PBS Professional at GE's Oil & Gas Business: Putting an Engineering Cluster to Work

Key Highlights

Industry
Oil & Gas

Challenge
A fast approach to job scheduling that was reliable to handle GE's applications.

Altair Solution
Configuration of the cluster and use of GE's Gigabit Ethernet switch now take greater advantage of their two internal networks.

Benefits
- Submit and manage its StarCD workload with confidence
- Able to expand their cluster by adding heterogeneous nodes

Customer Profile

Next time you stop to fill your fuel tank, reflect on the fact that a company on the sunny slopes of Tuscany may have helped to make it possible. Nuovo Pignone, now a key technological component of GE's Oil & Gas business, began life 100 years ago as a foundry. Today more than 20,000 machines – turbo machinery, compressors, pumps, valves, and metering and fuel distribution equipment – manufactured by this GE business are operated worldwide by major companies to keep petroleum products moving from oil rigs to storage facilities to refineries to distribution points. In order to produce this essential machinery, engineering groups at GE's Oil & Gas Florence headquarters work extensively with commercial and proprietary CFD and CEA tools which are used to build and test product designs. At the end of 2002, the gas turbine engineering group was upgrading its HPC resources, moving from an 8-CPU UNIX server to a 20-CPU HP ProLiant 380 cluster running Red Hat Linux. StarCD was installed. Then the group ran into unexpected difficulties.

"We tried a number of approaches to job scheduling using open source code, but nothing was working," says Alessandro Ciani, Group Leader, Heat Transfer and Secondary Flows. "It was getting very difficult to explain to my boss why the system wasn't in production after two months." Ciani, a fluid dynamics engineer, was charged with

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GE Success Story

“Altair looked at the configuration of our cluster and suggested a way to use our Gigabit Ethernet switch that would take greater advantage of our two internal networks. They did all the customizations we needed to run our jobs efficiently, and drew on their engineering expertise to make creative suggestions. They are problem solvers.”

Alessandro Ciani,
Group Leader, Heat Transfer and Secondary Flows, GE

getting the cluster into production and was frustrated with the delays. He asked Altair's Turin office to make a formal presentation of PBS Professional® workload management software.

“The situation was urgent, so I suggested a pilot installation instead of a standard presentation,“ says Paolo Masera of Altair. “We were confident that Altair could solve the problem.“ Masera and colleague Dario Dorella installed an integrated workload management solution optimized for running the StarCD application. The GE engineering team was soon able to submit and manage its StarCD workload with confidence.

Onward and Upward: Building a Bigger Cluster

GE's Oil & Gas business purchased PBS Professional licenses for all CPUs in the cluster and hired Altair to integrate their other applications: ANSYS CFX, Fluent and Tacoma (GE's proprietary CFD code) into their PBS Professional cluster.

“The people from Altair were very good,“ says Ciani. “They looked at the configuration of the cluster and suggested a way to use our Gigabit Ethernet switch that would take greater advantage of our two internal networks. They did all the customizations we needed to run our jobs efficiently, and they drew on their engineering expertise to make creative suggestions. They are problem solvers.“

After the initial ProLiant cluster was released for production work, the GE team expanded it by adding heterogeneous nodes. It now consists of 45 two-processor nodes, including 14 64-bit nodes that were added in the summer of 2005. The group's engineers have started to run jobs in Fluent's 64-bit release, and are planning to install 64-bit ANSYS CFX as well. All 90 processors in the cluster and the corresponding application licenses are efficiently managed with PBS Professional.

GE, which bought Nuovo Pignone, a leading supplier of machinery to the Oil & Gas industry, in 1994 following a long working relationship, is using the cluster to help maintain its globally recognized position in oil and gas transportation.

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"My office designs gas turbines that are installed in the pipeline system or offshore for mechanical drive applications," says Ciani. "Our customers are major petroleum companies like Shell and Texaco, with sites around the world." At any given time on a typical day, 15 or 20 engineers will be running jobs on the gas turbine engineering cluster from their desktop PCs. Their jobs are inherently compute-cycle hungry, with models of up to six million cells that run on 12 or 16 processors at a time. Three or four users may be running these big jobs at the same time. PBS Professional easily manages this workload.

Looking Ahead: Cycle Harvesting, Web Access, and Grid Computing

Based on the success of this first installation, the GE Oil & Gas business is now looking for other ways to use PBS Professional's capabilities to increase efficiency. One approach now being considered is a plan to harvest unused compute cycles from engineering workstations.

"We have about 40 people using Windows-based HP workstations," says Ciani. "We'd like to use their workstations for running calculations at night and when they're idle during the day. We're planning to do a PBS Professional pilot across this workstation grid to capture these unused computing cycles." Ciani is also contemplating the use of PBS Professional for resource-sharing with another of GE's Oil & Gas engineering groups. The compressor engineering group has two Linux clusters, and combining the resources of the two groups would increase efficiency and make it possible to run larger models or reduce runtimes for large jobs. Another possibility is the use of a web-based portal for user access to the clusters. "PBS Professional could become more of an enterprise-wide solution," says Ciani. In the meantime, PBS Professional keeps the group's compute resources humming and productive.

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About Altair

Altair empowers client innovation and decision-making through technology that optimizes the analysis, management and visualization of business and engineering information. Privately held with more than 1,800 employees, Altair has offices throughout North America, South America, Europe and Asia/Pacific. With a 27-year-plus track record for high-end software and consulting services for engineering, computing and enterprise analytics, Altair consistently delivers a competitive advantage to customers in a broad range of industries. Altair has more than 3,000 corporate clients representing the automotive, aerospace, government and defense, and consumer products verticals. Altair also has a growing client presence in the electronics, architecture engineering and construction, and energy markets.

About PBS Works

PBS Works™, Altair's suite of on-demand cloud computing technologies, allows enterprises to maximize ROI on existing infrastructure assets. PBS Works is the most widely implemented software environment for managing grid, cloud, and cluster computing resources worldwide. The suite's flagship product, PBS Professional®, allows enterprises to easily share distributed computing resources across geographic boundaries. With additional tools for portal-based submission, analytics, and data management, the PBS Works suite is a comprehensive solution for optimizing HPC environments. Leveraging a revolutionary "pay-for-use" unit-based business model, PBS Works delivers increased value and flexibility over conventional software-licensing models.

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Altair Engineering, Inc., World Headquarters: 1820 E. Big Beaver Rd., Troy, MI 48083-2031 USA
Phone: +1.248.614.2400 • Fax: +1.248.614.2411 • www.altair.com • info@altair.com