



Improving crop yields

Biogemma boosts research into plant genetics with new high-performance computing platform powered by the Intel® Xeon® processor 7500 series

Formed from the merger of biotech research activity at three major seed companies, Biogemma conducts cutting-edge commercial research into the genetic makeup of common field crops and helps identify opportunities to improve their performance. Its researchers use a complex software stack of over 100 applications to perform the advanced calculations needed to analyze the genetic components of test specimens, and rely on the processing power provided by the company's high-performance computing (HPC) platform. Biogemma recently replaced its existing HPC technology with a new SGI solution powered by the Intel® Xeon® processor 7500 series. The new platform provides researchers with greater processing and memory capacity, allowing them to perform calculations that are essential to their research up to 10 times faster¹.



"With the Intel® Xeon® processor 7500 series we are able to deliver a high-performance computing environment that offers the processing and memory bandwidth needed to run the advanced genetics applications our teams rely on for their research."

Didier Hatsch Ph.D.,
IT Manager, Biogemma

CHALLENGES

- **Performance:** Biogemma wanted a new HPC platform that could better support the applications needed for advanced genetic research and deliver results faster
- **Greater memory:** With genomics applications capable of utilizing over a terabyte of memory, Biogemma needed a processor architecture that maximized the amount of system memory available at once
- **Linux compatibility:** Biogemma had chosen Linux* as the best operating environment for its applications and wanted hardware that was fully compatible

SOLUTIONS

- **Future-proof:** Biogemma identified the six-core Intel Xeon processor 7500 series as offering the best solution for its processing requirements
- **First choice:** It chose to implement an SGI Altix* UV 1000 solution, containing 32 Intel Xeon processors 7500 series (giving a total of 192 processing cores), using symmetric multiprocessing to maximize the memory available across the system
- **Optimization:** The company's IT team used Intel® C Compiler and GCC to optimize more than 100 genomics applications for use with the SGI and Intel® Xeon® processor environment

IMPACT

- **Expediting research:** Since implementing the new HPC platform, Biogemma's researchers have been able to perform calculations significantly faster; in some cases, the time to perform certain processes has been reduced by several days
- **Serving clients better:** The increased performance of the new HPC platform has also improved the computing resources Biogemma can offer to external researchers from shareholder organizations, who use its bioinformatics platform to support their own enquiries
- **Future enhancement:** Since implementing the new system, Biogemma is already planning an additional extension to further increase the processing and memory resources available to its researchers

At the forefront of genetic research

Based in France, Biogemma is one of the leading centers for commercial research into plant genetics. Formed from the merger of the biotech research sections of three major seed production companies, its research teams study the genetic makeup of common field crops, including corn, wheat, sunflower and rapeseed. They aim to identify genetic variations that can confer beneficial new attributes, such as increased robustness to inclement weather or infection. Biogemma then passes this information on to its partner organizations to implement into field trials to test their commercial viability.

To support its research, Biogemma maintains a dedicated bioinformatics portal containing over 100 specialized genomics applications, which run on an internal HPC system. Around 30 research staff have direct access to this portal as part of their normal activities, with a further 50 employees relying on the data produced for their research. Biogemma also makes its bioinformatics portal available to external researchers from shareholder organizations to support their own investigations. Around 20 percent of processes performed on its HPC platform are undertaken in this way.



Biogemma increases the processing and memory resources available for advanced genetic research applications

Continuous improvement

In 2009, Biogemma decided to replace its existing HPC platform with newer and more advanced technology to enhance the computing resources available to researchers. The old system, based on HP blade servers with AMD Opteron* processors, was originally chosen because of its compatibility with Oracle Solaris*. However, Biogemma had subsequently chosen to migrate to a Red Hat Linux operating environment and wanted a new platform that could support this natively.

As well as increasing the processing capacity of its HPC resources, Biogemma also required a solution that could maximize the amount of system memory available to applications as they are running. The existing equipment offered only 32GB, creating performance bottlenecks for researchers running complex, memory-intensive genomics calculations. For example, a recent wheat genome analysis involved 100 GB of starting data, required 860 GB of memory and generated five terabytes of information in total.

Making the choice

After surveying the available processor options, Biogemma identified the six-core version of the Intel Xeon processor 7500 series as the optimal solution for its requirements. This offered the best combination of processing performance, memory utilization and the potential to remain compatible with future application developments.

With the Intel Xeon processor 7500 series a central part of its requirements for a new HPC platform, Biogemma chose to implement

an SGI Altix UV 1000 solution containing 32 processors (offering a total of 192 cores) and a terabyte of RAM. This supports Linux as standard and uses symmetric multiprocessing to ensure that all processing cores have access to the full system memory.

As part of the implementation of the new platform, Biogemma acquired a license for an Intel C Compiler, which its engineers used to optimize its full genomics application stack for use within the new SGI and Intel hardware environment. In total the team recompiled over 100 applications, and also optimized some programs with GCC to ensure the best performance could be achieved.

Enhancing performance

Since installing the new platform, Biogemma's researchers have benefited from the higher processing capacity of the Intel Xeon processor 7500 series and the greater amount of memory available to applications as they are being run. Initial benchmarking tests for the new hardware have shown performance improvements of up to 59 percent for the advanced genetics applications that are essential to the company's research¹. In the case of a program researchers use to assemble genomics sequences, the time to perform some calculations has been reduced by four-and-a-half days.

As a result of these performance improvements, Biogemma's researchers can obtain the data they need for their investigations faster, and can feed their conclusions back to the company's partners sooner. Besides benefiting Biogemma's own staff members, the improved performance of the new HPC

Spotlight on Biogemma

Biogemma was formed in 1997 from the merger of biotech research activity at three major seed producers, Vilmorin & Cie, Euralis and RAGT. The company is involved in more than 200 collaborations across the world. It specializes in genetic analysis of common field crops and conducts research to identify variations that can enhance their performance. Biogemma shares the findings with its commercial partners to be implemented into field trials, with a view to bringing the improved crop offerings to market.

platform also enhances the support it can provide to researchers at its shareholder organizations, helping them expedite their own studies.

Evolution

Following the success of the implementation, Biogemma already has plans to further expand its HPC platform, with the aim of increasing the processor and memory resources available to applications. It intends to add eight more Intel Xeon processors 7500 series, increasing the total number of processor cores to 240, and an additional terabyte of system memory, bringing the total to two terabytes. By further enhancing the computing resources available to its teams, Biogemma is ensuring that they can continue to support their research with the most advanced genomics applications.

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