

AC3

- » **CHALLENGE** Boost the power at a state data center to satisfy a large, unmet demand for computing capacity
- » **SOLUTION** Deploy a cost-effective supercomputing cluster comprising 155 Dell™ PowerEdge™ 1750 servers with dual Intel® Xeon™ processors and 2 GB memory, a Foundry Networks FastIron 1500 switch, and the Red Hat® Linux® 9 operating system
- » **BENEFIT** The creation of one of the fastest supercomputers in Australia, which attracts new researchers by exceeding the 1-teraflop mark to offer superb performance, saves money using standards-based compute nodes, and maximizes reliability with an inherently redundant cluster architecture

Customer Spotlight

Computational physics, chemistry, photonics, nanotechnology, genome research, bioinformatics, and other scientific and technical applications often require huge amounts of computing capacity. In the Sydney area, that power is provided by the Australian Centre for Advanced Computing and Communications (ac3), a specialist computing center that hosts and manages three supercomputers. Owned by the state government of New South Wales and a consortium of eight universities, ac3 is a for-profit organization that manages complex computing environments for the government, university researchers, and other clients.

In late 2002, ac3 had a critical decision to make. One of its supercomputers was nearing the end of its lease. At the same time, demand for computer capacity at ac3 was exceeding supply by a factor of three to one. The organization required a significant boost in power. Limited funding prompted ac3 to opt for a cost-effective and reliable way to gain performance and capacity—

a supercomputing cluster built from industry-standard, Intel architecture-based components. Several of ac3's shareholder universities were successful in obtaining a grant from the Australian Research Council (ARC) and, with additional financing from the universities' own coffers, ac3 was ready to go shopping.

Dell offers ac3 a winning value proposition

At the beginning of 2003, ac3 worked with a consortium of five of its shareholder universities, led by the University of Technology, Sydney, to develop a request for tender (RFT) for a supercomputing cluster. Eight responses were received, and officials from ac3 and its associated universities began conducting briefings with vendors to narrow the list of prospects.

"I came away thinking that the Dell presentation was by far the most professional," says Dr. Lindsay Botten, a professor of applied mathematics at the University of Technology, Sydney. "The Dell representatives were extremely well prepared. They knew their products, and they answered every question we had. We felt confident moving forward with Dell."

Dell cluster at ac3 becomes a major supercomputer in Australia

A cost-effective Dell cluster exceeds the 1-teraflop mark to maximize a data center's computing power



Officials at ac3 engaged Dell Professional Services to install the supercomputing cluster, and deployment of the cluster began in August 2003. Dell Professional Services installed 147 Dell PowerEdge 1750 servers with dual Intel Xeon processors, 2 GB of memory, and the Red Hat Linux 9 operating system. The nodes are connected by a Foundry Networks FastIron 1500 switch.

“We wanted to maximize the amount of computational power we could obtain on our budget,” Botten says. “By going with Dell, we got more nodes, a better file system, and a better switch. Dell offered the best value for the money.”

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Dell supercomputing cluster exceeds 1 teraflop

After Dell finished the initial configuration, ac3 measured the cluster's performance at around 960 gigaflops using the Linpack benchmark. University and ac3 officials decided to try for a teraflop, which means the supercomputer would process 1 trillion calculations per second. Through a cooperative arrangement with a small group of researchers, enough additional grant money was obtained to purchase eight more nodes for the cluster—a total of 155 nodes in all, which includes two head nodes and one file server node.

The extra nodes, in combination with performance tuning from Intel Solution Services, enabled the Dell cluster to become the first supercomputer in Australia to exceed 1 teraflop in the Linpack benchmark. The November 2003 TOP500 list of supercomputer sites ranked it as 108th among the world's most powerful computers.¹ Exceeding 1 teraflop has generated considerable excitement in the ac3 user base.

“We have always had a tried-and-true user community for the ac3 supercomputing facilities,” says Dr Philip McCrea, CEO of ac3, “but now we have new users coming out of the woodwork. Many of these researchers are using the Dell cluster to conduct more compute-intensive types of research than we have seen here in the past. For example, previously not many people in bioinformatics used the machines at ac3, but we are noticing a move in that direction.”

Cluster architecture provides reliability through built-in redundancy

The new Dell supercomputer provides ac3 with great reliability in addition to performance. This reliability can be attributed to the cluster's built-in redundancy. “If a compute node fails, 151 other nodes can take over,” says McCrea. “Overall performance is barely affected.”

Users show support for Dell cluster at ac3

The Dell cluster is now becoming the main general-purpose computational machine among ac3's three supercomputers. The organization is currently migrating users off its 64-processor symmetric multiprocessing (SMP) machine, which will now be used primarily by applications that have large memory requirements. One of ac3's other supercomputers, a small vector machine, will continue to be used by a modest number of researchers.

The Dell cluster is an order of magnitude bigger than the supercomputer at ac3 that it replaced. Users were quick to take advantage of the additional power, and the machine has been running at maximum capacity since early 2004.

“Users vote with their feet,” says McCrea. “They want to use a machine that provides good performance, and the Dell cluster delivers. In this and many other respects, the interaction with Dell has been a positive and productive experience for us.” **D**

¹ TOP500 List of World's Fastest Supercomputers, November 2003, <http://www.top500.org/list/2003/11>.