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Strategic Snapshot

IBM POWER as an Industry Standard

The Intersection of Collaboration and Innovation

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March 2004

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IBM POWER as an Industry Standard: The Intersection of Collaboration and Innovation

ABSTRACT

Business evolves through alternating cycles of innovation and standardization. Those products and processes that are widely adopted or influential often become accepted as Industry Standard. While Industry Standard is a commonly used marketing slogan, its misuse has confused and diluted the term's meaning. In IT, an Industry Standard can be proposed and/or accepted by technology standards organizations such as the W3C or the OPEN Group or arise because a business process has been legislated or regulated. A technology can also achieve De Facto Industry Standard status through wide acceptance by vendors, supply chains, and customers. This is a particularly slippery area since it is the market, and not the vendors who profit from its approval, that essentially grants De Facto Standard status. In addition, over the past decade, a third class of innovative Industry Standards has evolved largely unrecognized as such by the IT industry and end users, though most have enjoyed these technologies' benefits. In this paper, we will discuss the origins and dynamics of industry standards and the evolution of new Innovative Standards as exemplified by IBM's POWER processor architecture. We will also consider the business and technological benefits of the POWER architecture and its effect on the IT industry, vendors, and end users.

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Introduction

IT vendors seek to achieve industry leadership and drive new business with innovative products and strategies; the bedrock of industry standard practices and technologies provide essential support for this innovation. Business evolves through alternating cycles of innovation and standardization in both products and processes. When these are widely adopted, they often become accepted or approved as Industry Standards. While use of the term Industry Standard is common, its precise definition is elusive at best. More importantly, the term's misuse can confuse and devalue its true meaning and import. For example, Intel's x86 platform is widely recognized as the engine of Industry Standard servers and PCs. However, ongoing efforts by Intel and vendors such as HP to brand Intel's Itanium processor, which is in the earliest stages of market adoption, as an Industry Standard 64-bit platform are both inaccurate and misleading. While Itanium may eventually become a commodity chip, it is not an industry standard by any definition we can see. Naming it as such, only serves to confuse if not mislead the marketplace.

Much of the complexity surrounding industry standards is due to their emergence from different starting points and through various processes. In a practical sense, standards provide the baseline that enable industry players to innovate in ways that would otherwise be impossible. Powerful initiatives like IBM's On Demand, HP's Adaptive Enterprise, and multiple vendors' Utility Computing efforts are the strategic offspring of a variety of tangible industry standards. Without standards, it would be impossible to virtualize and manage the plethora of heterogeneous technologies and processes existing in organizations today.

Industry Standards by Design and Demand

To better understand how technologies and products achieve recognition as standard, the following explores the three types of industry standards.

Commodity Standards: Innovation through Cooperation

The best-known industry standards are what we call Commodity Standards, which typically arise in response to systemic marketplace factors that, if left unaddressed, would severely limit the viability of all players, or prevent a market from reaching its full potential. Commodity Standards such as SCSI, Ethernet, or XML, for example, are developed with predetermined specifications outlined by cooperative, essentially agnostic parties, including trade consortia and other recognized standards bodies. Initially, the level of innovation of Commodity Standards is fairly high but plateaus until additional performance or features are required. Products and services based on Commodity Standards are sourced from multiple vendors, and are generally created and brought to market after the official ratification process is concluded. Commodity Standards free companies to focus on areas where they can add value as opposed to recreating basic technology.

De Facto Standards: Industry Acceptance through Mass Adoption

De Facto Standards focus on specific needs in reaction to unmet or leading edge market opportunities. While De Facto Standards such as Intel's x86 instruction set and Microsoft Windows dominate some markets, their development, and that of associated solutions are tightly controlled by their owner vendors. These standards develop along a notably different evolutionary path than Commodity Standards as solutions generally come to market without concern for recognition by official standards bodies, and seek to create or drive demand for new products and services. As the volume of these products increases, so do the number of third parties creating solutions based upon and adding value to the Commodity Standard. At

one level, this singular control simply reflects the needs or desires of end users. Microsoft has a history of successfully incorporating popular functionalities into its operating systems that were originally championed by third parties; however, such reactive tendencies can also backfire. AMD's inclusion of 64-bit extension technologies in its Opteron processors is an innovation that was initially derided by standard-bearer Intel, until market opinion forced Intel to reverse its position.

Innovative Standards: Driving Evolution Cooperatively

By comparison, Innovative Standards are a hybrid of Commodity and De Facto Standards. Innovative Standards are entrepreneurial in nature and tend to be broadly or architecturally based so they can be leveraged across a wide range of IT and business processes. These innovative "building blocks" are Renaissance technologies that promote value-added behavior. Innovative Standards are generally owned or initially controlled by single entities, but quickly gather communities of innovators who collaboratively leverage these architectures to their and the market's advantage. Some common examples include IBM's POWER processor architecture, Linux, and Sun Microsystems's Java. The evolution of Innovative Standards tends to rise continually, often rapidly, reflecting participant interest and enthusiasm. Innovative Standards can also play critical roles in times of change because their innate flexibility is appealing to developers and businesses that want to leverage new technologies but need to minimize risk by basing their efforts and investments on robust, proven solutions.

The Business Benefits of Innovative Standards

Flexibility and Time to Market

Innovative Standards often drive highly integrated, value-added vertical solutions, yet the building blocks themselves are widely deployed horizontally. Due to the flexibility Innovative Standards offer, developers tend to utilize these architectures to create new market opportunities. In addition, developers gain a competitive advantage in delivering better products to market faster than would be otherwise possible. As a result, consumers of innovative standard products such as Linux, Java, and IBM POWER-based solutions unknowingly benefit from the skills and enthusiasm of multiple developers working together on a uniquely large scale.

Progress through Partnerships

One benefit of building products and solutions on Innovative Standards is that the risks and rewards of embracing a new technology are spread across many players and/or products, thus enabling the critical mass needed to drive success for all involved. At the same time, the best practices for the technology are not necessarily market-specific, which means that multiple players can leverage the results across disparate markets without sacrificing their unique value-add. This also means that applications driving vertical markets support the development of underlying horizontal opportunities. In the end, this is a win for all participants, because the intersection of myriad markets affected by Innovative Standard-based solutions provides the widest possible scope of and support for product development.

IBM POWER as an Innovative Standard

IBM's POWER architecture is probably best known as the underlying 64-bit architecture of the company's eServer pSeries and iSeries solutions. However, POWER-based solutions offer

a Renaissance approach to IT that focuses broadly across the entire business and consumer technology markets. POWER is used by hundreds of manufacturers, supported by thousands of developers, and depended upon by millions of business and consumers. POWER cores are used as building blocks in products ranging from automotive control systems to entertainment and game consoles, as well as in disk storage systems, desktop computers, and high-performance computing systems. Although IBM owns and develops the core POWER architecture, it works with companies to create custom ASICs, (application-specific integrated circuits) for industries such as telecommunications, data processing, and digital image and sound processing. In some cases, POWER chips have become standard products for their market segment.

POWER began its life in IBM's Advanced Computing Systems and was initially designed as an experimental RISC technology. As illustrated in Table 1, The POWER architecture has evolved into an Innovative Standard across technology as well as the platform for two of IBM's flagship operating systems, AIX, and OS/400.

Table 1: Highlights of POWER's History and Innovation

Year	Event	Comment
1965	IBM Advanced Computing Systems (ACS)	First ideas for POWER
1970s	RISC technology developed for the experimental 801 project	To build a high-speed telephone switching network
1985 – 1989	First RISC-based Computers, Virtual Resource Manager (VRM) and AIX v1/2	Development and prototyping continues
1990	First POWER chip introduced for technical computing (32-bit)	RS/6000 introduced running AIX v3
1991	PowerPC Alliance formed	With Motorola and Apple
1993	POWER2 introduced for technical computing systems (32-bit)	IBM's first RS/6000 POWER2
1995	PowerPC AS for AS/400 brings 64-bit computing to commercial space	For commercial applications
1997	PowerPC RS64 for RS/6000 brings 64-bit computing to commercial UNIX space	Same processor now used for AS/400 and RS/6000
1998	POWER3 brings 64-bit and multiprocessor capabilities to technical computing	First POWER chip compatible with PowerPC
1998	PowerPC RS64 II updates for commercial lines stays separate	RS/6000 renamed eServer pSeries AS/400 renamed eServer iSeries
2001	POWER4 introduction – two architectures merged into one design; First chip used for technical and commercial computing	For AIX 5L, OS/400 and Linux
2004	POWER5 introduction	Continues one chip for all systems and workloads

This year, 2004, marks the end of the third decade of POWER as an architecture with unmatched scalability, and sees the debut of the new POWER5 processor, the first generation of POWER technology to benefit from IBM's new state-of-the-art 300mm chip fabrication plant in Fishkill, NY. IBM continues to drive POWER's evolution within the company through solutions including eServer pSeries, eServer iSeries systems, and eServer JS20 blade servers, as well as computing grids and high performance computing (HPC) installations. In keeping with POWER's position as an Innovative Standard, IBM also leverages the POWER architecture through significant partner relationships in many markets where end users are unaware that they exist, particularly in embedded products.

Innovative Standards through Partnerships and OEMs

IBM has taken advantage of market dynamics by collaborating with many industry leaders. The reason for POWER's popularity and market reach is both simple and elegant. IBM approaches POWER as an architecturally based solution instead of a platform-specific chip like Intel's Xeon and Itanium offerings or Sun's UltraSPARC. The result is that the POWER architecture's capabilities provide a wide variety of innovation-enabling building blocks that drive evolution to a unique depth and breadth of IT products and markets.

Desktops and Servers

Perhaps the best-known POWER partners are Apple and Motorola in their long-term collaboration on Apple's Macintosh personal computers. The PowerPC chip provides the basis of these computers and both directly and indirectly drives innovation across desktop computing. Apple is continuing its commitment to POWER by using the PowerPC 970 core, the same technology that drives IBM's own JS20 blade server, in the G5 desktop, laptop, and Xserve products.

Gaming, Outer Space, and Storage

POWER is quickly becoming the De Facto Standard platform for consumer gaming, including current generations of Game Cube and other consoles. In addition, NASA chose radiation-hardened POWER-based solutions for key applications in space exploration and remote control devices, including the successful Mars Rovers Spirit and Opportunity. Closer to home, Motorola embeds POWER technologies in mobile automobile and transportation applications including digital signal processing (for computerized fuel injection), GPS, and other navigation solutions. EMC deploys POWER in its Symmetrix storage system controllers, and AMD uses POWER components in its Opteron processors.

Embedded POWER

At another level, IBM has embedded POWER Architecture technologies in several classes of products including embedded memory, such as SRAM, DRAM, and CAM. These innovations have led to denser memory, lower standby power requirements, and higher-performance storage products. POWER technology is also found in MPEG audio and video compression systems providing the basis of digital broadcast (both HDTV and DBS) as well as the decoding used in home entertainment products such as DVDs and VCDs. These POWER-based products are also found in set-top boxes that are planned for use in next-generation Web browsing, internet gaming, ecommerce, and email capabilities. Companies including WindRiver, MontaVista, and Data Design provide embedded solutions on a range of POWER-based products from automotive to defense industry offerings, and from consumer products to Open Source software solutions.

Function-Specific POWER

IBM also provides custom chips and ASICs, the essential building blocks of the POWER Architecture, and can help partners build an ASIC from the design phase, to embedded memory, packaging, and cores, and creating products. This allows third parties to create and retain intellectual property related to processors, networking, and consumer products. IBM works with wireless, security, and even general-purpose intellectual property development in their labs, and because the company has optimized standard functions such as core performance and timing parameters, partners can focus on their unique value-add and bring new, innovative products to market more quickly. IBM has now expanded these programs to its business partners as well as technology partners, through agreements with engineering design service providers such as Avnet Cilicon.

The Road to Industry Standard Status

IBM's nurturing of POWER partnerships is no accident, but a critical part of a long-term strategic effort. During the past four years, IBM has increasingly defined itself as an agnostic provider of business computing solutions for multiple operating environments. This approach stands in stark contrast to evangelical product development models such as HP's Itanium + Windows efforts and Sun's UltraSPARC + Solaris focus. By creating an architecturally inclusive Innovative Standard, IBM is extending its own industry leadership as well as helping other companies clarify their own unique visions. *The essence of IBM's POWER strategy lies in delivering a highly flexible and robust platform that partners and developers can leverage for new classes and generations of products.*

A key element of IBM's strategy is its leverage of multiple operating systems for POWER solutions. IBM provides standalone OS alternatives such as AIX and OS/400, along with support for multiple operating environments including Windows in its eServer iSeries solutions. In addition, IBM's long standing support of Linux provides the company and its partners the potential to create a single platform basis for delivering various general purpose and function-specific POWER-based offerings. POWER + Linux offers an Innovative Standard 32- and 64-bit environment that can be deployed in general business and commercial applications, HPC, and GRID environments through a variety of form factors including stand alone servers, workstations, and blade environments. *This is another example of how Innovative Standards offer the flexibility to react to market opportunities in a robust and timely fashion.*

What Does It All Mean?

Since Industry Standards tangibly impact every IT vendor, developer, and user, understanding the use and misuse of the term is a critical issue for everyone involved. While they share some similarities with traditional Commodity and De Facto Standards, Innovative Standards such as IBM's POWER architecture deliver unique advantages that combine the collaborative efforts of vendors and entrepreneurial developers to create broad, architecturally based solutions for a wide range of IT/business processes. Innovative Standards provide developers and OEMs the technological building blocks they need to build truly innovative products while assuring these players that their efforts and investments are being based on mature, robust, proven solutions.

IBM's POWER architecture is not as well recognized as some Commodity and De Facto Standard technologies, but we believe that POWER delivers deep, broad benefits to a wide variety of vendors, developers, and end users. This is in sharp contract to most competitive 64-bit computing solutions. Simply put, the POWER architecture provides the basis for

development and innovation across a far greater number and variety of consumer and business IT solutions and processes than any other processor architecture. In addition, while POWER enjoys a distinguished history, a bright future lays ahead. Development of new POWER-based solutions by IBM's partners, notably Apple and EMC, continues apace, and IBM solutions including eServer pSeries, eServer iSeries, and blade servers stand to benefit from future generations of IBM's enterprise computing processor family, including the upcoming POWER5. Overall, given its leverage of collaborative processes and IBM's ongoing commitment to partner relationships, along with its continuing technological evolution and expanding influence, we believe IBM's POWER architecture easily qualifies and should be recognized as an Innovative Standard that is unique and unmatched in the IT industry.