

COMING IN FIRST WITH DELL

Monash University Health Sciences gets research results in a week instead of months using a Dell-based high-performance computing cluster



SOLUTIONS
• HPC



CUSTOMER PROFILE

COUNTRY: Australia

INDUSTRY: Education

FOUNDED: 1958

NUMBER OF STUDENTS: 55,000

NUMBER OF FACULTY AND STAFF: 7,000

WEB ADDRESS:

www.med.monash.edu

CHALLENGE

Monash University needed to construct a high-performance computing (HPC) cluster to support its biomedical research efforts. The cluster needed to be easily expandable, and CPU power per dollar spent was a major consideration.

SOLUTION

The IT group within the Faculty of Medicine, Nursing and Health Sciences at Monash University assembled a cluster using Dell™ PowerEdge™ blade servers, Dell PowerVault™ storage and Red Hat® Enterprise Linux, reinforcing Monash's position as one of the premiere biomedical research facilities in the world.

BENEFITS

RUN IT BETTER

- Able to add a new server node in minutes, with no downtime
- Able to support 400% more research projects
- Research completed in a week vs. months

GROW IT SMARTER

- Favorable price per flops compared to competition
- Lower power requirements than competitive blade offerings
- Easy expandability of both cluster and storage

Although recruiting the best students is usually the most visible area of competition among universities, research and innovation are the true pillars on which the reputations of educational institutions rest. Success in scientific research often requires access to powerful computing infrastructures that, until recently, have been out of reach for many schools.

“USING STANDARDIZED, OFF-THE-SHELF DELL SERVERS FOR OUR CLUSTER NODES INSTEAD OF CUSTOM-BUILT HPC HARDWARE HAS ALLOWED US TO PURCHASE MUCH MORE CPU POWER PER DOLLAR.”

Adrian Ling, manager, infrastructure and major I.T. projects, MNHS, Monash University

Melbourne-based Monash University, Australia’s largest university, is known as a worldwide leader in biomedical research. Until recently, however, the university’s researchers were limited in their ability to achieve results quickly due to fragmented and often insufficient computing resources. They sometimes had to spend precious research dollars hiring outside computing facilities to meet their needs—until a high-performance computing (HPC) cluster built on Dell hardware changed everything.

MORE CPU POWER PER DOLLAR

Although the university’s IT leaders knew that a local HPC cluster would greatly improve the situation, they had held off on the purchase due to cost and scalability concerns. “Building a cluster using specialized HPC hardware would have been too expensive, yet we knew we needed to start providing better

computing facilities in order to remain competitive,” says Adrian Ling, manager, infrastructure and major I.T. projects.

“Also, we knew that once we built it, it was going to grow quickly, so we wanted to make sure we could add new servers and storage capacity easily.”

The solution to both problems turned out to be the cost-effective combination of Dell PowerEdge blade servers and the Red Hat Enterprise Linux operating system. After considering servers from five vendors, Monash decided that Dell servers offered the most compute power per dollar spent. “Using standardized, off-the-shelf Dell servers for our cluster nodes instead of custom-built HPC hardware has allowed us to purchase much more CPU power per dollar,” says Ling. “Dell’s pricing was much better than the competition on a price-per-flops basis.”

HOW IT WORKS

HARDWARE

- Dell™ PowerEdge™ M600 blade servers with Intel® Xeon® processors
- Dell PowerEdge M1000e enclosures
- Dell PowerVault™ MD3000 modular disk storage arrays
- Dell PowerVault MD1000 disk expansion enclosures

SOFTWARE

- IBRIX Fusion
- Red Hat® Enterprise Linux 4 Update 3 (64-bit)
- Platform OCS (Open Cluster Stack) v4.1.1

“USING THE DELL CLUSTER, IN MANY INSTANCES OUR WORK IS ACHIEVABLE IN A WEEK OR SO, WHERE PREVIOUSLY IT WOULD HAVE TAKEN MUCH, MUCH LONGER.”

Patrick Sexton, lead researcher, Monash University

INFINITE SCALABILITY

It's also an infinitely scalable, plug-and-play solution. “As money becomes available, we can simply purchase more Dell blades and plug them into our system,” Ling adds. “We can add a new server node in minutes, with no downtime or interruption to service.” To easily manage and scale the cluster, Monash is using Platform OCS (Open Cluster Stack), a Dell-certified open-source software solution for managing Linux clusters on x86-based hardware.

In its two-year existence, the cluster has grown to encompass more than 240 CPU cores in parallel operation. Five Dell blade enclosures now hold three generations of Dell blade servers: Dell PowerEdge 1855, 1955 and the latest M600 blades, which feature Intel Xeon processors for optimal performance per watt. In fact, the M600 blade server performs better, consumes up to 19 percent less power and delivers up to 25 percent better performance per watt than the HP BladeSystem c-Class and IBM BladeCenter H.¹

“Power efficiency was one of the key determining factors for selecting the Dell blade solution,” says Ling. “We noticed that the power requirements of the Dell blades are lower than other comparable systems.”

SUPPORTING 400% MORE RESEARCH

So far, the cluster has crunched numbers for over 350,000 research experiments, and the hardest part about deploying the cluster has been

keeping up with demand for its use, says Ling. In fact, the cluster is so popular with researchers that Ling hasn't been able to schedule a window to benchmark its raw compute power. “Most of the time, we're running at 100 percent CPU utilization,” he says. “It's really fantastic—the Dell cluster is allowing us to support 400 percent more research projects than we could previously.”

Patrick Sexton, lead researcher at Monash's Drug Discovery Laboratory, has been using the cluster to construct complex three-dimensional models of protein structures, which aid in the development of therapeutic drugs. Before the Dell cluster, Sexton did not have access to sufficient compute power to construct these models. “The analysis we do is critically dependent on parallel processing power,” explains Sexton.

Using the Dell cluster, Sexton's research has been so successful that he and his colleagues received a program grant of 6.5 million AUD from Australia's National Health and Medical Research Council. “Using the Dell cluster, in many instances our work is achievable in a week or so, where previously it would have taken much, much longer,” says Sexton.

FAST, SCALABLE STORAGE

To provide additional high-performance storage for the cluster, Monash relies on Dell PowerVault MD3000 highly available modular disk storage arrays and Dell PowerVault MD1000 direct-attached storage arrays,

which leverage higher capacity 3.5-inch drives and support mixing both SAS and SATA drives within a single enclosure, making them ideal for high-capacity applications.

To optimize throughput, Monash is using IBRIX Fusion software, purchased through Dell, to aggregate I/O and storage systems into a single clustered environment to achieve better performance.

“Our datasets grow quite quickly and quite large, so we needed high-speed disk that was right next to the cluster, ready to search, so researchers weren't twiddling their thumbs waiting for datasets to be transferred,” says Ling. “Dell suggested IBRIX software to reduce the lag time while waiting for datasets to be moved from storage through to the cluster, and then write the results. They also manage the relationship with IBRIX, so we have a single point of contact through Dell.”

Again, scalability came into play. The modular design of the Dell PowerVault storage simplifies expansion, allowing the university to add capacity as needed. “Storage needs are constantly increasing,” says Ling. “With Dell PowerVault direct-attached storage, we can always add more.”

ATTRACTING THE BEST AND BRIGHTEST

Meanwhile, the Dell cluster will help Monash attract the best and brightest researchers from all over the world. “Like all successful universities, we have

a push to bring world-class researchers here,” says Ling. “We’re giving our researchers an advantage, and that’s very important to the university.”

“You need to be first in biomedical research,” Sexton agrees. “You don’t get prizes for coming in second or third. As long as the best researchers keep coming to Monash, our cluster will continue to grow.”

BRINGING IT ALL TOGETHER

While Dell technology is helping Monash take its research efforts to the next level, Ling credits Dell’s customer service and commitment to the project as the real enabling factors. “Our Dell account team was very involved early on, and helped to get partners such as Intel involved in the project to make sure we had access to the right expertise,” says Ling. “It was

our relationship with Dell that really drove this, and they made sure that everything came together. No other vendor was able to put together a complete solution and say, ‘This is what we think will work best for you.’ As soon as we get additional funding, we’ll be adding more Dell blades.”

1. Based on Principled Technologies “SPECjbb2005 performance and power consumption on Dell, HP, and IBM blade servers” December 2007 test report commissioned by Dell: http://www.dell.com/downloads/global/products/pedge/en/pe_blades_specjbb2005.pdf

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