

High-performance, flexible partitioning and high-availability
for server consolidation and database applications



IBM @server xSeries 445



Highlights

- **The next generation of the award-winning¹ industry-standard Enterprise X-Architecture (EXA)**
- **Latest EXA technology delivers leadership IA-32 performance with high availability**
- **Three levels of memory protection including hot-swap and hot-add memory support**
- **XpandOnDemand™ for pay as you grow scalability with high-performance Intel® Xeon™ Processors**

Enterprise X-Architecture extended

The IBM @server® xSeries® 445 packs the latest IBM Enterprise X-Architecture™ technologies that help balance high availability with high performance. The x445 reinvents the concept of scalability through a modular architectural design.

Start with a base 2-way configuration and add incremental capacity as your needs grow. This modular server architecture delivers investment protection without the upfront costs of expensive switch-based alternatives.

XpandOnDemand scalability

The x445 can expand to changing needs, helping IT administrators do more with less:

- *Scale up to 32-way for better performance with the Intel Xeon Processor MP*
- *Currently the industry's only server available from a major vendor in configurations up to 4-way with Intel Xeon Processors for outstanding price/performance*
- *Achieve higher availability through more efficient partitioning and clustering*
- *Consolidate servers to lower costs and improve utilization.*



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XpandOnDemand provides a route to higher performance using industry-standard hardware. Each x445 can scale from 2-way to 8-way in a single chassis (expanding beyond 4-way requires that all processors be the Intel® Xeon™ Processor MP). Grow to 16-way simply by connecting two 8-way chassis or up to 32-way by connecting four chassis. This enables you to add processing and memory capacity as your needs change.

To increase I/O capacity, the optional RXE-100 Remote Expansion Enclosure provides up to 12 additional Active™ PCI-X slots for triple the I/O without the expense of a full system upgrade.

XpandOnDemand provides outstanding flexibility because it allows the x445 to scale both UP and OUT.

- *Scaling UP is simple, because the x445 is a rack-dense 16-way or 32-way configuration. You benefit because today's x445 can continue to scale with needs into the future.*
- *Scaling OUT is easy for server consolidation using VMware™ ESX Server™, which can enable up to 80 virtual servers on one 8- or 16-processor configuration. Server capacity can increase dynamically with little effort and cost.*

With exceptional expandability, the x445 is designed to conform to the changing requirements of the most demanding business-critical transaction workloads like customer relationship management (CRM), enterprise resource planning (ERP) and business intelligence.

High-octane performance

Built on the foundation of Enterprise X-Architecture, which has claimed 50 number 1 benchmarks in its history, the x445 establishes a new standard for industry-leading performance².

With enhanced Xcel4 system cache, the x445 exploits 64MB of integrated Level 4 cache per four CPUs—for a substantial leap in processing power through reduced latency.

The x445 delivers impressive memory capacity with up to 64GB per chassis—an Intel Xeon Processor architectural limit. Sufficient memory means that demand paging events are kept to a minimum, resulting in ultra-fast execution. Consequently,

you may be able to load entire databases into main memory for extremely fast transaction processing to create a formidable database engine.

Robust memory subsystem

The x445 delivers OnForever™ availability features with a memory subsystem that provides remarkable defenses against downtime. Active Memory™ offers industry-leading availability that is OS independent for maximum flexibility including:

- *Hot-swap memory enables the replacement of failed DIMMs while the system is running to maximize availability of mission-critical servers.*
- *Hot-add memory supported with Microsoft® Windows® Server 2003³ powers the dynamic addition of main memory to increase performance.*
- *Chipkill™ memory allows multiple single-bit errors to be corrected using off-the-shelf memory—helping protect your data and budget.*



XpandOnDemand powers x445 scalability in 8-processor nodes (shown above as a two-node 16-way with an RXE-100).

- *Memory ProteXion™ keeps the server running smoothly by rerouting data in the event of an on-DIMM chip failure—enhancing the effectiveness of Chipkill technology.*
- *Memory mirroring protects data by writing simultaneously to independent memory cards—helping minimize downtime and lost productivity.*

Other self-healing capabilities such as Copper Diagnostics™ help enable uptime with minimal IT interaction. The x445 comes standard with IBM Director systems management software, the award-winning suite of proactive server tools⁴, and the integrated Remote Supervisor Adapter II for EXA (RSA II-EXA), the computer within the computer that remotely monitors system health and delivers high-speed text and console redirect.

When combined, these capabilities power virtual 24x7 operations with Predictive Failure Analysis® to monitor critical components and trigger alerts before problems arise. IBM light path diagnostics expedites repairs by pinpointing faulty components with LEDs.

On demand ready

The x445 helps businesses become more responsive, adaptable, focused and resilient as they respond to customer needs, market opportunities or external challenges. The x445 delivers these on demand attributes:

- ***Integrated**—The x445 helps businesses leverage IT investments and data into the future. This mission-critical server incorporates industry-standard technologies that help businesses solve problems while lowering IT costs.*

- ***Open**—The x445 helps you deal with change. It runs industry-standard solutions for Microsoft Windows, Linux and other operating environments, allowing businesses to choose optimal applications.*
- ***Virtualized**—The x445 helps businesses adapt in today's dynamic business environment. It delivers pay-as-you-grow scalability, whether businesses scale up or scale out.*
- ***Autonomic**—The x445 uses predictive and proactive service processor and systems management technology to deliver self-healing and self-protecting capabilities.*

Enterprise operating system flexibility

The IBM Datacenter Solution Program offers you a wide array of technical services for running Microsoft Windows Server 2003. Cost-effective Red Hat Linux or SUSE LINUX solutions provide reliable, enterprise servers that help support the constant uptime required for today's datacenter.

For more information:

World Wide Web

U.S. ibm.com/pc/us/eserver/xseries/x445.html
 Canada ibm.com/pc/ca/eserver/xseries/x445/more_about.shtml

IBM TotalStorage® Products

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IBM @server xSeries Systems Management

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¹ "Award for Technical Excellence," in the Network and Enterprise Hardware category, PC Magazine, 12/24/2002, page 102.

² Denotes benchmarks that were achieved during 2002 and 2003. Benchmark status often changes. For most recent benchmark data, visit ibm.com/pc/ww/eserver/xseries/benchmark/index.html

xSeries 445 at a glance

Form Factor	Rack/4U per chassis
Processor	Intel® Xeon™ Processor MP up to 3.0GHz or Intel® Xeon™ Processor 3.0GHz
Number of processors (min/max)	2/32 with Intel Xeon Processor MP 2/4 with Intel Xeon Processor
Cache (max)	4MB L3, 64MB XceL4™ Server Accelerator Cache/4-way for Intel Xeon Processor MP or 512MB L2, 64MB XceL4 Server Accelerator Cache/2-way for Intel Xeon processor
Memory (max)	64GB Chipkill™ DDR SDRAM per chassis
Expansion Slots	6/6 Active PCI-X per chassis (2 at 133MHz, 2 at 100MHz and 2 at 66MHz), with optional 12 Active PCI-X slots via RXE-100 Remote Expansion Enclosure
Disk bays (total/hot-swap)	2/2
Maximum internal storage	293.6GB ⁵ Ultra320 SCSI
Network	Integrated dual 10/100/1000 Ethernet
Power supply (std/max)	1200W 2/2 hot-swap
Hot-swap components	Power supplies, cooling fans, hard disk drives, PCI-X adapters and memory DIMMs
RAID support	Integrated RAID-1
Systems management	IBM Director, Remote Supervisor Adapter II-EXA standard
Operating systems supported	Windows 2003 Server Family ⁶ , Windows 2000® Server Family Edition, Windows NT 4.0 Enterprise Edition, Linux (Red Hat Enterprise Linux AS, SUSE LINUX Enterprise Server), Novell Netware 6.0, VMware™ ESX Server™ ⁷
Limited warranty⁸	3-year onsite limited warranty

³ Hot-add memory support requires Microsoft Windows Server 2003 Enterprise edition or Datacenter edition.

⁴ PC Magazine Editor's Choice Award, October 2002, IBM Director v3.1.

⁵ When referring to storage capacity, GB means 1,000,000,000. Accessible capacity is less.

⁶ 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.

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