Brazil Center for Excellence in Bioinformatics at FIOCRUZ Chooses Convey to Advance Genomics

Convey HC-1^{ex} Accelerates Current Bioinformatics Research, Allows Additional Research Opportunities, Reduces Power Consumption

Richardson, Texas–April 5, 2012–Convey Computer announced today that CEBio (Center for Excellence in Bioinformatics), part of Brazil's prestigious FIOCRUZ organization, has deployed the Convey HC-1^{ex} hybrid-core computer to upgrade its bioinformatics capabilities. Jointly established by FIOCRUZ and the Minas Gerais State government, CEBio's mission is to bring genomics and cutting-edge bioinformatics to Brazil's rapidly growing biotech and health care sectors.

"We evaluated several platforms and are excited to be working with the Convey hybrid-core system," said Dr. Guilherme Oliveira, CEBio coordinator, who is also President of the Brazilian Association for Bioinformatics and Computational Biology and a member of the Board of the International Society for Computational Biology. "Speed and power consumption were the top concerns. We've had assemblies we couldn't complete on our 256-node cluster simply because they were taking too long and had to be stopped so we could run other jobs. We need to be able to assemble and compare sequences much faster."

The new Convey system will enable CEBio to substantially accelerate bioinformatics applications and extend its ability tackle computationally intensive problems. Assembly of large genomes for species like bovine and swine—which CEBio works with—are especially demanding. The new system will also help CEBio reduce its carbon footprint because the HC-1^{ex} requires substantially less power, space, and cooling than a comparable cluster. "Electricity is expensive and of course we wanted to contain our costs, but it was also important to us to be ecologically responsible. The Convey system helped meet this goal as well," said Dr. Oliveira.

CEBio works with industry, academia, and government on a wide array of projects spanning agriculture, animal husbandry, human health, and biodiversity. Clients vary from small biotechs and academic departments to large Brazilian multinational companies.

"We are delighted to be working with CEBio and Dr. Oliveira to help deliver the enormous value of modern genomics to the region," said Dr. George Vacek, Director of Convey Computer's Life Sciences business unit. "CEBio's choice of the Convey HC-1^{ex} is another example of Convey's growing global reach and of the confidence the bioinformatics community is showing in Convey's innovative hybrid-core systems."

Convey's hybrid-core architecture pairs classic Intel® x86 microprocessors with a coprocessor comprised of field-programmable gate arrays (FPGAs). Particular algorithms—DNA sequence assembly, for example—are optimized and translated into code that's loadable onto the FPGAs at runtime. Convey calls these accelerated algorithms "personalities" and offers an expanding suite of them explicitly for bioinformatics applications. In addition to the acceleration gained through the personalities, the Convey architecture features a highly parallel memory subsystem, which removes memory bottlenecks inherent to commodity servers.

The Convey GraphConstructor (CGC), for example, accelerates construction and manipulation of de Bruijn graphs commonly used in short-read genome assembly applications such as Velvet.[1] CGC consistently achieves memory and runtime performance gains over large shared-memory servers. Additional performance and workflow optimization includes a fast kmer counting tool that allows quick identification of optimal kmer length and coverage cutoffs for de novo assembly; avoiding low coverage kmers that generally result from sequence errors yields both faster run times and higher quality assemblies.

Dr. Oliveira noted that deployment of the HC-1^{ex} was an unexpectedly easy and very welcome. "Our IT staff was initially concerned because high-

[1] http://www.ebi.ac.uk/~zerbino/velvet/; Velvet is the most widely used program for de novo assembly of short-read sequences.

performance machines usually don't work right of out of the box. The Convey system did. We were up and running in a day and I can tell you the IT folks were pleasantly surprised."

An aggressive user of NGS technology, CEBio is heavily involved in *de novo* sequencing, re-sequencing, and reference mapping. "Our work covers a wide range of disciplines from basic biology to agribusiness work such as cattle and fish—and recently we've started working with plants and metagenomics," said Dr. Oliveira. "We're also working with private industry to develop new diagnostics tools for cancer research."

Among the many genomes CEBio has worked on are: Bos indicus (cattle), Schistosoma mansoni (Schistosomiasis-causing nematode), HIV, honey bee and wild bees, yeast, and Mycobacterium tuberculosis, to name just a few. "The number of species we work with is growing rapidly, the amount of data we must deal with is growing, and we are venturing into transcriptomics as well," said Dr. Oliveira. "We are thrilled to have the Convey system to help us take advantage of these new opportunities."

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. More information may be found at: www.conveycomputer.com.

About CEBio
CEBio is part of one of the FIOCRUZ units located in Belo Horizonte, Brazil. CEBio networks extensively with academia, in Brazil and worldwide, and with the industry on a wide range of projects. CEBio has substantial and increasing next generation DNA sequence capacity and HPC solutions for data analysis.
For more information, see www.cebio.org

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