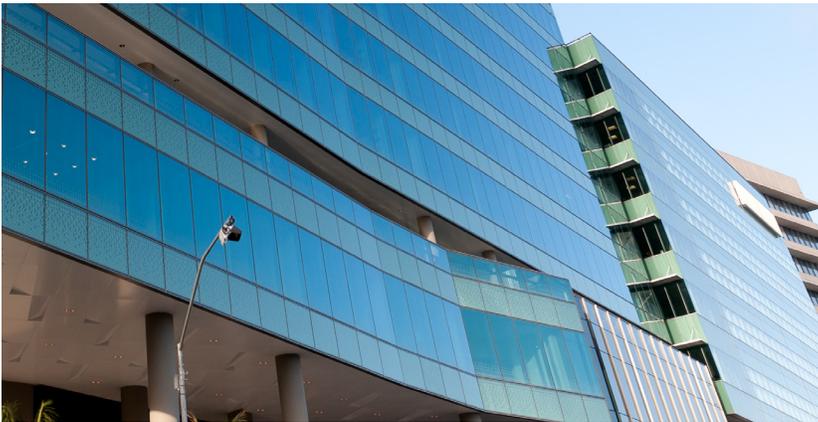




QIMR Improves HPC Capabilities and Supports Higher Quality Research with PBS Professional



Queensland Institute of
Medical Research

Key Highlights

Industry
Life Sciences

Challenge
Provide shared HPC resources to enhance research capabilities.

Solution
Dell HPC cluster with Altair's PBS Professional for reliable workload management.

- Benefits**
- Higher quality research outcomes
 - Support for breakthrough projects
 - Reduced management overhead

Customer Profile

Established in 1945 by the Queensland Government, the Queensland Institute of Medical Research (QIMR) is one of the largest and most successful medical research institutes in Australia, and is recognized worldwide for the quality of its research.

QIMR is home to more than 700 scientists, students and support staff with over 50 separate laboratories supporting six research departments: Biology, Cell and Molecular Biology, Genetics and Computational Biology, Immunology, Population Health, and Joint Programs. Its researchers investigate the genetic and environmental influences of a range of diseases including cancer, asthma, HIV, malaria, endometriosis and dengue fever.

The Challenge: Delivering Shared HPC Resources to Hundreds of Users

Like all research facilities, QIMR's scientists need access to high-performance computing (HPC) resources to achieve breakthrough innovations and results. Without the most

advanced facilities, QIMR would not be able to support its scientists' cutting-edge projects or attract the best researchers to the facility.

"It began with the requirement for more computing power, driven by the bioinformatics and statistical analysis groups," says Jonathan Davies, Chief Information Officer at QIMR. "Researchers needed access to an HPC cluster to process large datasets concurrently. Soon more and more groups were asking for similar resources. We're talking about the majority of our research groups here, not just one or two. Across the board, this is what our scientists require to do their best work."

To meet this need, an HPC cluster was established to be shared as a service among the scientific labs at QIMR, with a workload management system to manage job scheduling and optimize throughput.

"For the workload manager, the most important requirement for us was reliability – we wanted a well-known, supported system we knew we could depend on to perform,"

QIMR Success Story

“Everyone has benefited from this installation. Our scientists can now deliver research outcomes faster and more accurately – we’re able to process much more data a lot more quickly. Researchers can also do things they couldn’t do before, like running jobs multiple times or utilizing larger data sets, to achieve outcomes they couldn’t otherwise get.

It’s pretty easy to see the value.”

Jonathan Davies,
CIO, QIMR

says Davies. “Our ITS team needed a system that could easily manage shared resources with ease of access across the Institute.”

The Solution: PBS Works for Reliable Workload Management

In late 2010, QIMR procured a number of Dell multi-core servers and storage to facilitate the shared HPC cluster, as a core service to the Institute’s labs. The cluster consists of a combination of Dell PowerEdge R815 Servers and Dell PowerEdge R710 Servers.

In selecting a workload management system, QIMR evaluated a number of commercial and open source options and examined how other institutes and research universities were solving similar problems. Their ITS team performed careful analysis of several systems, including product demos, before choosing PBS Works from Altair.

PBS Works is a suite of job scheduling, on-demand computing, and analytics products for managing HPC workload. The suite’s flagship product, PBS Professional®, is among the top-rated available products for HPC workload management and job scheduling.

“With PBS Professional we knew we had a well-tested, commercial-grade system that would perform reliably, especially in our complex environment with different researchers across many labs and programs,” says Davies.

“We also knew we could rely on expert support to be readily available from Altair.”

QIMR also wanted to be sure their cluster could easily scale up as the Institute expanded. “PBS Professional seemed ideal for that scenario,” says Davies. One of the most scalable workload management systems available, PBS Professional can scale to hundreds of thousands of cores and manages workload for many Top500 supercomputers around the globe.

“Initially the cluster was set up with the TORQUE Resource Manager, but we found that needed too much hands-on support from our team.” says Davies. “The support and training we’d have to invest to maintain that system was just too great.”

In 2011 the team installed PBS Professional and began bringing users on board; in 2012 they moved the HPC cluster into a new

purpose-built data center which provides more potential for expansion, an enhanced operational environment and more resilient power management. The cluster now serves over 50 scientists in all six of its research departments. PBS Professional manages a wide range of job types and sizes, balancing workload and ensuring HPC capacity is available for the researchers who need it.

The Results: Delivering Better Research Outcomes

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In just one example, genetics researchers working on a thousand-genome project wanted to perform computations against a massive amount of genomic data. This type of work simply would not have been possible before.



Project Summary

QIMR implemented a Dell HPC cluster managed by PBS Professional to be shared among dozens of scientists in multiple research labs. Now, the institute is able to offer a reliable, powerful high-performance computing resource to its scientists, resulting in expanded project scope and higher quality research outcomes.

Scientists at QIMR have found PBS Professional to be an easy-to-use yet powerful tool for submitting HPC jobs. Davies reports that one group of statisticians who had never used a product like PBS Professional were able to get up to speed very quickly – and within 1 week were running jobs as confidently as QIMR's experienced users.

“Using the PBS Professional system is very straightforward. As a user I was intimidated by the idea of using HPC, but PBS Professional makes it easy to run HPC jobs and with a little guidance I've found it very easy to use the cluster to run jobs,” says Leesa Wockner, a Biostatistician in the QIMR/RBWH Statistics Unit.

“Before, our scientists were running processes on individual workstations – it could take weeks to get the results they needed,” says Davies. “Now the turnaround times are in hours or minutes.”

Even the Genetics and Computational Biology group, part of which operates their own Condor cluster, is turning to the central PBS Professional system for processing.

“The central cluster is typically much faster, and has more available capacity for our researchers,” says Yi Lu, Research Assistant from the Statistical Genetics lab.

System administrators at QIMR like PBS Professional's ease of management from a corporate perspective, and appreciate the flexibility and control in managing job scheduling, tasks and resources.

Current Status and Future Plans

QIMR plans to expand the scale of the cluster as more researchers learn of the availability and benefits of this shared resource.

In one example, the Systems Neuroscience lab is running MATLAB as part of its mental health research. “MATLAB gives us an easy to use interface for both GPU computing and communicating with PBS Professional, allowing us to leverage the power of the cluster from our desktops without having to rewrite all our code,” said Anton Lord a PhD student in the lab. “This saves us time and effort.”

This group's needs are in part driving the expansion of the central cluster to more

nodes and also determining requirements like NVIDIA Tesla for the central Dell-based system running the Altair software. “Strategically, we were careful to choose a workload manager that supports GPUs,” notes Davies.

QIMR expects PBS Works to be the platform for their HPC growth, keeping the Institute among the top global facilities for medical research.

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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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