



Iowa State University Students Win MemoCODE Design Contest Using Convey Computer HC-1

--Over 24 times faster than next-place entrant--

Richardson, Texas—July 12, 2012 Convey Computer today announced that students at Iowa State University won first place in the 2012 MemoCODE Conference¹ design contest with their fast exact-match short-read aligner. Using a Convey HC-1, the students' solution achieved the highest overall performance—more than 24 times faster than the second place finisher.

Experts from all segments of the commercial and academic world embarked upon the month long challenge, using a variety of design tools, hardware and software. The contest addressed a common challenge of DNA sequence alignment: efficiently map millions of 100 base pair sequences to a reference human genome of 3.1 billion base pairs, improving the performance of the reference implementation. In genomics it is necessary to map short DNA sequences (reads) generated by next generation sequencers to a reference genome in order to detect genetic variations.

Advised by Iowa State professors Phillip Jones and Joseph Zambreno, several graduate students in the Department of Electrical and Computer Engineering divided into two teams—each using a different coprocessor technology. Jones's group selected the Convey HC-1 with a field-programmable gate array (FPGA) architecture, while Zambreno's team used graphics processing units (GPUs).

Although the GPU-based team got off to a fast start, it soon became clear that the Convey FPGA solution was far superior. "This particular challenge had a big memory bandwidth issue—and having local memory was vital," explained Zambreno. "By their nature, GPUs are fairly limited to how much on-chip, easily accessible memory is available."

¹ The winners will be presenting their methods at the 10th ACM/IEEE International Conference on Formal Methods and Models for Codesign, Arlington, Virginia. July 16-17, 2012. <http://www.memocode-conference.com>

After a month of design planning and long hours of implementation, the students on the Convey team debuted a solution they called Shepard. "The meat of the application—doing the actual alignment— took about one second," explained Kevin Townsend, one of the grad students on the Convey team. "We won because we were able to get 80 gigabytes of memory bandwidth on Convey's coprocessor."

The team credits their success to the Convey server. "The Convey system makes it easy to develop algorithms because of its design and toolset," said Jones. "The development infrastructure is amazing compared to other FPGA solutions I have seen. And from a user's point of view, the Convey system simplifies how to get access to memory." Jones concluded, "Overall, the development infrastructure makes the HC-1 an ideal architecture for this solution."

The team sees Shepard as a potential game changer. "This type of big speed up could enable all sorts of different algorithms in bioinformatics," concluded Chad Nelson, another grad student on the Convey team. "As DNA sequencing quality improves, so will the usefulness of exact match alignment tools such as Shepard. Additionally, other application domains could also benefit from the Shepard architecture, such as data mining, social graphs, and search optimization."

About Convey Computer Corporation

Based in Richardson, Texas, Convey Computer breaks power, performance and programmability barriers with the world's first hybrid-core computer— a system that marries the low cost and simple programming model of a commodity system with the performance of a customized hardware architecture. Using the Convey hybrid-core systems, customers worldwide in industries such as life sciences, research, big data, and the government/military enjoy order of magnitude performance increases while reducing acquisition and operating costs.

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