 2 product lines at Quorum Business Solutions, Inc. (Quorum): Enterprise GIS Applications, and Pipeline Operations & Integrity Data Mgmt. He is responsible for all aspects of strategy, product development, delivery, and support for enterprise GIS implementations and web based development supporting the Quorum Energy Suite of products. In addition, he is responsible for the development of web based applications and Portal Implementations for large integrated and midstream energy companies.

Past Experience

Prior to Quorum, Lance held the positions of Manager, and Senior Consultant within the Energy ECommerce Practice at Anderson Consulting. Lance began his career with Chevron Petroleum Technology Company as a Programmer Analyst.

Educational Information

Lance holds a B.S. Computer Science, minor in Mathematics, University of Houston.

Professional Memberships

GITA

Bridging Multiple Disciplines, Vendors, and Tools

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1. ABSTRACT

Energy companies are faced with numerous choices among various vendors, GIS technologies and tools when optimizing operational efficiencies. The challenge is how to take advantage of sound data management principles, while choosing the most effective combination of tool, technology, and turnkey solutions provider for each specific discipline. Using case studies, this paper will demonstrate how alternative Enterprise GIS platforms have been tightly integrated with Land, Right Of Way (ROW), and Pipeline Integrity applications to optimize efficiencies while addressing the needs of various groups across the organization.

2. DATA INTEGRATION CHALLENGES

2.1 Generic Challenges – Information vs. Data

s

Energy companies often have access to a great deal of "data" but little "information". As a result, they fail to effectively make data work for them. In many companies, it has been determined that a professional spends 40-60% of company time seeking, gathering, and finding data.

Often, data may not be viewed as a corporate asset or even as a shared asset across departments. In most cases, data has been managed in departmental silos, with multiple owners. Furthermore, because data maintenance functions are not occurring close to the source, poor data quality and gaps result. This situation does not facilitate data mining, reporting, and decision making processes.

2.2 Challenges In Managing Land & ROW Data

Specific to Land departments, data is often managed in antiquated legacy systems or simply as paper agreement files, spreadsheets, and plat maps.

Data for ROW departments in particular is often unstructured, managed only as files, spreadsheets, and alignments in file cabinets or boxes. Paper and digital alignment sheets may be the only bridge to integration with the engineering and construction pipeline data. Much of this data is graphics-only with annotation and lacks the intelligence provided by well-organized, discrete attributes associated with the map objects.

In some cases, attempts have been made to create small desktop database systems, but these tend to easily fall out of date, are only available as single-user applications, and lack strong data integrity controls. As a result, critical information, as well as how the data are organized, may exist only in the heads of key Land, ROW or Pipeline Specialists. This presents considerable risk to energy companies. Specific examples include losing the seasoned workforce due to retirement or reorganizations.

2.3 Challenges In Managing Pipeline Data

Data management for pipeline companies has traditionally been the responsibility of the Drafting or Mapping groups. As these assets typically have been in place a long time, they are often a mix of paper-based, manually drafted alignment sheets and CAD-based drawing files for pipeline data. Engineering information and stationing on the pipeline centerlines is often only captured through annotation. This is a result of a historical data maintenance philosophy whereby the focus has been on "Map" maintenance as opposed to "Data" maintenance. New regulatory requirements are requiring changes to this paradigm, but as of today only a fraction of the pipeline attribute data has been captured. Drafting or Mapping groups are typically small and attached as a satellite

department to operations and engineering departments. Often there are backlogs in keeping the maps up to date. Frequent mergers & acquisitions activities within the sector as well as new regulatory requirements further complicate these issues.

Field personnel are often using out of date maps, or in a worse case, maintaining distinct local copies of information that is also being maintained by others, elsewhere.

Draftsmen or mapping technicians are working very hard, but are still struggling as long as they continue to use manual or file based processes. Increased data management demands are putting a higher work load on draftsmen and mapping technicians. As a result, the capabilities of these individuals will become limiting factors.

2.4 The Root Cause Of Data Problems

Focusing on the data flow and work processes that exist in companies with these challenges, a common thread of problems emerges. Data maintenance functions are often:

- manual,
- inefficient, and
- bottlenecked in the hands of a few key overworked individuals.

Management, seeking a solution to the data maintenance problem, may simply throw new technology, "GIS" into the hands of these individuals and expect improved results and efficiencies. However, without a well-planned GIS strategy and implementation, simply making GIS technology available can actually worsen to the core problem. The end goal should be to evenly distribute the data maintenance capabilities and responsibilities appropriately across the entire organization, and not simply increase the workload of an already overburdened group.

For example, many energy companies today fall into a "single threaded" (see figure 1) category whereby all data changes from the field, data collected by external vendors, and map creation requests are serviced by a small group of drafting or map technicians. Providing just enhanced GIS technology and systems to this small group may provide some marginal increase in efficiencies, but the added data capture and quality requirements will overwhelm these resources effectively eliminating any efficiencies gained. The problem remains—too much data, with poor accuracy, and too few resources.

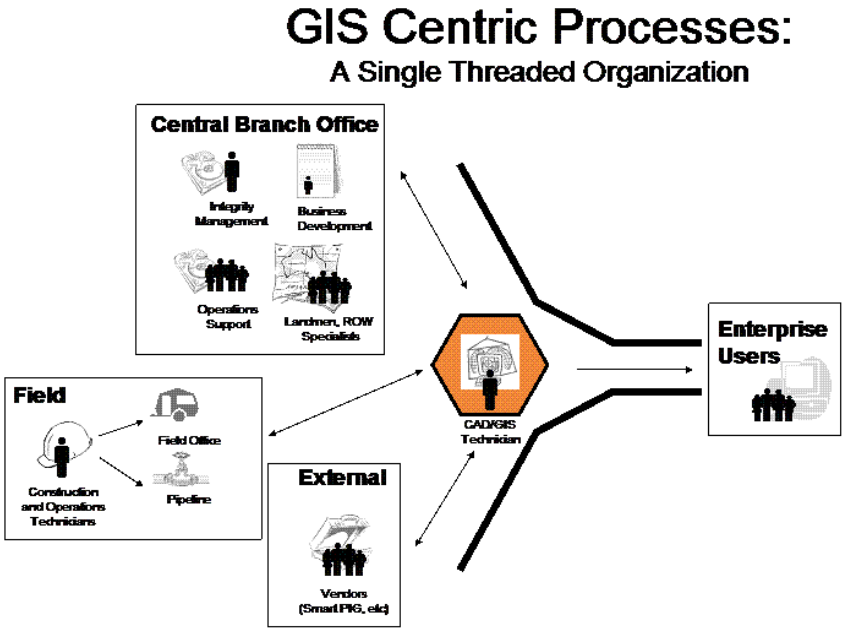

Figure 1

3. MATURITY MODEL –AN ASSESSMENT TOOL TO DETERMINE GIS ADOPTION LEVEL

Quorum has developed a maturity model to assess GIS adoption level. The following is an example for pipeline companies to determine their current vs. desired level of adoption of GIS technologies throughout the organization. In addition, this concept can be an effective tool for educating and communicating with management as well as the rest of the organization.

Pipeline Information System Maturity Model	Level 0 Manual Processes	Level 1 File Server Based	Level 2 Information Silos	Level 3 Document Management Systems	Level 4 Integrated Information Systems
Alignment Sheets	Paper or Digital	Paper or Digital	Paper or Digital Some GIS Interfaces	Paper or Digital	Paper or Digital GIS and Business System Interfaces
Inspection Processes	Paper	Word Documents	Small Applications, GIS	Digital Documents CAD	Distributed Robust Applications
Vendor Data (ILI, DA)	Spreadsheets	Spreadsheets and Access Databases	Spreadsheets, Access Databases, GIS	Spreadsheets, Access Databases, GIS	Data Exchange and Autoload processing
Data Search and Retrieval	None	Directory and Filename	Limited to GIS Users	Limited to GIS or a few key attributes	Comprehensive
Data Reporting	Manual	Manual	Limited to GIS or within applications	Limited to GIS or within applications	Comprehensive
Data Mining	None	None	Difficult and inefficient	Difficult and inefficient	Extensive Capabilities
Integrated Workflows	None	None	GIS and Edit Users (maybe)	GIS and Edit Users (central office maybe)	Extensive Capabilities Process Reengineerig
Databases	None	File Directories or Access Databases	GIS Projects, Isolated Databases	Document Management Functions	Centralized and Integrated
Industry Data Exchange	None	None	None	None	Comprehensive
Data Visibility across Organization	Very Low	Low	Fair, Silos of Information	Good	Very Good
Knowledge Management	Poor	Poor	Fair	Good	Very Good
Risk	Highest	High	Medium	Low	Lowest

Figure 2

As illustrated above, when a company evolves from level 0 to level 4, the company gains two key benefits:

- increased knowledge management
- reduced risk in decision making by using better qualified information in the decision making process

4. DESIGNING SYSTEMS TO SOLVE DATA INTEGRATION PROBLEMS

4.1 What Is Your Overall Organizational GIS Landscape?

Multi-Threaded Organizations

In contrast to the single threaded organization previously discussed (see figure 1), an ideal organizational GIS landscape is a “Multi-Threaded” system architecture (see figure 3) that leverages the strengths of GIS and traditional Information Systems targeted at collecting data efficiently. Responsibilities for collecting related data are split between the GIS components and the Business Applications. Work processes across business systems and the GIS are optimized. GIS technology typically provides a higher degree of self-service allowing the mapping technicians to focus more on data quality.

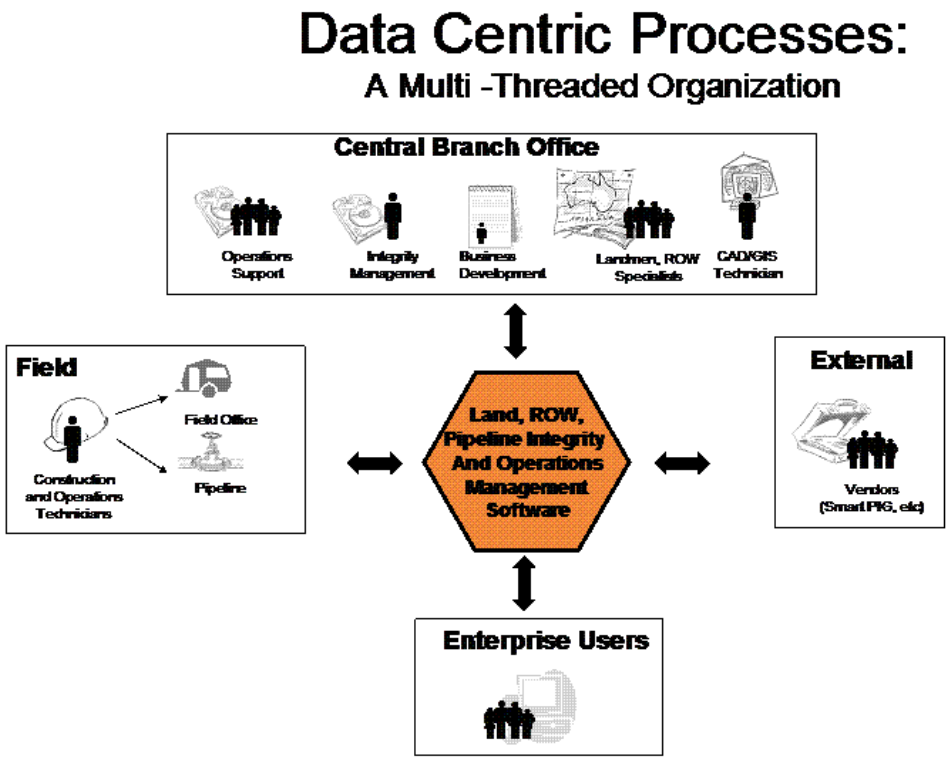

Figure 3

4.2 What Are The Technology Considerations?

To reach the highest level of GIS maturity one of the key strategies is successful data integration. These components should be targeted to distribute and deploy data changes and the supporting user functionality where it is required. Leveraging web based technology to accomplish this is ideal due to its ease of deployment and natural componentized nature. We refer to this method as a "componentized approach to solutions".

A typical componentized approach would consist of the following:

- A core data maintenance application to solve a particular business problem
- GIS Map Viewers (typically web based is preferred) for self service mapping
- Web Based Information windows integrated with the GIS Map Viewer
- Targeted GIS data capture and linking tools that leverage the standard functionality of the GIS platforms
- Specialized High End GIS Query and Analysis capabilities
- Enterprise Reporting (Ad Hoc)

4.3 To What Extent Should You Utilize Vendor Tools?

Another advantage of a componentized approach to solutions is the ability to leverage the strengths of multiple vendors when constructing a solution to a particular work process or business problem. One example would be the functional requirement for automating Land lease and contract polygon generation for Jeffersonian survey systems. Quorum's Land Clients wanted to remove the burden of digitizing agreement boundaries where Jeffersonian and aliquot legal descriptions existed. In this case, Quorum provided the Core Land application that allows land personnel to capture all of the information about contracts and leases, including a formatted legal description. In addition, a source of intelligently attributed Jeffersonian survey grid was available within an enterprise GIS spatial database.

Another vendor, Premier Data Services, provided their Carteview/LotFinder tool, which specializes in composing polygons from legal descriptions and Lot definitions against the backdrop of survey grid. To tightly integrate the

two applications, Quorum devised a wrapper within its software to queue requests for polygon generation, extract the necessary legal description information for the affected agreements as well as a subset of the survey grid polygons, and launch Carteview/LotFinder with these inputs.

As a result, the Land and Lease polygons generated are automatically uploaded into the spatial database and are immediately available to an Enterprise GIS implementation. In addition, the polygon generation solution has eliminated numerous manual steps and processes, improved quality, and taken on an enterprise context by reducing the reliance on file management and project based data management.

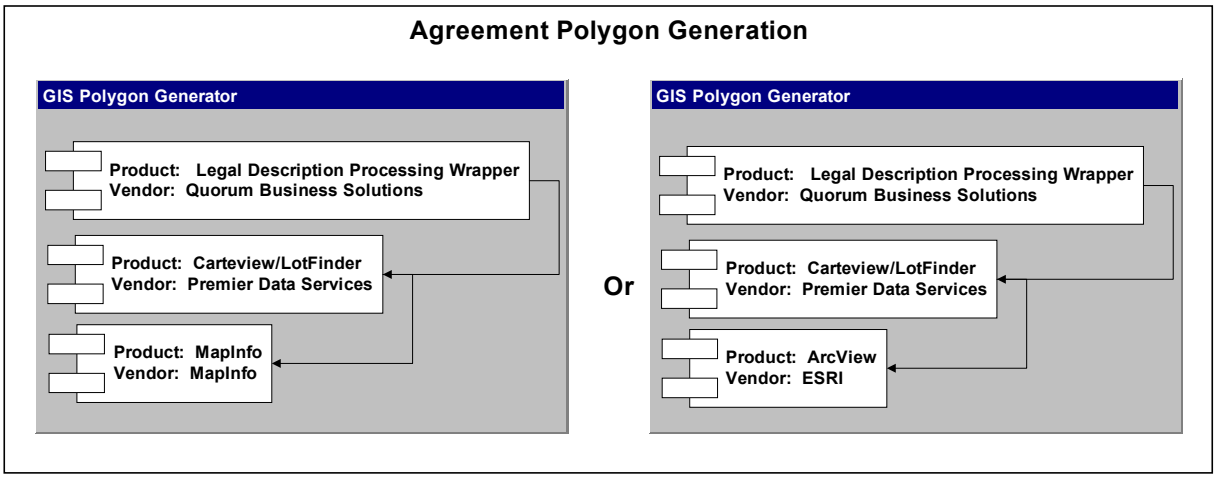

Figure 4

4.4 What GIS Platform Should Be Chosen?

Energy companies today have a mix of GIS and Mapping software in the hands of different groups and mapping technicians (see figure 5). In some of the larger companies there may be efforts underway to standardize on a particular technology platform for perceived cost considerations. In reality, migrating highly skilled personnel off of an entrenched and familiar mapping product without affecting productivity can be a difficult undertaking. In many cases, the practical necessity of supporting multiple platforms wins out over the desire to adopt a single platform. To meet these diverse needs, a componentized approach to architecting solutions is a fundamental requirement. Strategically isolating functionality to accommodate the nuances of different platforms is critical to meeting the diverse needs of different groups and organizations.

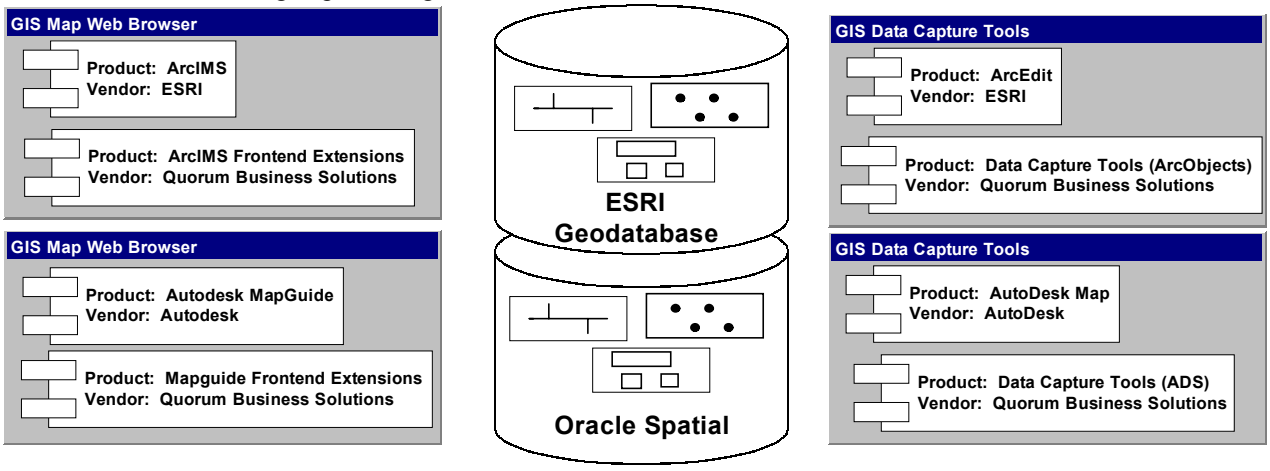

Figure 5

4.5 How Can We Leverage All Of The Above To Streamline Work Processes?

Achieving the full benefit from any business system or collection of systems, including GIS enabled systems, requires a holistic review of all the work processes and collaborative user roles. Goals for sound GIS work process design should include:

- Capture the data only once across related systems
- Capture the data at its source and consistent with the natural work processes
- Target different audiences with different capabilities
- Split the work and processes between GIS and Business functionality
- Establish a goal of self-service functionality for customers external to the core user community — avoid the 80/20 rule as a guide for design when delivering web screens
- Provide a simplified interface
    - Focus on ease of Navigation
    - Organize along work processes
- Leverage functionality in standard GIS platforms
- Integrate data capture workflow with that of core system — Polygon statuses, work queues

In addition, look for opportunities to exploit the capabilities of GIS systems while solving key business problems.

One such opportunity is set out in Figure 6 below. Here we demonstrate how the standard functionality in any GIS, such as polygon intersection, can improve efficiencies for Land specific processes. Examples include automated calculation of net working interest on overlapping leases, federal chargeable acreage calculation based on overlapping leases, and federal unit boundaries, as well as system created agreements and well cross references for reporting.

Figure 7 below illustrates how linear referencing capabilities in GIS platforms can be leveraged to allow the creation of spatial features in the background based on pipeline events entered within a PODS based facility management application. This also improves efficiencies for Land specific processes.

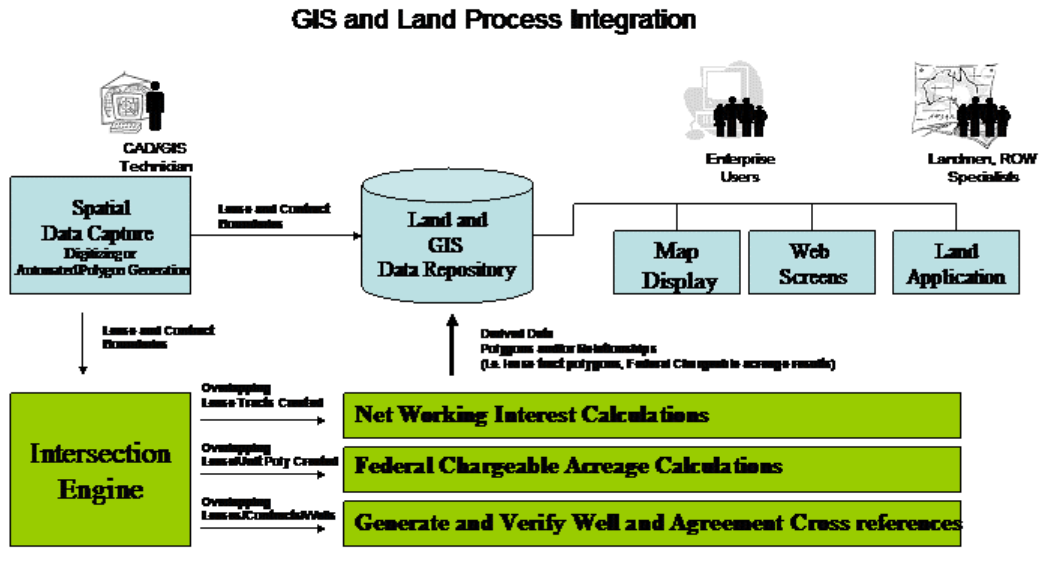

Figure 6

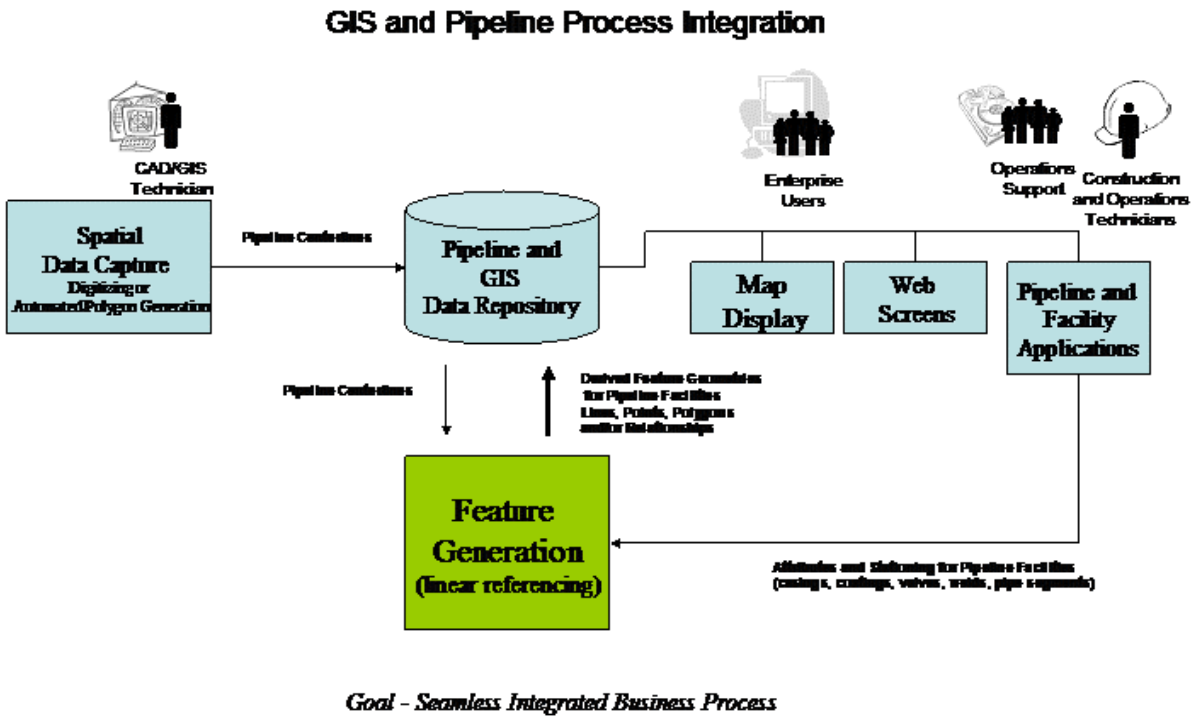

Figure 7

5. CASE STUDIES

Supporting Multiple GIS Technology Platforms and Vendor Configurations

Case 1: Multiple GIS Platforms; examples of two companies of varying size with similar strategies

Company Profiles: A) A Fortune 500 midstream processing company
B) A small E&P company

Turnkey Systems	GIS Tool, Vendor, or Platform	Purpose
Quorum Land Suite	Quorum LandGIS	Land Data Management
SAP or Oracle Financials	AutoDesk Mapguide	GIS Web Based Viewer
	AutoDesk Map	Spatial Data Capture and High Quality Map Creation
	MapInfo	Polygon Generation and Specialized Mapping Request by SQL Query
	Carteview/Lotfinder	Polygon Generation
	Oracle Spatial	Spatial Data Repository

Case 2: Different GIS Vendors across Client Implementations; examples of two companies varying sectors with similar strategies

Company Profiles: A) Large to Small Integrated E&P companies
B) A Midstream Processing Company

Turnkey System	GIS Vendors	GIS Platform
Quorum ROW Suite Quorum Pipeline Integrity Suite	Quorum Business Solutions, Inc.	ESRI and AutoDesk
Quorum Land Suite	Client Proprietary	Proprietary
Quorum Land Suite	PetroWeb	ESRI
Quorum Land Suite	LandWorks	ESRI
Quorum ROW	Multiple PODS Vendors (Quorum Business Solutions, Inc, Moore Resource Systems, Blue Sky, MJ Harden…)	ESRI

Case 3: Multiple Turnkey Systems with Common GIS

Company Profile: A Midstream Processing Company

Turnkey System	GIS Vendors	GIS Platform
ROW	Quorum Business Solutions, Inc.	ESRI and AutoDesk
Measurement		
Contract Management (Transactions)		
Pipeline Integrity and Facility Management		
Pipeline Transactions (Transmission and Gathering)		
Gas Plant Accounting		
SAP, SAP PM		

6. CONCLUSION

Today's energy companies are faced with numerous challenges to reduce cost and optimize business processes. Regulatory requirements are forcing pipeline companies in particular to collect additional information that they previously were not required to obtain. To be effective, companies need well thought out business processes supported by information systems including GIS solutions. Simply throwing technology at the problem to a small subset of users will not achieve the work process improvements desired by most organizations. Assessing the maturity of your organization today with regard to technology and processes is the first step to successfully optimizing your capabilities. Insuring that solutions provided are componentized, flexible, solve real business problems, and can be integrated with multiple vendors and systems can reduce the risk of implementation greatly and allow for future expansion to new capabilities that can further optimize your organization.