Repsol YPF's Kaleidoscope Supercomputer Operations Depend on CyrusOne for Ultra High-Density, Mission-Critical Colocated Data Services

REPSOL YPF

When it comes to deciding whether to retrofit an existing data center, build a new one or to colocate, important factors need to be considered. Cost, infrastructure reliability, system uptime, power and cooling needs, efficiencies, security, future growth, resources and time are some of the major considerations. These critical factors greatly intensify when one considers the needs of supercomputer operations that have worldwide impact - as was the case with Repsol YPF.

Repsol YPF, an integrated oil and gas company operating in over 30 countries, recently had this very dilemma. Where would it host and support its groundbreaking Kaleidoscope Project system architecture? This architecture is designed with Repsol's Kaleidoscope Supercomputer at its core: an IBM-powered, ultra high-performance computing platform with far-reaching capabilities for energy exploration.

Challenges

- Significant investement needed to support infrastructure
- Power & cooling systems needed to meet super computing platform requirments
- Rapid timeline

Strategy: Find a colocation provider that could assure the highest level of operational uptime for sopohisticated supercomputer systems.

Repsol's Kaleidoscope project is a "dream team" partnership of top geophysicists, computer scientists and organizations from around the world. Launched in November 2006, its research data is powered by IBM PowerXCell™ 8i processors, which image 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 known to be present below thick masses of salt, but have been difficult to pinpoint using conventional seismic imaging technology. Now, Kaleidoscope's clearer, faster seismic images bring unprecedented opportunities for energy companies to accurately identify underground oil and gas reserves in these traditionally hard-to-image areas.

Kaleidoscope enables 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 of Mexico's surface, for example. The U.S. 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 $65/barrel, would be worth over $3 trillion and would meet the entire U.S. demand for oil and gas for about 2.5 years.

These reserves are very difficult to find and reach due to thick layers of salt that preclude the imaging and visualization of the oil-bearing sands underneath. The oil industry uses sophisticated technologies to locate and visualize these exploratory objectives. These technologies are computing intensive and the success to properly "see underneath" depends largely on the power of the supercomputers used. The application of imaging technologies that, until today, had been considered a utopia in the oil industry, result in more reliable exploration.

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Challenges

Signficant investement was needed to support infrastructure

Power and cooling systems needed to meet demands of supercomputing platform

Timing was of the essence

Solution

Tier IV data center with 750+ watts of power per sqaure foot

Result

Avoided extensive capital outlay with building a data center

Capacity on demand

Future-proof performance

Dense enviornment and skill set to meet the high-availabilty demands of the Kaleidoscope project

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A Supercomputer Milestone

In addition to launching the project's first real-world applications, Repsol has also made the commitment and investment to build and operate its own supercomputer to provide the computational power and stability needed for Kaleidoscope's future expansion. The Kaleidoscope Supercomputer, a 120 teraflop, scalable Linux cluster computer system powered by IBM PowerXCell 8i processors, runs the project's RTM production code on large datasets of information. The IBM PowerXCell 8i, originally developed for next-generation gaming consoles, is a critical component to the development of this new class of seismic technology. As the first supercomputer to combine these technologies, the Kaleidoscope Supercomputer has a peak performance equivalent to 10,000 Pentium 4 processors, the mainstream desktop and laptop central processing units (CPUs).

High-Density Data Center Infrastructure Requirements

With the goals for the Kaleidoscope project the stakes were high in determining the best solution to house the state-of-the-art seismic technology. After much discussion and calculations, it was determined that if they could find a colocation partner, to house the high density equipment, who could meet their unique power and density needs, this would be the best solution. "To meet the Kaleidoscope Supercomputer's ultra-dense data center requirements and guarantee optimal installation and future-proof performance, we needed a colocation provider, or data center partner, who would be able to deliver superior high-density capabilities across the board," said Francisco Ortigosa, Repsol's chief geophysicist and project leader. The high-density requirement was the deal breaker with most providers. Repsol's server technology required a data center infrastructure to support 750+ watts of power per square foot. The majority of providers were unable to provide this level of high-density support. In their search for a collocation partner, Ortigosa learned of CyrusOne, an ultra high-density data center located in Houston, Texas.

Upon evaluating a data center solution for the Kaleidoscope project, Repsol considered two options: retrofitting their existing "server room" in Houston or leveraging a colocation provider. Significant capital investments to their infrastructure were required in order to support the high-powered systems in-house and would prolong the project for up to six months. Repsol had a strict time line to abide by and needed a quick solution; therefore, the internal option was not realistic. When considering outside providers, Ortigosa's team carefully considered security, power and cooling capacities, availability of space, installation time and additional services, such as implementation and smart hands (rebot servers, rack and stack, tape rotations, etc.)

Repsol chose CyrusOne specifically due to their power and cooling capacity available per square foot. CyrusOne was the only provider that was able to accommodate Repsol within their time line. Other providers were faced with investing capital into their infrastructures, specifically for Repsol's project, which could take up to three months. Because CyrusOne provides high density infrastructure to all of its customers, CyrusOne was able to deliver a scalable and timely solution for Repsol.

"At 750 watts per square foot, high-density colocation proved to be the optimal solution for Repsol from a technical, practical and economical point of view," said Blake McLane, senior vice-president of business development for CyrusOne. "In the short term, the evolution of the PowerXCell 8i processor will increase by four times the computing power within the same footprint. This additional power, however, requires a robust data center infrastructure that can support maximum power and cooling. We recognize this installation as the start of a trend in ultra-dense green supercomputers that will lead to affordable petascale capacity in the near future."

Management is taking a closer look at how to properly and efficiently manage their systems and, in many cases, find that outsourcing the more challenging and resource intensive part of their data center is a prudent and cost-effective decision. Implementation, technology upgrades, personnel and geography all play important considerations when running high-availability operations. "The Kaleidoscope project represents the culmination of the very best that technology has to offer. We were very pleased that CyrusOne had the dense infrastructure capabilities (power, cooling, redundancies, security, etc.) our supercomputing platform required along with the technical skills and vast experience to accommodate our mission-critical operations. We look forward to successful energy exploration with the help of CyrusOne," said Ortigosa.