

A rock-solid, performance server for your most demanding applications



## Product Guide

February 2011

# IBM System x3500 M3

## Product Overview

The ultimate balance of performance, availability, security, and powerful yet easy management

**Suggested uses:** Workgroups of medium-to-large corporations; remote offices; fast growing small businesses.

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In a distributed computing environment, servers are spread across many locations; therefore, as limited resources challenge IT management, high availability is crucial. The **dual-socket IBM® System x3500 M3**, incorporating **IBM X-Architecture™** features, delivers the superior power and availability needed by small businesses and those with branch or remote locations. The x3500 M3 supports the latest **6-core** and **4-core** Intel® **Xeon™** 5600 series processors, designed with up to a leading-edge **1333MHz** memory access speed and **12MB** of L3 cache, to help provide you with the computing power you need to match your business needs and growth. In addition, the x3500 M3 uses industry-standard **registered DDR-3** memory with **Chipkill™ ECC** (Error Checking and Correcting) protection—for high performance, energy savings, and reliability. For even higher levels of availability, the x3500 M3 also offers **memory mirroring**. A **dual-port** integrated high-speed **Gigabit Ethernet** controller is standard (including TOE, RDMA, and iSCSI support), as are high-performance PCIe adapter slots and a legacy PCI slot to support legacy expansion cards.

All models offer impressive scalability, including dual-processor support and up to **192GB** of memory. Base models support **8** high-performance **2.5-inch hot-swap** Serial-Attach SCSI (**SAS**) HDDs with a maximum internal storage capacity of up to **4.8TB**, or **2.5-inch hot-swap** Serial ATA II (**SATA II**) HDDs with a maximum internal capacity of up to **4TB**. Optional upgrade kits are available to boost the storage to **16** or **24 2.5-inch hot-swap SAS/SATA** HDDs for up to **9.6TB** or **14.4TB (SAS)** or **8TB** or **12TB (SATA)** of internal storage capacity (respectively). Models with **16** or **24** drive bays *standard* are available via configure-to-order (CTO). For even more internal storage capacity, models supporting **8 3.5-inch hot-swap** or **simple-swap SATA** (**16TB** max.) or **hot-swap SAS** (**16TB** max.) drives are available via CTO.

For additional performance and high availability, all x3500 M3 models include an **IBM ServeRAID®** controller *standard*, providing hardware **RAID** support. Controllers supplied standard include the **ServeRAID-M1015**, **ServeRAID-M5014**, or **ServeRAID-M5015** (server-dependent). The high-end **ServeRAID-M5025** is also available as an option.

The x3500 M3 ships as a tower unit, or a tower-to-rack option can be ordered to help save precious data center floor space; CTO models can be ordered as a **5U** rack-mounted server.

Standard in the x3500 M3 is an **Integrated Management Module (IMM)** that enables users to manage and control the server easily—both locally and remotely. Unified Extensible Firmware Interface (**UEFI**) is an evolutionary leap over legacy BIOS. This high level of manageability is designed to keep costs down and the system up—even when network usage increases. The built-in, **externally viewable light path diagnostics panel** enables quick servicing of the system if a problem develops. These advanced features help maximize network availability by increasing uptime, as do **hot-swap/redundant HDDs**, **power** and **fans**; **Active Memory™**; integrated **RAID**; **temperature-controlled fans** with **Calibrated Vectored Cooling™**; industry-standard **IPMI 2.0** support, including **highly secure remote power control** and **Serial over LAN**; as well as **text-console redirect over LAN**.

With the inclusion of unique IBM service and support features such as **light path diagnostics**, **IBM Systems Director**, **IBM ServerGuide™** and the IMM, the x3500 M3 is equally well designed for a locally managed data center environment as for a remotely managed or stand-alone environment, while offering maximum availability.

For a balance of high-performance six-core, dual-socket processing, high availability and vast internal storage, the x3500 M3 is the ideal system.

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## Selling Features

## Price/Performance

The x3500 M3 offers numerous features to help boost performance and reduce product and operating costs:

- Up to **two 6-core** Xeon 5600 or 5500 series processors and **12MB** of shared cache per processor, offer superior performance capable of tackling the toughest jobs. **64-bit extensions** provide the flexibility to run 32-bit and 64-bit applications concurrently. Xeon 5600 series processors offer up to **40%** better performance than the previous-generation 5500 series processors and up to **900%** better performance than the single-core processors of a few years ago that you may still be using.
- **Sixteen** DIMMs of ultra-fast registered **1333MHz** (or **1066MHz**) **DDR3** ECC memory with optional **Chipkill**<sup>1</sup> protection provides speed, high availability, and a memory capacity of up to **192GB**.
- **Five high-speed PCIe Gen 2 adapter slots** (plus a 6<sup>th</sup> PCIe Gen 1 slot) offer investment protection by supporting high-performance adapters, such as 10Gb Ethernet, Fibre Channel and InfiniBand™ cards, none of which will run in older conventional PCI slots. A legacy PCI/33 adapter slot offers support for older adapters.
- The integrated **6Gbps ServeRAID-M1015** controller (model-specific) provides **RAID-0/1/10** (upgradeable to **RAID-5** with **Self-Encrypting Disk**, or **SED**, for greater data protection) standard for SAS/SATA drives. Other server models include the **6Gbps ServeRAID-M5014** controller, which provides **RAID-0/1/10/5/50** standard (upgradeable to **256MB** of battery-backed cache and **RAID-6/60** with **SED**), or the integrated **6Gbps ServeRAID-M5015** controller, which provides **RAID-0/1/10/5/50** and **512MB** of battery-backed cache standard (upgradeable to **RAID-6/60** and **SED**) without consuming a valuable adapter slot.. All models can be upgraded to the **ServeRAID-5025**.
- Up to **24 2.5-inch hot-swap SAS** hard disk drives offer high-performance with high availability. The SAS controller provides full-duplex **6Gbps** data transfers for SAS drives. Support for **8** high-capacity **3.5-inch hot-swap SAS/SATA** hard disk drives is available via CTO.
- The integrated **dual-port Gigabit Ethernet** controller with **IPMI 2.0** support provides high-speed network communications, as well as **TOE**, **RDMA**, and **iSCSI** support to offload work from the system processor. (Note: iSCSI/RDMA support requires an optional license key.)
- A **high degree of device integration**, including SAS, RAID, IMM, dual Gigabit Ethernet, systems management, embedded hypervisor, and video, helps to lower costs and frees up valuable adapter slots.
- Energy-efficient components, including low-voltage transistors and voltage regulator modules, and power supplies that are up to **90%** efficient, help keep your energy bills down.

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## Flexibility

The x3500 M3 has the ability to grow with your application requirements, thanks to:

- A choice of **six-core** or **four-core** processors at **1.6GHz** to **3.6GHz** clock rates, up to **6.4 gigatransfers per second**, and **40W** to **130W** maximum power draw.
- Up to **192GB** of high-speed registered **DDR3** system memory.
- **Six available high-performance PCIe** adapter slots and one **legacy PCI** slot in all models. Optionally, a riser card supporting two **PCI-X/133** adapters can be exchanged for the PCIe Gen 1 slot.
- The x3500 M3 supports both the new **6Gbps RAID** technology and the previous generation 3Gbps RAID controllers. With the new **ServeRAID-M1015**, the x3500 M3 offers **RAID-0/1/10**, standard (**RAID-5** with upgrade). The **ServeRAID-M5014** offers **RAID-0/1/10/1E/5/50** with **256MB** of cache, upgradeable to battery backup. The **ServeRAID-M5015** offers the same RAID levels, but with **512MB** of battery-backed cache standard. They can both be upgraded to **RAID 6/60** with Self Encrypting Disk.
- The **eight USB 2.0** ports (six external, two internal) are up to **40X** faster<sup>2</sup> than older **USB 1.1** ports. This provides speedy access to external HDDs (non-arrayed), floppy drives, flash drives, optical drives, tape drives, and other USB devices. Two ports are on the front of the unit and four are on the back.
- Support for up to **24** internal **2.5-inch HDDs**, and **1 half- high tape** or **optical drive** offer tremendous internal storage capability and full data backup. (16 internal 2.5-inch HDDs maximum with 1 half-high tape drive.) Standard models offer **8** 2.5-inch HDDs with a maximum of **4.8TB** of **hot-swap 2.5-inch SAS** or **4TB** of **hot-swap 2.5-inch SATA**. Up to **14.4TB** of internal **2.5-inch hot-swap SAS** or **12TB** of **hot- or simple-swap SATA** storage is supported via optional storage options and CTO models. Alternatively, some models support up to **4 3.5-inch hot-swap SAS** drives or up to **4 3.5-inch hot- or simple-swap SATA** drives, all with a maximum

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<sup>1</sup> All models require Chipkill-enabled DIMMs (provided standard) for Chipkill protection.

<sup>2</sup> Data transfer rates may be less than the maximum possible.

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capacity of **8TB**.

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## Manageability

Powerful systems management features simplify local and remote management of the x3500 M3:

- **UEFI** — The Unified Extensible Firmware Interface is the next generation of BIOS, providing greater manageability and function. Used in PCs for several years, it is now moving into the server arena. IBM is the first to incorporate UEFI in our new servers. Features include:
  - Human readable event logs — no more beep codes
  - Complete out-of-band coverage by the Advance Settings Utility to simplify remote setup
  - A complete setup solution, allowing adapter configuration functions to be moved into UEFI
  - Consistent firmware management across an entire product line
- The x3500 M3 includes the **IMM** to monitor server availability, perform Predictive Failure Analysis, etc., and trigger IBM Systems Director alerts. The IMM enables service personnel to use sophisticated diagnostic tools, such as light path diagnostics, to resolve problems quickly.
- Integrated **IPMI 2.0** support alerts IBM Systems Director to anomalous environmental factors, such as voltage and thermal conditions. It also supports **highly secure remote power control** using data encryption.
- **Text Console Redirection** support allows the administrator to remotely view x3500 M3 text messages over Serial or LAN.
- Integrated **Trusted Platform Module (TPM) 1.2** support.
- The completely redesigned **IBM Systems Director** is included for proactive systems management. IBM Systems Director comes with a portfolio of tools, including *Active Energy Manager*, and *Service and Support Manager*. In addition, IBM Systems Director offers extended systems management tools for additional server management and increased availability. When a problem is encountered, IBM Systems Director can issue administrator alerts via e-mail, pager, and other methods.
- **IBM Systems Director Active Energy Manager™**, an IBM-exclusive, is designed to take advantage of new system power management features, by providing power monitoring and power capping features.
- The IMM provides remote presence without consuming a valuable adapter slot.

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## Availability and Serviceability

The x3500 M3 provides many features to simplify serviceability and increase system uptime:

- x3500 M3 servers offer optional **Chipkill** ECC memory protection<sup>3</sup> (when using x4 DIMMs). Chipkill memory is up to **16X** better than standard ECC memory at correcting memory errors. This can help reduce downtime caused by memory errors.
- The x3500 M3 offers **memory mirroring** for redundancy in the event of a non-correctable memory failure
- **Toolless cover removal** provides easy access to upgrades and serviceable parts. Similarly the **ServeRAID** controllers can be installed and replaced without tools. This means less time (and therefore less money) spent servicing the x3500 M3. Additionally, **hot-swap/redundant HDDs, fans and power supplies**, as well as **online mirrored** memory, mean greater system uptime while these components are being serviced.
- **Environmental monitoring** with fan speed control for temperature, voltages, fan failure, power supply failure, and power backplane failure.
- The **externally visible light path diagnostics panel** and individual light path LEDs quickly lead the technician to failed (or failing) components. This simplifies servicing, speeds up problem resolution and helps improve network availability.
- **IPMI 2.0** supports highly secure remote system power control using data encryption. This allows an administrator to restart a server without having to visit it in person, saving travel time and getting the server back up and running quickly and securely. It also adds new features to those provided by IPMI 1.5, including **VLAN** support, **Serial over LAN**, enhanced authentication and encryption algorithms (**RMCP+** and **AES**) and a **firmware firewall**.
- **Temperature-controlled fans** adjust to compensate for changing thermal characteristics. At the lower speeds they draw less power and suffer less wear. Equally important in a crowded data center, temperature-controlled fans produce less ambient noise in the data center than if they were constantly running at full speed.
- The **three-year (parts and labor) limited onsite warranty**<sup>4</sup> helps afford you peace of mind and greater investment protection than a one-year warranty does.

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<sup>3</sup> Chipkill protection is supported with x4 DDR-3 DIMMs, but not x8 DIMMs.

## Key Features

## High-Performance Xeon Processors

The x3500 M3 supports up to two high-performance Intel Xeon **5600** or **5500** Series processors, allowing you to upgrade to a second processor as business needs require. The x3500 M3 offers a choice of processor clock rates, memory access speeds and power draw:

- **130W 6-core** Xeon **5600** series processor model **X5690** or **X5680** at 3.46 or 3.33GHz (respectively), running at **6.4GTps** (gigatransfers/second) with **12MB** of L3 processor cache, **1333MHz** memory access, and Intel Turbo Boost technology and Hyper Threading Technology
- **95W 6-core** Xeon **5600** series processor models **X5675**, **X5670** or **X5650** at 3.06, 2.93 or 2.66GHz (respectively), running at **6.4GTps** with **12MB** of L3 processor cache, **1333MHz** memory access, 2 threads per core, and Intel Turbo Boost technology and Hyper Threading Technology
- **80W 6-core** Xeon **5600** series processor models **E5649** or **E5645** at 2.53 or 2.4GHz (respectively), running at **5.86GTps** with **12MB** of L3 processor cache, **1333MHz** memory access, and Intel Turbo Boost technology and Hyper Threading Technology
- **80W 4-core** Xeon **5600** Series processor models **E5640**, **E5630**, or **E5520** at 2.66, 2.53, or 2.40GHz (respectively), running at **5.86GTps** with **12MB** of L3 processor cache, **1066MHz** memory access, and Intel Turbo Boost technology and Hyper Threading Technology
- **80W 4-core** Xeon **5600** series processor model **E5606** at 2.13GHz, running at **4.8GTps** with **8MB** of L3 processor cache, and **1066MHz** memory access.
- **80W 4-core** Xeon 5500 series processor model **E5506** at 2.13GHz running at **4.8GTps** with **4MB** of L3 processor cache, and **800MHz** memory access

Other Xeon 5600 and 5500 series processor are supported via CTO, including:

- **130W 4-core** Xeon **5600** series processor models **X5687** or **X5677** at 3.60 or 3.46GHz (respectively) running **6.4GTps** with **12MB** of L3 processor cache, **1333MHz** memory access, and Intel Turbo Boost technology and Hyper Threading Technology
- **95W 6-core** Xeon **5600** series processor model **X5660** at 2.8GHz running at **6.4GTps** with **12MB** of L3 processor cache, **1333MHz** memory access, and Intel Turbo Boost technology and Hyper Threading Technology
- **130W 4-core** Xeon **5600** series processor model **X5647** at 2.93GHz running at **5.8GTps** with **12MB** of L3 processor cache, **1066MHz** memory access, and Intel Turbo Boost technology and Hyper Threading Technology
- **60W 6-core** Xeon **5600** series processor model **L5640** at 2.26GHz, running at **5.86GTps** with **12MB** of L3 processor cache, **1333MHz** memory access, and Intel Turbo Boost technology and Hyper Threading Technology
- **40W 4-core** Xeon **5600** series processor model **L5630** at 2.26GHz running at **5.86GTps** with **12MB** of L3 processor cache, **1066MHz** memory access, and Intel Turbo Boost technology and Hyper Threading Technology
- **40W 4-core** Xeon **5600** series processor model **L5609** at 1.86GHz running at **4.8GTps** with **12MB** of L3 processor cache, and **1066MHz** memory access
- **80W 4-core** Xeon **5600** series processor models **E5607** or **E5603** at 2.26 or 1.60Ghz (respectively) running at **4.8GTps** with 8MB or 4MB of L3 processor cache, and **1066MHz** memory access
- **80W 4-core** Xeon 5500 series processor model **E5507** at 2.26GHz running at **4.8GTps** with **4MB** of L3 processor cache, and **800MHz** memory access

With the Xeon 5500 and 5600 series processors, Intel has diverged from its traditional Symmetric Multiprocessing (SMP) architecture to a Non-Uniform Memory Access (NUMA) architecture. The Xeon 5600 processors are connected through a serial coherency link called QuickPath Interconnect (QPI). QPI is capable of 6.4, 5.6 or 4.8 GTps (gigatransfers per second), depending on the processor model.

**Six-core Xeon** processors contain **six complete processor cores**. Processors contain one **shared 12MB** L3 cache. The cache is dynamically allocated between the cores as needed. The multiple cores appear to software as multiple physical processors. Six-core processors offer considerably higher performance than a same-speed Xeon processor with four cores or two cores.

**Turbo Boost Technology** increases performance by translating the temperature, power and current head room into higher frequency. It will dynamically increase by 133MHz for short and regular intervals until the upper limit is met or the maximum possible upside for the number of active cores is reached. The maximum frequency is dependent on the number of active cores. The

<sup>4</sup> For terms and conditions or copies of the IBM Statement of Limited Warranty, call 800-772-2227 in the U.S. In Canada call 800-426-2255. Telephone support may be subject to additional charges. For warranties including onsite labor, a technician is sent after IBM attempts to resolve the problem remotely. International warranty service is available in any country in which this product is sold.

amount of time the processor spends in the Turbo Boost Technology state depends on the workload and operating environment, providing the performance you need, when and where you need it. For example, a **3.33GHz six-core X5680** processor with **3-6** cores active can run the cores at **3.46GHz**. With only **one** or **two** cores active, the same processor can run those cores at **3.6GHz**. Similarly, a **3.46GHz four-core X5677** processor can run at **3.6GHz** or even **3.73GHz**. When the inactive cores are needed again, they are dynamically turned back on and the processor frequency is adjusted accordingly.

**Intelligent Power Capability** powers individual processor elements on and off as needed, to reduce power draw.

**Execute Disable Bit** functionality can help prevent certain classes of malicious buffer overflow attacks when combined with a supporting operating system.

Intel's **Virtualization Technology (VT)** integrates hardware-level virtualization hooks that allow operating system vendors to better utilize the hardware for virtualization workloads.

## DDR-3 Registered Memory with Chipkill ECC Protection

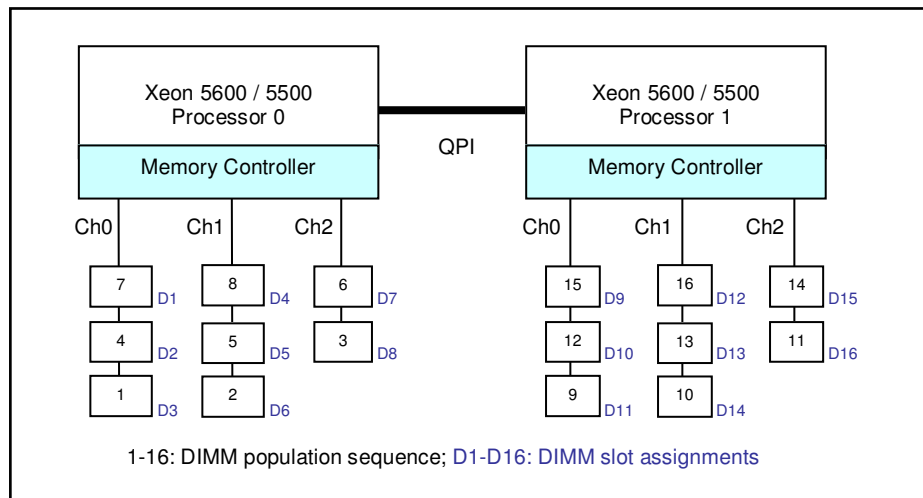
The x3500 M3 ships with registered double data rate III (DDR-3) memory and provides Active Memory features, including advanced **Chipkill** memory protection (optionally), for **up to 16X** better error correction than standard ECC memory. In addition to offering better performance than DDR-2 or fully-buffered memory, DDR-3 memory also uses less energy. DDR-2 memory already offered up to 37% lower energy use than fully buffered memory. Now, a generation later, DDR-3 memory is even more efficient, using **22% less energy** than DDR-2 memory.

The x3500 M3 supports up to **192GB** of memory with **16** DIMM slots. Redesign in the architecture of the Xeon 5500 and 5600 series processors bring radical changes in the way memory works in these servers. For example, the Xeon 5500/5600 series processors **integrate the memory controller inside the processor**, resulting in two memory controllers in a 2-socket system. Each memory controller has three memory channels. Depending on the type of memory, population of memory, and processor model, the memory may be clocked at **1333MHz**, **1066MHz** or **800MHz**.

**Note:** If only one processor is installed, only the first eight DIMM slots can be used. Adding a second processor not only doubles the amount of memory available for use, but also doubles the number of memory controllers, thus doubling the system memory bandwidth. If you add a second processor, but no additional memory for the second processor, the second processor has to access the memory from the first processor "remotely," resulting in longer latencies and lower performance. The latency to access remote memory is almost **75% higher** than local memory access. So, the goal should be to always populate both processors with memory.

The **X56xx**, **L5640**, and **E5645** or above processors support up to **1333MHz** memory clock speed, while the **E560x**, **E5620/E5630**, **L5609/L5630**, and **E556x**-and-up models support up to **1066MHz** clock speed, while the **E550x** models support **800MHz** clock speed. Using 1333MHz memory (where supported) versus 1066MHz offers up to **9%** better performance, while 1066MHz memory produces up to **28%** better performance than 800MHz memory.

Xeon 5600/5500 series processors access memory with almost **50% lower latency** than the previous generation 5400 series processors. That can result in faster processing of latency-sensitive workloads.



This new processor design comes with some trade-offs in memory capacity, performance, and cost: For example, **greater memory capacity** comes with **lower memory speed**. Alternatively, it is possible to achieve the **same memory capacity at lower cost** but **at a lower memory speed**.



Regardless of memory *speed*, the Xeon 5600/5500 platform represents a significant improvement in memory *bandwidth* over the previous Xeon 5400 platform. At 1333MHz, the improvement is almost **500%** over the previous generation. This huge improvement is mainly due to the dual integrated memory controllers and faster DDR-3 1333MHz memory. Throughput at 800MHz is **25 gigabytes per second** (GBps); at 1066MHz it's **32GBps**; and at 1333MHz it's **35GBps**. This improvement translates into improved application performance and scalability.

Memory interleaving refers to how physical memory is interleaved across the physical DIMMs. A balanced system provides the best interleaving. A Xeon 5600/5500 processor-based system is balanced when all memory channels on a socket have the same amount of memory.

A memory rank is simply a segment of memory that is addressed by a specific address bit. DIMMs typically have 1, 2 or 4 memory ranks, as indicated by their size designation.

- A typical memory DIMM description is 2GB 4Rx8 DIMM
- The 4R designator is the rank count for this particular DIMM (R for rank = 4)
- The x8 designator is the data width of the rank

It is important to ensure that DIMMs with appropriate number of ranks are populated in each channel for optimal performance. Whenever possible, **it is recommended to use dual-rank DIMMs** in the system. Dual-rank DIMMs offer better interleaving and hence better performance than single-rank DIMMs. For instance, a system populated with six 2GB *dual-rank* DIMMs outperforms a system populated with six 2GB *single-rank* DIMMs by **7%** for SPECjbb2005. Dual-rank DIMMs are also better than quad-rank DIMMs because **quad-rank DIMMs will cause the memory speed to be down-clocked**.

Another important guideline is to populate equivalent ranks per channel. For instance, **mixing one single-rank DIMM and one dual-rank DIMM in a channel should be avoided**.

**Note:** It is important to ensure that all three memory channels in each processor are populated. The relative memory bandwidth decreases as the number of channels populated decreases. This is because the bandwidth of all the memory channels is utilized to support the capability of the processor. So, as the channels are decreased, the burden to support the requisite bandwidth is increased on the remaining channels, causing them to become a bottleneck.

For increased availability, the x3500 M3 offers an additional (but mutually exclusive) level of IBM Active Memory protection: online **memory mirroring**.

*Memory mirroring* works much like disk mirroring. The total memory is divided into two channels. Data is *written concurrently to both channels*. If a DIMM fails in one of the DIMMs in the primary channel, it is instantly disabled and the mirrored (backup) memory in the other channel becomes active (primary) until the failing DIMM is replaced. One-half of total memory is available for use with mirroring enabled. (**Note:** Due to the double writes to memory, performance is affected.)

Mirroring is handled at the hardware level; no operating system support is required.

DDR3 memory is currently available in **1GB, 2GB, 4GB, 8GB** and **16GB** RDIMMs, or **1GB, 2GB, 4GB** UDIMMs. DIMMs are installed individually (not in pairs). However, for performance reasons, in a 2-processor system, it's best to install matching DIMMs for each processor.

Maximum memory capacity and speed in 2-processor configurations include:

Memory Frequency	DIMMs per Channel	Max. Memory Capacity	5600 Series	5500 Series
1333MHz	1 (6 DIMMs)	96GB RDIMM; 24GB UDIMM	E5645, E5647, E5649, X5650 and above	N/A
1333MHz	2 (12 DIMMs)	192GB RDIMM; 48GB UDIMM	E5645, E5647, E5649, X5650 and above	N/A
1066MHz	2 (12 DIMMs)	192GB RDIMM; 48GB UDIMM	E5603 – E5607, E5620 and above	E5520 and above
800MHz	3 (16 DIMMs)	192GB RDIMM; 48GB UDIMM	E5620 and above	E5502 - E5507 and above

800MHz-1333MHz (Mirroring)	3 (12 DIMMs)	192GB RDIMM; 24GB UDIMM	E5620, L5609 and above	E5502 - E5507 and above
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## Hot-Swap/Redundant Components

System availability is maximized through the extensive use of hot-swap and redundant components, including:

- **Redundant memory protection** (with **memory mirroring** enabled) and **Chipkill** protection (standard or optional--model specific)
- **Hot-swap, redundant hard disk drives** (with **RAID-1/10/1E/5/50/6/60** protection—model-specific)
- **Hot-swap, redundant power supplies**
- **Hot-swap, redundant cooling fans**

## Large HDD Storage Capacity

The x3500 M3 offers a choice of disk storage, supporting up to **8, 16, or 24 2.5-inch hot-swap Serial-Attach SCSI (SAS)** or Serial ATA II (**SATA II**) drives. Standard models include **8 or 16 2.5-inch HDD bays**; **24 2.5-inch or 8 3.5-inch HDD bays** are available via HDD upgrade option kit or CTO.



### 2.5-inch Hot-Swap SAS

- **15,000 RPMs** — 73.4 or **146.8GB (1.17TB)** maximum capacity standard; **2.35TB** or **3.52TB** via upgrade or CTO)
- **10,000 RPMs** — 146.8 or 300GB, **600GB (4.8TB)** standard; **9.6TB** or **14.4TB** via upgrade or CTO)
- **7.2K RPMs** — **500GB (4TB)** standard; **8TB** or **12TB** via upgrade or CTO)

### 2.5-inch Hot-Swap SATA

- **7.2K RPMs** — 160GB or **500GB (4TB)** standard; **8TB** or **12TB** via upgrade or CTO)

### 3.5-inch Hot-Swap SAS

- **15,000 RPMs** — 300, 450, **600GB (4.8TB)** via CTO only)
- **7,200 RPMs** — 1TB, **2TB (16TB)** via CTO only)

### 3.5-inch Hot-Swap SATA

- **7,200 RPMs** — **2TB (16TB)** via CTO only)

### 3.5-inch Simple-Swap SATA

- **7,200 RPMs** — **2TB (16TB)** via CTO only)

**Notes:** Hot-swap SAS drives use the Converged Tray for interchangeability with other IBM System x® systems. If you need more storage space, terabyte capacities are possible with external direct-attach, NAS and SAN solutions.

## Disk/Tape Controllers

All x3500 M3 models include an integrated **ServeRAID SAS/SATA** controller (model-specific). The controller provides data transfer speeds of up to **6Gbps** per SAS port on a x8 PCIe card. It supports both SAS and SATA HDDs. Additional expanders are required for 16- or 24-drive models.

The **ServeRAID-M1015 SAS/SATA** controller supports **RAID-0/1/10** (no cache) for up to 32 drives. The **IBM ServeRAID M1000 Series Advance Feature Key** adds **RAID-5** with **SED** (self-encrypting drive) support (limited to available bays).

The **ServeRAID-M5014 SAS/SATA** controller offers enhanced performance with **256MB** of cache memory, and supports **RAID-0/1/10/5/50** with SED for up to 32 drives (limited to available bays).

The **ServeRAID-M5015 SAS/SATA** controller offers enhanced performance with **512MB** of cache memory and battery backup, and supports **RAID-0/1/10/5/50** with SED for up to 32 drives (limited to available bays).

The optional **ServeRAID-M5025 SAS/SATA** controller is similar to the M5015, but adds support for up to **240** external drives, via IBM System Storage expansion units

The **IBM ServeRAID M5000 Series Advance Feature Key** adds **RAID-6/60** with **SED** support to the M5014 and M5015. The **IBM ServeRAID M5000 Series Battery Key** adds **battery backup** support to the M5014.

x3500 M3 models with the ServeRAID-M1015 controller standard can upgrade to the M5014 or

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5015 controller. Models equipped with the ServeRAID-M5015 controller can upgrade to the 5015 controller. Any of them can be replaced with the MR10M controller for external storage needs, or it can be installed additionally in one of the standard PCIe slots.

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## Drive Bays

The x3500 M3 contains **11** drive bays in standard models and up to **25** bays in CTO models. Standard models offer **8** HDD bays that support small form-factor (SFF) **2.5-inch hot-swap SAS** drives. HDD upgrade options are available to offer **16** or **24** total 2.5-inch bays. Base models include **3 5.25-inch** bays, one reserved for the optical drive and two for a **tape drive** or **8 additional 2.5-inch HDD bays**.

An internal **full-high** tape drive can be installed using **2** of the 5.25-inch drive bays; alternatively, an internal **half-high** tape drive can be installed using **1** of the 5.25-inch drive bays. The tape drive must have a **USB 2.0** interface. **Note:** Upgrading to 24 2.5-Inch drives will leave only **one** 5.25-inch bay for either a half-high tape or optical drive.

A half-high DVD-ROM drive with a SATA interface ships standard in the other 5.25-inch bay. No diskette drive is supplied with any model; an external USB floppy drive may be used, if needed.

Hot-swap drives may be inserted or removed through the front of the server without powering off the system.

For still more storage, a direct-attach, NAS or SAN external expansion option can be added, using an optional controller.

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## High-Performance Adapter Slots

The x3500 M3 provides **seven** adapter slots standard: **five PCIe Gen 2** slots, **one PCIe Gen 1** slot, and **one legacy PCI** slot. **PCI Express** Gen 2 is the next-generation of high-performance, low-latency, serial I/O bus. **Slot 2** is a **x16** ("by 16") physical/**x8** electrical **PCIe (PCI Express) Gen 2** adapter slot. This means that although the slot runs at **x8 Gen 2** speeds (**8GBps**), it can accept a x16 Gen 2 adapter in the slot. It is also capable of supporting **x1/x4/x8** adapters at full speed. In addition to this slot, the x3500 M3 also includes two **x8 physical/x8 electrical Gen 2** slots (**8GBps**), two **x8 physical/x4 Gen 2 electrical** slots (**4GBps**), one **x8 physical/x4 Gen 1 electrical** slot (**2GBps**) on a riser card, and one **33MHz legacy PCI** slot. As part of a configure-to-order (CTO) build, the PCIe riser card can be replaced with a riser card containing two 133MHz PCI-X slots, for a total of **8** slots.

**Slot 1** is a **half-length/full-height PCIe** slot; **slots 2, 3, 4** and **5** are **full-length/full-height** PCIe slots, and **Slot 6** is a **half-length/full-height 33MHz legacy PCI** slot. **Slot 7**, on the **PCIe** riser card, is a **full-length/full-height** slot. The **PCI-X** riser contains two **full-length/full-height** slots (**7** and **8**).

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## Internal Backup

The x3500 M3 supports several internal data backup options. Supported technologies include:

- **DDS-5** (half-high)
  - **DDS-6** (half-high)
  - **RDX – Internal/External** (half-high)
  - **LTO-3 Ultrium** (half-high)
  - **LTO-4 Ultrium** (half-high)
  - **LTO-5 Ultrium** (half-high)
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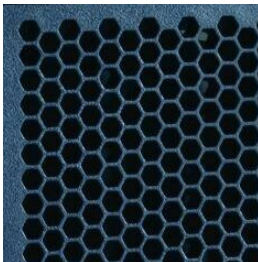
## Ultra-Efficient Cooling

Strategically located fans, combined with efficient airflow paths, provide highly effective system cooling for the x3500 M3, known as **Calibrated Vektored Cooling**. The base server with one power supply includes **three hot-swap** fans. Adding the optional power supply for redundant power adds **three** more hot-swap fans, for redundant cooling. In addition, each power supply also contains a fan.

The system contains **three cooling zones**. **Zone 1** cools the **memory slots** and the three **5.25-inch drive bays**. **Zone 2** cools the **processors** and **drives 9-16** (in a CTO configuration), while **Zone 3** cools the **adapter slots** and the standard **8 HDD bays**.

The fans automatically adjust speeds in response to changing thermal requirements, depending on the zone, redundancy, and internal temperatures. When the temperature inside the server increases, the fans speed up to maintain the proper ambient temperature. When the temperature returns to a normal operating level, the fans return to their default speed. Why not simply run the fans at 100% capacity all the time? For several good reasons: to reduce the ambient noise, reduce the wear-and-tear on the fans and reduce the server power draw. The reduction in ambient noise and power draw may be relatively minor for a single server, but put dozens or hundreds in a data center and it can make a big difference!

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In addition, the server uses **hexagonal ventilation holes** in the chassis. Hexagonal holes can be grouped more densely than round holes, providing greater airflow through the system cover.

This cooling scheme is important because newer, more powerful processors generate a significant amount of heat, and heat must be controlled for the system to function properly.

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### Dual-Port Gigabit Ethernet Controller

The x3500 M3 includes **one dual-port** integrated **Broadcom 5709C** Gigabit Ethernet controller for up to 10X higher maximum throughput than a 10/100 Ethernet controller, as well as support for **PXE 2.0 remote boot**, TCP/IP Offload Engine (**TOE**), Internet SCSI (**iSCSI**), Remote Direct Memory Access (**RDMA**), and **jumbo frames** (9KB). A license key is required to enable the iSCSI and RDMA features.

**Jumbo Frames**—those larger than the standard frame (packet) size of 1,500 bytes—can be more efficient, dramatically increasing network performance and reducing server CPU overhead. **TOE** helps improve overall system performance by offloading TCP/IP protocol processing from the system microprocessor to the onboard Ethernet TOE processor. There is no additional charge for this capability.

It also supports highly secure remote power management using **IPMI 2.0**, plus **Wake on LAN®** and **PXE** (Preboot Execution Environment) flash interface. Optional PCIe adapters offering failover and load balancing between adapters are available for added throughput and increased system availability.

#### Integrated Ethernet ports:

- 3 Gb RJ45 Ethernet ports, ideal for virtualization and I/O-intensive workloads
- 2 ports standard for Gb Ethernet and plus 1 dedicated Fast Ethernet port for systems management
- Improves system performance by offloading protocol processing from CPU to a separate TOE engine
- Primary performance improvement for data copying (CPU) where CPU utilization is 90-100%
- The embedded NIC/TOE supports software iSCSI using a Microsoft iSCSI initiator
- Using a software initiator enables offloading the processing of TCP frames with the TOE engine in the adapter card, but the processing of iSCSI packets themselves is not hardware-offloaded at the Broadcom NIC
- Broadcom hardware-offloaded iSCSI (using TOE engine) of the iSCSI frames

Onboard Broadcom 5709C Gigabit Ethernet controller provides two Gigabit ports supporting IEEE 802.3 for 1000Base-T, 100Base-TX, and 10Base-T applications (802.3, 802.3u, 802.3ab) over a CAT 5 twisted-pair cable. TOE support on Windows is available today, but requires the Windows Scalable Network Pack (SNP) installed. Linux has no plan to support TOE at this time. Please refer to *TOE\_RDMA\_iSCSI.doc* for technology details. *Internet Protocol version 6 (IPv6) is supported.*

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### Light Path Diagnostics

Light path diagnostics enables a technician to quickly identify and locate a failed or failing system component, such as a specific processor, DIMM, HDD, VRM, fan, or power supply. This enables quick replacement of the component, which helps increase server uptime and lower operating costs.

An LED panel is mounted on the front of the server for easy viewing without the need to open the server cover (or remove the server from a rack). The light path diagnostics panel tells the service technician which component requires attention. In addition, many components have their own identifying LEDs. For example, each of the twelve memory modules has an LED next to the socket, as do both processors, all adapter slots, all fans, all power supplies, the voltage regulator module and the service processor, allowing the service technician to easily identify exactly which component needs servicing. By following the "light path," the component can be replaced quickly, and without guesswork. (**Note:** In the event of a failed DIMM, the system will restart and mark the DIMM as bad while offline, thus allowing the system to continue running, with reduced memory capacity, until serviced.)

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### Other Features

- **Eight USB 2.0 ports** — Provides flexibility to add high-speed external devices. The USB 2.0 specification supports up to 480Mbps transfer rates. (Note: Not all USB 2.0 devices are capable of achieving this rate.) Two ports are provided on the front of the server, four are on the back, one is internal to support a USB-interface tape drive, and one is internal to support a USB flash drive for an embedded hypervisor.
  - **Embedded hypervisor**; a USB port on the motherboard, activated with an optional 2GB USB key for supporting VMware vSphere for virtualization
  - **Remote Presence** — This standard feature adds local and remote management functions
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without consuming a valuable adapter slot.

- **Toolless chassis** — The cover can be opened without tools, and many components can be removed and replaced without tools, including the CD-RW/DVD combo drive, hot-swap drives, and PCIe/PCI-X adapters, as well as the integrated ServerRAID controller, and embedded hypervisor key. This can save a servicer significant time.
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## Extensive System Support Features

The IBM services and technical support portfolio provides world-class, consistent, high-quality service and support. The x3500 M3 server offers a number of tools and services designed to make ownership a positive experience. From the start, IBM programs make it easier for you to plan for, configure and purchase System x servers, get them running and keep them running long-term. These features include IBM Express Portfolio, IBM ServerProven<sup>®</sup>, the IBM Standalone Solutions Configuration Tool, IBM System x and BladeCenter Power Configurator, IBM ServerGuide, IBM Systems Director Service and Support Manager, Product Customization Services and extensive technical support offerings.

This System x server is part of the **IBM Express Portfolio**, designed, developed and priced to meet the specific needs of midsized businesses. The IBM Express Portfolio of solutions is easy to acquire, install and manage. And they leverage IBM technology to provide tangible solutions to help you solve business problems in an on demand world.

The IBM **ServerProven** program provides the confidence that specific options and operating systems have been tested on the server and are officially supported to work together. It is updated frequently to ensure that the latest compatibility information is always at your fingertips.

The IBM **Standalone Solutions Configuration Tool** (SSCT) is a downloadable tool that simplifies the often complex chore of configuring a full rack of servers (including blade servers) and confirming that you have all the cables, power distribution units, KVM (keyboard, video and mouse) switch boxes and other components you need, as well as the proper airflow clearances, electrical circuits and other environmental conditions.

**IBM System x and BladeCenter Power Configurator** helps IT managers plan for data center power needs, by providing the following information for specific configurations of System x and BladeCenter systems: *power input* (watts), *PDU sizing* (amps), *heat output* (BTUs), *airflow requirements through chassis* (CFM), *VA rating*, *leakage current* (mA), and *peak inrush current* (amps).

**IBM ServerGuide** (installed from CD) simplifies the process of installing and configuring System x servers. ServerGuide goes beyond mere hardware configuration by assisting with the automated installation of the Microsoft<sup>®</sup> Windows<sup>®</sup> Server 2003 and 2008 operating systems, device drivers and other system components, with minimal user intervention. (Drivers are also included for support of Novell NetWare, Red Hat Linux and SUSE LINUX.) This focus on deployment helps you reduce both your total cost of ownership and the complexity that administrators and technical personnel face.

**IBM Systems Director Service and Support Manager** (previously called IBM Electronic Service Agent<sup>™</sup>) is an innovative “call home” feature that allows System x and BladeCenter servers to automatically report hardware problems to IBM support, which can even dispatch onsite service if necessary to those customers entitled to onsite support under the terms of their warranty or an IBM Maintenance Agreement. Electronic Service Agent resides on a server and provides electronic support and problem management capabilities through a highly secure electronic dialogue between your systems and IBM. It monitors networked servers for hardware errors and it can perform hardware and software inventories and report inventory changes to IBM. All information sent to IBM is stored in a highly secure database and used for improved problem determination.

Additional services include hardware warranty upgrades and factory-installed **Product Customization Services** (PCS), such as asset tagging, hardware integration, software imaging and operating systems personalization.

IBM offers extensive **technical support** by phone and via the Web. Support options include links to forums/newsgroups, problem submission, online shopping support, service offerings, device drivers for all IBM product lines, software downloads and even upcoming technical seminar worldwide schedules and registration. Also available are remote installation, configuration and usage support for System x hardware and software, as well as onsite custom services to provide the level of expertise you require.

**IBM Maintenance and Technical Support** solutions can help you get the most out of your IT investment by reducing support costs, increasing availability and simplifying management with integrated support for your multiproduct, multivendor hardware and software environment. For more information on hardware maintenance, software support, solution support and managed support, visit <http://ibm.com/services/maintenance>.

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## Advanced Systems Management Capabilities

The x3500 M3 has a high level of systems management capabilities that are well-suited to remote locations as well as to stand-alone environments. Features include UEFI, IMM, IBM ToolsCenter, IBM Systems Director Active Energy Manager, Automatic Server Restart, Wake on LAN<sup>®</sup> support, PXE support, text console redirect, Predictive Failure Analysis, and IBM Systems Director.

The **Integrated Management Module (IMM)** provides industry-standard **Intelligent Platform Management Interface (IPMI) 2.0**-compliant systems management. It provides a number of important system functions, including:

- Monitoring of system and battery voltage, system temperature, fans, power supplies, processor and DIMM status
- Fan speed control
- Product ID and Family ID detection
- Highly secure remote power on/off
- System reset control
- NMI/SMI detection and generation
- System diagnostic LED control (power, HDD, activity, alerts, heartbeat)
- IPMI over LAN
- Serial Over LAN
- Proxy server support
- LAN messaging and alerting
- Text console redirection over LAN
- Predictive Failure Analysis for system fans
- Web-based out-of-band control
- SSL (Secure Socket Layer) and LDAP (Lightweight Directory Access Protocol) support
- VLAN support
- Enhanced authentication and encryption algorithms (RMCP+ and AES)
- Local update of BMC firmware
- Firmware firewall
- Support for IPMI v2.0 compliant management software (e.g., xCAT)
- Other mandatory and optional IPMI BMC functions

The IMM alerts IBM Systems Director to anomalous environmental factors, such as voltage and thermal conditions—even if the server has failed.

The x3500 M3 also includes IMM remote presence standard for additional systems management capabilities, including:

- Latest OS failure screen capture
- Graphical console redirection over LAN
- Remote virtual floppy and CD-ROM
- High-speed remote redirection of PCI video, keyboard and mouse

IBM **ToolsCenter** consolidates 42 needed tools for managing servers individually into an integrated suite of 8 tools. They are organized by function: deployment, updates, configuration and diagnostics. Tools are now simpler to access and use with a single webpage for access, a common look and feel and a common command line interface for the scripting tools. The ToolsCenter **Bootable Media Creator** offers significantly more functionality than past tools with the ability to add more tools to the bootable image and to automatically download the bootable environment if needed. Bootable Media Creator allows you to create bootable CDs, DVD, and USB keys for updates customized to your systems.

IBM developed IBM **Systems Director Active Energy Manager** to put control of system power-saving features at the fingertips of administrators. Active Energy Manager is designed to take advantage of new features, such as monitoring power usage and balancing the performance of the system according to available power input. It provides the ability to plan and predict power consumption based on your hardware configuration. It also helps enable you to reduce the infrastructure required for redundancy, by using fewer servers on smaller power feeds and potentially lowering your overall data center support costs. It does this by inventorying all components, then adding up the total power draw and tracking the usage. It also includes power management and capping features to help administrators manage or reduce power usage.

**Automatic Server Restart (ASR)** helps reduce downtime by restarting the server automatically in

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the event of a system lockup. ASR technology is a combination of hardware circuitry tied into the server's system reset function and a device driver. As long as the server continues running, the ASR watchdog timer will keep being reset, but if the operating system crashes or the hardware freezes somehow the ASR software will be unable to reset the hardware timer. If the timer is not reset within five minutes, it automatically triggers the ASR hardware, which immediately restarts the server (and logs an ASR event with IBM Systems Director). These features are designed so that *no more than five minutes can pass before the server is restarted.*

**Wake on LAN** permits the server to be remotely powered on if it has been shut off. Once powered up, the server can be controlled across the network, using the **Preboot Execution Environment (PXE)**.

Like Wake on LAN, PXE is system firmware. It enables software such as the optional **IBM Remote Deployment Manager** to take control of a system before the BIOS, operating system or applications are loaded (using Wake on LAN/PXE) and lets an administrator perform many low-level tasks remotely that would otherwise require a visit to each system. These tasks may include such things as formatting a hard disk drive, updating system firmware, or deploying a Windows or Linux operating system.

**Text Console Redirection** support allows the administrator to remotely view x3500 M3 text messages over serial or LAN. This feature is standard on the x3500 M3.

**Predictive Failure Analysis (PFA)** is designed to allow the system to detect impending failure of supported components (processor, memory, HDDs, fans, VRM, and power supplies) *before* actual failure, and alert the administrator through IBM Systems Director. This gives you the ability to *replace* the failing component *before* it fails, resulting in increased uptime.

**IBM Systems Director** software for advanced workgroup management is included with the x3500 M3. IBM Systems Director comes with a portfolio of tools, including *Systems Director Active Energy Manager*, *System and Support Manager*, and other tools. *System Availability* (a no-charge download) and *Capacity Manager* (sold separately) are available as add-ons for additional server management and increased availability. IBM Systems Director provides a single uniform graphical interface for all of these systems management functions.

IBM Systems Director enables you to customize thresholds and monitor system components (for things like temperature, voltage regulation, etc.) to help maximize uptime.

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## Key Options

### IBM options for System x servers help you take your servers to a higher level

You can rely on System x options to supply a complete solution for your business needs. Options help you create an optimized server system to meet your data protection, storage and availability needs. Every IBM option is designed and tested for peak performance and flexibility, helping to maximize your return on investment. The combination of System x servers and options lets you keep your fingers on the pulse of your e-business.

**Processors** — The Intel Xeon processor provides high clock rates, four cores, 64-bit extensions, a large cache and advanced features for availability and manageability. Large cache size, combined with fast **1333MHz**, **1066MHz** or **800MHz** memory access and an integrated memory controller reduce memory latency and facilitates the movement of data. (**Note:** System performance depends not only on the number of processors in the server but also on the power and functionality of each processor.) Adding a second processor may be a cost-effective way to achieve significant performance improvements.

**Memory** — Memory is a significant factor in systems application performance. Adding more memory to a System x server is one of the most effective ways to increase application performance. For best performance in a server with a six-core processor, there should be three times as much memory available as for a 2-core processor.

**Backup Drives** — Backup drives help you protect your data. IBM offers several choices of capacities and technologies, including **DDS-5**, **DDS-6**, **LTO-3**, **LTO-4**, and **LTO-5** tape backup, as well as the **RDX Removable Disk Cartridge** drive (internal and external).

**Hard Disk Drives** — IBM hard disk drives help you improve the transaction and cost performance of your System x servers. The choice of hard disk drives can be a critical aspect of maximizing the I/O throughput of the system. **SAS** 2.5-inch hard disk drives are available for the x3500 M3 with capacities up to **600GB** apiece at **10,000 RPMs** or up to **146.8GB** apiece at **15,000 RPMs**. Also, 2.5-inch **SATA** drives up to **500GB** at **7,200 RPMs** are available. For CTO models with **3.5-inch** bays, **SAS** drive capacities up to **600GB** at **15K RPMs** are available, as well as **7,200 RPM SAS** or **SATA** drives up to **2TB**.

**Power Supply** — The optional second power supply for the x3500 M3 enables redundancy for hot-swap power. In addition, its 90%-efficient design helps lower your energy bill for power and cooling.

**ServeRAID Controllers** — System x servers using ServeRAID technology allow companies to build a reliable foundation for business-critical computing. IBM ServeRAID technology allows an array consisting of multiple physical hard disk drives to be treated as one logical drive. ServeRAID



technology also allows data to be stored redundantly, across multiple hard disk drives— enhancing both the integrity and the availability of the data. SAS and SATA ServeRAID controllers offer enhanced performance due to onboard processors and cache. Because IBM ServeRAID controllers can help significantly improve data transfer rates, this technology is extremely effective when implementing demanding, transaction-oriented applications. By employing the advanced fault tolerance of IBM ServeRAID technology, companies can effectively implement networked business systems that require large amounts of storage space for data and applications that must be available for their businesses to continue operating.

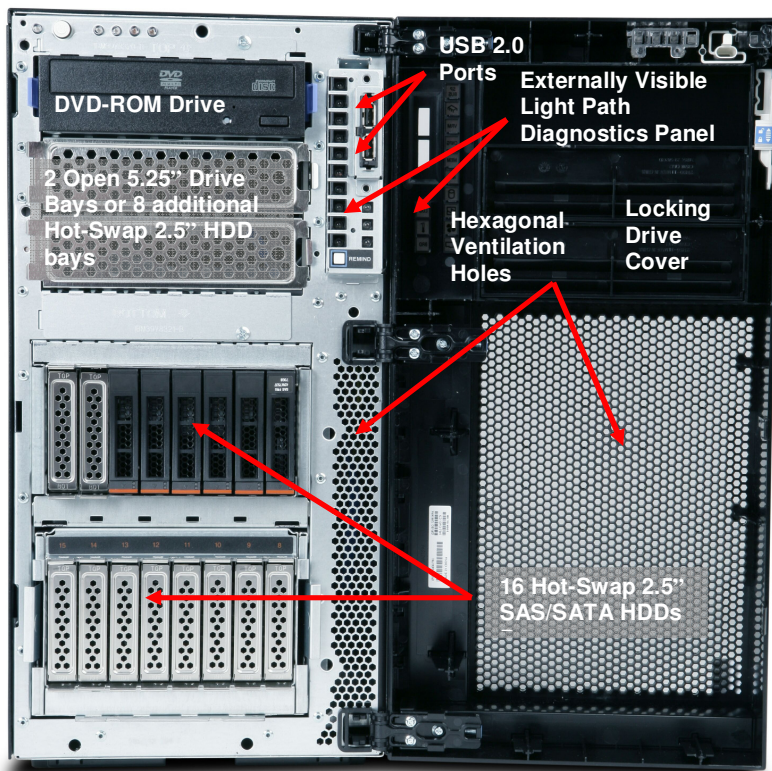
The IBM **ServeRAID-M1015**, x8 PCIe and **6Gbps**, offers RAID-0/1/10; optionally RAID-5 with **SED** support. The IBM **ServeRAID-M5014**, x8 PCIe and **6Gbps**, provides **256MB** cache and **RAID-0/1/10/5/50**; optionally RAID-6/60 with SED, and battery backup). The IBM **ServeRAID-M5015**, x8 PCIe and **6Gbps**, has **512MB** cache and RAID-0/1/10/5/50; optionally RAID-6/60 with SED, and battery backup. For external storage, the **6Gbps ServeRAID-5025** controller provides **RAID-0/1/10/5/50** support and **512MB** of onboard cache and enables connection to multiple IBM System Storage **EXP3000** SAS expansion units (**240** HDDs total). The **IBM ServeRAID M1000 Series Advance Feature Key** adds **RAID-5** and **SED** support to the ServeRAID-M1015. Similarly, the **IBM ServeRAID M5000 Series Advance Feature Key** adds **RAID-6/60** with **SED** support to the M5014 and M5015. The **IBM ServeRAID M5000 Series Battery Key** adds **battery backup** support to the M5014.

**External Storage** — The IBM **System Storage DS3000**, **DS4000**, **DS6000**, and **DS8000** series, as well as the **N3000**, **N5000**, and **N7000** series, comprise a powerful and broad shared storage family with integrated management software designed to meet midrange and enterprise needs. For lower-end needs, IBM offers the System Storage **DS400** storage enclosures.

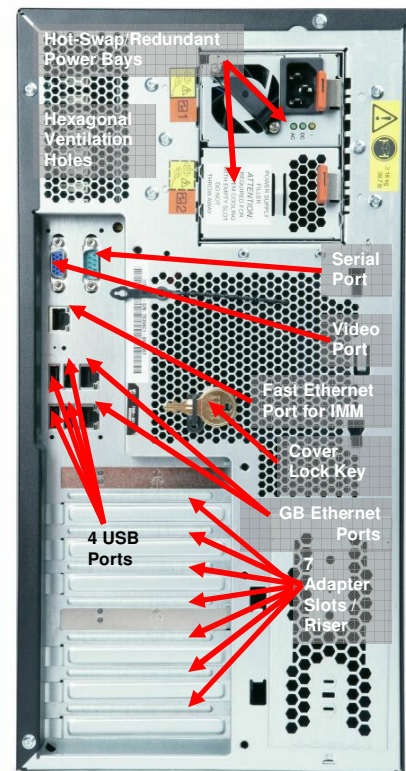
External SAN, iSCSI, and direct-attach storage is available using one of several IBM System Storage and TotalStorage host bus adapters. Additionally, external LAN-attached tape storage is available.

## x3500 M3 Images

### Front View



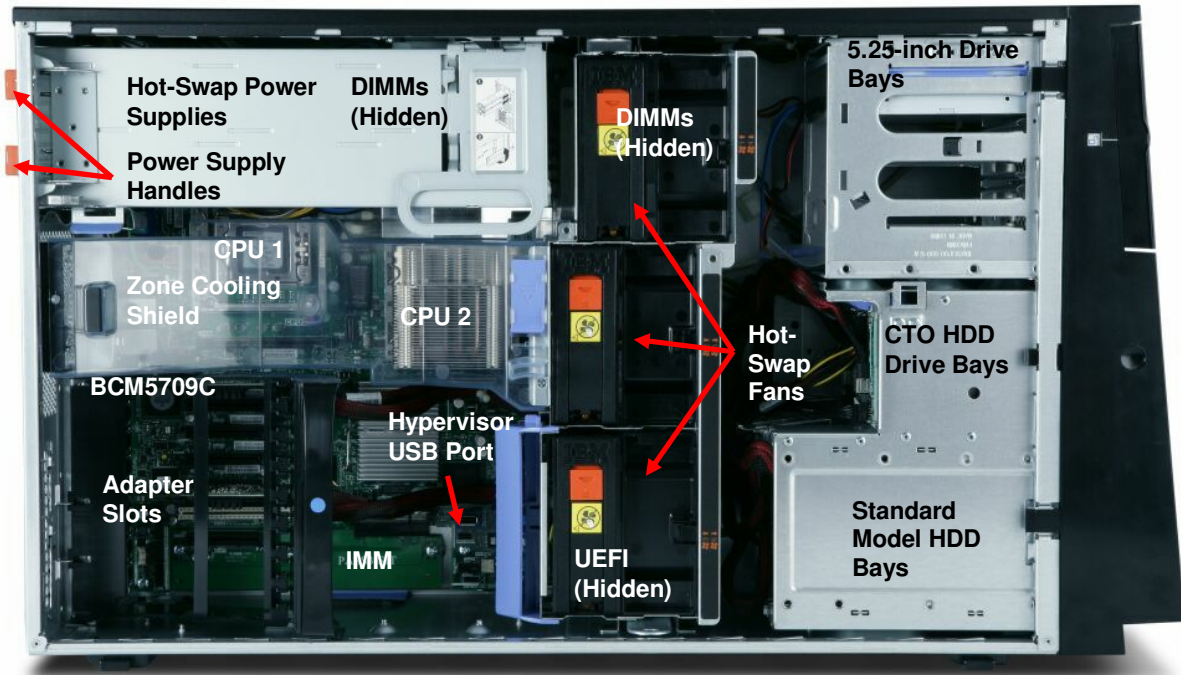
### Rear View





A rock-solid, performance server for your most demanding applications

### Interior View



<b>x3500 M3 Specifications</b>			
<b>Machine type</b>	7380-32x, 42x/44x, 52x, 62x, 72x/74x, 82x, 92x, B2x, D2x, F2x, G2x, H2x		
<b>Form factor</b>	Tower (or 5U rack via CTO or conversion kit)		
<b>BIOS type</b>	Unified Extensible Firmware Interface (UEFI)		
<b>Processor type</b>	<b>6-Core Intel Xeon (E56xx/L56xx/X56xx)</b> 1.6GHz E5603 (CTO), 2.26GHz L5640 (CTO), 2.40GHz E5645 (D2x), 2.53GHz E5649 (F2x), 2.66GHz X5650 (72x/74x), 2.8GHz X5660 (CTO), 2.93GHz X5670 (82x), 3.06GHz X5675 (G2x), 3.33GHz X5680 (92x/94x), 3.46GHz X5690 (H2x)	<b>4-Core Intel Xeon (E56xx/L56xx/X56xx)</b> 1.6GHz E5603 (CTO), 1.86GHz L5609 (CTO), 2.13GHz E5606 (B2x), 2.13GHz L5630 (CTO), 2.26GHz E5607 (CTO), 2.4GHz E5620 (42x/44x), 2.53GHz E5630 (52x), 2.66GHz E5640 (62x), 2.93GHz X5647 (CTO), 3.46GHz X5677 (CTO), 3.6GHz X5687 (CTO)	<b>4-Core Intel Xeon (E55xx)</b> 2.13GHz E5506 (32x), 2.26GHz E5507 (CTO)
<b>Maximum processor power draw</b>	130W (92x/94x, H2x, X5647/X5677/X5687 via CTO)	95W (72x/74x, 82x, G2x, X5660 via CTO)	80W (32x, 42x/44x, 52x, 62x, B2x D2x, F2x, E5503/E5507/E5603/E5607 via CTO)
<b>QuickPath Interconnect (QPI) speed (gigatransfers per second)</b>	6.4GTps (72x, 74x, 82x, 92x, G2x, H2x)	5.86GTps (42x, 52x, 62x, D2x, F2x)	4.8GTps (32x, 44x, B2x)
<b># of processors standard / maximum</b>	1 / 2		
<b>Internal L3 cache</b>	12MB—42x/44x, 52x, 62x, 72x/74x, 82x, 92x, D2x, F2x, G2x, H2x	8MB—B2x	4MB—32x

Please see the Legal Information section for important notices and information.

A rock-solid, performance server for your most demanding applications

<b>x3500 M3 Specifications</b>				
<b>Chipset</b>	Intel 5520			
<b>Standard memory (maximum<sup>5</sup> 192GB)</b>	<b>8GB</b> (2 x 4GB)—62x, 72x, 82x, 92x	<b>4GB</b> (1 x 4GB)—32x, 42x/44x, 52x, 74x, B2x, D2x, F2x, G2x, H2x		
<b>Standard memory type</b>	<b>Registered</b> PC3-10600 DDR III ECC ( <b>Chipkill</b> protection when using x4 DIMMs); single-, dual-, or quad-rank			
<b>Maximum memory access speed</b>	<b>1333MHz</b> (72x, 74x, 82x, 92x, D2x, F2x, G2x, H2x)	<b>1066MHz</b> (42x, 44x, 52x, 62x, B2x)	<b>800MHz</b> (32x)	
<b>DIMM capacities supported</b>	1GB, 2GB, 4GB, 8GB, 16GB			
<b># of DIMM sockets total / available</b>	16 (8 per processor) / <b>14</b> —62x, 72x, 82x, 92x	16 (8 per processor) / <b>15</b> —32x, 42x/44x, 52x, 74x, B2x, D2x, F2x, G2x, H2x		
<b>Online hot-spare memory supported</b>	No			
<b>Memory mirroring supported / # of DIMM sockets reserved for mirroring</b>	Yes / 12 (6 per processor)			
<b># of drive bays total / available</b>	11 or 17 standard	25 via CTO or options		
<b># of 5.25-inch bays total / available</b>	3 / 2 (optical drive installed)—16-HDD models	3 / 1—24-HDD models		
<b># of HDD drive bays total / available</b>	<b>8 / 8</b> (2.5-inch standard or 3.5-inch via CTO)	<b>16 / 16</b> (via CTO or upgrade kit)	<b>24 / 24</b> (via CTO or upgrade kit)	
<b># of 2.5-inch HDD drive bays total / available</b>	<b>8 / 8</b> standard	<b>16 / 16</b> (via CTO or upgrade kit)	<b>24 / 24</b> (via CTO or upgrade kit)	
<b># of 3.5-inch HDD drive bays total / available</b>	8 / 8 (via CTO only)			
<b>Maximum HDD capacity</b>	<u><b>2.5-inch Hot-Swap SAS</b></u> <b>4.8TB</b> (8 x <b>600GB</b> ) standard; <b>9.6TB</b> (16 x <b>600GB</b> ) standard or via upgrade kit or CTO; <b>14.4TB</b> (24 x <b>600GB</b> ) via upgrade kit or CTO)	<u><b>2.5-inch Hot-Swap SATA</b></u> <b>4TB</b> (8 x <b>500GB</b> ) standard or via upgrade kit or CTO; <b>8TB</b> (16 x <b>500GB</b> ) standard or via upgrade kit or CTO; <b>12TB</b> (24 x <b>500GB</b> ) via upgrade kit or CTO)	<u><b>3.5-inch Hot-Swap SAS</b></u> <b>16TB</b> (8 x 2TB) via CTO only	<u><b>3.5-inch Hot-Swap or Simple-Swap SATA</b></u> <b>16TB</b> (8 x 2TB) via CTO only
<b>HDD capacities supported</b>	<u><b>2.5-inch Hot-Swap SAS</b></u> 73.4, <b>146.8GB</b> — <b>15K</b> RPMs; 146.8, 300GB, <b>600GB</b> — <b>10K</b> RPMs; <b>500GB</b> — <b>7.2K</b> RPMs	<u><b>2.5-inch Hot-Swap SATA</b></u> 160GB, <b>500GB</b> — <b>7.2K</b> RPMs	<u><b>3.5-inch Hot-Swap SAS</b></u> 300, 450, <b>600GB</b> — <b>15K</b> RPMs 1TB, <b>2TB</b> — <b>7.2K</b> RPMs	<u><b>3.5-inch Hot-Swap SAS</b></u> 1TB, <b>2TB</b> — <b>7.2K</b> RPMs
<b># of HDDs standard</b>	None			
<b># of optical drives standard</b>	1 SATA <b>DVD-ROM</b> Combo (in dedicated 5.25" bay)			
<b># of diskette drives standard</b>	None (USB-attach)			
<b>Internal tape drives supported</b>	<b>1</b> full-high or <b>2</b> half-high (uses one or two 5.25-inch bays)—8 or 16-HDD models	<b>1</b> half-high (for either 5.25-inch optical or tape drive)—24-HDD models		
<b>Disk drive technology</b>	Hot-swap SAS			
<b>Integrated disk controller</b>	ServeRAID- <b>M5015</b> ( <b>512MB</b> cache) with battery— <b>RAID-0/1/10/5/50</b> ;	ServeRAID- <b>M5014</b> ( <b>256MB</b> cache) internal SAS/SATA— <b>RAID-</b>	ServeRAID- <b>M1015</b> (no cache) internal SAS/SATA— <b>RAID-0/1/10</b> ; optional RAID-	

<sup>5</sup> Maximum memory and disk capacity may require the replacement of standard components with the largest supported component available.

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<b>x3500 M3 Specifications</b>			
	optional RAID-6/60, SED (72x/74x, 82x, 92x/94x, G2x, H2x)	<b>0/1/10/5/50</b> ; optional RAID-6/60, battery, SED (62x, F2x)	5/50, SED (32x, 42x/44x, 52x, B2x, D2x)
<b>Optional RAID controller</b>	ServeRAID- <b>M5025</b> —all models	ServeRAID- <b>M5015</b> —32x, 42x/44x, 52x, 62x, B2x, D2x, F2x	ServeRAID- <b>M5014</b> —32x, 42x/44x, 52x, B2x, D2x
<b># of disk drives supported per port</b>	1		
<b>External disk drives supported</b>	Yes, via ServeRAID- <b>M5025</b> controller ( <b>512MB</b> cache standard—SAS/SATA; RAID-0/1/10/5/50/6/60)		
<b># of adapter slots total / available</b>	7 / 6 (standard); 8 / 7 (via CTO)		
<b># of PCIe x16 Gen 2 physical/x8 Gen 2 electrical slots (8GBps)</b>	1 full-height/full-length		
<b># of PCIe x8 Gen 2 physical/x8 Gen 2 electrical slots (8GBps)</b>	2 full-height/full-length (1 slot reserved for RAID card)		
<b># of PCIe x8 Gen 2 physical/x4 Gen 2 electrical slots (4GBps)</b>	2 full-height/full-length		
<b># of PCIe x8 Gen 1 physical/x4 Gen 1 electrical slots (2GBps)</b>	1 full-height/half-length (on an extender card)		
<b># of PCI-X/133 slots (1GBps)</b>	<b>None standard</b> (2 optional via CTO, by replacing the PCIe extender card)		
<b># of 33MHz legacy PCI slots</b>	1 full-height/half-length		
<b># of video ports</b>	1		
<b>Video controller</b>	Matrox G200eV (in IMM)		
<b>Video memory</b>	16MB DDR-2 SDRAM		
<b>Maximum video resolution at 32-bit color</b>	1600 x 1200 x 16-bit color at 85Hz		
<b>Gigabit Ethernet controller</b>	<b>1 dual-port</b> Broadcom <b>BCM5709C</b> (TOE, iSCSI, RDMA)—iSCSI/RDMA support requires license key		
<b># of Gigabit Ethernet ports</b>	2 (rear)		
<b># of Fast Ethernet ports (via IMM)</b>	1 (rear)		
<b># of RS485 ports</b>	None		
<b># of serial ports</b>	1 (rear)		
<b># of parallel ports</b>	None (USB-attached)		
<b># of PS/2 mouse ports</b>	None (USB)		
<b># of PS/2 keyboard ports</b>	None (USB)		
<b># of USB 2.0 ports</b>	<b>8 total</b> ; <b>6 external</b> (2 front, 4 rear) ports, plus <b>1 internal</b> connector for a tape drive and <b>1 internal</b> connector for an embedded hypervisor (on USB flash drive)		
<b>Integrated systems management controller</b>	Yes (IMM)		
<b>Optional systems management controller</b>	None		
<b>Light path diagnostics support</b>	Yes, with externally viewable panel (processors, DIMMs, HDDs, VRMs, fans, and power supplies)		
<b>Predictive Failure Analysis support</b>	Processors, memory, HDDs, VRMs, fans, and power supplies		
<b>Power supply size</b>	920W universal, autoswitching		

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<b>x3500 M3 Specifications</b>				
<b># of power supplies standard / maximum</b>	1 / 2			
<b>Hot-swap/redundant power supported</b>	Yes / Yes (with two power supplies installed)			
<b># of fans/blowers standard / maximum</b>	3 (with one power supply installed) / 6 (with redundant power installed)			
<b>Hot-swap/redundant fans supported</b>	Yes / Yes (with two power supplies installed)			
<b>Heat emitted: minimum/maximum BTUs/Watts</b>	2,013 / 2,610 (BTUs); 590 / 1058 (Watts)			
<b>Maximum altitude</b>	7,000 ft; 2,133 m			
<b>Operating temperature range</b>	50 – 95° F; 10 – 35° C (up to 7,000 ft / 2,133m)			
<b>Operating humidity range</b>	8-80%			
<b>Dimensions (HWD) / weight</b>	<u><b>Tower</b></u> 17.3" (440mm) <b>H</b> 8.6" (218mm) <b>W</b> 30.2" (767mm) <b>D</b>	<u><b>Tower</b></u> 44.0 – 83.6 <b>lb</b> ; 20.0 - 38.0 <b>kg</b> (min/max)	<u><b>Rack</b></u> 16.7" (424mm) <b>H</b> 8.6" (218mm) <b>W</b> 27.6" (702mm) <b>D</b>	<u><b>Rack</b></u> 44.0 - 74.8 <b>lb</b> ; 20.0 - 34.0 <b>kg</b> (min/max)
<b>Operating systems supported</b>	Microsoft Windows Server 2008 & R2 32/64-bit, Microsoft Windows Server 2003 32/64-bit, RHEL 4/5 32/64-bit (with and without Xen), SLES 10 64-bit (with and without Xen), VMware ESX/ESXi/vSphere 4.0			
<b>Length of limited warranty</b>	3 years (parts and labor) <sup>6</sup>			

## The Bottom Line

The x3500 M3 is an extremely powerful system, incorporating leading-edge industry-standard features and adding IBM-unique innovations:

### Performance

- **High-throughput processors** — Up to two **2.40 to 3.46GHz 6-core** or **1.60 to 3.60GHz 4-core** Xeon 5600 processors, or up to two **2.13GHz** four-core Xeon **5500** Series
- **Large cache** — **12MB, 8MB** or **4MB** of L3 processor cache
- **Fast memory** — Registered **PC3-10600 DDR-3** ECC DIMMs standard, operating at **1333MHz, 1066MHz** or **800MHz** (depending on processor model and memory configuration). Low Voltage (1.35V) memory is also supported.
- **Fast disk technology** — Integrated **SAS** controller and slotless hardware-based **RAID-0** data striping
- **Fast communications** — Integrated **dual-port Gigabit Ethernet** controller standard, supporting **Jumbo Frames, TOE**, and optional **iSCSI** and **RDMA** (requires license key); **two additional NICs optional**
- **Fast I/O** — Five **PCIe Gen 2** adapter slots and one **PCIe Gen 1** slot

### Flexibility

- **Large memory capacity** — Up to **192GB** of registered DDR3 DIMMs, using **16** DIMM slots
- Up to **24 2.5-inch hot-swap SAS/SATA** drives
- **Choice of disk storage** — Up to **4.8TB** of internal **2.5-inch SAS** (standard); Up to **4TB** of internal **2.5-inch SATA** (standard); up to **14.4TB** of internal **2.5-inch SAS** (optional or via CTO); up to **12TB** of internal **2.5-inch SAS** (optional or via CTO); up to **16TB** of internal **3.5-inch SAS** or **SATA** (via CTO only)
- **High-performance external expansion** — **Six** 480Mbps **USB 2.0** ports (two front, four rear)
- Hardware-based **RAID** support standard; optional support for **RAID-6/60** with **full disk encryption** and **external storage**
- **Seven available** adapter slots —
  - **One x16/x8<sup>7</sup> PCIe Gen 2** slots (8GBps)

<sup>6</sup> For terms and conditions or copies of the IBM Statement of Limited Warranty, call 800-772-2227 in the U.S. In Canada call 800-426-2255. IBM makes no representation or warranty regarding third-party products or services including those designated as ServerProven or ClusterProven. Telephone support may be subject to additional charges. For warranties including onsite labor, a technician is sent after IBM attempts to resolve the problem remotely. International warranty service is available in any country in which this product is sold.

- Two x8/x8<sup>8</sup> PCIe Gen 2** slots (8GBps)
  - Two x8/x4<sup>9</sup> PCIe Gen 2** slots (4GBps)
  - One x8/x4<sup>10</sup> PCIe Gen 1** slots (2GBps)
  - One 33MHz PCI** slot (500MBps)
  - A riser card containing **two 133MHz PCI-X** slots can replace the x8/x4 Gen 1 slot (via CTO)
- Integrated **DVD/CD-RW** combo drive

**Manageability, Serviceability and Availability**

- **IBM Systems Director** systems management software, including:
    - Active Energy Manager
    - Service and Support Manager
  - **Integrated Management Module (IMM):**
    - IPMI 2.0** compliance, including highly secure remote power control
    - Text console redirection** systems management standard
    - Combines former **BMC** and **Remote Supervisor Adapter II** functions
  - **Active Memory protection:**
    - Advanced Chipkill** ECC memory protection
    - Memory mirroring**
  - Support for **highly available** optional hardware-based **RAID-1/10/1E/5/50/6/60** arrays with self-encrypting drive
  - **Hot-swap SAS** or **SATA** hard disk drives
  - **Ultra-efficient cooling** incorporating **Calibrated Vecteded Cooling** features
  - Optional **hot-swap/redundant power supplies and cooling**
  - **Light path diagnostics** (front externally viewable light path panel)
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<sup>7</sup> The x16/x8 Gen 2 slot can accept x1, x4, x8, or x16 adapters running at x1, x4, x8, or x8 throughput, respectively.

<sup>8</sup> The x8/x8 Gen 2 slots can accept x1, x4, or x8 adapters running at x1, x4, or x8 throughput, respectively.

<sup>9</sup> The x8/x4 Gen 2 slots can accept x1, x4, or x8 adapters running at x1, x4, or x4 throughput, respectively.

<sup>10</sup> The x8/x4 Gen 1 slots can accept x1, x4, or x8 adapters running at x1, x4, or x8 throughput, respectively.



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### Server Comparison Table

The following table shows the suggested uses for the respective IBM System x tower servers, including comparisons of the uses for which each server is best suited:

Important    
  Nice to Have    
  Can do without    
  Best    
  Better    
  Good

Theme	Key Workloads	Requirements										Towers				
		Scalability	Floating Point Performance	Memory Throughput	Integer Performance	I/O and Storage	Density	High Availability	Systems Management	Security	Distributed Deployment	x3100 M3	x3200 M3	x3400 M3	x3500 M3	
HPC	Cluster / HPC															
	Modeling & Simulation															
	High Performance DB															
	Business Intelligence															
Web 2.0 / Web 3D	Search															
	Content															
	Communities															
	Commerce															
	Collaboration															
Business Applications	ERP/SCM															
	CRM															
	Hosted Client															
	Point of Sale															
	Branch Office															
Infrastructure Applications	Virtualization															
	Business Continuity															
	Database															
	Email/Collaboration															
	Security															
	Web Serving															
	File & Print															

## For More Information

IBM System x Servers

<http://ibm.com/systems/x>

IBM Systems Director Service and Support Manager

<http://ibm.com/support/electronic>

IBM System x and BladeCenter Power Configurator

<http://ibm.com/systems/bladecenter/resources/powerconfig.html>

IBM Standalone Solutions Configuration Tool

<http://ibm.com/systems/x/hardware/configtools.html>

IBM Configuration and Options Guide

<http://ibm.com/systems/x/hardware/configtools.html>

IBM ServerProven Program

<http://ibm.com/systems/info/x86servers/serverproven/compat/us>

Technical Support

<http://ibm.com/server/support>

Other Technical Support Resources

<http://ibm.com/systems/support>

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Produced in the USA

February 2011

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

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

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

XSO03096-USEN-03