A new paradigm for rapid technology onboarding

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Summary

The emergence of Java as a serious numerical and 2D graphics language and the general acceptance of open source maintenance agreements have laid the foundation for a new paradigm that allows rapid technology onboarding. This paradigm has a backplane of Seismic Unix as the data standard enhanced to allow fast random access and to store horizons as well as layer based models. Attached to this backplane are proprietary Seismic Unix modules (e.g., wavelet based seismic lithofacies identification, and stochastic model based inversion) as well as commercial and consortia modules (e.g., Delphi, Colorado School of Mines, advanced full wavefield migration, and Monte Carlo driven map migration). This data format allows for multidimensional indexing - critical for uncertainty, 4D, wavelet and AVO analysis. A final ingredient is an open sourced Java based viewer of the data (synchronized map and cross section views). This unifies the user interface and frees the internal, consortia, and commercial development to improve the core technology, not develop yet another user interface. The final result is rapid delivery of technology to the user that is determined by what is of value to him.

Vision and Implementation

Recently, Java has emerged as a serious language for numerical computation and 2D graphics. Its numerical floating point speed now rivals that of FORTRAN. The difference is the time needed to develop an application – Java development takes 1/3rd the time required by more traditional languages. In addition, Java is web native and platform independent, enabling efficient multi-tiered software architectures and applet-servlet remote computation and viewing. This allows a sophisticated viewing package that would have cost more than US$1,500,000 with conventional languages such as C++, to be developed for under US$500,000 with Java. Thus, is removed a barrier to the implementation. The development scale is changed from a major effort that only a large oil company or substantial software vendor could justify, to one that a small or midsized company could do.

A complementary development has been the general acceptance of open source maintenance models. Development costs are traditionally only a fraction the cost of software. Maintenance and marketing are the major expenses. With use of an open source license that requires the licensee to make all enhancements to the software available to the provider and, through the provider, to all other users; the cost of the maintenance is greatly reduced. The need for marketing is also greatly reduced because this paradigm involves the user in the onboarding of the technology. Traditional marketing focuses on educating and convincing the user of what is needed. The user now would specify what he needs and then receive it. This has the important additional benefit that the technology that will be delivered to the user is determined by what is of value to him.

These two environmental factors have enabled a new paradigm for rapid technology onboarding (see Fig. 1). The backplane of this paradigm is the Seismic Unix data and software infrastructure (Cohen and Stockwell, 1998) developed by the Colorado School of Mines. It has been enhanced to have fast random access and to store horizons as well as layer based models (Glinsky et al., 2002). This allows quick access to hypercubes of data (e.g., with indexed coordinates such as inline, crossline, offset, time, statistical realization number, 4D survey, etc.) A Java based viewer has been developed that will take arbitrary 2D slices through the data (Glinsky et al., 2003). These slices can be synchronized with each other so that one can navigate through the hypercube of data. The viewer can be executed as either an application or as an applet.

The viewer makes available to the user a list of scripts that are executed on the same computer, if launched as an application, and on the server, if launched as an applet. The script is given information about the current view, so that it can process only the viewed data. This is a very important feature of the viewer. It is now an extendable platform. Consortia or vendors can make available scripts that will present a GUI, obtain processing parameters, then process the Seismic Unix data (seismic, horizons, or events). Consequently, the user is presented with only one data viewing interface, the data can be freely shared amongst the applications, vendors can sell new technology that can be plugged in as applications, and consortia can make technology available in a form that can be immediately used.

The Seismic Unix software as well as the extensions are available via an open source license. An application version of the viewer is available free of charge. The source and applet is available via an open source agreement with the purchase of a development license for the underlying Java infrastructure. This allows the system to be scalable. There is no additional charge for each user and

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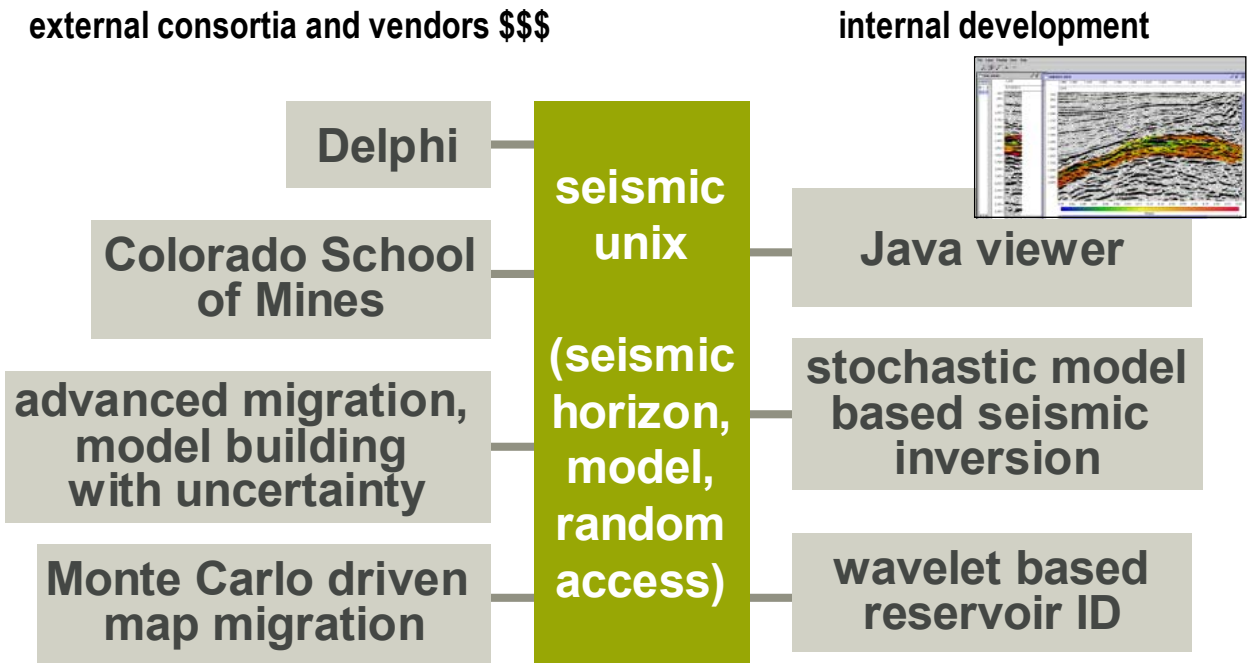

Figure 1. Structure of software. Backplane of seismic unix with a common Java based viewer. Vendors and consortia can add modules. Internal developed propriety or openSource modules can easily be added.

very little initial cost, if any. This is in contrast to most commercial packages where there is a substantial charge for each seat, which acts as a barrier to adoption.

The strategy behind the implementation is simple. An oil company does not compete on the basis of the proprietary technical tools that it has, it competes on the basis of knowing how to combine technology in a way that increases the value of its assets, gives it access to assets, or allows it to recognize the value of its assets. It is the quality of its people and their knowhow that are the company's competitive advantage. A technology infrastructure that inhibits the onboarding and development of technology, does not allow a company to take advantage of its superior knowhow. Therefore, an environment where each vendor has its own user interface and the transfer of data between those platforms is limited does not allow a company to exploit its competitive advantage. It also strangles the development of new technology, as the revenue from current technology is maximized by the vendor. This is the situation that we have today. This paradigm will change this.

Since the viewer and many parts of this new infrastructure are written in Java, they are platform independent and web smart. This allows better knowledge management. Instead of a web page having an inert picture of some data, it can be a preview of an active view of the data in the applet. If that picture is touched the user will receive an active view of the same data that can be explored according to the will of the user. The user will view the data locally, even though it will be stored and processed remotely.

A final but very important facet of this strategy is enabling the estimation and reduction of uncertainty. All common data structures used by our industry allow access via three or four coordinates. It is a fundamental limitation that is very hard to overcome as more data and uncertainty is examined. That is the simplicity and beauty of seismic data formats. They have a couple hundred coordinates called header words. Quite efficient infrastructure also exists for handling large quantities of that data. By enabling a random access and viewing of seismic data, one can now estimate and reduce uncertainty. That is the knowhow that creates business value for an oil company.

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Summary and Conclusions

A new paradigm for rapid technology onboarding has been developed, and significant progress made on its implementation. The viewer (Glinsky et al., 2003), Seismic Unix (Cohen and Stockwell, 1998), wavelet based reservoir ID (Strauss et al., 2002), stochastic model based inversion (Gunning and Glinsky, 2003), and the BHP extensions (Glinsky et al., 2002) to Seismic Unix are all currently available on the internet. The next year will be a critical time in its rollout and the quantification of its business impact.

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