Up to 16-way power for high-end databases, server consolidation and mission-critical business applications

IBM @server **xSeries 440**

Highlights

■ *Intel® Xeon™ Processors MP deliver breakneck 8-way performance in a slim 4U form factor*

■ *True "pay as you grow" scalability stretches your IT dollars and provides a growth path for up to 16-way SMP and remote I/O*

■ *Mainframe-inspired technologies bring unprecedented innovation to industry-standard servers to help you achieve new levels of performance and availability*

■ *Smart tools usher in the new era of self-healing, self-managing and self-optimizing systems*

Revolutionary economics

Innovative technology, application flexibility and new tools: The IBM @server xSeries™ 440 delivers on all three pillars of the IBM @server vision and initiates a smarter, more cost-effective strategy for high-performance server computing on industry-standard hardware. The x440 succeeds via groundbreaking IBM Enterprise X-Architecture™ technology. In fact, it is the first IBM @server system to incorporate the full scope of these technologies for a flexible building-block approach to scalability—along with radical advancements in performance, availability and systems management. Bottom line: The x440 delivers revolutionary economics to help you do more with your IT dollars.

XpandOnDemand scalability

The x440 empowers IT administrators as never before, delivering on the promise of a bold, new economic model that lets you do more with less. Scale quickly to greater SMP for better performance. Achieve higher levels of availability through more efficient clustering, and boost your bottom line by consolidating servers using system partitioning. By taking industry-standard processors, memory and I/O, and making them work better together, the x440 truly represents a new era in high-performance server computing.

With the x440, you get more than the power of the latest Intel Xeon Processors MP. You get the flexibility to purchase only the processing, memory and I/O capacity you need, when you need it. You no longer have to buy server headroom that may go unused, simply for the sake of trying to anticipate growth. Instead, the modular design of the x440 allows you to pay as you grow.

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Called XpandOnDemand™ scalability, this building-block approach consists of x440 scalable enterprise nodes—bet-your-business enterprise servers that initiate a clever, more cost-effective strategy for growing your enterprise infrastructure on industry-standard hardware. Each x440 scalable enterprise node contains an SMP Expansion Module that houses up to four processors, memory and L4 cache, and can be joined to another SMP Expansion Module to easily take your 4-way x440 to an 8-way. The x440 scalable enterprise node can also be connected to another x440 via a super-fast scalability port for expansion up to 16-way SMP in as little as 8U of rack space.

True investment protection
Along with the impressive flexibility of scalable enterprise nodes, the Enterprise X-Architecture blueprint delivers another pay as you grow first in industry-standard computing—remote I/O. The IBM RXE-100 Remote Expansion Enclosure gives the x440 up to 12 additional Active™ PCI-X slots per enclosure with an innovative, high-speed interconnect. This capability adds another dimension to XpandOnDemand scalability: You're able to add bandwidth to your server without paying for a full system upgrade.

Because the 3U RXE-100 can sit as far as eight meters away from the x440, it fits easily into your existing rack environment. Two servers can even share the RXE-100, for exceptional investment protection, growth by business demand, multi-system scalability and savings of rack space.

Mission-critical e-business
Because the x440 so quickly and cost effectively scales into larger SMP systems, you can give your data-intensive, mission-critical applications the computing power they need for significant performance gains. Built to exploit the horsepower of up to 16-way processing, the x440 is optimized for deployment of database applications as well as e-business solutions such as ERP, CRM and business intelligence.

If the highest achievable availability is your priority, the x440 can be configured into a flexible clustering solution. Vital to mission-critical environments, clustering allows multiple servers to be connected in order to share workload and provide

redundancy and failover. With the modular design of the x440, you no longer have to incur the expense of purchasing separate servers, adapters and switches in order to reap the benefits of clustering. You can cluster nodes much more affordably in a variety of combinations by using the x440 scalability ports as high-speed interconnects.

Unmatched flexibility
The x440 is also ideal for server consolidation, which can improve your bottom line. With XpandOnDemand scalability, IT administrators can more effectively centralize mission-critical applications such as e-mail and databases housed within smaller distributed servers—helping reduce the sprawl of IT assets and consequently shrinking overall IT management costs.

SMP Expansion Module takes a 4-way x440 to an 8-way x440.

For server consolidation, the x440 provides a logical partitioning solution that lets you run numerous operating systems on one server. To implement this consolidation strategy, you can use VMware™ ESX Server™ software to create logical partitions *within* each x440 node. ESX Server lets you allocate the processors to different operating systems and applications in whatever combinations you like, always with the option to dynamically reconfigure. Your operating systems and applications run on each partition or "virtual server," just as if it were a physically independent server. ESX Server software is officially supported by IBM on the x440 through the ServerProven® program[1].

The physical and logical partitioning capabilities of the x440 give you considerable flexibility for implementing a server consolidation or clustering solution. They allow you to optimize the application workload to the operating system, run multiple operating systems on a single configuration and allocate workloads to specific physical resources—letting you make the most of your IT resources and strengthen your bottom line.

High-octane performance

As the first industry-standard server to introduce Level 4 system cache, the x440 delivers ultimate performance. This XceL4™ Server Accelerator Cache can increase overall system performance up to 20% by alleviating the processors' need to access main memory for data. With 32MB of XceL4 cache per 4-way, the x440 is able to exploit up to 128MB of Level 4 cache in 16-way SMP configurations—for a substantial leap in processing power.

The memory capacity of the x440 is enormous with 16GB per 4-way node, yielding 32GB per 8-way. Its size ensures that the processors rarely need to exchange data past the layers of cache and main memory—translating into consistently fast execution. Consequently, your network will fly as you are able to load entire databases into main memory for fast data transfer and transaction processing. And because the x440 has integrated gigabit Ethernet, which can transmit data at up to 1Gbps, that performance increase is passed along to end users.

Defenses against downtime

You can count on the x440 to deliver OnForever™ availability with an impressive array of features that keep your applications running around the clock. Revolutionary advancements in the memory subsystem help give the x440 a remarkable defense against downtime. These Active Memory™ technologies, memory mirroring, Chipkill™ memory and Memory ProteXion™, include progressive capabilities that are a first in the industry-standard server market.

• Memory mirroring—Introducing a level of redundancy similar to RAID-1 disk mirroring, memory mirroring writes data simultaneously to two independent memory cards, but without the performance penalty of other designs. By protecting data in mirrored memory, Active Memory enables IT administrators to plan for scheduled maintenance to repair a failed memory DIMM, helping to minimize unplanned downtime and lost productivity.

Memory mirroring provides greater reliability using industry-standard DIMMs.

- Chipkill memory—New third-generation Chipkill memory technology, integrated into the IBM XA-32™ chipset, allows multiple single-bit errors to be corrected using off-the-shelf, industry-standard ECC memory.

- Memory ProteXion—Using spare bits analogous to a hard disk drive hot spare, the memory controller automatically reroutes data in the event of an on-DIMM chip failure to keep the server running smoothly. The combination of Memory ProteXion and Chipkill memory is designed to correct virtually all the memory errors a server is likely to encounter.

Other hardware features that help keep the x440 in operation 24x7 include redundant, hot-swap hard disk drives, fans and power supplies—as well as Active PCI-X technology, which allows you to hot add and hot swap I/O adapters without powering down. The x440 also includes two important hardware alerting systems to combat downtime. Predictive Failure Analysis® (PFA) monitors critical components and triggers administrator alerts about impending issues before they can affect performance; Light Path Diagnostics™ expedites repairs by helping you pinpoint the exact location of the faulty component.

Data center solution

Running large SMP operations on the x440 becomes easier, more manageable and more reliable via the IBM Datacenter Solution Program. Stemming from collaboration between IBM and Microsoft®, this program offers you a wide array of services and support for running Microsoft Windows® 2000 Datacenter Server[2], the industry's most scalable operating system. Datacenter Server is the only operating system that, beyond 8-way, can sustain the SMP computing power of the x440. Select models of the x440 come preloaded with Datacenter Server, providing a turnkey solution. Additional testing services, planning services and the expert support of IBM Global Services are available to provide successful implementations.

Remote management made simple

Outfitted with the latest eLiza capabilities to provide sophisticated self-healing tools, the x440 empowers your IT staff to work smarter, not harder. The integrated Remote Supervisor Adapter contains a sophisticated systems management processor to make that possible. The Remote Supervisor Adapter is literally another computer within the x440 that monitors systems health and gives you around-the-clock remote management and troubleshooting capabilities. It continuously measures environmental and performance factors, and sends administrator alerts through IBM Director about potential issues with temperature, cache, fan redundancy, memory and hard disk drives *before* failures occur. Even if the x440 is powered down or otherwise non-responsive, the independently powered Remote Supervisor Adapter can bring the x440 back under your control.

x440 with Light Path Diagnostics panel and RXE-100

Self-managing servers

In addition to the powerful alerting functionality of PFA and the Remote Supervisor Adapter, IBM Director delivers the most advanced suite of proactive, predictive server management tools in the industry. Called IBM Director Extensions, they're easy to use and are included at no additional charge. You'd pay a substantial premium for less functional tools from other vendors, but would not receive the depth of capability, the extent of downtime protection or the support and expertise of IBM. Visit **ibm.com**/eserver/xseries/extensions for more information on these tools.

Join the Enterprise X-Architecture technology revolution

With the IT challenges of the 21st century, it's more important than ever to remain competitive and prepare for growth opportunities. Whether the challenge is adapting to changing customer demographics, dynamic e-business demands or shifting world economies, IBM Enterprise X-Architecture technology can give your infrastructure the flexibility and performance to do more with less. Through pay as you grow scalability, unprecedented performance, OnForever availability and tools that endow servers with self-managing capabilities, the x440 is the bet-your-business system that revolutionizes the industry-standard server platform. Join the revolution in server computing. Bring Enterprise X-Architecture technology to your enterprise IT.

x440 at a glance

Form factor	Rack-optimized 4U
Processor	Intel Xeon Processor MP 1.4, 1.5 or 1.6GHz
Number of processors (std/max per chassis)	2/8
Level 3 cache	512KB or 1MB depending on the processor
Level 4 cache (std/max per chassis)	XceL4 Server Accelerator Cache, 32MB/64MB
Chipset	IBM XA-32
Memory (std/max per chassis)	2GB/32GB Chipkill ECC SDRAM (16GB/4-way or 32GB/8-way)
Active PCI-X I/0 slots	6; (2) 64-bit/133MHz, (2) 64-bit/100MHz, (2) 64-bit/66MHz
Internal hard disk drives	Not Included
Maximum internal storage	146.8GB[3]
Bays	4; (2) 3.5", (1) diskette, (1) CD-ROM
PCI disk controller	Integrated dual Ultra160 SCSI
RAID support	Via optional SCSI ServeRAID™ adapter
Network	Integrated 10/100/1000 Ethernet adapter
I/O ports	1 serial, 3 USB, 1 Ethernet, 2 RXE-100 expansion, 1 keyboard, 1 mouse, 1 video, 2 systems management (RS485)
CD-ROM/diskette drive	24X[4]/1.44MB
Power supply	2x1050W (220v) hot-swap and redundant
Cooling fans	4 hot-swap and redundant
Systems management	Alert on LAN™ 2, Automatic Server Restart, IBM Director, IBM Director Extensions, IBM ServerGuide™, Integrated Remote Supervisor Adapter, Light Path Diagnostics, PFA on hard drives, processors, L4 cache, fans and memory, Wake on LAN®
Operating systems supported	Microsoft Windows 2000 Server/Advanced Server/ Datacenter Server, Microsoft Windows NT® 4.0 Enterprise Edition, Red Hat Linux®, SuSE Linux, Novell NetWare 6.0
Limited warranty[5] and support	1-year onsite limited warranty, 24x7 same day onsite repair

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1 IBM makes no warranties, express or implied, regarding non-IBM products and services that are ServerProven, including but not limited to the implied warranties of merchantability and fitness for particular purpose. These products are offered and warranted solely by third parties.

2 Some software may differ from its retail version (if available) and may not include user manuals or all program functionality. Software license agreements may apply.

3 When referring to storage capacity, GB means 1,000,000,000 and TB means 1,000,000,000,000. Accessible capacity is less.

4 CD drives list the maximum rates; rates are variable and often less than the maximum.

5 For a copy of the IBM Statement of Limited Warranty, call 1 800 772-2227. Telephone support may be subject to additional charges. For onsite service, IBM sends a technician after attempting to diagnose and resolve the problem remotely.