How to Enhance Performance and Reduce Energy Costs in the Mid-Market

By Aditya Jamwal
Mark T. Chapman
IBM Systems and Technology Group
Executive Overview

The current global financial downturn, along with exploding levels of information, has forced many organizations to change their operating model. The global recession has midsized companies looking for ways to become more competitive, to survive and grow. More information, increasing customer expectations, and continued globalization and growth in emerging economies are driving new business models and shifting the competitive landscape in the midmarket. The world is not only getting smaller and flatter, it's getting smarter. In almost all cases, this means a business and IT infrastructure that will support and sustain competitive advantage while also delivering significant cost efficiencies.

In business, growth is good. Ensuring that your technology and infrastructure keep up with growth is even better. Finding the right servers to meet your needs both today and tomorrow can be the key to sustaining that growth. More than equipment, servers are the foundation of a dependable IT infrastructure.

IBM has announced a new generation of System x® and BladeCenter® servers and other supporting options, offering an unbeatable combination of performance, value and energy efficiency designed to help you improve service, reduce costs and manage risk. The new systems include:

- System x3650 M2 and System x3550 M2 rack servers
- System x3500 M2 and System x3400 M2 tower servers
- BladeCenter HS22

These new servers feature the Intel® Xeon® Processor 5500 Series, the next generation of intelligent server processors. With these new servers you have the benefit of proven reliability, breakthrough performance and operational advantages of using advanced server technology developed specifically for small and medium businesses.

This paper shows how these new servers, by integrating innovations like IBM Systems Director 6.2, Systems Director Active Energy Manager, and the Integrated Management Module (IMM), offer an outstanding platform for virtualization and consolidation. Moreover, it’s a platform that’s easy to use and manage, allowing you to lower total cost of ownership, reduce development costs, increase performance within the same energy and cooling envelope and with continued investment protection, and dramatically increase workload performance.

Server Refresh: A Smart Choice

Your servers have done the job so far, but you’re seeing the strains of outdated technology, having to manage multiple systems and locations, and the growing footprint of piecemeal server management. Updated servers can also enhance the performance of new applications or operating systems. With IBM servers based on the latest Intel Xeon processors, your business will have the headroom to handle bigger data loads and more people, while delivering the performance that your customers and employees demand. And you can do so with fewer servers, not more.

Updating your servers can offer you:

- Optimal support for the latest applications
- New hardware with warranty support
- The ability to consolidate servers through virtualization, to save space, run quieter, and simplify management
- Reduced total cost of ownership due to lower maintenance costs, more efficient energy usage, fewer software licenses, and less downtime
**Dramatically Reduce Costs**

A longtime leader in the data center market, IBM uses a comprehensive understanding of customers' evolving computing needs to continually produce new, standards-setting offerings across an array of product classes. Among the company’s most recent additions to its leading-edge products are the System x3650 M2 and System x3550 M2 rack servers. Featuring innovative and energy-efficient designs, simplified IT management, and dramatic improvements in performance and function, the x3650 M2 and x3550 M2 set new cost-efficiency standards for the x86 processor-based server market.

IBM asked Technology Business Research (TBR) to assess the strength of the x3650 M2 and x3550 M2 product offerings and to evaluate whether their design points fully reflect market needs. TBR accomplished this task through a detailed survey1 of more than 150 data center customers, consisting of a mix of Dell, HP, and IBM users. The report’s conclusion: “IBM has met customers’ needs. In fact, 91% of our respondents indicated that no important functions were missing from the feature lists for IBM’s System x3650 M2 and x3550 M2. IBM well understands how to serve customers, offering them the benefits of improved energy efficiency and better performance per watt computing, virtualization, reliability and manageability. The System x3650 M2 and the System x3550 M2 represent the best choices when it comes to selecting Xeon 5500 processor based 2U and 1U general purpose servers for enterprise deployment.”

In addition, an IBM engineering research survey conclusively showed that IBM’s new rack servers can reduce annual energy costs by up to $100 per year per server over even the previous-generation x3550 and x3650 models2 through innovative, energy-smart designs and simplified management. Integrating two Intel Xeon processor 5500 Series processors with Intel QuickPath Technology and Intel Turbo Boost Technology, the IBM servers deliver dramatic performance improvements over previous generations, while also offering low acquisition cost. Dramatic performance gains and new virtualization solutions can offset the initial outlay in fewer than seven months3.

Designed to be growth engines for expanding businesses, the x3500 M2 and x3400 M2 tower servers are dual-socket servers equipped with Intel Xeon 5500 Series processors. These are designed to offer high reliability as well as extraordinary performance and outstanding power efficiency to help reduce costs. Figure 1 shows the dramatic server consolidation made possible by replacing 4-year-old rack and tower servers with the new System x servers. (The x3400 M2, x3500 M2, and x3550 M2 servers offer the same kind of consolidation potential as the x3650 M2.)

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3 Intel Research Study, 2009
In addition to the energy savings enabled by the more efficient processors, the new IBM servers also use DDR3 memory, which is 15% more energy-efficient than the older DDR2 memory (and even more so than fully-buffered memory). With servers now containing as much as 128GB of RAM, this energy savings is significant. In addition, the servers incorporate more efficient power supplies (92% efficiency), transistors and voltage regulator modules (88%) that help reduce energy costs, along with 2.5-inch drives that use up to 80% less energy than 3.5-inch drives, and solid-state drives that consume only 2W of power. Finally, IBM Systems Director Active Energy Manager provides you with the tools necessary to monitor actual energy usage (not simply the theoretical maximum power draw), track trends, and even cap energy usage at a predetermined point.

From a management standpoint, to use features beyond that of the standard Baseboard Management Controller (BMC) in the older servers (such as remote management and IPMI 1.5), you had to spend several hundred dollars to purchase an IBM Remote Supervisor Adapter II. Now, all of that functionality (along with the BMC and IPMI 2.0) is incorporated inside the new IBM Integrated Management Controller, standard with each of the new servers.

**Dramatically Increase Workload Performance**

Get great performance, energy and cost-efficiency, and plenty of room to grow and virtualize in the future with next generation of IBM x86 servers based on Intel Xeon processor 5500 series. These servers offer you maximum performance for heavy workloads, while reducing energy consumption when workloads are light. It all adds up to intelligent performance that keeps energy costs low.

Application performance is critical for day-to-day business operations, as well as for creating new products and services, increasing competitiveness, and reaching new customers. For the past decade, IT has rapidly added low-cost hardware to accommodate business growth, and many data centers are now stretched to capacity in terms of power, cooling, and floor space. By refreshing your data center infrastructure with higher performance, more adaptive, power-conscious servers, you can deliver additional capability and scalability within the same energy and space footprint, staying ahead of ever-increasing business demands.

The Intel Xeon processor 5500 Series brings together a number of innovative technologies to deliver intelligent performance. New features include:

- **Intel Turbo Boost Technology** — Turbo Boost dynamically turns off unused processor cores and increases the clock speed of the cores in use, by up to two model frequencies. For example, with three cores active, a 2.26GHz processor can run the cores at 2.4GHz. With only one or two cores active, the same processor can run those cores at 2.53GHz. Similarly, a 2.93GHz processor can run at 3.06GHz or even 3.33GHz. When the cores are needed again, they are dynamically turned back on and the processor frequency is adjusted accordingly.

- **Intel Hyper-Threading Technology** (Intel HT) — lets today’s well-threaded applications make the most of every clock cycle. With Intel HT Technology, multi-threaded software applications can execute threads in parallel within each processor core.

- **Intel QuickPath Technology** — Along with an integrated memory controller, Intel QuickPath Technology helps speed traffic between processors and I/O controllers for bandwidth-intensive applications. With the Intel Xeon 5500 Series processors, Intel has diverged from its traditional Symmetric Multiprocessing (SMP) architecture to a Non-Uniform Memory Access (NUMA) architecture. The Intel Xeon 5500 processors are connected through a serial coherency link called Intel QuickPath Interconnect (QPI). QPI is capable of 6.4, 5.6 or 4.8 GT/s (gigatransfers per second), depending on the processor model. This allows the new servers to deliver as much as 25.6GB/s, up to 3.5x the bandwidth of previous-generation servers.
Figure 2 shows how you can use the new performance capability to significantly increase workload levels with the same data center footprint and design, while reducing energy costs.

### Figure 2. Performance improvement enabled by the new IBM servers

- **2005 x346 Server**
  - 1-Core processor
  - 382W per server
  - 51K business operations per second (BOPS)
- **2009 x3650 M2 Server**
  - 4-Core processor
  - 315W per server
  - 447K BOPS

**8.8x more performance**

- **18% lower annual energy costs**
- Same data center footprint and design

**Intel Xeon 5500 Series Performance Benchmark Results, 4Q08**

Dramatically Increase Performance with Continued Investment Protection

Rack and tower servers are not the only area to benefit from new-generation technology. The BladeCenter HS22 blade server also offers great performance, balanced with flexible configuration options and simple management. All together, this creates an efficient server designed to run a broad range of workloads exceptionally well.

You can also mix-and-match the HS22 with other BladeCenter blades⁴ and various operating systems⁵ in existing BladeCenter S or BladeCenter E chassis for unmatched investment protection, incredible flexibility and deployment choice. And with new innovations, such as Unified Extensible Firmware Interface (UEFI), the IBM Integrated Management Module (IMM), and IBM Systems Director 6.2, you can further simplify systems management and future-proof your infrastructure. Compared to earlier-generation Intel Xeon processor-based servers, IBM BladeCenter HS22 blade servers can help improve the economics of your data center with:

- Up to 11X faster performance than 2005-era servers
- Up to 91% reduction in energy costs from server consolidation (11:1 ratio)
- Up to 91% IT footprint reduction from server consolidation

In addition, BladeCenter consolidation and integration offers significant benefits over rack servers:

- Up to 65% lower connectivity costs
- Up to 84% fewer cables

Figure 3 shows how you can use the new performance capability to expand your existing IT infrastructure, by reusing your existing chassis.

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⁴ Compatible blades include HC10, HS12, HS20, HS21, HS21 XM, HS40, LS21, LS22, LS41, LS42, JS12, JS21, JS22, QS21, and QS22.

⁵ Operating systems supported include Microsoft® Windows®, Linux®, Novell NetWare, IBM AIX® and Sun Solaris. (Supported OSes are blade server-specific.)
Dramatically Increase Performance within the Same Energy Envelope

Mid-sized companies can now enjoy the dramatic increase in performance with new HS22 blades without increasing their data center space or energy footprint. Figure 4 illustrates how you can expand your IT infrastructure without bearing the burden of an increase in power cost. (This example uses new low-voltage 60W HS22 blades with a 2005-era BladeCenter E chassis upgraded to a 2000W power supply.)

Mid-sized companies are energy-constrained. This reduces the power envelope while maintaining performance.
Summary

IBM, your trusted partner in growth, enables your business growth by offering the right technology to meet your needs today and tomorrow. With IBM servers based on the latest Intel Xeon processors, your business will have the headroom to handle bigger workload, more people, and deliver dramatic performance that your customers and employees demand, with fewer servers and without impacting too much on your wallet.

For more information call the concierge Monday through Friday at 1-877-IBM-ACCESS for smart help in selecting or enhancing your current infrastructure. After normal business hours or on weekends, you can leave a message and you'll be contacted the next business day.

Or, visit our IBM Express Advantage home page for more information:

Sources

- ibm.com™
- IBM Mid Market Top Innovator’s Report
- IBM white paper: Optimizing the Performance of IBM System x and BladeCenter Servers using Intel Xeon 5500 Series Processors
- Intel white paper: Intel Xeon Processor 5500 Series — An Intelligent Approach to IT Challenges
- Intel white paper: Solutions for Small and Medium Business Powered by Intel Xeon processor based servers
- Intel white paper: Performance that Adapts to Your Business Environment
- TBR: IBM’s leadership in x86 rack servers: System x3650 M2 and System x3550 M2

IBM System x & BladeCenter with Intel Xeon 5500
IBM Systems Consolidation Tool for Intel
IBM BladeCenter Server and options
IBM System x and BladeCenter Power Configurator
IBM Standalone Solutions Configuration Tool (SSCT)
IBM Electronic Service Agent
IBM ServerProven Program
IBM Technical Support
IBM Configuration and Options Guide
Intel Xeon Processors

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For More Information

IBM System x Servers
IBM System x & BladeCenter with Intel Xeon 5500
IBM Systems Consolidation Tool for Intel
IBM BladeCenter Server and options
IBM System x and BladeCenter Power Configurator
IBM Standalone Solutions Configuration Tool (SSCT)
IBM Electronic Service Agent
IBM ServerProven Program
IBM Technical Support
IBM Configuration and Options Guide
Intel Xeon Processors

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Dept. U2SA
3039 Cornwallis Road
Research Triangle Park, NC 27709

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Some machines are designed with a power management capability to provide customers with the maximum uptime possible for their systems. In extended thermal conditions, rather than shutdown completely, or fail, these machines automatically reduce the processor frequency to maintain acceptable thermal levels.

MB, GB and TB = 1,000,000, 1,000,000,000 and 1,000,000,000,000 bytes, respectively, when referring to storage capacity. Accessible capacity is less; up to 3GB is used in service partition. Actual storage capacity will vary based upon many factors and may be less than stated.

Performance is in Internal Throughput Rate (ITR) ratio based on measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput that any user will experience will depend on considerations such as the amount of multiprogramming in the user’s job stream, the I/O configuration, the storage configuration and the workload processed. Therefore, no assurance can be given that an individual user will achieve throughput improvements equivalent to the performance ratios stated here.

Maximum internal hard disk and memory capacities may require the replacement of any standard hard drives and/or memory and the population of all hard disk bays and memory slots with the largest currently supported drives available. When referring to variable speed CD-ROMs, CD-Rs, CD-RWs and DVDs, actual playback speed will vary and is often less than the maximum possible.