CASE STUDY

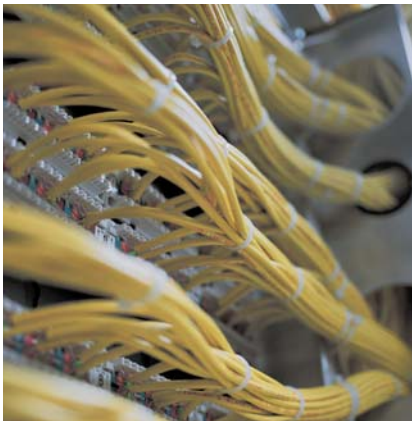
Intel® Xeon® processor 7500 series

High-Performance Computing
Data Intensive Computing

Shine on

France's prestigious Soleil Synchrotron institute gives its particle radiation research a powerful boost

Soleil Synchrotron is a high profile French scientific organisation that engages in particle acceleration and synchrotron radiation research. To advance understanding into medicine, chemistry, geophysics, biology and more recently the study of fine art and heritage objects, Soleil Synchrotron is developing a new 64-core supercomputer based on the Intel® Xeon® processor 7500 series. Powerful and scalable performance, quick I/O throughput and good bandwidth for its storage system enables different groups within the organisation to run concurrent workloads, while also gaining a faster data processing speed that is at least three times higher than that enabled by its previous supercomputer.



"Intel® Xeon® processor 7500 series has provided us with a powerful and scalable platform to accelerate our research into key areas of human understanding such as medicine and physics."

Phillippe Martinez,
Head of Scientific Computing,
Soleil Synchrotron

CHALLENGES

- **Greater demands:** Soleil Synchrotron's laboratories were competing for computing power in the face of heavier workloads
- **Performance shortage:** Existing computer resources were not enough to meet growing high-performance computing demands

SOLUTIONS

- **Benchmarking:** The organisation benchmarked the Intel® Xeon® processor 7500 series against its existing 72-core supercomputer powered by Intel® Xeon® processor 7400 series and Intel® Xeon® processor 7300 series
- **Broad criteria:** It aimed to assess I/O throughput, memory bandwidth and performance

IMPACT

- **Faster:** Intel Xeon processor 7500 series delivered in-house application performance up to three times faster than the computer powered by Intel® Xeon® processor 7300 series
- **Better:** Memory bandwidth and I/O throughput was more than high enough to enable demanding data storage and retrieval needs
- **Brighter:** The organisation's labs can process more workloads at faster speeds while sharing resource, accelerating research work

The radiating sun

Soleil Synchrotron is one of France's most prestigious scientific research organisations. It is the national synchrotron facility, a multi-disciplinary instrument and research centre. The facility itself consists of a huge circular track in which light electrons are speeded up. Each time these electrically charged particles of matter turn they emit a luminous ray called a 'synchrotron ray'. These rays have remarkable properties such as spectral continuity over a range extending from infra-red to X-rays, and flux and luminescence billions of times greater than those of classical X-ray sources, as well as other properties.

In practice this means that the research institute can carry out both fundamental and applied research across a wide number of disciplines including physical chemistry, astrophysics, nano-sciences, life sciences, the environment and archaeology. This research has plentiful applications in a wide number of industries including agribusiness, chemistry, electronics, transport and energy. In short, the organisation is at the forefront of research designed to advance human knowledge across many areas of endeavour.

New supercomputer will drive forward future research

Complex calculations

The data that the organisation's five different laboratories gather from their particle acceleration and synchrotron radiation tests are analysed using in-house applications, FDMNES* and FEFF*, running on a Linux* operating system. Previously Soleil Synchrotron was using a 72-core supercomputer built by NEC* and powered by Intel® Xeon® processors 7300 series and Intel® Xeon® processors 7400 series. This computer provided adequate processing power but as laboratory workloads increased it wanted to provide more high-performance computing power.

Given its previous positive experience with the Intel Xeon processor 7300 series and Intel Xeon processor 7400 series Soleil Synchrotron wanted to benchmark the Intel® Xeon® processor 7500 series ahead of its commercial release. It was specifically interested in establishing whether large memory requirements would have an adverse impact on performance, scalability and memory bandwidth.

Intel supplied Soleil Synchrotron with two white box servers powered by eight Intel Xeon processors 7500 series. An Intel technical team also fine-tuned the processors to increase memory capacity from 64GB to 120GB. Soleil Synchrotron then ran its FDMNES and FEFF applications on the white boxes comparing performance with eight cores from its existing supercomputer. A simulation was also launched to compare the performance of a 64-core computer powered by the Intel Xeon processor 7500 series against its existing supercomputer.

Building the future

Phillippe Martinez, in charge of Scientific Computing, said: "Different labs are running different workloads so it's important for us to be able to accommodate these, some of which are becoming increasingly more demanding in terms of computing resources. So, we wanted to ensure that we could still run concurrent workloads while meeting these higher demands.

"The Intel® Xeon® processor 7500 series had a very good I/O throughput which was essential for our data storage needs. Furthermore there was no degrading of memory bandwidth performance which in itself was very good as was scalability."

Spotlight on Soleil Synchrotron

SOLEIL (Source Optimisée de Lumière d'Energie Intermédiaire du LURE) Synchrotron is a prestigious research facility run by the French National Centre for Scientific Research and the Commissariat a l'Energie Atomique (CEA), two national research agencies. It is located in a south-western suburb of Paris and performed its first acceleration of electrons on May 14, 2006. The facility is engaged in particle and synchrotron radiation research to further understanding into a wide range of areas including nuclear physics, medicine and the environment.

Labs within Soleil Synchrotron will now be able to access high-performance computing power that will reduce the time required for workloads and also enable faster calculations. In turn, this ensures that the important and high-profile work carried out at Soleil Synchrotron can carry on at a faster and more accurate pace, resulting in greater benefit across key areas of human endeavour such as medicine, nuclear physics and the environment.

Performance: Data Intensive Computing: Support the most demanding business data processing and computationally-intense graphics

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