



CASE STUDY

Fractal Technologies needed to store complex data types and inter-relationships in support of their products. They needed to:

- Support thousands of unique objects with data sizes ranging from 3-10GB;
- Handle objects comprised of thousands, tens of thousands, even millions of individual components;
- Create a single common database for data from disparate sources.

With ObjectStore at the heart of their solutions, they are able to:

- Consolidate a wide range of data sourced from different applications;
- Provide a common visualization tool for all the disparate data;
- Allow simultaneous display of multiple objects.

Fractal Technologies: The Power of ObjectStore for Geospatial Visualization

Mineral exploration is a complex and challenging, high risk/high reward proposition. Mineral deposits – whether precious metal or more commoditized materials – can be of immense value, with millions or billions due to the firm that finds the proverbial mother lode. As an example, in the Spring of 2000, a major Canadian mining firm, GoldCorp, sponsored a world-wide contest to uncover new gold deposits in one of its existing mines and found 6 million ounces of gold with a value approaching \$2.5B.

The problem, of course, is that such mineral deposits are hidden below the earth's surface and not easily detectable. Even if there is "gold in them thar hills" (to quote Walter Huston from "The Treasure of the Sierra Madre") – or silver, zinc, copper, platinum, palladium, or even lead – the effort to find the mineral and extract it is a challenge. To discover a significant deposit can mean great profits for the finder, but the costs associated with exploration are significant enough that minimizing risks is crucial. Drilling and excavation efforts represent too significant an investment to expend on deposits that prove too small to be profitable or simply just are not there. Deciding where to look can prove to be a daunting challenge.

Daunting unless technology can be applied to the exploratory effort, thus changing the dynamics. Continuing advances in technology are transforming the business of mineral discovery such that knowledge and skill become more dominant characteristics, reducing the role of luck in finding the next big strike. One company in the forefront of providing solutions that help change the dynamics of mineral exploration is Fractal Technologies, a geospatial software vendor based in Perth, Australia. Leveraging the sophisticated data management capabilities of ObjectStore, Fractal delivers a geospatial database and a unique range of three dimensional visualization capabilities that are helping a large number of mineral exploration companies increase their likelihood of detecting valuable deposits below the earth's surface.

Background

Australia is a mineral rich continent, producing more than 20 different types of minerals in significant amounts (per the latest information compiled by the Australian Mineral Council Report). Of particular note is the fact that Australia is among the world's leading producers of bauxite, alumina, zinc, iron, nickel, gold and diamonds. Equally noteworthy is Australia's standing as an originator of the technology that helps to manage the mining industry. More than 60% of the software deployed worldwide in mineral exploration and mining comes from vendors who are based in Australia. So when the business involves digging "down under" [the earth's surface], it is likely that the software supporting that effort has also come from "down under."

Fractal Technologies began as an early 1990's development project sponsored by Australia's Commonwealth Science and Industrial Research Organization's (CSIRO) Division of Exploration and Mining. The project's goal was to explore the use of graphical visualization tools in the process of mineral exploration. Visualization provides a valuable mechanism for analyzing data about the earth and its geology, thus helping users to better understand resources below the surface, both with respect to quality, amount, and accessibility. Having geological data available through visual tools greatly enhances evaluation of various mineral formations. Visual representation provides an understanding of sub-surface shapes and their inter-relationships that can help confirm



judgments about what is actually below the surface. For example, visualization would allow the analysis to simulate the evolution of geological components over time in ways that simple queries to a database would fail to illustrate. Though the age-old adage claims that a “picture’s worth a thousand words;” in mining a picture may be worth millions of dollars.

Early on in the CSIRO project, the decision was made to develop a set of three-dimensional geological interpretation tools – rather than two-dimensional – in order to better depict the geological complexity underneath the surface. That geo-science visualization effort later emerged as a geological consulting company, Fractal Graphics, which in turn became Fractal Technologies in 2002, a software technology firm focused specifically on commercialization of the visualization and data management product.

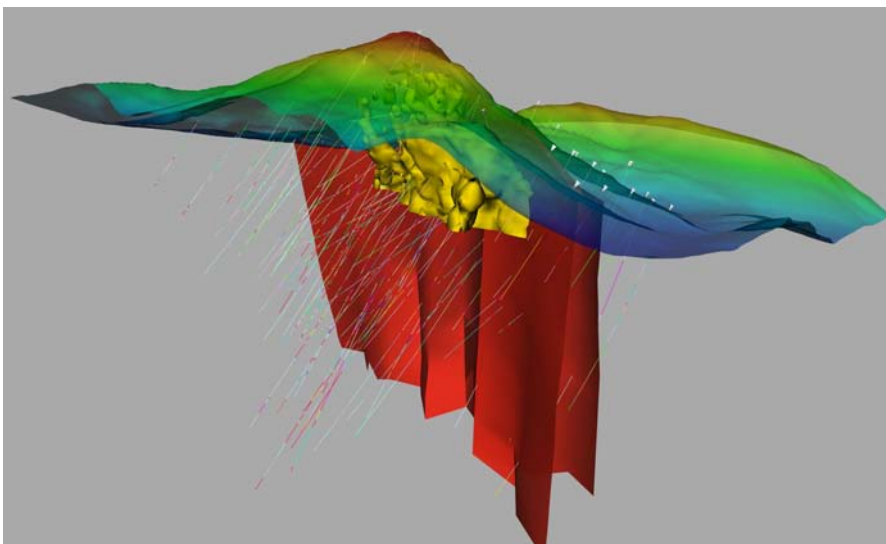
FracSIS

Fractal’s main product – based upon the ObjectStore database – is FracSIS (Fractal Spatial Information System), a three dimen-

sional visualization tool that excels at consolidating a wide range of data sourced from different applications and presenting the information in a consolidated solution. Data from close to thirty different applications commonly found in the mineral exploration market can contribute their proprietary files to a common FracSIS application database. Typical deployments often have between 10-20 different file types that are imported into a FracSIS database, which then converts the data into a unified format and applies a common set of data management and viewing tools. FracSIS also supports standard office files like Microsoft Word, Excel, and PowerPoint, thus enabling it to act as a comprehensive project management solution for mineral exploration.

Rather than use proprietary image viewers that are specific to each data/object type, FracSIS provides a common visualization tool for all the disparate data – regardless of the application that sourced the data. This allows FracSIS to operate as a visual “lingua franca” for a wide range of file types. Beyond the common viewer, FracSIS also allows simultaneous display of multiple objects at the same time. To spatially coordinate the files from different sources, FracSIS incorporates a knowledgebase of coordinate systems. These coordinates allow data generated from different sources – with different scales and boundaries – to be commonly rendered in a single viewing application. FracSIS manages all the transformations required to show differently sourced data in a common view, properly and proportionally scaled.

As part of its ongoing development, Fractal has introduced a new application, the Fractal Technologies Spatial Data Server. Clients can select ObjectStore as their database option with this new product. The new solution builds upon the capabilities of FracSIS with a range of auditing and versioning features that facilitate deployment of enterprise spatial data management solutions, which have a broader range of usage models – extending beyond the geologists and analysts that typify FracSIS users. The Fractal Technologies Spatial Data Server is



FracSIS in action. Drill data and topography from Mt Olympus, Western Australia.

effectively a geospatial content management system providing workflow, versioning, and auditing features that enhance a company's ability to meet regulatory and financial compliance requirements. Given the importance of mineral deposits to the valuation of public mining companies, the new Fractal application can be expected to deliver considerable value to organizations that must document and manage procedures associated with estimation of the value of their mineral assets.

Using ObjectStore to Manage Complex Data

Typical Fractal implementations involve thousands of unique objects with data set sizes that range from 3-5GB, though some deployments far exceed 10GB. Alternative geospatial applications may store complex geological models in a file system as binaries or, in some cases, use relational databases with binary large object (BLOB) technology. Such architectures are quite resource intensive and result in organizations with poor data interoperability and information sharing since binary files – whether managed in a file system or as BLOBS in a database – provide no real understanding of the internal structure of the object.

To manage all the components needed to represent geological models across a diverse range of applications requires a sophisticated object model. In excess of 300 object types typically are represented in a FracSIS database schema and individual objects can be comprised of thousands, tens of thousands, even millions of individual components. With ObjectStore, a wide range of data that includes point samples, line strings, polygons, triangulations, grid meshes, geophysics, block models, images, and drill hole information can be stored in a common database for manipulation. Multiple users share the same data, thus reducing duplication and improving data management.

"We realized very early in the development of FracSIS that the demands of 3D, graphically-based and georeferenced data meant that conventional relational database approaches would

not provide adequate performance to support an interactive and responsive application. Other mining software vendors had already gone down this path and failed to deliver viable products – instead reverting back to traditional file-based storage solutions," explains Mark Morrison, Technical Director, Fractal Technologies. "The type of data that FracSIS deals with is fundamentally thought of and utilized as objects by the end-users. ObjectStore provides a way for us to store, access, and query the data naturally as objects without any need to interpose an inefficient mapping layer between the way the users want to deal with the data and the way that the database is storing it – as would be the case with relational database systems, which would need to reconstruct objects by querying through tables containing billions of rows. By using ObjectStore, we have been able to create the first viable database solution for 3D geoscience data."

Depicting a Glass Earth

An example of Fractal's – and ObjectStore's – power is evidenced in numerous situations. Australia's Glass Earth Project has a goal "to make the top kilometer of the Australian continent, and the geological processes operating within it, transparent." With a transparent view of the earth below, the project envisioned the ability to find "the next generation of giant ore deposits in Australia." To achieve that result, Australia chose Fractal's database and 3D visualization software to develop a data repository that manages geological, geochemical, and geophysical information.

Similarly, another FracSIS customer, Exco Resources, has used the solution to quickly consolidate data from a multitude of disparate sources into a single interactive visual environment, supporting a crucial decision to acquire rights to a major copper site. Not only did FracSIS facilitate the analysis that drove the investment decision, but the FracSIS visual tools were also key components in the presentations that the company did to secure financing for the project.

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Mark Morrison, Technical Director, Fractal Technologies



Summary

Modern day mining operations are sophisticated operations and the technology needed to support such operations is equally sophisticated. Though the popular image might be of grizzled miners carrying pick-axes, the reality of the 21st century is that technology leads the way, playing a crucial role in the success and profitability of mineral exploration efforts.

ObjectStore partner, Fractal Technologies, has proven itself an industry leader in this sector. Leveraging the capabilities of ObjectStore, Fractal has implemented a sophisticated object model that can easily accommodate the compute-intensive data manipulation required for its 3D visualization. With ObjectStore, Fractal offers an industry leading solution that is unique in its ability to consolidate disparate information from a variety of sources into a single view.

C A S E S T U D Y

THE BOTTOM LINE

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