sgi®

Success Story

Marathon Oil U.K., Ltd.

Drilling Smarter with Altix®

"We've done very little system administration since we implemented, it just hasn't been necessary."

– Bruce Dempsey,
IT Analyst,
Marathon UK

More than a mile beneath the cold, crashing surf of the North Sea lie some of Europe's richest oil and gas deposits. It's hard to imagine a more hostile work environment for energy exploration, where grey skies can breed violent winds that send white-capped waves slamming into oil platforms. So it's little wonder that energy industry leaders like Marathon Oil Company prefer, as much as possible, to explore undersea reservoirs from the safety and comfort of an office.

Yet subsurface reservoir simulation does far more than minimize exposure to unfriendly weather: It can save oil companies millions, helping them to pinpoint the most productive areas of an offshore discovery, and allowing them to determine drilling strategies that maximize their return on an exploration investment.

For 20 years, Marathon Oil has been producing oil and natural gas in the United Kingdom. With European operations based in Aberdeen, Scotland,

Marathon's net 2003 production from UK fields averaged 40,000 barrels per day of crude oil and 208 million cubic feet per day of gas. Marathon remains committed to operations in the UK sector of the North Sea and is actively pursuing further opportunities to optimize its involvement in this area.

Maximizing Exploration Dollars
Crucial to maximizing every dollar spent on exploration is Marathon's ability to understand before hand what it will find when its drilling rigs penetrate the ocean floor. For this reason, leading energy companies like Marathon are increasingly committing more time, energy, and resources up front to determine the properties and potential of a reservoir.

"Developing as much foreknowledge as possible about the discovery provides an edge in determining the best place for the drilling platform, the optimal angles of approach and the most advantageous extraction strategy," notes Bill Bartling,

"Reservoir simulation is about dynamic modeling of the area you plan to tap, so it requires true HPC capabilities."

– Bill Bartling,
Senior Director of Energy Markets Strategy,
SGI

senior director of energy markets strategy at SGI. "How much can be extracted from a field is important, but how efficiently it can be done often determines how profitable the field ultimately is. The two are inexorably linked."

In the face of challenges that can vary dramatically – from economic conditions to weather forecasts – striking the best balance between expenses and results isn't always an easy task.

Marathon's discovery off the coast of Norway in Spring 2003 prompted the need for a new subsurface simulation resource. But to be able to conduct its analysis locally, the Marathon UK team needed a solution fast. Marathon wanted to make drilling strategy decisions on the new discoveries in the Alvheim field offshore Norway before the end of the year, which meant the company's IT team had to sort out computing solutions among a variety of Linux® OS-based options.

"We were working in very tight time scales, and the fact that Alvheim had three assets situated closely together made it more challenging," recalls Paul Beckett, IT Infrastructure Supervisor at Marathon's office in Aberdeen. "The discovery was in the early appraisal stage, and we needed to make some key commercial decisions by the end of the year. We started assessing our needs in early July, and we needed the new system up and running in mid-September. That really is an aggressive time scale."

Altix: The Clear Choice

While the window to select and install a new high-performance computing (HPC) class system was small, Marathon's search was narrowed somewhat by the company's desire to only consider hardware platforms certified to run GeoQuest ECLIPSE®, the reservoir simulation application suite from Schlumberger Limited. To identify the best system for their needs, Marathon engineers collected real-world data samples and brought it to Schlumberger to run ECLIPSE performance trials on 12-processor configurations: clusters from HP and IBM, and a single SGI® Altix® 3000 system. After exhaustive benchmarking, the choice was Altix®.

Marathon installed the Altix system, outfitted with 12 Intel® Itanium® 2 processors and 16GB of memory, in September of 2003. The HPC capabilities of the company's Altix system leverages the built-in SGI® NUMAflex™ architecture, which dramatically reduces the time and resources required to run technical applications by managing extremely large data sets in a single, system-wide, shared-memory space. For the first time, more complex data sets and complete workflows can be driven entirely out of memory, enabling productivity break-throughs that traditional Linux clusters or repurposed e-commerce UNIX® servers can't achieve. Altix systems feature a fully supported, standard 64-bit Linux operating system and advanced SGI

intel.®
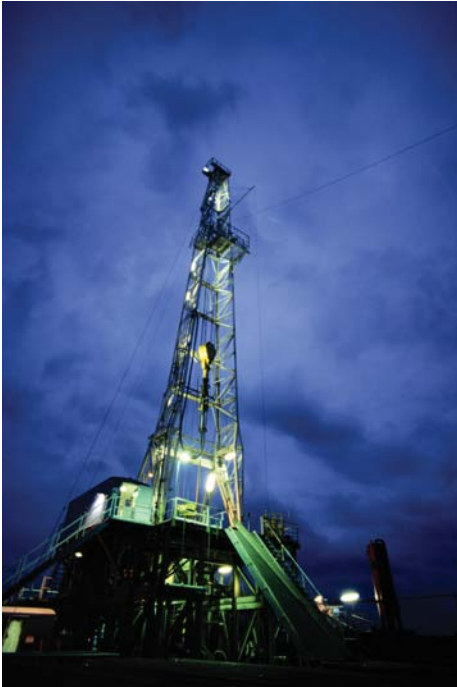
ProPack™ development environment specifically optimized for technical applications like ECLIPSE.

The Altix architecture's ability to handle large data sets is a huge advantage for Marathon, whose simulations can reach 2.3GB in size. But the company also found the system was easy to install and administer. "We've done very little system administration since we implemented, it just hasn't been necessary," says Bruce Dempsey, IT Analyst with Marathon UK.

Marathon UK operates the Altix system on a Storage Area Network (SAN), tapping a 600GB LSI storage solution via the SAN. Altix supports an integrated multidisciplinary workflow, in which geophysical engineers using SGI® workstations and other systems fit subsurface reservoir simulation into a series of disparate tasks that ultimately lead to cost-saving insights.

'The Best Possible Play'
Systems like Altix are crucial to generating high-fidelity understanding of a reservoir's potential. "Reservoir simulation is about dynamic modeling of the area you plan to

tap, so it requires true HPC capabilities," says SGI's Bartling. "You plug in different variables like real pressure, various fluid data you've gotten from nearby wells or the well itself, and information on where you've already found hydrocarbons. A large part of this process is determining how the reservoir will react under certain conditions. You're after the best possible play while investing the least amount of time, energy and resources."

High-fidelity simulation pays potentially vast dividends: in detecting subsurface hazards, for instance, or in helping map the most cost-effective way to drill for oil or gas through miles of ocean water. For industry leaders like Marathon, powerful simulation platforms like Altix and ECLIPSE can be instrumental in making the most of the energy deposits awaiting exploration teams in the North Sea and beyond.
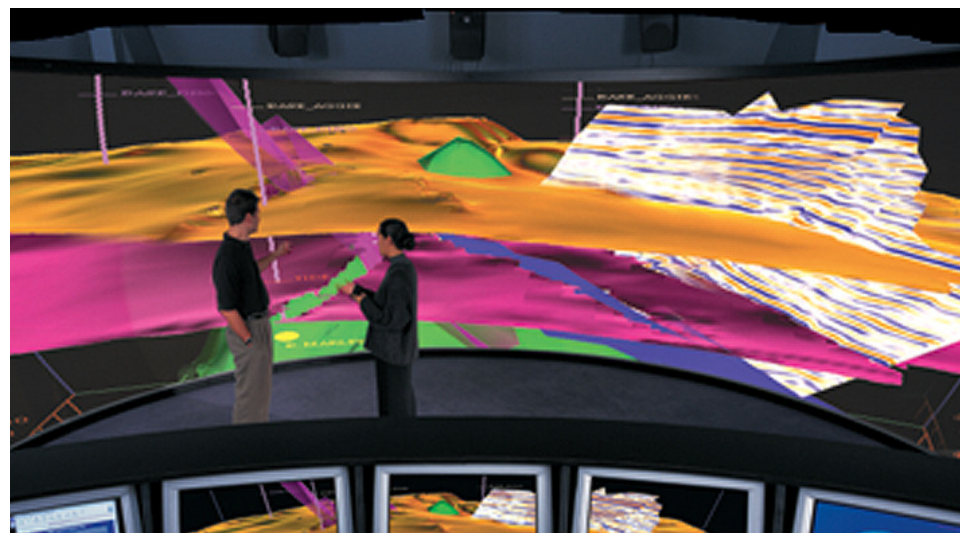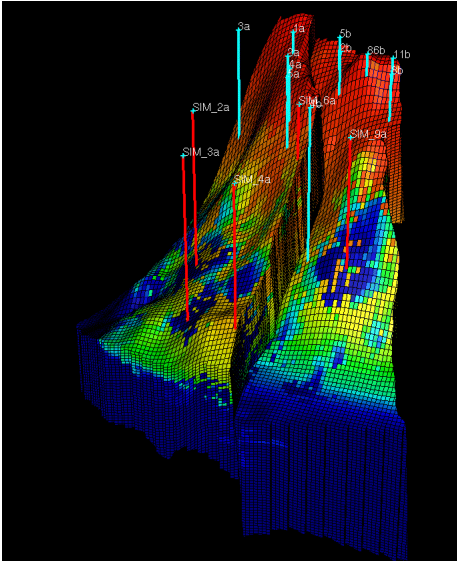
Narrowing the Search for Oil and Gas with Altix and SGI

With SGI Altix, exploration analysts are able to estimate oil and gas reserves in the subsurface and predict how quickly the company can produce those reserves: the geocellular model, a static model describing the rocks and fluid properties of the field, reservoir simulation, a fluid dynamic model characterizing how fluids flow through and from those rocks, and the economic model, enabling the company to efficiently manage the monetary resources required to produce the hydrocarbons.

Altix is a crucial part of SGI® high-performance computing, complex data management, and visualization solutions, all of which are well suited to existing and emerging applications associated with exploring and producing petroleum in the energy industry. Seismic imaging applications make extensive use of the high-performance 3D and 4D processing and volume-visualization capabilities of SGI® Reality Center® environments to make oil-well planning a faster and more accurate process. In addition, the scalable computing and complex data management capabilities of the SGI Altix family of servers and supercomputers are utilized for reservoir simulation to more efficiently manage existing energy reserves.

4

sgi®

Corporate Office
1500 Crittenden Lane
Mountain View, CA 94043
(650) 960-1980
www.sgi.com

North America +1 800.800.7441
Latin America +55 11.5509.1455
Europe +44 118.912.7500
Japan +81 3.5488.1811
Asia Pacific +1 650.933.3000