



Success Brief

Intel® Xeon® processor
5500 series
Manufacturing

“The Intel® Xeon® processor 5500 series allows us to run our HPC applications in a much more efficient way in our multi-purpose cluster environment. It even enables new use cases that were considered unpromising only a few months ago.”

Thomas Wagner,
Manager High Performance
Computing at BMW Group

Refreshing benefits at BMW Group

Migration to Intel® Xeon® processor 5500 series lowers total cost of ownership and increases flexibility

Company	BMW Group is a worldwide manufacturer of premium automobiles and motorcycles
Product evaluated	Intel® Xeon® processor 5500 series
Challenge	Lower total cost of ownership (TCO): IT hardware, energy and software licence costs, while increasing high-performance computing (HPC) capacity and throughput to enable new HPC use cases with cost-efficient IT solutions
Results	When compared to the Intel® Xeon® processor 5100 series with two cores, the Intel® Xeon® processor 5500 series with four cores multiplies capacity by a factor of 2 worst case scenario and up to a factor of 5 best case scenario
Impact	The new server infrastructure based on the Intel® Xeon® processor 5500 series significantly increases the capabilities of the organisation's HPC clusters for a lower TCO and enables new application use cases
Next steps	BMW Group is deploying Dell PowerEdge* servers powered by the Intel® Xeon® processor 5500 series, which will replace a RISC-based infrastructure that has much higher costs, lower performance and less flexibility

Challenge

The BMW Group is a worldwide manufacturer of automobiles and motorcycles. With the three brands BMW, MINI and Rolls-Royce Motor Cars, the BMW Group has its sights set firmly on the premium sector of the international automobile market. BMW Group has a presence in more than 150 countries and its revenue in 2007 was just over EUR 56 billion (USD 75 billion).

BMW Group's success has been built on its unerring conviction to innovate. Significant advancements in aerodynamics, safety and powertrain, and efficient dynamics for example, have enabled it to clearly stand out from the competition in an increasingly aggressive premium market.

Much of this innovation is based on research and development, which requires sophisticated simulation software. Unsurprisingly the computations, which perform billions of calculations per hour, require enormous amounts of processing power.

To keep driving innovation forward while remaining competitive, BMW Group continuously updates its IT infrastructure to ensure it is achieving optimum output for the best price. It does this by working closely together with its long-standing technology partner Intel.

Deployment

BMW Group strives to strike the best balance between hardware costs, energy costs and software licensing costs, while maintaining high performance.

In the past BMW Group used large proprietary RISC-based high-performance computing (HPC) server systems. Since these specific environments are rather inflexible, the average workload could not run at much over 50 percent capacity without adversely affecting users and business processes.

Starting in 2006, BMW Group decided to move and consolidate HPC applications to a multi-purpose clustered server environment based on the Intel® Xeon® processor 5100 series with two cores. This allowed BMW Group to increase the workload to more than 80 percent and to significantly decrease the total cost of ownership (TCO).

Due to the expensive per-core license schemes for some of the applications used on the cluster, BMW Group's TCO calculation showed that in some cases it is more cost effective to run certain applications only on one core instead of using the multi-core technology – although the server utilisation and energy consumption in this case is not desirable.

Seeking to optimise the TCO of its HPC clusters, BMW Group decided to evaluate the performance of the Intel® Xeon® processor 5500 series with four cores. Using its own benchmarking standards, BMW Group evaluated performance versus cost running a range of typical engineering applications such as Computational Fluid Dynamics (CFD) and crash simulation.

Results

The evaluations showed that the Intel Xeon processor 5500 series helps BMW Group to balance hardware, energy and application licensing costs, while increasing performance. Due to the great scalability of the platform it is clearly more cost-effective for BMW Group to utilise all four of the processor's cores, even for expensive applications.

The following graph compares the options to run a specific application licensed to run on 16 cores. These results are not representative, but offer a good example of what it is like running a demanding, multi-threaded application on an Intel® Xeon® processor technology platform.

The first bar represents benchmark performance with the natural configuration of an Intel® Xeon® processor 5100 series with two cores. To run the application's 16 threads in parallel, four servers are needed, each equipped with two processors. The second option uses the same server type, but only utilises a single core per processor.

In this example we see that the application performance dropped down heavily when using multi-core: the runs using the single core showed 25 percent performance gain. However, this requires eight servers, doubling the infrastructure costs including energy consumption and cooling. Taking application licence cost and higher throughput into account even this single-core configuration with eight servers may be preferable – although not satisfying from an IT perspective.

The benchmark run on an Intel Xeon processor 5500 series-based system shows, that this processor architecture enables running on four cores per processor with even higher performance than on the former systems in both dual- and single-core configurations. Since each server is equipped with eight cores, it requires just two servers.

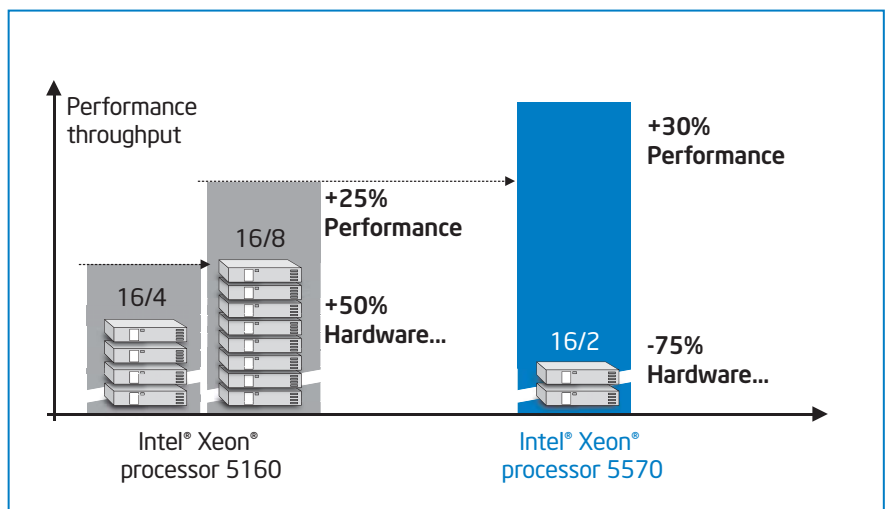
Impact

The Intel® Xeon® processor 5500 series provides BMW Group with the capabilities and scalability to deliver high-performance computing (HPC) capacity for excellent engineering, while improving the balance between performance and costs for HPC applications and infrastructure.

With the new Intel Xeon processor 5500 series-based infrastructure BMW Group can make the required HPC capacity available at a significantly lower level of energy consumption and cooling demands.

In addition to the efficiency improvements, the higher performance and scalability of the new processor technology can even leverage new virtual product development methods. In fact, BMW Group now decided to build a Realtime Raytracing Solution based on Intel Xeon processor 5500 series HPC infrastructure.

Raytracing is used at BMW, for example, to get in early design state visual impressions of reflections and refractions in front and rear lights. Thus far, doing raytracing in realtime has not been a viable option for BMW Group since processor technology has been too slow from a performance perspective and too expensive for an IT application and infrastructure solution. However, running on the Intel Xeon processor 5500 series this becomes a viable option for the first time.



Future

BMW Group has ordered 128 Dell PowerEdge* R610 servers and 11 Dell PowerEdge* R710 servers powered by the Intel® Xeon® processor X5570 to implement new building blocks within their high-performance computing cluster. The new Xeon-based compute capacity replaces RISC-based servers which are at their end of life.

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