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Crossing the Chasm: E&P Multi-vendor Integration Today

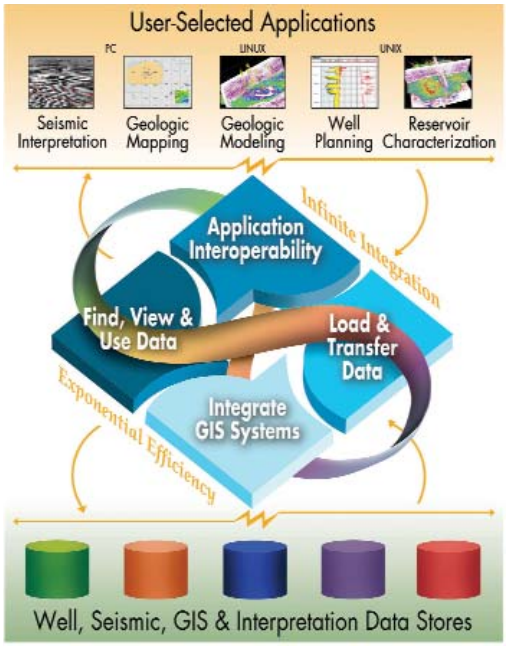
By Jay E. Valusek

"All oil companies have mixed software portfolios today. It's a market reality," says Dave Williams, Director of Information Management & Infrastructure, Landmark/Halliburton. Grant Monaghan, Managing Director of Perigon Solutions, concurs: "Ten years ago, many operators liked to keep their eggs in one basket. Today, they're aggressively seeking the best tool for the job—regardless of vendor."

"The upstream business today is more complicated and more specialized," explains Herb Yuan, former Manager of Upstream Information Technology for Shell E&P. "No single vendor covers the waterfront. The challenge is to get more oil out of the ground and keep costs down. Getting the right information, workflows and integration are critical to success."

Given today's business challenges, what kind of integration is the "right" integration? *E&P multi-vendor integration.* "No single vendor covers the waterfront." To create fit-for-purpose workflows that meet the complex, specialized needs of their E&P professionals, oil companies are seeking more effective methods of connecting diverse applications and data repositories from multiple vendors. "Multi-discipline" connectivity is different. Multi-discipline workflows link two or more technical *domains*, but they don't necessarily cross the chasm between different *vendors*—especially the chasm between major competitors.

To better understand the need for E&P integration across vendor boundaries and to identify viable solutions, I interviewed industry leaders working for oil companies, application developers—including the Big Three software vendors—and other organizations. The following briefly summarizes their views on multi-vendor integration.



OpenSpirit provides the connectivity environment that drives multi-vendor, cross-discipline collaboration.

Why is E&P multi-vendor integration critical today?

Business drivers. Everyone agrees the proverbial "easy oil" is gone. Conventional resources are diminishing. Remaining targets are smaller, deeper, more complex, less accessible, more often found in remote, hostile environments. As James Calaway, President of Calaway Interests, observes: "You're looking for needles in a haystack." With current costs for drilling and extracting hydrocarbons, huge financial motivations exist, as one expert put it, to "get it right." E&P companies must ensure that analysis, interpretation and modeling of voluminous, multi-domain data sets justify the risky and expensive decisions made every year.

Best-of-breed philosophy. To that end, over the past decade most energy companies have consciously adopted a "best-of-breed" software strategy. Rather than remaining hostage to one vendor's solutions, they are deploying the most appropriate applications and databases for their unique and evolving business objectives. "Oil companies want to combine best-of-breed algorithms into custom, integrated workflows to fit their particular needs," says Williams. "Plus they want to plug in their own 'special sauce' to gain a competitive edge, since every company does things a little differently."

Due to ongoing competition, no single vendor or suite of software dominates the market over time. Entrepreneurs and unexpected breakthroughs constantly alter the competitive landscape. "The best approach for an oil company," says the Chief Information Officer of one large independent, "has been to cherry-pick the highest value applications, then find ways to move data in and out of various steps in their workflows." Thus, heterogeneous computing environments are the norm today. This, of course, makes multi-vendor integration critical.

Changing workforce needs. The upstream industry workforce has changed dramatically over the past decade as well. Highly experienced geologists and geophysicists are in short supply. No one wants them wasting precious time

moving or duplicating data among disparate applications and repositories. "Geoscientists are paid a lot of money these days, so oil companies want them to have whatever tools they need, so they can deliver," says Mike Potter, Director of Strategic Relationship Management for Deloitte Services LP. Allowing experts to use familiar software avoids forcing a corporate IT standard and unproductive retraining down their throats, while enabling them to tackle opportunities more efficiently.

However, software has proliferated in this environment. Even smaller oil companies today have suites from multiple vendors to empower their expert users. Following mergers and acquisitions, many companies inherited diverse, incompatible portfolios of technology. It is vital, therefore, to make these tools work together more seamlessly without cramping anyone's style. "There will always be a need to plug other tools into your workflow," adds Peter Breunig, General Manager, Chevron Information Technology Company.

Younger personnel entering the oil and gas business in recent years have grown up with computers, the Internet, and slickly integrated horizontal technologies like Google Earth. They are impatient with the technological hoops previous generations of E&P professionals had to jump through. No one today wants to spend time migrating projects from one vendor's system to another.

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Everyone agrees. These are some of the factors driving E&P multi-vendor integration today. Integration across vendor boundaries matters, even to vendors. As John Gibson, former Chief Executive Offer of Paradigm notes, "It's really difficult for solution developers to provide best-of-class science *and* best-of-class integration." It is increasingly important for vendors to have viable ways of ensuring their solutions remain accessible to oil companies that have multi-vendor environments. The Big Three E&P software developers understand that customers prefer different mixes of their solutions. Monaghan adds, "It also helps smaller software vendors to get their applications accepted alongside the major players, if they can be integrated."

How can oil companies solve the multi-vendor integration problem?

According to industry experts, there are two general categories of solutions to today's E&P multi-vendor problem: data-level integration and application-interoperability. Let's consider the data level first.

Custom proprietary links. Many large energy companies have sufficient IT resources to build custom links between applications and databases. These are usually "hardwired," point-to-point connectors that hook one software tool to one database. But large companies may have dozens of technologies to connect. The resulting tangle of connectors is often dubbed "spaghetti integration." One advantage custom links have is that they can move data very quickly and cleanly from one place to another. Unfortunately, they typically replicate data. Duplicates proliferate, and get out of sync. Also, custom links can be slow and costly to create, inflexible to use, and difficult to support over time. Every new application or database release may require a rewrite of the link from scratch. "Everyone has a heart attack when a vendor decides to change its data model," remarks the Director of Enterprise Integration for a large independent. "You have to do all these gyrations to catch up."

As oil companies focus more on core competencies and abandon non-core activities, maintaining proprietary connectors becomes unwieldy and expensive. IT personnel no longer want to figure out how to move data between disparate commercial environments.

Project data management systems. Another way E&P companies achieve data-level integration is through common project data management systems. Sharing data among multiple applications enables a higher level of integration than migrating and duplicating data. Unfortunately, major competitors—especially the Big Three software vendors that oil companies want to use side-by-side—don't voluntarily integrate with one another on these platforms.

Middleware infrastructures. Another, newer category of data-level integration is "middleware," so called because it is neither an application nor a database. It is a layer of consistent data exchange protocols that sits in the "middle," facilitating communications among many applications and databases. By mapping data from diverse data stores to a common data model, middleware enables applications to access data from other vendors' repositories *without necessarily moving or copying anything.*

Users no longer must determine where E&P data are located or how they are formatted. No software must be configured to read multiple formats; each application has one connector to the middleware, which handles all other data connections. Middleware effectively insulates oil companies from version changes and upgrades that "break" proprietary connections. "With a third-party middleware solution that has economies of scale and scope," explains Gibson, "you can get new technologies connected into established workflows using a standard set of tools."

By piggybacking off a widely adopted middleware infrastructure, independent software developers save money too. They no longer have to maintain custom connections to many different repositories. They can focus instead on software innovation. As the Executive Vice President of R&D for one software company states, a good middleware solution provides roughly the same level of integration *among multiple vendors* that a single vendor provides among multiple *products.*

Application interoperability. The second approach to integrating across vendor boundaries—application interoperability—is less well known in the upstream industry, but seems to be gaining momentum. It nicely complements data-level integration. While data integration links applications *by way of a database*—sharing or copying and moving data—application

interoperability allows software tools to talk *directly* with one another.

The primary way this may be achieved is through special application connectors hooked into established middleware infrastructures. Just as multi-vendor applications communicate with databases via connectors through middleware, they can also communicate with other applications when they are properly enabled. Two key sources of E&P middleware exist today. One is vendor-specific middleware platforms from Schlumberger, Landmark/Halliburton, and Paradigm, each of which provides third-party integration via open Software Development Kits (SDKs). The other is independent, vendor-neutral middleware solutions, such as OpenSpirit.

While the level of business logic and workflow support improves with application interoperability, there are no published E&P industry standards to govern these interactions today. Each middleware provider, therefore, implements application-level integration with its own unique flavor.

SOA and Web Services. Service-Oriented Architectures (SOA) and associated Web Services represent another potential path to multi-vendor integration. "Everyone seems to be moving to SOA," says Breunig. "I think it might represent the future of integration." These new architectures and Internet communication protocols can promote flexible and customizable business processes, including integration of applications and data stores. While many suspect web-based systems will dominate E&P in the future, no one has yet solved the problem of how to migrate or visualize terabytes of high-end reservoir data efficiently over the Internet. Hence, the jury is still out.

A case study in middleware-based E&P multi-vendor integration

Since middleware appears to be the dominant emerging solution to the E&P multi-vendor integration problem, I asked industry leaders more about OpenSpirit's vendor-neutral middleware capabilities. What do they consider the value of this approach?

About OpenSpirit. First, everyone agrees that OpenSpirit—originally launched in 1997—provides a well-established middleware infrastructure with an impressive global presence. OpenSpirit enjoys strong relationships with energy companies and with all the top upstream technology vendors. Both Schlumberger and Paradigm are shareholders, and Landmark/Halliburton is working closely with OpenSpirit. Given the complexity of current technologies and the fact that OpenSpirit has 200 man-years already invested, the barrier to entry for another company to move into this space would be extremely high.

Historically, observers associated OpenSpirit with data-level integration, due to its robust connectors to the leading subsurface data stores. Some assert that OpenSpirit is used widely enough to qualify as a standard for E&P multi-vendor data integration. "OpenSpirit has become a *de facto standard,*" says the Director of Enterprise Integration for a large independent. "People use it because it works."

G&G database integration. OpenSpirit has built data connectors for about a dozen of the dominant industry databases, focusing initially on high priority G&G data types its customers wanted to integrate. Its middleware platform defines a consistent data model that maps data from these repositories and provides OpenSpirit-enabled applications access to those data. Applications "see through" the middleware directly into native multi-vendor databases. They don't need to recognize different formats, transfer or replicate data.

Transparent data connectors provide every vendor's data store a broader audience, without forcing them to spend a fortune or reinvent the wheel. OpenSpirit offers what one software developer calls "the path of least resistance"—*and* lowest cost. "OpenSpirit maintains data connectors to a wide range of external solutions, which would be too expensive for us to maintain on our own," adds Gibson. Data connectors enable end-users to leverage multiple vendors' systems in individualized, fit-for-purpose workflows. They also provide oil company personnel a standard way to link in-house technologies with commercial data stores, without all the trouble. Since many companies have grown through mergers and acquisitions, OpenSpirit's data connectivity can enable them to link disparate, unwieldy portfolios of applications and databases.

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While its footprint remains primarily in geology and geophysics, OpenSpirit recently revamped its architecture and data model. It can now be extended to engineering, production and other data types, according to customer demand.

But data-level integration is only part of the story. Several experts explained that OpenSpirit also provides an intriguing level of *application interoperability,* which may be the company's best-kept secret. In fact, OpenSpirit is the industry's *only* real vendor-independent solution for application-level integration.

Multi-vendor application interoperability. For years, "application integration" in E&P took place primarily by way of an underlying database. Different pieces of software—typically from one vendor—"shared" data by sending messages to and from tables in a common project database. To a user, it looked like two applications were talking with each another. In fact, they were cleverly chatting with a database.

True software interoperability enables two applications to act, at least somewhat, like a single, better application by sharing actions and events—*without the intervention of a database.* The benefits lie in saving time, streamlining and customizing workflows, and hopefully in discovering something new, like using two eyes instead of one.

"OpenSpirit is involved in application interoperability quite strongly," says Monaghan. When software vendors or oil

companies decide to "OpenSpirit-enable" any of their products, they obtain OpenSpirit's SDK with all the necessary APIs, code, libraries, and a test project. OpenSpirit provides support and answers technical questions. The result: an application adapter, or "plug-in," that provides a single connection to OpenSpirit's middleware—and automatic interoperability with *any other* OpenSpirit-enabled application, regardless of vendor.

Currently, OpenSpirit adapters exist for 40 partner applications, and more than 55 partners are in development. OpenSpirit-enabled applications interoperate in two ways. First, cursor tracking enables users to look at the same XYZ location in different types of data. Second, "data events" enable them to examine the same data in different analytical tools.

"To me, OpenSpirit is a no-brainer," concludes Monaghan. "A smaller vendor's products can be more readily accepted alongside major applications without duplicating data. Maintaining one plug-in versus a lot of bespoke adapters could save us tens of thousands of pounds—or more—a year. I can't think of a single reason not to have an OpenSpirit application plug-in."

Performance and growth. While some experts mentioned that OpenSpirit's middleware had performance issues in the early days, recent development of the next-generation infrastructure, enhancements to the open SDK, upgrading the APIs, and new licensing alternatives have effectively laid this concern to rest. As a result, OpenSpirit has been signing a growing number of enterprise-level deals with oil and gas companies. As Yuan reports, "Companies are taking a more strategic approach, asking themselves: 'How can we integrate *all* of our applications, not just one or two?'"

The more geoscientists can combine favorite, best-of-breed applications into flexible and intelligent workflows, the more likely oil companies will be able retain the talent they need in coming years. With vendor-neutral database integration and application interoperability, could OpenSpirit become a sort of "Google for the oil patch"? Who knows. But it certainly seems plausible, given the company's unique position within the upstream industry.

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Enabling Cross-Discipline Collaboration in the Digital Oilfield
Increasing reservoir complexity demands comprehensive analysis coupled with excellence in science. Multi-vendor environments allow you to bring together the best tools to view the subsurface, making collaborative workflows and cross-discipline decisions a business imperative.

However, fundamental integration challenges still exist in our industry. Data locked away in diverse data stores, multiple legacy projects and inherited IT environments are a barrier to realization of this Digital Oilfield vision.

At OpenSpirit, our sole focus is integration:
- SOA
- Standards Based
- Platform Independent
- Vendor Neutral
- Event Driven

As the industry's undisputed open-integration standard, OpenSpirit is the key to achieving true workflow transparency.

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