



Case Study
Intel® Xeon® Processor
Automotive

Virtualisation simplifies server management

The BMW Group improves IT performance and stability while reducing costs thanks to server virtualisation based on the Intel® Xeon® processor 5400 series and Microsoft Hyper-V* technology

As IT becomes increasingly challenging, virtualisation offers greater flexibility, data security, reliability and a safe investment prospect. But for initiatives to really pay off, they need to be based on a virtualisation platform that enables the best performance and headroom for consolidation.

„Microsoft Hyper-V based on the Intel Xeon processor 5400 series offers a high-performance and low-cost virtualisation solution.“

Falko Wien,
Hyper-V Project leader,
BMW Group

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- Initial situation:**
- **The BMW Group** has so far implemented two virtualisation solutions at its larger sites and production plants: VMware ESX* Server for its Microsoft Windows* environment and Xen for its Linux environment.
 - **The company is currently expanding** virtualisation to smaller sites, in order to consolidate its physical servers (totalling 1000); reduce energy consumption; lower costs; and minimise space needed for hardware.
 - **The objective is to create** a stable, easy-to-manage virtualised IT platform, that allows data to be mirrored from the host system to keep it redundant and therefore highly available.

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- Solution:**
- **In the lab, a project architecture** was evaluated using Microsoft Windows Server 2008*
 - **The software platform runs** on energy-efficient Intel® Xeon® processors 5400 series, based on 45nm next-generation Intel® Core™ Microarchitecture
 - **Intel® Virtualisation Technology was used** in combination with Microsoft Hyper-V*
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Highly available virtual systems with Microsoft Hyper-V*

The situation

The BMW Group uses virtualisation to ensure efficient utilisation of IT resources at its larger sites and production plants. Virtualisation offers the opportunity to divide a single server (host) into several virtual systems (partitions). By reducing the number of physical servers (consolidation), it can achieve higher server utilisation. Moreover, power consumption and the need for space and cooling decrease, since there are fewer servers to supply with energy. Virtualisation generally boosts the flexibility of IT in a company, since virtual servers can be allocated within minutes. Servers can be logically partitioned according to capacity to respond to the demands of new applications, growing workload or necessary system maintenance.

Spotlight: BMW Group

- The BMW Group was founded in 1916 as the 'Bayerische Flugzeugwerke AG' and with 107,000 employees it is currently one of the largest car manufacturers in the world
- The BMW Group owns the brands BMW, MINI and Rolls-Royce. With these brands the Group operates exclusively in the premium segments of the automobile market - from small to luxury cars. In total, the company shipped around 1.5 million vehicles in 2007
- The BMW Group has 23 production plants in 12 countries and sales points in over 150 countries on every continent
- The 2007 fiscal year was the most profitable in the history of the company. The BMW Group achieved record sales of EUR 56 billion and pre-tax profits of EUR 3.87 billion

Currently the BMW Group has achieved virtualisation across its larger sites and production plants using VMware ESX* Server for its Windows environments and Xen for its Linux servers. In addition some computers are running on Microsoft Virtual Server 2005. The company is now extending virtualisation technology to smaller sites around the world to consolidate existing Windows servers (totalling 1,000); reduce power consumption; lower costs; and save space.

With VMware ESX Server, host mirroring is currently not possible. In addition, hardware needs to be reliable and high-performing since, with virtualisation, several servers or workloads are consolidated onto a single physical host.

The solution

In an IT lab a project architecture was set up comprising Microsoft Windows Server 2008 Hyper-V* and Intel® Xeon® processors 5400 series – using a low-voltage CPU Xeon L5420, with a thermal design power (TDP) of 50 W. This CPU gives the highest possible performance/WATT on today's Xeon Server and is a perfect candidate for virtualization. Currently, the BMW Group has virtualised around 40 servers with the Intel/ Microsoft solution.

Microsoft Hyper-V* supports various types of operating systems running simultaneously on different 32- and 64-bit server platforms. It offers improved memory access including SAN and internal hard drive systems. Also, Microsoft Hyper-V works in a virtual environment with up to four processor cores, so that virtual machines can return maximum performance on multi-threaded applications.

The hardware runs on the Intel Xeon processor 5400 series based on 45nm next-generation Intel® Core™ Microarchitecture. The new 45nm semiconductor manufacturing process has led to significant server energy-efficiency gains. By using new materials such as hafnium-based high-k gate dielectrics and metal gates, electrical current leakage in transistors is significantly reduced leading into an unmatched performance/WATT ratio.



„Virtualisation and the use of energy-efficient Intel Xeon processors 5400 series help us to reduce energy costs.“

Falko Wien,
Hyper-V Project leader,
BMW Group

Remarkably increased performance

Intel® Xeon® processors 5400 series boost the performance of virtual machines as they accelerate transit times (entry/ exit) by 25-75 percent. This is made possible by improvements in the underlying microarchitecture and happens transparently to the software running in the virtual machines. Tests in the BMW Group labs showed that the Microsoft Windows Server 2008 Hyper-V system runs approximately 50 percent faster than a system based on Microsoft Virtual Server 2005*.

The main reason for this is that Microsoft Hyper-V takes advantage of Intel® Virtualisation Technology (Intel® VT), whereas Microsoft Virtual Server 2005 does not. With support from the processor, chipset, BIOS and enabling software, Intel VT improves traditional software-based virtualisation. By offloading workloads to system hardware, Intel VT offers greater stability and also ensures that the performance of the virtualised environment is equal to any non-virtualised infrastructure.

Key technologies

- The high performance Intel® Xeon® processor 5400 series is a perfect platform for virtualisation. The advanced energy-efficient operation reduces energy consumption and cooling costs
- With extended hardware functionality, Intel® Virtualisation Technology offers greater stability compared to virtualisation implemented just on a software basis. It improves performance, as the server carries out less software-based translations between the host operating system and the external operating system
- Microsoft Windows Server 2008 Hyper-V* offers a reliable, scalable and efficient platform for all virtualisation scenarios

Reliable and highly available

The combination of Microsoft Windows Server 2008 Hyper-V and Intel Xeon processors 5400 series provides a stable, highly-available and secure system. They offer complementary features and functions to prevent downtime, thereby improving business continuity.

Thanks to integrated status monitoring, Microsoft Hyper-V offers proactive control of virtual machines, increasing availability as software and hardware problems can be detected and dealt with at an early stage. In addition, Windows Hardware Error Architecture (WHEA) provides a common infrastructure for handling hardware errors on Windows platforms. WHEA reduces meantime-to-recovery for fatal hardware errors through richer error reporting and reduces system crashes related to hardware errors through effective operating system hardware error recovery and health monitoring.

The Intel® Xeon® processors increase availability with memory mirroring and data error correction through the ECC memory (Error Correcting Code). Unplanned downtimes cannot be completely avoided. In case of disasters such as fire or flooding, the BMW Group has to be able to restore the system as fast as possible and with minimal data loss. To ensure this, Live-Backup from Microsoft Windows Server 2008 with Volume Shadow Copy Services (VSS) is able to secure data and the system status of a virtual machine without shutting it down. It is also possible to create virtual machine snapshots of running virtual machines. These secure the status of the virtual system so that BMW Group administrators can set the machine back to a previous mode more easily.

In order to quickly restore in the event of a disaster, systems are mirrored in two locations synchronously. As soon as the virtual machine is booted at the second location, it is possible to immediately access all the current data. This technology (host-based mirroring) can be applied smoothly with Microsoft Hyper-V, as it is based on Microsoft Windows Server 2008.

Intel® Virtualisation Technology ensures higher system performance

Outlook

In addition to greater stability, higher reliability and better performance; Microsoft Hyper-V* also offers significant cost benefits. Since it is already integrated into Microsoft Windows Server 2008, licence costs can be saved. For example, businesses with a Microsoft Windows Server 2008 enterprise licence can operate up to four virtual machines; and for businesses with a Microsoft Windows Server 2008 data centre licence, the number of virtual machines is unlimited.

Following the positive lab tests, the BMW Group has decided to roll out a Microsoft Hyper-V virtualisation solution based on the Intel® Xeon® processor 5400 series across its smaller sites.

Benefits at a glance

- Reliable and highly available virtualisation solution
- Higher performance with virtualisation
- Lower operating costs due to reduced power consumption and cooling requirements
- Simple administration of server landscape through server consolidation
- Reduced licence costs



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