# IBM Power 770 server

*Reliable, secure systems for your critical information*

## Highlights

- Cloud enabled for fast implementation of new workloads

- Designed for secure, application availability

- Modular, economically efficient design

- Virtualized from within for better integration

- Supports your growth, without disrupting your business

Everyone knows what "performance" meant for IT in the past. But the IT landscape is evolving rapidly. And, as processes become more interrelated and complex, IT is being called upon to solve challenging new problems—and implement new projects, both with higher service levels and in a more cost effective manner. IBM has the systems, software and expertise to help clients implement projects that make their IT an enabler of innovation and a catalyst for business change in this new world of critical information.

Today's IT performance means delivering services faster, with higher quality and with superior economics. The emerging measures of IT performance are around agility and the ability to help the business capitalize on new opportunities. IT is measured on providing an infrastructure that can handle rapid growth and manage business risk while meeting higher required service levels. And of course it is expected that new services will be delivered within tighter budget constraints—with IT expected to do more with less and find the most efficient solutions possible.

Designed for virtualized consolidation of business-critical workloads, the IBM® Power® 770 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 to optimize performance and enable higher utilization levels while optimizing energy usage. Supported environments include AIX®, IBM i, Linux for Power applications, all on the same system.

Ever increasing numbers of IBM Power clients are reporting enormous savings from faster provisioning using cloud enabled technologies. Of course this comes in addition to the more traditional savings of reduced

software costs, energy, floor space and administrative overhead. Additional benefits include increased application performance, operational availability and security 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 database serving, the Power 770 provides a system designed for demanding, critical, cloud-enabled workloads. Demonstrating outstanding performance across multiple database solutions and multiple operating systems, the Power 770 shows its true heart and soul when entrusted with a company's most treasured IT asset, the database of critical information.

For transaction processing workloads, the IBM Power 770 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 770 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 Power 770 makes a great business solution.

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 770—the ideal combination for your IT environment.



Power 770 modular building blocks

## 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. New with POWER7+ are a larger L3 cache and two built-in accelerators for additional performance, the Active Memory Expansion hardware accelerator and the AIX cryptographic accelerator. L3 cache on POWER7+ processors has been increased to 10 MB per core, 2.5 times that found on previous POWER7 processors. Imbedded accelerators for memory compression and AIX file encryption now offload processors from these tasks and improve performance of those functions.

| 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 |

Increased clock speeds provide additional performance gains to make the POWER7+ processor a continued workhorse for critical workloads. What this means is that applications can run faster and be more responsive, which can result in competitive advantages and 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.

## Workload optimization

New with POWER7+ is a hardware feature called Dynamic Platform Optimizer. This feature monitors processor and memory affinity and adjusts workload placement to optimize performance for virtualized consolidated environments. All operating systems are supported. Dynamic Platform Optimizer is designed to simplify your operation and help you get the most from your system.

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 two threads per core, or SMT with four threads per core. As a result, applications can run at their peak performance and systems can increase their workload capacity.

Available with all POWER7 processors 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. This feature enables customization by partition 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 770, PowerVM includes base components provided with IBM Power Systems firmware, which includes logical partitioning (LPAR) technologies. PowerVM allows any individual LPAR or VM 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 improved resource utilization, cost savings and flexibility by enabling workload mobility. These functions are managed through use of a hardware management console (HMC) or through IBM Systems Director software with the VMControl virtualization management plug-in or through PowerVC Virtualization Center.

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 VMs 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[1] (LPM), PowerVM Active Memory Sharing[2] and PowerVP (virtualization performance monitoring).

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. PowerVP is a virtualization performance monitoring solution for Power Systems that which shows what virtual workloads are using which physical resources on a Power server.

## Active Memory Expansion

Active Memory Expansion (AME), new with POWER7, allowed the effective memory capacity of the system to be much larger than the true physical memory. POWER7+ imbeds an accelerator onto the processor chip to provide improvement in AME performance and greater processor efficiency. 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.

## System Networking

IBM System Networking solutions connect servers and storage with a high-speed and intelligent network fabric that is smart, fast and easy to manage. IBM System Networking offers low latency, low power and low cost top of rack, as well as innovative network virtualization and management solutions. These solutions are designed to power optimized workloads, such as public and private clouds, analytics, financial services and other high performance computing applications.

## Security

Security and compliance are intrinsic to today's business processes, development and daily operations and should be factored in to the initial design of any IT or critical infrastructure solution, not bolted on after the fact. By building security and compliance into the overall design of a system, an application or a cloud delivery model, businesses are better able to create agile solutions that reduce risk while cost-effectively addressing audit requirements. POWER7+ systems architecture has security

designed into each layer of the stack from the hardware to the firmware and through the systems software. PowerSC a key security and compliance offering is integrated with this stack to lower the cost of maintaining compliance and security.

## Mainframe-inspired availability features

Leading the world-class RAS capabilities provided for the Power 770 is Active Memory Mirroring for Hypervisor, which is designed to prevent a system outage in the event of an uncorrectable error in memory being used by the system hypervisor. Also available are a sophisticated service processor with a redundant service processor and a redundant clock for systems larger than one building block. Standard features for all Power 770 systems include many hot-plug, hot-swappable, redundant components; Chipkill 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 770 can be clustered with IBM PowerHA® SystemMirror for disaster recovery (DR).

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 770 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.[3] 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 the system down. Enabled for all nodes within the system this unique capability helps define what it means to be an IBM enterprise class 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 Power 770 referred to as Hot-node Add, just one part of the overall availability story with IBM Power 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 (Elastic 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.

Power Enterprise Pools[4] enhances this capability and extends it to a pool of systems. Mobile activations are provided for use on the Power 770, 780 and 795 systems and are transferable to other systems in a pool by the user with simple HMC commands. No additional paperwork is required and IBM does not need to be notified. The simplicity of operations provides new flexibility when managing large workloads in a pool of systems. This feature is especially appealing when providing continuous operations during maintenance windows. Not only can workloads easily move to alternate systems but now the activations can move as well.

## 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 770 offers over five times the capacity of standard POWER6 570 systems while consuming only 20 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 770 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 systems are consistently recognized 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. 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.

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, in addition to efficiently 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. The Power 770 platform offers the flexibility and performance to consolidate x86 servers running a mix of web, application and database workloads, helping clients to better manage growth without adding complexity.

The new Integrated Facility on Linux (IFL) enables users to easily acquire processor and memory activations on their Power 770 system for use with their Linux operating systems and do so at very attractive pricing. In addition, this feature allows users to reduce the complexity of operations associated with server sprawl by consolidating disparate, redundant and/or underutilized Linux servers while leveraging enterprise resources, processes and skills that are already in place. Providing a consolidated environment for Linux workloads can improve scaling performance, virtual network connections and security, while providing seamless, non-disruptive growth.

**IBM Power 770 at a glance**

| Configuration Options | Per building block | System maximum |
|---|---|---|
| Processors | 16 x 3.8 GHz POWER7+ processor cores or 12 x 4.2 GHz POWER7+ processor cores | 64 x 3.8 GHz POWER7+ processor cores or 48 x 4.2 GHz POWER7+ processor cores |
| Sockets | Four | Sixteen |
| Level 2 (L2) cache | 256 KB L2 cache per core | 256 KB L2 cache per core |
| Level 3 (L3) cache | 10 MB L3 cache per core (eDRAM) | 10 MB L3 cache per core (eDRAM) |
| Enterprise Memory | Up to 1 TB of 1066 MHz DDR3 Active Memory Expansion | Up to 4 TB of 1066 MHz DDR3 Active Memory Expansion |
| Integrated SAS bays for Solid State Drives (SSD) or Hard Disk Drives (HDD) | Up to six SFF SAS drive bays | Up to 24 SFF SAS drive bays |
| Integrated media bays | One slimline for SATA DVD-RAM | Four slimline for SATA DVD-RAMs |
| Integrated PCI adapter slots | Six PCIe Gen2 slots | 24 PCIe Gen2 slots |

## IBM Power 770 at a glance

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|---|---|---|
| Integrated multifunction card | Up to one per enclosure:<br>• Dual 10 Gb + Dual 1 Gb | Up to four per system:<br>• Dual 10 Gb + Dual 1 Gb |
| 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-bandwidth PCI adapters | 6 Gigabit SAS<br>8 Gigabit Fibre Channel<br>10 Gigabit Ethernet<br>10 Gigabit Fibre Channel over Ethernet<br>40 Gigabit QDR | |
| Other PCI adapters supported | SAS, Fibre Channel, Ethernet, SCSI, WAN/Async, USB, Crypto, iSCSI | |
| **PowerVM virtualization technologies** | | |
| POWER Hypervisor™ | LPAR, Dynamic LPAR; Virtual LAN (Memory to memory interpartition communication) | |
| PowerVM Standard Edition (optional) | Micropartitioning with up to 20 micropartitions per processor; Multiple Shared Processor Pools; Virtual I/O Server; Shared Dedicated Capacity | |
| PowerVM Enterprise Edition (optional) | PowerVM Standard Edition plus Live Partition Mobility (LPM)[1] and Active Memory Sharing (AMS)[2] | |
| RAS features | Processor Instruction Retry<br>Alternate Processor Recovery<br>Selective dynamic firmware updates<br>Chipkill memory<br>Memory DRAM sparing<br>ECC L2 cache, L3 cache<br>Redundant service processors with automatic failover[3]<br>Redundant system clocks with dynamic failover[3]<br>Hot-swappable disk bays<br>Hot-plug/blind-swap PCI slots<br>Hot-add I/O drawers<br>Hot-plug power supplies and cooling fans<br>Dynamic Processor deallocation<br>Dynamic deallocation of logical partitions and PCI bus slots<br>Extended error handling on PCI slots<br>Redundant power supplies and cooling fans<br>Active Memory Mirroring (optional) | |
| **Capacity on Demand features** (optional) | Processor and/or Memory CUoD<br>Elastic Processor and/or Memory CoD<br>Trial Processor and/or Memory CoD<br>Utility CoD<br>Power Enterprise Pools[4] | |
| Operating systems | AIX, IBM i and Linux for Power[6] | |
| Power requirements | Operating voltage: 200 V ac to 240 V ac<br>Power consumption: 1,925 watts maximum per enclosure | |
| **System dimensions** | Power 770 rack drawer building block:<br>6.9 in. H (4U) × 19.0 in. W × 34.0 in. D (174 mm × 483 mm × 863 mm)<br>Weight 155 lbs (70.3 kg)[7] | |
| **Warranty** (limited) | Nine hours per day, Monday through Friday (excluding holidays), next business day for one year at no additional cost; onsite for selected components; CRU (customer replaceable unit) for all other units (varies by country). Warranty service upgrades and maintenance are available. | |

## For more information

To learn more about the IBM Power 770 server, please contact your IBM representative or IBM Business Partner, or visit the following websites:

- **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

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] Live Partition Mobility is not supported on IBM i 6.1

[2] Active Memory Sharing requires AIX 5.3-12 SP5, IBM i 6.1 or later, SUSE Linux Enterprise Server 10 SP4 for Power or later, or Red Hat Enterprise Linux 6.1 or later.

[3] Requires two or more building blocks (nodes)

[4] General availability, April 25, 2014

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

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

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