success story

"The new Itanium 2 cluster will greatly benefit our exploration into the properties of new piezoelectric materials. Programs that are currently hitting a wall-clock limit of five days will now take two, maybe two and a half days, to complete – a significant difference, opening the door to more extensive research opportunities."

Dr. Eric Walter
Scientific Programmer
Center of Piezoelectrics by Design

Itanium 2-based servers take the Center of Piezoelectrics by Design's research to new heights

At first glance, there appears to be no similarities between the following technologies: accurate detection of underwater objects; medical ultrasound probes; and clear cell-phone reception.

Think again! All of these items depend on the unique attributes of a special group of materials – known as piezoelectrics – which convert sound waves into electrical signals and back.

The usefulness of piezoelectric devices has resulted in a group of universities and research laboratories establishing a consortium dedicated solely to the research of new piezoelectric materials. Known as the Center of Piezoelectrics by Design (CPD), it is based at the College of William & Mary in Williamsburg, Virginia, and funded by a major grant from the Office of Naval Research.

The search for better piezoelectric materials has generally relied on costly and time consuming trial and error synthesis and testing of candidate materials. The Center of Piezoelectrics by Design takes a different approach, using computational modeling to develop new types of candidate materials and to screen them for desired properties before taking them into the laboratory.

pushing the bounds of current chip-sets

Michael Barnes, CPD's Systems Administrator explained, "We were looking for a new system that is reliable, fast, and able to address large amounts of memory. Specifically, these systems should be fast with floating point computations, and able to sustain these computations over large amounts of data in memory. This limited our search to a 64bit architecture that performs well under these conditions."

CPD's existing computing environment consists of a cluster of 60 dual-processor 666 MHz Alphas, each with 4 gigabytes of memory. However, the constantly growing demands for computing resources by the consortium's scientists meant that many of the more cpu-intensive requests were taking in excess of five days to complete processing. Even worse, some programs were not submitted for fear of totally monopolizing the computers for unacceptably long periods of time.

To accommodate these more demanding calculations, CPD began the search for a next-generation computer architecture. The consortium's Scientific Programmer, Dr. Eric Walter observed, "We knew we wanted a large memory bandwidth, to give us the ability to move a large array of floating-point numbers quickly to and from the processor."

benchmarking hp/Intel®'s innovation

Dr. Walter continued, "We undertook a number of different benchmarks and the Itanium 2's performance was outstanding in all of them. Our results confirmed the advertised performance and led us to move forward with a purchase."

"One characteristic of HP's Itanium 2 system was HP's new chipset on the motherboard, which had an incredibly high memory bandwidth, or the number of gigabytes per second that could be moved through memory," added Barnes.

HP's introduction of servers and workstations based on the Intel Itanium 2 processor is a good match for the resource-intensive needs of the Center of Piezoelectric by Design. The 64-bit chipset architecture is based on the Explicitly Parallel Instruction Computing (EPIC) that was co-developed by HP and Intel, and provides amazing price/performance benefits. The ability to use systems with this chip-set to consolidate, cluster or inter-operate with existing systems opens up a wide variety of implementation options.

enabling new research into uncharted territories

To fully evaluate the performance impact of the Itanium 2 systems, the CPD took advantage of the HP Intel Solution Center, located in Cupertino, California. The goal was to test the new architecture, understand the ease of

challenges

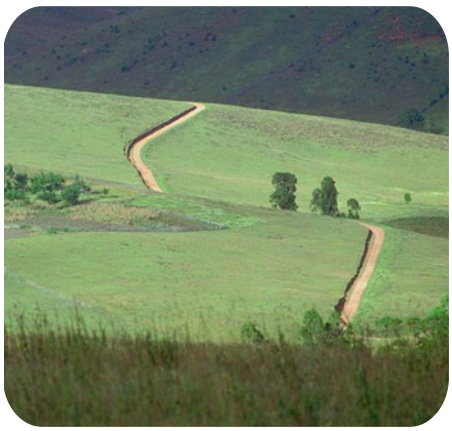
- need for huge processing power to execute memory-intensive scientific analyses
- all programs are custom designed & unique, making standard application benchmarks invalid for comparison of chip-sets
- proof of concept required before moving to purchase decision for new servers

solution

- extensive access to the hp Intel Solution center allowed comprehensive profiling of porting and performance characteristics
- CPD staff already building substantial Itanium 2 knowledge base
- three Itanium 2 systems ordered

results

- application run times reduced by 50 to 60%
- have ability to execute tasks that would previously take too long to complete
- team has full confidence in the ability of the systems to deliver as expected and in their ability to provide users with a high-quality and reliable service



porting applications, and gauge the performance of executing scientific applications on Itanium 2 based systems running Linux.

The HP Intel Solution Center is a joint worldwide strategic initiative between the two technology powerhouses designed to accelerate the adoption of the Itanium 2 technology. The centers provide customers and partners with a complete datacenter infrastructure – including Itanium 2 servers and workstations, storage and networking – to conduct "proof of concept" testing of Itanium 2-based solutions in a dedicated, controlled environment.

The extended periods spent running benchmark applications gave the CPD team great confidence that the new servers would deliver good results in their own environment and that they would provide users with a high-quality and reliable service.

"Having 'hands on' access to the new machines in a similar configuration to our production environment enabled us to give other members of our organization real world results," noted Barnes.

He continued, "In our tests, the Itanium 2 always out-performed our existing Alpha cluster. With these new systems, we'll be able to get results far more quickly, and we can now routinely perform tasks that were previously only executed intermittently."

Dr. Walter concurred, "The new Itanium 2 cluster will greatly benefit our exploration into the properties of new piezoelectric materials. Programs that are currently hitting a wall-clock limit of five days will now take two, maybe two and a half days, to complete – a significant difference, opening the door to more extensive research opportunities."

For additional information, please visit www.hp.com

http://www.cpd.wm.edu

www.hp.com

at a glance:

CPD

organization: Center of Piezoelectrics by Design

location: based at the College of William & Mary in Williamsburg, Virginia / Applied Research Center, Newport News, Virginia

URL: http://www.cpd.wm.edu

primary activities: conducting research into the theoretical prediction and experimental realization of new piezoelectric materials

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