

success story



**Queen's University
Belfast builds
world-class
computing cluster**

Queen's University Belfast builds world-class computing cluster based on Itanium™ 2-based systems from hp

In the realm of science, Itanium 2-based systems are helping researchers achieve dramatic breakthroughs. At Queen's University Belfast in Northern Ireland, scientific researchers each day face tasks that require computationally intensive calculations. With its large on-chip cache and massively parallel architecture, the Intel® Itanium 2 processor excels in computational analysis. For these reasons and more, Queen's University Belfast has become the first university in the United Kingdom to install Itanium 2-based servers from HP.

By building a computing cluster of 21 Itanium 2-based HP rx2600 and two HP rx5670 servers running HP-UX 11i, the university is delivering higher-performance computing to researchers across disciplines. Clustering Itanium 2-based HP servers helps Queen's to improve price/performance and consolidate system resources such as I/O bandwidth, memory, mass storage, and compute capacity.

Major research areas at Queen's University Belfast include everything from atomic collision theory to drug reaction simulations and aerodynamics modeling. Some research applications at Queen's require vast amounts of memory; others demand extreme processing speeds. No matter what researchers require, the 50-CPU Itanium 2-based HP cluster delivers.

"In scientific research, it's all about having the fastest, most advanced systems to accelerate research," says Ricky Rankin, principal analyst within Information Services of Queen's University Belfast. "Our HP Itanium 2-based systems running HP-UX 11i are faster per node than our previous IBM SP cluster."

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The university's primary concern in selecting a replacement for its IBM SP cluster was price versus performance. In extensive benchmark tests, Itanium 2-based systems from HP not only outperformed systems from IBM, Sun, and other vendors but also were more cost-effective. Another criterion for Queen's was the ability to grid-enable its new cluster, allowing researchers inside and outside the university to share the cluster's resources. HP delivered on this requirement as well.

Installed since 2002 by HP channel partner Centrom, the Itanium 2-based HP cluster running HP-UX 11i is helping Queen's strengthen its position as a research institution of international standing by enabling large-scale computer models to be processed many times faster. One group using an Intel Pentium® 4-based cluster has achieved up to three-fold speed increases in processing jobs by moving them to the Itanium 2-based HP cluster. Aerodynamics simulations converted from current RISC systems to the Itanium 2-based cluster are running 3.5 times faster.

When research jobs take many hours or even days to run, a three-fold speed increase can mean the difference between days of delay and scientific breakthroughs. Increased performance, however, is only part of the equation. Itanium 2-based systems from HP not only provide unprecedented raw performance, but also offer cutting-edge compilers, libraries, and development tools that yield highly efficient and scalable code. One major advantage for Queen's is Caliper, an HP-UX 11i toolset for debugging and optimizing code that enables programs to run far more efficiently.

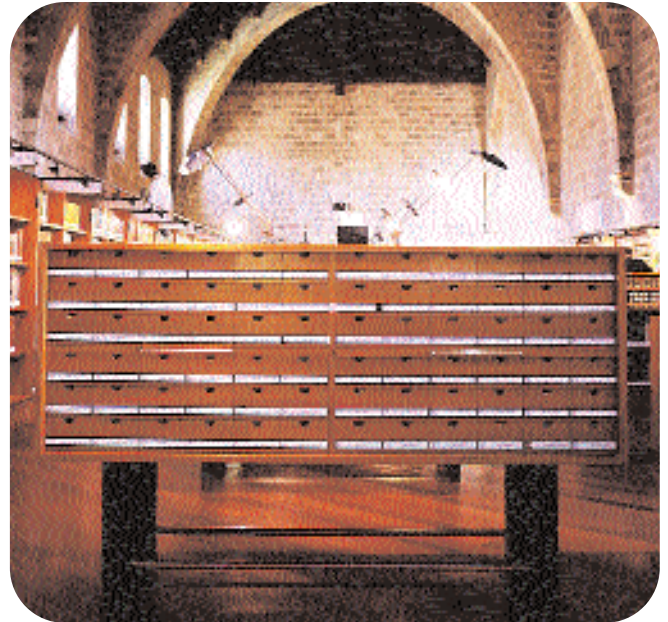
Itanium 2-based HP servers also scale well, thanks to the capabilities of HP-UX 11i, a major prerequisite in scientific research where simulations and calculations are often run across multiple processors. "We've tested numerous jobs on four processors and then on eight," says Rankin. "We are using standard switched Ethernet on our HP cluster, and we've found the scaling of the HP servers and HP-UX 11i to be exceptional."

Resources of the cluster are available to many researchers. To monitor and control system usage as well as distribute the cluster's workload, Queen's is using hptc/ClusterPack cluster management software. Based on HP Servicecontrol Manager and Platform Computing's Clusterware, hptc/ClusterPack allows Queen's to manage and administer its cluster through a single point of control and optimize IT resource efficiency.

Perhaps most important, the HP cluster gives Queen's the flexibility of running multiple operating systems side-by-side. Some Queen's University Belfast researchers have developed their applications for Linux. The HP rx2600 and rx5670 servers support both HP-UX 11i and the new Red Hat Linux Advanced Workstation for Itanium 2-based systems, opening the possibility of also running Linux in the future.

The ability to run both operating systems gives researchers at Queen's University Belfast increased flexibility. Atomic collision simulations, for example, can be quickly recompiled and run on either operating system. "Because of the HP-UX 11i libraries and compilers, we've found that programs running on HP-UX 11i are faster," says Rankin. "However, the portability of software and flexibility of HP Itanium 2-based systems means that we can run jobs on just about any operating system."

In the United Kingdom, the government ranks research institutions and allocates funding accordingly. Many research departments within Queen's already rate grade-5 or grade-5*, the highest achievable ranking. By modernizing its technology infrastructure, Queen's is giving more departments within the university state-of-the-art computing power to help them boost their rating to grade-5 or 5* as well. "We were the first to own a Cray system in Ireland when Cray was the latest technology," says Rankin. "Now, we're the first to own an Itanium 2-based cluster, reinforcing our stature as a research facility of international excellence."



customer at a glance

name: Queen's University Belfast

industry sector: research/higher education

URL: www.qub.ac.uk

technology highlights

- 21 HP rx2600 servers
- 2 HP rx5670 servers

challenges

- insufficient I/O bandwidth and memory capacity
- slow computing time for complex calculations and simulations

solution

- Itanium 2-based HP rx2600 and rx5670 servers
- Gigabit Ethernet
- Globus Toolkit for grid computing
- HP-UX 11i
- hptc/ClusterPack for cluster management and distributed workload management
- Red Hat Linux

results

- two- to six-fold increase in speed of processing jobs
- excellent scalability
- researchers can share the cluster's resources

funding

- grant from Engineering and Physical Sciences Research Council (a UK government agency) to the Theoretical Computational Physics Group within the School of Mathematics and Physics
- Queen's University Belfast's own resources



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