QUT Builds Flexible Environment to Sustain Innovation and Accommodate Growth

Queensland University of Technology

Queensland University of Technology
Brisbane, Australia
www.qut.edu.au

Industry:
Education & Research

Annual Revenue:
US$101-$500 million

Employees:
5,000

Oracle Products & Services:

Oracle SOA Suite
Oracle Database
Oracle Real Application Clusters
Oracle Clusterware
Oracle Data Guard
Oracle Enterprise Manager
Oracle Automatic Storage Management
Oracle Portal
Oracle Internet Directory
Oracle Workflow
Oracle Designer
Oracle Developer
Oracle Discoverer
Oracle Financials

Oracle Partner:

INTELLIGENT PATHWAYS

Intelligent Pathways
www.intelligentpathways.com.au

"We found Oracle's product set to be a strong fit for our needs, with the SOA Suite in particular having moved beyond the hype and enabling the delivery of real business benefits." – Ian McDonald, Administrative Systems Coordinator, Queensland University of Technology

Queensland University of Technology (QUT) is a culturally diverse Australian education provider with campuses in Brisbane and southeast Queensland. The institution is home to several national research centers and research institutes supported by government and philanthropic bodies.

QUT has about 40,000 enrolled students, including more than 5,000 international students from 85 countries, and 5,000 staff. Its bachelor degree graduates represent the largest group from any university in Australia that enter full-time employment.

In 1989, QUT decided to partner with Oracle to deliver key elements of its information technology architecture. The university has maintained the relationship since then and recently significantly expanded its Oracle footprint to meet increasingly demanding business requirements. This expansion includes deployment of a service-oriented architecture (SOA) to reduce development time and cost, grid computing and clustering to improve redundancy and scalability, and a new financials system with improved functionality.

"Oracle has been prepared to step out of its comfort zone to help us achieve our goals," said Ian McDonald, administrative systems coordinator at QUT. "In addition, our stringent evaluation processes concluded that technologies such as the Oracle SOA Suite were mature and capable of delivering good value to our institution."

SOA Boosts Flexibility

As a leader in information technology deployment, QUT constantly assesses ways it can reduce costs and better service staff, students, and alumni. In 2006, QUT decided to upgrade its environment, including implementing a new student management

Published April 2008

ORACLE

Key Benefits:

- Implemented a flexible environment that reduces development time for new applications by employing a service-oriented architecture
- Utilized grid computing and clustering to improve availability, redundancy, and scalability
- Enhanced access to information and reduced duplication

system and a new online learning system. To support this recast strategy, QUT reviewed the architecture supporting its systems, which also included an intranet used by students and staff to manage information about their interaction with the university.

Following an extensive review, QUT opted to use Oracle products to develop a flexible architecture incorporating high availability, redundancy, flexibility, and efficiency. This series of projects, due for completion by the end of 2008, includes implementation of grid computing, clustering, and an SOA. Once completed, the project will ensure that data entries or changes are seamlessly recorded and acted on by all relevant QUT systems.

"For example, if a student has failed to pay a course fee and QUT has restricted his or her access to services, we would like our system architecture to be flexible so that any system touched by that event would update in real time," said McDonald. "Also, when those fees are paid, we would want our systems to record and respond accordingly."

QUT eventually plans to operate the SOA in an Oracle-managed grid environment, with QUT's corporate records management system the first to be transitioned in August or September 2007. At present, the SOA is operating on standalone hardware before being migrated to a high availability configuration from the end of the second quarter of 2008.

"We found Oracle's SOA Suite provided a strong platform for QUT to deploy Web services across our architecture," said McDonald. "Not only does the suite easily enable us to catalog and secure Web services, it also delivers access to services deployed using other components such as the Microsoft .NET platform."

The online learning system was implemented on high availability infrastructure across all faculties bar two by July 2007, while the student management system is scheduled for full deployment by the end of 2008. Disaster recovery and high availability for the online learning system is provided by Oracle Data Guard, with other QUT applications expected to be migrated shortly.

High Availability Computing Enhances Flexibility

QUT elected in 2002 to implement a highly available environment to support an upgrade to a new intranet known as QUT Virtual.

Published April 2008

"We previously used large, expensive, and inflexible mainframe computers and had been looking for some time at ways we could more cost-effectively provide hardware infrastructure for the portal application," explained Joe Dascoli, associate director, Information Technology Services, QUT.

In 2002, QUT Virtual, which is used by more than 40,000 students and staff, was redeveloped using Oracle Portal technologies and PL/SQL language to manipulate Oracle database information.

"We needed a solution that could scale out as well as provide high availability for QUT Virtual," said Dascoli. "We purchased a number of four-processor servers, given servers with eight or more processors were too expensive. The logical choice was to deploy Oracle Real Application Clusters (RAC), which enabled us to achieve horizontal scalability and high availability at an affordable price."

After starting with three back-end servers, QUT progressively added a fourth and a fifth node. "The performance was very good and we achieved almost a linear improvement in performance as we added more servers," said Dascoli. "Stability also continued to be excellent."

At this stage, QUT Virtual was running on Oracle Portal and PL/SQL on Oracle Application Server.

In September 2006, QUT replaced the five back-end servers with new hardware incorporating four AMD dual-core processors and migrated to Red Hat Enterprise Linux 4 running Oracle RAC 10.2.0.2. This implementation utilizes Oracle Clusterware to manage the servers and provide high availability support for applications hosted by the environment, while Oracle Automatic Storage Management (ASM) enables QUT to manage required storage via a single simple interface.

"The new commodity servers have delivered improved performance, while the 10*g* database is also delivering better performance than 9*i*," said Dascoli. "We found installation of the RAC software and setting up of Oracle Clusterware and Oracle ASM to be relatively straightforward."

The new environment has also delivered sound stability, scalability, and performance, while load balancing and failover are working "very well," he added. "A key improvement is in the

Published April 2008

way we can now change the server configuration while core services are still available for use by students and staff."

Ease of Maintenance

The environment has enabled QUT to perform hardware maintenance on individual nodes while maintaining service, while key systems can be transferred to secondary nodes with minimum downtime in the event of hardware failure. This was proven when the new learning management system was failed over to a secondary node due to a machine failure the day before the first day of the second semester in Australia.

QUT has also upgraded QUT Virtual to Oracle Application Server 10.1.2.0.2 incorporating Oracle Internet Directory (OID) and Oracle Single Sign-On (SSO). The QUT Virtual front-end is deployed on three commodity servers in a high availability configuration with a Web cache cluster set up across the three nodes. Oracle Cluster File System provides file clustering across the database servers.

"The portal allows us to present a unified interface to our intranet business functions with an inbuilt security mechanism," said Dascoli, "while OID and SSO allow us to integrate login to QUT Virtual with our inhouse-developed single sign-on process."

This enterprise SSO engine functionality has now been made more broadly available to the higher education sector through an open source agreement which enables federated authentication to be set up from any university.

"The high availability setup protects us from any single machine failure and provides us with the ability to perform hardware maintenance without taking our services offline," said Dascoli. "We can also undertake rolling software upgrades and patching.

"In addition, it enables us to scale up if necessary as use of our services grows, providing a better performing, more resilient, reliable, and fault-tolerant platform for our business applications."

Future Plans

QUT's shift to a new Oracle Financials module has yielded extensive functionality the university is yet to fully exploit.

The institution is considering implementing a revenue management system that could enable all fees and charges paid by

Published April 2008

students to feed back automatically into financials and other systems.

QUT is also establishing another two-node production cluster to migrate other applications such as human resource management to a high availability environment, and will use Oracle Grid Control to add and remove nodes on demand.

Why Oracle?

With QUT partnering with Oracle since 1989, the institution has a long-standing and productive relationship with the vendor.

However, stringent governance processes ensure Oracle's products must meet or exceed QUT's business needs before an upgrade is approved.

While undertaking this rigorous due diligence, QUT found Oracle's products compared favorably to those of its rivals. The vendor's preparedness to step outside its comfort zone when addressing issues with QUT emphasized the strength of the relationship.

"We found Oracle's product set to be a strong fit with our needs, with the SOA Suite in particular having moved beyond the hype and enabling the delivery of real business benefits," said McDonald.

Implementation Process

QUT's key priorities have included ensuring the institution gains the knowledge internally to manage its environment, with minimal reliance on service providers.

"We have a very good relationship with the team in Oracle's Brisbane office. When we have been short of expertise, Oracle has been our first port of call," said McDonald. After an extensive review of vendors with suitable expertise in SOA deployment and a recommendation from Oracle , QUT selected Brisbane-based Oracle Certified Partner Intelligent Pathways to help deliver the project.

QUT expects Intelligent Pathways to play a significant role in this process, which will include implementing the SOA; ensuring knowledge is transferred back to QUT staff to enable the system to be run effectively in-house; and integrating the student management system into the current applications environment.

Published April 2008

"Our engagement with QUT commenced in May 2007," said Jerry Gaines, engineering manager, Intelligent Pathways. "In September 2007, Oracle helped us establish a testbed high availability environment in our offices to mirror the QUT setup and generate some additional support materials for QUT's use.

"Oracle is always there with technical backing when we need it."

Intelligent Pathways is working closely with QUT teams to develop SOA governance, standards, processes, and procedures. The company's analysts are working closely with an integration group charged with developing a common Web-based experience across QUT's back-end systems and with developers working on the processes required to implement the student management system.

The latter project spans business processes supporting more than 25 external systems as well as the core student management system and other mission-critical applications.

"Go live of the new environment is scheduled for the end of 2008. We'll continue to be involved after that to backstop the QUT team on enhancements and additional system interfaces," said Gaines.

Oracle will continue to play a quality assurance role during the implementation of the SOA. The new architecture will be used to manage integration points between the student management system and other core systems, including human resources, financials, and the new online learning system.

Queensland University of Technology (QUT) is one of Australia's largest and most diverse tertiary institutions. QUT has about 40,000 enrolled students, including more than 5,000 international students from 85 countries, and 5,000 staff.

Published April 2008