DownUnder GeoSolutions Deploys Lustre* for Seismic Data Processing in the Oil & Gas Industry

The oil and gas industry relies heavily on seismic data for the exploration and appraisal of new oil and gas reserves and for the monitoring of existing reserves. Single datasets can be as large as hundreds of terabytes in size, and require dedicated high-performance computing solutions for processing and interpretation. DownUnder GeoSolutions is a geosciences company that uses a cluster of Lustre-powered servers to process seismic data efficiently allowing visualization of an interpretation of the underlying geology.

The Problem:
Massive Seismic Data Processing for Exploration and Drilling

Oil companies rely extensively on seismic data for their exploration and drilling activities. This data is collected by recording sound waves which travel from the surface of the earth, reflect off the geological layers deep beneath the surface and are then recorded using hydrophones or geophones. Processing this data and enhancing the image quality is achieved using a variety of complex algorithms and iterative workflows. The processed and imaged data is then used with well data to interpret and analyze the potential for oil and gas reserves. However, generating images from raw 2D and 3D data is computationally expensive and time-consuming.

The data needs to be processed using algorithms for noise reduction, migration, signal enhancement, and more, and then processed into optimized 3D images that can be used for geological interpretation. A typical large project might consist of more than 100 terabytes (TBs) of data, and often requires up to 10 times that storage capacity to hold in-progress enhancements or copies of the original raw field data. These tasks are best performed using high-performance computing (HPC) clusters that can operate on the data in parallel, thus reducing project length and generating results in the shortest possible time. A high-performance consolidated file system is a mandatory requirement for this type of parallel computing, as it provides the necessary infrastructure for mass storage and access. In fact, the seismic processing industry is one of the largest (if not the largest) user of commercial HPC systems.

The Solution:
Massive Seismic Data Processing for Exploration and Drilling

In 2005, DownUnder GeoSolutions was already using NFS, but the technical team realized that NFS in itself would not be sufficient to meet future scalability needs. With up to 20 projects at a given time, and with larger projects consisting of more than 100 TB of data, DownUnder GeoSolutions needed the ability to store and access many thousands of terabytes in a consistent and efficient way. NFS limited each file system to 2 TB in size and its I/O performance did not scale well enough to meet the company’s ambitious data processing and efficiency goals.

As DownUnder GeoSolutions began to grow and acquire more customers for its seismic data processing services, the company realized that it would need to scale up its compute infrastructure to better host the massive amounts of data it would need to accommodate. One alternative to NFS was the General Parallel File System (GPFS) developed by IBM. However, GPFS, in addition to being an expensive investment, carried the long-term risk of vendor lock-in. The technical team went back to the drawing board and looked at other options. They looked at Lustre, an open source, parallel distributed file system. Lustre met all of the company’s technical needs. It allowed data to be stored in a single namespace without limitation, bypassing the limitations of NFS. It supported petabytes (PBs) of storage and over 300 GB/s of I/O performance. It ran on commodity hardware, making it possible to scale up efficiently without vendor lock-in. Lustre’s performance scaled horizontally as more servers were added to the cluster. And finally, it was available under the GNU GPL, saving potentially millions of dollars in licensing costs and ensuring complete freedom from proprietary hardware and the ability to customize and adapt the system to specific needs over the long-term. In short, it was an excellent fit.
**About DownUnder GeoSolutions**

DownUnder GeoSolutions is an innovative geosciences company that provides integrated data design, processing and interpretation services, and software for oil and gas exploration. Based in Perth, Australia, the company was founded in 2003 and offers a comprehensive suite of exploration and production services to the global oil and gas industry, including petrophysics, seismic data processing, depth imaging, geostatistical depth conversion, quantitative interpretation, and seismic acquisition planning. The company has offices around the globe, including in Malaysia, Canada, Indonesia, the United States, and Singapore.

"We run our cluster entirely with commodity hardware and with Lustre, we’re able to easily add new servers to grow our cluster without experiencing any downtime."

"Lustre is also easy to set up and integrate with our existing IT environment, and with its WAN support, we’re able to connect our data centres across the globe to ensure consistent high-speed access to data from all our office locations."

Dr Stuart Midgley, CTO
DownUnder GeoSolutions

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