# IBM Power 780 server

*Modular and scalable systems for performance, availability and IT efficiency*

## Highlights

- For large-scale server consolidation across UNIX®, IBM i, and Linux® workloads
- For large database serving
- For large transaction processing such as ERP and CRM applications
- For a complete business system combining all aspects of a company's IT infrastructure

Designed for virtualized consolidation of business critical workloads, the IBM Power® 780 delivers on performance, availability, efficiency and virtualization in a way that is unique in the industry. PowerVM™ virtualization enables continuous, dynamic resource adjustments across all partitions and operating environments, independent of physical placement, to optimize performance while minimizing energy usage. Supported environments include AIX®, IBM i, Linux for Power and x86 Linux applications, all on the same system.

IBM Power clients continuously report savings from reduced hardware, software, energy, floor space and administrative overhead. Additional benefits include faster provisioning, increased application performance and an operational availability that can only come from IBM. All of this is delivered on the latest technology from a vendor you can trust. No wonder more and more companies are switching to IBM Power Systems™.

For large database serving, the Power 780 provides a system designed for demanding, critical, back-end workloads. Demonstrating outstanding performance across multiple database solutions and multiple operating systems, the 780 shows its true heart and soul when entrusted with a company's most treasured IT asset, the database.

For transaction processing workloads, the IBM Power 780 server delivers outstanding performance, mainframe-inspired reliability, modular nondisruptive growth and innovative virtualization technologies. These features are integrated to enable the simplified management of growth, complexity and risk.

For complete business system needs, the Power 780 provides a unique combination of performance across multiple workloads and availability features to keep your business running. In addition, PowerVM virtualization helps to maximize your efficiency and nondisruptive growth options are designed to keep your costs in line with your business. With all this coming together in one integrated energy-saving package, the 780 makes a great business solution.

Now available in configurations up to 64 POWER7™ processor cores, this new version of the popular modular design delivers more capacity with more efficiency than ever before. The result is more performance per system, more performance per footprint, and best of all, more performance per watt. This innovative design approach also enables near-linear scaling and nondisruptive growth while maximizing your investment. POWER7 technology, PowerVM virtualization and the Power 780—the ideal combination for your IT environment.

IBM Power 780

| Feature | Benefits |
|---|---|
| **Industry-leading POWER7 performance** | • Better customer satisfaction due to improved response time to your customers<br>• Infrastructure cost savings from a reduction in the number of servers and software costs<br>• Improved efficiency in operations from consolidating multiple workloads on fewer systems |
| **Exceptional PowerVM virtualization capability** | • Improves system efficiency, which lowers operational expense<br>• Provides flexibility in responding to changing business requirements<br>• Enables energy savings and maintains application availability<br>• Provides ability to handle unexpected workload peaks by sharing resources<br>• Enables consolidation of multiple AIX, IBM i and Linux workloads |
| **Mainframe-inspired availability features** | • Better customer satisfaction due to improved application availability<br>• Get more work done with less disruption to your business<br>• Faster repair when required due to sophisticated system diagnostics |
| **Nondisruptive growth options** | • Enables your system to change with your business without forcing everything to stop<br>• Aligns expense with usage without sacrificing performance or future growth options |
| **Frugal EnergyScale™ technology** | • Helps lower energy costs without sacrificing performance or business flexibility<br>• Allows business to continue operations when energy is limited |
| **Innovative Active Memory™ Expansion** | • Enables more work to be performed with existing resources<br>• Partition level control enables flexibility and optimization for workload |
| **Broad business application support** | • Allows clients the flexibility to select the right application to meet their needs<br>• Helps keep you in the mainstream and off the bleeding edge |

## Industry-leading POWER7 performance

The POWER7 processor serves up several new and unique innovations to continue the long history of leadership performance that now serves as the standard for the industry. POWER6®, recognized as the world's fastest chip, must now make room for something even faster. The amazing fact is that the POWER7-based 780 system accomplishes this no small feat in 25 percent of the space, using over 70 percent less energy and produces more performance per core with less clock speed than comparable POWER6-based systems.[1] What this means is that applications can run faster and be more responsive, which can result in competitive advantages or higher customer satisfaction. In addition, a single system can now run more applications which can drive utilization even higher and result in infrastructure cost savings. The improved performance with POWER7 also enables clients to get more processing power with fewer processors, resulting in lower per-core software licensing costs.

What makes the Power 780 truly unique is the ability to switch between its standard throughput optimized mode and its unique TurboCore™ mode, where performance per core is boosted with access to both additional cache and additional clock speed. Available only on IBM's largest systems, this approach to design allows users to decide how they wish to optimize their system, even after it is installed and operational. Based on the user's configuration option, any Power 780 system can be booted in standard mode, enabling up to 64 processor cores running at 3.8 GHz or in TurboCore mode, enabling up to 32 processor cores running at 4.1 GHz and twice the cache. Flexibility has once more been redefined.

POWER7 processors also feature Intelligent Threads technology, which enables workload optimization by dynamically switching between threading modes. Each application can be run in the most suitable threading mode; either single thread per core, simultaneous multithread (SMT) with 2 threads per core, or SMT with 4 threads per core. As a result, applications can run at their peak performance and systems can increase their workload capacity.

Also new with POWER7 is the ability of the processor to run at a higher frequency if environmental conditions permit, resulting in increased performance; or alternatively run at a lower frequency if user settings permit, resulting in greater energy efficiency. Operating in concert with IBM Systems Director Active Energy Manager™, this feature enables customization for maximum performance, maximum energy savings or a mixture of both.

## Exceptional PowerVM virtualization capability

PowerVM is the family of technologies, capabilities and offerings that deliver industry-leading virtualization on IBM POWER processor-based systems. On the Power 780, PowerVM includes base components provided with IBM Power Systems firmware, which includes logical partitioning (LPAR) technologies. PowerVM allows any individual LPAR to access the maximum amount of memory and CPU cores that are available on the server. In addition, optional components in PowerVM Editions are designed to provide advanced virtualization technologies resulting in efficiencies in resource utilization and cost savings. These are managed through use of a hardware management console (HMC) or through IBM Systems Director software with the VMControl virtualization management plug-in.

PowerVM Standard Edition includes Micro-Partitioning™ and Virtual I/O Server (VIOS) capabilities, which are designed to allow businesses to increase system utilization, while helping to ensure applications continue to get the resources they need. VIOS allows for the sharing of disk and optical devices as well as communications and Fibre Channel adapters to help drive down complexity and systems/administrative expenses. Also included is support for Multiple Shared Processor Pools, which allows for automatic nondisruptive balancing of processing power between partitions assigned to the shared pools, and Shared Dedicated Capacity, which helps optimize use of processor cycles.

PowerVM Enterprise Edition includes all the features of Standard Edition plus Live Partition Mobility[2] (LPM) and PowerVM Active Memory Sharing.[3] LPM allows a partition to be relocated from one server to another with virtually no impact to the applications running inside the partition. LPM is designed to enable servers to work together to help optimize system utilization and energy savings, improve application availability, balance critical workloads across multiple systems and respond to ever-changing business demands. PowerVM Active Memory Sharing is an advanced memory virtualization technology that intelligently flows memory from one partition to another for increased utilization and flexibility of memory usage. With this memory virtualization enhancement IBM i, AIX, and Linux partitions can share a pool of memory and have PowerVM automatically allocate the memory based on the workload demands of each partition.

## Active Memory Expansion

Active Memory Expansion is a new POWER7 technology, which allows the effective memory capacity of the system to be much larger than the true physical memory. Innovative compression/decompression of memory content can allow memory expansion up to 100 percent. This can allow a partition to do significantly more work with the same physical amount of memory or a server to run more partitions and do more work for the same physical amount of memory. Active Memory Expansion is available for partitions running AIX 6.1 or later.

## Mainframe-inspired availability features

When your business is 24x7, shouldn't your system be? That's the goal of the Power 780, to be available whenever you need it, night or day, rain or shine, to keep your business going, even when you're not there. Designed for no-compromise operations, the Power 780 keeps your applications operational when rebalancing workloads amongst systems, when adding additional memory, during selected component failures and with advance planning, even the subsequent repair. Your business is important, treat it with respect, treat it with an IBM Power System.

Among the world-class RAS capabilities provided in the Power 780 are a sophisticated service processor with a redundant service processor and clock for systems larger than one building block with dynamic failover; hot-plug, hot-swappable, blind-swap and redundant components; IBM Chipkill™ ECC memory with additional DRAM sparing; First Failure Data Capture mechanisms; and

dynamic deallocation of system components. These capabilities help to increase system availability and allow more work to be processed with less operational disruption. For enhanced server availability, the Power 780 can be clustered with IBM PowerHA™ SystemMirror for disaster recovery (DR) or DB2® pureScale™ for continuous database availability.

Processor Instruction Retry and Alternate Processor Recovery are designed to enhance application availability and improve the quality of the service provided. Both technologies come standard on the Power 780 and provide for the continuous monitoring of processor status with the capability to restart a processor if certain errors are detected. If required, workloads can be redirected to alternate processors, all without disruption to application execution.

With proper planning and configuration, Hot-node Repair is designed to enable repair and replacement of components by deactivating a node with reduced impact to the system operation. When the repair is complete, the module can be brought back online and the new resources made immediately available for assignment to new or existing application environments. This capability can also be used to add additional memory without bringing down the system. Now enabled for all nodes within the system,[4] this unique capability helps define what it means to be an IBM Power enterprise system.

## Nondisruptive growth options

IBM's modular design allows clients to start with what they need and grow by adding additional building blocks, all with minimal disruption to the base system. This is accomplished via a new innovative feature for the 780 referred to as Hot-node Add,[4] just one part of the overall availability story with IBM Power enterprise systems.

As enhanced growth options, several types of Capacity on Demand (CoD) are optionally available. Clients can install processors or memory and activate them on a 30-day trial (Trial CoD), a day-to-day basis (On/Off CoD) or permanently (Capacity Upgrade on Demand (CUoD). Additionally, Utility CoD allows clients to install processors and have them automatically activated as needed on a minute-to-minute basis. Clients may start small and grow with systems designed for continuous application availability.

## Frugal EnergyScale technology

As the price of energy increases and capacity limits become more common, optimization of available power has become increasingly vital. Consolidating onto IBM Power Systems using PowerVM virtualization technologies provides you the best way to maximize your service to clients while minimizing your energy consumption. The Power 780 offers over four times the capacity of standard POWER6 570 systems while consuming only 14 percent more energy.[5] Consolidating older systems, especially those from other vendors, provide an even more dramatic reduction in energy usage.

IBM's PowerVM Editions can help simplify and optimize your IT infrastructure by reducing energy and infrastructure costs. IBM Systems Director Active Energy Manager software exploits POWER7 EnergyScale technology by monitoring power/thermal utilization and actively adjusting system operations through energy management features for improved system utilization and energy efficiency. The entire hardware and software environment is designed to work in concert to provide you total operational control of your energy policy.

## Broad business application support

The Power 780 is designed to give clients the flexibility to run the AIX, IBM i and Linux operating systems concurrently. The AIX operating system, IBM's industrial-strength UNIX environment, has delivered exceptional reliability, availability, and security for business-critical applications. AIX and Power Systems have received numerous awards for delivering the best availability of any server platform outside the mainframe. AIX is designed to be compliant under the Common Criteria of CAPP/EAL4+ and has a history of receiving that certification for AIX including certification for the Virtual I/O Server, and Workload Partitions virtualized environments. AIX 6, the most recent version of AIX includes substantial security, availability, manageability and virtualization features that are designed to deliver even more capability to provide a secure, efficient platform for our clients most demanding workloads.

The IBM i is the integrated operating system for Power Systems that is built for efficiently deploying business processing applications. IBM i integrates a trusted combination of relational database, security, Web services, networking and management capabilities. It is a highly scalable operating system, delivering the capability to run multiple applications on a single instance of the operating environment. IBM i offers a virus-resistant architecture with a proven reputation for exceptional business resiliency. Running applications based on this platform has helped companies over many years to focus on innovation and delivering new value to their business, not just on managing their data center operations.

The Red Hat and Novell/SUSE Linux for Power operating systems may be ordered from IBM and select Linux distributors and include many open source applications, tools and utilities. IBM is firmly committed to Linux and has enabled many of the unique Power Architecture® technologies into the Linux kernel. When configured with a PowerVM Editions feature, PowerVM Lx86, running on a Linux for Power distribution, the 780 platform offers the flexibility and performance to consolidate x86 servers running a mix of Web, LAMP (Linux, Apache, MySQL and PHP/Perl/Python) and database workloads, helping clients to better manage growth without adding complexity.

## IBM Power 780 at a glance

| **Configuration Options** | Per building block | System maximum |
|---|---|---|
| Processors | Two 3.8 GHz POWER7 processor modules with eight cores each or<br>Two 4.1 GHz POWER7 processor modules with four cores each | Eight 3.8 GHz POWER7 processor modules with eight cores each or<br>Eight 4.1 GHz POWER7 processor modules with four cores each |
| Sockets | Two | Eight |
| Level 2 (L2) cache | 256 KB L2 cache per core | 256 KB L2 cache per core |
| Level 3 (L3) cache | 4 MB L3 cache per core (eDRAM) or<br>8 MB L3 cache per core (eDRAM) | 4 MB L3 cache per core (eDRAM) or<br>8 MB L3 cache per core (eDRAM) |
| Memory | Up to 256 GB of 1066 MHz DDR3 or<br>Up to 512[6] GB of 800 MHz DDR3<br>Active Memory Expansion[7] | Up to 1 TB of 1066 MHz DDR3 or<br>Up to 2 TB[6] of 800 MHz DDR3<br>Active Memory Expansion[7] |
| Solid State Drives (SSD) | Up to six SFF drives | Up to 24 SFF drives |
| Disk drives | Up to six SFF SAS drives | Up to 24 SFF SAS drives |
| Media bays | One slimline for SATA DVD-RAM | Four slimline for SATA DVD-RAMs |
| PCI adapter slots | Six PCI Express 8x slots | 24 PCI Express 8x slots |
| Integrated Virtual Ethernet | Choice of one per enclosure:<br>- Quad 1 Gb Ethernet<br>- Dual 10 Gb + Dual 1 Gb (Optical)<br>- Dual 10 Gb + Dual 1 Gb (Copper) | Choice of four per system:<br>- Quad 1 Gb Ethernet<br>- Dual 10 Gb + Dual 1 Gb (Optical)<br>- Dual 10 Gb + Dual 1 Gb (Copper) |
| Integrated SAS controllers | Two SAS DASD/SSD controllers<br>One SATA media controller | Eight SAS DASD/SSD controllers<br>Four SATA media controllers |
| Other integrated ports | Three USB; two HMC; two SPCN | Nine USB; four HMC; four SPCN |
| GX slots (12X) | Two | Eight |
| **Expansion features** (optional—operating system dependencies) | | |
| I/O expansion | Up to 4 PCIe 12X I/O drawers<br>Up to 8 PCI-X DDR 12X I/O drawers | Up to 16 PCIe 12X I/O drawers<br>Up to 32 PCI-X DDR 12X I/O drawers |
| High-performance PCI adapters | 8 Gigabit Fibre Channel<br>10 Gigabit Ethernet<br>10 Gigabit Fibre Channel over Ethernet | |
| Other PCI adapters supported | SAS, SCSI, WAN/Async, USB, Crypto, iSCSI | |
| **PowerVM virtualization technologies** | | |
| POWER Hypervisor™ | LPAR, Dynamic LPAR; Virtual LAN (Memory to memory inter-partition communication) | |
| PowerVM Standard Edition (optional) | Micro-Partitioning with up to 10 micropartitions per processor; Multiple Shared Processor Pools; Virtual I/O Server; Shared Dedicated Capacity; PowerVM Lx86 | |
| PowerVM Enterprise Edition (optional) | PowerVM Standard Edition plus Live Partition Mobility (LPM)[2] and Active Memory Sharing (AMS)[3] | |
| **Capacity on Demand features** (optional) | Processor and/or Memory CUoD<br>On/Off Processor and/or Memory CoD<br>Trial Processor and/or Memory CoD<br>Utility CoD | |
| Operating systems | AIX, IBM i, and Linux for Power[8] | |
| High availability | IBM PowerHA family | |
| Power requirements | Operating voltage: 200 V to 240 V ac<br>Power consumption: 1,600 watts maximum per enclosure | |
| **System dimensions** | 780 rack drawer building block:<br>6.9"H (4U) x 19.0"W x 34.0"D (174 mm x 483 mm x 863 mm)<br>weight 155 lb (70.3 kg)[9] | |
| **Warranty** (limited) | 24x7, same day response for one year; onsite (varies by country).<br>Warranty service upgrades and maintenance are available. | |

## For more information

To learn more about the IBM Power 780 server, please contact your IBM representative or IBM Business Partner, or visit the following Web sites:

- **ibm.com**/systems/power/
- **ibm.com**/servers/aix
- **ibm.com**/systems/i/advantages/index.html
- **ibm.com**/linux/power
- **ibm.com**/systems/p/solutions
- **ibm.com**/common/ssi

This equipment is subject to FCC rules. It will comply with the appropriate FCC rules before final delivery to the buyer.

Information concerning non-IBM products was obtained from the suppliers of these products. Questions on the capabilities of the non-IBM products should be addressed with the suppliers.

All performance information was determined in a controlled environment. Actual results may vary. Performance information is provided "AS IS" and no warranties or guarantees are expressed or implied by IBM. Buyers should consult other sources of information, including system benchmarks, to evaluate the performance of a system they are considering buying.

When referring to storage capacity, total TB equals total GB divided by 1,000; accessible capacity may be less.

[1] Comparison between a single-node 16-core POWER7 780 system and a four-node 16-core POWER6 570 system

[2] Live Partition Mobility not supported on IBM i 6.1

[3] Active Memory Sharing requires AIX 6.1 TL3, IBM i 6.1, or SUSE Linux Enterprise Server 11 for Power or later

[4] Planned for general availability in 4Q 2010

[5] Comparison between a four-node 64-core POWER7 770 system and a four-node 16-core POWER6 570 system

[6] Requires 32 GB DIMM, which is planned for general availability in 4Q 2010

[7] Optional. Requires AIX 6.1 or later

[8] See Facts and Features for specific supported operating system levels

[9] Weight will vary when disks, adapters and peripherals are installed



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