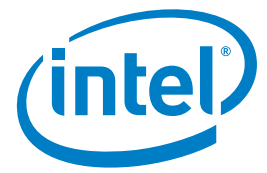


CASE STUDY

Intel® Xeon® processor 5600 series

Performance:
Data-Intensive Computing



Bioinformatics research deepens

Europe's leading agricultural laboratory adopts Intel® Xeon® processor 5600 series to extend its research

The French National Institute for Agricultural Research (INRA) is the number one agricultural institute in Europe and ranked second in the world. Its Versailles-Grignon research center employs approximately 1,500 people and carries out research into plant genomics and integrative biology, agricultural production, and food quality. Their research addresses worldwide challenges related to food and production, the environment and land use, and agronomics. This includes areas such as climate change, human nutrition, and the exhaustion of fossil resources. To carry out more research and attract more funding from the French government and European Union, the INRA Unité de Recherche Génomique-Info (URGI) wanted to upgrade its computer cluster to make it faster.



CHALLENGES

- **System expansion:** INRA URGI wanted to expand its computing platform to ensure a competitive research advantage
- **New DNA sequencing technology:** It needed to be in a position to use next-generation sequencing technology, which has only been available since 2009
- **Galvanise:** INRA wanted to strengthen its position as Europe's leading agricultural institute and the world's number two agricultural laboratory

SOLUTIONS

- **Measurements:** It benchmarked the Intel® Xeon® processor 5600 series against the Intel® Xeon® processor 5400 series, which was powering its existing computing cluster
- **Performance leap:** The Intel Xeon processor 5600 series provided an average 50 per cent performance increase over the Intel Xeon processor 5400 series

IMPACT

- **New cluster:** INRA URGI also implemented 22 new HP BL460c* blade servers powered by 44 Intel Xeon processor 5600 series and plans to introduce a further 40, or more, processors by the end of the year
- **New details:** It can now take full advantage of next-generation sequencing, which enables the sequencing of DNA at unprecedented speed
- **Reaching out:** The new cluster permits more concurrent users, enabling INRA URGI to expand its usage into the wider research community

Bio research

As Europe's leading biology laboratory, INRA URGI prides itself on carrying out cutting-edge research and supporting other biology laboratories in the wider research community. Much of this work is crucial in helping develop future economic and social compatibility.

Within this context, and with the advent of next-generation sequencing, INRA URGI wanted to develop its computing cluster to accommodate increases in data volumes and demand for computing resources. For example, next-generation sequencing (NGS) can sequence DNA at unprecedented speed, enabling impressive scientific achievements and new biological applications.

Only available since 2009, the technology generates much larger volumes of data than previous DNA sequencing methods. This provides INRA URGI researchers with greater potential for bioinformatics breakthroughs.

The organization had an existing computer cluster based on the Intel® Xeon® processor 5400 series that laboratories in the Versailles-Grignon complex used for differing research needs. However, sometimes the compute power was not sufficient. For example, it had only been able to carry out relatively minor next-generation sequencing projects. In these cases, INRA would turn to [Oxalya](#), a high-performance computing service provider.



"We gained memory bandwidth and an average 50 per cent performance improvement. In the best case, we gained a 70 per cent performance improvement."

Sébastien Reboux,
System administrator, INRA URGI



BLAST and next-generation sequencing receive big boost

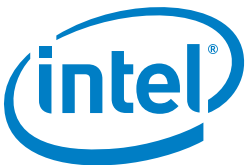
Next-generation sequencing

Since INRA URGI wanted to process next-generation sequencing data, Oxalya recommended it test the Intel® Xeon® processor 5600 series. The institute also considered rival processor technology, but decided to benchmark Intel technology because data sheets showed that it was faster. It was also more easily available. If the benchmarking produced positive results, INRA Versailles-Grignon would implement another computing cluster using this processor technology.

The Intel Xeon processor 5600 series was benchmarked against the Intel Xeon processor 5400 series running Basic Local Alignment Search Tool* (BLAST*) software on an HP BL460c* HPC cluster. BLAST is very common among bioinformatics researchers and the INRA URGI hardware systems had been optimised to provide the high frequency and high performance required for BLAST.

Initially, the benchmarking focused on measuring performance on a core-by-core basis. This produced a 15 per cent performance improvement in favour of the Intel Xeon processor 5600 series.

This was a substantial gain. But when the processors were measured against each other on a full server system, the improvement was striking. Sébastien Reboux, System administrator, INRA URGI, said: "We were a little astonished. The results were much better when we compared systems. We gained memory bandwidth and an average 50 per cent performance improvement. In the best case, we gained a 70 per cent performance improvement."



Increased density

Alongside faster application performance, INRA URGI also flagged increased server density as a significant benefit. "With Intel Xeon processor 5600 series, we could fit 12 cores into one server. It was one of the best things about this processor. For each blade server there was a 46 per cent improvement on the time it took to complete concurrently running processing jobs when compared to the Intel Xeon processor 5400 series," added Sébastien Reboux.

Following the positive results, INRA URGI decided to implement 22 HP BL460c blade system servers with 42 Intel Xeon processors 5600 series. Sébastien Reboux said, "Application performance was absolutely key to our requirements and this processor delivers that."

Generally speaking, the Intel Xeon processor 5600 series boosts server performance by up to 15x² over single-core servers, with processors that intelligently adapt to workloads.

INRA URGI is now running the new server cluster alongside its existing cluster powered by the Intel Xeon processor 5400 series. This existing cluster will still be used to run BLAST software, while the new Intel Xeon processor 5600 series-based cluster will primarily be used for next-generation sequencing data.

Essentially, the greater computational muscle and faster performance mean that researchers can carry out more calculations in the same amount of time while also being able to cope with the increased data workloads generated by next-generation sequencers.

A wider community

The benefits clearly don't stop there. The new cluster can support more concurrent users, which provides INRA URGI with a platform to support the wider research community.

Spotlight on INRA Versailles-Grignon

Founded in 1946, the French National Institute for Agricultural Research (INRA) is a mission-oriented public research institution under the joint authority of the French Ministry of Higher Education and Research and the Ministry of Agriculture and Fisheries. INRA Versailles-Grignon carries out mission-oriented research for high-quality and healthy foods, competitive and sustainable agriculture, and a preserved and valorised environment. Guided by developments in scientific fields, its research focuses on worldwide challenges facing the world of agriculture and agronomics related to food and nutrition, the environment, and land use. It produces fundamental knowledge that leads to innovation and know-how for society. It also lends its expertise to public decision-making.

Many smaller bioinformatics laboratories do not have their own computing resources and will eventually be able to use the new INRA URGI computing cluster.

Supporting other laboratories not only galvanises INRA Versailles-Grignon's standing as Europe's leading agricultural research organisation, and the world's number two agricultural institute, but also strengthens its case for increased investment.

Funded by the French government and the European Union, INRA Versailles-Grignon is expanding its research, particularly in the field of next-generation sequencing, substantially strengthening its case for more monies.

With this in mind, and the sizzling processor performance it has gained, INRA URGI aims to double the size of its computing cluster by the end of 2010 by implementing a further 40 or more Intel Xeon processor 5600 series.

Find a solution that is right for your organization. Contact your Intel representative or visit the Reference Room at www.intel.com/references.

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² Claim: "Up to 15x performance per server" Disclaimer: Intel performance comparison using SPECjbb2005* business operations per second between four-year-old single-core Intel® Xeon® processor 3.8 GHz with 2M cache-based servers and one new Intel® Xeon® processor X5670-based server. Performance tests and ratings are measured using specific computer systems and/or components and reflect the approximate performance of Intel® products as measured by those tests. Any difference in system hardware or software design or configuration may affect actual performance. Buyers should consult other sources of information to evaluate the performance of systems or components they are considering purchasing. For more information, visit www.intel.com/performance/server. - Baseline platform: Intel® server platform with two 64-bit Intel Xeon processor 3.80GHz with 2M L2 cache, 800 FSB, 8x1GB DDR2-400 memory, 1 hard drive, 1 power supply, Microsoft® Windows® Server 2003 Ent. SP1, Oracle® JRockit* build P27.4.0-windows-x86_64 run with 2 JVM instances - New platform: Intel server platform with two six-core Intel Xeon processor X5670, 2.93 GHz, 12MB L3 cache, 6.4QPI, 12 GB memory (6x2GB DDR3-1333), 1 hard drive, 1 power supply, Microsoft Windows Server 2008 64 bit SP2, Oracle JRockit build P28.0.0-29 run with 2 JVM instances

*Other names and brands may be claimed as the property of others.

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