Grid computing for Energy Exploration and Development

Bevc, D., Feodorov, O., Musat, I., and Zarantonello, S., Mini-symposium on Grid Computing for the Oil and Gas Industry, SIAM Conference on Parallel Processing for Scientific Computing, San Francisco, February 2004

By providing an infrastructure for workload management and distributed computing, the Grid will allow the oil and gas industry an order-of-magnitude increase over the amount of computational resources it has now at its disposal. In this mini-symposium we will investigate the state of development of Grid technologies specific to the search for oil and gas. In particular we will focus on seismic imaging and reservoir simulation - the industry's most resource-demanding applications - and investigate the levels of parallelism and integration in a Grid environment that promise their greatest improvement in efficiency.

Abstract:

Seismic imaging for oil and gas exploration is among the most compute-intensive commercial applications that exist, representing one of the largest commercial markets for scientific high-performance computing. The reconstruction of accurate 3-D images of the subsurface from 3-D seismic data requires the handling of huge data volumes – in the order of 10-15 terabytes for a single modern marine 3-D survey – and the application of computation intensive imaging algorithms. Only large-scale parallel computers can apply these algorithms effectively to image modern marine surveys, and deliver the results within a useful turn-around time. Harnessing Grid resources flexibly and effectively is thus a promising, alluring, and encouraging development for the energy industry. We describe 3DGeo's Internet Seismic Processing (INSP) system, and discuss how we are extending its concepts and functionality to harness the full potential of Grid Computing. The Internet has caused a paradigm shift in the way that seismic processing and interpretation is done - enabling remote access to data, remote collaboration, access to resources, and reducing the time needed to make a drilling decision. Seamless integration of Grid concepts into INSP allows access to on-demand computing capacity and improved interaction with data libraries, by developing a virtual environment that links dispersed resources over the Internet to solve large computational problems. While the benefits from this technology are not limited to seismic imaging, they will allow energy companies to more effectively compute 3-D images of the earth and substantially reduce the risk of drilling.