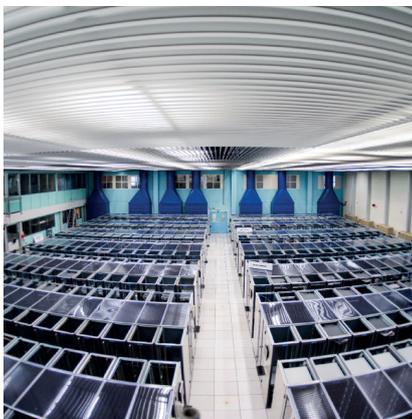


Powering breakthroughs

CERN IT boosts performance per watt for key server cluster with Intel® Xeon® processor E5-2630L

CERN's IT Department is committed to providing the information technology required by the experiments it hosts, through building world-class competencies in the technical analysis, design, procurement, implementation, operation and support of computing infrastructure and services. The IT department (CERN IT) replaces its data center servers when they run out of warranty, meaning refresh cycles to partially renew the servers occur around every six to 12 months. CERN IT is therefore regularly testing new server technologies to ensure it is equipping scientists with the best possible resources in terms of performance per watt for a given price envelope. It recently compared various servers in a competitive tender and selected those equipped with the Intel® Xeon® processor E5-2630L. Benchmarking showed that this processor's performance per watt is 20 percent more efficient than that of the Intel Xeon processor L5640.



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"We recorded a 20 percent lift in performance per watt with the platform powered by the Intel Xeon processor E5-2630L compared with that powered by the Intel Xeon processor L5640. The improved performance this platform delivers to the applications we need to run, offers a significant benefit to our users."

Olof Barring,
technical manager responsible for
procurement of servers and storage,
CERN IT

CHALLENGES

- **Groundbreaking research.** CERN conducts detailed research into some of the world's most perplexing scientific questions and requires a lot of computing power and storage to do it
- **Stay ahead.** To that end, and to effectively support complex applications and calculations, the IT team must keep up with technological developments

SOLUTIONS

- **Careful measurement.** The IT team assessed the performance of core applications on multiple platforms, using the SPEC® CPU 2006 benchmark to select the higher performance and energy efficient solution for a given price envelope
- **Strongest performance.** The platforms powered by the Intel Xeon processor E5-2630L delivered a 20 percent performance lift per watt over the platforms powered by the Intel Xeon processor L5640

IMPACT

- **Performance boost.** Scientists' applications now benefit from a greater level of performance to process data with higher throughput, which empowers scientific research
- **Power efficient.** Greater performance from the same level of power input helps data center run more efficiently

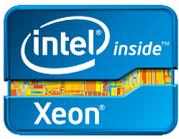
Complex calculations

A hub of scientific advancement since its founding in 1954, the European Organization for Nuclear Research (CERN) has become a household name for particle physics over the last few years. Technological wonders like the Large Hadron Collider* and breakthroughs such as the discovery of a particle consistent with the long-sought Higgs boson have brought the Geneva-based research organization global attention.

Behind the scenes, teams of skilled scientists spend their days conducting the detailed high-energy physics calculations and experiments that underpin many of these discoveries. Each experiment has developed its own applications, which are run on the high-performance computing (HPC) platform provided by the IT department's data center. The applications that the scientists create can be highly complex, sometimes involving millions of lines of code.

The HPC platform in the data center needs to live up to the high performance and availability demands of these applications. Each year, the research teams submit their expected requirements in terms of computing performance, and it is CERN IT's responsibility to ensure that the platform it makes available meets these needs.

"CERN's computing needs are not getting any simpler," comments Olof Barring, technical manager responsible for procurement of servers and storage. "We operate a six-to-12-month incremental refresh cycle for the servers in our HPC cluster, partly for replacing obsolete equipment and partly for increasing compute capacity. We aim at delivering the best performance per watt for our scientists' applications, keeping power consumption and costs down."



Leading scientific research organization strengthens HPC cluster with Intel® technology

Robust benchmarking

Each time a new server platform is under consideration, the CERN IT team benchmarks it against other options. It uses the SPEC® CPU 2006 benchmark with a configuration tailored to compare high-energy physics applications that would typically be run on the data center's HPC cluster.

The IT department was considering a number of options for one refresh cycle. It ran the benchmark using a platform based on the Intel Xeon processor E5-2630L. For comparison, it also ran the benchmark on a platform powered by the Intel Xeon processor L5640.

Performing well

"We observed a 20 percent lift in per-core performance¹ per watt with the platform powered by the Intel Xeon processor E5-2630L compared with the one powered by the Intel Xeon processor L5640," explains Barring.

Based on these results, CERN IT decided to purchase 440 dual-socket servers based on

Intel Xeon processors E5-2630L for inclusion in the next refresh of its HPC cluster, which will give a total of 880 Intel Xeon processors E5-2630L in its data center. It uses Intel® Node Manager², which is part of the platform, to monitor the servers' power consumption and gain greater visibility of energy use across the cluster. The platforms are configured with Simultaneous MultiThreading (SMT) or Intel® Hyper-Threading Technology³ (Intel® HT), which have proven beneficial for the applications.

With enhanced performance per watt, CERN IT can now deliver an increased level of performance to its users for equal electrical power consumption, helping make the data center more energy efficient.

The addition of the latest Intel technology empowers CERN IT's HPC cluster to better meet researchers' computing needs. "We can deliver the level of service availability, performance and throughput that our researchers require for further boosting scientific measurements and new discoveries," comments Barring.

Lessons learned

When HPC performance is so important, the most reliable way of ensuring a new platform will meet the needs of users and their applications is to carry out benchmarking across a variety of specially-configured options. By systematically carrying out impartial SPEC benchmarks across the latest computing platforms, CERN IT is able to identify which server delivers the best performance per watt in a given price envelope. The latest solution chosen, based on the Intel Xeon processor E5-2630L, represents a 20 percent performance per watt increase over the Intel Xeon processor L5640 based platforms.

"As our server refresh cycle continues, we are interested in exploring the possibility of gathering more data from the server fleet on performance, power usage and other criteria to enable us to better manage the cluster," Barring says. Technologies such as Intel Node Manager will help the team to achieve this objective.

Find the solution that's right for your organization. Contact your Intel representative, visit Intel's Business Success Stories for IT Managers (www.intel.co.uk/Itcasesstudies) or explore the Intel.co.uk IT Center (www.intel.co.uk/itcenter).



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¹ Software and workloads used in performance tests may have been optimized for performance only on Intel microprocessors. Performance tests, such as SYSmark and MobileMark, are measured using specific computer systems, components, software, operations, and functions. Any change to any of those factors may cause the results to vary. You should consult other information and performance tests to assist you in fully evaluating your contemplated purchases, including the performance of that product when combined with other products. For more information go to <http://www.intel.com/performance>

² Intel® Node Manager technology requires a system with an Intel® Xeon® processor, supported Intel® Enterprise chipset, BIOS, and other requirements documented in the applicable Platform Design Guideline documentation and applications enabled for virtualization technology. Functionality, performance or other power capping technology benefits will vary depending on hardware and software configurations. For more information, visit <http://www.intel.com/content/www/us/en/data-center/data-center-management/techrefresh-info-nodemanagerfull.html>

³ Intel® Hyper-Threading Technology (Intel® HT Technology) is available on select Intel® Core™ processors. Requires an Intel HT Technology-enabled system. Consult your PC manufacturer. Performance will vary depending on the specific hardware and software used. For more information including details on which processors support Intel HT Technology, visit <http://www.intel.com/info/hyperthreading>.

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