



IBM @server xSeries 445 server with RSAL-EXA – The next-generation scalable enterprise server powered by Enterprise X-Architecture

Overview

New levels of performance, scalability, and manageability for the xSeries® 445 server are powered by next-generation Enterprise X-Architecture™ (EXA).

These 4 U rack-optimized scalable enterprise servers feature mainframe-inspired technologies that bring new levels of performance and reliability to Intel™ processor-based servers.

Embracing on demand with performance and availability

Become more responsive, adaptable, and resilient in responding to customer needs and market opportunities on demand.

On demand business attributes:

Integrated — The mission-critical x445 server incorporates industry-standard technologies that help businesses solve problems while helping lower IT costs.

- Choice of base systems
 - Two SMP Intel Xeon MP processors at 2.2 or 2.7 GHz¹ with full-speed 2 MB ECC L3 cache technology
 - Four SMP Intel Xeon MP processors at 3.0 GHz¹ with full-speed 4 MB ECC L3 cache
- Two or four SMP Intel Xeon DP processors at 3.0 GHz¹ with full-speed 512 KB L2 cache
- 2 GB of high-speed PC2100 Double Data Rate (DDR) SDRAM memory; supporting two-way interleaving and 64 GB maximum
- 64 MB of Xcel4 Server Accelerator Cache per SMP Expansion Module
- Six 64-bit Active PCI-X slots
- Integrated dual port 10/100/1000 Mbps Ethernet and dual channel Ultra320 SCSI (up to 320 MB/s)

controllers with integrated RAID-1 support

- IBM XA-32 second-generation chipset — Higher performance through increased scalability and reduced latencies
- Remote Supervisor Adapter II standard

Open — Helps you deal with change. It runs industry-standard solutions for Microsoft™ Windows™, Linux, and other operating environments, allowing businesses to optimize applications by operating systems.

Virtualized — The x445 combines pay-as-you-grow scalability with optional next-generation VMware ESX software to deliver scale-up and scale-out through virtualized logical partitioning.

Autonomic — Uses predictive and proactive service processor and systems management technology to deliver self-healing and self-protecting capabilities.

Datacenter Solutions on the x445 server are available with a choice of Microsoft Windows 2000 or Microsoft Windows Server 2003 Datacenter Preloads.

Key prerequisites

For details, refer to the **Technical information** section.

Planned availability dates

- March 19, 2004, for xSeries 445 with RSAL-EXA
- March 25, 2004, for Datacenter models with Windows 2000 Preload kits
- March 25, 2004, for Datacenter models with Windows Server 2003 Preload kits

At a glance

Powered by Enterprise X-Architecture (EXA), the xSeries 445 server with RSAL-EXA sets a new industry standard in the market for 8-way and 16-way blending XpandOnDemand scalability, superior benchmark performance, and OnForever™ availability for mission-critical database, ERP, and server consolidation

- XA-32 second-generation chipset
- Intel Xeon MP, from 2-way to 16-way with up to 3.0 GHz/4 MB L3 in 2X and BX models
- Intel Xeon, from 2-way to 4-way with the 3.0 GHz/512 KB L2 in EX models
- Active Memory with new hot-swap and hot-add support
- Xcel4 Server Accelerator Cache, 64 MB per CEC
- 2 GB DDR memory up to 64 GB
- 6 x 64-bit Active PCI-X slots
- Ultra320 SCSI, integrated RAID1
- Dual Gigabit Ethernet standard
- Integrated remote I/O (RIO) support including RIO sharing
- 4 U rack-optimized tool-free chassis
- Remote Supervisor Adapter II standard
- Windows and Linux support for operating system flexibility

Datacenter Solutions on x445 include a choice of Microsoft Windows 2000 or Microsoft Windows Server 2003 Datacenter Preloads

For ordering, contact:

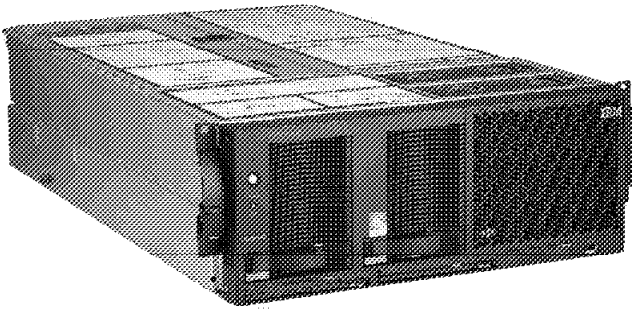
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Description



Related options

xSeries 2.2 GHz 2 MB L3 Cache Upgrade with Xeon Processor MP (13N0723) is a 2.2 GHz Xeon MP processor that supports internal processing speeds of 2.2 GHz and contains an integrated, full-speed 2 MB L3 cache.

xSeries 2.7 GHz 2 MB L3 Cache Upgrade with Xeon Processor MP (13N0722) is a 2.7 GHz Xeon MP processor that supports internal processing speeds of 2.7 GHz and contains an integrated, full-speed 2 MB L3 cache.

xSeries 3.0 GHz 4 MB L3 Cache Upgrade with Xeon Processor MP (13N0721) is a 3.0 GHz Xeon MP processor that supports internal processing speeds of 3.0 GHz and contains an integrated, full-speed 4 MB L3 cache.

These options feature:

- External processing operations to memory at 400 MHz
- Hyper-threading technology

They currently support up to 16-way SMP applications in the xSeries 445 with RSAL-EXA server.

Support for 16-way SMP applications in the xSeries 445 with RSAL-EXA server will be available in second quarter 2004. Refer to the **Limitations** section for important installation requirements. A voltage regulator module (VRM) and heatsink, specifically designed to support these processors in the xSeries 445 with RSAL-EXA server, are included.

xSeries 445 SMP Expansion Modules

For details, refer to the **xSeries 445 SMP Expansion Modules** section in the **Additional information** section.

The IBM RXE-100 Remote Expansion Enclosure (86841RX) is a remote I/O drawer.

For details, refer to the **RXE-100 Remote Expansion Enclosure** section in the **Additional information** section.

Datacenter related options

Preload kits for Microsoft Windows 2000 Datacenter are available to support 1 to 8 and 1 to 16-way SMP. Preload kits for Microsoft Windows Server 2003 Datacenter Edition are available to support 1 to 4, 1 to 8, and 1 to 16-way SMP.

For details, refer to the Datacenter **related options** section in the **Additional information** section.

Software Subscription

For details, refer to the **DC Software Subscription** section in the **Additional information** section.

Maintenance Update Subscription

For details, refer to the **DC Maintenance Update Subscription** section in the **Additional information** section.

xSeries 445 with RSAL-EXA description

xSeries 445 with RSAL-EXA configuration

Models	Processor	L3 cache	Memory	HDDs	Power supply
8870-12X	2 x 2.2 GHz	2 MB	2 GB ECC	Open bay	Two
8870-22X	2 x 2.7 GHz	2 MB	2 GB ECC	Open bay	Two
8870-42X	4 x 3.0 GHz	4 MB	2 GB ECC	Open bay	Two

Xeon DP Models xSeries 445 with RSAL-EXA configuration

Models	Processor	L2 cache	Memory	HDDs	Power supply
8870-3EX	2 x 3.0 GHz	512 KB	2 GB ECC	Open bay	Two
8870-4EX	4 x 3.0 GHz	512 KB	2 GB ECC	Open bay	Two

Datacenter Model base configurations

Models	Processor	L3 cache	Memory	HDDs	Serve-RAID	PS
8870-1BX	2 x 2.2 GHz	2 MB	0 GB ECC	Open bay	Yes	Two
8870-2BX	2 x 2.7 GHz	2 MB	0 GB ECC	Open bay	Yes	Two
8870-4BX	2 x 3.0 GHz	4 MB	0 GB ECC	Open bay	Yes	Two

Note: Memory and HDDs are configured in second-level manufacturing before customer shipment.

High-performance server subsystems: xSeries 445 with RSAL-EXA servers are high-throughput, highly scalable, 16-way SMP-capable Xeon MP-based network servers. The BX and 2X models are equipped with powerful 2.2, 2.7, or 3.0 GHz Xeon MP processors that contain either 2 MB or 4 MB ECC L3 caches. The 3EX and 4EX models are equipped with powerful 3.0 GHz Xeon DP processors that contain ECC 512 KB L2 caches. High-speed, PC2100 DDR ECC SDRAM provides excellent processor-to-memory subsystem performance.

The xSeries 445 with RSAL-EXA is tuned and engineered with the IBM XA-32 second-generation chipset to optimize throughput between the powerful Xeon and Xeon MP processors, the XcelL4 Server Accelerator Cache, and other components of the server. The architecture consists of the following components:

- Xeon MP processors in the BX and 2X models
- Xeon DP processors in the EX models
- XcelL4 Server Accelerator Cache
- Up to two SMP expansion modules (one or two standard)
- Two PCI-X host-bridge controllers

These next-generation Xeon and Xeon MP processors use 100 MHz common clock speed for external operations. Source synchronous strobes of 200 and 400 MHz are used to support 200 MHz (double-pumped) address and 400 MHz (quad-pumped) data buses to the memory controller. This allows up to 6.4 GB/s data transfers between memory and the processors.

Each SMP expansion module contains:

- Four processor connectors for Xeon MP
- 64 MB of XcelL4 Server Accelerator Cache
- Sixteen memory slots, supporting up to 32 GB of ECC DDR SDRAM

- Memory controller that supports:
 - Data flow between the processor, Xcel4 system cache, and memory, and to the two PCI-X host-bridge controllers
 - High-speed port to exploit external PCI-X expansion, connecting an optional RXE-100 Remote Expansion Enclosure
 - Chipkill™ ECC memory function

The 16 PC2100 DDR SDRAM memory sockets, synchronized to the 100 MHz processor speed, support up to 32 GB of system memory on each SMP expansion module (using the 2 GB DDR DIMM) for a total of 64 GB system memory per chassis. The memory is two-way interleaved (memory installed in pairs) with two ports to the memory controller supporting up to 6.4 GB/s data transfers.

Note: The x445 server supports a maximum of 64 GB of addressable system memory. This can be up to 128 GB of physical memory in mirrored configurations. The total 64 GB addressable limit may span up to four chassis in 16-way configurations.

xSeries 445 with RSAll-EXA has two PCI-X host-bridge controllers that reside between the PCI buses and the memory controller or controllers, depending on the configuration. These host-bridge controllers support six PCI buses. Two buses are for integrated functions and four buses are dedicated to the six 64-bit PCI-X expansion slots.

Buses that support integrated functions include:

- Bus F supports 66 MHz, 64-bit PCI-X controllers:
 - LSI Logic Dual Ultra320 SCSI with integrated RAID-1
 - Broadcom dual port 5704 10/100/1000 Ethernet
- Bus E supports:
 - Remote Supervisor Adapter II installed in dedicated slot. For details, refer to the **Remote Supervisor Adapter II** section in the **Additional information** section.
 - SVGA (ATI Rage XL, 8 MB), EIDE, and super I/O controllers.

The four 64-bit, PCI-X buses support the following 64-bit, PCI-X slots:

- Bus D: one 133 MHz PCI-X adapter
- Bus C: one 133 MHz PCI-X adapter
- Bus B: two 100 MHz PCI-X adapters
- Bus A: two 66 MHz PCI-X adapters

High-availability and serviceability features: Many enterprise e-business environments run around the clock, supporting the need for continual access to information around the globe. These environments require ruggedly dependable servers designed with features that can tolerate a component failure without total shutdown. xSeries 445 with RSAll-EXA servers pack numerous fault-tolerant and high-availability features into a high-density, rack-optimized package that significantly reduces the space needed to support massive network computing operations.

For details, refer to the **High-availability and serviceability features** section.

Copper diagnostics

- Copper diagnostics require IBM Director, in addition to BIOS (also Service Processor code)
 - Auto-detection: Detects and reports a correctly cabled multichassis configuration prior to boot for optimized performance.
 - Cable failover and redundancy: Minimizes single point of failure by supporting failover of a single cable to any remaining cable in the event of a cable pull or cable failure. System transitions all traffic to the remaining cable in many cases without requiring a reboot.

Remote I/O (RIO) sharing: Supported single RIO configurations include one RXE-100 Remote Expansion Enclosure shared between two x445 4-way, 8-way, or 16-way xSeries 445 servers. Both PCI-X 6-packs must be installed to support RIO sharing as each server will access six additional PCI-X slots.

XpandOnDemand scalability: xSeries 445 with RSAll-EXA servers are designed for complex applications needed for your business today. They feature XpandOnDemand scalability from Enterprise X-Architecture technology for future growth potential.

Features include:

- Massive I/O expansion with support for up to 24 PCI-X card slots:
 - Six Active PCI-X, full-length adapter card slots standard
 - Optional RXE-100 Remote Expansion Enclosure, supporting up to 12 more Active PCI-X slots in a single RXE-100 that can be shared with a second x445 server
- Up to 16-way SMP operations with powerful new Xeon MP processors
- 2 GB high-speed PC2100 DDR SDRAM ECC memory standard, supporting up to 64 GB of system memory per chassis
- Two hot-swap drive bays, supporting up to 292 GB of internal data storage (using two 146 GB Ultra320 hot-swap HDDs)
- Terabytes of external data storage, supporting optional EXP storage units, ServeRAID™ SCSI controllers, FASiT Fibre Channel controllers, and storage units

Systems management: xSeries 445 with RSAll-EXA servers feature IBM Director, a powerful, highly integrated systems management software solution built on industry standards and designed for ease of use.

IBM Director lets IT administrators view the hardware configuration of remote systems in detail and monitor the usage and performance of critical components such as processors, HDDs, and memory.

For details, refer to the **IBM Director** section.

With the Remote Supervisor Adapter II built into the xSeries 445 server, the IT administrator gains comprehensive, virtual on-site control of xSeries servers through the ability to remotely:

- Access the server in many cases without regard to its status
- Inventory and display detailed system and component information

- View server bootup during POST
- Browse and delete logs of events and errors
- Reset or power-cycle the server
- Run diagnostics, SCSI, RAID setup during POST
- Monitor and set threshold on server health including:
 - Operating system load
 - POST time-out
 - Temperature
- Set proactive alerts for critical server events including PFA on:
 - Processors
 - Xcel4 cache
 - Memory
 - Fans
 - Power supplies
 - HDDs
- Define automated actions such as:
 - Send an e-mail or page to an administrator
 - Execute a command or program
 - Pop-up an error message to the IBM Director console
- Flash BIOS

For details, refer to the **Remote Supervisor Adapter II** section in the **Additional information** section.

Datacenter Solution

The Datacenter Solution is ideal for high-availability applications. Single-node machines, as well as two-, three- and four-node clusters are supported. Additional options are tested to meet various customer application requirements. Datacenter configurations are custom solutions from IBM consisting of certified hardware components, software, and IBM services. Contact your IBM representative or IBM Business Partner for more information.

For details, refer to the **Datacenter Solutions** section in the **Additional information** section.

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Product positioning

The xSeries 445 with RSAII-EXA server is positioned as the flagship of xSeries IA-32 products. Its advanced function and up to 16-way SMP capability using high-performance Xeon MP processors of up to 3.0 GHz expand your choices for:

- Consolidating server applications such as:
 - Database
 - E-mail and collaboration
 - Customer applications
- Requiring an advanced platform for complex, mission-critical applications such as enterprise resource planning (ERP)
- Expanding e-business applications such as:
 - Customer relationship management (CRM)
 - Business intelligence

The xSeries 445 with RSAII-EXA server contains numerous Enterprise X-Architecture design points to significantly enhance performance and reliability, making it ideal for advanced, mission-critical applications.

Reference information

¹ GHz and MHz denote the internal and/or external clock speed of the microprocessor only, not application performance. Many factors affect application performance.

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http://www.ibm.com/servers/support/machine_warranties/

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IBM US Announcement Supplemental Information

March 2, 2004

Additional information

IBM Director

IBM Director lets IT administrators view the hardware configuration of remote systems in detail and monitor the usage and performance of critical components such as processors, HDDs, and memory. IBM Director can be extended with optional add-ons for advanced server management, deployment, and software distribution. All of these tools smoothly integrate into IBM Director for consistent look-and-feel and single point of management while taking advantage of IBM Director's monitoring, scheduling, alerting, event management, and group management capabilities.

- The IBM Director Server Plus Pack is a collection of five tools with predictive and autonomic capabilities that help deliver optimal server performance and high availability. The five tools include Capacity Manager, Software Rejuvenation, Active PCI Manager, System Availability, and Rack Manager.
- Application Workload Manager extends IBM Director to enable the control of how multiple applications use server resources and protects against unexpected resource contention.
- Remote Deployment Manager is an effective tool for the initial deployment phase of a system's life cycle with its ability to remotely send out complete software images for installation in a preboot environment.
- Software Distribution Premium Edition enables you to create and distribute software packages to systems on your network, saving travel and labor costs.

IBM Director also provides integration into leading workgroup and enterprise system management environments, via Upward Integration Modules. This enables the advanced management capabilities built into xSeries® servers to be accessed from:

- Tivoli® Enterprise and Tivoli NetView®
- Computer Associates CA Unicenter TNG Framework
- Microsoft™ SMS
- HP OpenView
- BMC Patrol
- NetIQ

The IBM RXE-100 Remote Expansion Enclosure

The IBM RXE-100 Remote Expansion Enclosure (86841RX) is a remote I/O drawer that attaches to Enterprise X-Architecture™ systems via a high-speed interconnect providing you with up to an additional 12 Active PCI-X slots for increased I/O capacity at a fraction of the system cost. A RXE-100 could also be shared between two x445 servers, giving each x445 an additional six PCI-X slots.

The Optional PCI-6 pack (31P5998) may be installed in the RXE-100 to support additional I/O. This enables you to add an additional six high-speed Active PCI-X slots to the RXE-100. It comes complete with a 9.5-in RS-485 cable.

xSeries 445 Two Chassis 16-way Configuration Kit (02R2013). This configuration option kit contains the requisite cables necessary to configure two x445 8-CPU servers into a single 16-processor configuration to support Microsoft Windows™ 2000 Datacenter Server, Windows Server 2003 Datacenter Edition, or VMware ESX Server 2.0. Before installing the cables and operating system, each of the x445 servers must have eight processors of the same type and clock and a minimum of 1 GB of memory in each SMP Expansion Module.

Feature and benefit: Four 2.5-meter copper-colored scalability cables

xSeries 445 SMP Expansion Module for Xeon MP Models (021870)

This optional SMP Expansion Module is installed on the x445 centerplane above the standard module. It is only compatible with the Intel™ Xeon MP models of the x445. This option must be used to upgrade to 8-way with the Intel Xeon MP 2.2 GHz, 2.7, or 3.0 GHz processors. Before installation, the standard SMP Expansion Module fully populated with four Intel Xeon processors MP of the same type and speed.

Features and benefits:

- Sockets for four additional Xeon MP Processors to support XpandOnDemand scalability
- 64 MB of Xcel4 Server Accelerator Cache powers higher performance through decreased latency
- Connectors for 16 DIMMs supporting an additional 32 GB of system memory for XpandOnDemand memory scalability
- Three SMP expansion ports to enable 8-way SMP up to 16-way in the future
- IBM XA-32 second-generation chipset powering the next-generation of break-through performance

xSeries 445 SMP Expansion Module with two Xeon 3.0 GHz CPUs for Xeon DP Models (021871). This optional SMP Expansion Module is installed on the x445 centerplane above the standard module. It is only compatible with the Intel Xeon DP models of the x445. This option includes two Intel Xeon 3.0 GHz processors standard. This is the option needed to upgrade the x445 from 2-way Xeon DP to 4-way Xeon DP, as there is no Intel Xeon DP option kit for the x445.

Features and benefits:

- Two Xeon 3.0 GHz processors pre-populated for ease of SMP expansion

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- 64 MB of XcelL4 Server Accelerator Cache powers higher performance through decreased latency
- Connectors for 16 DIMMs supporting an additional 32 GB of system memory for XpandOnDemand memory scalability
- Three SMP Expansion ports enabling 4-way SMP with the ability to upgrade to Xeon MP in the future for up to 16-way
- IBM XA-32 second-generation chipset powering the next-generation of break-through performance

High-availability and serviceability features

Many enterprise e-business environments run around the clock, supporting the need for continual access to information around the globe. These environments require servers that are ruggedly dependable and designed with features that can tolerate a component failure without total shutdown. xSeries 445 servers pack numerous fault-tolerant and high-availability features into a high-density, rack-optimized package that significantly reduces the space needed to support massive network computing operations.

Features:

- Advanced memory features:
 - Active Memory including support for hot-swap and hot-add memory, Memory Mirroring, Memory ProteXion, and third-generation Chipkill™ memory
 - Hot Memory Add
- Active PCI-X slots: Hot-add and hot-swap adapters in Windows 2000, Windows 2003, and NetWare environments.
- Two standard SCA-2 compliant, hot-swap HDD bays.
- ECC L3 cache processors on BX and 2X models help improve data integrity and helps reduce downtime.
- ECC L2 cache processors on 3EX and 4EX models help improve data integrity and helps reduce downtime.
- PFA on HDD options, memory, processors, XcelL4 cache, power supplies, and fans in conjunction with IBM Director alerts the system administrator of an imminent component failure.
- Scalable Systems Manager (SSM) with IBM Director enables the x445 server to be scaled up from 8-way to 16-way. RxEs resources can be assigned (shared or dedicated) to x445 servers using SSM. This tool also allows for verification of scalability cabling.
- Two 1200-watt, hot-swap redundant power supplies support n+1 redundancy in full configurations.
- Four hot-swap, multi-speed fans and up to 10 thermal sensors provide ample cooling, cooling redundancy, and enable individual fan replacement without powering down the server.
- Integrated Remote Supervisor Adapter, for Enterprise X-Architecture enabling diagnostic, reset, POST, high-speed graphics, and text redirect, internal floppy and CD, and auto recovery functions from remote locations and monitoring of temperature and fan speed, generates alerts when thresholds are exceeded.
- Information LED panel and innovative, front accessible pull-out, Light Path panel provide first-level diagnostics and second-level component diagnostics for easy diagnostics without removing the top cover.

- Easy top access to system board, adapter cards, processor, and memory.
- CPU failure recovery in SMP configurations allows a failed processor to be forced offline, the server rebooted, an alert generated, and continue operation with the working processors.

Enterprise X-Architecture technology

These 4 U rack-optimized scalable enterprise servers feature mainframe-inspired technologies that bring new levels of performance and reliability to Intel processor-based servers.

Features:

- XpandOnDemand scalability: Affordable, modular building blocks ready for 16-way processing.
- XcelL4 Server Accelerator cache: Up to 512 MB of high-speed system cache memory propels memory-to-processor performance to new levels.
- Active Memory: Rich memory reliability technology including support for hot-swap and hot-add memory, Chipkill, Memory ProteXion, and Memory mirroring.
- Remote I/O expansion: Triples the number of high-speed, PCI-X I/O expansion slots available to your configuration for investment protection and flexible growth.

Embracing on demand with performance and availability

The xSeries 445 embraces the future of on demand computing to help businesses become more responsive, adaptable, focused, and resilient as they respond to customer demands, market opportunities, and external challenges.

On demand business 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 helping lower IT costs.

- Choice of systems: Two SMP Intel Xeon MP processors at 2.2 or 2.7 GHz with full-speed 2 MB ECC L3 cache, 400 MHz quad-pumped front side bus, and new hyperthreading performance technology. Four SMP Intel Xeon MP processors at 3.0 GHz with full-speed 4 MB ECC L3 cache, 400 MHz quad-pumped front-side bus, and new hyperthreading performance technology.
- Two or four SMP Intel Xeon DP processors at 3.0 GHz with full-speed 512 KB L2 cache, 400 MHz quad-pumped front side bus, and new hyperthreading performance technology 2 GB of high-speed PC2100 DDR SDRAM memory; supporting two-way interleaving and 64 GB maximum.
- 64 MB of XcelL4 Server Accelerator cache per SMP Expansion Module; double that of the x440.
- Six full-length, 64-bit Active PCI-X slots: Two slots at 133 MHz, two slots at 100 MHz, two slots at 66 MHz.
- High-performance, integrated dual port 10/100/1000 Mbps Ethernet and dual channel Ultra320 SCSI (320 MB/s) controllers with integrated RAID-1 support.
- IBM XA-32 second generation chipset — higher performance through increased scalability and reduced latencies.

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.

- Support for three generations of Microsoft operating systems including Microsoft Windows Server 2003, Windows 2000, and Windows NT™ 4 Enterprise Edition.
- Support for the latest Enterprise Linux operating systems Red Hat Enterprise Linux AS and SuSE Linux Enterprise Server.
- Support for other high-performance, industry-standard operating systems including Novell NetWare and SCO UnixWare.

Virtualized — the x445 helps businesses adapt in today's dynamic e-business environment. It delivers pay-as-you-grow scalability, whether businesses scale up or scale out.

- 2-way up to 16-way XpandOnDemand Scalability for application and operating system optimization and investment protection.
- Innovative RXE port, supporting up to 12 additional 64-bit Active PCI-X slots with the optional RXE-100 Remote Expansion Enclosure.
- The x445 also supports the ability to share a RXE-100 with another x445 server for optimized rack-dense I/O.
- The x445 supports the latest VMware ESX Server 2.0 that introduces support for up to 2-way SMP within the virtual machine as well as support for greater than 64 virtual machines per configuration.
- As the industry's leading solution for scalable virtualization and server consolidation, the x445 combined with VMware delivers the dynamic resource allocation and logical partitioning demanded of today's 24 x 7 datacenter environment.

Autonomic — the x445 uses predictive and proactive service processor and systems management technology to deliver self-healing and self-protecting capabilities.

- Active Memory including support for hot-swap and hot-add memory, Memory Mirroring, Memory ProteXion, and third-generation Chipkill memory technologies
- Active PCI-X slots for hot-add and hot-swap adapters
- Hot-swap drive bays and redundant fans: Replace components without powering down the server
- Two hot-swap, redundant power supplies: Power and redundancy standard for full configurations (requires only two line cords)
- Predictive Failure Analysis® (PFA) on processors, Xcel4 cache, memory, fans, power supplies, and HDD options to warn of problems before they occur
- Integrated Remote Supervisor Adapter II-EXA to support out-of-band system management and remote POST, setup, high-speed graphics, and text redirect, internal floppy and CD, and diagnostics
- Innovative Light Path Diagnostics and top access design; easy to service and upgrade

Remote Supervisor Adapter II

The next-generation Remote Supervisor Adapter II adds accelerated graphics and delivers advanced control and monitoring features to manage your IBM eServer® xSeries server (selected models) at virtually any time, from virtually any place. This half-length, 32-bit PCI adapter enables easy console redirection with text and graphics, keyboard (operating system independent) and mouse (Win32 only) support over the system management LAN connections. With video compression now built into the adapter hardware, it is designed to redirect graphics up to five times faster than its IBM predecessor. It enables display of server activities from power on to full operation remotely, and allows remote user interaction at virtually any time. The embedded Web browser provides remote control from any standard Web browser. No additional software is required on the remote administrator's workstation. System management software is not required on the managed server for remote control. The Remote Supervisor Adapter II provides remote management and control of the system independent of the server status, in many cases even if the server is powered off or otherwise disabled.

Features and benefits

- Continuously monitors system environmentals (temperatures and voltages), operating system status, critical system components such as processors, VRMs, memory, fans, power supplies and power backplanes (where supported by the system)
- Video compression hardware is built in, eliminating drivers
- Up to five times faster graphics response than with IBM predecessor product makes monitoring and control more efficient
- System independent installation designed to eliminate need to install drivers, helping save IT staff time and reducing installation complexity
- Virtual CD and floppy designed to provide the user with the ability to configure and diagnose a server remotely without a visit from your IT staff
- RSAll supports SSL (Secure Socket Layer) and LDAP (3Q03 availability)
- Integrated with IBM Director and Director Agent
- Built in LAN and serial connectivity supports virtually any network infrastructure
- IBM Interconnect supports legacy servers and servers installed with the RSA I
- Supports more than five worldwide languages
- Multimode alerting warns system administrators of potential server problems over e-mail, pager, LAN, or SNMP

Datacenter Solutions

Hardware configurations: Typical Datacenter Solution configurations include an xSeries 445 server with:

- Eight Xeon MP processors
- 2 GB of system memory
- TotalStorage® FAST FC-2 Host Bus Adapter
- FAST900 Storage Server
- EXP700 storage units with choice of HDDs
- ServeRAID™ -6M Controller (256MB Cache)

- Two 36.4 GB 15K-rpm Ultra320 SCSI Hot-Swap SL HDDs

For a list of hardware configurations included with each ordering part number, supported options, and new configurations tested to enhance these solutions, visit:

<http://www.pc.ibm.com/ww/eserver/xseries/windows/datacenter.html>

Software: Each Datacenter Solution is preloaded with a choice of Windows 2000 or Windows 2003 Datacenter Server licensed for up to 16 processors.

Datacenter-related options

Preload kits for Microsoft Windows 2000 Datacenter are available to support 1 to 8 and 1 to 16-way SMP. Preload kits for Microsoft Windows Server 2003 Datacenter Edition are available to support 1 to 4, 1 to 8, and 1 to 16-way SMP. An appropriate kit with license entitlement to support the Datacenter configuration must be ordered as a part of the Datacenter Solution. By ordering the preload kit with your Datacenter xSeries 445 model, IBM will preload either Windows 2000 Datacenter Server or Windows Server 2003 Datacenter as ordered, at the factory before delivery. The preloaded software is tested with the configured server to facilitate deployment and installation.

These Preload Kits, Microsoft Windows 2000 Datacenter Server or Microsoft Windows Server 2003 Datacenter Edition, can also be ordered separately for installation on xSeries 445 configurations certified for the Datacenter Solution. Each Preload Kit is licensed for installation only on xSeries 445 servers. It is considered customer installable.

Each kit provides license entitlement for operation on the server with the number of processors specified. The kit includes installation guide, system documentation, and recovery CD-ROMs.

Preload Kit offerings

- Preload Kit for Microsoft Windows 2000 Datacenter (1 to 8 processor licenses) supports xSeries 445 installations with up to eight processor, or by purchasing two kits, can be used to upgrade an eight processor installation to 16-way.
- Preload Kit for Microsoft Windows 2000 Datacenter (1 to 16 processor licenses) supports xSeries 445 16-way models.
- Preload Kit for Microsoft Windows Server 2003 Datacenter (1 to 4 processor licenses) supports xSeries 445 installations with up to four processor, or by purchasing two, four, or eight kits, can be used to upgrade a four processor installation to 8- or 16-way respectively.
- Preload Kit for Microsoft Windows Server 2003 Datacenter (1 to 8 processor licenses) supports xSeries 445 installations with up to eight processor, or by purchasing two kits, can be used to upgrade an eight processor installation to 16-way.
- Preload Kit for Microsoft Windows Server 2003 Datacenter (1 to 16 processor licenses) supports xSeries 445 16-way models.

Note: Both Preload Kits, for Microsoft Windows 2000 Datacenter and Microsoft Windows Server 2003 Datacenter Edition, include five client access licenses (CALs). A CAL is required for each client attached to the Datacenter Server.

Software Update Subscriptions: Software Update Subscription for Microsoft Windows 2000 Datacenter (1 to 8-way or 1 to 16-way) (4816-ABX or 4816-ADX) and Software Update Subscription for Microsoft Windows Server 2003 Datacenter Edition (1 to 4, 1 to 8, or 1 to 16-way) (4816-CAX, 4816-CBX, or 4816-CDX) provides periodic updates to the Microsoft Windows Datacenter operating system, which you license for a period of one year.

This subscription also includes IBM updates to firmware and device drivers certified by Microsoft for use with the Datacenter Solution. IBM builds, tests, and provides the complete tested package of these components.

IBM provides program updates as they become available for a period of one year. A program update may contain a new version, release, supplements, or service packs as IBM determines, announced during the subscription term.

IBM does not guarantee that updates will be announced during the annual term. The subscription is sold on a per server basis for xSeries servers.

The Software Update Subscription for Microsoft Windows Datacenter should be purchased at the same time as your Datacenter Solution. If you purchase this subscription after your original Datacenter Solution purchase, you are entitled to only those software updates and upgrades for the 12 months, beginning from the date of your Datacenter server solution entitlement period.

Maintenance Update Subscriptions: Maintenance Update Subscription for Microsoft Windows Server 2003 Datacenter Edition (1 to 4, 1 to 8, or 1 to 16-way) (4816-DAX, 4816-DBX, or 4816-DDX) provides periodic updates to the Microsoft Windows Datacenter operating system, which you license for a period of one year. This subscription also includes IBM updates to firmware and device drivers certified by Microsoft for use with the Datacenter Solution.

IBM builds, tests, and provides the complete certified package of these components. IBM provides program updates as they become available for a period of one year.

A program update may contain supplements, or service packs as IBM determines, announced during the subscription term.

Maintenance Update Subscriptions do not contain updates for new versions or releases of the Microsoft Windows Datacenter operating system as provided with Software Update Subscriptions.

IBM does not guarantee that updates will be announced during the annual term. The subscription is sold on a per server basis for xSeries servers.

The Maintenance Update Subscription for Microsoft Windows Datacenter should be purchased at the same time as your Datacenter Solution. If you purchase this subscription after your original Datacenter Solution purchase, you are entitled to only those software updates and upgrades for the 12 months, beginning from the date of your Datacenter server solution entitlement period.

IBM will renew expiring subscriptions under the agreement terms in effect on that date, for an additional payment for an additional one year term if IBM or your IBM Business Partner receives one of the following:

- Your order to renew (as an example, order form, order letter, purchase order) not later than the last day of the current term.

- Your payment within 30 days of your receipt of the subscription invoice for the next term.

This subscription service is vital for running business-critical applications efficiently and is strongly recommended.

IBM Services

Solution Assurance Review

IBM and IBM Business Partners participating in the Datacenter Solution offerings can assist you with a solution assurance review following IBM guidelines.

MAPS Software Support — IBM provides cost-effective, quality software support for Datacenter with Microsoft Authorized Premier Support (MAPS). As the base software support offering for Datacenter, MAPS combines IBM and Microsoft world-class expertise to deliver superior product support, conveniently packaged in blocks of 10, 25, 50, and 100 incidents.

MAPS service consists of the following:

- Prompt and accurate problem resolution for Microsoft technologies with 24 x 7 telephone support every day of the year, including:
 - Usage and installation questions
 - Product compatibility and interoperability issues
 - Diagnostic information review
 - Specific configuration questions
 - Defect support
- An assigned IBM Technical Account Manager
- A Microsoft-designated support account manager
- Support coverage in blocks of 10, 25, 50, and 100 incidents (unlimited callers)
- Monthly status call and reports
- Escalation assistance with third-party support coordination
- Unlimited access to Microsoft Premier Online Web site, including solutions to common problems, product-critical problem alerts, and expert roundtables
- One-year subscription to Microsoft Technet Plus (server license); monthly CD kits with software fixes, drivers, and technical documentation

For additional information on MAPS, visit:

<http://www-1.ibm.com/services/its/us/drmklm10.html>

Advanced support — Highest level of remote support available through IBM with 24 x 7 coverage every day of the year. This service is tailored to meet your unique needs for continuous, business-critical system operation. In addition to MAPS, Advanced Support can provide:

- Unlimited incidents
- Single point of contact for hardware and software issues
- Enhanced response
- Proactive assistance
- Change management assistance
- Initial on-site visit
- Access to Microsoft's High Availability Resolution Queue (HARQ)
- Operational assessments

For additional information on Advanced Support, visit:

<http://www-1.ibm.com/services/its/us/mus89d1.html>

Custom Installation Services — Datacenter customers receive skilled, experienced technical resources to deliver installation services for Datacenter Solutions.

High Availability Services — Comprehensive, business-critical support services for xSeries server environments help improve availability and reduce the duration and impact of outages should they occur. IT consultants deliver these services in a phased approach that now includes availability guarantees in eligible xSeries environments.

- Availability readiness workshop
- Comprehensive availability assessment
- Develop and deliver a tailored packaged solution
- Service level agreement for an availability guarantee on eligible xSeries platform environments "Up to 99.99"

Operational Support Services — Electronic Systems Management for xSeries Servers — An IBM solution designed to reduce total cost of ownership in complex xSeries system managements environments. This service includes:

- Server Health Management: Remote problem response and resolution
- Server Service Level Management: Automated local and remote backup and restoration
- Server Accounting Management: Automated monitoring and asset tracking

For additional information on this offering, visit:

<http://www-1.ibm.com/services/its/us/ss-spelecnet.html>

Enterprise Services for Microsoft Technologies — Skilled Microsoft Certified Professionals deliver migration, assessment, planning, architecture, design, and deployment services to assist with the implementation of Datacenter and other Microsoft products.

Testing Services — Proof of concept, assessment, design, planning, and automated testing to help determine IT problem areas before system applications are launched. These services help create a scalable, stable, and reliable business environment.

Business Continuity and Recovery Services — Plan, design, and implement processes and solutions in preparation for potential business disruptions or disasters.

Note: Not all services listed are enabled for Business Partners. Services will vary by geography.

Publications

The following publications and CD-ROMs are shipped with the xSeries 445 with RSAIL-EXA.

- xSeries 445 with RSAIL-EXA Installation Guide contains an introduction to the computer, installation and setup, installing options, reference information, and problem determination. The installation guide has easy-to-use text and pictorials to enable users to quickly set up their xSeries 445 with RSAIL-EXA server.
- IBM Director system management software is included.

Note: Software versions, features, and functions shipped with these systems may change as new releases become available or may be discontinued at any time.

The *xSeries 445 with RSAll-EXA Installation Guide* and *Hardware Maintenance Manual*, in U.S. English versions, are available from:

<http://www.ibm.com/pc/support>

Services

Integrated technology services

IBM services include business consulting, outsourcing, hosting services, applications, and other technology management.

These services help you learn about, plan, install, manage, or optimize your IT infrastructure for e-business. They can help you integrate your high-speed networks, storage systems, application servers, wireless protocols, and an array of platforms, middleware, and communications software for IBM and many non-IBM offerings. IBM is your one-stop shop for IT support needs.

For more details on available services, contact your IBM representative, or visit:

<http://www.ibm.com/services/>

Your IBM representative can help you determine availability of standard and customized services.

For details on education offerings related to specific products, visit:

<http://www.ibm.com/services/learning/index.html>

Select your country, and then select the product as the category.

Technical information

Physical specifications

- Width: 483 mm (19.0 in)
- Depth: 713 mm (28.1 in)
- Height: 178 mm (7.0 in)
- Weight:
 - Minimum configuration: 39.90 kg (88 lb)
 - Maximum configuration: 54.30 kg (120 lb)

To ensure installability and serviceability in non-IBM industry standard racks, review the installation planning information for any product specific installation requirements.

xSeries 445 with RSAll-EXA

	8870-12X	8870-22X
Processor	Xeon MP	Xeon MP
Internal speed	2.2 GHz	2.7 GHz
External speed	400 MHz (QP)	400 MHz (QP)
Number standard	2	2
Maximum	16 ²	16 ²
L3 cache (full speed)	2 MB	2 MB
L4 cache	Xcel4	Xcel4
Standard	64 MB	64 MB
Maximum	256 MB ²	256 MB ²

8870-12X

	8870-12X	8870-22X
Memory (PC2100 DDR)	2 GB	2 GB
RDIMMs	4 x 512 MB	4 x 512 MB
DIMM sockets	32 ³	32 ³
Capacity	128 GB ²	128 GB ²
Video	SVGA	SVGA
Memory	8 MB	8 MB
SCSI controller	Ultra320	Ultra320
Channels	2	2
Connector internal	1	1
Connector external	1	1
HDD	0	0
Total bays	4	4
DVD-ROM	1	1
Diskette slim	1	1
Hot-swap	2	2
Internal capacity	292 GB ⁴	292 GB ⁴
Bays available	2	2
5.25-in slim	0	0
3.5-in slim	0	0
Hot-swap	2	2
PCI slots	6	6
64-bit/133 MHz	2	2
64-bit/100 MHz	2	2
64-bit/66 MHz	2	2
Slots available	6	6
RXE Port		
Standard	1	1
Maximum	2 ⁵	2 ⁵
RSAll mgmt proc	Standard	Standard
Dual Ethernet contr	10/100/ 1000 Mbps	10/100/ 1000 Mbps
DVD-ROM (EIDE)	8x	8x
Diskette drive	1.44 MB	1.44 MB
Power supply	1200 W	1200 W
Number standard	2	2
Hot-swap	Yes	Yes
Redundant power	Standard	Standard
Auto restart	Yes	Yes

² Maximum for 16-way requires installation of optional SMP Expansion Module and connection to second x445 chassis.

³ Requires installation of optional SMP Expansion Module.

⁴ Capacities are based on installation of two 146 GB slim-high, Ultra320 HDDs. For the latest information on supported HDD options, visit:

<http://www.ibm.com/pc/us/compat>

⁵ A second RXE Port is activated if an optional SMP Expansion Module is added.

xSeries 445 with RSAll-EXA

8870-42X

Processor	Xeon MP
Internal speed	3.0 GHz
External speed	400 MHz (QP)
Number standard	4
Maximum	16 ²
L3 cache (full speed)	4 MB
L4 cache	Xcel4
Standard	64 MB
Maximum	256 MB ²

	8870-42X		8870-3EX	8870-4EX
Memory (PC2100 DDR)	2 GB	Bays available	2	2
RDIMMs	4 x 512 MB	5.25-in slim	0	0
DIMM sockets	32 ³	3.5-in slim	0	0
Capacity	128 GB ²	Hot-swap	2	2
Video	SVGA	PCI slots	6	6
Memory	8 MB	64-bit/133 MHz	2	2
SCSI controller	Ultra320	64-bit/100 MHz	2	2
Channels	2	64-bit/66 MHz	2	2
Connector internal	1	Slots available	6	6
Connector external	1	RSAll mgmt proc	Standard	Standard
HDD	0	Dual Ethernet contr	10/100/ 1000 Mbps	10/100/ 1000 Mbps
Total bays	4	DVD-ROM (EIDE)	8x	8x
DVD-ROM	1	Diskette drive	1.44 MB	1.44 MB
Diskette slim	1	Power supply	1200 W	1200 W
Hot-swap	2	Number standard	2	2
Internal capacity	292 GB ⁴	Hot-swap	Yes	Yes
Bays available	2	Redundant power	Standard	Standard
5.25-in slim	0	Auto restart	Yes	Yes
3.5-in slim	0			
Hot-swap	2			
PCI slots	6			
64-bit/133 MHz	2			
64-bit/100 MHz	2			
64-bit/66 MHz	2			
Slots available	6			
RXE Port				
Standard	1			
Maximum	2 ⁵			
RSAll mgmt proc	Standard			
Dual Ethernet contr	10/100/ 1000 Mbps			
DVD-ROM (EIDE)	8x			
Diskette drive	1.44 MB			
Power supply	1200 W			
Number standard	2			
Hot-swap	Yes			
Redundant power	Standard			
Auto restart	Yes			

⁶ Requires installation of optional SMP Expansion Module, which includes two additional processors.

Datacenter models

			8870-1BX	8870-2BX
		Processor	Xeon MP	Xeon MP
		Internal speed	2.2 GHz	2.7 GHz
		External speed	400 MHz (QP)	400 MHz (QP)
		Number standard	2	2
		Maximum	16 ²	16 ²
		L3 cache (full speed)	2 MB	2 MB
		L4 cache	Xcel4	Xcel4
		Standard	64 MB	64 MB
		Maximum	256 MB ²	256 MB ²
		Memory (PC2100 DDR)	0 GB	0 GB
		RDIMMs	0	0
		DIMM sockets	32	32
		Capacity	128 GB ²	128 GB ²
		Video	SVGA	SVGA
		Memory	8 MB	8 MB
		SCSI controller	Ultra320	Ultra320
		Channels	2	2
		Connector internal	1	1
		Connector external	1	1
		HDD	0	0
		Total bays	4	4
		DVD-ROM	1	1
		Diskette slim	1	1
		Hot-swap	2	2
		Internal Capacity	292 GB ⁴	292 GB ⁴
		Bays available	2	2
		5.25-in slim	0	0
		3.5-in slim	0	0
		Hot-swap	2	2
		PCI slots	6	6
		64-bit/133 MHz	2	2
		64-bit/100 MHz	2	2
		64-bit/66 MHz	2	2
		Slots available	6	6
		RXE Port		
		Standard	1	1
		Maximum	2 ⁵	2 ⁵
		RSAll mgmt proc	Standard	Standard
		Dual Ethernet contr	10/100/ 1000 Mbps	10/100/ 1000 Mbps
		DVD-ROM (EIDE)	8x	8x
		Diskette drive	1.44 MB	1.44 MB

xSeries 445 with RSAll-EXA Xeon DP Models

	8870-3EX	8870-4EX
Processor	Xeon DP	Xeon DP
Internal speed	3.0 GHz	3.0 GHz
External speed	400 MHz (QP)	400 MHz (QP)
Number standard	2	4
Maximum	4 ⁶	4
L2 cache	512 KB	512 KB
L4 cache	Xcel4	Xcel4
Standard	64 MB	128 MB
Maximum	128 MB	128 MB
Memory (PC2100 DDR)	2 GB	2 GB
RDIMMs	4 x 512 MB	4 x 512 MB
DIMM sockets	32 ⁶	32
Capacity	64 GB ⁶	64 GB
Video	SVGA	SVGA
Memory	8 MB	8 MB
SCSI controller	Ultra320	Ultra320
Channels	2	2
Connector internal	1	1
Connector external	1	1
HDD	0	0
Total bays	4	4
DVD-ROM	1	1
Diskette slim	1	1
Hot-swap	2	2
Internal Capacity	292 GB ²	292 GB ²

	8870-1BX	8870-2BX
Power supply	1200 W	1200 W
Number standard	2	2
Hot-swap	Yes	Yes
Redundant power	Standard	Standard
Auto restart	Yes	Yes

Datacenter Solution

	8870-4BX
Processor	Xeon MP
Internal speed	3.0 GHz
External speed	400 MHz (QP)
Number standard	2
Maximum	16 ⁷
L3 cache (full speed)	4 MB
L4 cache	XceL4
Standard	64 MB
Maximum	256 MB ⁷
Memory (PC2100 DDR)	0 GB
RDIMMs	0
DIMM sockets	32
Capacity	128 GB ⁷
Video	SVGA
Memory	8 MB
SCSI controller	Ultra320
Channels	2
Connector internal	1
Connector external	1
HDD	0
Total bays	4
DVD-ROM	1
Diskette slim	1
Hot-swap	2
Internal capacity	292 GB ⁴
Bays available	2
5.25-in slim	0
3.5-in slim	0
Hot-swap	2
PCI slots	6
64-bit/133 MHz	2
64-bit/100 MHz	2
64-bit/66 MHz	2
Slots available	6
RXE Port	
Standard	1
Maximum	2 ⁵
RSAll mgmt proc	Standard
Dual Ethernet contr	10/100/ 1000 Mbps
DVD-ROM (EIDE)	8x
Diskette drive	1.44 MB
Power supply	1200 W
Number standard	2
Hot-swap	Yes
Redundant power	Standard
Auto restart	Yes

⁷ Requires connection to a second x445 chassis.

Note: Memory and HDDs will be configured in second level manufacturing prior to customer shipment.

8x DVD Ultrabay™ 2000 drive characteristics

- DVD-ROM speed: 8x maximum
- Drive interface type: EIDE
- Form factor: SL
- Storage capacity: 4.7 GB
- Buffer size: 512 KB
- Average access time: 100 ms
- Average data transfer rate: 7200 KBps

Dimensions

- Width: 483.0 mm (19.0 in)
- Depth: 713.0 mm (28.1 in)
- Height: 178.0 mm (7.00 in)
- Weight:
 - Minimum configuration: 39.9 kg (88 lb)
 - Maximum configuration: 54.2 kg (120 lb)

Electrical

- 100 to 127 (nominal) V ac; 50 Hz or 60 Hz; 9 A
- 200 to 240 (nominal) V ac; 50 Hz or 60 Hz; 7 A
- Input kilovolt-amperes (kVA) (approximately):
 - Minimum configuration: 0.521 kVA (two power supplies)
 - Maximum configuration: 1.05 kVA (two power supplies)
- Btu output:
 - Ship configuration: 1776 Btu/hr (521 watts)
 - Full configuration: 4090 Btu/hr (1200 watts)
- Noise Level horizontal position: 6.5 bels

Note: The noise emission level stated is the declared (upper limit) sound power level, in bels, for a random sample of machines. All measurements made in accordance with ISO 7779 and reported in conformance with ISO 9296.

xSeries 445 with RSAll-EXA servers are intended for use as rack-drawer servers and are tested and designed to operate in a horizontal position.

Standards: These systems support or comply with the following standards:

- Multiprocessor Specification (MPS) 2.0
- Hardware-enabled to meet the International Organization for Standardization (ISO) 9241, Part 3

The xSeries 445 with RSAll-EXA server is designed to the Peripheral Component Interconnect-X (PCI-X) specification 1.0A.

Equipment approvals and safety

- FCC — Verified to comply with Part 15 of the FCC Rules, Class A
 - Canada ICES-003, issue 3, Class A
 - UL 1950⁸
 - CSA C22.2 No. 950
 - NOM-019⁸
- ⁸ This server is certified by the respective UL and NOM agencies.

Operating environment

- Temperature:
 - 10.0° to 35.0°C (50° to 95°F) at 0 to 914 m (0 to 3,000 ft)
 - 10.0° to 32.0°C (50° to 90°F) at 914 to 2,133 m (3,000 to 7,000 ft)
- Relative humidity: 8% to 80%
- Maximum altitude: 2,133 m (7,000 ft)

Hardware requirements: For attended installation of an operating system, this server requires a compatible:

- Keyboard
- Mouse
- Display

Unattended or remote installation may be performed without requiring some or all of these components. Review your unattended software installation program information for specific hardware configuration requirements.

For service, the server requires a compatible:

- Keyboard
- Mouse
- Display

When having the unit serviced, plan to have these components attached to your server either directly or indirectly via a console switch.

Software requirements: The following network operating systems have been tested for compatibility with the xSeries 445 with RSAII-EXA server:

- Microsoft
 - Windows NT 4.0 Server Enterprise Edition: One SMP Expansion Module only; for example, 4-way Xeon MP or 2-way Xeon DP
 - Windows 2000 Advanced Server: Up to 8-way
 - Windows 2000 Server: Up to 4-way
 - Windows 2000 Datacenter: Up to 16-way
 - Windows Server 2003 Standard Edition: Up to 4-way
 - Windows Server 2003 Enterprise Server: Up to 8-way
 - Windows Server 2003 Datacenter Edition: Up to 16-way
- Novell:
 - NetWare 6.5: Up to 8-way

Customers must install NetWare 6.5 and then install the IBM device driver to be able to support the RSA-2.

- Linux
 - Red Hat Enterprise Linux AS 2.1: Up to 8-way
 - SUSE Linux Enterprise Server 8: Up to 8-way
- VMware
 - VMware ESX Server 2.0: Up to 16-CPU's

Note: For additional information on network operating system support, certification, and versions, visit:

<http://www.ibm.com/pc/us/compat>

Compatibility: The xSeries 445 with RSAII-EXA server contains licensed system programs that include set configuration, set features, and test programs. IBM system BIOS is loaded from a "flash" EEPROM into system memory. This BIOS provides instructions and interfaces designed to support the standard features of the xSeries 445 with RSAII-EXA server and to maintain compatibility with many current software programs.

For detailed information about IBM and non-IBM devices, adapters, software, and network operating systems supported with xSeries servers, visit:

<http://www.pc.ibm.com/us/compat>

Contact your IBM representative, IBM Business Partner, the Support Center, or refer to the IBM Sales Manual for information on the compatibility of hardware and software for xSeries servers. The Sales Manual is updated periodically as new features and options are announced that support these servers.

Limitations

- Standard xSeries 445 with RSAII-EXA models contain two or four processors. SMP upgrades must be performed as follows:
 - Processors must be of the same type and clock speed. Mixing processors of different speeds or cache sizes is not supported.
 - From two-way to four-way, upgrades to three-way are not supported at this time.
 - The standard SMP expansion module must be fully populated with four processors before installing either an xSeries 445 SMP Expansion Module or an xSeries 445 SMP Expansion Module with four Xeon MP processor options.
- The xSeries 445 with RSAII-EXA servers contain a standard SMP expansion module with 16 DIMM sockets. A maximum of 32 GB of system memory per SMP expansion module is supported by adding a 2 GB PC2100 DDR ECC SDRAM RDIMM in each of the 16 DIMM sockets. An optional xSeries 445 SMP Expansion Module can be installed to support additional processors and another 16 DIMM sockets for a total system memory capacity of 64 GB. All supported system memory is addressable through direct memory access.
- The xSeries 445 with RSAII-EXA uses 72-bit DDR SDRAM RDIMMs in sizes ranging from 512 MB to 2 GB. The system is shipped with 2 GB and can be expanded to 32 GB per SMP Expansion module using 16 x 2 GB DIMMs. xSeries 445 with RSAII-EXA memory is two-way interleaved, DIMMs must be added two at a time. Each group of two DIMMs must be the same memory size. Different groups can be 512 MB, 1 GB, or 2 GB DIMMs. Supported RDIMMs can coexist in the same server; however, due to two-way interleaving, memory RDIMMs of the same capacity must be installed in matched sets of two. Refer to the **Planning information** section or the xSeries server Web page for memory options.
- The two 1200-watt power supplies standard with xSeries 445 with RSAII-EXA produce the full 1200 watt power rating when connected to 220 V ac power sources. When connected to 110 V ac, they produce 600 watts of power for system use. This power may be insufficient to provide n+n redundancy in full configurations. For this reason, the xSeries 445 with RSAII-EXA server should be connected to 220-watt power sources.

The processor upgrades 2.2 GHz/2 MB (13N0723), 2.7 GHz/2 MB (13N0722) and the 3.0 GHz/4 MB (13N0721) are not supported on the following models:

- 8870-1RX
- 8870-2RX
- 8870-4RX
- 8870-3RY
- 8870-4RY
- 8870-1AX
- 8870-2AX
- 8870-4AX

Refer to the **Software requirements** section for operating system limitations.

Planning information

Customer responsibilities

xSeries 445 with RSAII-EXA and related options

The xSeries 445 with RSAII-EXA server and related options are designated as customer setup. Customer setup instructions are shipped with systems and options.

Configuration information

Bay configuration

The xSeries 445 with RSAII-EXA server contains four drive bays on the lower front side of the server. The bottom two side-by-side bays contain the standard DVD-ROM and 1.44 MB diskette drive. Two 3.5-inch, SCA-2 compliant, slim-high, hot-swap drive bays are located above these two bays.

The EIDE DVD-ROM is cabled directly to the IDE port. The two hot-swap bays are connected to the integrated Ultra320 SCSI controller through a 16-bit LVDS cable.

Internal SCSI cabling

An optional ServeRAID controller is supported for internal RAID applications beyond RAID-1. A separate 16-bit LVDS cable is included with the system to attach the hot-swap backplane to the ServeRAID controller. RAID Level 1 provides redundancy by writing all data to two or more drives. The performance of a level 1 array tends to be faster on reads and slower on writes compared to a single drive, but if either drive fails, no data is lost. This is a good entry-level redundant system, since only two drives are required; however, since one drive is used to store a duplicate of the data, the cost per megabyte is high. This level is commonly referred to as mirroring.

The Ultra320 SCSI controller contains a second channel that supports external SCSI devices. The controller is connected to an external, industry-standard, 0.8 mm very high density connector interface (VHDCI) through a 16-bit LVDS cable.

Memory support

The following memory options are supported:

- 512 MB PC2100 DDR ECC SDRAM RDIMM (33L5038)
- 1 GB PC2100 DDR ECC SDRAM RDIMM (33L5039)
- 2 GB PC2100 DDR ECC SDRAM RDIMM (33L5040)

Rack installations

xSeries 445 with RSAII-EXA 4 U, rack-optimized servers are designed to be installed in a 19-inch rack cabinet designed for 26-inch deep devices, such as the NetBAY42 ER, NetBAY42 SR, or NetBAY25 SR. Tower-like or mini-rack xSeries 445 with RSAII-EXA installations can be created with the NetBAY11 Standard Rack Cabinet.

If you use a non-IBM rack, the cabinet must meet the EIA™ -310-D standards with a depth of at least 0.72 meters (28 inches). Also, adequate space (approximately two inches for the front bezel and one inch) must be maintained from the slide assembly to the front door of the rack cabinet to allow sufficient space for the door to close and provide adequate air flow.

Power considerations

The xSeries 445 with RSAII-EXA includes two, standard 1200-watt, hot-swap, redundant power supplies. This provides sufficient power to support n+n redundancy for all configurations.

Cable orders: The 10/100/1000 Mbps full duplex, Dual Ethernet PCI controller, standard with xSeries 445 with RSAII-EXA, is connected directly to a RJ-45 connector. The RJ-45 connector provides a 10BaseT or 100/1000Base-TX interface for connecting twisted-pair cable to the Ethernet network. Cabling is not included with the server. To connect the Ethernet controller to a repeater or switch, use an unshielded twisted pair (UTP) cable with RJ-45 connectors at both ends. For 100/1000 Mbps operation, Category 5 cabling must be used. For 10 Mbps operation, Category 3, or better, cabling must be used.

There are no additional cabling requirements, other than for system power, keyboard, mouse, and monitor connections.

SMP Expansion Modules must be cabled together in installations that use greater than four Xeon MP processors or more than two Xeon DP processors.

Installability: The xSeries 445 with RSAII-EXA requires about 20 minutes for installation. Installation includes unpacking, setting up, and powering on the system. Additional time is required to install an operating system, additional adapters, or features.

Packaging

xSeries 445 with RSAII-EXA: One box

System Unit Carton

- System unit
- Rack components:
 - Slides and cable management arm
 - Two 9-foot 220 V intra-rack cables

Country Kit Carton

- Two line cords (220 V for wall outlet)
- xSeries 445 Installation Guide
- Safety booklet
- Serial port cable
- Rack install template
- IBM Director
- CD-ROM packages
- On/off switch cover

The xSeries 445 with RSAII-EXA system is shipped as a single package. The country kit carton is contained inside the top portion of the system unit carton.

Datacenter Solution: One box

System Unit Carton

- System unit
- Rack components:
 - Slides and cable management arm
 - Two 9-foot 220 V intrarack cables

Country Kit Carton

- Two line cords (220 V for wall outlet)
- xSeries 445 Installation Guide
- Safety booklet
- Serial port cable
- Rack install template

- IBM Director
- CD-ROM packages
- On/off switch cover

Datacenter Preload Kit Ship Group

- Datacenter Product Manual
- Product Manual DVD-ROM
- Recovery CD-ROM Pack

Related options

Processor upgrade option

- Xeon MP processor
- Heatsink
- VRM
- Safety instructions/warranty

xSeries 445 SMP Expansion Module

- Card assembly
- Card cover assembly
- Two 10-inch scalability cables
- Installation instructions/warranty

Security, auditability, and control

Security and auditability features include:

- Power-on and privileged access password functions provide controls of who has access to the data and server setup program on the server.
- Set unattended boot mode allows the system keyboard to be locked to all entries except the password and at the same time allows other computers on the network to access the system disk drive.
- Selectable boot sequence can be used to prevent unauthorized installation of software or removal of data from the diskette drive.

Limitations: The xSeries 445 with RSAll-EXA server has no security intrusion detection; therefore, it should be installed in a rack environment that provides security through lockable doors or other security measures. It is a customer's responsibility to ensure that the server is secure to protect sensitive data.

The customer is responsible for evaluation, selection, and implementation of security features, administrative procedures, and appropriate controls in application systems and communications facilities.

Terms and conditions

This product is available for purchase under the terms of the IBM Customer Agreement (ICA).

Each IBM machine is manufactured from parts that may be new or used. In some cases, a machine may not be new and may have been previously installed.

Regardless, IBM's appropriate warranty terms apply.

IBM Global Financing: Yes

xSeries 445 with RSAll-EXA and related options

To obtain copies of the IBM Statement of Limited Warranty, contact your reseller or IBM.

In the United States, call 800-IBM-SERV (426-7378), or write to:

Warranty Information
P.O. Box 12195
Research Triangle Park, NC 27709
Attn: Dept JDJA/B203

Warranty period

- System hardware — Three years
- Optional features — Three years

Warranty service: If required, IBM provides repair or exchange service depending on the type of warranty service specified for your computer. An IBM technician will attempt to resolve your problem over the telephone. You must follow IBM problem determination and resolution procedures. Scheduling of service depends on the time of your call and is subject to parts availability. Service levels are response time objectives and are not guaranteed. The specified level of warranty service may not be available in all worldwide locations. Additional charges may apply outside normal IBM service area. Contact your local IBM representative or your reseller for country and location-specific information.

Customer replaceable unit (CRU) service: If your problem can be resolved with a CRU (keyboard, mouse, speaker, memory, HDD, or other easily replaceable parts), IBM will ship CRU parts to you for your replacement. If IBM instructs you to return the replaced CRU, you are responsible for returning it to IBM in accordance with IBM's instructions. If you do not return the defective CRU, if IBM so instructs, within 30 days of your receipt of the replacement CRU, IBM may charge you for the replacement.

On-site service: IBM on-site repair (IOR), 9 hours per day, Monday through Friday excluding holidays, next-business-day (NBD) response. IBM will repair the failing computer at your location and verify its operation. You must provide a suitable working area to allow disassembly and reassembly of the computer. The area must be clean, well lit, and suitable for the purpose. On-site service is not available in all countries, and some countries have kilometer or mileage limitations from an IBM service center. In those locations where on-site service is not available, the normal in-county service delivery is used.

Optional features: Optional IBM features initially installed within a system carry the same warranty as the system. If installed after the initial system installation, they carry the balance of the system warranty or the optional feature warranty, whichever is greater.

Call IBM at 800-IBM-SERV (426-7378) to assist with problem isolation for hardware to determine if warranty service is required. Telephone support may be subject to additional charges, even during the limited warranty period.

International Warranty Service (IWS): IWS is available during the warranty period to customers who travel or relocate to countries where their computer is sold and serviced by IBM or IBM resellers authorized to perform warranty service. Eligible IBM computers are identified by their four-digit machine type.

You can obtain IWS through the method of service, such as CRU, depot, carry-in, or on-site, provided in the servicing country. Service methods and procedures vary by country, and some service or parts may not be available in all countries. Service centers in certain countries may not be able to service all models of a particular machine type. In addition, some countries may

have fees and restrictions that apply at the time of service.

To determine the eligibility of your computer and to view a list of countries where service is available, visit:

<http://www-3.ibm.com/pc/support/site.wss/warranty/warranty.vm>

For more information on IWS, refer to Services Announcement 601-034, dated September 25, 2001.

Licensing: Programs included with this product are licensed under the terms and conditions of the License Agreements that are shipped with the system.

Maintenance services — ServiceElect and ServiceSuite™

ServiceElect and ServiceSuite provide hardware warranty service upgrades, maintenance, and selected annuity support services in one agreement.

Warranty service upgrade: During the warranty period, warranty service upgrade provides an enhanced level of on-site service for an additional charge. A warranty service upgrade must be purchased during the warranty period and is for a fixed term (duration). It is not refundable or transferable and may not be prorated. If required, IBM will provide the warranty service upgrade enhanced level of on-site service that you acquired.

An IBM technician will attempt to resolve your problem over the telephone. You must follow IBM problem determination and resolution procedures. Scheduling of service depends on the time of your call and is subject to parts availability. If applicable, parts that are considered CRU are provided as part of the standard warranty CRU service. Service levels are response time objectives and are not guaranteed.

The following warranty service upgrade options are available:

- IOR, 9 hours per day, Monday through Friday excluding holidays, 4-hour average response. IBM will repair the failing computer at your location and verify its operation. You must provide a suitable working area to allow disassembly and reassembly of the computer. The area must be clean, well lit, and suitable for the purpose.
- IOR, 24 hours per day, 7 days a week, 4-hour average response
- IOR, 24 hours per day, 7 days a week, 2-hour average response

Maintenance service: If required, IBM provides repair or exchange service depending on the type of maintenance service specified for the computer. An IBM technician will attempt to resolve your problem over the telephone. You must follow IBM problem determination and resolution procedures. Scheduling of service depends on the time of your call and is subject to parts availability. Service levels are response time objectives and are not guaranteed.

CRU service: If your problem can be resolved with a CRU (keyboard, mouse, speaker, memory, HDD, or other easily replaceable parts), IBM will ship CRU parts to you for your replacement. If IBM instructs you to return the replaced CRU, you are responsible for returning it to IBM in accordance with IBM's instructions. If you do not return the defective CRU, if IBM so instructs, within 30 days of

your receipt of the replacement CRU, IBM may charge you for the replacement.

On-site service: IBM will repair the failing computer at your location and verify its operation. You must provide a suitable working area to allow disassembly and reassembly of the computer. The area must be clean, well lit, and suitable for the purpose.

The following options are available:

- IOR, 9 hours per day, Monday through Friday excluding holidays, NBD response
- IOR, 9 hours per day, Monday through Friday excluding holidays, 4-hour average response
- IOR, 24 hours per day, 7 days a week, 4-hour average response
- IOR, 24 hours per day, 7 days a week, 2-hour average response

Maintenance service (ICA)

Maintenance services are available for ICA legacy contracts. The preferred go-to-market offerings are ServiceElect. However, ICA legacy contracts will still be available for current customers until they are withdrawn.

Alternative service (warranty service upgrades): During the warranty period, warranty service upgrade provides an enhanced level of on-site service for an additional charge. A warranty service upgrade must be purchased during the warranty period and is for a fixed term (duration). It is not refundable or transferable and may not be prorated. If required, IBM will provide the warranty service upgrade enhanced level of on-site service that you acquired.

An IBM technician will attempt to resolve your problem over the telephone. You must follow IBM problem determination and resolution procedures. Scheduling of service depends on the time of your call and is subject to parts availability. If applicable, parts that are considered CRU are provided as part of the standard warranty CRU service. Service levels are response time objectives and are not guaranteed.

The following warranty service upgrade option is available.

IOR, 24 hours per day, 7 days a week, 4-hour average response. IBM will repair the failing computer at your location and verify its operation. You must provide a suitable working area to allow disassembly and reassembly of the computer. The area must be clean, well lit, and suitable for the purpose.

Maintenance service: If required, IBM provides repair or exchange service depending on the type of maintenance service specified for your computer. An IBM technician will attempt to resolve your problem over the telephone. You must follow IBM problem determination and resolution procedures. Scheduling of service depends on the time of your call and is subject to parts availability. Service levels are response time objectives and are not guaranteed.

CRU service: If your problem can be resolved with a CRU (keyboard, mouse, speaker, memory, HDD, or other easily replaceable parts), IBM will ship CRU parts to you for your replacement. If IBM instructs you to return the replaced CRU, you are responsible for returning it to IBM in accordance with IBM's instructions. If you do not return the defective CRU, if IBM so instructs, within 30 days of

your receipt of the replacement CRU, IBM may charge you for the replacement.

On-site service: IBM will repair the failing computer at your location and verify its operation. You must provide a suitable working area to allow disassembly and reassembly of the computer. The area must be clean, well lit, and suitable for the purpose.

The following on-site service options are available:

- IOR, 9 hours per day, Monday through Friday excluding holidays, NBD response
- IOR, 24 hours per day, 7 days a week, 4-hour average response

Non-IBM parts support

Warranty service: IBM is now shipping machines with selected non-IBM parts that contain an IBM field replaceable unit (FRU) part number label. These parts are to be serviced during the IBM machine warranty period. IBM is covering the service on these selected non-IBM parts as an accommodation to their customers, and normal warranty service procedures for the IBM machine apply.

Warranty service upgrades and maintenance services: Under certain conditions, IBM Integrated Technology Services repairs selected non-IBM parts at no additional charge for machines that are covered under a warranty service upgrade or maintenance services.

IBM Service provides hardware problem determination on non-IBM parts (adapter cards, PCMCIA cards, disk drives, memory, and so forth) installed within IBM systems covered under warranty service upgrade or maintenance services and provides the labor to replace the failing parts at no additional charge. If IBM has Technical Service Agreements with the manufacturers of the failing part, or if the failing part is an accommodations part (a part with an IBM FRU label), IBM may also source and replace the failing parts at no additional charge. For all other non-IBM parts, customers are responsible for sourcing the parts. Installation labor is provided at no additional charge, if the machine is covered under a warranty service upgrade or maintenance services.

IBM hourly service rate classification: One

ServicePac® offerings

Warranty and maintenance options: The announced products may be eligible for ServicePacs for warranty and maintenance options, convenient prepackaged offerings for warranty service upgrades and maintenance services.

Installation services: The announced products may be eligible for ServicePacs for installation services, convenient prepackaged offerings for installation services. Refer to the **Prices** section for information on the availability of ServicePac offerings.

For additional ServicePac information, visit:

<http://www-1.ibm.com/services/its/us/servicepac.html>

Field-installable features: Yes

Model conversions: No

Machine installation: Customer setup. Customers are responsible for installation according to the instructions IBM provides with the machine.

Graduated charges: No. This product does not contain licensed internal code or licensed machine code.

Prices

Xeon MP models

Description	Machine type/ model	Part number	IBM list price ⁹
xSeries 445 — Rack, 2 x 2.2 GHz/ 2 MB, 2 GB	8870-12X	887012X	\$18,599
xSeries 445 — Rack, 2 x 2.7 GHz/ 2 MB, 2 GB	8870-22X	887022X	20,399
xSeries 445 — Rack, 4 x 3.0 GHz/ 2 MB, 4 GB	8870-42X	887042X	40,799
xSeries 445 — Rack, 2 x 3.0 GHz/ 512 KB L2, 2 GB	8870-3EX	88703EX	16,799
xSeries 445 — Rack, 4 x 3.0 GHz/ 512 KB L2, 2 GB	8870-4EX	88704EX	25,049

Datacenter Solution¹⁰

Description	Part number	IBM list price ⁹
xSeries 2.2 GHz 2 MB L3 Cache Upgrade with Xeon Processor MP	13N0723	\$2,099
xSeries 2.7 GHz 2 MB L3 Cache Upgrade with Xeon Processor MP	13N0722	3,499
xSeries 3.0 GHz 4 MB L3 Cache Upgrade with Xeon Processor MP	13N0721	6,599

Description	Part number	IBM list price ⁹
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Package quantity: 1

IBM Preload Kit for Microsoft Windows 2000 Datacenter Edition, 1 to 8 processors	48166BU	\$27,279
IBM Preload Kit for Microsoft Windows 2000 Datacenter Edition, 1 to 16 processors	48166DU	54,555
IBM Preload Kit for Microsoft Windows Server 2003 Datacenter Edition, 1 to 4 processors	48167AU	13,659
IBM Preload Kit for Microsoft Windows Server 2003 Datacenter Edition, 1 to 8 processors	48167BU	54,555
IBM Preload Kit for Microsoft Windows Server 2003 Datacenter Edition, 1 to 16 processors	48167DU	18,599

⁹ IBM list price does not include tax or shipping and is subject to change without notice. Reseller prices may vary.

¹⁰ Contact your IBM representative or IBM telesales at 866-CLUSTER (258-7837) for complete configuration and services pricing.

ServicePac for warranty and maintenance

Description	Part number
1-year MA IOR 9 x 5 NBD average response	96P2679
1-year MA IOR 9 x 5 4-hour average response	96P2680
1-year MA IOR 24 X 7 4-hour average response	96P2681
1-year MA IOR 24 x 7 2-hour average response	96P2682
2-year MA IOR 9 x 5 NBD average response	96P2683
2-year MA IOR 9 x 5 4-hour average response	96P2684
2-year MA IOR 24 X 7 4-hour average response	96P2685
2-year MA IOR 24 x 7 2-hour average response	96P2686
3-year IOR 9 x 5 4-hour average response	96P2687
3-year IOR 24 x 7 4-hour average response	96P2688
3-year IOR 24 x 7 2-hour average response	96P2689
4-year IOR 9 x 5 NBD average response	96P2690
4-year IOR 9 x 5 4-hour average response	96P2691
4-year IOR 24 x 7 4-hour average response	96P2692
4-year IOR 24 x 7 2-hour average response	96P2693
5-year IOR 9 x 5 NBD average response	96P2694
5-year IOR 9 x 5 4-hour response	96P2695
5-year IOR 24 x 7 4-hour response	96P2696
5-year IOR 24 x 7 2-hour response	96P2697

Maintenance service charges (ICA)

Alternative service (warranty service upgrades)

**IOR
24 x 7**

\$3,390

Annual maintenance service

IOR	IOR
9 x 5	24 x 7

\$2,743	\$4,115
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For ServiceElect (ESA) Maintenance Service Charges, contact IBM Global Services at 888-IBM-4343 (426-4343).

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<http://www.ibm.com/financing>

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