

A Brief History of RISC, the IBM RS/6000 and the IBM eServer pSeries

Reduced Instruction Set Computer (RISC) architecture is the basis for most workstations and UNIX-based servers in use today, and is widely viewed as the computing architecture of the future. The RISC concept simplified the instructions given to run computers, making them much faster and more powerful. Based on pioneering work at IBM's Thomas J. Watson Research Center starting in 1975, a first prototype was completed in 1980, and the groundbreaking RISC Superscalar RS/6000 was introduced into the market in 1990, providing a lower-cost method of conducting high-performance calculations necessary for engineers and scientists. Today, this powerful computer architecture has applications in many fields owing to its simplicity and speed, and it is evolving as the basis for a new generation of faster and more powerful personal computing devices.

The following is a brief review of some of the key developments in IBM's RISC technology and the RS/6000 family and its successor.

1986

IBM introduces in January the RT Personal Computer line of high-speed workstations intended for technical professionals. The RT is the first workstation to use Reduced Instruction Set Computer (RISC) architecture originated by IBM researchers.

1987

New models of the RT Personal Computer are announced, with a 32-bit microprocessor, an IBM-invented program compiler, an IBM-invented one-megabit chip and a new high-resolution display.

1988

Three new models -- Models 130, 135 and B35 -- of IBM's Reduced Instruction Set Computer (RISC) Technology workstation series are announced. The RT system -- previously called the RISC Technology Personal Computer or RT PC -- is a full-function, 32-bit workstation for use as an independent system or connected to a host computer. Also announced is a new 310-million-character disk storage device and several program products for the AIX/RT operating system.

1990

IBM announces in February the RISC System/6000, a family of nine workstations that are among the fastest and most powerful in the industry. The RISC System/6000 uses Reduced Instruction Set Computer technology, an innovative computer design pioneered by IBM that simplifies processing steps to speed the execution of commands, and a new version of Advanced Interactive Executive (AIX), IBM's implementation of the UNIX operating system.

1991

The RISC System/6000 family is broadened with new high and low-end models, and enhanced with new software, memory and disk storage that enables customers to run applications faster and boost overall workstation performance.

Apple Computer Inc. and IBM announce in October a series of agreements which include Motorola Inc. as a technology partner. The agreements include new Reduced Instruction Set Computer microprocessors for personal computers and low-cost workstations; and a new open-systems environment in which both IBM AIX and Macintosh software programs can run on RISC-based systems from both companies.

1992

In the biggest RISC System/6000 announcement since the original product launch, IBM expands the performance and flexibility of its family of advanced workstations and servers with the introduction of five new POWERstation/POWERserver models — the 220, 340, 350, 520H and 560 — and a host of new software offerings, including AIX Version 3.2. The company rolls out in April a new high-end, rack-mounted RISC System/6000 server — the POWERserver 970 — that delivers double the expansion capability and nearly twice the disk storage capacity of IBM's existing high-end server model. In addition, IBM introduces a powerful new family of RISC-based System/88 continuously-available computers, doubling the system's power and significantly improving price/performance.

In software, IBM announces Advanced Interactive Executive/Enterprise Systems Architecture (AIX/ESA) to provide native UNIX capability on the System/390 family of ESA-capable processors, and new cluster software to enable customers to tie together two RISC System/6000 systems for maximum system availability

Other product announcements in 1992 include IBM AIX Cashier Security and Productivity Assistant/6000, to collect and analyze data from IBM 4680 POS terminals to alert store managers to performance problems involving individual cashiers.

Marriott selects IBM systems integration services, as well as RISC System/6000 servers, for a new hotel management system to be used in more than 230 hotels worldwide.

Groupe Bull of France and IBM announce a far-reaching open-systems technology and associated manufacturing relationship covering RISC technology, personal computer development, interoperability, manufacturing and equity.

1993

IBM introduces the Scalable POWERparallel System, the first in a family of microprocessor-based supercomputers using RISC System/6000 technology. IBM announces in February nine new systems and enhanced features for the RISC System/6000 family, including a

new entry-level 2D color graphics system, a new series of specialized desktop graphics workstations, and a new high-performance, high-capacity Network File System server. Seven new systems are added to the RISC System/6000 line in May, including the most powerful entry desktop models to date. Four months later, IBM makes the most significant RS/6000 announcement since the original launch of the RISC System/6000 product line in February 1990, introducing major enhancements to that family of workstations and processors, including four new desktop workstation and server models based on the PowerPC 601 microprocessor and three new high-end models that use IBM's own multi-chip microprocessor, the POWER2, the highest performance microprocessor in the industry. At the same time, the company announces the general availability of its scalable POWERparallel system.

IBM's software announcements in 1993 include a new release of AIX/6000 and other software enhancements for the RISC/6000 family.

1994

IBM adds seven new servers — including the Model C10 PowerPC server, and four new client workstations — to the RISC System/6000 line. The company later introduces three new PowerPC symmetric multiprocessor servers — RS/6000 Models G30, J30 and R30 — and the RS/6000 Model 40P workstation. IBM unveils its second PowerPC-based system, the RISC System/6000 N40 notebook workstation, the most powerful system of its class in the world.

The Cornell Theory Center receives the world's fastest, most powerful general purpose computer: a massively parallel IBM Scalable POWERparallel Systems SP2, capable of performing 136 billion calculations per second. CERN, the European Laboratory for Particle Physics, takes delivery of the most powerful IBM supercomputer ever ordered in Europe: a 64-node, AIX-based IBM Scalable POWERparallel Systems SP2.

1995

IBM forms the Server Group, to include the AS/400, RS/6000 and Systems Technology and Architecture divisions, as well as the businesses that had been part of the Large Scale Computing Division (LSCD). Two new divisions replace LSCD: System/390 Division and the Power Parallel Division. (The IBM RISC System/6000 Division and POWER Parallel Division are combined later.)

IBM rolls out in February the RISC System/6000 Model 3CT and Model 39H; IBM Xstation 160, the first IBM product to incorporate a PowerPC 603 microprocessor; and a new, RS/6000-based processor for the IBM SP2 offering higher “number crunching” performance than its current counterpart. The RS/6000 Model 591 desktide and Model R21 rack-mounted systems, which can be configured with as much as 2 gigabytes of memory, are announced in July. The following month, IBM introduces a faster high-end processor for the RS/6000 Scalable POWERparallel Systems (SP), and in October, the RS/6000 Model E20. An IBM Scalable POWERparallel System is used to provide access to the Wimbledon Home Page on the Internet.

1996

IBM announces in February the RS/6000 Model F30 server to support World Wide Web home pages and other applications, and in June, the company rolls out enhanced RS/6000 Internet POWERsolution Web Servers, new Internet POWERsolution Firewall and Proxy Servers, and new Internet Commercial Application Servers. The following month, three new RS/6000 servers debut — Models G40, J40 and R40 — using symmetric multiprocessor computing and the PowerPC 604 chip. New RS/6000 servers, including Internet-ready systems equipped with Lotus Notes and electronic-commerce software, are brought out in October.

The U.S. Department of Energy selects IBM to build the world's fastest supercomputer. Capable of performing more than three trillion calculations per second (3 teraflops), the RS/6000 SP will simulate nuclear explosions and reduce the need for live tests.

IBM also announces the R/390, a new server comprised of a RISC System/6000 computer with an integrated S/390 processor card.

At the 1996 Centennial Olympic Games in Atlanta, Georgia, an IBM SP2 supercomputer acts as the World Wide Web server and runs the Regional Weather Forecasting System.

1997

The company reports in September performance improvements from the new Power PC 604e microprocessor that make the RS/6000 SP up to 58 percent faster. The next month, the RS/6000 Model 70 server, the most comprehensive 64-bit UNIX computing solution available, is rolled out.

In a six-game match, a chess-playing IBM computer known as Deep Blue defeats chess grandmaster Garry Kasparov — the first time a reigning world champion loses a match to a computer opponent in tournament play. Deep Blue is an IBM RS/6000 SP supercomputer capable of calculating 200 million chess positions per second.

NASA's *Pathfinder*, equipped with IBM RS/6000 technology for its onboard flight computer, lands on Mars. (The flight computer is responsible for more than 100 pyro events, including deploying the parachutes, inflating the airbags and firing the retro rockets that allow *Pathfinder* to land safely.)

1998

IBM announces in April improvements to the RS/6000 SP — the result of IBM's new 332 MHz PowerPC 604e microprocessor — that deliver five times the performance of the IBM Deep Blue computer that defeated chess Grand Master Garry Kasparov. The next month, the company rolls out the RS/6000 HA50 High-Availability Cluster Server which uses clustering technology that allows more than one computer to be linked together to provide superior reliability and availability. A month after that, IBM reports record-breaking business intelligence benchmarking

results using the RS/6000 SP, DB2 Universal database Enterprise-Extended Edition and IBM's Serial Storage Architecture disk technology. IBM and FTL Systems announce in June breakthrough software running on an RS/6000 SP supercomputer that can test and verify electronic circuits and chip designs hundreds of times more complex than can be tested at the time. IBM introduces its first server — the RS/6000 Enterprise Server Model S70 — powered by a new second-generation 64-bit microprocessor that set a record for speed on the Web, and the RS/6000 43P Models 260 and 150.

The U.S. National Weather Service selects IBM to provide an IBM RS/6000 SP — more than 10 times more powerful than the system made famous during Deep Blue's 1997 victory over chess Grand Master Garry Kasparov — to improve the agency's national weather and climate forecasting capabilities.

IBM debuts the RS/6000 HA-S70 Advanced Cluster Server, a packaged solution that includes two preconfigured S70 Advanced servers coupled with IBM's High Availability Cluster Multi-Processor software.

IBM delivers in September the world's first copper-based microprocessors, including a PowerPC 740/750 operating at 400 MHz. Microprocessors that incorporate copper wiring boost chip performance by about one-third. IBM says it will incorporate copper into its S/390, RS/6000 and AS/400 server families.

1999

IBM launches the next generation of its RS/6000 SP supercomputer with POWER3 microprocessors that more than double its number-crunching power at approximately the same price. The POWER3 can perform up to two billion operations per second and is more than twice as powerful as the POWER2 Super Chip inside IBM's "Deep Blue," the computer that beat world chess champion Garry Kasparov in 1997.

The National Center for Atmospheric Research in Boulder, Colo., takes delivery of an IBM RS/6000 SP that will accelerate researchers' abilities to simulate global climate patterns. The new RS/6000 SP — code-named "blackforest" — is five times larger and 20 times more powerful than the system made famous during Deep Blue's historic 1997 victory over world chess champion Garry Kasparov.

IBM becomes the leading vendor in the field of high performance computing. More universities, government laboratories and businesses use IBM supercomputers (RS/6000 SPs) than those of any other manufacturer on the "TOP500 Supercomputing Sites" list.

An IBM RS/6000 S80 almost doubles the best Java performance claim to date and sets a world record for Web serving, while a cluster of five 12-way RS/6000 S70 Advanced Enterprise Servers set a new world record for transaction processing by clustered servers, surpassing all other computer makers in a key computing criteria used to evaluate both system performance and

availability. Later in the year, an IBM RS/6000 S80 Enterprise Server sets a new world record for transaction processing performance by a single-server system.

2000

IBM introduces the IBM eServer, a new generation of servers featuring mainframe-class reliability and scalability, broad support of open standards for the development of new applications, and capacity on demand for managing the unprecedented needs of e-business. The new servers feature technology from IBM's high-end servers applied across the entire product line, and include the eServer pSeries -- the most powerful, technologically advanced UNIX server.

IBM announces the IBM eServer pSeries 680 -- code-named "Turbo" -- as the most powerful commercial server in history. Built on the award-winning RS/6000 S80 design, the p680 immediately captures eight major performance benchmark records using up to 24 copper microprocessors with IBM's breakthrough Silicon-on-Insulator (SOI) technology.

The company reports that it has reached a new milestone in server sales with the shipment of the 1,000th RS/6000 S80 server just four months after its product launch. Six months later, IBM announces "Blue Hammer," the world's most powerful UNIX cluster system dedicated to Web-based commerce, to bring the comprehensive management capabilities of IBM's industry-leading supercomputers to its top-performing RS/6000 S80 enterprise server.

IBM debuts a commercial version of ASCI White -- the most powerful supercomputer in the world. The new RS/6000 SP system uses performance-enhancing copper microprocessors, silicon switching technology and advanced software to provide e-businesses with the unmatched processing speed, scalability and reliability needed for demanding e-commerce applications. Also introduced is the RS/6000 44P Model 270, the world's fastest 4-way Web Server. The first entry UNIX server to implement performance-enhancing copper technology, the Model 270 is ideal for running sophisticated e-commerce applications as well as general business applications used by small- and medium-sized companies. Complementing the Model 270, IBM also rolls out the RS/6000 44P Model 170 uniprocessor system.

The Finnish academic supercomputing center -- CSC -- selects an ultra-powerful IBM RS/6000 SP system as its next generation supercomputer for the Ministry of Education. Upon installation, the IBM system will be the most powerful commercial supercomputer in Europe. IBM reports that its next generation RS/6000 SP system with DB2 Universal Database Version 7.1 set a new record for business intelligence performance in the TPC-H benchmark, easily beating the previous record at a price/performance ratio three times better than the competition.

In building and managing the technology infrastructure for the Sydney 2000 Olympic Games, IBM turns in a Gold Medal performance. The official Games Web site, powered by IBM, handles unprecedented Internet traffic with 11.3 billion hits, a 1,700 percent increase over the Nagano Games official site in 1998. More than 13 million lines of software code are written and thoroughly tested before the Games begin. Nearly 6,000 people provide technology support for

300 medal events in 37 sports competitions held in 39 venues. Fifty IBM RS/6000 PC and three RS/6000 SP servers manage and organize data generated by Olympics.com and an intranet system.

2001

In October, IBM announces the eServer p690 (“Regatta”) as the world’s most powerful UNIX server, crowning a five-year effort to deliver a new class of UNIX system that incorporates microprocessor breakthroughs and mainframe technologies. When tackling the most complex problems, multiple p690 servers can be linked together to create supercomputers powered by more than 1,000 processors. Later in the month, IBM reports that “Regatta” sets a world record for processing speed on the important Fluent engineering benchmark. The company begins shipping “Regatta” in volume in December.

The company announces the IBM eServer p660 Model 6M1, the world’s most powerful midrange server. In October, it introduces the IBM eServer p610 as the world’s most powerful entry server, a two-way UNIX system that provides industry-leading performance, wireless manageability features and advanced self-healing technologies.

IBM says its middleware software portfolio will capitalize on the company’s new eServer p690 (“Regatta”) to deliver an e-business infrastructure solution offering the highest speed connections in the world running on a UNIX system.

The U.S. Government dedicates ASCI White, the world’s fastest supercomputer at the Lawrence Livermore National Laboratory in California. ASCI White, an IBM system, covers a space the size of two basketball courts and weighs 106 tons. It contains six trillion bytes (TB) of memory, almost 50,000 times greater than the average personal computer, and has more than 160 TB of IBM TotalStorage 7133 Serial Disk System capacity -- enough to hold six Library of Congress book collections.

The U.S. National Center for Atmospheric Research selects IBM to provide the world’s powerful supercomputer for predicting climate changes. Code-named “Blue Sky,” the system will be powered by IBM’s SP supercomputer and IBM eServer p690 systems, and is designed to achieve a peak speed of seven trillion calculations per second with 31.5 trillion bytes of IBM SSA disk storage.

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