

## Virtualizing Business-Critical Applications



Most IT organizations are already using virtualization to consolidate their infrastructure, reduce costs and improve service levels through live migration and automated failover of virtual machines. Many have already extended these benefits to their most demanding applications, including enterprise databases and high-volume business, middleware and productivity applications (Figure 1 on the next page). Others are interested in virtualizing their business-critical applications but want to be absolutely certain they can deliver the same or better performance, scalability and availability in a virtualized environment.

In the vast majority of cases, they can. VMware® vSphere™ 4 and the latest Intel® Xeon® processor-based servers deliver up to 275 percent better virtualization performance<sup>1</sup> than previous generations, with lower overhead and improved scalability. With VMware® Enhanced VMotion,™ the combined solution also supports production-quality virtual machine migration for enterprise-class availability and disaster recovery. With these advancements, most enterprise applications, including 95 percent of production databases<sup>2</sup>, can be supported as well or better in a virtualized environment than on dedicated physical servers, and at much lower cost.

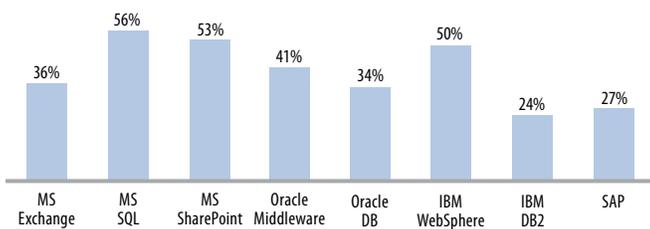
## Near-Native Performance in a Virtual Environment

Business-critical applications typically need to process a high volume of complex business transactions with low latency per transaction. As a result, they tend to place heavy demands on server CPU, memory or I/O resources, so a low-overhead virtualization solution is critical for achieving desired performance levels. Intel® Virtualization Technology<sup>o</sup> (Intel® VT) provides hardware assists for key virtualization processes across the entire server platform, including Intel® processors, chipsets and networking devices. In conjunction with software optimizations in VMware vSphere 4, this enhanced hardware support:

- Reduces round-trip virtualization latencies by up to 40 percent<sup>3</sup>
- Reduces performance overhead to as low as 2 percent (typically 2 percent to 10 percent)<sup>4</sup>
- Enables near-native I/O performance through direct assignment of I/O devices to meet the demanding networking requirements of large databases and transactional applications

These benefits are magnified by the industry-leading performance and energy efficiency of the latest Intel Xeon processor-based servers. Applications tend to run much faster in virtual machines on these new systems than they do on dedicated older servers<sup>5</sup> so integrating virtualization in tandem with a server upgrade will typically deliver significant performance gains. It can also reduce server counts by 5 to 10 times and reduce energy costs even more by replacing power-hungry older servers with more energy-efficient systems.

### Percentage of Customers Running Business-Critical Applications in Production on VMware<sup>a</sup>



<sup>a</sup>Source: VMware customer survey, Sept 2008, sample size 1,038. Data: Within subset of VMware customers running a specific application, percentages that have at least one instance of that application running in production in a VM.

Figure 1. Significant percentages of VMware customers are already running business-critical production applications in a virtual environment.

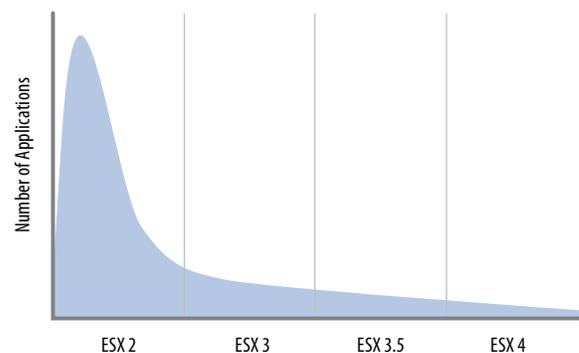
## Scalability for Heavy Workloads

Intel Xeon processor-based servers provide the high-end scalability needed to consolidate demanding, business-critical enterprise workloads. Four-socket servers based on the Intel® Xeon® processor 7500<sup>A</sup> series provide up to 32 cores, 64 execution threads and a full terabyte of memory, and eight-socket and larger systems are in development by leading server vendors. For IT organizations that prefer scale-out server solutions, two-socket Intel® Xeon® processor 5600 series-based servers provide even better per-core performance and energy efficiency and provide up to 12 cores and 24 execution threads per server.

VMware vSphere 4 lets you take full advantage of these powerful hardware platforms. With every new product generation, VMware has delivered significant gains in virtual machine scalability (Figure 2). A single virtual machine can now support up to eight virtual CPUs, 255 GB of memory, 30 GB/s of network bandwidth and more than 300,000 I/O operations per second (Figure 2). With this capacity, more than 95 percent of production databases can now be considered great candidates for virtualization<sup>6</sup>.

VMware vSphere 4 is not only scalable enough to handle enterprise workloads, it is also increasingly necessary to fully utilize today's multi-core server processors. For example, a single instance of Microsoft Exchange\* 2007 does not scale well past eight cores. VMware vSphere 4 enables IT organizations to bypass this constraint by hosting multiple software instances per physical server.

### Application Performance Requirements



	ESX 2	ESX 3	ESX 3.5	ESX 4
<b>Overhead</b>	30%–60%	20%–30%	< 10%–20%	< 2%–10%
<b>CPU</b>	1 vCPU	2 vCPU	4 vCPU	8 vCPU
<b>Memory</b>	< 4 GB	16 GB	64 GB	255 GB
<b>Network</b>	380 Mb/s	800 Mb/s	9 Gb/s	30 Gb/s
<b>IOPS</b>	< 10,000	20,000	100,000	> 300,000

Figure 2. VMware has increased virtual machine scalability with every new product generation, and virtual machines in VMware® ESX® 4 (a component of VMware® vSphere™ 4) now provide sufficient resources to support more than 95 percent of production databases.

As demonstrated by VMware and EMC in a study validating the building-block guidelines for Virtualizing Exchange 2007 mailboxes, this strategy doubles the number of mailboxes that can be hosted on a standard four-socket Intel Xeon processor-based server.<sup>7</sup>

## Guaranteed Service Levels at Lower Cost

### Instant Scaling of Server Resources

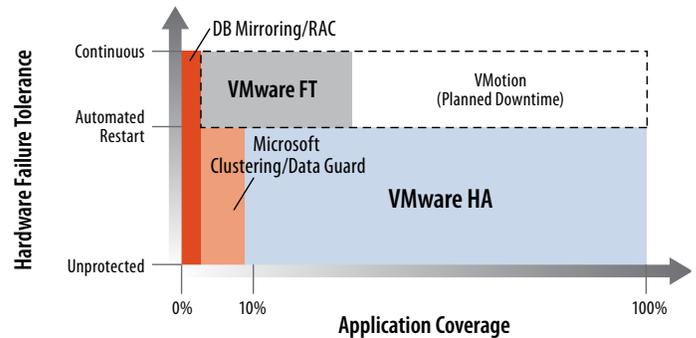
IT organizations tend to massively overprovision their business-critical applications to ensure headroom for growth and unexpected workload spikes. This is an extremely costly strategy. With vSphere on Intel Xeon processor-based servers, processor, memory, I/O and storage resources can be added to a running virtual machine on demand. This helps to ensure consistent performance without overprovisioning.

### Enterprise-Class Workload Balancing, High Availability and Disaster Recovery

The Intel Xeon processor 7500 series delivers more than 20 new reliability, availability and serviceability (RAS) features, enabling levels of data integrity and system resiliency never before seen on industry-standard servers. These new RAS features provide or enable advanced error detection, correction and containment. They also support hard partitioning and the ability to add or replace components in running systems to scale resources and avoid downtime. With these new capabilities, Intel Xeon processor 7500 series-based servers provide the robust hardware foundation businesses need to safely consolidate multiple business-critical workloads per system.

VMware Enhanced VMotion complements these inherently resilient servers by enabling live migration of virtual machines for workload balancing and failover. In tandem with Intel® Virtualization Technology FlexMigration (Intel® VT FlexMigration), it provides a proven enterprise-ready solution that ensures migration compatibility among current and future Intel Xeon processor-based servers. The combined solution has been extensively tested with diverse systems and demanding workloads, both in the lab and in thousands of live customer environments. It provides the foundation for enterprise-class high availability, fault tolerance and disaster recovery (Figure 3).

- **High Availability.** VMware High Availability (HA) eliminates the need for dedicated, standby hardware by automatically restarting virtual machines on servers that have spare capacity. It can be implemented with a mouse click, making it both easy and cost-effective to protect a much wider range of applications.
- **Fault Tolerance.** VMware Fault Tolerance (FT) takes high availability to the next level by providing mirrored operation with



**Figure 3.** VMware® vSphere™ 4 on Intel® Xeon® processor-based servers supports enterprise-class high availability (HA) and fault tolerance (FT) to minimize or even eliminate both planned and unplanned downtime.

instantaneous failover to another physical server. Data and transactions are fully preserved and there is no disruption to IT services.

- **Disaster Recovery.** VMware vCenter Site Recovery Manager (SRM) automates failover for an entire data center without the need for duplicate hardware or elaborate, error-prone manual processes. Unlike traditional DR solutions, the recovery plan can be easily changed and fully tested without disrupting production systems.

VMware Enhanced VMotion and Intel VT FlexMigration not only enable these solutions today, but also protect your investment in years to come, by ensuring full live-migration compatibility when you add future Intel Xeon processor-based servers to your existing HA, FT and DR solutions.

### Reduced Risk and Faster Development

The advantages of VMware vSphere 4 on Intel Xeon processor-based servers extend beyond the hardware infrastructure. VMware Snapshots can be used to capture a complete virtual machine environment, including memory, OS, application and data states. Snapshots can be taken and stored automatically to enable simple rollback to a known good state in the event of problems. Entire production environments can also be cloned for test and development, including complex three-tier application architectures. With this capability, new applications, upgrades, patches and other changes can be fully integrated and tested without putting production systems at risk. Changes can then be pushed to production in minutes, with simple and near-instant rollback if needed.

These capabilities will be even more important as IT organizations continue to move away from large, monolithic business applications toward loosely coupled software components based on service-oriented architecture (SOA) and Web 2.0 technologies. Duplicating

hardware infrastructure for realistic testing can be almost impossible in these distributed environments, while cloning the virtual environment remains a practical and cost-effective strategy.

## Broad ISV Support

The overwhelming majority of independent software vendors (ISVs) provide full technical support for applications running on VMware vSphere and Intel Xeon processor-based servers, including HP, IBM, Microsoft, Oracle, SAP, Fujitsu and many others. For a complete listing of the thousands of supported software applications, visit the VMware Web site at [www.vmware.com/solutions/business-critical-apps/isv-support.html](http://www.vmware.com/solutions/business-critical-apps/isv-support.html).

## Moving Forward with Confidence

Virtualization on Intel Xeon processor-based servers can bring enormous value to your business-critical computing environment through cost savings, improved service levels and enhanced business agility. Virtualizing business-critical applications does not have to disrupt your operations or introduce excessive cost or risk. Introducing virtualization during planned hardware or software upgrades can reduce cost and effort for the upgrade by enabling quick, low-cost provisioning of test environments. With the time saved, you can test and validate new capabilities, such as VMware Enhanced VMotion, VMware HA and VMware FT. Once tested, the new solution can be deployed to production in minutes.

Intel and VMware offer industry-leading solutions today. The two companies are also synchronizing future developments to deliver next-generation capabilities that will help you further streamline and automate your data center, so you can continue to support your business more effectively and at lower cost.

## Additional Resources

- **VMware business-critical application Web site:** Get best practices, reference architectures and case studies focused on specific applications, including Microsoft (Exchange, SQL Server,\* and SharePoint\*), Oracle and SAP. [www.vmware.com/solutions/business-critical-apps](http://www.vmware.com/solutions/business-critical-apps)
- **VMware and Intel Web site:** Access extensive resources for understanding, evaluating and deploying VMware on Intel Xeon processor-based servers. [www.vmware.com/go/intel](http://www.vmware.com/go/intel)
- **VMTN user communities:** Learn directly from others who are deploying and using VMware solutions. [communities.vmware.com/community/vmtn](http://communities.vmware.com/community/vmtn)



<sup>4</sup>Intel processor numbers are not a measure of performance. Processor numbers differentiate features within each processor family, not across different processor families. See [www.intel.com/products/processor\\_number](http://www.intel.com/products/processor_number) for details.

<sup>5</sup>Intel® Virtualization Technology requires a computer system with an enabled Intel® processor, BIOS, virtual machine monitor (VMM) and, for some uses, certain platform software enabled for it. Functionality, performance or other benefits will vary depending on hardware and software configurations and may require a BIOS update. Software applications may not be compatible with all operating systems. Please check with your application vendor and software configurations. Consult with your system vendor for more information.

<sup>1</sup>Based on published VMware VMmark results. For information, visit <http://www.vmware.com/products/vmmark/results.html>.

<sup>2</sup>Source: Survey of 1,038 VMware customers, September 2008.

<sup>3</sup>Source: Intel internal measurements. Intel® Xeon® processor 5500 series (Nehalem) vs. Intel® Xeon® processor 5400 series.

<sup>4</sup>Source: VMware Capacity Planner assessments.

<sup>5</sup>For example, SAP ERP running in VMware vSphere 4 on the Intel Xeon processor 5500 series performed up to 2.03 times better than running in a native environment on the older Intel Xeon processor 5400 series.

<sup>6</sup>Source: VMware Capacity Planner analysis of more than 700,000 servers in customer production environments.

<sup>7</sup>See the VMware and EMC white paper, "Secure and Consolidated 16,000 Exchange Users Solution on a VMware/EMC Environment," May 2008, [http://www.vmware.com/files/pdf/resources/16000\\_exchange\\_on\\_vmware.pdf](http://www.vmware.com/files/pdf/resources/16000_exchange_on_vmware.pdf).

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