

# Maximize the Business Value of Datacenters with VMware Virtualization Solutions Powered by IBM and Intel

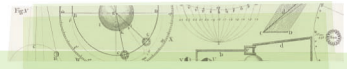
## HIGH-PERFORMANCE VIRTUALIZATION

Virtualization has transformed enterprise IT by generating more business value from datacenter servers than ever before—accomplishing more with less. Virtualization optimizes IT by unchaining IT services from specific hardware, redelivering them in a flexible, virtual form which maximizes the return on IT investment.

Consider a traditional server with one operating system. Often, it is responsible for one IT service, such as database hosting or e-mail, which doesn't make optimal use of the server's hardware. Any extra computational power is wasted and cannot be reallocated to a different IT service.

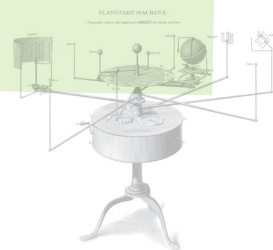
Virtualized servers make the most of their underlying hardware. Through virtualization, one physical host consolidates the software elements of multiple traditional servers—their operating systems, their applications, and their data—and runs them all simultaneously.

Tremendous business value can be generated through this approach. When driven by powerful solutions such as the Intel® Xeon® processor 7400 series-based IBM System x3850 M2 and x3950 M2 powered by VMware, virtualization can improve IT service levels while also decreasing costs: fulfilling operational goals while also freeing resources for new revenue-generating business initiatives.



## HIGH-PERFORMANCE VIRTUALIZATION PROVIDES BUSINESS AGILITY

- Rapid IT response to business needs
- Computing performance optimized for virtualization
- Availability for mission-critical workloads
- Energy efficiency
- Capital and operating cost savings



## MAXIMIZING THE RETURN ON IT INVESTMENT

**Reduce total cost of ownership per server.** Multiple virtual servers on a single x86 host allow lower costs for each workload than traditional x86 implementations. Because each physical server can host multiple virtual servers, a virtualized data center requires fewer physical hosts, and thus occupies less physical space, consumes less electricity, and generates less heat. With thousands of servers commonly found in an enterprise-class datacenter, capital and operational savings can result in a significantly reduced TCO for the IT organization.

Processor-rich virtualization solutions increase the savings. The more powerful the physical hosts, the fewer hosts are required to support virtual machines—and the lower TCO becomes for each application workload. The Intel-based IBM System x3850 M2 and x3950 M2 are just such processor-rich solutions.

**Increase hardware utilization.** If an x86 host server is underutilized, IT can add more virtual servers to it until utilization approaches target levels. And studies have repeatedly shown that x86 servers with more processors will generally deliver higher overall utilization than servers with fewer processors. The IBM System

x3950 M2, with up to 16 Intel Xeon processors, featuring six computational cores each, is ideal for virtualization.

**Allocate computational power to IT services on demand.** With virtualization, computational power becomes a fluid resource which can be allocated dynamically as needs change. If a given IT task requires more computational power, it can be provided by redistributing virtual servers to higher-end physical hosts.

## OPTIMIZING VIRTUALIZATION WITH TARGETED SOLUTIONS

Achieving the highest business value from any virtualization strategy requires targeted solutions which are designed for virtualization from the ground up.

Fortunately, IBM, Intel, and VMware have collaborated to deliver enterprise-level virtualized solutions: the IBM System x3850 M2, powered by the Intel Xeon 7400 processor series and running VMware Infrastructure software. These solutions leverage many unique optimizations to provide outstanding virtualization performance with lower energy consumption. Server virtualization solutions are also available on the IBM BladeCenter® architecture and other members of the IBM System x™ server portfolio.

**Superior virtualization performance delivers rapid ROI.** The IBM/Intel/VMware offering is collectively designed to spur virtualization performance. IBM's proven fourth-generation X-Architecture® eX4 has been engineered for very high workloads, allowing IT to consolidate an exceptionally high number of x86 server workloads onto a single machine. Both the IBM System x3850 M2 and x3950 M2 are driven by the Intel Xeon processor 7400 series, which delivers up to 39% better performance<sup>1</sup> in

a virtualized environment than previous generation processors within the same power envelope, and provides up to 24 cores on a four socket system and up to 48 cores on an eight socket system. Each core offers seamless compatibility with both 32-bit and 64-bit software, allowing customers to deploy and run virtually any required software with minimal context-switching

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performance penalties.

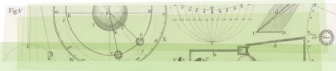
The IBM System x3850 M2 offers up to four Intel Xeon processors, for as many as 24 cores of optimized compute power and up to 256 GB of memory. For demanding workloads, the x3950 M2 allows you to scale up to 16 sockets of performance while offering an incredible full terabyte of memory.

On the software side, VMware ESX 3.5, an optimized platform-agnostic hypervisor, serves as an extremely efficient liaison between hardware and virtual servers. Networking performance has been accelerated through new support for TCP Segmentation Offloading, which frees processing power for business tasks by assigning network overhead to specialized hardware. And memory performance has been accelerated with new support for up to 256 GB across all virtual machines and up to 64 GB for any one machine.

Because the IBM x3850 M2 supports VMware ESXi 3.5 (embedded form), IT can power it up and be immediately ready to provision virtual servers. With the help



of VMware Converter, IT can migrate conventional non-virtualized x86 servers to an embedded virtual environment quickly and efficiently.



## BREAKING DOWN THE SCALABILITY BARRIER FOR MS EXCHANGE 2007

Recent testing by VMware sets new benchmark record: 16,000 mailboxes.

- More than doubles the Exchange 2007 theoretical maximum workload for a single physical host.
- Provides a scale-up alternative to the resource limits of Exchange that force scale-out, while leveraging the benefits of Virtual Infrastructure.
- Tested configuration: VMware ESXi 3.5 on the IBM x3850 M2 with 4 Intel 7350 CPUs and 128GB RAM. 8 virtual machines, each with 14GB RAM, 2 vCPUs and Windows 2003 R2 DataCenter x64.
- Significant server headroom was observed even at highest levels tested. This configuration could achieve even better results while maintaining acceptable response times.

## Enhanced energy efficiency reduces TCO per server.

Energy costs are now estimated by some analysts to amount to 55% of total datacenter overhead, including hardware and software. Managing energy costs is therefore a critical facet of IT's strategic role. The IBM eX4 technology included in the IBM System x3850 M2 and x3950 M2 offers unusually high potential for server consolidation, delivering a reduction in the number of physical hosts required—along with their associated energy costs. The memory architecture of these powerful servers has also been specifically engineered to support up to a full terabyte of RAM while also reducing

power requirements, achieving over 27% better performance per watt when compared to competing solutions, according to a 2008 finding of Principled Technologies, Inc. The Intel Xeon processor 7400 series built on the energy efficient Intel® Core™ microarchitecture and Intel's 45nm silicon process technology, delivers up to 54% better performance per watt vs. previous generation processors.

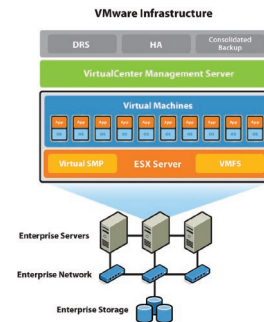
VMware Infrastructure can help contain energy costs by migrating virtual servers dynamically. In situations of lower demand, VMware Dynamic Resource Scheduler can shift virtual servers to alternative hosts to use less power. VMware's Distributed Power Management (experimental) consolidates workloads when fewer resources are needed, places unneeded servers in stand-by mode, and brings servers back online when workload needs increase.

## High reliability improves IT service availability.

As IT deploys more services on fewer physical hosts, each host becomes more critical to the overall strategy—increasing the need for a reliable, available server infrastructure. Availability is also improved with VMware VMotion™, which can move virtual machines out of harms way whenever there is an issue with the server host.

Toward that end, IBM and VMware have delivered groundbreaking enhancements in hardware reliability which collectively work to maximize each host's uptime—and with it, IT services.

IBM's Predictive Failure Analysis (PFA) technology increases server reliability through holistic monitoring, including low power RAM, processors, a voltage regulator module, power supplies, fans, and hard drives: tracking component health, proactively anticipating potential failure, and generating an alert if a problem is



likely to occur. These alerts can lead to a virtual machine being moved automatically to an alternative host.

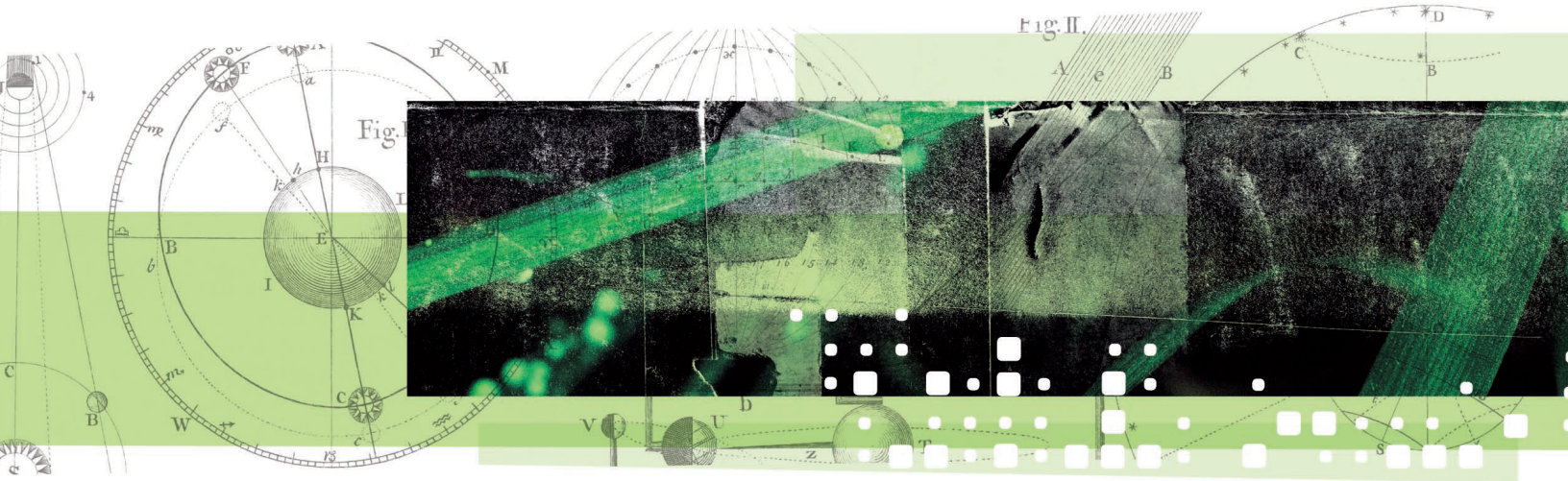
Standard on System x enterprise servers is IBM Memory ProteXion™ technology. With Memory ProteXion, the memory controller can automatically re-route data around a failed DIMM through spare bits to provide an extra level of security.

Fault isolation integrated into VMware ESX Server prevents problems in one virtual machine's OS or application from negatively influencing another on the same host. And VMware Infrastructure's failover flexibility allows IT to migrate services from one physical server to a backup, in the event of a physical problem with the host.

<sup>1</sup> VConsolidate 1.1 running VMware ESX 3.5GA on \*\*Intel Xeon X7460 (16M cache, 2.66 GHz, 1066FSB) 6-Core compared to Intel Xeon X7350 (4M cache, 2.93GHz, 1066FSB) Quad-Core.

Combining the strengths of the Intel® Xeon® processor 7400 series, the IBM eX4 technology, and VMware Infrastructure software, organizations can virtualize x86 servers to maximize business agility in the enterprise data center, making them more efficient, cost-effective, and flexible instruments of business goals and requirements.





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