CASE STUDY

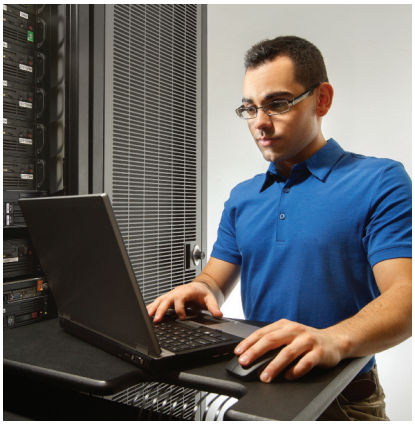
Intel® Xeon® Processor E5 Family, Intel® Solid-State Drive (Intel® SSD)

Manufacturing
High-Performance Computing

Brembo accelerates product development with Intel® Xeon® processor E5 family

Integration of computerized modeling into standard brake design process reinforces competitive advantage

Brembo has always used innovative technology to maintain its leading position in the field of brake systems. The arrival of the Intel® Xeon® processor E5 family provided an opportunity for the company to boost the effectiveness of its product design with faster and more detailed computerized calculations and simulation processes. Since upgrading its systems, Brembo has seen average performance increases of 66 percent[1] and has made computerized modeling an essential part of its product development. This has helped eliminate bottlenecks in research and design and improve the quality of the finished product.



"With the Intel® Xeon® processor E5 family, the performance of our calculation and simulation processes has increased by an average of 66 percent. As a result, we have been able to completely change our approach to designing new products. IT has gone from a complex problem-solving resource to a simple and indispensable design tool."

Paolo Crovetti,
ICT Director,
Brembo

CHALLENGES

- **Eliminate bottlenecks:** Speed up the computer simulation process used in the development of brake systems, thus reducing the time-to-market of new products
- **Fully integrated:** Transform IT from being merely a limited, problem-solving resource to a tool that is indispensable throughout the entire design phase
- **Increase reliability:** Improve the intrinsic quality of Brembo products by conducting more (and more accurate) simulations of all new brake systems

SOLUTIONS

- **Technology upgrade:** Brembo updated the severs it uses to perform scientific calculations and simulations with new models supplied by Dell
- **High volume:** Each server is powered by two Intel Xeon processors E5 family, and contains Intel® Solid-State Drives (Intel® SSDs) to boost data transfer rates
- **Additional features:** In addition to raw processing power, the processors use Intel® Hyper-Threading Technology (Intel® HT)[2] and Intel® Advanced Vector Extensions (Intel® AVX)[3] to maximize performance

TECHNOLOGY RESULTS

- **Faster performance:** With the new technology, the time it takes to perform computerized simulations and calculations is reduced by 66 percent on average, with some applications running up to five times faster
- **Extra boost:** Intel AVX helped increase processor performance by an additional 10 percent

BUSINESS VALUE

- **Increased productivity:** The additional computing resources available to Brembo's designers mean that they now undertake around 100 simulation tasks each day, compared to one per day a decade ago
- **TCO reduction:** The increased productivity the new technology has enabled, along with reduced energy and management costs, has made it possible to lower the total cost of ownership (TCO) for the design and simulation departments
- **Maintaining competitiveness:** With support from advanced computing resources, Brembo has sped up product development to better serve the changing needs of customers, and delivers higher-performing, more reliable and efficient brake systems

Investing in staying ahead

Established in 1961 as a small mechanic shop, Brembo soon became the unrivaled leader in brake systems (discs, calipers, and complete systems). In 1995, Brembo was listed on the Milan Stock Exchange and made a name for itself as a model medium-sized Italian enterprise.

Today, after half a century in business, Brembo is a multinational organization operating on three continents, running production sites in 15 countries worldwide and marketing its products in 70 different countries. The group has revenues of over EUR 1.2 billion (more than USD 1.5 billion) and over 7,000 employees, 10 percent of whom are involved in research and development. This is an investment that is essential to helping Brembo maintain its leadership in the industry.

Design at the heart of business

An essential part of launching a new brake system is the road test. This is used to verify whether or not designers' and engineers' work can soon be turned into a commercial product or if further refinement is needed. It is a critical phase because the time-to-market of products is fundamental to success in a sector as competitive and high-tech as the automotive industry. A brake product

Brembo improves development output and lowers the TCO of its IT resources with the Intel® Xeon® processor E5 family

Lessons learned

After enhancing its computing resources with the Intel Xeon processor E5 family, Brembo saw the potential to integrate software-based modeling tools more fully into its product development processes. By using computerized forecasts to speed up the process of refining product designs prior to production, it has reduced the time-to-market for new brake systems while improving their quality, helping maintain its competitive advantage. The greater processing capacity of the technology has also enabled the company to reduce the TCO of supporting its IT resources, while serving more users simultaneously.

can only be released once it has been demonstrated that its fluid dynamic and heating performance and resilience to vibrations fall within the necessary thresholds.

Issues relating to vibrations and fluid dynamics in brake systems are so complex that they cannot be studied and calculated manually, and even years of practical engineering experience cannot guarantee that everything will function as it should. To support its research and development processes and withstand increasingly tough competition in the international arena, Brembo equipped itself with IT systems capable of simulating the reaction of discs and calipers under different conditions. These computerized models allowed it to predict the performance of new brake products before road testing, resulting in a more efficient design cycle.

"During our first few years using IT systems to simulate brake performance, we were able to conduct around one test per day," explains Paolo Crovetti, ICT director for Brembo. "Only a select few specialists knew how to use these tools and, after starting the simulation, the engineers would focus on other tasks while they waited for the results. Despite the initial limitations, these computer processes soon became fundamental to the design process. We saw an opportunity to increase the support our IT resources could offer our designers by taking advantage of developments in processing technology."

Next-generation computing

Brembo has regularly refreshed its workstations as new processing technology has become available. Most recently, it identified an opportunity to harness the Intel Xeon processor E5 family to boost the performance of its systems.

"We were dying for more calculation potential," explains Crovetti. "The capacity of the machines had become a bottleneck within the overall design process. Working with one of our vendor partners, we got access to a sample server with the new Intel processors."

The server Brembo tested contained two Intel Xeon processors E5 family with Intel HT Technology and Intel SSDs for enhanced data access performance. It soon added three more Dell servers, which were configured into a single cluster to support 50 to 100 users within the company, including specialist designers and engineers as well as general personnel.

Brembo successfully installed two simulation software packages on the servers, Nastran* from MSC Software and Star CCM* from CD-adapco. Technicians immediately noticed the increase in performance over the previous technology. "With the Intel Xeon processors E5 family," states Crovetti, "the performance of our calculation and simulation processes has improved by an average of 66 percent, with speeds up to five times faster in some applications. This is proof of how essential it is for us to keep up with technological developments through our relationship with Intel to continue offering our customers competitive solutions."

Part of the improvement in the performance of Brembo's simulation applications was achieved through the use of Intel AVX technology in the new processors. By adding further support for data-intensive computing processes, this increased CPU processor performance by an additional 10 percent.

Paradigm shift

The performance improvements Brembo achieved with the new hardware has had a fundamental impact on the way it uses technology to support product development. It has transformed the role of computerized simulations from a problem-solving resource – used only when a specific issue with a brake system needed to be examined – to a platform that is used as standard during the development process. By enabling staff to identify and respond to potential design issues at an earlier stage, Brembo has reduced the time to market for its products.

"The new processors allow us to carry out around one hundred simulation tasks a day compared to the one-task-a-day capabilities we had just 10 years ago," says Crovetti. "The increased performance of the platform has met the ongoing needs of our designers, who have had to adapt to the changing conditions of the marketplace for brake products. As well as speeding up the execution of new designs, integrating computerized modeling into our development cycle has enabled us to provide our customers with more reliable, efficient and high-quality brake systems, as a result of their functionality being analyzed down to the finest detail."

Greater efficiency

As well as improving the quality of the finished product, the higher performance of Brembo's computing platform has also allowed it to improve the efficiency of its IT. By supporting more users and enabling more tasks to be performed on each server, Brembo has reduced the TCO of its IT resources, including lowering power consumption and service costs.

Brembo sees its Dell servers as a focus point for future expansion and development. "We are fully utilizing the current systems' processing potential," says Crovetti. "This makes it possible to identify 95 percent of potential problems with new brake designs before testing the systems out on the road. However, we would like the results of our computerized simulations to correspond even more precisely to the real performance of our products, and are interested in harnessing the potential of computing resources to make this possible. As a result, we are following the development of Intel's processing platforms with the same interest we have always shown."

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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

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[2] Requires an Intel® Hyper-Threading Technology-enabled system, consult with your PC manufacturer. Performance will vary depending on the specific hardware and software used. Not available on all Intel® processors. For more information, including details on which processors support Intel HT Technology, visit http://www.intel.com/go/ht

[3] Intel® Advanced Vector Extension (Intel® AVX) is a new 256-bit instruction set extension to SSE and is designed for applications that are floating-point intensive. To learn more about Intel® AVX, visit http://software.intel.com/en-us/avx/

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

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