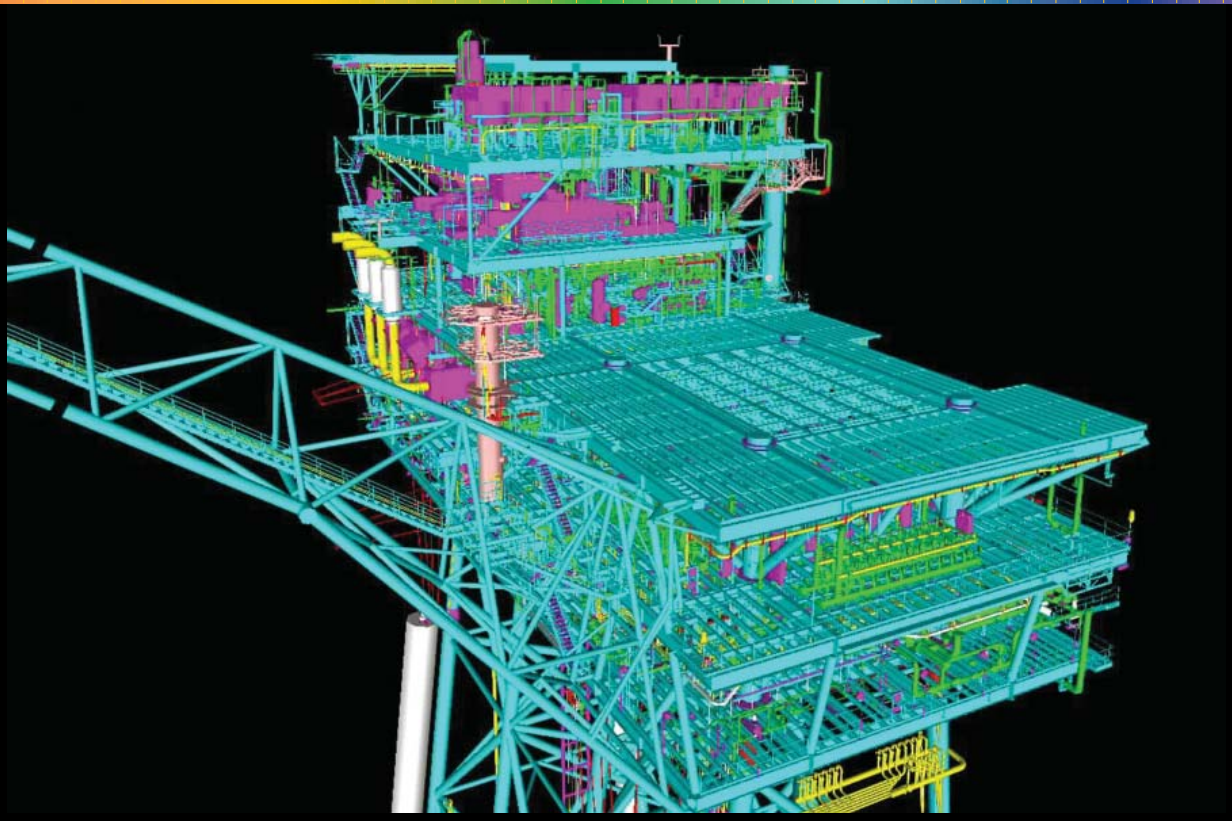
UPSTREAM TECHNOLOGY



A Focus on the Full Spectrum of IT Solutions for Oil & Gas

Enabling Upstream Operations with SOA

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Enabling Upstream Operations with SOA

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Even in times of record profits, the oil and gas industry faces many challenges. Now is the time for forward-thinking companies to dramatically reshape the way they manage their business by investing some of these recent profits in information technology. The appropriate use of information technology can improve efficiency in upstream operations and thus increase the ratio of barrels of oil equivalent produced per day per employee (b/e). Let's take a look at some of the challenges in upstream operations that are prime candidates for using technology to improve visibility, decision-making and efficiency.

Companies still struggle with islands of data – functional silos that hamper efforts to integrate business operations and prevent a holistic view of the company's performance. Key information describing business entities like wells is managed by multiple systems, each with a fractured and incomplete view. Overlapping and related information cannot be aggregated or correlated without extensive manual efforts from business analysts, who repeat the same tedious steps to create spreadsheets and reports necessary to support routine operational decisions. Business critical functions like prospecting must gather information from myriad systems and groups in order to make the critical decisions related to pursuing new opportunities. In some cases, key data may not be accessible for critical decisions, which may mean the difference between profit and loss.

The well is arguably the most important entity for all upstream business processes, however, each business unit is interested in different subsets of a well's attributes and characteristics, and each wants to view that information through their particular lens, from their unique viewpoint. Geologists, geophysicists, petrophysicists, engineers, executives and financial analysts all look at a well from different perspectives. This is a tremendous challenge for IT, where there are competing requirements to aggregate all of the information related to a well and provide a single source of truth, yet each of the different perspectives on that data must be provided in a way consistent with the needs of the various user communities.

The challenge to present aggregated views of well data is further complicated because key well lifecycle data are stored not only in structured databases but also in unstructured formats such as documents, spreadsheets, forms, images, maps and geological and seismic data. A lack of efficient access mechanisms and processes to examine historical data hinders a company's ability to leverage past experience when evaluating current operations, much less new opportunities.

Another negative impact of data silos results from the overlapping information stored by the various systems involved with different stages of the well lifecycle. Because these systems store many of the same well attributes, but are poorly integrated, knowledge workers must repetitively enter the same data into different systems. This is inefficient, tedious, prone to errors and over time leads to inaccurate and out-of-date information.

Many systems lack an audit trail, preventing decision makers from determining what changes have been made to critical business information, when they were made, and by whom. When coupled with the lack of automated activity tracking, it is not surprising

Well Status

District: Gulf 3

Well Name	Geology	Pre Drill	AFE	Schedule	Drilling	Production
SWB-10-55						
BBR-33-55						
EWB-11-45						
BCQ-09-08						
NEC-98-01						
LUW-09-14						
NEW-08-13						
PRW-18-64						

Figure 1. A dashboard gives an individualized overview based on a person's role in the organization, with drill-down capabilities to analyze specifics.

that sensitive data often becomes inaccurate, that important steps in human workflow are either missed completely or stall the business process for lengthy periods, and that the time required to begin producing hydrocarbons is unnecessarily long.

Technology Solutions

These challenges are symptomatic of an aging and diseased Information Technology environment. Service-oriented architecture (SOA) is an approach to enterprise architecture that addresses these symptoms in a systematic way, rather than treating each with one-off solutions that may relieve the immediate pain, but in the end contribute to the systemic illness afflicting the entire IT environment.

SOA defines a set of practices and technologies that break apart the monolithic application environment into independent parts that provide a standardized set of services. A service can represent a single step in a business process or an entire process from beginning to end.

An SOA adoption program needn't be a big bang project. The process of migrating from a company's current state to the desired future state can be iterative and incremental, with each step prioritized by return on investment to yield business value on its own, executed in a manner consistent with the company's strategic direction. Let's take a look at how an IT environment based on the tenets and best practices of SOA would address the challenges above.

A single point of contact between the IT environment and all employees, customers and business partners provides a consistent and seamless view of the company's information assets and business processes. In upstream operations, this enterprise portal organizes the applications and management dashboards in ways appropriate to the different user communities. Some people may need a structure based around the well lifecycle, while others may operate completely within a single stage of the lifecycle and prefer an organizing principle such as geography.

The portal is built on top of a suite of "services" that are provided by the applications in the IT environment. The services required to execute the business processes are designed as standard, generic functions that are exposed to the entire enterprise via interoperable interfaces. This creates an environment where the portal can present each user community with their unique view, while ensuring that the information presented is consistent at a point in time across all assets and users.

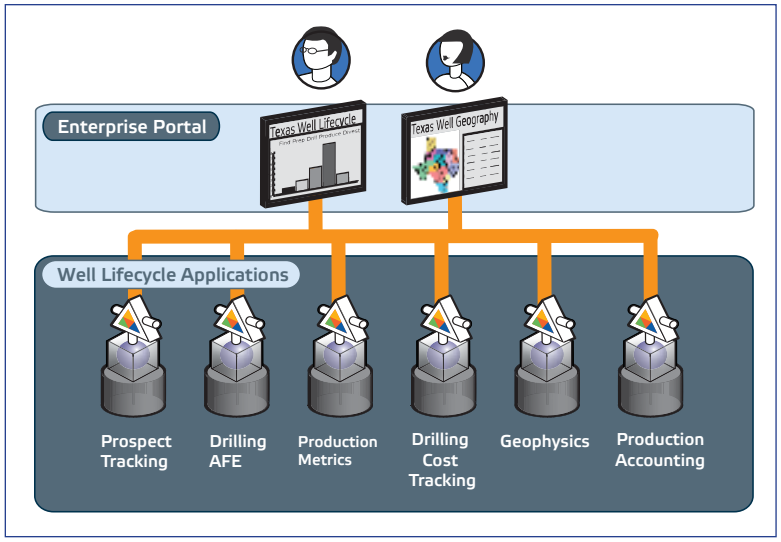

Figure 2. An example of integrating the various departments of an oil company with SOA.

This single point of contact creates opportunities for increased efficiency by enabling collaboration among diverse business users. Business processes that incorporate human workflow can generate approvals, notifications and other action items for all users, irrespective of department or business unit. The portal provides the users with the experience of a single repository for all data, whether structured or unstructured, and the necessary security, auditing and change tracking to ensure the company's intellectual property is protected.

Composite applications assembled from application services not only present accurate, real-time information retrieved from those source systems, they also eliminate the need for entering the same data over and over again in multiple forms and documents, creating even greater efficiencies for knowledge workers and increasing the barrel-per-employee ratio.

Dashboards are a powerful type of composite application enabled by SOA (see Figure 1). Dashboards utilize services provided by operational systems, business intelligence tools and data warehouses to present decision makers with performance indicators and business metrics. Instead of a weekly, monthly or even quarterly report that takes hours to generate and is out of date before it is even used, dashboards present continuous, real-time information along with historical trends, directly from the source systems and without the need for human intervention. Different user communities can view the indicators most important to them, through lenses that are appropriate to their job function. For example, some may need to see metrics presented at the district, regional and national levels, while others are interested in the metrics of individual wells. By implementing dashboards on top of application services, the business can be sure

that all of these views into the performance metrics are consistent, accurate and timely.

Getting There From Here

A successful SOA adoption program will require the company's enterprise architects to understand the business. Instead of focusing on the disparate custom and off-the-shelf applications and the environments in which they run, enterprise architects must understand the business units that make up the organization and the capabilities they provide. These includes services offered externally to customers and partners, as well as internal services offered by accounting, HR, engineering, compliance or operations. The services that these business units offer play a role in the business process lifecycle and should be available to the entire enterprise.

There are typically multiple applications that support the delivery of a service. They may be ERP applications, custom applications, or some combination. In some instances, there may be very close parallels between the services that these applications offer and the services that the business unit offers. More often than not, the applications are built at a more granular level. These applications will implement the services needed to enable the solutions described above.

Once suites of application services are exposed to the network with standard access protocols, other business units and processes can utilize them. For example, the enterprise portal can leverage a suite of services to build a collaboration environment for all of the geologists supporting exploration. The services offered by accounting can supply aggregated costs for a particular well, which can be displayed in an executive dashboard.

Adopting the principles and best practices of SOA will yield ever-increasing benefits to the organization as progressively more of the information technology assets are service-enabled and can be leveraged. SOA is not a "rip and replace strategy;" it is a "leave and layer" approach that creates reusable building blocks from the core services that have always been offered by an organization's business units.

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Editor's Note:
Chip Wilson's recently published book, Transparent IT: Building Blocks for an Agile Enterprise, describes a detailed framework and roadmap for adopting SOA and creating an agile enterprise.