

HP server cluster meets the high demands of oil exploration simulations



“We are very pleased with the reliability of the HP cluster we are using to run our reservoir simulations. It’s all about reducing the time it takes to produce the commercially critical decisions that define Total’s profitability.”
Dave Ibbotson, head of IT architecture & systems, Total E&P UK

Objective:

Total is the fourth largest oil and gas company in the world and its researchers at Total E&P UK in Scotland are constantly seeking and evaluating new fields in the North Sea. Computer simulation plays a key role but these simulations have huge appetites for processing power. To meet these demands, Total needs to provide definitive high performance hardware platforms.

Approach:

- Seeking to improve on the performance of its old DELL workstation cluster, Total E&P approached HP who brought its specialist partner, OCSL, into play.
- OCSL designed and built a new high performance cluster with an HP ProLiant DL385 headnode and eight HP ProLiant DL145 processing nodes linked by a Gigabit backbone attached to an Ethernet network.

IT improvements:

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- The cluster has been designed to be tested to the extremes, crashed and then easily and quickly rebuilt.
- Performance benchmarks conducted by Total have revealed a 40 per cent improvement in performance due solely to running Linux instead of UNIX or Windows.

Business benefits:

- Using a powerful HP cluster of this type cuts simulation time which speeds up decisions and has a direct effect on Total’s profitability.

The world’s fourth largest oil and gas company, Total, generates some impressive figures. It has 95,000 employees, operates in more than 130 countries, runs 17,000 service stations and sells some 3.9 million barrels of oil a day, generating recent annual sales income of €143.2 billion.

Total’s operation spans the entire oil and gas chain from refining and marketing to crude oil and petroleum product trading and shipping. However, none of this would be possible without the crucial upstream activities of prospecting and exploration.

Oil exploration is an expensive and high-risk operation and if geologists get it wrong, it can have disastrous financial consequences. Finding new hydrocarbon reservoirs and then correctly establishing what they will produce and how they should be worked, is critical to Total’s ongoing success.

Total E&P UK, the company’s UK exploration and production organisation based in Aberdeen, plays a major part in ensuring that Total can continue to profit from its lucrative North Sea oilfields. Computer simulation is key to this and for Total, the huge computational demands of these simulations are being met by a high performance cluster of HP servers running Red Hat Linux.

Profit critical

“We use reservoir simulation as a significant part of our business and it helps us make some key decision on where we drill, what we drill and the production methods we use,” says Dave Ibbotson, head of IT architecture and systems at Total E&P. “We take the known facts about a reservoir and then we add assumptions about its performance. We can put in information about the type of well we are going to drill into that reservoir and we can simulate the impact that this will have on the production of hydrocarbons from the reservoir.

Customer solution at a glance

Primary hardware

Hardware

- 1 x HP ProLiant DL385 server running Red Hat Linux
- 8 x HP ProLiant DL145 servers running Red Hat Linux

Primary software

- Schlumberger Eclipse simulation programs

"These simulations can take anything from hours to days, so we are always looking at ways to reduce the time it takes to run them and make the commercially critical decisions that define Total's profitability."

Linux speed

"These applications will just use all the processing power that you can throw at them so using clusters offers a significant improvement in performance," adds Ibbotson. "In the production environment, we used to have eight older DELL Pentium Workstations machines working together as a cluster and it was time to look at how we could improve performance."

"HP provide all our servers and we have a good relationship so when we were looking at upgrading and moving from a workstation to a server-based environment, we naturally spoke to HP as our preferred supplier."

HP put Total in touch with its specialist partner, OCSL, who sent a team to Aberdeen to define what was required and then designed and built a high performance solution. This was based on HP ProLiant Opteron servers and includes one HP ProLiant DL385 headnode and eight HP ProLiant DL145 processing nodes linked by a Gigabit backbone attached to an Ethernet network serving just the cluster and running Linux.

"Choosing Linux was, again, because of performance," adds Ibbotson. "The performance of Red Hat Linux in this kind of environment, compared to UNIX or Windows, is as different as night and day. The benchmarks we have run suggest that there is a 40 per cent improvement just based on Linux alone."

Researchers in Total's Aberdeen office work closely with manufacturers and vendors to constantly re-evaluate the simulation software, mainly Eclipse from Schlumberger.

"Because of the type of testing our research guys get involved in, they test the cluster to the extreme, crashing the servers as part and parcel of the business so it is important that we can rebuild them very quickly. This ability for quick rebuild was part of the design spec and that is what OCSL has provided for us by developing scripting on Red Hat Linux."

Definitive platform

"Here, our aim is to produce an approved hardware and software platform for reservoir simulation. This is the definitive platform that we provide to the research centres and which they can test to the extreme before it goes into the production environment. Once they have done their tests, they can recommend which simulation software can be used on that platform to help us find more oil and produce it at less cost. If this can take a day off the decision making process it can have significant financial impact."

The process is ongoing and with OCSL's help, Total is now moving up to a 12 node cluster with very high speed InfiniBand connections.

"We are very pleased with the support that OCSL gave us at every stage from design to installation and support," says Ibbotson. "It is too early yet to say that as a result of deploying this technology we have been able to save a certain amount of money or come up with a certain amount of proposals but it is perceived so far as being a successful project that we are very pleased with."

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