IBM *@*server **pSeries 690**

As the flagship system of the IBM *@*server® pSeries® product line, the pSeries 690—a highly advanced server that can help lower costs, improve efficiency and speed transformation to e-business—is the gold standard for UNIX® computing in the on demand world. Through leading-edge innovations such as high-performance microprocessors, dense packaging, advanced clustering techniques and mainframe-inspired reliability, availability and serviceability (RAS) features, the pSeries 690 helps deliver top power, flexibility and reliability to simplify your computing infrastructure.

pSeries 690 high-end server with optional expansion frame

Highlights

■ **IBM POWER4+ processors provide high performance for diverse workloads**

■ **pSeries on demand capabilities help businesses adapt at the pace of e-business**

■ **Self-managing features enhance resiliency and help reduce total cost of ownership**

Success in today's e-business world requires that companies react immediately—on demand—to any shift in the competitive environment. Clients expect instantaneous adaptation to changing market conditions, which means that companies can no longer afford to wait for their IT infrastructure to catch up to their strategy. Needed is the agility to scale at a moment's notice with unprecedented power and performance from every component. And to support it all, companies need mainframe-level reliability features designed to ensure that applications and data are available 24 hours a day, 7 days a week.

Features such as dynamic logical partitioning (LPAR) and flexible Capacity on Demand (CoD) capabilities contribute to strong pSeries 690 performance while preserving operational versatility. In addition, innovative self-managing RAS features help to drive down costs and complexity by lowering administrative overhead. Combining the most advanced IBM leadership technology for enterprise-class performance and flexible adaptation to changing market conditions, the pSeries 690 delivers the key capabilities businesses need to compete in today's e-business on demand™ environment.

Fast processors and dense packaging

The pSeries 690 is the ultimate high-end IBM UNIX server. Designed to provide datacenter-class capacity, performance and RAS, the POWER4+™ microprocessors in the pSeries 690 utilize "SMP-on-a-chip" design. At 1.5 GHz, 1.7 GHz and 1.9 GHz, these processors are among the fastest 64-bit chips in the world[1]. Because they also incorporate copper and silicon-on-insulator (SOI) technology, POWER4+ processors consume less power—saving energy while delivering high reliability and outstanding performance. Clients with an existing POWER4™ pSeries 690 system can upgrade to a POWER4+ configuration to boost application speed and throughput.

Innovative CPU packaging also contributes to enterprise-class performance and reliability in the p690. Advanced Multichip Modules (MCMs), similar to the design used in IBM @server zSeries® servers, places up to eight microprocessors in a single MCM so small that it can fit in the palm of your hand. To further enhance performance, 128MB of Level 3 (L3) cache is packaged with the MCM. L3 cache helps stage information more effectively from processor memory to application programs. By decreasing the physical distance between components, MCMs enable faster movement of information—resulting in greater speed and improved reliability compared with earlier, less dense component configurations.

Additional "book" packaging for memory also enhances reliability by helping to protect components from electrostatic discharge and physical damage. With space for up to eight memory books per server, the pSeries 690 offers up to a 32-way configuration with 8GB to 1024GB of total memory—providing tremendous enterprise-class processing power and capacity for both commercial and technical workloads.

Designed to support the incredible speed of the processors, pSeries 690 architecture also features a peak aggregate memory to L3 cache bandwidth of 204.8GB per second in a 32-way configuration. In addition, the system can deliver an aggregate I/O subsystem bandwidth of up to 44GB/second. With its unique system architecture, the pSeries 690 can offer the speed and power to deliver efficient, cost-effective data sharing and application throughput.

Partitioning for quick response to change

IBM's logical partitioning implementation provides outstanding flexibility in matching resources to workloads, facilitating higher efficiency and lower total cost of ownership (TCO), while providing robust isolation of operating environments. The pSeries 690 system can be divided into as many as 32 independent logical servers or partitions, each with its own memory, processors, I/O and copy of the AIX 5L™ or Linux operating system. By enabling consolidation of applications using both operating systems onto a single platform, system utilization can be increased providing greater flexibility to manage the dynamics of multiple workloads in a single server, reducing complexity and delivering significant administration savings.

Based on business requirements and application needs, administrators can assign and manage resources using a single interface—the Hardware

Feature	Benefits
POWER4+ microprocessors with L3 cache	• Provide excellent system and application performance and high reliability for commercial applications in a small, efficient dual-processor chip • Offer capacity to grow to 32 processors
Copper and SOI technology	• Improves processor performance and reliability while using less power and producing less heat to help conserve energy and help lower operational costs
High memory and I/O bandwidth	• Helps remove performance bottlenecks that can occur when fast processors must wait for data to be moved through the system • Delivers increased memory bandwidth for the needs of HPC applications
Up to 1024GB ECC Chipkill™ bit-steering memory	• Allows exploitation of 64-bit addressing for large database and HPC applications • Provides growth options with outstanding throughput • Significantly lowers number of memory failures that can cause system outages, thus increasing system availability • Automatically activates memory spares when multiple memory errors are encountered
Capacity Upgrade on Demand	• Offers flexibility to cost-effectively and easily add permanent processing and memory capacity to help meet workload growth—with minimal disruption
On/Off Capacity on Demand	• Provides temporary processor use to meet unexpected workload demands
Capacity BackUp	• Offers disaster recovery solution with low entry price • Provides rapid deployment on demand in disaster situations
Book packaging	• Protects memory components against accidental disconnection and/or contamination • Facilitates easier servicing
Logical partitioning	• Permits up to 32 UNIX or Linux partitions to be consolidated on a single system, easing maintenance and administration • Offers greater flexibility in using available capacity and dynamically matching resources to changing business requirements (requires AIX 5L v5.2)
Up to 160 PCI/PCI-X hot-plug/blind-swap adapter slots	• Provides growth options for significantly increased capacity • Supports many commonly used adapters for increased availability at a lower cost • Allows adapters to be added or removed without interrupting the system
Hot-swappable disk bays	• Provide greater system availability and smoother growth by allowing swapping or adding of disk drives without powering down the system
Built-in service processor	• Continuously monitors system operations and takes preventive or corrective action for quick problem resolution and high system availability • Allows diagnostics and maintenance to be performed remotely
Redundant hot-plug power and cooling subsystems	• Enhance system availability since cooling fans and power supplies can be changed without interrupting operations • Provide backup power and cooling if primary unit fails
Dynamic processor and PCI bus slot deallocation	• Automatically deallocates resources when impending failure is detected, so applications continue to run uninterrupted
IBM @server Cluster 1600	• Provides centralized management of multiple interconnected systems • Provides ability to handle unexpected workload peaks by sharing resources • Allows for more granular growth so user demands can be readily satisfied
Linux operating system	• Enables access 32- and 64-bit Open Source Linux applications • Provides a common operating environment across IBM @server platforms
AIX 5L operating system	• Delivers maximum throughput for mixed workloads without complex system configuration or tuning • Provides upward binary compatibility to help preserve software investments • Extends application choices with Linux affinity

Management Console for pSeries. This dedicated workstation is used to define and manage the allocation of processors, memory and I/O resources to partitions. Dynamic LPAR, a function of AIX 5L v5.2, even allows reallocation of system resources without rebooting the affected partition and the creation of new partitions from resources removed from one or more partitions. Unused PCI I/O expansion slots and disk bays can also be populated concurrent with system operation to create new partitions. IBM's dynamic partitioning capabilities mean that partition changes can take effect much more rapidly, enabling companies to respond faster to changing requirements.

Extensive configuration options

As the largest UNIX server from IBM, the pSeries 690 offers exceptional configuration flexibility to meet most capacity and growth requirements. Processor MCMs, L3 cache and memory books are packaged into a 24-inch system frame containing 42 EIA units (42U) of rack space. The frame utilizes a 350-volt DC bulk power subsystem, incorporating redundant hot-plug bulk power assemblies to provide power for other pSeries 690 components.

In addition, the system frame contains a media drawer with five media bays and up to four 7040-61D I/O drawers (one is required), each with 20 PCI or PCI-X adapter slots and 16 hot-swappable Ultra3 SCSI disk bays for 36.4GB, 73.4GB or 146.8GB disk drives. The PCI slots support 64-bit adapters and offer backward compatibility for 32-bit cards, thereby providing investment protection and ample room for growth. The hot-plug/blind-swap slots allow the insertion and removal of adapters with the I/O drawer in place, which helps prevent system interruption and improves availability.

The pSeries 690 provides additional I/O capacity via a second 24-inch frame, which can accommodate up to five 7040-61D I/O drawers for a maximum of eight I/O drawers. When fully configured, a pSeries 690 server offers 160 PCI/PCI-X slots and 128 disk bays for extensive attachability and up to 18.7TB of online disk storage.

For even greater levels of disk storage capacity and performance, many customers choose the IBM 2104 Expandable Storage Plus and IBM FAStT Storage Server. These storage solutions for the pSeries 690 offer terabytes of external data storage at Ultra320 and Fibre Channel speeds respectively.

pSeries Clustering

Clustering—an advanced computing technique designed to promote higher performance, scalability, availability and manageability—allows multiple pSeries servers to be interconnected into a single unified computing resource. Clusters of pSeries servers, which may include the pSeries 690, are known as the IBM @server Cluster 1600. Using software that has been designed to simplify and streamline the management of tens or hundreds of pSeries servers or server partitions, the Cluster 1600 can help reduce the cost of datacenter administration, while ensuring continuous access to business-critical data and applications.

Diverse workloads such as Web serving and hosting, enterprise resource planning (ERP), enterprise resource management (ERM), supply chain management (SCM), and business intelligence (BI) can all benefit from the increased performance, scalability, availability and manageability offered by pSeries clusters.

With the Cluster 1600, clients can manage up to 128 operating system images from a single point-of-control. A higher scalability limit of 512 is available by special order. Up to 32 pSeries 690 servers, each with up to 32 LPARs can participate in a Cluster

1600 (maximum of 128 LPARs per cluster). Each pSeries 690 server can be interconnected to the pSeries High Performance Switch (HPS) with AIX 5L v5.2 and Cluster Systems Management (CSM) v1.3 cluster management software. The scaling limit for a pSeries 690/HPS cluster is 16 servers and 32 HPS links. In July 2004, the scalability limit will be increased to 32 pSeries 690 servers and 128 HPS links. Higher scalability limits are available by special order.

pSeries 690 servers can also be interconnected with cluster networks such as Ethernet or SP™ Switch2. These are supported by AIX 5L on either CSM or Parallel System Support Programs (PSSP) managed clusters. This provides investment protection for customers who want to add the latest pSeries 690 servers to existing clusters without also having to upgrade the interconnection network or cluster management software.

Grid readiness
The pSeries 690 is designed to participate in Grid Computing—an emerging technology that creates virtual computing resources across an intranet or the Internet using industry-standard protocols. By harnessing unused computing cycles, Grid Computing allows organizations to make more efficient use of existing resources, giving them additional computing power while lowering their overall cost of computing.

Keeping businesses running
Several innovations stemming from the IBM autonomic computing initiative—a blueprint for self-managing systems—help contribute to uncompromising pSeries reliability, manageability and serviceability features. Its goal is to create an intelligent IT infrastructure that responds to unexpected capacity demands or to system failures while at the same time helping to control spiraling pressure on critical skills, software and service/support costs.

To boost availability, an integrated service processor in every pSeries 690 server monitors system health. This feature can detect error conditions within the hardware and automatically place a service call to IBM, often before the problem becomes apparent to users. Then, if repairs are necessary, the service processor can initiate dynamic reconfiguration to correct the failure. In this manner, automated monitoring helps businesses minimize costly outages and reduce administrative overhead and support costs.

First Failure Data Capture (FFDC) identifies and logs both the source and root cause of system failures to help prevent the reoccurrence of intermittent failures that diagnostics cannot reproduce. Designed to prevent outages and reduce repair time by identifying failing components in real time, FFDC also contributes to outstanding pSeries 690 system availability.

The use of IBM Chipkill technology allows detection and correction of most multi-bit memory errors on the pSeries 690. This protection from memory failures helps prevent costly system memory crashes and improves pSeries 690 reliability. In fact, IBM studies show that systems with Chipkill memory are up to 100 times less likely to have outages because of memory failure[2].

To help prevent system shutdowns caused by main memory and L2/L3 cache errors, error checking and

correcting (ECC) memory detects both single- and double-bit errors and corrects all single-bit errors dynamically—complementing Chipkill memory to improve reliability. In addition, the pSeries 690 includes redundant, spare main memory chips. Through a technique known as bit-steering, these spares can be dynamically activated to replace a failing memory chip if multiple memory bit errors exceed a threshold.

The pSeries 690 server also features the ability to deallocate critical system resources, including the processors and PCI-X bus slots. In the unlikely event that an impending failure of one of these components is indicated, this capability—working with AIX 5L, system firmware and the service processor—can dynamically take the faulty component offline. The system can reassign the workload to other resources to avoid interruption or automatically bring a spare processor online if available. If the system must be rebooted, previously deallocated components will not be included to avoid repetition of the error condition. Failing components can be replaced during normal service to minimize system and application downtime.

Reliability and availability features also include redundant hot-plug power supplies and cooling fans, designed for easy replacement without affecting system operations. Environmental monitoring functions—such as temperature monitoring that increases the fan speed in response to above-normal temperatures—boost reliability by helping to maintain the correct conditions for sound system operation.

The pSeries 690 system frame includes two redundant hot-plug bulk power supply subsystems. The frame also includes reliability and availability features such as optional Internal Battery Backup (IBB) to keep the system running during brownout conditions and to provide for orderly shutdown in the event of loss of power. For full power loss protection, the pSeries 690 system frame supports optional uninterruptible power supply (UPS) systems in addition to, or in place of, the IBB features.

For near continuous availability, from two to 32 pSeries 690 servers can be clustered with High Availability Cluster Multiprocessing for AIX 5L (HACMP™) software from IBM.

HACMP helps to minimize downtime of systems and applications, providing a superior base for high availability—an essential ingredient of business-critical environments.

Open standards for e-business
The pSeries 690 server is matched with AIX 5L—the advanced, open, scalable UNIX operating system from IBM. Providing real value in reliability, availability and security, AIX 5L is tuned for e-business application performance and is recognized as state-of-the-art in systems and network management.

AIX 5L delivers Java™ technology, Web performance and scalability enhancements for managing systems of all sizes—from single servers to large, complex e-business installations. Web-based remote management tools give administrators centralized control of the system, enabling them to monitor key resources such as adapter and network availability, file system status and processor workload. AIX 5L also incorporates Workload Manager, which can help ensure that critical applications remain responsive even during periods of peak system demand.

pSeries 690 at a glance

Minimum configuration	
Microprocessor	8-way SMP (one 8-way MCM); 1.5 GHz, 1.7 GHz or 1.9 GHz POWER4+
L3 cache	128MB (ECC)
RAM (memory)	8GB
Disk bays	16 hot-swappable via one 7140-61D I/O drawer
Media bays	Five (four available)
Expansion slots	20 PCI or PCI-X (64-bit) via one 7140-61D I/O drawer (speeds up to 133 MHz)
PCI bus width	32- and 64-bit
Standard features	
I/O adapters	Two integrated Ultra3 SCSI controllers
Ports	Two serial ports for connecting Hardware Management Console for pSeries
System expansion	
SMP configurations	16-, 24-, 32-way SMP (two, three or four 8-way MCMs); 1.5 GHz, 1.7 GHz or 1.9 GHz POWER4+
L3 cache	128MB per MCM (512MB maximum)
RAM	Up to 1TB (ECC, Chipkill)
PCI/PCI-X expansion slots	Up to 160 adapters via seven additional 7140-61D I/O drawers
Disk bay expansion	Up to 128 hot-swappable disk bays via seven additional 7140-61D I/O drawers; up to 18.7TB (36.4GB, 73.4GB and 146.8GB disk drives available)
Battery backup	Up to two (optional)
Cluster features	
Cluster attachment:	CSM v1.3 with AIX 5L v5.2
	PSSP v3.5 with AIX 5L v5.1/5.2
Cluster Interconnect:	Ethernet (CSM or PSSP)
	High Performance Switch (CSM only)
	SP Switch2 (PSSP only)
RAS features	Copper, SOI microprocessors
	Chipkill ECC, bit-steering memory
	ECC L2 cache, L3 cache
	Service processor
	Hot-swappable disk bays
	Hot-plug/blind-swap PCI/PCI-X slots
	Hot-plug power supplies and cooling fans
	Dynamic deallocation of logical partitions and PCI bus slots
	Redundant power supplies and cooling fans
	Battery backup (optional)
Operating systems	AIX 5L Versions 5.1/5.2
	Selected Linux distributions*
Power requirements	200v to 240v; 380v to 415v; 480v AC
System dimensions	79.7" H x 30.9" W x 58.8" D (202 cm x 79 cm x 149 cm)
	Weight 2,666 lb (1,209 kg)**
Warranty	On site 24x7 for one year (limited) at no additional cost

*   Details on supported Linux distributions may be found at **ibm.com**/servers/eserver/pseries/linux/whitepapers/linux_pseries.html

** With acoustic door. Weight will vary when disks, adapters and other peripherals are installed.

The pSeries 690 exemplifies the IBM @server commitment to application flexibility through open standards. In addition to including enhanced Java scalability and performance, AIX 5L provides application programming interfaces (APIs) that allow popular Linux Open Source applications to run on AIX 5L with a simple recompilation. The AIX® Toolbox for Linux Applications provides utilities, editors, debuggers and other application development tools to aid in this recompilation.

Linux support offers versatility
The Linux operating system is available for the pSeries 690 from one or more Linux distributors, offering packages that include a complement of Open Source tools and applications. Linux does not require the use of AIX 5L. Linux applications can run independently in an LPAR, which allows them to utilize I/O resources and benefit from many of the performance features of the pSeries 690[3]. IBM Global Services and Linux distributors offer service and support offerings for Linux.

Greater application choice
The entire IBM @server product line offers uncompromising flexibility in selecting, building and deploying the applications businesses need to succeed in today's on demand world. Toward that end, IBM offers one of the industry's broadest ranges of hardware platforms and systems software. IBM is committed to industry-standard, cross-platform technologies that form the core of a flexible computing infrastructure.

Support for these standards in key middleware—including DB2® Universal Database™, WebSphere® and MQSeries® software—means that companies need not get locked into a single platform as their business grows. By embracing open standards, organizations gain the flexibility to deploy applications in a cost-effective way.

Managing an on demand business
The IBM @server product line is backed by a comprehensive suite of offerings and resources that provide value at every stage of IT implementation. In addition to building on IBM innovations in chip technology, clustering and multiplatform design, the pSeries 690 also leverages flexible Capacity on Demand features to provide one of the most scalable and rapidly adaptable servers available today. In an on demand world, having the agility to scale-up at a moment's notice can be the difference between capturing a flood of orders following a weekend advertising blitz or alienating buyers with slow system response times and poor service.

On/Off Capacity on Demand for processors gives pSeries 690 systems the ability to handle business spikes. This feature works like a debit card, allowing the temporary activation of pairs of reserve processors. Companies pay only for the processing power they need, when they need it—which makes the pSeries 690 a great server to support unanticipated or seasonal peak workloads.

Capacity Upgrade on Demand (CUoD) for processors and memory allows businesses to anticipate growth and workload requirements by bringing reserve resources online incrementally. When extra power becomes necessary, administrators activate pre-installed processors in pairs—or memory in 4GB increments—on a permanent basis. Dynamic LPAR can make this activation seamless. By bringing capacity online as processing demands grow, companies can easily and economically scale to meet market requirements.

In environments where the applications running on the pSeries 690 are mission-critical, it is possible to install an affordable backup server with Capacity BackUp (CBU) functionality. The CBU system with four active and 28 inactive processors remains in standby mode until needed for disaster recovery. The price of the backup system is less than the production system since its resources are only activated when the production system is down.

In environments with CUoD for processors, an availability-enhancing feature known as Dynamic Processor Sparing allows inactive processors to act as dynamic spares. By transparently activating an inactive CPU when a failing processor reaches an error threshold, Dynamic Processor Sparing can help maintain performance and improve system availability. When the failing processor returns to service, the spare returns to the inactive CUoD processor pool of resources.

In addition, IBM Global Services experts can help with business and IT consulting, business transformation and total systems management services, as well as customized e-business solutions.

Enterprise-class security for safe data
The pSeries 690 builds on IBM innovations in encryption—as well as performance and manageability—to safeguard sensitive information. Earning the U.S. government's highest certification for commercial security (Cryptographic Coprocessor with Federal Information Coprocessing Standard (FIPS) Certification—140-Level 4), pSeries servers with AIX 5L are among the world's most well protected. This outstanding level of safety enables companies to conduct business via secure transactions while protecting customers and suppliers.

IBM provides around-the-clock support
pSeries 690 systems are backed by worldwide service and support from IBM. The one-year, end-to-end, basic warranty includes AIX 5L operating system support, hardware fixes, manned phone hardware support and call tracking.

This hardware warranty provides 24x7x365 coverage. The warranty terms and conditions may be different in some countries. Please consult your local IBM marketing representative or IBM Business Partner for country-specific terms and conditions.

Flexible Financing
IBM Global Financing offers a wide range of financing options to help manage the bottom-line and meet the varying needs of e-business on demand.

Uncompromising functionality for on demand computing
IBM advances in processor technology, clustering, scalability and autonomic and on demand computing put pSeries servers among the most powerful, versatile, reliable and secure systems in the world. The pSeries 690—as the flagship in the pSeries server family—can deliver a highly available, cost-effective system tuned for e-business and a range of diverse workloads. Through its uncompromising performance and flexibility, the pSeries 690 sets a new standard for UNIX and Linux computing—both within IBM and throughout the industry.

For more information

To learn more about the
IBM @**server** pSeries 690, contact
your IBM marketing representative or
IBM Business Partner, or visit the
following Web sites:

- **ibm.com**/eserver/pseries
- **ibm.com**/servers/aix
- **ibm.com**/eserver/pseries/linux
- **ibm.com**/servers/solutions
- **ibm.com**/common/ssi

[1] Based on SPEC CPU2000 benchmarks on a 1.9 GHz POWER4+ processor as of February 27, 2004, available at www.spec.org.

[2] IBM study by Timothy J. Dell, "A White Paper on the Benefits of Chipkill-correct ECC for PC Server Main Memory," November 19, 1997. Available at **ibm.com**/servers/eserver/pseries/campaigns/chipkill.pdf

[3] Many of the pSeries 690 features described in this document are operating system dependent and may not be available with the Linux operating system. For more information, please visit **ibm.com**/servers/eserver/pseries/linux/whitepapers/linux_pseries.html