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Workflow-derived applications: A cost-effective multivendor solution

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Consider the amount of effort required to install, maintain, and enhance complex multiple vendor software systems. Now add the time associated with finding, moving, translating, and converting data stores to meet the requirements of each of those systems. This effort and the associated costs are often referred to as transaction costs. It is estimated that up to 50% of an oil company's technical resources (including information technology costs) are consumed by transaction costs. As the industry develops electronically enabled oil fields, including downhole monitoring systems, permanent seismic monitoring systems and remote controlled platforms and wells, cycle times must be reduced through reduced transaction costs to provide timely analysis of larger and more diverse data sets. The solution is integration of applications from multiple vendors into highly interactive and interdisciplinary workflows. When these new reservoir technologies are coupled with thorough and rapid analysis using integrated multivendor workflows, the results will be more effective reservoir depletion and fewer marginal and dry holes.

There are two possible solutions to reducing transaction costs in the office and the field, a single vendor solution or a multivendor workflow-derived solution. A traditional single vendor solution involves the use of only one software vendor's applications through the entire workflow while the emerging alternative solution is a workflow constructed "on the fly" from small best-in-breed functional components contributed from multiple vendors. This approach is already showing new real potential to reduce transaction costs and allow explorationists to get back to the productive work of finding oil and gas. As the amount and diversity of data increases, cycles times are compressed, and the number of qualified scientists and engineers continues to decline, every company will need to get more out of available resources by reducing transaction costs through integration of the best available technologies the industry has to offer.

In an ideal world, the explorationist would build problem-oriented workflows specific to the problems they are confronted with and then execute that workflow utilizing the best technologies available regardless of vendor. However, the best technologies for a particular workflow usually come from multiple vendors. These applications are not always well integrated and often require data conversions and translations during the process. Furthermore, multiple complex applications, running on multiple hardware platforms often create additional capital and training requirements.

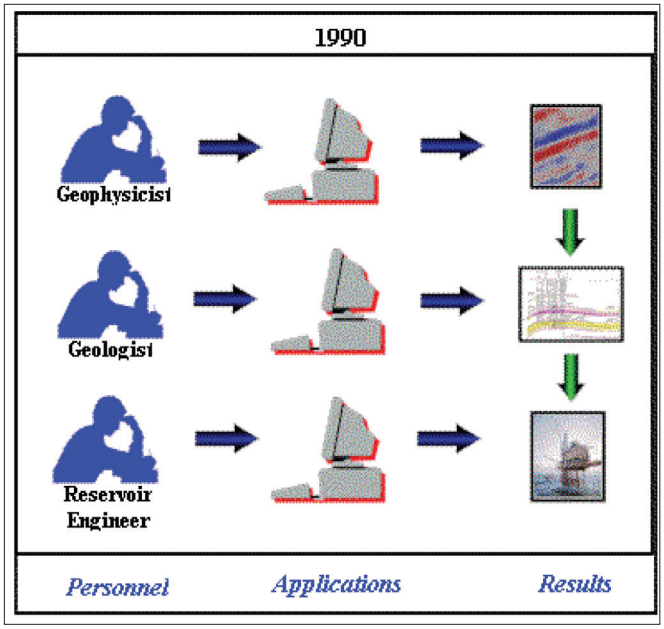

Figure 1.

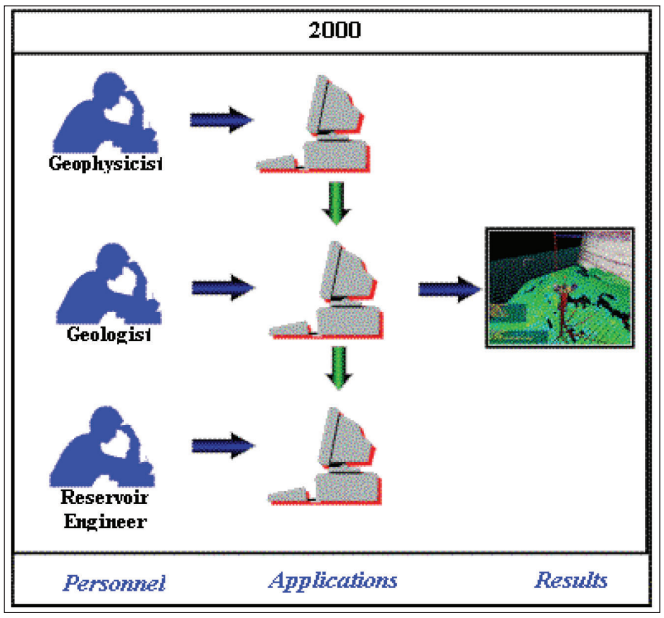

Figure 2.

State of the industry. Many current applications contain code that was written more than 10 years ago. Considering the independence of industry disciplines (geophysics, geology, and reservoir engineering) a decade ago, it is not difficult to understand how current application suites were built over different and incompatible data structures. Each discipline had a specific set of applications that were designed to handle their specific workflow requirements, and it was uncommon for these groups to interact as they do today. As Figure 1 shows, integration efforts were delayed until each discipline had completed its respective analysis.

With the advent of the asset team, cross-discipline application integration began to be considered, but software vendors had already invested heavily in their current systems and technologists liked working with familiar applications.

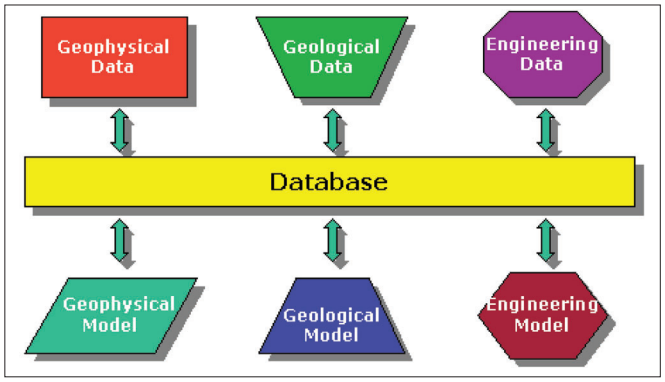

Figure 3.

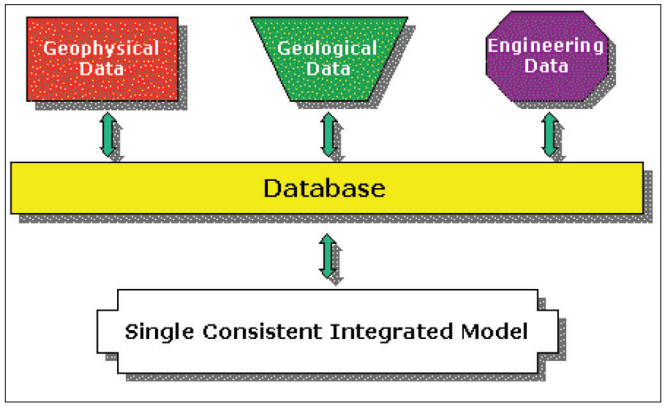

Figure 4.

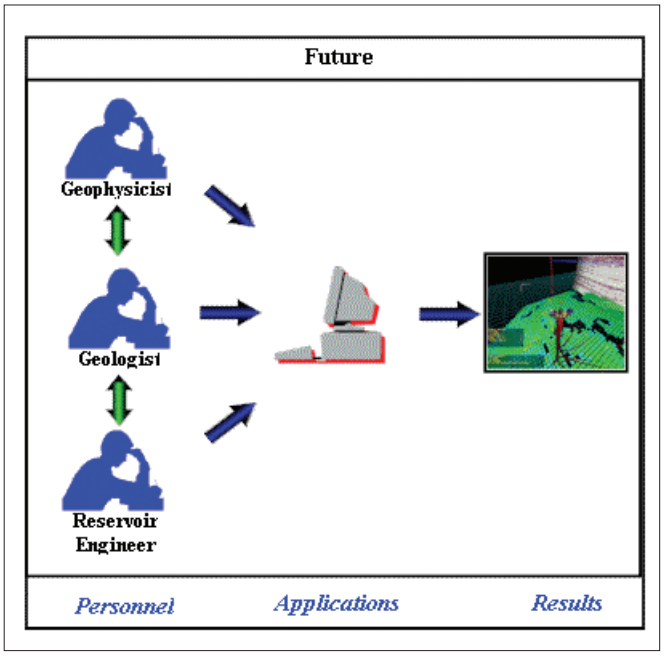

Figure 5.

As Figure 2 shows, multidisciplinary workflows led to a sequence of low-level translations that not only impeded the analysis process but usually resulted in a degradation in data integrity and resolution.

As more cross-disciplinary workflows were developed through the loose integration of applications, it became obvious that the current software architectures cannot handle future workflow requirements. Cross-discipline exchange mechanisms emerged in an attempt to enable these complex workflows. While these efforts continued to expand the life of legacy applications, they introduced still more transaction costs and were unable to address data integrity issues associated with model translations between applications. These problems can become significant when the workflow process is iterative. Dynamic reservoir monitoring and interpretive target refinement while drilling are particularly susceptible to this problem. Most current systems and architectures do not properly address these workflow needs due to incompatible databases and modeling systems. Until recently, the only viable solutions were single vendor application suites that were more tightly integrated than multiple vendor solutions, and therefore provided reduced cycle times. As workflow requirements continue to accelerate, even these solutions are proving incapable of efficiently addressing industry needs.

Data models—time for change. The largest impediment to reduced transaction costs and iterative cross-discipline workflows is the database and modeling infrastructures that current systems are built on. Most industry software products are built on different databases based on specific application requirements. Traditional solutions have involved the translation and conversion of data and models between applications, resulting in high transaction costs and reduced flexibility for cross-disciplinary workflows.

Most software vendors have recognized that a critical component to addressing integration and transaction costs issues is development of applications over common database structures (Figure 3). While a common database is critical to the true integration of any suite of applications, it only partially addresses the integration problem. Each technological domain uses completely different modeling techniques, requiring conversions and translations even if data are stored in a common database. While the applications may appear integrated on the surface, these time-consuming conversions and translations result in data resolution and integrity compromises that make iteration between domains costly and inaccurate. A common database is only part of the solution; a single consistent model (SCM) is also needed.

A SCM utilizing a common database (Figure 4) provides the complete integration solution and meets the needs of all disciplines without data integrity and resolution compromises. This allows rapid, interactive iteration between geoscientists, geologists, and reservoir engineers. When all application components use the same modeling subsystem the results are fast and accurate workflows. An additional benefit is that multiple vendors can easily contribute interoperating components to any workflow—resulting in a fully integrated, multivendor solution.

Multivendor workflow-derived applications. With the development of an SCM subsystem that accommodates the needs of all disciplines, the industry can finally contemplate the ultimate solution: a multivendor workflow-derived solution. This solution gives the "best in breed" capabilities. A workflow-derived solution reduces transaction costs and workflow cycle times by allowing technologists to define the workflow based on geoscience, geology, and engineering needs instead of computer science and application limitations.

A multivendor workflow-derived solution consists of an SCM subsystem built over a common database. These low-level capabilities are the "glue" required to allow multiple vendors to integrate technologies into any given workflow and, in turn, provide clients the flexibility to derive an application from their workflow instead of building a workflow

based on available application capabilities. Unlike traditional workflows, this approach does not require the user to limit a workflow to the capabilities provided by a limited number of vendors; nor does it require the user to consider the database incompatibilities between different vendor systems and models. The user simply informs the software what data are available and what the workflow objectives are, and a workflow recommendation is constructed. No more need to learn complex applications, no more need to pay for 100% of application capabilities when only 20% are ever used; and no more paying for applications 100% of the time when they are only used 20% of the time. Workflow-derived applications enable the technologist to concentrate on workflow requirements, not application limitations.

Figure 5 shows the ultimate goal: a cross-disciplinary asset team defining project objectives and workflows, deriving multivendor applications based on these workflows, and therefore focusing on geoscience and engineering instead of computer science. The integration occurs when the members of the asset team jointly determine the cross-disciplinary objectives of the workflow and are provided with a dynamically linked and integrated application, and therefore integrated results without compromising data resolution and integrity.

Path forward and conclusion. The technical arguments for tight integration of multiple vendor solutions are obvious, but the business drivers may slow the adoption of these crucial technologies. Progress in this area requires that the industry as a whole recognize the importance of these technologies and endorse a specific approach via standards organizations.

The industry has reached the point where existing applications and related subsystems can no longer support complex workflow needs. There is only one solution: multivendor workflow-derived applications based on a single consistent model. The potential to reduce transaction costs, and operate fast, accurate iterative workflows can provide the next wave of increased operational efficiency and reduced finding costs to our industry. TLE

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