



# Benefits of Intel® Xeon® Processors and Windows Server® 2008 R2 for Business-Critical Applications

## EXECUTIVE BRIEF

Business-critical applications are the essential programs on which your organization depends to get work done. These applications directly affect the company's ability to generate revenue and stay in business. They play a key role in making employees more productive and in keeping customers satisfied. For these reasons, your organization must carefully decide which platform to use for running these vital applications.

Operating in today's challenging economic climate and in a competitive business environment, organizations need to extract a greater return on their IT investments while maintaining or increasing the level of reliability, availability, and serviceability. Moving business-critical applications from expensive, proprietary server architectures to cost-effective industry-standard architectures can be an easy way to provide equal or greater performance at a lower total cost.



## The Challenge: Requirements for Business-Critical Applications in the Enterprise

The platform you choose to run business-critical applications must meet a number of criteria:

- It must be reliable to ensure the integrity of your mission-critical data.
- It must be available to support ongoing productivity and to ensure minimum downtime.
- It must be serviceable to minimize disruption of normal operations due to maintenance or repair.
- It must be scalable to allow for expansion as your business grows.
- It must be secure to help protect your valuable electronic assets.
- It must be cost effective in a competitive business environment.

RISC-based servers, typically running UNIX\*-based operating systems, historically have been seen as a good choice to meet these criteria. These RISC-based systems generally consist of a proprietary stack of hardware, software, and management tools and services, all of which are provided by one vendor. Although this may appear to simplify the initial deployment process, it also locks you in to that vendor, which reduces flexibility and limits your software, hardware, and support choices. This reduced flexibility and limited choice can often mean increased capital and operating expenses. Typically, RISC-based systems come at a significant capital and operating cost when compared to the alternative: an industry-standard platform that is built on Intel® Xeon processors and that is running Windows Server® 2008 R2 with Microsoft® SQL Server® 2008 databases.

## The Solution: Maintain or Increase Reliability, Increase Choice, and Reduce Costs by Transitioning from RISC and UNIX to Intel Xeon and Windows®

Business decision makers want to reduce costs and improve service levels, but they must be assured that changes will not

result in reduced reliability. The combination of an Intel Xeon processor and a Windows® operating system is an industry-standard, proven platform for running business-critical applications, and many companies are making the switch. For example, Arçelik, a large appliance manufacturer in Turkey, analyzed different technology stacks, including Sun/Solaris\*/ Oracle\*, IBM/DB2\*, and Intel Xeon/Windows Server 2008/ SQL Server 2008. Arçelik determined that it would get the best performance and the lowest total cost of ownership (TCO) by migrating its 5-terabyte SAP infrastructure to the Intel and Windows platform. Since the migration, Arçelik has realized three-times better performance and a lower TCO, with a broad range of choices for applications and additional hardware.<sup>1</sup>

### Reliability, Availability, and Serviceability of the Intel Xeon and Windows Platform

Servers that are built on Intel Xeon processors and that are running the Windows Server 2008 R2 operating system enable high availability and increased uptime. Intel Xeon 7400 series processors are designed for reliability, with features such as Enhanced Memory ECC, Memory Sparing, Memory Mirroring, and Memory CRC. Intel Xeon 5500 series processors, which are built on the Nehalem microarchitecture, add new memory controller features to improve reliability.

Windows Server 2008 R2 further enhances reliability with new features such as Live Migration, enhanced clustering, and 64-bit functionality. Live Migration is a new feature in Windows Server 2008 R2 that allows you to move Hyper-V™ virtual machines between hosts with no downtime and that increases reliability and availability of the virtualized environment. Windows Server 2008 R2 also simplifies server clustering, making high availability of the server inexpensive. Finally, the Windows Server 2008 R2 operating system is available in a 64-bit edition only. This ensures that all servers will reap the reliability and scalability benefits, which include signed drivers and a larger memory address space, of 64-bit technology.

Mike Binkley, Director of Office Automation Services at the Michigan Department of Information Technology, said that “just one outage of mission-critical services could be a disaster to the state and to the residents we serve. With Microsoft, we are far better protected than ever before and far less likely to see such outages. That’s a benefit of incalculable value.”<sup>2</sup>

## Cost Benefits of the Intel Xeon and Windows Platform

In evaluating a platform solution, you must take into account all the costs that are associated with each platform. RISC-based solutions introduce higher hardware acquisition costs, higher software support costs, higher administrative costs, and higher energy costs. These higher costs ultimately result in a significantly higher TCO and a lower return on investment (ROI).

### Reduce Hardware Acquisition Costs

You can deploy Intel Xeon processor-based servers for a much lower cost than RISC-based servers. For example:

- Intel Xeon 5570 systems can cost up to 92 percent less than IBM Power6\* servers to handle an equivalent workload.<sup>3</sup>
- Intel Xeon 7460 systems can cost up to 89 percent less than IBM Power6 servers to handle an equivalent workload.<sup>4</sup>

Using the Hyper-V virtualization technology in Windows Server 2008 R2 can reduce the number of physical machines that are required to run your mission critical servers.

### Reduce Software Support Costs

You can reduce software licensing and support costs by using the virtualization technologies that are built into the Intel hardware and the Windows Server® operating system. Because UNIX-based software is typically priced per processor core (instead of per socket), the savings multiply with scale. Using a standardized platform also reduces the need for testing before deployment, which can be a significant cost.

### Reduce Administrative Costs

The cost of hiring qualified personnel to administer Intel Xeon processor-based servers that are running Windows Server is lower than the cost of hiring of RISC and UNIX administrators. This matters because the cost of managing and maintaining IT systems accounts for about 60 percent of TCO.<sup>5</sup>



## Continental Airlines case study:

“In a virtualization environment, you often have to make software updates to both individual VMs and hosts. So the ability to easily move VMs from host to host with Live Migration while making updates—with no interruption in service to the user—will be invaluable to us.”<sup>12</sup>

—Charles Chow  
Enterprise Engineer  
Continental Airlines

Multiple salary surveys have documented that those who manage RISC and UNIX systems are paid much higher salaries than their Windows counterparts.<sup>6</sup> This is due in large part to the law of supply and demand; there are many more job candidates who are trained in Intel and Windows administration and, therefore, there is more competition in the market, which drives salaries down. This also means that it is likely to take less time to locate and hire administrative personnel for the Intel Xeon and Windows platform.

### Reduce Energy Costs

Energy costs make up a significant portion of a large company's ongoing expenses for server operations. Reducing energy consumption not only positively impacts the bottom line, it also helps companies meet goals for becoming more "green" in keeping with government standards, corporate policies, and societal mandates.

### Increase Choice

Microsoft and Intel have assembled a broad ecosystem of committed businesses that provide organizations with an extensive array of applications, hardware, and services that can help build and support business-critical solutions.

## The Platform: Meeting Evolving Needs with the Intel Xeon and Windows Platform

In addition to the reliability, availability, and serviceability features discussed earlier, the Intel Xeon and Windows platform offers an attractive alternative to the RISC and UNIX platform in the areas of scalability, power efficiency, and performance and also provides the advantages of virtualization.

### Scalability

The Intel Xeon and Windows platform offers the scalability that is required to confidently run business-critical applications. Intel Xeon 7400 series processors provide four or six cores per processor and up to 16 megabytes of L3 cache. Intel Xeon 5500 series processors provide four cores per processor and up to 8 megabytes of L3 cache.

With the ability to scale to 256 logical processors per operating system instance and with support for up to 2 terabytes of RAM, Windows Server 2008 R2 takes advantage of the Intel Xeon processors' capabilities, forming the ideal choice for ultra dense, large scale applications. The improved Network Load Balancing feature allows you to combine two or more servers in a cluster and distribute the workload for even greater scalability.

### Power Efficiency

The Intel Xeon 7400 series processors can reduce power consumption by up to 10 percent with performance increases approaching 50 percent.<sup>7</sup> Overall, Intel Xeon 7400 series processors provide up to 60 percent better performance per watt than previous-generation processors.<sup>8</sup>

New features in the Intel Xeon 5500 series processors—including Intel® QuickPath Technology, the integrated memory controller, and Intel® Smart Cache—enable a smaller energy footprint and increase the performance-to-power consumption ratio. Windows Server 2008 R2 takes advantage of the new energy-saving features in the Intel Xeon 5500 series processors, such as Intel® Intelligent Power Technology, with a number of technologies in the operating system to minimize power consumption.

Intel and Microsoft worked in close collaboration to ensure that Windows Server 2008 R2 would capitalize on the powerful new features that were introduced by Intel in the Nehalem microarchitecture. One of these new features is Intel® Deep Power Down, which enables greater power efficiency for server workloads. Windows Server 2008 R2 takes advantage of this capability with a number of technologies, such as Intelligent Timer Tick Distribution, timer coalescing, and Core Parking.

Windows Server 2008 R2 supports a balanced power policy that monitors the utilization level of processors on the server and dynamically adjusts processor performance states so that power usage is adjusted based on the needs of the current processing workload. Windows Server 2008 R2 also introduces the ability to park idle processor cores to reduce power consumption.<sup>9</sup>

## Performance

Benchmarks show that the Intel Xeon 7400 series processors were designed to provide best-of-class performance, whether they are running business-critical databases or virtual machines.<sup>10</sup> With up to six cores and 16 megabytes of L3 cache, these processors enjoy performance gains of up to 48 percent over previous generations and up to 40 percent better performance in virtualized environments.<sup>11</sup>

Intel Xeon 5500 series processors automatically optimize performance to fit your business and application requirements, making this the world's most adaptable server platform. Intel® Turbo Boost Technology provides power on demand, Intel QuickPath Technology and the integrated memory controller speed up traffic between processors and I/O controllers, and Intel® Hyper-Threading Technology (Intel® HT Technology) delivers greater throughput and responsiveness for multithreaded applications. Servers based on the Intel Xeon processor 5500 series boost performance while saving on power and cooling requirements, dramatically reducing power idle and delivering as much as 2.25 times more performance with the same power usage as older processors.

Windows Server 2008 R2, with improved multicore processor performance, takes advantage of the Intel Xeon processors' capabilities. The 64-bit-only nature of the operating system means increased performance with the larger RAM capacity, and a number of under-the-hood improvements have been made to Hyper-V, which increase its performance.

## Virtualization

Virtualization is playing an increasingly important role in enterprise-level networks. Server virtualization can reduce the number of physical machines that are required, which decreases costs and simplifies management. Application virtualization can enhance security through isolation of business-critical applications. Four- and eight-socket servers that are based on Intel Xeon 7400 series processors and that have a large memory capacity can meet the demands of running multiple virtual machines.



## Lionbridge Technologies case study:

“By using Hyper-V instead of physical servers, we’ve tripled the number of servers we run without increasing floor space or using more power. As a result, we have probably saved \$30,000 or more per month in additional rack space and electricity.”<sup>13</sup>

—Oyvind Kaldestad  
Vice President of Corporate IT  
Lionbridge Technologies



## Fidelity National Financial case study:

“The key metric I track is the cost of hardware per month per user. With Windows Server, that number is less than \$20 and declining each month.”<sup>14</sup>

—Ronny Chapman  
General Manager, Originations  
Fidelity Loan Origination

One of the most anticipated new features in Windows Server 2008 R2 Hyper-V is Live Migration. Live Migration is the ability to migrate running virtual machines from one server to another without any service disruption. Live Migration enables usage models such as planned hardware maintenance and consolidation for power management or reliability. One of the keys to Live Migration is Intel® VT-x technology, which provides the hypervisor with insight into servers that are available targets for migration.

The new architecture of the Intel Xeon 5500 series processors enables two-socket processors to narrow the performance gap for virtualized servers and applications. Intel® Virtualization Technology (VT) and Windows Server 2008 R2 Hyper-V make this an ideal platform for high availability virtualization deployments. Intel also introduced Extended Page Tables (EPT), which significantly reduce the overhead that is associated with virtualizing, essentially creating virtual memory for the virtual machine.

The vConsolidate benchmark shows a performance improvement of up to 172 percent for an Intel Xeon 5570 processor-based server with Windows Server 2008 R2, when compared to older hardware and software.

## Summary

Intel and Microsoft have worked together for more than two decades to ensure the utmost reliability, availability, and serviceability for business-critical computing. With the latest Intel Xeon processor-based servers running Windows Server 2008 R2 and Microsoft SQL Server 2008, your organization can migrate its business-critical applications from platforms based on RISC and UNIX with confidence and can enjoy significant cost savings without sacrificing performance or scalability.

<sup>1</sup> [http://www.microsoft.com/casestudies/Case\\_Study\\_Detail.aspx?CaseStudyID=4000002932](http://www.microsoft.com/casestudies/Case_Study_Detail.aspx?CaseStudyID=4000002932)

<sup>2</sup> [https://www.microsoft.com/casestudies/Case\\_Study\\_Detail.aspx?casestudyid=4000004879](https://www.microsoft.com/casestudies/Case_Study_Detail.aspx?casestudyid=4000004879)

<sup>3</sup> <http://communities.intel.com/docs/DOC-3252>, pg. 24.

<sup>4</sup> <http://communities.intel.com/docs/DOC-3252>, pg. 25.

<sup>5</sup> IDC, Three Year Server TCO. Based on interviews conducted across numerous platforms.

<sup>6</sup> <http://aplawrence.com/Opinion/joemckearnings.html>

<sup>7</sup> [http://www.techpowerup.com/71465/New\\_Intel\\_High-End\\_Xeon\\_7400\\_Server\\_Processors\\_Raise\\_Performance\\_Bar.html](http://www.techpowerup.com/71465/New_Intel_High-End_Xeon_7400_Server_Processors_Raise_Performance_Bar.html)

<sup>8</sup> [http://cache-www.intel.com/cd/00/00/40/17/401761\\_401761.pdf](http://cache-www.intel.com/cd/00/00/40/17/401761_401761.pdf)

<sup>9</sup> <http://www.microsoft.com/windowsserver2008/en/us/R2-features.aspx#none>

<sup>10</sup> [http://www.intel.com/performance/server/xeon\\_mp/summary.htm?iid=products\\_xeon7000+body\\_benchmarks](http://www.intel.com/performance/server/xeon_mp/summary.htm?iid=products_xeon7000+body_benchmarks)

<sup>11</sup> <http://www.intel.com/Assets/PDF/prodbrief/7400-prodbrief.pdf>

<sup>12</sup> [http://www.microsoft.com/casestudies/Case\\_Study\\_Detail.aspx?casestudyid=4000004993](http://www.microsoft.com/casestudies/Case_Study_Detail.aspx?casestudyid=4000004993)

<sup>13</sup> [http://www.microsoft.com/casestudies/Case\\_Study\\_Detail.aspx?casestudyid=4000004997](http://www.microsoft.com/casestudies/Case_Study_Detail.aspx?casestudyid=4000004997)

<sup>14</sup> [www.microsoft.com/casestudies](http://www.microsoft.com/casestudies)

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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.

Intel® VT-x supports both 32-bit and 64-bit Intel® Xeon® processor-based solutions (Intel® 64 and IA-32).

Intel® VT-x is included in Intel® Xeon® processors.

Intel® Active Management Technology requires the platform to have an Intel® AMT-enabled chipset, network hardware and software. The platform must also be connected to a power source and an active LAN port.


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