



Edison Group, Inc

The Scalable x64 Server Advantage

Business Strategy Report

For

IBM

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Introduction

When searching for a server that will yield the most performance, it is difficult to determine how best to meet your needs with a unit that will literally stand the test of time. It doesn't help that each vendor will tell you a different story. So, it's up to you to determine the true facts of the case—which is where this Business Strategy Report can be of use.

Performance statistics, benchmark results, and speed are all variable numbers. Tests, by themselves, will not tell you what you really need to know. The intent of this document is to enable you align technical capabilities with your business requirements. The true test of performance lies most heavily in the types of applications you run, the number of users you have, and how efficiently those servers react to heavy processor loads.

Business requirements change, thereby redefining your computing needs. Symmetric Multiprocessing machines may seem expensive, but getting something you know can grow with your needs is more essential than the initial costs of acquisition. Nobody wants to spend resources on a unit that cannot be upgraded to yield more power when it's really needed. The ability to stay current defines not just how you do business today, but how it extends into your ability to do business tomorrow in the most cost effective manner possible.

Who Should Read this Document?

Anyone looking for “plain talk” or situational examples involving servers will benefit from reading this document. Because it is most difficult to get a direct answer from any one vendor about what you *really* need, this report is meant to give you the perspective you need to determine how an 8-processor varies from a 4-processor—and what benefits it will provide you in the long run.

Maximizing Customer Benefits

Performance is the catchword of mission-critical business applications, but it is often limited by how well your platform can scale to meet your computing needs. Scalability is a function of both software *and* hardware. Developers code the ability to scale into their business applications (called thread-level parallelism), but it's the hardware that has the power to take advantage of that code. IBM's xSeries 460 offers an expandable 64-bit x86 (x64) processing platform that can “scale” to maximize the performance enhancements of the software. Other Intel Xeon MP servers from HP and Dell will never

run the software as efficiently because they cannot scale from 4-processor to 8-processor and beyond¹.

Key advantages to using an 8-processor server:

- The system makes greater use of the capabilities of multi-threaded applications such as database management systems like SQL Server, Oracle or DB2.
- The system can grow with your business by allowing you to add new users onto your networked workgroups.
- A higher system replacement ratio with virtualization/server consolidation makes it much easier to manage network costs.
- Investments can be protected despite evolving business demands by increasing server performance and processing power.

Insight and Overview

There are two major ways in which an 8-processor server can yield benefits:

- 1) Scalability
- 2) Consolidation

Scalability allows you to meet increasing demands for your computing resources. As workloads increase, your system must scale to meet the demand (or you must add more systems and load balance across them).

Consolidating your resources makes it easier to deploy multiple servers quickly and cost-effectively. An 8-processor server can better manage both your human and physical resources through the consolidation of multiple underutilized 2-processor resources into a single larger server including “virtual” machines.

Why “Scale Up” with IBM Instead of “Scaling Out” With the Competition?

Performance is closely tied to the ability to manage computing power by the most effective means possible. But, power can be built in one of two ways; you can either “scale up” or “scale out.”

When you scale up, you add more processors to your server. You effectively increase the “horsepower” of your server so that it can handle a greater amount of tasks or processor load. This is like dropping a more powerful V8 into a truck—it yields great capacity for

¹ The IBM xSeries 460 scales from 4 to 32 processors. For more information: <http://www-03.ibm.com/servers/eserver/xseries/x460.html>.

large jobs. Scaling up gives you power to do more, support more tasks, and yield a more resilient platform for your computing tasks. Everything works as expected since there is still only one copy of the operating system and application software instance; however, scalability is rarely linear due to the sharing of non-CPU resources.

When you scale out, you add additional server systems to form clusters. These clusters of computers provide enhanced performance and fault tolerance depending upon the operating systems chosen and the programs being run. In keeping with the automotive metaphor, it's like having a fleet of trucks hauling your load. They still have small bore engines, but they each can carry a load. Getting them all to the same destination becomes the challenge, and any serialization—like a stop sign—can introduce serious delays.

One 8-processor server is at least four times easier to manage than four 2-processor servers. Complex processor-intensive business applications such as online transaction processing (OLTP), messaging, enterprise resource planning (ERP), and data warehousing require maximum throughput and large available memory capacities to complete their tasks efficiently. Instead of dealing with multiple operating systems on multiple servers, it is far easier and less expensive to deal with one large system having multiple software images. With a scalable workload, savings of several hundred man-hours (at a national average cost of \$65/hour) would really make a difference.

The costs associated with installation can escalate rapidly with respect to the number of servers you have. Installing one server is less expensive than installing two or more to handle the same workloads.

Implementation costs are factored by the amount of work required for each server.

Each server requires four to six reboots whenever you update the operating system, update the drivers, and burn-in the unit with an extensive test cycle of at least two to three days.

Updating an operating system costs time and money. It takes a network engineer 20 minutes to install a typical Microsoft Update, 10 minutes to completely reboot the server,

By the time an update is selected, installed, and running there is a cost of approximately 30 minutes on average for a 2 Processor system. If the average rate of a network engineer is about \$50/hour, it would cost \$25 for each update. If we multiple that update by a factor of four—you pay of \$100 each update appears!

In comparison, one 8 Processor system requires a fraction of one quarter this amount of effort—thereby reducing your costs to \$25 per occurrence on an 8 Processor system.

When comparing a 4-processor and 8-processor server, setting your operating system configuration options enables you to focus your processing power squarely on those applications that perform mission-critical business functions. Joseph Basanta of Systems Solutions (a full service consulting firm and systems integrator specializing in all areas of Information Technology indicated that, “an 8-processor configuration will exhibit

peak performance improvements of about 50 percent for processor intensive applications such as SQL Server.” In many cases, an 8-processor system runs multiple applications far more efficiently than simply scaling up just one application due to the fact that the application doesn’t scale at all. The key is allowing only those applications that run well together on one copy of an operating system without fear of any conflicts (which is why VMware ESX is so popular). The best general rule of thumb is to have one major application per server so that everything runs smoothly.

Benchmark tests do not reflect the behavior of every application, most especially for those that lack standard benchmark results (i.e., Citrix.) Some applications scale better in an 8-processor configuration.

NOTE: It is important not to let Windows handle your processor management. If you do, you will NOT achieve the performance you need. You will achieve far better performance if you set affinities for your applications. For example, you can assign four processors to run SQL Server, two processors to run Internet Information Server (IIS), and two processors to run your Windows Server environment. Remember that processor affinities can be set through the Registry or by using third-party software tools.

Even if a study asserts only about a 34 percent performance increase from a 4-processor to an 8-processor, consider that every drop of performance you can wring out of a system is essential to doing business. Running a database application that cannot be partitioned or spread across multiple systems or federated, for example, bumps up against the ultimate performance limit in a 4-processor system. In such cases, a 34 percent performance increase may look good at any price, otherwise you suffer the consequences of completing a forklift upgrade (or worse, a platform migration introducing a new hardware architecture into the data center) which may cost you hundreds of thousands of dollars over only a few days time (please see Appendix A describe features and costs per competitive model.).

Scalability is *critical to the architecture* of an effective computing environment. Scalability within a server comes from using multiple microprocessors. Servers utilizing Symmetrical Multi-Processing (SMP) offer less latency and more predictable response times for computing-intensive applications such as SQL Server. A Microsoft study of scalability indicated they have achieved good results with 8-processor systems based on [TPC-C](#)² test results showing a 65 percent performance improvement for 8-processor vs. 4-processor systems. A better source for such comparisons is www.tpc.org where there are numerous benchmark results comparing 4-processor to 8-processor to 16-processor configurations.

² Transaction Processing Performance Council’s (TPC’s) TPC-C Benchmarks (<http://www.tpc.org/tpcc>)

If you run applications that are *not* CPU-intensive, your scalability works differently with each application. Applications that depend heavily on disk or network activity are limited by sever platform limitations. Memory is a determining factor in performance. An operating system can easily consume one half to one gigabyte of memory. Without sufficient resources, there is a significant latency caused by the operating system using the storage device as part of its virtual memory. Slow storage devices compound this problem when there are significant I/O

Large-scale application development benefits greatly when developers integrate the ability to scale to the computing platform on which it is installed. This means that an application that can support multiple processors will scale to using all available computing resources in the most effective manner possible to provide the best performance possible within its computing environment.

An 8-processor offers the best advantage because it can allocate computing resources across several CPUs. The application then has the ability to devote a sufficient amount of resources to function without any latency.

read/writes to the disk. Larger SMP servers support larger memory configurations. A typical 2-processor server will have six DIMM slots capable of supporting 1GB, 2GB or 4GB DIMMs or a maximum of 24GBs. IBM's x460 server has 16 DIMM slots per four-processor node or 64GBs even when only two processors are installed.

Scalability and consolidation are what makes an 8-processor server the best choice for mission-critical business applications. An 8-processor server is an investment in the future of your business. As time goes by, your business grows—why not have a server that grows with you? The nice part about the IBM xSeries 460 is that you pay as you grow—so your base unit can be a 4-processor system to keep your initial costs down. But, unlike the competition, it can grow all the way up to a 32-processor server to accommodate database applications and virtualized server environments.

Consolidation

Consolidating several servers on a single system can effectively merge multiple servers into one, provided that processor affinities can be established for the types of applications you are running. There are two ways that server consolidation can be accomplished:

- 1) Multiple application instances on a single operating system
- 2) Multiple operating system instances (individually hosting its own applications) each in its own dedicated virtual server

Consolidation of different types of servers varies depending on their specific functions. In the chart below, you can determine how well you can consolidate file/print, web, application, and database servers.

<u>Category</u>	<u>Old Servers</u>	<u>New Virtual Servers</u>	<u>New Physical Servers</u>
File /Print Servers	16	8	1
Web Servers	24	24	1
Application Servers	8	8	1
DB Servers	2	0	2
Total	50	40	5

The greater expansion capabilities of IBM scalable servers make the benefits of server consolidation even more apparent. A very basic example: setting up hardware is a very time-consuming task. In many organizations the costs for setting up a server are directly billed against the IT budget. Setting up one server to act as many can bring down this line item cost immediately. Once the hardware is installed, virtualization of server images reduces the setup time for each OS instance from a few hours on a physical server to only a few minutes on an image.

Significant benefits are made possible by consolidating a number of server images on an 8-processor server using virtualization software. Microsoft Virtual Server 2005 gives you the ability to expand as needed. You can partition two of your eight CPUs for one virtual machine to run processor-intensive tasks such as the operating system and Internet applications. Partitioning the remaining processors for heavy-duty processing such as required by SQL Server actually yields excellent performance that scales up with your computer needs. In contrast, VMware virtualizes all the processors—where its largest partition is limited to a 2-way server environment until VMware ESX 3.0 ships in 1Q06.

TCO Savings

The whole point to server consolidation is to contain server sprawl by consolidating servers into virtual machines hosted on fewer but more powerful servers.

What consolidation really offers is cost savings. On the surface, you save a great deal on electrical power consumption and network costs. More importantly, it reduces complexity – which is associated with “people costs.” Less hardware to manage means there is much less that can go wrong. Server reliability is often stated in terms of Mean Time Between Failure or MTBF. It’s an average measure, meaning that one part will fail over some period of time. The more parts you have, the more chance you’ll see a failure within the population. And when something goes wrong, human resource costs go through the roof from staff spending all their time repairing systems that should never be offline.

It is possible to consolidate several small ERP and financial applications into a single, enterprise wide system with the goal of achieving better customer service, improving manageability, and TCO while providing high availability and scalability for future growth.

A typical organization can reduce their server count from 158 servers to 12 with an xSeries x460 by consolidating. 11 Exchange servers into 2 – 8 Processor x460s.. You can take 110 application servers and consolidate them to 4 – 8 Processor x460 servers with VMware. In addition, you can consolidate 37 development and test servers into 6 – 4 Processor x460 servers with VMware.

Instead of using several boxes, you can use just one server. The xSeries 460 shows redundancy with both network ports active. “You can have two xSeries 460 servers running as many as 90

What these numbers demonstrate is that it is very possible for a smaller organization to replace its datacenter consisting of 16 file/print, 24 web, 8 application, or 2 SQL database servers into a single industry standard 42U rack consisting of 8-processor

applications depending on the how heavy the CPU is loaded when running them”, says Joseph Basanta. If your critical application cannot afford to go offline, you could establish failover and split the applications equally between two systems. At an average cost of \$110 per port, the cost per gigabit is very high. Cost factors for each hardware device are further multiplied with the price you pay for electricity to power these extra devices. Remember, it isn’t just the initial cost of the system – it’s the extra components that consume dollars and electrical power too. When comparing several 1-2 way servers to an 8-processor server – consider that more machines require more hardware components because they cannot be so densely packaged. Costs soar when more Ethernet cables, network cards, electrical power, and cooling systems are added to maintain several machines instead of just one.

For smaller applications, it makes sense to consolidate programs onto an 8-processor server as opposed to dedicating an entire server to running just one application. In contrast, it is highly advantageous to have a very processing-intensive application such as SQL server to scale to use as much processing power as needed in order to function properly and literally “handle the load.”

Virtualization does much more than simplify management for IT engineers; it makes it easier to manage network costs far more effectively through the reduction of man hours required to maintain the same number of server platforms. This is further demonstrated by making it easier to restore backup server images

When computing cost savings for the x460, the following percentages determine cost saving factors including rack and floor space:

- 25% less rack space 3U 4-way vs. competitors' 4U/5U 4-way rack servers
- 40% more processors per rack and uses 36.3% less floor space.
- 25% smaller form factor allows for more

by re-deploying them at a moment's notice. Images can be reset quickly from backup media—this means you can be back up online in as little time as possible. In a VMware migration, you can simply copy one file over to another host. The benefit of an 8 Processor system is that you can insert the new image without disturbing the other applications and operating systems running on the other processors.

Consolidating many machines into one can more effectively manage both your processor and electrical power performance because; you have one centrally managed machine that serves your business demands in the most cost-effective way possible.

Competitors such as HP, Dell, and Sun lack an offering in this space: they claim that more power with fewer processors is better. The truth is that a 2-processor server can be likened to a small car pulling a trailer up a hill. On a flat, level surface the little car can pull the trailer just fine. But, when the road turns rocky and has a steep incline, that little car can no longer pull the weight of the trailer without straining its engine. A 2 Processor machine won't struggle for database tasks, it will queue the requests until resources become available. This might mean a query completes in minutes vs. seconds—resulting in a loss of business. In contrast, an 8-processor server can be likened to a V8 engine-powered car with the power to handle any conditions at any time. Speed is fine, but strength is better. IT users will get the results they need within an acceptable period of time and won't leave uncompleted transactions in a queue or on the floor.

The xSeries 460 is a most effective 4-processor server, but it's price/performance is unequalled as it grows into an 8-processor or larger configuration that provides you with the strength you need for the long haul.

Virtualization Strategies

In order to really capitalize on the power of an 8-processor server for non-scalable software workloads, virtualization plays a key role. For this paper, we choose to reference the most popular vendor: VMware. However, it is important to note that other vendors — including Microsoft and Virtuozzo — also compete in this market space,

with offerings that produce the same basic result. Virtualization software provides cost savings and increased flexibility, and fosters scalability that allows you to build virtual systems according to your exact needs. Once you put 50 server images onto a single box, you start to see how a virtual infrastructure can replace numerous hardware servers.

Virtual machines clone the “master” copy of an operating system to create the rest of the virtual machines. You can partition the machines to run on any installed NICs so that you can load balance the virtual machines to maximize your 8-processor server performance. One of the advantages of an xSeries 460 is that you can add network cards to provide as many ports as you need for your virtual machines. With dual port cards, an IBM 8-processor server could have 16 ports, provided you have a large enough memory footprint to support that many virtual machines.

IT managers will find it most advantageous to learn that a virtual infrastructure greatly speeds up provisioning new services to businesses by eliminating the time-consuming task of configuring a new server every time a new service is needed.

High utilization applications that peak in performance are seamlessly moved between virtual machines using tools such as VMware *VMotion* to maintain performance. VMware can package 30 more servers into an 8-processor server than into a 4-processor system. This means you can run additional network applications that provide functionality without over-utilizing server resources. Calculate the amount of space you would save on racks when consolidating virtual servers into an x460. Higher density servers allow you to squeeze an entire series of machines into 3U! Saving rack space allows you to pack your data center more densely. It costs an average of \$120/year per square foot of office space. Imagine how much space is consumed by 90 servers versus one. Many of your virtual machines are running smaller applications; as a result, they do not require the sort of extensive processing power required by, say, a SAP or Oracle application.

IBM's “pay as you grow” approach explains how the 460 has lower price points than a 4-processor system, but can grow to as high as a 32-Processor. It has an entry price for a 2-processor at \$18,000, a 4-processor at \$25,000–\$30,000, and about \$75,000 for an 8-processor. These price points are far less expensive than any other enterprise database server.

Virtualization Benefits

Virtualization is of great benefit to those wishing to make their computing life easier. Virtualization drives down costs so you needn't invest in so many hardware platforms. You can consolidate all those servers into a scalable x64 platform. The goal is to keep your systems manageable and therefore gain significant benefits in the most cost-effective manner possible.

When using numerous hardware instruction set architectures, you must consider all the issues involved. For example, multiple hardware servers consume extensive electrical power. Electricity is very costly and using it for computational results generates a lot of heat. Keeping those machines running constantly requires a considerable investment of money, time, and resources into an effective cooling system. The cost of electricity is on average \$0.09 per KWH, but is even higher in the Western United States where power is sold at a premium. It costs far less to cool four HP DL-Class 2 Processor servers than it would to cool just ONE x460 server—resulting in a savings of power consumption and cost each day.

Consider what happens during a power outage, too. You may have a UPS and generator, but when the power goes out — how long does it take for the air circulation system to come back online while your servers are humming away? Those fifteen boxes in the top racks (that are already warm) are really heating up. By the time air flow resumes, they may be well on their way to burnout and may simply shut down! One more good reason to consolidate into an 8-processor machine is because 8-processor servers are generally installed on lower racks and get more cooling versus stacking servers far away from the air flow.

All these costs directly relate to the IT costs involved in managing multiple servers. “People Costs” decrease significantly when you have far less machines to manage. More does not always mean better, because power is expressed in strength rather than numbers. The following indicators explain how you can achieve a reduction in costs while also improving resource utilization.

- Reduced costs:
 - Electrical
 - Cooling
 - Hardware Cables, Switches, and Plugs
 - Systems Upgrade & Maintenance
- Improved resource utilization:
 - Easier to virtually manage and monitor one platform than multiple platforms
 - IT staff can move server images and upgrade O/S components more quickly
- Reduced expenditures in hardware:
 - Overall costs are greatly reduced because you need only buy what you need, when you need it

- Increased control and manageability because one person can effectively manage an 8-processor server more easily than managing eight or more individual servers
- Standard systems management
- Increased platform reliability and responsiveness to achieving at least 99.9% up-time for mission-critical business applications

The goal is to quickly gain the ability to deploy applications and balance workloads between existing computing resources. You want to take advantage of your virtual infrastructure environment so that you can rely on fewer physical systems.

Managing several virtual machines on one x460 can be very highly beneficial as it provides you with the means to manage several computers on one, yielding significant savings associated with managing multiple virtual servers as opposed to several physically dispersed hardware servers. No longer is there a need to have massive racks of servers requiring extra air circulation or consuming extra electricity. Even more importantly, you don't need to restart each server several times to get the operating system ready to have your applications installed. You can curtail these costs and management problems by virtualizing a limited number of servers into images on your scalable system. The number of servers depends on how many and what types of applications you can run most effectively for each virtualized server per workload. If you need to install an extra server, simply duplicate the image and you are instantly ready to have another server. When you virtualize your hardware into a couple of 8-processor servers, you clear out several rows of racks from the data center. That space then becomes available for new systems as your needs grow.

Comparing 8-processor vs. 4-processor Servers

High performance servers like the 8-processor IBM xSeries 460 scale up very well. For example, 8-processor systems based on [TPC-C](#)³ test results showing a 65 percent performance improvement for 8-processor vs. 4-processor systems. Scalability is therefore a key factor determining how much growth and change your systems are expected to handle. The critical issues for scalability involve peaks in usage as well as long-term growth. An 8-processor solution must scale well enough to provide for intermediate usage increases.

³ Transaction Processing Performance Council's (TPC's) TPC-C Benchmarks (<http://www.tpc.org/tpcc>)

The advantages of this architecture are realized when you have more processors; you can then dedicate those computing resources to specific bottlenecks in your applications.

In order to take advantage of your extra processors, you must know how to optimally tune your applications. Dedication of server resources will increase overall application performance. If you have several hundred users who will utilize database or enterprise applications, then an 4-processor configuration may work, but if you plan on several thousand users— then a scalable x460 makes better sense.

Hewlett Packard is one company that may tell you that faster processors in a 4-processor design reduces the performance gap between a 4-processor and an 8-processor server. The truth is that faster does not mean better. The power of 8 processors can fix bottlenecks in your applications. Extensive disk writes, database queries, and server tasks collectively diminish overall user performance. Increased computing availability removes those bottlenecks so that users can work effectively on a responsive platform.

In order to really see where an 8-processor server outperforms, you have to first see how to compare a 4-processor to an 8-processor server running Windows Server with SQL Server Enterprise Edition. The result: a 65 percent improvement in the 8-processor over the 4-processor server. However, some vendors will note that it is possible to upgrade the 4-processor server with more memory. TPC-C test results indicate there is nearly a 60 percent increase in an 8-processor versus a 4-processor server. Running SQL Server, an 8-processor score 238,000 tpm-C, whereas a 4-processor runs 141.00 tpm-C.

The discrepancy between these values underscores how any given benchmark can vary drastically with respect to memory configuration changes. It is important never to take any value as gospel without further investigating the conditions under which the benchmarks are run. One tip is to make certain that memory is configured equally on each server. Only then can you determine the scalability associated with an 8-processor server.

Dell says you can make two 4-processor servers or four 2-processor servers do everything than an 8-processor server does in its Scalable Enterprise Architecture white paper.

NOTE: Performance improvements vary depending on the applications you run. Marginal performance gains of 34 percent between a 4-processor and 8-processor server are misleading, because that number fails to account for "real-world" factors.

But, in reality it is definitely *not that simple*. Scalability is a critical factor. An 8-processor server often has the ability to expand and scale up to meet the needs of the number of users and computing resources required for memory-intensive applications, and the processor power required. An 8-processor has more available expansion slots to accommodate more network connections, storage adapters, and memory. An 8-

processor can be more highly utilized than a 4-processor machine—and yield greater processing results.

Scalable Server Cost Justifications

Several factors contribute to actual cost savings when an x460 server is implemented. For example, consider the time needed to upgrade and change from a server limited to 4-processor to an 8-processor or larger system. Swapping out the hardware alone takes as much as three days. With 3U rack space, it is very modular going from a 4-processor to an 8-processor with the IBM platform. The point is to avoid as much as possible the downtime, staffing costs, and extraneous upgrade expenses necessary with a “forklift” upgrade. Since procurement and capital costs can be very high, with 8-processor you buy the server once — and then expense the growth in that server instead of putting in requests for additional acquisitions.

Business growth and software enhancements require scaling applications to systems greater than a 4-processor server to take advantage of large memory support from multi-threaded applications. An 8-processor server is meant to improve productivity with increased system performance.

Maintenance benefits are critical to working effectively. If you plan on using these servers for at least five years, it is necessary to pay for two extra years of extended warranty. Long-term goals necessitate proper functionality today.

To better quantify the comparison between an 8-processor and 4-processor, consider that an xSeries 460 with eight processors costs between \$75,000 and \$100,000 depending on the configuration and speed of the processors. However, if you were to purchase two comparable 4-processor servers such as the HP Proliant DL-585 or DL580 G3, their cost would be between \$79,000 and \$84,000. Note that two 4-processors do not add up to the power of one 8-processor. You can't combine the competition's machines to create a 16-processor or 32-processor as you can with the IBM machines.

Most importantly, there is no excuse for any mission-critical business application to fail. Under heavy load, applications such as SQL Server and Microsoft Exchange can slow considerably—and users won't tolerate that. A scalable server is literally designed to support thousands of users.

IBM's "Value Add"

IBM is unlike other companies. For example, hardware is manufactured with mission-critical business processes in mind. The xSeries 460 exemplifies the sort of superior reliability, better management, and increased performance built into IBM's hardware.

IBM monitors processors, VRMs, memory, disk drives, fans, and power supplies. In contrast, Dell only monitors processors and hard drives. IBM does more than just produce hardware; they add value in every offering by producing something very special that can literally get the job done.

Why an 8-processor IBM Server Beats the Competition

Simply put, IBM 8-processor server beats the competition because it offers lower TCO in the following areas:

- Price and performance
- Reliability (especially with respect to mission-critical business applications)
- Consolidation (running four 2-ways with 4 partitions is not as cost-effective as running a consolidated 8-processor)
- IBM “Value Add” (yielding a unique high-performance, vendor-supported solution)

Conclusion: Decision Factors

4-processor servers that cannot be upgraded when you need more power simply lack the sheer power to drive the computing needs essential to doing business in today’s mission-critical environments. Merely stating that an 8-processor server can outperform a 4-processor server does not adequately convey the real advantages involved. A realistic decision requires that you ask yourself, “How important is the performance of my business applications?”

“When a server fails, it is never as simple as a print server,” said Joseph Basanta of Systems Solutions.

The IBM xSeries 460 offers advantages with respect to performance, power consumption, and people costs. It’s unique scalability has the potential to do the work of many servers. It offers you the chance to grow and evolve according to your business needs. Most importantly, it is an IBM product that will both meet your needs and continue to serve your users with the best possible performance metrics required to executive your workloads most effectively.

Appendix A: Competitive Price Comparison

<p>x460</p> <ul style="list-style-type: none"> ▶ 4 x Xeon MP 2.83 GHz processors w/ 4 MB L3 cache and Xcel4v ▶ 4 GB DDR2 memory ▶ 2 x 36.4 GB SAS 10 K hot swap HDD ▶ SAS storage controller ▶ Integrated 10/100/1000 dual Ethernet ▶ 2 x hot swap redundant power supplies ▶ IBM Remote Supervisor Adapter ▶ 3-year limited warranty ▶ \$24,063 	<p>HP ProLiant DL740</p> <ul style="list-style-type: none"> ▶ 4 x Xeon MP 3.0 GHz processors w/ 2 MB L3 cache ▶ 4 GB (8x512 MB+2x512 MB for redundancy) ECC ▶ 2x72.8 GB Ultra320 SCSI 10 K hot swap HDD ▶ Dual Channel Ultra160 SCSI controller ▶ Two (2) NC7781 PCI-X Gigabit NICs ▶ 2 x hot swap redundant power supplies ▶ iLO standard ▶ 3-year limited warranty ▶ \$38,697
<p>IBM list price and HP web pricing July 22, 2005</p>	

<p>x460 (8870-22X)</p> <ul style="list-style-type: none"> ▶ 4 x Xeon MP 2.83 GHz processors w/ 4 MB L3 cache and Xcel4v ▶ 4 GB DDR2 memory ▶ 2 x 36.4 GB SAS 10 K hot swap HDD ▶ SAS storage controller ▶ Integrated 10/100/1000 dual Ethernet ▶ 2 x hot swap redundant power supplies ▶ IBM Remote Supervisor Adapter ▶ 3-year limited warranty ▶ \$24,063 	<p>HP ProLiant DL760 G2</p> <ul style="list-style-type: none"> ▶ 4 x Xeon MP 3.0 GHz processors w/ 2 MB L3cache ▶ 4 GB (8 x 512MB + 2x512 MB for redundancy) ECC ▶ 2x72.8GB Ultra320 SCSI 10 K hot swap HDD ▶ Dual Channel Ultra160 SCSI controller ▶ Two 10/100/1000 Ethernet adapters ▶ 2 x hot swap redundant power supplies ▶ RiLO edition II (management adapter) ▶ 3-year limited warranty ▶ \$42,096
<p>IBM Ideas International and HP web pricing July 22, 2005</p>	

<p>x460</p> <ul style="list-style-type: none"> ▶ 8 – 3.33 GHz Intel Xeon processor w/ 8 MB L3 cache ▶ 16 GB memory ▶ 2x36 GB 10 K SFF SAS HDD ▶ Four Gigabit Ethernet (2 per 4-processor) ▶ 3-years limited warranty ▶ \$72,273 	<p>HP Integrity rx7620</p> <ul style="list-style-type: none"> ▶ 8 - 1.6 GHz Intel Itanium 2 processor w/ 6 MB L3 cache ▶ 16 GB memory ▶ 2x73GB 15 K Ultra160 SCSI HDD ▶ 1 Gigabit Ethernet ▶ 1-year limited warranty ▶ \$128,792
<p>The x460 is priced extremely competitively and includes a 3-year warranty.</p>	

The pricing advantage will continue to increase for those customers who require more memory.

Ideas International on July 22, 2005

<p>x460</p> <ul style="list-style-type: none"> ▶ 16 – 3.33 GHz Intel Xeon MP processor w/ 8 MB L3 cache ▶ 16 GB memory ▶ 2x36 GB 10 K SFF SAS HDD ▶ Eight Dual Gigabit Ethernet (2 per 4-way) ▶ 3-years limited warranty ▶ \$131,863 	<p>HP Integrity rx8620</p> <ul style="list-style-type: none"> ▶ 16 - 1.6 GHz Intel Itanium 2 processor w/ 6 MB L3 cache ▶ 32 GB memory ▶ 2x73 GB 15K Ultra160 SCSI HDD ▶ 1 Gigabit Ethernet ▶ 1-year limited warranty ▶ \$275,515
<p>The x460 is priced extremely competitively and includes a 3-year warranty. The pricing advantage will continue to increase for those customers requiring more memory.</p> <p style="text-align: center;">Ideas International on July 22, 2005</p>	

<p>x460</p> <p>▶ 4-processor 2.83 GHz Intel Xeon processor MP, 4 MB L3 & Xcel4v cache, 16 GB Memory, 2x36 GB, DS4000 Host Bus Adapter, DS4000 EXP710 Storage Exp. Unit , 6x73 GB 10 Krpm SCSI Hot-Swap HDD, floppy, and CD-ROM, 2 hot swap redundant power supplies, Gigabit Ethernet, IBM Remote Supervisor Adapter, SUSE LINUX Enterprise Server, 3 HW year limited warranty</p> <p>▶ Total - \$46,384</p>	<p>Sun Fire V890</p> <p>▶ 4-processor 1.35 GHz UltraSPARC IV, 8 MB External Cache, 16 GB Memory, 6x146 GB 10 K FC-AL Disk Drives, 1 DVD-ROM 10 Drive, 3 hot swap redundant power supplies, keyboard, 10/100 Ethernet + Gigabit Ethernet, Solaris 10 Operating Environment Server License, 3 yr. limited on site warranty</p> <p>▶ \$75,995</p>
<p>x460</p> <p>▶ 8 - 2.83 GHz Intel Xeon processor MP, 4 MB L4 & Xcel4v cache, 32 GB Memory, 2x36 GB, Floppy and CD-ROM, 2 hot swap redundant power supplies, Gigabit Ethernet, IBM Remote Supervisor Adapter, SUSE LINUX Enterprise Server, 3 year limited**</p>	<p>Sun Fire V890 8-processor</p> <p>▶ 8 - 1.35 GHz UltraSPARC IV, 8 MB External Cache, 32 GB Memory, 6x146 GB 10 K FC-AL Disk Drives, 1 DVD-ROM 10 Drive, 3 hot swap redundant power supplies, keyboard, 10/100 Ethernet + Gigabit Ethernet, Solaris 10 Operating Environment Server License, 3 year limited onsite warranty</p>

warranty on parts and onsite labor, DS4000 Host Bus Adapter, DS4000 EXP710 Storage Exp. Unit, 6x 73 GB 10 K/rpm SCSI hot swap HDD ▶ Total - \$66,571	▶ Total \$123,995
Ideas International pricing or Sun web pricing July 22, 2005	

x460 (8870-22X) ▶ 8 x Xeon MP 2.83 GHz processors w/ 4 MB L3 cache and Xcel4v ▶ 16 GB DDR2 memory ▶ 2 x 36.4 GB SAS 10 K hot swap HDD ▶ SAS storage controller ▶ Integrated 10/100/1000 dual Ethernet ▶ 2 x hot swap redundant power supplies ▶ IBM Remote Supervisor Adapter ▶ 3-year limited warranty ▶ \$42,003	Sun Fire V40z ▶ 4 AMD Opteron Model 875 (Dual Core) Processors ▶ 16 GB ▶ 2x72.8 GB Ultra320 SCSI 10 K hot swap HDD ▶ Ultra320 SCSI controller ▶ Two 10/100/1000 Ethernet adapters ▶ 2 x hot swap redundant power supplies ▶ Service Processor ▶ 3-year limited warranty ▶ \$39,145
IBM Ideas International and Sun web pricing July 22, 2005	

Appendix B: Cost savings Opportunities

Cost per Service Pack Upgrade

- Time for a network engineer to install a typical Microsoft Update= 20 minutes
- Time to reboot an average Windows Server= 10 minutes
- Total time= 30 minutes on average for a 2 Processor system.
- Average rate of a network engineer= \$50/hour,
- Cost per each update= \$25
- Cost factor x four= \$100 per each update appears!

Server Consolidation

- One 8 Processor system requires a fraction of one quarter this amount of effort
- Cost reduction= \$25 per occurrence on an 8 Processor system.
- Reduction of server count with an xSeries x460 by consolidating:
 - Exchange servers into 2 – 8 Processor x460s..

- Application servers and consolidate them to 4 – 8 Processor x460 servers with VMware.
- Development and test servers into 6 – 4 Processor x460 servers with VMware.
- What these numbers demonstrate is that it is very possible for a smaller organization to replace its datacenter consisting of:
 - file/print
 - web
 - application, or
 - SQL database servers

Cost Savings

Consolidation into a single industry standard 42U rack consisting of 8-processor consolidated virtualized servers

Cost savings for the x460 determine cost saving factors including rack and floor space:

- 25% less rack space 3U 4-way vs. competitors' 4U/5U 4-way rack servers
- 40% more processors per rack and uses 36.3% less floor space.
- 25% smaller form factor allows for more servers per 42U rack

Pay As You Grow

IBM's "pay as you grow" approach explains how the 460 has lower price points than a 4-processor system, but can grow to as high as a 32-Processor. It has an entry price for a 2-processor at \$18,000, a 4-processor at \$25,000–\$30,000, and about \$75,000 for an 8-processor. These price points are far less expensive than any other enterprise database server.