

New Technology Magazine, 7/2/2008

Repsol, Barcelona Supercomputing Center Use IBM Technology To Tap New Frontiers Of Oil Exploration

Driven by the increasing demand and rising costs for energy worldwide, Repsol YPF and the Barcelona Supercomputing Center (BSC) have announced research results using IBM supercomputers powered by the Cell Broadband Engine as the standard for future hydrocarbon exploration.

The preliminary findings show IBM BladeCenter QS22 supercomputers, powered by the IBM PowerXCell 8i processor, enable searching for oilfields at greater depths up to six-times faster than conventional technology currently deployed by the oil and gas industry.

The IBM PowerXCell 8i, originally developed for next-generation gaming consoles, is a critical component to the development of a new class of seismic technology enabling Repsol to locate oil reserves buried some 30,000 feet (10,000 feet of water and then 20,000 more feet of seabed) below the gulf's surface.

The U.S. Department of the Interior's Minerals Management Service estimates the Gulf of Mexico holds approximately 56 billion barrels of oil equivalent (oil and natural gas), which, at \$130 per barrel, would be worth over \$7 trillion and would meet the entire U.S. demand for oil and gas for about five years.

Repsol and the Barcelona Supercomputing Center are using a process known as Reverse Time Migration (RTM), a sophisticated subsurface imaging tool accepted by the oil industry. It has proven essential for imaging areas of complex subsurface geological structure, such as the rich hydrocarbon provinces of the deep waters of the Gulf of Mexico, offshore Brazil and West Africa.

These basins are the new frontiers in oil exploration, where significant oil reserves are present below thick masses of salt that have made seismic imaging difficult. But the new technology will accelerate and streamline oil and gas exploration in these promising regions by several orders of magnitude compared to current industry methods.

"Fidelity of the RTM images reduces the risks associated with oil exploration in these prolific but complex areas," said Francisco Ortigosa, director of Geophysics, Repsol.

"However, the universal use of this technology is limited by processing speed. The IBM PowerXCell 8i processor's unparalleled speed for the imaging algorithm allows extensive use of the technology. By speeding up seismic imaging, we foresee a revolution in exploration that will be comparable to the revolution in medical imaging technologies, such as MRIs, that today routinely yield detailed images from inside the body."

RTM is one of the key efforts driven by the work of the Kaleidoscope Project, a collaboration between Repsol; the Barcelona Supercomputing Center; 3DGeo, a Houston-based imaging company formed by Stanford University professor and seismic imaging pioneer Biondo Biondi; and Stanford University's Stanford Exploration Project (SEP), a leading industry-funded academic consortium, whose purpose is to improve the theory and practice of constructing 3-D and 4-D images of the earth from seismic echo soundings.

The project utilizes new models, algorithms and the BSC, also called the MareNostrum, one of the world's most powerful supercomputers, which features IBM's latest processing technology.

"The high-speed communications capabilities of the new IBM PowerXCell 8i processor in the IBM BladeCenter QS22 can help companies create and run vastly improved visual, immersive, real-time simulations," said Jim Comfort, vice-president, IBM Systems & Technology Group.

"These simulations are already helping companies like Repsol make significant headway in hydrocarbon exploration by allowing them to locate energy reserves previously unknown. IBM has built a strong ecosystem around the new QS22 to address critical real-time analytic and imaging projects, and Repsol is a great example of a company reaping the benefits."


"Kaleidoscope is a pioneer project showing the industrial impact of a new generation of high performance heterogeneous processors with one order of magnitude increase in performance and a power consumption decrease of one order of magnitude. Kaleidoscope produces its first results at the same time that the petaflop barrier is broken by a Cell based computer," said Jose M. Cela, BSC CASE department director.

Repsol is an integrated international oil and gas company, operating in more than 30 countries and is the leader in Spain and Argentina. It is one of the ten major private oil companies in the world and the largest private energy company in Latin America in terms of assets. From exploration and production to marketing, Repsol is present in all stages of the business.

In 2004 the Ministry of Education and Science, the Generalitat de Catalunya and the Technical University of Catalonia took the initiative of creating a National Supercomputing Center in Barcelona. The Barcelona Supercomputing Center, Centro Nacional de Supercomputacion (BSC), is the National Supercomputing Facility in Spain. Established in 2005, BSC manages MareNostrum, one of the most powerful supercomputers in Europe.

BSC is a research center in computer sciences as well as in fields that demand high performance computing resources such as life sciences and earth sciences. Following this multidisciplinary approach, BSC brings together a critical mass of researchers, high performance computing experts and cutting-edge supercomputing technologies in order to foster scientific progress.

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