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Repsol, IBM team in supercomputing

Joint research project uses latest cell broadband engine processor to reach record speeds, deeper depths in finding energy reserves.

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Driven by the increasing demand and rising costs for energy worldwide, Repsol YPF and the Barcelona Supercomputing Center (BSC) 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 oil fields 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 20,000 ft (6,100 m) below the Gulf of Mexico's surface. The US Department of the Interior's Minerals Management Service estimates the Gulf holds approximately 56 billion barrels of oil equivalent (oil and natural gas), which, at $130/barrel, would be worth over $7 trillion and would meet the entire US 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 (www.KaleidoscopeProject.info), 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 data. The project uses 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."

Added José M. Cela, BSC CASE Department Director, "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."