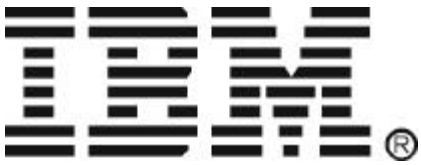
SOFTWARE STRATEGIES

Enterprise Server Spotlight Report

Technology Fit for Business

IBM's New iSeries – "On Demand" Consolidation Powerhouse for Wider Roles/Markets



About this Enterprise Server Spotlight Report

The IBM iSeries integrated business server systems, and its AS/400 and System/38 predecessors, have been a leading force and an enduring architecture, at the forefront of the mid-market for business computing for over 28 years, with over 750,000 systems sold, and over 250,000 customers.

Whilst lacking the high media profile of the more fashionable Windows/Intel and RISC UNIX server systems of recent years, the iSeries continued to enjoy an great reputation amongst its loyal customers and IBM channel business partners, for its sterling qualities and attributes.

Long known for their integrated hardware and software, high reliability, and ease and low cost of ownership and management, iSeries servers support the core business systems of their small, medium, and medium-large enterprise customers across 152 countries and in over 50 languages.

Some competitors have sought to denigrate the iSeries as a costly, closed and proprietary line of systems which, they claimed, was destined to be swept away in the flood of industry-standard systems.

Now, in its biggest iSeries Announcement since the debut of the AS/400 in 1988, IBM has swung onto the offensive, with a complete and wide-ranging rejuvenation of this evergreen business server family, its hardware, software, workload diversity, pricing and packaging.

This Software Strategies Enterprise Server Spotlight Report provides our in-depth assessment of the new 2003 iSeries.

A shorter 20-page summary of our preliminary findings, under the same title, was earlier published on 31st January 2002 as an Analyst 1st Review Note, and is still available for those requiring an overview.

Written by: Ian Bramley

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1. Executive Summary

This new Enterprise Server Spotlight Report, published on 28th February 2003, gives Software Strategies' full, in-depth assessment of the 20th January 2003 IBM eServer iSeries Announcement. IBM executives claimed that this was the most comprehensive and significant advance for the platform since the 1988 AS/400 debut. It positions this next-generation iSeries as an "e-Business On Demand Operating Environment" for new workload consolidation roles. Many key iSeries partners warmly welcomed the Announcement.

This executive summary provides our half-page précis and assessment and of these important developments, as follows:

- Strategic **focus on new/extended roles for iSeries**, enabled by higher levels of integration, advanced virtualisation, further autonomic computing gains, and full open-industry-standards support.
- **Significant "Cost³" reductions** for iSeries customers; in up-front system costs; ongoing operating/staff cost; and by minimising technology transition costs. Up to 80% price/performance improvements are claimed.
- **A near all-new family of iSeries servers**, the i800, i810, i825, i870, and i890 (*enhanced*) models, plus a new Domino solution package server line.
- **A major new V5R2 OS/400-SLIC OS release**, supporting the new family's "e-Business On Demand" capabilities, & with extensive, native Linux support/integration.
- **More advanced virtualisation capabilities** than any other system. Extended dynamic LPAR, comprehensive storage virtualisation, virtual I/O capabilities, high-speed virtual Ethernet network connections, plus integrated on-board/off-board Intel/Windows servers. These enable resource-efficient, manageable & secure mixed workload operations.
- Upper i825, i870 & i890 models now all **powered by stunningly capable POWER4 64-bit chips**, lower models i800 & i810 by established S-Star processors.
- **Industry-leading processor Capacity Upgrade on Demand (CUoD)** support on all POWER4 models, including Permanent, and the first full Temporary On/Off, CUoD options.
- **New Enterprise Editions** (*of the i810, i825, i870 and i890 models*), packaging hardware, extensive IBM e-Business middleware/management software, unlimited iSeries interactive CPW capacity, and various other valuable feature combinations.
- **Radical pricing/packaging changes** to sharply reduce "Cost³", including lower base hardware prices, drastic simplification of software price tiers, unlimited 5250 CPW (*Enterprise Editions*), etc.
- **Extensive, new, all-GUI-based tooling** in the management, application development and Web-deployment software.

In our assessment we find that IBM has transformed this legendary business platform into an "e-Business On Demand Operating Environment" and server workload consolidation powerhouse, for both traditional and new market opportunities. In our view, these striking advances position iSeries well for renewed success and growth over the rest of the first decade of the 21st century, bringing much needed simplicity to the management of multiple workloads.

2. Report Introduction

About This Report

IBM launched what it described as "The next generation iSeries – bringing simplicity to an On Demand world" in its 20th January 2003 Announcement. In this Report, we assess and evaluate this major revamp of iSeries, the most important advance since the AS/400 in 1988. The Announcement brought: new iSeries strategies and positioning; four new iSeries servers; radical new packaging and pricing; extended integration, virtualisation, autonomic computing & open standards support foundations; and a new "e-Business On Demand hub" role in customer infrastructures. These new iSeries systems will ship to the US and EMEA markets from 21st February 2003.

Who Should Read This Report?

This Report provides business and IT executives in Small/Medium/Medium-Large (SMML) business enterprises, their technical managers and architects, industry business partner and ISV executives, and the IT media, with our full assessment of this major development. A shorter Analyst Note summary of our findings was previously published on 31st January 2003, and is still available.

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Rochester Research

The author, with other analysts, visited iSeries headquarters in snowy, cold Rochester, Minnesota, just before public Announcement, for an in-depth drill-down into the new strategy, positioning, new hardware, software and technologies, packaging, pricing, and business solutions, etc. Several days of briefings, demonstrations and discussions with the 20+ key IBM executive, directors, managers and technologists behind this 2003 iSeries launch, (*who were present in Rochester*), together with review of hundreds of pages of materials provided, was the research basis for this Software Strategies Enterprise Server Spotlight Report.

Report Coverage

In this Enterprise Server Spotlight Report, Software Strategies provides its in-depth evaluation and assessment of the wide-ranging, 2003 IBM "New iSeries" Announcement. The Report looks deeply at, and seeks to answer, the following key questions, amongst others:

- What is today's marketplace for mid-range business systems, how has it evolved, which are the major platforms addressing this market, and where does the iSeries stand in the segment? What impact has the rise of Windows/Intel industry-standard systems, and RISC UNIX platforms, had on this segment? Who are IBM's competitors in the space today? What are the key customer needs in this market? (*We examine these issues in Section 3.*)

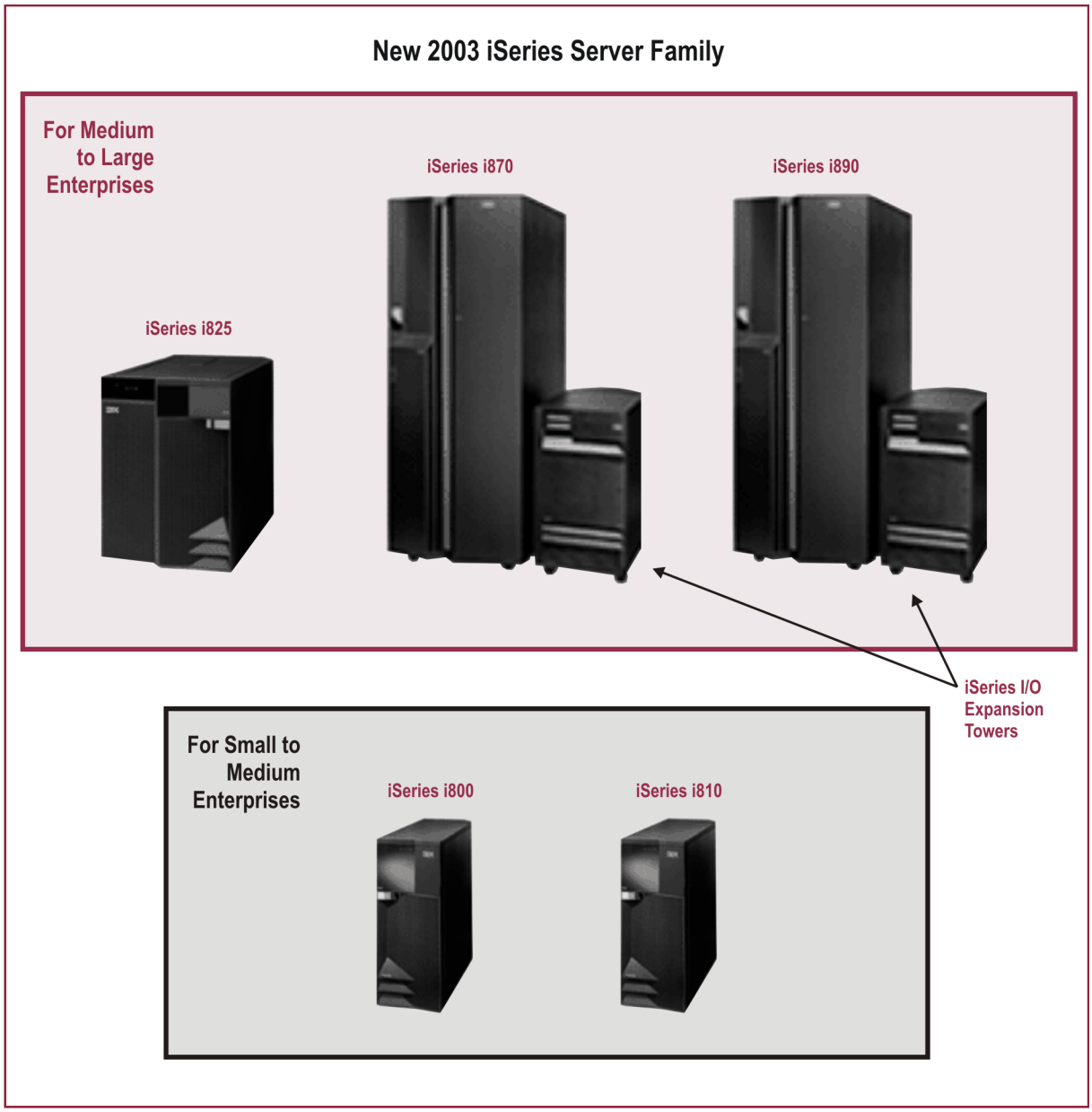

Figure 1 – Family Album: The New 2003 IBM iSeries Servers

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- What are the overall strategies, directions, emphases, and focuses of IBM's 2003 iSeries Announcement? Is this really, as IBM claims, a complete reinvention of this long-successful platform? Does it meet the new On Demand business needs of its market place better than alternatives? (*We provide an overview of the main elements of the 2003 iSeries Announcement in Section 4.*)
- What are the new iSeries servers for 2003? What performance and capacity do they offer? What are the new Standard Edition and Enterprise Edition packages, and how do they differ? What are the key capabilities of each model in the family? (*We look at the main characteristics of the new iSeries family in Section 5.*)
- The iSeries is often called "the software machine", for its unique software-defined architecture, its own integrated software stack, and its support for thousands of popular ISV business applications and complementary tools. What are the main new developments in the core iSeries OS/400 software platform? What e-Business middleware software does IBM now provide on the new iSeries to support newer types of Web applications? What types of software workloads can now be run on/from the new iSeries, under partitioning, and with Windows/Intel integration? (*We review the key systems and middleware software advances on the new iSeries, and assess their strengths, in a lengthy Section 6, one of the most important in this Report.*)
- What processors, systems architecture, I/O technology, and storage hardware technologies do the new 2003 iSeries employ? How do these rate compared to other mid-range systems? What expansion options do the servers offer? How wide is the range of hardware options provided? How well do the hardware capabilities support the target business role for iSeries servers? (*We summarise the key hardware advances and technologies, the range of hardware options, and assess their strengths, in Section 7.*)
- The new iSeries offers amongst the strongest virtualisation technology of any system, which underpins its expanded capability to run multiple like or unlike workloads on a single iSeries server. Why are these virtualisation capabilities so important? What are they? How strong is the iSeries partitioning? What benefits do storage, I/O and networking virtualisation bring? (*We examine these issues, and assess the strength of the new iSeries virtualisation technologies in Section 8.*)
- In the past, most server customers faced the choice of over-ordering systems with ample headroom for future growth at a high cost, or of facing frequent disruptive upgrades as workload demands changed. With today's more dynamic e-Business environment, does this old model still work? Why does the new iSeries offer an extensive range of Capacity Upgrade On Demand options? What capabilities do these provide to help customers more closely match their capacity to changing business demands, and to pay for such capacity at the time they need it? (*In Section 9 we assess these new approaches to supporting today's "On Demand" business environment, and evaluate the new iSeries offerings in this key area.*)
- What workloads do iSeries customers run across their portfolio of systems? How can these be consolidated on the iSeries platform? What are the advantages of bring workloads together on an iSeries? How does the system serve as the "Consolidation Hub" for its mid-market customers? (*In Section 10, we assess the diverse workloads which can now be run on/managed by an iSeries system, and evaluate the benefits of this approach.*)
- What underpins the iSeries legendary reputation for manageability? What are the principal systems management capabilities on iSeries today? How does the renamed iSeries Navigator improve the user interface for managing iSeries systems? (*In Section 11 we review the systems management capabilities, and the improvements made in the V5R2, to assess how these contribute to the platform's very low operating costs.*)
- What has changed in iSeries pricing and packaging? How significant are these changes? What do they mean for current and prospective customers? (*In Section 12 we review the radical changes IBM has made to iSeries hardware and software pricing, and compare this with 2002 levels.*)
- Which other platforms compete with iSeries? What are its comparative advantages? How does the new 2003 iSeries announcement affect its relative competitive position? What about Hewlett-Packard's (HP's) confusing server roadmap? (*In Section 13 we review and assess the competitive landscape for the iSeries in 2003, consider its position relative to the main Windows/Intel and UNIX opposition, and compare what it offers against HP's fading mid-range systems.*)
- Leading features today are important, but customers also want to understand their platform's future. What is the iSeries roadmap? How strong and how well-founded is the plan? Does IBM fully stand behind the platform? (*In Section 14 we examine the facts, look at the planned iSeries development, and assess IBM's motivation and determination to stand behind this key member of its eServer family.*)
- Most iSeries customers are supported directly by the channel, of distributors, resellers, ISV's and other partners, who are such an important part of the iSeries community. What has their reaction been to the new iSeries? How will it strengthen their commitment to the platform? What does this mean for customers? (*In Section 15 we review the reaction to the Announcement from the partner community, and evaluate its significance.*)

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- What are our overall conclusions and assessments on the new iSeries? Is this as significant a change as IBM has claimed? Does it mean the platform is likely to grow in market share? Are the cost savings promised real? (*In Section 16 we draw together the key findings from our research for this Report, and highlight the most significant factors, as well as issuing our recommendations to iSeries customers.*)

Not Covered

This Report provides substantial in-depth coverage of most major aspects of the new iSeries Announcement. However, there is always a trade-off, in time-to-publish and size, with such Reports. To have extended our coverage would have delayed release, and made the resulting Report too large. The iSeries line of systems has deep multi-layered strengths, and our time/space constraints precluded us from fully covering them all here. For example, we have not covered in any detail key iSeries capabilities in:

- Security (*which is extremely strong*).
- iSeries multi-systems configurations (*which are well supported*).
- iSeries Clustering for High Availability or Disaster Recovery (*where there are several strong IBM and ISV options*).

One reason we took this decision was that in the course of our research we examined the available material, publications, Red Books, Web sites, presentations, and training materials, etc., on the iSeries quite carefully. See below.

Industry's Best Documented Platform!

We found an amazing breadth, depth, diversity and strength of published material, going well beyond what is usually available for a server platform. This rich set of materials covers almost every conceivable aspect of the iSeries hardware, software, architecture, applications, networking, security, partners and channels, experience and successes. The IBM Rochester iSeries team, distant from the big cities, and with a far-flung customer and partner base to support, seem to have worked harder and more effectively to provide this cornucopia of valuable information, materials, tools and data on their beloved systems. We contrast this with our frequent experience of some other vendor server launches, where getting much beyond their press release and PowerPoint presentations is often an analyst's challenge, and award iSeries our "Industry's Best Documented Platform" accolade. Selected key links to some of these resources are provided in the Links Section, for those readers wishing to drill-down for further information in these areas.

3. Mid-Range Markets: iSeries – An Industry Phenomenon

Mid-Range Business System Evolution

IT market researchers traditionally studied the business computing platforms marketplace in three categories, on the basis of both price points and on the type/size of business enterprise they were adapted to/or targeted at:

1. **Low-End Systems Solutions** – Entry-level, lowest cost systems category, for small enterprises/businesses/branches.
2. **Mid-Range Business Systems** – Mid-power, mid-cost, business-processing-focused systems, targeted at medium business enterprises, requiring robust, simple to operate core systems, for core business applications.
3. **Mainframes & Enterprise Servers** – High-power, higher-cost, high-capacity systems, for the core, large-scale processing needs of large enterprises and government organisations.

From the 1960s these three categories of business systems were all proprietary, largely incompatible, and were produced by traditional computer manufacturers, such as IBM, Univac, Burroughs, NCR, ICL, Bull, Siemens, and the Japanese players. In each case, the vendor designed, built, integrated, tested, packaged and supported the entire hardware (*processors, memory, storage, printers, etc.*) and software (*operating systems, languages, tools, applications, etc.*). They also provided extensive service and support on the whole solution to customers. This was costly, and meant relatively high but inclusive system prices, which at first restricted market penetration. Over time, the capabilities and price/performance of all three categories rose steadily, and in turn significantly widened the market for each class of system, as more enterprises in each category began to be able to afford them. Gradually, the original software approach of the customer building most of their own applications changed, particularly below the mainframe, as packaged business applications steadily became more widely available on the more popular mid-range business systems market.

The first radical change was the 1970s spread of the mini-computer, originally built for scientific and technical work, into the low- and mid-range segments of business computing, shown in Figure 2. Led by Digital Equipment, first with the PDP11, and then the VAX, with others such as Data General, Wang, Prime Computer, and Harris, etc., following, the mini-computer provided a cost-effective interactive computing alternative to low-end proprietary systems, and became a stronger competitor to the main mid-range business systems.

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Business Systems Market Category	1960s Decade	1970s Decade	1980s Decade	1990s Decade	2000s 1st Decade
Low-End Business Systems for Smaller Businesses	Proprietary Small Business Systems	Proprietary Small Business Systems	Proprietary Small Business Systems	Open-Small Business Minicomputers	Open-Small Business Systems
		Proprietary Business Minicomputers	Proprietary Business Minicomputers	Proprietary Business Minicomputers	
			PCs	PCs & Intel Servers	Intel Servers
			Small RISC UNIX Servers	Small RISC UNIX Servers	Small RISC UNIX Servers
Mid-Range Business Systems for Medium-Sized Businesses	Proprietary Mid-Range Business Systems	Proprietary Mid-Range Business Systems	Proprietary Mid-Range Business Systems	Open Mid-Range Business Systems	Open Mid-Range Business Systems
	Small Proprietary Mainframes	Small Proprietary Mainframes	Small Proprietary Mainframes	Small/Mid Open CMOS Mainframes	Small/Mid Open CMOS Mainframes
		Proprietary Business Minicomputers	Proprietary Business Minicomputers	Proprietary Business Minicomputers	
				Intel Mid-Range Servers 2-4-8 way	Intel Mid-Range Servers 2-4-8 way
Large-Scale Business Systems for Larger Enterprises	Proprietary Medium/ Large Mainframes	Proprietary Medium/ Large Mainframes	Proprietary Medium/ Large Mainframes	Medium/Large Open CMOS Mainframes	Medium/Large Open CMOS Mainframes
				RISC UNIX Enterprise Servers	RISC UNIX Enterprise Servers
					Open Enterprise Business Systems
					Intel Powered Mainframes

Figure 2 – Evolution of Small, Medium & Large Business Computer Systems 1960s-2003

These minicomputers were also completely proprietary systems, using unique architectures, their own processors, and operating systems, etc. Typically, minicomputers were sold as "naked hardware and basic software", with the customer expected to integrate much more of the whole solution, and build or buy their software applications, with less overall support and integration from the manufacturers than with traditional business systems. Minicomputers drove down the entry point and margins in the low-and mid-range markets, and took significant share in this space for 20 years, but had mostly faded out by the mid-1990s.

RISC UNIX server technologies directly succeeded the mini-computers, after their peak, as can be seen in Figure 2. From the mid-late 1980s, these platforms promised higher performance from RISC processors, open-industry standards with the UNIX operating system, and better price-performance than high-end mini computers. Again, these systems were originally designed for technical and scientific computing, where pure processor performance was most important. Vendors like Sun, HPDigital, IBM, Pyramid, Sequent, Bull, Siemens, and the Japanese firms, all entered this technology wave. Over time, the rough and complex UNIX operating system was bullied, modified and wrestled into a workable commercial applications platform, although the open claims faded, as each vendor developed incompatible, proprietary UNIX versions. Third-party ISV (*Oracle, BEA, etc.*) DBMS and TP facilities were added and refined over time on UNIX. These platforms always stressed processor performance, were generally weaker on I/O, and lacked the balanced commercial capabilities of refined mid-range systems or mainframes. Their sales revenues peaked in 2001, and are now slowly declining.

Mainframes have been a continuing core business computing platform over this entire time-span, but underwent radical change from the early 1990s to switch to CMOS-technology (=*cost-competitive*), and to become much more open. Over the whole period, mainframes always played in both the high-end, large enterprise, large systems market, but also in the mid-sized, medium business segment with smaller models but the same software architectures. Mainframes were generally much less successful in the latter space than in the former. In this first decade of the 21st century, the remaining mainframe systems now face competition from high-end RISC UNIX enterprise servers, from scaled-up integrated business systems from the mid-range (*such as the i890*), and even from Intel powered mainframes (*such as the Unisys ES/7000*). For their high-volume OLTP or Web serving capabilities, large enterprise, data centre-based role, extreme reliability and high-manageability, high-end mainframes such as IBM's zSeries continue to thrive, after their transformation of the last 12 years, but we do not discuss them further in this Report.

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The PC revolution spread the footprint of affordable computing far wider than previously, as it advanced quickly across all sizes of business from the early PC years. From the 1980s, Intel-powered, PC-architecture servers appeared, using low-cost PC-standard technologies and Microsoft software, and they advanced strongly in power, capabilities, software strengths and reliability through the 1990s, until today. Now 80%+ of all servers shipped are Intel-based, and the largest Intel-based systems reach up to the mainframe level in raw power.

The evolution of our prime focus in this Report, the small and mid-range business systems marketplaces, has changed substantially under these technology waves, as can be seen in Figure 2. The boundary between the small/low-end and mid-range/medium enterprise has been fluid, and serves little purpose today. Software architectures used, and types of workloads best supported, much more clearly delineate the platform that should be used today by a given customer. Price point definitions have also faded under the relentless downtrend in hardware costs, which has been seen on all the platforms of Figure 2.

Smaller Businesses Become Vendor's Focus

The increasing power, falling costs, and ever-wider range of software solutions, have continued to bring ever larger numbers of businesses within the price span of affordable business computing, in one or several of its then-current forms. The numbers of global enterprises in each category vary greatly:

- **Small business enterprises**, 10s of millions worldwide, with much lower IT penetration.
- **Medium business enterprises**, high 100s of thousands/low 1s of millions worldwide, medium IT penetration.
- **Large enterprises**, 10s of thousands worldwide, high IT penetration.

The system needs of these business categories are not mutually exclusive, because many large and medium enterprises also have distributed operations, with local IT needs that are quite similar to those of medium to small stand-alone enterprises.

With the technology downturn of 2001/2002, IT vendors who had traditionally chased the richer, easier pickings of the larger or medium business enterprise markets have all become much more focused on the potential of the smaller business markets. 'SMB', as many now call it, has become a key focus for the leading hardware and software vendors, all finding high-end growth hard to achieve, and recognising the large, untapped IT needs and potential in the small, small-medium, and medium enterprise business computing market. IBM, Microsoft, HP, Oracle, and SAP are amongst the industry giants trying to strengthen their appeal to this growth opportunity market. This was good news for medium and smaller enterprises able to benefit from a wide choice of quality hardware and software solutions.

The IBM Small/Medium Business Systems – Evolution Overview

Just one company has consistently pursued and supported the smaller and medium business systems marketplace, with dedicated business-focused systems, for over 33 years, through all the changes mentioned above. IBM has, at various times, had other different offerings overlapping in this space, but its strongest footprint has long been that of the Rochester systems, which have always focused on this segment foremost. The lineage is shown in Figure 3 below.

IBM Small/Medium Business Systems Platform Line	Time Span	Notes
System/3	1969- 1975	Low-end batch system replacement for unit-record equipment. Used RPG programming language. Disc and terminals soon added. 28-instruction CPU. Over 25,000 sold.
System/32	1975-1977	System/3 follow on.
System/34	1977-1981	System/32 follow on. Ran SSP OS
System/36	1981-1986	System/34 follow on. Ran SSP OS
System/38	1978-1988	Pioneering design, revolutionary architecture system, continued in AS/400 and iSeries to date, provides complete insulation for user applications against technology change. Also, first system line to include in-built relational database system. Ran CPF OS. More than 250,000 S/34, S/36 & S/38 sold by end 1988.
AS/400	1988-2000	Repackaged and improved S/38, hugely successful in medium business markets, using S/38 architecture. Later, supported other workloads. By mid-late 1990s, became open, e-Business capable server. 200,000th AS/400 sold by 1992.
iSeries	2000-2002	Repackaged and re-branded AS/400, under eServer strategic initiative.
New iSeries	2003 on	Radically reshaped and extended, repackaged and re-priced iSeries, repositioned as "On Demand" e-Business hub platform for SMML enterprises, also consolidating Windows/Intel, Linux and AIX, as well as traditional OS/400, workloads. Subject of this Report.

Figure 3 – IBM Rochester Small/Medium Business Computer System Lines – 1969 to 2003

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These business systems were/are IBM's contenders in the three row segments of Figure 2, on page 9, that are shaded grey. Note here, that with the advent of the mainframe-like <32-way i890, the line now stretches upward into the high-end enterprise segment, previously exclusively the province of mainframe and top-end RISC UNIX systems, in terms of power and capacity.

iSeries – An Industry Phenomenon Rejuvenated?

The IBM iSeries, the e-Server successor to its legendary AS/400 and System/38 predecessor, is an industry phenomenon. These integrated business systems use an enduring, distinctive hardware and software architecture (*see Appendix B for our primer*), optimised for reliable, manageable business processing in SMML enterprises. Successful in business solutions-driven markets from the 1978 System 38 debut, through the AS/400 from 1988, and since the iSeries launch of September 2000, a large user-base has grown-up. More than 750,000 systems have been sold and nearly 250,000 customers use the platforms today. For these businesses, they deliver reliable, secure, core transaction, database, e-Business and Web, messaging, and other key business application services, easily and with low TCO. Thousands of IBM PartnerWorld iSeries business partners, including leading ISV's, resellers, systems integrators, and service providers, deliver and support the platform with their software, solutions and services, alongside IBM.

The IBM iSeries, the e-Server successor to its legendary AS/400 and System/38 predecessor, is an industry phenomenon.

User business directors and IT staff, this large partner community, and a few industry watchers, have long known and valued the reliability, manageability, high-integration, long-life and low staffing levels needed on iSeries, and its predecessors. These attributes equipped it to serve as the mission-critical, core business systems platform for users' SMML enterprises. Users knew, both from their own experiences and from several in-depth analyst comparisons, that iSeries already delivered the lowest TCO amongst mid-range systems, despite a news media reputation for higher initial costs. The IBM iNation community Web site, the focal point for information and experience on the platform, supports over 80,000 registered members, as just one measure of the scale of this iSeries community.

Wintel & UNIX Market Challenges? Linux at the Starting Gate.

Since the mid-1990s, the Windows/Intel and the "RISC UNIX disunited" vendors, and their media/analyst supporters, fuelled by big marketing spends, grabbed most industry attention and user mindshare for new server platform decisions, claiming price/performance and technology/performance leading edges respectively. Meanwhile, new generations of IT professionals and users/managers entered the business, familiar only with these technologies from college. Ill-informed industry media, and these vendors, often falsely portrayed the AS/400 & iSeries as an older, proprietary, closed, technology-lagging platform, with high initial hardware and software costs. Some of these portrayals were made out of pure ignorance, some for competitive advantage. Whilst nothing could be further from the truth today, even the most loyal iSeries users went with the market flow and installed numerous Windows/Intel servers, plus some RISC UNIX platforms, alongside their iSeries in their infrastructures. Now, another new technology wave – Linux and open-source software – is just beginning to emerge into wider business computing use, and is now also starting to be used by a small proportion of medium businesses.

Other Mid-Range Competitors Fade

IBM has long faced multiple competitors for its mid-range business systems lines, as can be seen in Figure 2, on page 9. In the earlier decades, these were the proprietary systems of the traditional computer manufacturers. Today, just a few of these survive in small niche markets, in small mainframe/midrange systems such as the low-end Unisys ClearPath NX systems, Bull GCOS 6 systems, and Fujitsu-Siemens Computers' smaller BS2000 systems, etc. Most of the business mini-computer firms, and their platforms, which were strong competition to IBM through the 1970s and 1980s, have gone. The main surviving, more directly comparable competitors were HP's OpenVMS systems (*inherited from Compaq, and acquired by it from its purchase of Digital*), and its own HP3000 MPE business minicomputer line. The OpenVMS software/Alpha hardware systems were the software architecture successors to Digital's legendary VAX minicomputer line, in its day the most successful of that breed. The HP 3000 was a more direct competitor to IBM's S/38 and AS/400. Sadly for the remaining users of both these platforms, HP has announced plans to terminate its hardware lines, and has invited its customers to migrate to its (*incompatible*) Intel Itanium-powered servers. We expect numbers of these abandoned customers will decline this costly challenge, and will move to iSeries for a more secure future.

"Mainframe Dinosaur" Turnaround Story Repeated?

Earlier, and similarly wrongful, characterisations of the IBM mainframe as a costly, outmoded "dinosaur" were later confounded by its renaissance, now continuing under the strong technology advances of zSeries, which have ensured it a continued thriving role in its different, high-end, large-enterprise data centre stronghold.

A market challenge, for both IBM and all iSeries users/supporters, has been to combat these false characterisations, and to keep the unique strengths of their favourite platform foremost when new business system investments were being planned. They had to accomplish this without the wider market exposure that the challengers' billion-dollar marketing spends brought them.

eServer 2000 Heralds Major IBM Server Push

The 2000 eServer debut, and iSeries re-branding, was a first step. Here, IBM aired new strategic plans to leverage its world-class technologies, decades of enterprise computing experience, advanced software skills, and new autonomic computing vision, to rejuvenate each of its main server families over time, and move them back to clear leadership/growth. We have already seen this process succeed, first with the zSeries mainframes, next with the pSeries RISC UNIX systems from late 2001, and most recently with the award-winning xSeries from Q2 2002, all of which are now thriving and gaining market share.

IBM Goes for iSeries Revival

With this January 2003 Announcement, the new iSeries has been rejuvenated and greatly extended, with a $500m investment behind it, and IBM now seeks a similarly strong market re-rating for the iSeries. Will iSeries stage such a revival following this Announcement? Will the large partner base be re-energised? Can iSeries overcome base erosion and grow share again? What does the Announcement really mean to business customers? We seek to answer these key questions, and others, in this Report.

Our Analysis

Many changes have taken place in the small-medium business systems market over the past 40 years. We saw many of the original computer manufacturers merge or exit the market. The mini-computer wave has come and gone, leaving some stamp on the small/medium business systems space. Newer server technologies, RISC UNIX and Intel-based servers, have entered these markets, the former now having peaked and begun a slow share decline, and the latter still growing strongly. Through all this turbulence, IBM's Rochester small/medium business systems have continued to hold a strong market position, with systems and technologies well adapted to the needs of such businesses. Since the System/38 of 1978, these systems have also offered arguably the most advanced architecture of any business computing platform, which has enabled them to hold their evidently strong user loyalty for over 24 years of rapid technical change. However, the hype and momentum behind Intel servers with Windows (*or Linux*) software, and behind RISC UNIX until its recent peak, has diverted market mindshare from the strengths of business-dedicated mid-range systems such as the iSeries. Recognising this threat, IBM has made a major and determined effort to reinvent and repackage this enduring platform for the 1st decade of the 21st century. It proposes a new and wider role, rooted in the strong technology underpinnings and advanced software of its contender, the 2003 "new iSeries". In the remainder of this Report we examine this offering, and gauge its chance of long-term success in this mission.

4. The January 2003 iSeries Announcement – A Strategic Overview

New iSeries Strategy Ambitious

With the new iSeries, IBM has both repositioned and completely rejuvenated its evergreen, integrated business system family, to serve as the hub of business and e-Business computing control, management, data storage, and security, both for its almost 250,000 loyal, mostly SMML, existing customers, and for many new ones. It also intends to re-energise the large community of iSeries business partners to champion and deliver their solutions, and the new supported workloads, on the platform.

iSeries	• An on demand operating environment for e-business
iNew Servers	• New iSeries servers deliver up to 80% price performance • New small to medium enterprise servers: i810 and iSeries 800 • New POWER4-based servers for medium to large enterprises • i825, i870, i890 *(feature On/Off Capacity Upgrade on Demand)* • New high performance PCI-X I/O
New Packaging	• Dramatically simplified product choice with Standard and Enterprise Editions • Unrestricted interactive 5250 CPW with Enterprise Edition • Designed for the exploitation of multiple e-business workloads • Enhanced integration with WebSphere®, Lotus®, Linux™ & Windows™ • Simplified software pricing tiers
New Capabilities	• On/Off Capacity Upgrade on Demand (temporary and permanent) • WebSphere Application Server – Express for iSeries • WebFaced applications run without interactive 5250 CPW
Key Dates	• Announced January 20, 2003, General Availability February 21, 2003 • WebFaced applications run without interactive 5250 CPW

Figure 4 – IBM's Own Announcement Highlights Summary

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Although the key rationale of the iSeries is simplified, cost-effective business computing, the underpinnings are a set of arguably the most advanced technologies of any platform, enabled by the unique architecture it uses (*see below*). IBM intends this strategy to raise the market visibility and reputation of this successful business systems family over time. It first expects to strengthen its footprint within, then move outwards from, this large, loyal customer base, and then secondly to win increasing numbers of new-name customer solution sales through its large channel, as the strong new capabilities and value-propositions new iSeries clearly offers become more widely appreciated.

Co-existence, consolidation and integration are the key messages. IBM has designed the new iSeries to host, consolidate and manage not only customers' established OS/400 workloads, but also most of the other computing workloads in their business. These include their Windows/Intel workloads, new e-Business Java-based WebSphere applications, customers' emerging Linux workloads, and later (*2004*) native AIX UNIX loads, all under the new iSeries' powerful virtual systems, storage, management and security facilities. The way IBM highlighted its view of the key elements of the Announcement is shown in Figure 4.

iSeries Changes Leadership for Renewed Market Push

IBM also moved passionate iSeries advocate, and popular General Manager of the last 3 years, Buell Duncan, who played a key role in these developments, to a key new post leading Developer Relations, a vital PartnerWorld group that encourages ISVs to work on the platform. New iSeries General Manager Al Zollar is well regarded as an effective leader, serving previously as a senior executive at the Lotus division of IBM Software Group. The first move indicates the high importance IBM places on renewing/extending its connection with the vital iSeries ISV partner community, amongst whom Buell Duncan is already well-known and liked. Zollar's appointment highlights the software-centric focus of the new iSeries value proposition.

"This is the most comprehensive reinvention of the product line since its inception more than a decade ago," said Zollar. "With its integrated software, capacity by the day, and dramatic price improvements, the IBM eServer iSeries now offers customers all the tools they need to respond to the world of on-demand business."

New Positioning, "e-Business On Demand Operating Environment"

The Announcement positions the new iSeries as the simplest solution for the "e-Business On Demand" world of today's SMML enterprises. In this world, most customers are seeking to deliver more advanced, better-integrated applications solutions, and to move further up the e-Business curve. Demands and workloads change quickly, systems must respond/scale equally fast. Delivering these newer services, at much reduced system and manpower costs, has become a universal customer need.

Flexibility to adjust workload resources up and down rapidly with changing demand, the ability to optimally use all the installed system capacity, without wasted headroom, and the scalability of all platform resources over a wide range, for long system life, are all key requirements in this world. The balance between in-house provision of computer service also changes, to embrace the use of external ASP, hosting, and even new utility "On Demand" services, to complement in-house dedicated resources, in some cases. Also long sought by customers, better matching of system costs to these changing demands, lower initial, operating and technology transition costs, and simpler, fairer system and software pricing were also needed. The iSeries Announcement addresses all these key "new-world needs" most effectively, as we highlight next.

Leadership Technologies Underpin iSeries Strategy/Positioning

IBM has developed the new iSeries generation by combining its leadership technologies into an integrated hardware and software system, with advanced virtualisation, strong autonomic computing advances, and comprehensive support for open industry standards. The new family extends iSeries strengths in these areas, combines them with leading-edge IBM processor/server hardware technology (*including POWER4 processors and systems architecture, new generation PCI-X IO, and new storage, etc.*) and new IBM e-Business middleware deployment, development and management software. It then wraps the systems with radical new pricing and packaging, and extensively improved tooling/user interfaces. In this way, IBM has been able to leverage its unrivalled 64-bit microprocessor chip design and high-bandwidth system architecture skills, mainframe RASM and partitioning expertise, in-depth Linux OS strengths, and corporate "autonomic computing" initiative strongly in the new iSeries, to provide substantially extended capabilities for its typical SMML customers. We look at the software and hardware technology advances supported in the platform in more detail in Sections 6 & 7.

iSeries Unique Architecture Enables

The distinctive iSeries capabilities this Report covers stem from the long-standing underlying architecture of these systems. We discuss this unique architecture more fully in Appendix B, and those unfamiliar with the platform are recommended to read this now for deeper background understanding. Experts can read on! The new iSeries, and its AS/400 and System/38 predecessors, were all built to five "sacred principles" which have underpinned these systems since 1978, and which have been crucial to their enduring success:

1. **Technology independence.**
2. **Object-based design throughout.**
3. **Hardware integration.**
4. **Software integration.**
5. **Single-level store for memory and disk.**

These architectural attributes have been the key enablers of many of the distinctive and valuable new capabilities the new iSeries now offers, and which we examine in detail in this Report.

Announcement Highlights

Broadly summarising our assessment of the main strategic directions of the Announcement, it was quite clear that IBM is seeking to:

- **Significantly Extend iSeries Workload Footprint, Market:** The emphasis throughout the Announcement was on broadening the workloads that can be run/consolidated upon/integrated with iSeries, greatly extending the platform's traditional core business applications role. The aim is to both enthuse its loyal existing users, but also to make it an attractive core solution for new customers in similar market segments, by providing the support for new integration services and roles that are much needed in this market. Four key technology thrusts underpin and enable these new/extended roles for iSeries. These are: the even higher levels of integration (*hardware and software*) now attained; the advanced virtualisation capabilities of the platform; the further autonomic computing progress which makes these systems easier and less staff-intensive to run; and the extensive support it now offers for all main open industry standards, which today make it an open and interoperable platform. These directions build strongly on the unique architecture of these systems, mentioned previously and covered in more depth in Appendix B.

- **Deliver Substantial "Cost³" Reductions:** Most system cost of ownership studies focus on initial hardware and software systems cost, and 3/5 year total operating costs, including staffing, which, added together, comprise the popular TCO metric. IBM extends this definition to what it terms "**Cost³**" for iSeries, by adding the customer costs of technology transitions. (*The latter includes conversion, migration, rewriting for different processors, operating systems, and architectures, etc.*). With its unique, technology-independent and insulated architecture, iSeries clearly scores best on this crucial cost element, over all competing systems. These invariably inflict technology discontinuities, and correspondingly high migration/conversion costs, on their customers, when technology shifts occur.

  A topical example is the popular Intel 32-bit industry-standard server architecture: the Intel roadmap is pointing customers towards 64-bit Itanium server platforms. Whilst Itanium systems can run 32-bit applications, it is only by redesigning, rewriting, re-compiling and optimising these applications comprehensively that customers could gain the full benefits of 64-bit Itanium architecture. This is a massive and costly task, so large that, to date, few of the millions of IA-32 server users are making this move. In their eyes, the costs and risks of doing so would far outweigh any practical business benefit from the 64-bit option, so it is little surprise that Itanium uptake has been so low.

  IBM has clearly recognised that initial costs for the iSeries, the first element of "**Cost³**", are always most visible in comparisons, and that those of iSeries were perceived to be high by the wider market (*in relation to Intel and UNIX*), despite the many other appeals of this integrated platform. It has therefore taken a sharp knife to the initial prices of the new iSeries, with up to 80% price/performance gains claimed for the 2003 line.

  The iSeries (*and AS/400*) have long scored well on the second element of "**Cost³**", the operating, staff and financial costs of the hardware and software over its practical service life. Numerous analyst studies have repeatedly and convincingly shown iSeries to have a two-, or even three-fold, TCO advantage, when including initial, and these operating costs, measured over 3- or 5-year spans. These results showed iSeries higher initial costs were greatly outweighed by their much lower operating, staffing, reliability, etc., operating costs. (*Some of these results are given in Section 13.*) The further improvements in manageability, consolidated workload management, reliability and availability, and in applications development productivity, made in new iSeries, have further extended this important advantage.

  We review the key pricing and repackaging changes in detail in Section 12.

- **Near All-New iSeries Server Family Widens Market Coverage, Capacity Span:** The Announcement introduced a largely all-new line of 5 main servers: the i800, i810, i825, i870, and i890 (*enhanced*) models, plus a new Domino solution packages line. The use of the impressive POWER4 chip and system architecture on the i825 and above delivers the leading edge of 64-bit technology and performance in these powerful systems. With the entry-level i800 Value Edition starting from $9,995, the benefits of this integrated business system family are now genuinely affordable, even by small businesses, who might otherwise feel that only Window/Intel server solutions were within their budget. At the other end of the scale, the i890 is a mainframe-class enterprise server system, with up to 32-processors, capable of supporting the largest OLTP or Web applications workloads under iSeries software architecture. First introduced in 2002, and enhanced in 2003, this massively-powerful system extended the iSeries target market far higher into the large enterprise user space, and is well capable of meeting the needs of large enterprise applications. From the smallest to the largest, the entire line offers the same iSeries software platform and functionality. The range therefore now spans a wide range of capacities:

  - **Processor performance:** From 300 CPW to 37,600 CPW, a 125.3-fold capacity range.
  - **Number of processors:** From 1 (*S-Star*) to 32 (*POWER4*), a 32-fold number of CPUs range.
  - **Memory:** From 256MB to 256GB, a 1,000-fold range of memory capacity.
  - **I/O Slot Capacity:** From 7 PCI to 672 PCI-X slots, a 98-fold span of I/O adapter slots/capacity.
  - **Direct Attached Disk:** From 17.5GB to 144TB, an 8,229-fold span of directly-attached storage capacity.

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The new Enterprise Editions (*of the i810, i825, i870 and i890 models*), for the first time, now package the hardware, standard software, an extensive set of IBM e-Business middleware/management software, and crucially provide unlimited iSeries Interactive CPW capacity. They also offer several other valuable features designed to encourage customers to explore and try the newer workload capabilities of the platform quickly, and without additional expenditure. The latter include Windows 2000 integration, Linux and WebSphere. We review fuller details of the new line of iSeries servers in Section 5.

- **Key, New V5R2 OS/400 Release:** Driving the wide range of new iSeries capabilities is a major new release of OS/400 (*and the SLIC kernel*). This supports the new family's key "e-Business On Demand" capabilities, adds extensive native Linux operating systems support/integration, embraces a wider range of open systems standards, and includes an extensive range of improvements to the core functionality of the platform.
- **Extended, Advanced Virtualisation:** The management of multiple workloads on a single system crucially depends on the platform's virtualisation capabilities, which determines how resources can be best allocated, shared and used between the loads and be easily managed and adapted to changing demands. Here, the new iSeries truly excels, with arguably the strongest, most complete set of virtualisation facilities, covering all system resources, on any platform outside the mainframe. These include a further extended and much enhanced dynamic LPAR partitioning capability, comprehensive storage virtualisation enabled by the unique iSeries single-level store architecture, virtual I/O capabilities, high-speed virtual Ethernet network connections, plus support for fully-integrated on-board/off-board Intel/Windows servers. These key capabilities enable resource-efficient, manageable & secure mixed workload operations, not available from any other system. We look in more depth at these virtualisation capabilities in Section 8.
- **Industry-Leading Processor Capacity Upgrade on Demand (CUoD):** IBM first introduced CUoD support for processors on high-end iSeries in October 2002, offering the Permanent CUoD form, whereby users could elect to permanently activate pre-installed standby processors. Over 1700 iSeries standby processors were shipped in the first two months of availability, showing strong customer demand for this capability. With the new 2003 iSeries, CUoD is supported on all the POWER4 models, and includes not only the above Permanent option, but also the industry's first Temporary On/Off, CUoD options. We look in more detail at this advanced CUoD capability and how it works in Section 9.
- **Radical Pricing/Packaging Changes:** To sharply reduce "Cost³", and to greatly strengthen the competitive position of the new iSeries, IBM has introduced the most significant re-pricing, repackaging, and price/performance enhancements ever made for the family. These bold moves include:
  - Substantial reductions in base server hardware and OS costs.
  - Achieving price parity with the competitive pSeries RISC UNIX systems for the first time, on higher-end iSeries systems. (*When comparable database software is included.*)
  - Making radical and welcome simplification in the previously complex and Interactive CPW variable software pricing tiers on iSeries. Now, just a single software price tier applies to each model, with no increment for Interactive CPW, and the tiers assigned are typically one lower than in 2002.
  - Providing a wider choice of "Editions", including the primary "Standard Edition" (*focused on low-entry price*), and Enterprise Editions (*focused on inclusive software value and unlimited Interactive CPW*).

  These changes will be widely welcomed by all iSeries customers and partners, and undoubtedly make substantial further improvements in the already strong iSeries "Cost³"measure. We look in detail at the new packaging and pricing, and how it has changed, in Section 12.
- **Extensive, New, All-GUI-Based Tooling:** The System/38 and AS/400 presented an operator and developer user interface using traditional "green screen" and command line interfaces. Over several years, and in a further substantial step forward with the new 2003 iSeries, IBM now provides an excellent Windows GUI to all the comprehensive functionality, via the re-named iSeries Navigator systems management software interface. Additionally, the fully integrated and now comprehensive unified applications development tool for the platform – WebSphere Studio Development Client for iSeries – also offers an elegant, modern, all-GUI interface. The result of these developments is modern, attractive, and easy-to-use tooling for all the primary management and development functions customer staff need to work with the platform.

Our Analysis

At the broad level covered in this Report, it can clearly be seen that the new iSeries Announcement is, as IBM claimed, the broadest, most far-reaching, and most ambitious for the platform in more than a decade. To equip the system for a more central consolidation hub role within its loyal customer base, IBM has equipped the new iSeries to manage, control and secure other key customer workloads (*Windows 2000/2003 Linux, Java-based Web applications, AIX UNIX applications*), alongside traditional OS/400 applications and package loads. For customers, this strategy offers many operating cost, staffing, storage consolidation and back-up cost reductions, whilst enabling them to deliver much more reliable, responsive, secure and manageable service for these combined workloads.

With over 3,000 iSeries sites already using the core LPAR partitioning enabler, and rather more customers using the Integrated xSeries servers, these approaches are already well-proven, and, we believe, will now see much wider, faster take up within the iSeries customer base. In our view, these striking advances position iSeries well for renewed success and growth over the rest of the first decade of the 21st century, bringing much needed simplicity to the management of multiple workloads.[1]

5. The 2003 iSeries Server Family

Near All-New Family of iSeries Servers

The Announcement brought an almost all-new iSeries server family. The models were pictured in Figure 1 on page 6. They are positioned in terms of power and prices, and with their key common and specific capabilities highlighted, in Figure 5 below.

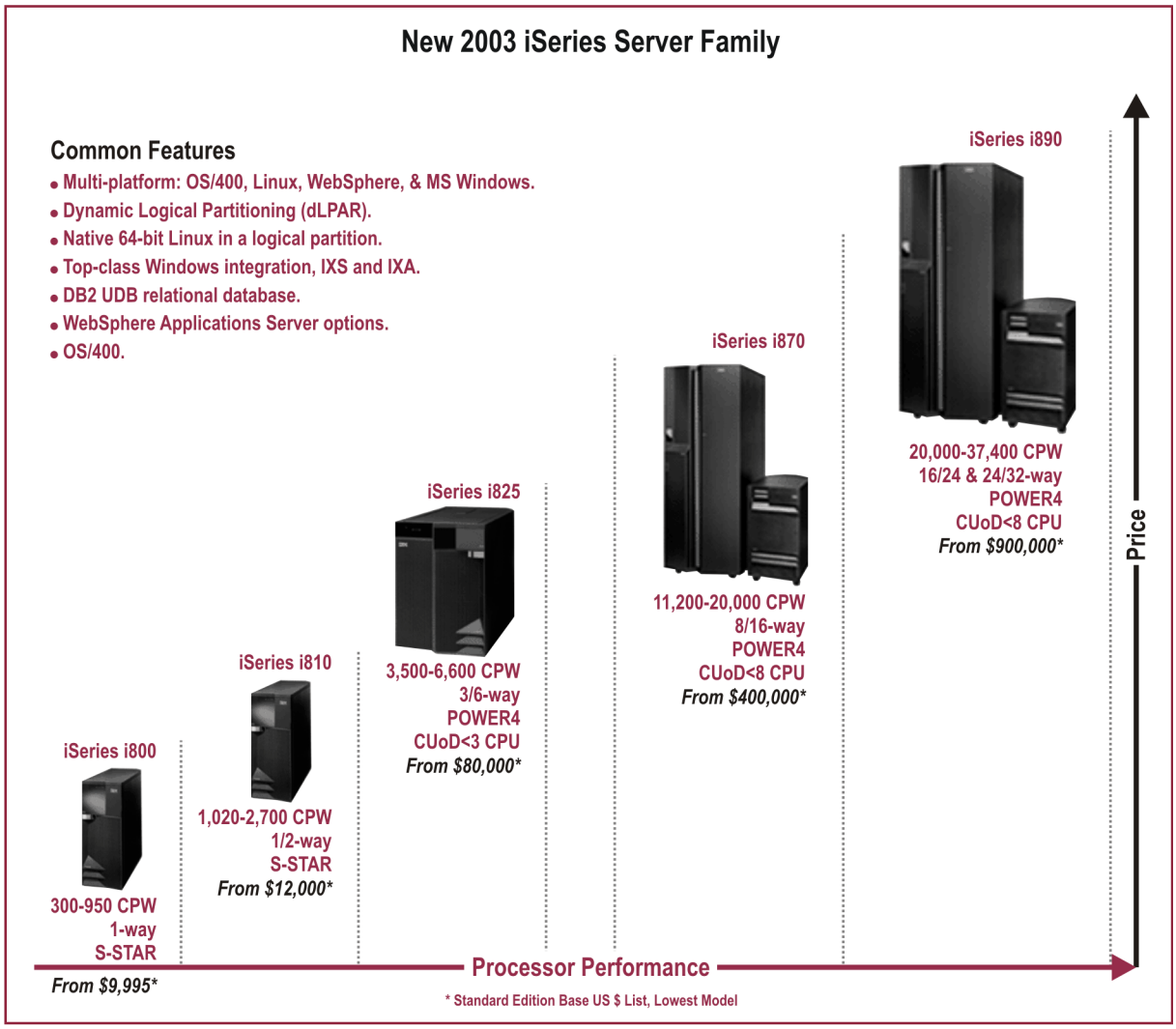

Figure 5 – The New iSeries Server Family: Key Features

[1]CPW = Commercial Processing Workload

IBM rates and compares iSeries system performance with a standard benchmark test known as Commercial Processing Workload (CPW). The reported results are widely used to compare relative performance characteristics of processor features on iSeries servers. The CPW relative performance measurement is made by performing standard, monitored, and measured commercial processing workloads on all new iSeries servers. CPWs are representative of commercial applications, particularly those that do significant database processing in conjunction with journaling and commitment control. The CPW workload is generally quite similar in to that of the external TPC-C transaction processing benchmark, although actual results cannot be compared.

Processor CPW: represents the maximum relative performance for an iSeries processor feature running commercial processing workloads (5250 interactive and/or other server workloads). This value can be used to compare relative performance between various processor features. The term "Processor CPW" reflects the total available CPW, not a subset.

Interactive CPW: represents the maximum relative performance available to perform 5250 interactive workloads. Interactive workloads are defined as jobs doing 5250 type display device I/O operations such as: 5250 sessions, "green screen" interfaces, Telnet or 5250 DSPT workstations, 5250/HTML workstation gateway, PCs using 5250 emulation, interactive program debugging, PC Support/400 workstation function, RUMBA/400, Screen Scrapers, or 5250 emulation.

The actual performance customers achieve may, of course, vary depending on workload characteristics. Throughout this Report, we use these terms and results to quote and compare new iSeries capacities and performance.

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Targeted at small/medium business are the low-end i800 (*1-way*), in three capacity packaged models, and i810 the (*1- to 2-way*), packaged in 3 capacity-rated models, both powered by the 7th generation S-Star 64-bit IBM RISC processor chip.

Targeted at medium to large enterprises, the new i825 (*3- to 6-way*), i870 (*8- to 16-way*), and two enhanced i890 (*16- to 24-way and 24- to 32-way*) models, are medium to high-end systems, covering capacities from 3,500 CPW to 37,600 CPW. (*CPW is the standard processor performance rating for iSeries – see footnote on page 16*). The latter systems are powered by the stunning POWER4 dual-processor chip and high-bandwidth systems architecture, first seen in iSeries with the original i890 announced in Q2 2002 (*and already successful in the high-end pSeries 690 and p670, which now hold a leading market share in high-end UNIX servers*). The iSeries i870 and i890 share their hardware with the pSeries 690 and 670 (*Regatta box*).

Two Editions – Standard & Enterprise

This new iSeries generation provides strong performance and capacity advances, a radical and more competitive new pricing and packaging strategy, with these available and manageable new servers. All models from the i810 to the i890 are now available in two forms:

- **Standard Editions:** Sharply more price-competitive, base system models, with simplified software tiers, for traditional iSeries OS/400 workloads and e-Business, starting from just $9,995 (*for the i800 Value Edition*) entry point – see below.
- **Enterprise Editions:** Same hardware, same simplified software tiers, plus an extensive set of bundled IBM e-Business middleware and enterprise management software on the higher models. Enterprise Editions also offer unlimited 5250 CPW Interactive capacity, and other valuable inclusive hardware and services features. We look at these interesting new packages in more detail below.

IBM stated that the new i870 and i825 models provide over twice the headroom of their nearest predecessors, and over three times for the i800 and i810.

Common Strengths

Both Editions benefit from the new iSeries core strengths in dynamic LPAR, multiple workload management, CUoD options on high-end systems, and enhanced management capabilities, etc. Detailed features of both Editions are tabulated in Appendix A. IBM stated that the new i870 and i825 models provide over twice the headroom of their nearest predecessors, and over three times for the i800 and i810. All are now powerful enough to run the key software proposed (*e.g. WebSphere Applications Server*). Figures A1 to A5 in Appendix A summarise all key capabilities and features of the new family.

Packaged Mail Server Solutions

Also announced were 5 new, pre-packaged "iSeries Dedicated Servers for Domino" (DSD) hardware/software systems for mail/collaboration demands. These are based on the i810 (*1- or 2-way*) and i825 (*3- to 6-way*) servers, and are rated at from 3,100 to 17,400 MCU (*Mail and Calendar Users*), and include Domino, other Lotus software, WebSphere, Linux support and DB2 integration software. Domino has been widely successful on iSeries, and these packaged systems are positioned to provide good-value Domino consolidation, and new mail system implementation, solutions.

Standard Edition Details

The new base iSeries servers are the "Standard Editions". They share the common features of dynamic LPAR, inclusive OS/400 license, inclusive DB2 UDB for iSeries relational database, strong Windows integration, and native 64-bit Linux support with the new Enterprise Editions described below. They are keenly priced, to show substantial reductions over similar predecessors, as we discuss in greater detail in Section 12. A key change, to a single software pricing-tier-per-model, often one tier lower, is supported in these Editions. The higher-end models support CUoD processors, with the new On/Off option. The three i810 models provide fixed CPW capacities, and the two i800 models offer fixed amounts of CPW capacity and Interactive CPW. Standard Editions also include the invaluable WebFacing software tool, for Web-modernising traditional 5250 "green-screen" applications, discussed below, and, in a crucial incentive for users to overhaul such applications with the tool, no Interactive CPW is charged on WebFacing modernised applications. The i800 Standard and Advanced Editions also include WebSphere-Express, the key new "on-ramp" entry applications server.

New Enterprise Editions

The new "Enterprise Editions" of the i810, i825, i870 and i890 server models package the same hardware as the Standard Edition, but add an extensive new suite of IBM e-Business middleware and management software (*see Figure 7 for software details*), valued at up to $467,000. The important change to a single software-pricing tier per model is also supported in these Editions.

Enterprise Edition Model	No. CPU or CPW Capacity	Unlimited Interactive CPW	IBM e-Business & Management Software Licenses	Inclusive Linux Processor Activation	Inclusive IXS Intel Server Onboard	Training & Services Vouchers	Value Of Inclusive Software Licenses	Enterprise Edition Base Price US$ List
i890	24/32-way	Yes	Yes, Full Set	Yes	Yes	Yes	$467,000	$2,550,00
i890	16/24-way	Yes	Yes, Full Set	Yes	Yes	Yes	$364,000	$1,970,00
i870	8/16-way	Yes	Yes, Full Set	Yes	Yes	Yes	$229,000	$1,330,00
i825	3/6-way	Yes	Yes, Full Set	No	Yes	Yes	$128,000	$330,000
i810	2,700 CPW	Yes	WAS-Exp. WebFacing	No	No	No	NA	$230,000
i810	1,450 CPW	Yes	WAS-Exp. WebFacing	No	No	No	NA	$78,000
i810	1,020 CPW	Yes	WAS-Exp. WebFacing	No	No	No	NA	$18,000

Figure 6 – iSeries Enterprise Edition Features/Pricing

All models also provide unlimited iSeries Interactive CPW capacity for all workloads. The i825, i870 & i890 packages include an inclusive Integrated xSeries Server (IXS) for on-board Windows 2000 loads. A free Linux processor activation is included on the i870 & i890 models. Education and services vouchers for WebSphere, Windows integration, or Linux consolidation start-up assistance from IBM are also included (*on the i825, i870 & i890*). The specific components included with each Enterprise Edition model, with their base price, and the value of the inclusive software licenses are shown in Figure 6 above. All three i810 models include the WebSphere-Express "on-ramp to the Web" entry applications server, which is packaged with the WebSphere Studio Developer Client for iSeries, and the WebFacing tool.

Enterprise Edition i825, i870, i890 Inclusive iBM e-Business Software	Enterprise Edition i825, i870, i890 Inclusive IBM Management Software
WebSphere-Express or WebSphere Applications Server 5.0	Performance Tools
Lotus Sametime	HA Cluster Resource
Lotus QuickPlace	Media & Storage Extensions
DB2 Query Manager & SQL Toolkit	Backup Recovery and Media Services
DB2 SMP	Tivoli Monitoring – PAC for Web
DataPropagator for iSeries	Tivoli Storage Manager Extended Edition
DB2 Extenders – XML & Text	

Figure 7 – iSeries Enterprise Edition Software Bundle

This extensive set of software adds the key elements for e-Business applications deployment, advanced collaboration, high database performance, and enterprise-level management, on top of the strong, standard, base OS/400 platform. This further software pre-integration and bundling will be an attractive time and cost saving benefit, with the other key Enterprise Edition features, for many new higher-end iSeries customers. We discuss some of these key software products in more detail in the Section. See Appendix A, Figure A3 for details of which software products are included with each model.

Our Analysis

The new range of iSeries servers covers a range of capacity (*from 300 to 37,600 CPW*), and of system base prices (*from $9,995 to $2,555,000*) with just five principal models, covering from the needs of the smallest business right up to that of a major enterprise. The new iSeries are offered in two interesting Editions, Standard, and Enterprise, the former orientated to providing base capabilities at aggressive new price levels, and the latter providing a more complete e-Business software, the hardware, and unlimited Interactive CPW workload, all inclusive in a bundled package. The Enterprise Editions provide a convenient and good value choice for customers with major e-Business workload plans and high volumes. We look in more detail at the pricing, packaging and comparative price/performance of the 2003 iSeries in Section 12, and at their underlying hardware and software in the next two Sections.

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6. iSeries – "The Software Machine"

Introducing "The Software Machine"

As mentioned previously, the iSeries systems architecture is completely defined by its software, not hardware, strong as the latter's technology is in this new generation. But this focus on software takes another major step forward in importance in the new iSeries in many aspects of the Announcement. These include:

- iSeries extended support for key open industry standards.
- Extended support for traditional OS/400 OLTP applications written in RPG and COBOL, including Web modernisation, and in the now fully unified applications development tool-set.
- The continuing "API stability" and long-term applications compatibility, ensured by the iSeries architecture, which insulates and protects both customers application inventory, and the huge range of ISV software on iSeries, from underlying hardware technology changes, eliminating the usual disruptive technology transition costs of other platforms
- Advanced support for running multiple software workloads, OS/400, AIX (*under PASE in OS/400*), Linux on the iSeries systems itself, and of also closely integrating, managing, and sharing storage and I/O with, Windows workloads.
- Further major strengthening of the key WebSphere family products on iSeries, providing the core infrastructure middleware for new Web e-Business applications.
- With new bundling of additional IBM enterprise level e-Business and management software in the Enterprise Editions, which simplifies ordering, and offers additional value.
- As well as, of course, in the many new, or substantially enhanced, key individual software components for the family also announced.

So, in a real sense, the new iSeries has become even more of a "software machine", and we devote correspondingly more space than usual to the software aspects in this Report, with correspondingly less on hardware "feeds and speeds".

iSeries Software Architecture

The main elements of the iSeries' closely-integrated software stack are depicted in Figure 8 below.

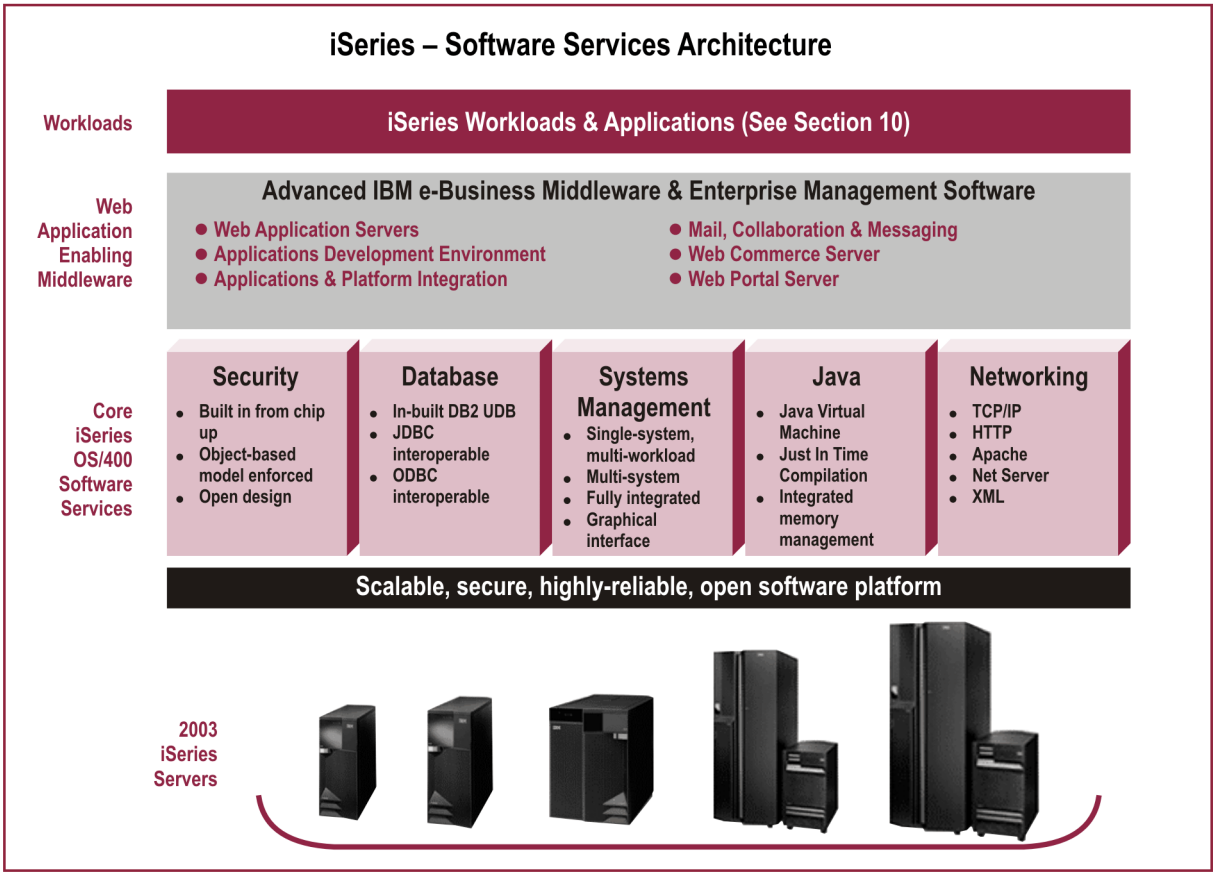

Figure 8 – iSeries – Software Services Architecture

The foundation OS/400 software services provide security services, advanced relational database management with database connectivity, systems management (*covered fully in Section 11*), the crucial Java language environment foundations, and the networking and interoperability. These provide the core software platform shown in the lower layer of Figure 8.

Above these, IBM now offers a full set of iSeries e-Business application-enabling middleware software services and enhanced access and management products, which greatly simplify the design, development, deployment, interconnection, and management of more advanced, new generation e-Business and Web applications on the platform. The database, Web and application serving, collaboration, development and management software of new iSeries is of world-class, comprehensive, integrated and productive. These technologies provide a strong base for the wider business role the new iSeries is proposed to fulfil in its customers' infrastructure.

Major New OS/400 Release

Version 5 Release 2 (V5R2) supports all the "e-Business On Demand" capabilities of the new iSeries family highlighted in this Report. Many of the key release features supported are described in individual Sections, so we do not discuss these in detail. To give an indicator of the breadth and span of enhancements in this important OS/400 release, we include a selective listing of enhancements made, in the areas of overall highlights, performance, infrastructure flexibility, logical partitioning, high-availability, systems management (*iSeries Navigator*), and on BRMS, in Figure 9 below.

OS/400 Version 5 Release 2 Selected Enhancements

High-Level New Capabilities
- IBM POWER4 - 64 bit technology support on wider range of models, 1.8X performance growth
- Flexible Capacity Upgrade on Demand now standard on every iSeries of 3-way and above
- Dynamic logical partitioning for 64-bit Linux
- Intuitive iSeries Navigator workload management tools
- Adaptive storage virtualization for high availability
  - Mainframe-class availability with switched disk cluster management
  - Self-optimizing, multiple IBM DB2 UDB images for business unit consolidation
  - Extensive Windows server management now supports Microsoft Cluster Server
- Industry-first eLiza Enterprise Identity Mapping enables true single sign-on
- Simple and pervasive operations with wireless-optimized Web-ready micro-drivers
- 2 GBps Fibre Channel SAN fabric support
- Support for FC zoning & 2109 switch

e-Infrastructure Flexibility Enhancements
- IPv6
- Wireless Web application development enhancements
- iSeries Toolbox for Java Micro Edition
- Java Database Connectivity (JDBC) Micro Edition
- Symantec Enterprise Firewall™ for Linux on iSeries
- Sub-capacity pricing for WebSphere Application Server & WebSphere Commerce Suite
- S.O.D. DB2 UDB & WebSphere Application Server for Linux on iSeries

Performance Enhancements
- Self-optimizing, intelligent cache for HTTP Server (Powered by Apache) secure sockets and caching accelerator
- Adaptive e-transaction services
- Secure Sockets Accelerator
- iSeries Cryptographic Adapter, processing <5 times as many secure sessions

Logical Partitioning Enhancements
- Support for i890 LPAR
- Linux processing unit movement
- Ease-of-Use updates for Graphical Interface
  - Save partition configuration data
  - Allows easier reconfiguration
  - Export configuration data to HTML
  - Format for hardcopy prints
  - Partition numbers visible with names
  - Ability to change Virtual Processors when moving processing units
  - Updates to Property sheets for Shared and Dedicated Processors
  - Select views by selecting columns to display
- Up to 10 LPAR/processor (POWER4)

High Availability Enhancements
- Database Journal Standby
- Database Journal Cache Commitment
- Storage "Migrate While Active" Data Movement
- Enterprise Identity Mapping (EIM) enhanced security
- Virtual Media Install for enhanced S/W maintenance
- WebSphere as resilient application
- Switched Disk or Replication Cluster
- User control over failover
- HA Journal Performance (OS/400 option 42)
- Journal Standby Mode for back up system – faster recovery
- Batch Journal Caching
- Management Central cluster support for 4 nodes
- New disk migration tool (migrate while active)
- SMAPP Enhancements: More control for user, faster system recovery
- Save-While-Active enhanced – save new member w/o waiting for unrelated DB commit

iSeries Navigator Systems Management Enhancements
- New name/brand
- New file and B2B activity monitors
- Work Management
- Graphical Storage Virtualization
- Backup Recovery and Media Services
- Database and Independent ASPs
- Linux 7/8 Partition Creation and Management
- Integrated File System support
- Network Enhancements
- Security and Enterprise Identity Mapping support

Backup Recovery and Media Services (BRMS)
- Enhanced graphical wizards and interfaces for
  - Backup policies
  - Media Library
  - Media Move Policies
- Notes server point-in-time recovery
  - Available through iSeries Navigator only
- Native TCP/IP support for BRMS network
- Performance enhancements for BRMS maintenance
- IASP support for library objects
- Easy to learn, quick deployment

Figure 9 – Selected OS/400 V5R2 Enhancements

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This partial listing indicates the wide spread and sweep of enhancements in this major new OS/400 release, across many key areas. Space restrictions here preclude detailed discussion of individual enhancements, but it can clearly be seen that V5R2 is a major release.

Strong Java Virtual Machine

To support the extensive role Java now plays on the iSeries, IBM has further refined and improved the Java Virtual Machine (JVM) included with the operating system. This Java Run-time Environment for iSeries has been supported, refined and improved since OS/400 V4R2, and is integrated beneath the Machine Interface (MI) for maximum security and highest performance. JVM Java byte-codes are implemented as MI instructions, which are translated into PowerPC instructions before execution. This provides far higher performance than the usual interpretative approach. The JVM supports both "direct execution" and "Just In Time" compiler options, supports the Java and Java 2 specifications, the JDK 1.1.8, 1.2, 1.3, and is compliant with reference implementations. This implementation give the winning performance reported from the benchmark tests summarised in Figure 18 on page 31.

Full 64-Bit Linux OS Support

New iSeries offers strong native support for new 64-bit versions of Linux running in an LPAR. The versions announced are:

- SuSE Linux Enterprise Server 8, with 64-bit kernel, supporting 64- & 32-bit applications: made available in December 2002.
- Turbolinux Enterprise Server 8 for iSeries, with 64-bit kernel, supporting 64- & 32-bit applications: available March 2003.
- Red Hat Linux 7.1 for iSeries, with 64-bit kernel, supporting 32-bit applications: available January 2003.

These distributions will include popular Linux applications like the Samba file server, Apache Web server, Squid proxy server, DNS/DHCP, MySQL database, and other key Linux infrastructure software. IBM has also announced DB2 UDB beta test availability on iSeries 64-bit Linux, and intends to bring WebSphere products onto the OS in future. A growing number of important ISV applications are also becoming available for this Linux platform, including Symantec's Enterprise Firewall, eOne's Commerce, Sage business applications, the Bynari mail server, MAPICS ERP, and a number of others. So, even at this early stage, iSeries Linux users have access to a diverse and fast growing, range of popular infrastructure and application products.

IBM continues to donate key operating system features to the Linux open source world, via its Linux Technology Center, notably here the 64-bit iSeries kernel developed in Rochester. IBM's long enterprise expertise in OS flexibility, performance, scalability, and reliability, are its other main contribution areas. These new 64-bit Linux versions have benefited from these efforts, and also integrate well with iSeries' systems management, clustering, Internet services and security strengths through LPAR under OS/400 primary control.

Key e-Business Software on iSeries

If we drill deeper than the overview of Figure 8 into the software stack offered on the new 2003 iSeries, the key e-infrastructure products provided for the platform, and their interconnections, can be clearly seen in Figure 10 below.

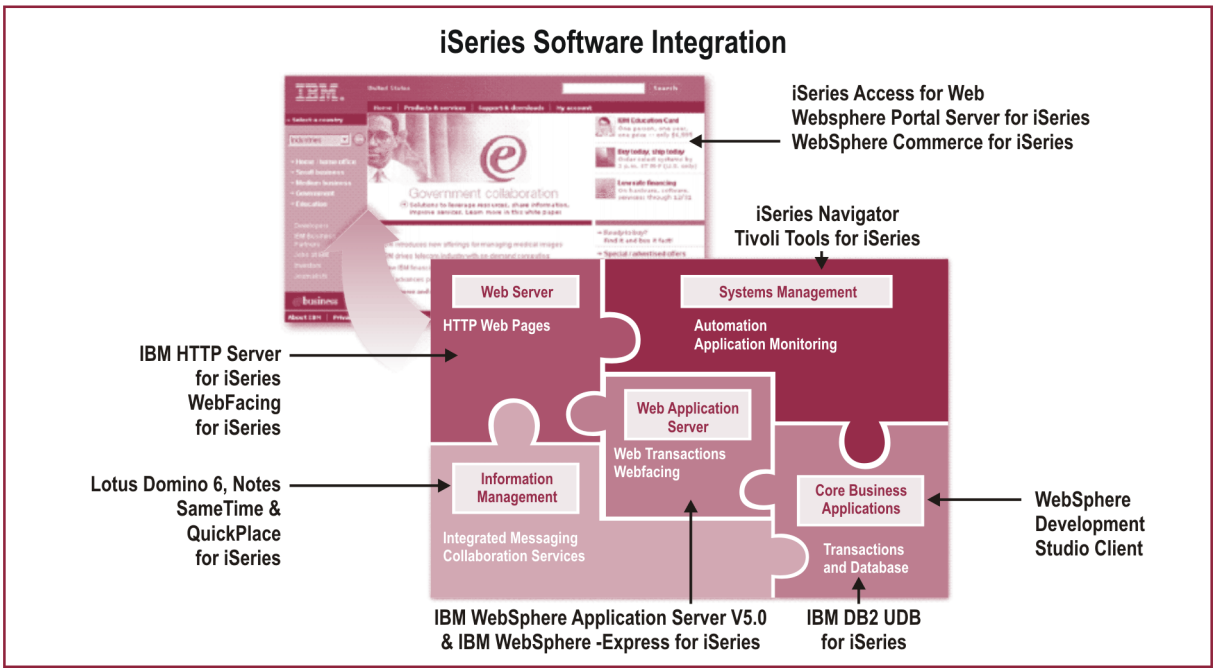

Figure 10 – iSeries Software Integration & Key Products

We look at some of these major software components in more detail in the following descriptions:

- **Inclusive DB2 UDB Relational Database**

  Uniquely amongst systems, all new iSeries continue to include the well-liked, and fully integrated DB2 UDB for iSeries Relational DataBase Management System (RDBMS), built-in at no extra license cost. Compared to UNIX systems, which all require purchase of a separate RDBMS license for commercial use. When the fee for Oracle or Sybase may exceed base server costs, this is a major iSeries cost advantage. The fact that the DB2 UDB is installed automatically with the OS, is tightly coupled with all the iSeries management and development tools, and is the universal standard used by almost every customer and ISV, also means skills and experience are widespread. These all bring further substantial lifetime operating cost savings. This version includes full support for the latest SQL & XML standards, reduced DBA costs via automation features and high-integration, self-optimising queries, and an autonomic index advisor. The DB2 SMP option enables the RDBMS to exploit iSeries processor-scalability, and take full advantage of parallelism. The database also supports B2B, though its DB2 XML Extender option. (*Both options inclusive in the Enterprise Edition software bundle.*)

- **WebSphere-Express or WebSphere Applications Server V5.0**

  The base, mainstream software platform for e-Business and Java applications is the new WebSphere Application Server V5.0 for iSeries release, the newest version of IBM's market-leading enterprise applications server, and this will be the choice for experienced users building large-scale WebSphere applications. (*Supports JSPs, Servlets, EJB, etc.*). However, to provide new-to-e-Business customers, looking for a faster, easier way to start developing their first interactive Web sites and services, IBM has also introduced WebSphere-Express for iSeries, a lighter, greatly-simplified, easy to install, configure and operate base applications server. With extensive wizards, Express can be installed and set up in minutes, is tightly integrated with the standard IBM HTTP (*Apache powered*) iSeries Web server, and provides an ideal starter Web applications platform. (*Supports JSPs, Servlets.*) Both servers support WebFacing Web-modernised 5250 applications. A choice of either server is inclusive within Enterprise Editions (*higher models*), with WAS-Express included on the i810, and included education/services vouchers may be used to "quick-start" support first customer WebSphere applications on the higher models. A real application – "IBM Telephone Directory" for 1000 customer employees – is included with both servers, to provide a useful, practical first application for customers to use and deploy with WAS-Express or WAS, is also included on i800 Standard and Advanced Edition servers, and Enterprise Editions. WebSphere Express is priced at a low $2,000 per CPU with unlimited Web users, or at $25/registered Intranet user. The WAS V5.0 product is priced from $8,951 per CPU with unlimited Web users.

  For users requiring the most advanced facilities for very large-scale applications, WebSphere Application Server Network Deployment Version 5.0 for iSeries includes the base WAS, plus a Network Deployment Manager, which adds additional features. These include: adding integrated support for private UDDI Registry and Web Services Gateway; more automated distributed system management under a central deployment manager (*with simpler to manage dynamic clustering*); extended application availability and elimination of SFOP with Advanced Multi-Domain Availability/Failover; support for multiple machine topologies; Workload Management (WLM) facilities for WAS server load balancing and failover; and the Dispatcher and Caching Proxy components of IBM Edge server to enhance load balancing, failover and performance capabilities. The Network Deployment Edition is charged at $13,441/CPU.

- **WebSphere Studio Developer for iSeries**

  A key component of the new software infrastructure is a much-extended version of the iSeries Applications Development Environment (ADE). The WebSphere Studio Developer iSeries (*WSD for iSeries*) provides an advanced, unified, integrated, single development tool environment. Web applications built with the tools execute under the tightly coupled, new WebSphere Application Server V5.0 or WebSphere-Express for iSeries servers discussed previously. The overall architecture of the WSD for iSeries ADE is depicted in Figure 11, and consists of the OS/400 host Integrated Language Environments (*RPG, COBOL, C & C++*) and ADST, and the powerful client development tool, WebSphere Studio Developer Client for iSeries (*WSDc for iSeries*). WSDc supports the building of traditional OS/400 RPG and COBOL language-based database applications, as well as new-generation, Web-based applications (*Java, HTML, XML & Web Services*) of all levels up to full J2EE.

  The tool also supports legacy CODE/400 and Visual Age for RPG. The client tool contains the powerful WebSphere Studio Site Developer Advanced core, which provides a rich set of tools for Web, Java, XML and Web Services development, the Remote System Explorer, and the WebFacing tool discussed separately. These WSDc capabilities are layered on the core services of the base WebSphere Studio Workbench infrastructure. A comprehensive, fully Windows GUI-based Client tool, the product offers a first-class user interface, with similar, but appropriately tooled, workplaces for each supported software environment.

  Because the tool is tightly integrated with iSeries, it recognises and supports key iSeries object classes, and can directly access directories, databases, catalogues, security, and any other system service required. A more detailed view of this development tool architecture is shown in Figure 12. The layered set of tools can be seen in full here.

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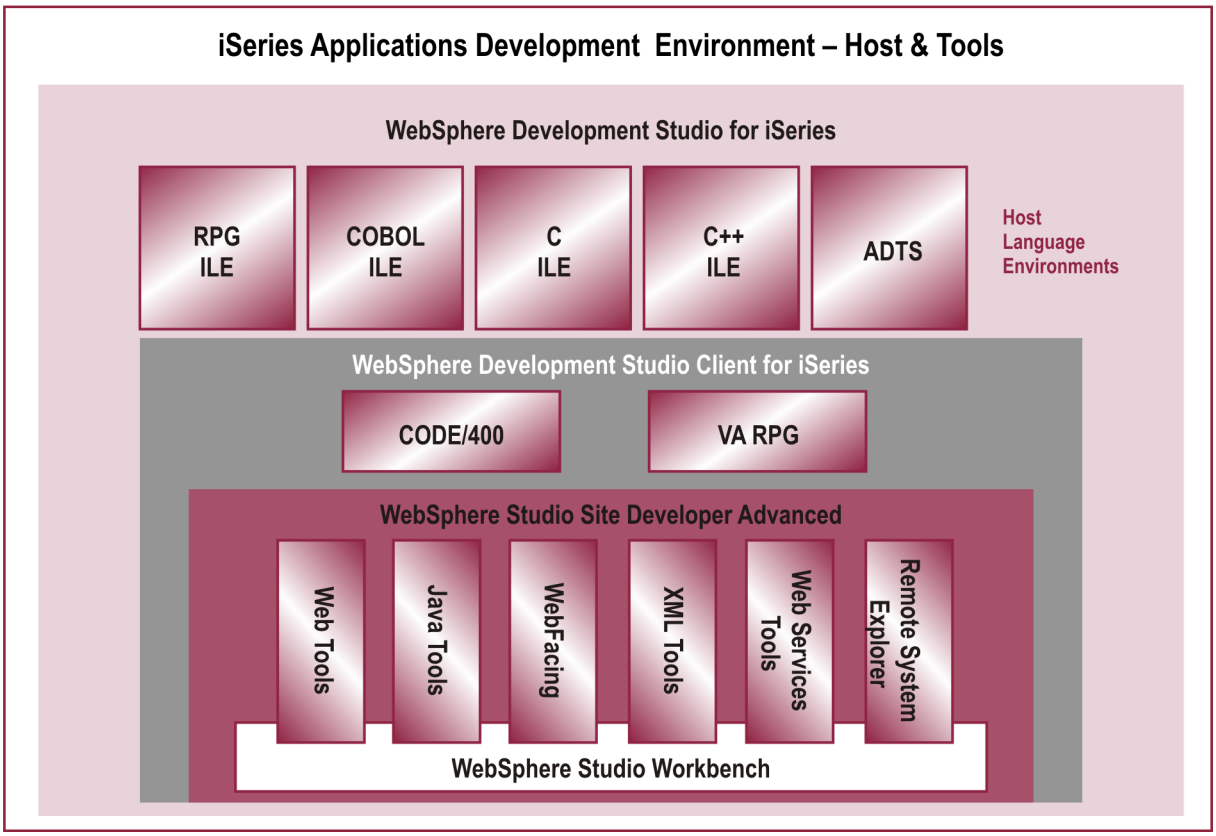

Figure 11 – iSeries Applications Development Environment: Host & Tools

The WebSphere Studio Applications Developer adds higher-end enterprise development support for J2EE and EJB applications, code-generation, performance tuning and direct support for RDBMS, and is an extra charge option for those developers building large-scale, heavy-duty Web applications. The base WSDc for iSeries functionality can also be seen in Figure 12. The tool is based on the open ECLIPSE AD standards base system, donated originally by IBM, which underpins the WebSphere Studio Workbench foundation.

Figure 12 – iSeries Applications Development Tools

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The product can also "wrap" existing RPG programs into new "Web Services", for reuse in new e-Business applications. The WSDc tool is packaged with WebSphere-Express for iSeries, and comes with the popular WebFacing tool for modernising 5250 "green-screen" applications for the Web, described later. There are major advantages for all iSeries users and developers with this single, comprehensive, powerful, and well integrated, open-standards-based, applications development environment. It will cut development times and costs, increase development productivity and enable easier skill sharing across the iSeries development communities (*RPG, Cobol, Java*). Over 70,000 copies of WSDc have been shipped since its first release on 23rd May 2001, which reflects the appeal and strengths of this powerful AD product, and this release, with the new iSeries, is certain to accelerate this uptake. We rate these development capabilities highly.

- **WebFacing**

This popular IBM software tool enables customers' traditional, RPG/5250 "green-screen" applications to be easily modernised into GUI Web applications that users can run from a Web browser, giving them a contemporary look-and-feel, and a renewed lease of life. Positive user reviews and feedback confirms how quick and easy WebFacing makes this modernisation process. The WebFacing Tool is part of WebSphere Development Studio Client, described earlier, and ships with that product. WebFacing operates by converting the traditional application's Display File Source Files (DSPF) automatically into servlets and JSPs, which then execute on a WAS server, delivering results to a modern Web browser interface. In a crucial, related commercial/pricing move, IBM announced that Interactive CPW workload charges for running WebFacing-modernised Web applications are eliminated on the new iSeries, and enhanced i890, servers. This brings a major cost advantage, and a strong new incentive to encourage users to modernise their traditional OS/400 applications in this way.

- **Domino Version 6 for iSeries**

Domino needs little description; because Lotus's successful mail and collaboration server is widely known and liked. Since Domino became available on iSeries, it has become extremely popular and is widely used by iSeries customers, enabling them to consolidate their mail and collaboration workloads on their beloved platform, and sales of Domino on iSeries are now second only to those on NT. Closely integrated with the OS/400 platform and the other products discussed here, Domino forms a key part of the new iSeries software infrastructure. Specific enhancements to the latest Domino 6 for iSeries improve integration with iSeries and OS/400, simplify installation, improve manageability, and raise performance of the server.

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The Domino server is closely integrated with the iSeries HTTP Server (*Powered by Apache*), and/or the WebSphere Application Server, a copy of the latter shipping with Domino 6 to support servlets. Closer integration with OS/400 Collection Services now allows Domino users to employ iSeries performance management tools like iSeries Navigator, CL commands, or to develop their own Domino statistics applications easily. A new InstallShield-based graphical set-up wizard speeds and simplifies Domino installation and set-up, from any network workstation. Record and playback wizard features automate server configuration, so cloned Domino images can easily be deployed on multiple iSeries servers. Finally, Domino 6 takes advantage of improvements made to OS/400's Integrated File System to improve file caching and system structures, bringing improved performance.

The **iNotes™ Web Access** facility delivers an intuitive browser-based Domino user interface to users throughout an iSeries customer's organisation, without the costs or complexity of PC client software installation.

- **IBM Lotus QuickPlace for iSeries**

This is a Web-based, team collaboration workspace server that allows non-technical staff to instantly create shared electronic workspaces to support a task, project, or initiative. With browser access to an Intranet or the Internet, authorised team members can access the workspace to communicate, share knowledge and ideas, maintain a project calendar, and organise team information, etc. The software provides a strong dynamic workspace and team communications tool for iSeries customers. A 100-user license of QuickPlace is included with iSeries Enterprise Edition systems.

- **Lotus Sametime**

Provides real-time collaboration, with on-line awareness, instant messaging, application sharing and virtual meetings support on iSeries. The server allows employees, customers, partners, and suppliers to easily interact with one another in real-time. This type of real-time collaboration can be seen as an extension to e-mail, which greatly enhances communications between all such interacting business communities. Applications can include new product or program launches, co-operative working with partners and suppliers, or delivering live support and service to customers, all through a Web browser. A 100-user license for Sametime is included with iSeries Enterprise Edition systems. Sametime is also used to provide instant messaging of iSeries Navigator systems management alerts and messages.

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- **IBM HTTP Server for iSeries**

  Not content with one HTTP Web server for iSeries, IBM provides two, the original IBM HTTP Server, and the IBM HTTP Server for iSeries (*Powered by Apache*), to provide secure, powerful, and comprehensive Web serving capability on the platform. The latter uses a Java Servlet and JSP engine based on technology from the Apache Software Foundation's Jakarta Tomcat project. The server also provides a Web server search engine and a Web crawler, uses a Triggered Cache Manager for performance, and offers strong iSeries-enforced security and integration. The result is excellent performance, as shown in key benchmarks, and high-availability HTTP serving capability.

- **WebSphere Portal Enable V4.1 for iSeries**

  WebSphere Portal Enable Version 4.1 for iSeries provides an easy, secure, single-access-point for the presentation of dynamic information, all types of applications, people, and many other resources. It aims to improve user productivity in accessing the services on iSeries that their business determines are most needed. The Server provides an open framework for creating scalable portals. These can be Business-to-Employee (B2E), Business-to-Business (B2B), or Business-to-Commerce (B2C) focused. It supports application portlets, syndicated content and collaboration, and offers strong personalisation technologies to tailor information display/access to a user's specific needs. Supported by WebSphere connectivity and integration products, and using the WAS 4.1 applications server, WebSphere Portal Enable V4.1 can thus provide convenient portal front-ends for Intranets or the Internet. The Server can also support access from any location, at any time, from any type of device, whether connected or wireless. The software is priced at $72,000/CPU.

- **WebSphere Commerce Version 5.4 for iSeries**

  The WebSphere Commerce Suite provides a Java-based commerce server, and supporting development & management tools, that allow iSeries customers to sell their products and services worldwide on the Web. The Suite allows customers to build and manage on-line stores, carry out B2B or business-to-consumer transactions, and to support mobile commerce. A low-cost Pro-Entry version is packaged for SME companies requiring a single store, at $22,400, with sub-capacity pricing. A Professional Edition adds more advanced order handling & inventory management, e-Business campaign management, integrated business intelligence, live help (*via Sametime*), auctions support, and payment management capabilities, and costs $89,600/CPU. A top-end Business Edition offers the same capabilities as Professional, but adds sell-side managed contracts support, RFQ's, approvals workflow, requisition lists, buyer/seller collaboration, advanced user management and access control, and costs $140,000/CPU. This easy to use, extensible Suite, is fully based on open industry standards, and can easily be integrated with iSeries customer's business systems. The suite uses the WebSphere Application Server as its core platform.

- **iSeries Access for Web**

  This product provides straightforward, browser-based access to iSeries 5250 and Web applications and iSeries resources. The server-based software is quick and easy to configure, deploy and, customise, and can be managed with central administration. iSeries Access for Web runs on iSeries using Java servlet technology, requires no JVM setup, and provides a "no-touch" client footprint for easy Web access to iSeries systems. The product includes **WebSphere Host Publisher**, which additionally provides methods of Web-enabling existing applications, delivering host integration via 5250, supporting data integration via SQL, and allowing multiple iSeries applications to be aggregated into a single Web page, without any change to the back-end applications.

- **Strong Open Standards Support**

  IBM has made a further large effort to extend the platform's strong support for all the main open standards throughout. Examples include: IBM's major Linux/open source emphasis; full support for the latest Web and Java standards; XML, LDAP, for the ECLIPSE open AD standards; and for all the key Web Services standards; for TCP/IP networking; and even support for Grid Computing standards. Today, these developments have now made the iSeries a truly open, interoperable, and open-standards-based platform, demolishing old, and now completely outdated, "proprietary" accusations.

  IBM has made a further large effort to extend the platform's strong support for all the main open standards throughout.

- **Single Software Maintenance & Support**

  Another desirable innovation for the new iSeries is that customers are now offered a unified software maintenance and technical support service. This covers not only the standard OS/400 base software, but also any bundled IBM e-Business or management software, or additional IBM Software optional products, purchased with a new iSeries server. Provided under a single one-year agreement, this simplification cuts administration, offers cost savings, and gives customers a single point to call for all iSeries software support.

ISV Software "Treasure Chest" Complements

The iSeries and its predecessors attracted a large community of third-party ISV business software applications, complementary tools, and other software components. This community has long been a key part of the appeal of the platform to SMML business enterprises, most of whom are more interested in these real business solutions than in IT technology per se. Indeed, a large majority of iSeries system sales have long been driven by these applications solutions through their vendors or resellers, with customers choosing the software first, and then adopting the hardware recommended to run it best, often iSeries. There is therefore a literal treasure chest of complementary software solutions available for the platform, and we look at this aspect in Section 15, because it is such an important component of the appeal of these systems.

Our Analysis

The iSeries now offers a rich, complete, stable, modern and open software foundation, in both its comprehensive, inclusive base OS/400 and related standard software set, and in the strong, tightly integrated set of e-Business-enabling middleware IBM offers for/with the platform. With the Enterprise Edition packages, many of the key e-Business and management products are inclusively packaged at a value price. For those choosing Standard Editions, some of the key e-Business products, such as WebSphere Application Server and WebSphere Commerce, have new, much lower-priced versions, with sub-capacity pricing, to encourage customers to advance to next-generation Web-Java applications more affordably and rapidly. The strength of these and other key high-level e-Business middleware components is complemented by a major new release of the operating system, V5R2. We would also highlight the achievement of a completely integrated, single applications development environment and tool, that encompasses all the traditional and new modes of development envisioned on the platform under a single product/framework, as a particularly noteworthy achievement, and a great benefit to both customers and ISV partners. The mail, messaging, e-collaboration and electronic workplace facilities are also strong, and are well integrated into the software platform, and will bring great benefit to many more iSeries customers.

Combine these deep platform software strengths with its "multiple software personality" ability – able to efficiently run and manage traditional OS/400 and new workloads, including Linux, AIX UNIX (*PASE under OS/400*), and to manage and integrate Windows workloads, all on the same reliable, well integrated and manageable software/hardware platform – and the appeal of the whole consolidation solution to small, medium and larger enterprises becomes even stronger.

Finally, there is rich range of ISV applications, tool and utility software for the iSeries, available from thousands of PartnerWorld partners, which provides a large choice of business solutions to customers. We look more deeply at this aspect in Section 15.

7. iSeries Hardware Technology Shines

Introduction

The new iSeries follows its predecessors in focusing primarily on its business solution platform strengths, its ease of manageability, its reliability, particularly on its impressive software platform, and its tight hardware and software integration, all of which are of major importance to its customers and ISV partners. The marketing of these systems has always stressed these strengths, which translate directly to their strong, enduring appeal to SMML business enterprises, rather than the "feeds and speeds" of the hardware. This has sometime led ill-informed observers and competitors to argue that the hardware is somehow behind the curve. In reality, nothing could be further from the truth for the new 2003 iSeries, which boasts some of the most advanced hardware technologies available in the marketplace today. The new iSeries server line brings truly leading-edge technology, throughout its hardware (*and software*). For this reason, we devote a (*shorter than usual in such a Report*) Section to the core hardware technologies used in the new iSeries. These are important underpinnings for the high-level business systems attributes on which these systems are normally purchased, and, in many ways, are outstanding.

eServer Strategy Bears Fully on iSeries

One of the lynchpins of the eServer strategy since 2000 has been IBM's resolute efforts to deploy its formidable microelectronics and microprocessor, balanced commercial systems design and architecture expertise, leading-edge storage and I/O skills, and decades-long RASM engineering skills, across all its server lines. The giant's aim has been to create distinctively different and better platforms than those of competitors in each line's market segment. The strategy also sought to design-in greater hardware reliability from the chip upward, and to add self-healing and self-repair capabilities wherever possible. This effort has greatly reduced the customer costs of hardware failure and downtime, using techniques and approaches proven on the mainframe and/or flowing out of IBM's corporate autonomic computing initiative. IBM has also shown itself able and ready to use these strengths to set new industry levels of price/performance with each line in turn, to offer greater value, for lower initial customer investments.

We have already seen these approaches bring strong dividends and substantial differentiation to the pSeries (*from late 2001*) and to the xSeries servers (*from April 2002*). Each of these genuinely advanced the industry state-of-the-art in their sector, and has done correspondingly well in the market as a result. Now, with the new 2003 iSeries, all these eServer elements have been fully deployed to advance this fourth system line by a similarly large and important further step.

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Hardware Positioning

The iSeries has always focused on, and been optimised for, the commercial business workload requirements of the mid-market, but now extend its capabilities to support to newer types of workload, such as Java-based Web applications, over a wide range of enterprise sizes. One of the "sacred principles" for the design of the family has always been hardware integration, which means providing well-balanced hardware architectures that deploy the right blend of processor power, system bandwidth, the high I/O volume support essential for commercial processing, and the fast task-switching essential for high-transaction performance. In addition, the capability to support and manage high volumes of storage easily and automatically, are critical in these commercial business systems, which are usually run by small IT staffs compared to other platforms of similar power. The new iSeries again follows this model.

Leading-Edge 64-bit Processors

The higher-end i825, i870 & i890 models are all powered by the stunningly capable POWER4 "SMP on a Chip", a 174 million transistor, 8th generation IBM 64-bit RISC processing chip. They use the extraordinarily high-bandwidth POWER4 system architecture these models share with their high-end pSeries RISC UNIX server brothers (*the latter already hugely successful in that market*). The POWER4 chip's key features are shown in Figure 13. It uses IBM's advanced copper interconnect and Silicon on Insulator 0.18 micron CMOS 8S2 process technologies. The chip packs two 64-bit RISC processor cores on a single chip, with onboard L1, shared L2 cache, and Level 3-cache directory. These were (*until POWER4+*) the industry's fastest and most highly-resourced 64-bit processors.

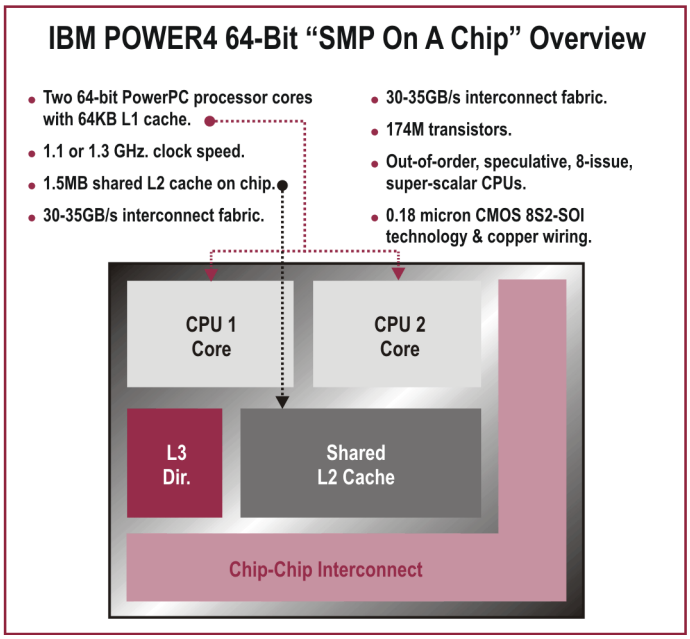

Figure 13 – IBM POWER4 64-Bit "SMP On A Chip"

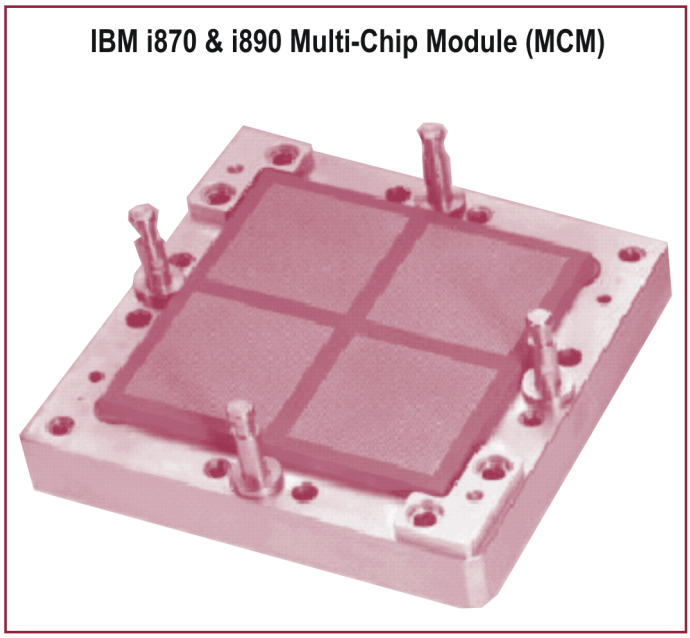

Figure 14 – IBM i870 & i890 Multi-Chip Module (MCM)

The cost-effective, value-focused, but still powerful S-Star 7th generation IBM 64-bit RISC processing chip powers the lower models, the i800 and i810.

With many software products licensed by number of processors, there is a strong software license cost advantage with systems such as new iSeries which rely upon relatively fewer, but powerful processors, such as those above.

With many software products licensed by number of processors, there is a strong software license cost advantage with systems such as new iSeries which rely upon relatively fewer, but powerful processors.

Dense Modules, Packaging on High-End Systems

The i870 and i890 high-end systems also use a mainframe-inspired, ultra-high density, Multi-Chip Module to pack four POWER4 chips into an 8-way SMP, all on one 4.5" square module, shown in Figure 14 above. This provides far higher density, shorter interconnection paths with lower latencies, much greater reliability and lower power and space requirements than competitor designs, all of which require at least two full-sized 4-way server processor boards for similar power 8-way.

The result is that even the massive 32-way iSeries i890 top-end system has its core 64-chip CEC (*Central Electronic Complex*) mounted on a single backplane. This holds the four MCM modules (*of four chips/eight processors each*), together with 512GB of Level 3 cache, and up to 256GB of main memory, and controllers, as can be seen in Figure 15 on the next page.

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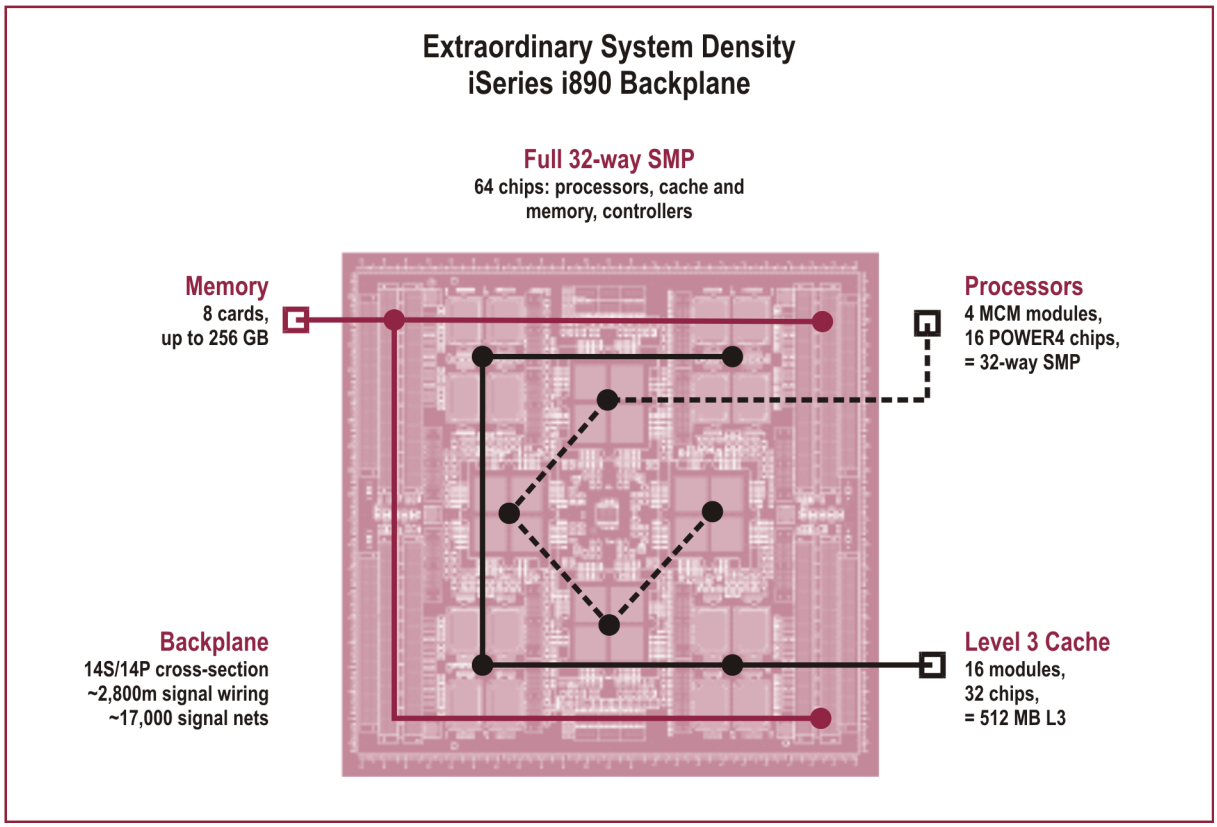

Figure 15 – Extraordinary System Density – iSeries i890 Backplane

High-Bandwidth Systems Architecture

The i870 & i890 employ the full high-bandwidth POWER4 systems architecture. This includes the advanced memory system (*described below*) with a large on-chip L2, and the impressive distributed switch interconnect. The latter is clocked at a direct ratio of processor rates (*3:1 processor to Level 3 cache clock speed ratio, 2:1 inter-chip fabric interconnect, and 3:1 GX bus chip to I/O subsystem*). This means the bandwidth of the architecture scales uniformly with processor clock rate increases. This architecture provides the i890 32-way system with an sector-leading total L3 cache to processor bandwidth of 221.6 GB/s (*1.3GHz. POWER4*), which drives the exceptional performance showed by these systems.

Advanced Memory System

In addition to on-chip processor Level 1, and 1.4GB shared Level 2 cache, the i870 & i890 use large, shared, fast eDRAM Level 3 cache on each processor (*32MB on the 1.45GHz processor, 8MB on the 1.2GHz.*). Each processor memory card also includes eight DIMM slots for main memory capacities of <32GB per card and <128GB (*i870*) and <256GB (*i890*) per system. Memory is EEC DDR SDRAM, with Chipkill™ and redundant bit steering protection, for high reliability and performance.

Fullest Exploitation of 64-Bit Technology

The unique iSeries/AS/400/S/38 base architecture provides the only platform today running 100% in real 64-bit mode, at hardware, operating system, key subsystems and all major middleware levels. Even more important, all user applications and ISV applications are also running in full 64-bit mode, without heavy rework. The iSeries single-level storage architecture also makes the fullest use of the massive address space 64-bit technology provides.

High I/O Performance & Scalability

The new iSeries greatly extends its traditionally high I/O strengths, with the 3* faster PCI-X I/O (*on i825, i870 & i890*) technology supported by POWER4. The iSeries also allows high I/O capacity scaling on all models, via its ability to support varying numbers of additional PCI-X I/O slots via 1GB/s HSL-connected I/O Expansion Towers. Details are shown in Figure 16, and total I/O slot support ranges from 21 (*i800*) to a massive 672 (*i890*).

Several sizes and formats of I/O Expansion Towers or Units, floor standing or rack, are available for the family, providing a wide range of configuration options to suit all needs. (*These options are detailed in Appendix A, Figure A4.*) This unique eServer ability to support massive off-board I/O expansion, with extended memory-bus speed connection to the server, via I/O Expansion Towers, brings the strikingly high I/O capacities, mentioned previously, across the range, and also allows customers to upgrade their I/O incrementally "On Demand" when needed.

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Storage & I/O Capacity	i800	i810	i825	i870	i890
Max. DAS Capacity	4TB	14TB	58TB	144TB	144TB
Max. No. HS HDD	1-63	1-198	1-825	2,047	2,047
I/O Technology	PCI	PCI	PCI-X	PCI-X	PCI-X
Standard No. I/O Slots	7	7	7	14	14
Max. No. I/O Slots	21	63	263	672	672
Max. No. I/O Expansion Towers	1	4	18	47	47
Standard DVD/ROM or DVD/RAM	Yes	Yes	Yes	Yes	Yes

Figure 16 – New iSeries Storage and I/O Capabilities

With hot-swap I/O, iSeries customers can add additional I/O adapters from local inventory themselves whenever needed, without stopping the system. Consider also that this I/O capacity can be allocated to, or dynamically or moved across, multiple like or unlike iSeries partition workloads on a single server. We discuss these consolidation benefits in Sections 8 & 10, but they clearly bring a further level of I/O resource-use efficiency, compared to the wasteful, separate, dedicated I/O resources needed for standalone workloads on separate systems.

Excellent Onboard/Outboard Storage/Media Capability

iSeries servers support either native internal disk drives, or external storage solutions, with most customers choosing the former. These native (*internal*) iSeries drives are physically housed in the iSeries system unit, or in Expansion Towers. The new iSeries offers a three-fold DAS throughput increase from PCI-X I/O technology, supports an efficient new 3-disk RAID-5 architecture with new Ultra RAID controllers, and supports new 15,000rpm 35GB and 70GB hot-swap hard disk drives, for internal disk storage.

Currently available iSeries internal disk drives are:

- 17.54GB disk drive – 10K rpm.
- 16GB disk drive – 10K rpm.
- 35.16GB disk drive – 15K rpm.
- 70.56GB disk drive – 15K rpm.

These drives are supported by iSeries server disk controllers and I/O processors, which provide additional performance and reliability benefits. OS/400 provides built-in disk mirroring support, and RAID5 support, where an appropriate disk controller is selected. Current controllers available are:

- **PCI-X Tape/DASD Controller:** Supports <6 internal HDD & <2 internal removable media (*DVD-ROM, DVD-RAM, or tape drive*). No cache or RAID-5.
- **PCI-X Ultra RAID Disk Controller:** Supports <18 internal HDD & <2 internal removable devices as above. Has 757MB write cache and RAID-5 capability, for which a 3+ drive set is needed.
- **PCI-X RAID Disk Controller:** Supports <12 HDD, the standard DVD feature, and an internal tape. 40MB write cache and RAID-5 capability. At least 3 drives are required for a RAID set.
- **PCI Fibre Channel DASD Controller:** Supports attaching external disk via a Fibre Channel connection.

Each of the systems can also support varying numbers of external I/O Expansion Towers or Units, connected by High-Speed Links (HSL) to the server, for maximum directly attached storage capacities of from 4TB (*i800*) to 144TB (*i870 and i890*). Details of these features are summarised in Figure 16 above. This invaluable eServer ability to support massive off-board DAS expansion, with extended memory-bus speed connection to the server, via I/O Expansion Towers, brings the above strikingly high DAS capacities across the range, and also allows customers to upgrade their DAS capacity incrementally "On Demand" when needed. With hot-swap DAS HDD, iSeries customers can add additional DAS capacity from local inventory themselves, whenever needed, without stopping the system. This DAS capacity can be shared dynamically across multiple like or unlike iSeries workloads on a single server.

The systems also support external storage options. For higher-end requirements, the IBM Enterprise Storage System (ESS) "Shark" is the most widely used option, attached by an iSeries Fibre Channel disk controller. Each server also provides an integrated, on-board DVD-ROM or DVD-RAM drive.

For back-up, internal QIC (*Quarter Inch Cartridge*) technology is usually used on iSeries, for its value, performance, packaging convenience and reliability. Internal iSeries QIC drives include 30GB and 50GB tape drive (*double capacity with typical 2x compression*), and all new iSeries servers can support one such internal drive in the system unit A wide range of other IBM external tape options, including automated libraries, can also be used, but are outside the scope of this Report.

Strong Choice of Network Connections

Using PCI I/O adapters (IOAs), iSeries servers support the popular connections, including:

- PCI 10/100 Ethernet IOA.
- PCI 1Gbps Ethernet IOA using Unshielded Twisted Pair (UTP) cabling.
- PCI 1Gbps Ethernet IOA using multimode fibre media (*fibre optic*) cabling.
- PCI 100Mbps Token Ring IOA.
- PCI 2-Line WAN IOA with two, one, or zero integrated modems.
- PCI Dual WAN/Modem IOA.
- PCI Quad Modem IOA or CIM.
- PCI Cryptographic.
- PCI Twinax workstation controller.

which cover most customers network environments.

High Reliability/Availability Engineered

The iSeries had long held had a deservedly high reputation for reliability and availability, derived from its architecture, high hardware and software integration and co-testing, bullet-proof security, and self-managing attributes, etc. With the new iSeries, these strengths are further extended. Figure 17 below highlights the fundamental "designed in from the chip up" RAS capability POWER 4 has brought to the new iSeries.

The new iSeries offers leading "RAS" engineering and "self-healing" hardware and software management features, at chip, subsystem, system, and systems management levels. Some of these flow from IBM's eServer and e-Liza autonomic computing initiatives, which have systematically brought proven RAS techniques to other server lines from mainframe or pSeries, and added valuable autonomic resilience. Here, they include Chipkill™ and ECC memory protection, redundant power, processor dynamic de-allocation, and efficient new internal RAID controllers. In addition, hot swap HDD, PCI-X or PCI-slots and redundant cooling, are standard. The extensive RAS features improve fault isolation, enable error recovery without system stops, and avoid recurrent faults. These high availability, reliability and serviceability features have already been well-validated in front-running pSeries practice. Various extended availability cluster options are also supported.

Core System Design	Fault Resilience
Avoid Failures Highest quality parts Fewer parts = fewer failures (*IBM 24-way outperforms 64-way systems*) Designed for low power consumption (*less heat = fewer failures*) Manufacturing methods, packaging, cooling Continuous system & commodity quality actions Integrated RAS Failure avoidance methodology Designed for ease of service	**Keep Application running** N+1 power supplies, regulators, power cords Dual redundant fans Dynamic CPU de-allocation "Chipkill™" technology Predictive Failure Analysis (PFA) Auto path reassignment – data paths, power
System Restore	**Fault Isolation and Diagnosis**
Recover the Server Deferred repair Concurrent repair LED service identification Service consoles Migration to guided maintenance	**Isolate the Failure** First Failure Data Capture Runtime self diagnostics Service processor Rifle-shot repairs (*no "plug and pray" parts replacement approach*)

Figure 17 – POWER4/5: RASM By Design From Chip Up

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e-Business Performance Leadership

Despite its business solution focus, the advanced hardware and software technologies used within the new generation iSeries allows the platform to deliver leadership performance ratings on e-Business workloads, as the top-class Apache Web serving performance results, shown in Figure 18 below, attest.

Benchmark Test/Server	iSeries Benchmark Performance	Comparisons
Apache Web Serving SPECwebSSL	**4,497 Simultaneous Connections SPECwebSSL result** IBM iSeries 890 16-way POWER 4, IBM HTTP Server (Apache)	**+2.2%** over HP 16-way PA8700 system running Zeus V4.1R3, **4,400** simultaneous connections result. +
Apache Web Serving SPECweb99 16-way	**12,900 Simultaneous connections SPECweb99** IBM iSeries 890 16-way POWER 4, IBM HTTP Server (Apache)	**-14%** under HP 16-way PA8700 system running Zeus V4.1R3, **15,000** simultaneous connections result.
Apache Web Serving SPECweb99 16-way	**21,000 Simultaneous connections SPECweb99** IBM iSeries 690 16-way POWER 4, Zeus 4.0. (Same hardware as i890)	**+14%** over HP 16-way PA8700 system running Zeus V4.1R3, **15,000** simultaneous connections result.
65% of production Web sites run Apache powered Web servers. IBM HTTP Server tested is full-function, industrial strength Web-server (powered by Apache). Zeus is a "benchmark speed demon" Web server, used in <2% of real-world sites.		

Figure 18 – iSeries Leading Web Serving Benchmarks

Form Factor Choice

All models in the new iSeries are supplied as standard in the floor-standing tower format, which is most commonly used for this class of business system. Many of the smaller-medium systems will be placed in normal office/warehouse/plant or branch environments. However, for those customers who use, or prefer, rack-based installations in their data centres, all models can be ordered for/with/in standard 19" rack-compatible formats.

iSeries/pSeries Hardware Convergence

As is now widely known, IBM has achieved considerable convergence in hardware between the pSeries (*RISC UNIX*) servers. For some years, both lines shared the same 64-bit POWER microprocessors. But now the convergence has now gone much further up to the system level, with the same POWER4 systems architecture, and essentially the same physical (*Regatta*) box being used for the iSeries i870 and i890 as or the equivalent pSeries p670 and p690. Both lines therefore obviously share the unique hardware advances, some of which we have mentioned previously. The performance-focused pSeries typically ships 6 months earlier than the corresponding iSeries with each major technology advance. This gap is partly because of their different market priorities, but also because of the much more extensive operating system kernel modifications (*SLIC*) and overall hardware/software testing that the iSeries, as a fully integrated hardware/software system, requires.

This commonality brings many advantages to both iSeries and pSeries customers in terms of advanced functionality, winning price/performance, and rapid pace of development. IBM also benefits by spreading core development costs over the combined marketplaces for the two server lines. The convergence is also progressing quickly in the systems middleware and packaging capabilities on both platforms, with such features as dynamic LPAR, and in the hypervisors. It is this hardware convergence that has also enabled IBM to move mid-high-end 2003 iSeries prices (*hardware and OS*) down to the market-competitive price levels of pSeries, when the cost of adding a comparable RDBMS on the UNIX system (*included on iSeries*) is factored in.

Our Analysis

Despite emphatically focused on providing an integrated, reliable, enduring software platform for SMML enterprises and their applications (*bought or built*) the new 2003 iSeries boast a genuinely leading-edge hardware architecture and specification. In the attributes of the platform reviewed earlier, we see the further unfolding of IBM's eServer strategy of providing leading technology server platforms, based on its unrivalled R&D and patents, at most competitive prices. So, from a hardware perspective, the unique, value-added capabilities of the iSeries, described in other sections of this Report, emphatically do not come at the price of any trade-off in hardware technology, rather the reverse. The hardware advances in the new 2003 iSeries keep the platform at the forefront of the industry in its hardware specification, aided by the increasingly strong commonality with pSeries. As we discuss in Section 14, the future roadmap for the iSeries hardware technology is also extremely strong, and current and potential new iSeries customers can feel entirely confident in the quality and technology of these platforms' hardware.

8. iSeries Virtualisation Capabilities Strong

Introduction – Why Virtualisation?

With the new iSeries, co-existence, consolidation and integration are the key messages. IBM has designed the new iSeries to host, consolidate and manage not only customers' established OS/400 workloads, but also other key workloads many users are already running within their businesses, or which they may need soon. These include their Windows/Intel workloads, new e-Business Java-based WebSphere applications, customers' emerging Linux workloads, and AIX/UNIX loads. It is the virtualisation and integration capabilities of the new iSeries, encompassing processor virtualisation and dynamic logical partitioning, comprehensive storage virtualisation, I/O virtualisation, and virtual networking, that enables the platform to deliver this "consolidation hub capability". In this Section, we look in more detail at these key virtualisation technologies, to provide a clear understanding of their capabilities and strengths. In Section 10, we examine how the multiple workloads mentioned above are supported, secured, managed and integrated more fully, and why this is so beneficial to users.

Advanced Virtualisation Key Enabler

The iSeries platform now provides one of the most advanced virtualisation capabilities of all main system resources to optimally and efficiently support multiple workloads (*as above*), on any platform. The key elements of this are:

- **Dynamic LPAR:** Further key extensions create amongst the most advanced dynamic logical partitioning capabilities available. See detailed description later.
- **Complete Storage Virtualisation:** The unique iSeries single-level-store architecture enables a fully virtualised, easily manageable, shared storage system, able to support the storage needs of all the workloads mentioned. This offers a high level of automation, common back-up/recovery, better protection, and less wasted space, etc. iSeries storage capacity is also highly expansible, through the server's capacity to support large numbers of DAS HS HDD on-board, or in HSL connected I/O Expansion Towers. See detailed description later.
- **I/O Virtualisation:** An I/O performance upgrade to PCI-X technology (*i825, i870 & i890*) almost trebles adapter bandwidth. I/O capacity is also highly extensible, again through complements of on-board slots, or in additional, HSL-linked I/O Expansion Towers. This iSeries I/O capacity can be assigned to OS/400 or Linux partitions directly, and/or a primary OS/400 partition can also provide virtual I/O capacity to a Linux partition.
- **High-Speed Inter-Partition and Inter-System Virtual Networking:** Virtual Ethernet links, running at 1GB/s, can provide inter-OS/400, OS/400-Windows, Windows-Windows, OS/400-Linux, and Linux-Linux links, without the switches, cabling, slower speeds, etc., of conventional inter-system connections, all "within the box" and "within the price". Up to 16 Virtual Ethernet links per system are supported, each easily established with a GUI tool. See detailed description later.

These capabilities, depicted in Figure 19, allow the iSeries to run/manage/control/secure mixed workloads and serve as the customers' "e-Business On Demand" hub, with high efficiency and resource sharing, superior manageability, and excellent security. The result is far lower operating costs, much better QoS, higher security, and lower staffing requirements, than with standalone "distributed islands". We look at each of these areas in more detail next.

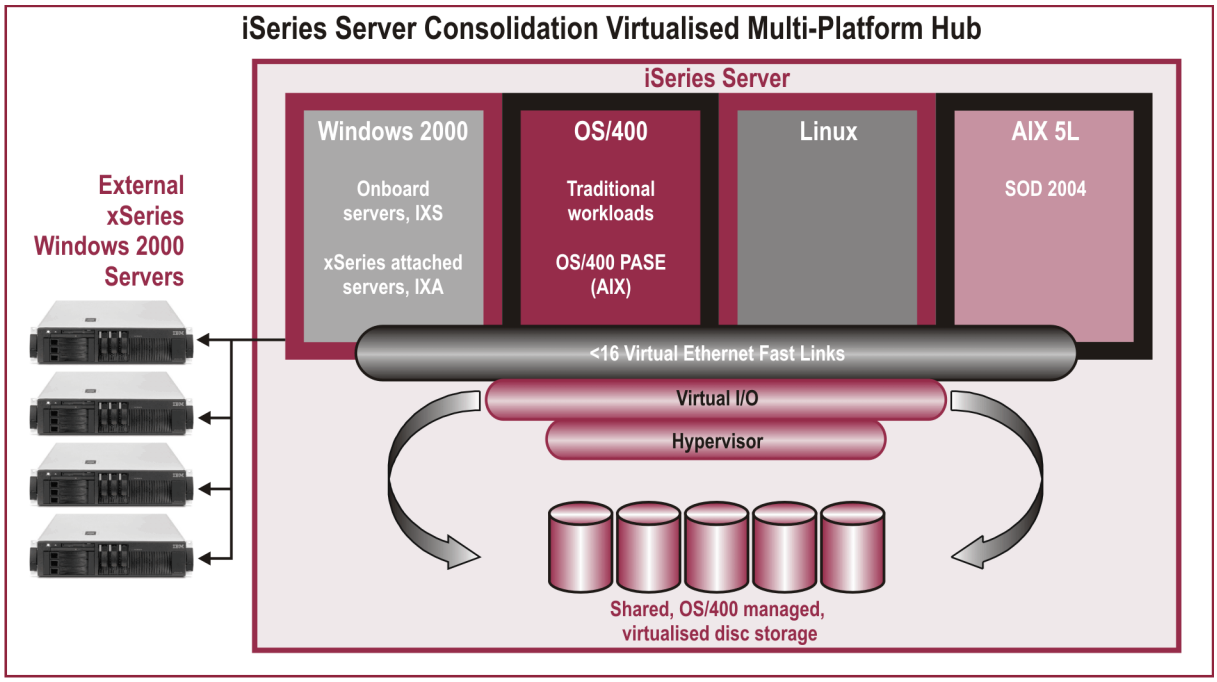

Figure 19 – iSeries Server Consolidation: A Virtualised Multi-Platform Hub

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Advanced Dynamic LPAR Partitioning Supports Workload Consolidation

The new iSeries extends its strong dynamic logical partitioning (*dLPAR*) under OS/400 V5R2, with increased capacities, new dynamic resource movement options, and easier partition management. Up to 32 partitions per iSeries (*POWER4*) system may be implemented. One must be a primary OS/400 partition, so up to 31 Linux partitions can be run on the POWER4 models. Up to 10 Linux partitions can now be run on a single POWER4 processor (*4 on the i800 & i810 S-Star powered systems*). The partitioning capacities of the new servers are summarised in Figure 20 below.

This dLPAR support now provides fine granularity of CPU allocation, down to 1/100 of a processor share, and for other resources such as memory (*1MB*), I/O (*1 IOA*), Virtual Ethernet network links, and storage resource assignment. It now allows these resources to be dynamically added to, or removed from, a partition without an IPL. A modern GUI component of the iSeries Navigator management interface allows these partition management operations to be performed "on-the-fly", easily and quickly. A pre-planned schedule can also be set up to move resources automatically for regular load peaks, strongly supporting the "On Demand" role.

Model	No Of CPU Base/Max.	Multiple OS Support	Max. No. dLPAR/ server OS/400	Max. No. dLPAR/ CPU	Max. No. Linux dLPAR/ server
i890*	24/32	Yes	32	10	31
i890*	16/24	Yes	32	10	31
i870*	8/16	Yes	32	10	31
i825*	3/6	Yes	32	10	31
i810*	1/2	Yes	8	4	7
i800+	1	Yes	4	4	3

* These apply to both Enterprise & Standard Editions of these servers
\+ These apply to the Advanced, Standard and Value Editions of the i800 servers

Figure 20 – Dynamic Partitioning Capacities: 2003 iSeries Servers

These key extensions give the new iSeries the most advanced dynamic partitioning capabilities available alongside the zSeries mainframe. This capability is thus a key enabler for new iSeries' strong multiple workloads consolidation ability. Over 3,000 iSeries sites are already running LPAR partitioning, 60% of them on small-mid-sized 1- to 4-way servers (*so not only large system users are benefiting*), and nearly 50% of the much larger i840 systems shipped use LPAR. We expect these numbers to rise sharply, as these new servers ship in volume, but LPAR has already shown fast customer uptake.

Either real dedicated, or shared virtual, storage resources and I/O resources may be allocated to OS/400 or Linux partitions.

These strong dLPAR capabilities are what make the new iSeries an ideal consolidation platform for its target SMML market customers, giving then a simple, rapid, effective way to run multiple virtual systems, supporting independent like or unlike workloads, on a single iSeries server. It provides, with the other virtualisation options discussed below, an efficient, low-waste, rapidly adaptable, way of managing multiple workloads and of implementing advanced high-availability solutions.

Complete Storage Virtualisation

The unique single-level store architecture of the iSeries, which stores both memory and disk storage objects alike in a huge, single, 64-bit address space (*See Appendix B*), has long provided the underpinnings of the sophisticated and automated storage and memory management on the platform. The integrated storage management of OS/400, for example, automatically stripes data across all the available drives, and automatically optimises and balances the use of all available disk arms for best read/write performance. It also uses an expert read/write caching technology, can automatically handle the addition and data distribution to new physical disks added to the system, uses dynamic on-the-fly compression to maximise the use of disk space, and automatically manages the use of the storage resources. These storage management operations, which must be manually planned, monitored and implemented on Windows Intel and UNIX systems, are completely automated on iSeries, to such an extent that iSeries sites do not need the dedicated storage management staffing these other systems invariably demand. The benefits also extend to the sophisticated back-up and recovery capabilities supported by the key standard BRMS software, which automates the full disk system back-up, recovery process and scheduling for an iSeries, to whatever tape media or systems are in use.

With the ultra-high bandwidth, intelligent I/O architecture of the iSeries, the combinations of these software and hardware capabilities combine to make the iSeries a powerful virtualised storage management system.

As we saw in our review of iSeries storage hardware in Section 7, the iSeries can support massive capacities of DAS storage (*up to 144TB on the largest system*) through the off-board extensibility of High-Speed-Link-connected Remote I/O Expansion Towers. iSeries systems use high-performance, reliable HDD, with strong RAID5 controller options, for total quality storage service.

With the ultra-high bandwidth, intelligent I/O architecture of the iSeries, the combinations of these software and hardware capabilities combine to make the iSeries a powerful virtualised storage management system.

These facilities are have long been invaluable to all iSeries users running standard OS/400 workloads, and are a major factor in the low operations staffing and TCO these system exhibit. However, they become even more valuable as customers now consolidate/run/manage multiple workloads on/from an iSeries.

- Where multiple OS/400 workloads are run in dynamic LPARs, storage virtualisation provides automated storage management for all the OS/400 partitions.
- Where ported AIX UNIX applications are run within an OS/400 LPAR under the PASE environment, storage for these applications can also be automatically managed and run by standard iSeries storage management facilities.
- When Linux partitions are run on an iSeries, either dedicated real HDD, or shared virtualised storage (*Virtual Storage Spaces*) may be assigned to a partition, managed automatically by the iSeries OS/400 facilities, providing integrated, high-performance, highly-reliable storage management for the Linux partition workloads as well. Linux partitions can also share and use iSeries DVD and tape facilities.
- When the iSeries is supporting Windows workloads, on either on-board Integrated xSeries Servers (IXS) or attached xSeries servers fitted with Integrated xSeries Adapters (IXA), OS/400 can provide complete storage management service for this entire Windows environment, with all the above capabilities. The Windows disks are managed from OS/400, can be dynamically defined and added to a Windows server without shutdown, with up to 2TB of disk per server supported. Essentially, these iSeries capabilities provide the equivalent of a fully virtualised SAN-like storage management capability for the customer's Windows environment, without any additional cost. All Windows storage management and backup-recovery can be easily managed by the iSeries operations team with little extra effort.

There are clearly major capacity utilisation, capital and operating cost, reliability and performance advantages for iSeries users from using these exceptional virtualised storage management and sharing capabilities across mixed workloads, in comparison to running other workloads (non-OS/400) on standalone servers, each with their own DAS storage.

We look more deeply at the multiple workload capability of the new iSeries in Section 10.

The new iSeries Navigator management interface provides an elegant and powerful set of GUI tools to create manage and monitor storage virtualisation on the iSeries. It provides self-guided configuration wizards, to simplify complex disk management tasks, and supports the set-up of RAID-5 and disk mirroring configurations.

There are clearly major capacity utilisation, capital and operating cost, reliability and performance advantages for iSeries users from using these exceptional virtualised storage management and sharing capabilities across mixed workloads, in comparison to running other workloads (*non-OS/400*) on standalone servers, each with their own DAS storage.

I/O Virtualisation

As discussed in Section 7, iSeries has strong I/O capabilities derived from its intelligent, high-bandwidth I/O architecture. The systems can also support substantial numbers (*up to 672 PCI-X adapters on the top i890 systems*), when the on-board slots are complemented with High-Speed-Link-connected I/O Expansion Towers, for high external I/O capacity. These physical I/O adapter resources can be assigned as needed to all the OS/400/Linux partitions and workloads, and can be moved dynamically if needs change. This virtualised approach to sharing I/O resources for maximum efficiency across workloads, and for the LAN/WAN external connections required, is valuable. Again, simple GUI wizard interfaces are used to set or change II/O resource allocations through the iSeries Navigator management interface.

High-Speed Inter-Partition and Inter-System Virtual Networking

The new iSeries OS/400 V5R2 also provides an invaluable, internal Virtual LAN and Virtual Link capability. Up to 16 high-speed TCP/IP connections can be set up; to create communication paths between the partitions on an iSeries, and to IXS or IXA connected Windows/Intel servers. The links emulate 1GB Ethernet adapters, and use the iSeries' high-performance memory bus. Links supported are OS/400-to-OS/400, Linux-to-OS/400, Linux-to-Linux, Windows-to-OS/400, Windows-to-Windows, and Windows-to-Linux. No additional hardware adapters, switches or cabling are needed, a major saving over the usual external systems interconnection approach. A typical example of the use of this powerful feature is shown in Figure 21.

In this example, four OS/400 partitions, and 2 Linux partitions are running on the iSeries. OS/400 LPARs #1 to #3, support the J.D. Edwards ERP system, the customer's own RPG OLTP applications, and a WebSphere-based e-Business workload respectively, and share a virtual LAN with 1 virtual link to each partition. The two Linux partitions run a cluster supporting a complex engineering application, and share a second virtual LAN with OS/400 partition #4, which is running a ported AIX UNIX engineering data management application, which uses results from the Linux design application.

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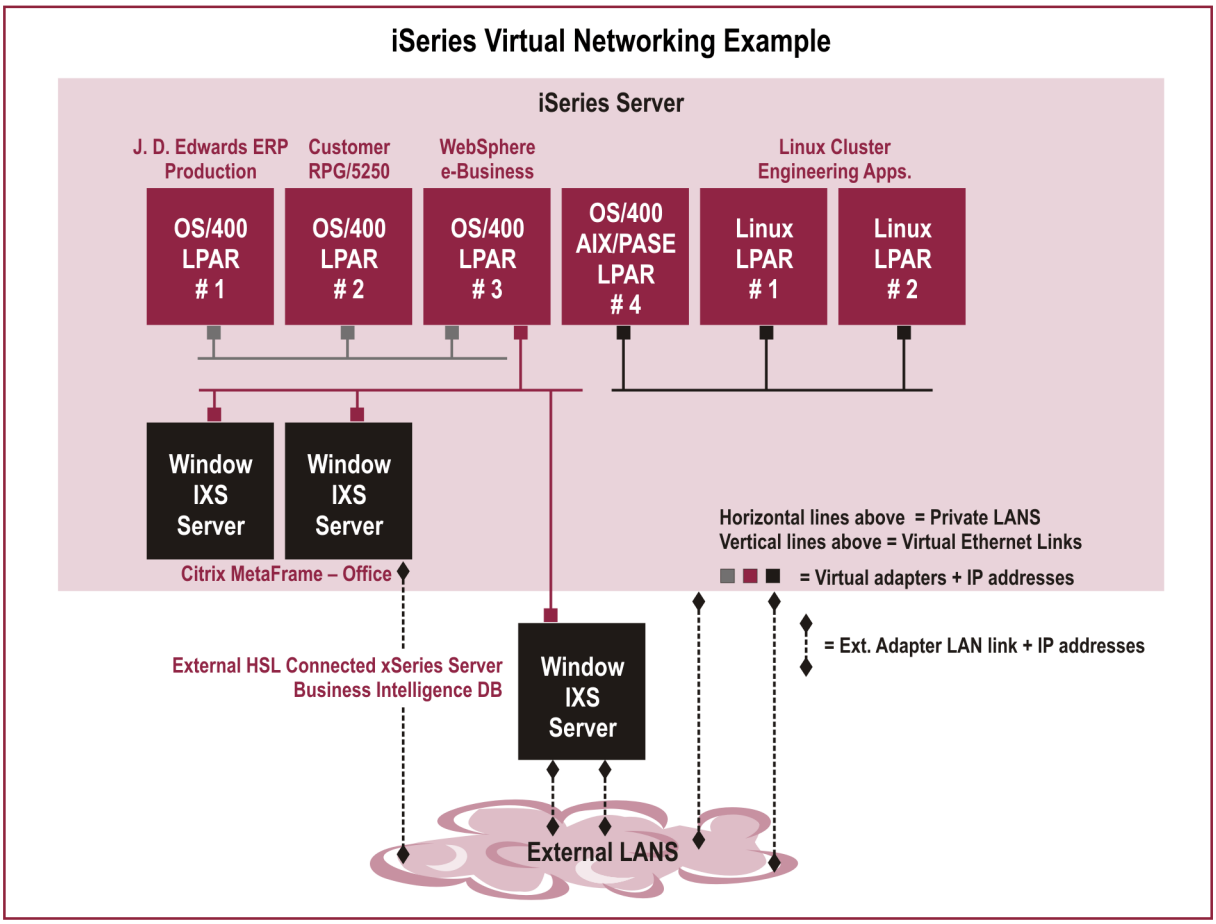

Figure 21 – iSeries Virtual Networking Example

Two on-board IXS Intel servers provide a thin-client Microsoft Office service to the company. These run on clustered Citrix MetaFrame server software, with a third virtual LAN connecting them together, to an external IXA Windows server running a business intelligence data warehouse, and to the OS/400 e-Business environment in OS/400 LPAR #3.

This elegant, fast, economical and dynamically configurable virtual networking has numerous, valuable uses for inter-partition and inter-system communications, clustering, database access and many other roles, all within the iSeries system, without extra switch hardware or software as an inclusive feature. The links can easily be dynamically defined or modified, and connected to partitions or Windows servers, through a simple GUI wizard in the iSeries Navigator management interface.

Hypervisor

The V5R2 system uses a powerful Hypervisor virtual machine management facility to manage the dynamic partitions, and takes advantage of the POWER micro-processor architecture's ability to run not only OS/400, but also Linux applications in the Linux partitions it manages. The hypervisor ensure workloads in one partition cannot interfere with, or affect, the workloads running in any other. A S.O.D for 2004 will further extend Hypervisor capability, to enable the full AIX5L operating system and ASIX5L applications to run in an iSeries partition and, at that time, the Hypervisors for the pSeries and the iSeries will essentially converge.

Our Analysis

These powerful and advanced iSeries virtualisation capabilities are the key technology underpinnings for the key new role, as the central server consolidation and mixed workload hub, that IBM proposes the platform should play for its SMML business customers.

These powerful and advanced iSeries virtualisation capabilities are the key technology underpinnings for the key new role, as the central server consolidation and mixed workload hub, that IBM proposes the platform should play for its SMML business customers. We examine the mixed workload capabilities that these technologies support more fully in Section 10. These virtualisation capabilities, provided as standard and inclusive with every new iSeries server, are exceptionally strong and undoubtedly bring a wide range of integration, consolidation, manageability, QoS, and cost saving benefits to customers, of considerable magnitude. These advanced facilities are also simple to set up, use and manage thanks to the modern GUI tools the iSeries Navigator manager provides for defining, or dynamically modifying, the resource allocations on a system.

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9. iSeries – Capacity On Demand for the "On Demand" World

Introduction

In today's tough business climate, IT customers are seeking new ways of buying and operating their core systems. Users need to cut initial costs to the minimum, and want to match system resources/costs more closely to real current workloads over their life. They no longer want to purchase heavily over-configured systems up-front, with large amounts of resource headroom built into the initial buy, just to accommodate future growth, give the platform a long-service life, and thus low depreciation. Nor do they want to face the costs and upheaval of the "rip and replace" approach so often used with most of today's industry-standard Intel servers. These often have limited extensibility, and so are often outgrown quickly. If not, they are run at wastefully low capacity utilisation levels (*many surveys have shown it is common for distributed Intel servers to run at only 10-20% average utilisation*), as the only way to avoid short service lives, and the consequent high depreciation costs, of early obsolescence. The disruption, effort and cost of making such frequent changes are no longer acceptable.

These challenges were hard enough in the older, more stable and predictable workload growth environments of the past, but this pattern no longer matches the real business world of today. Some workloads may grow quickly, as new e-Business initiatives take flight: Other workloads may have sharp calendar or campaign peaks for short periods, and some older workloads may fall as processes change and are modernised. Today, in many businesses, these workload changes are unpredictable, and no longer merely follow the stable growth lines of standard capacity planning. What customers need today, from their business systems for this On Demand world, is:

- Highly scalable systems, all of whose resources can be incrementally increased over a wide range of capacities, to give long service lives, without requiring server replacement.
- Increments in system capacity that ideally need only be paid for when actually needed and used.
- Increases in system resource capacities should be capable of rapid implementation on-site, preferably by customer staff, and without interrupting system operation.
- Customers urgently want to eliminate the huge waste of processor, storage, and I/O capacity that is intrinsic when each workload runs on separate, dedicated, small servers, the common "Wintel model", to cut their infrastructure costs sharply.

The new iSeries is specifically designed to meet these "On Demand Challenges, with some innovative new capabilities, and with some intrinsic strengths put to use in this new environment, in order to give customers what they have been asking for above.

Permanent, & Industry-First Temporary, CUoD Processor Upgrades

IBM has extended iSeries processor CUoD capabilities on the new POWER4 models. This includes the Permanent processor CUoD capability (*first introduced in October 2002, with over 1700 standby processors shipped in first two months*), which is normally used to accommodate planned growth in workloads. What is new in 2003 is the addition of an industry-first Temporary CUoD On/Off capability, whereby processors may be dynamically activated on-demand, but deactivated after the requirement has passed, prices from $1,100 per day per processor. Key details are shown in Figure 22 below.

Model Line	CPW Range	CUoD Types	Base CPUs	CUoD CPUs	Max. CPUs	1 CPU Perm. CUoD H/W $US	1 CPU/day Temp. CUoD H/W $US	1 CPU Perm. CUoD With OS $US
i890	29,300 to 37,300	Perm. & Temp.	24	8	32	$30,000	$1,300	$60,000
i890	20,000 to 29,300	Perm. & Temp.	16	8	24	$30,000	$1,300	$60,000
i870	11,200 to 20,000	Perm. & Temp.	8	8	16	$25,000	$1,200	$55,000
i825	3,500 to 6,600	Perm. & Temp.	3	6	6	$20,000	$1,100	$50,000

Figure 22 – iSeries Capacity Upgrade on Demand: Permanent and Temporary On/Off Details

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Each of these systems is shipped with a base number of processors activated for client use, and an additional number of installed standby processors, which may be activated by the client for either Permanent or Temporary processor-power CUoD. 8 standby-processors are installed in each i870 and i890 model, and 3 in each i825 system. Permanent processor activation costs from $20,000 to $30,000/CPU for the hardware upgrade, and from $50,000 to $60,000 for hardware and the OS/400 software license, both depending on model. The schematic view of CUoD iSeries servers is shown in Figure 23 below.

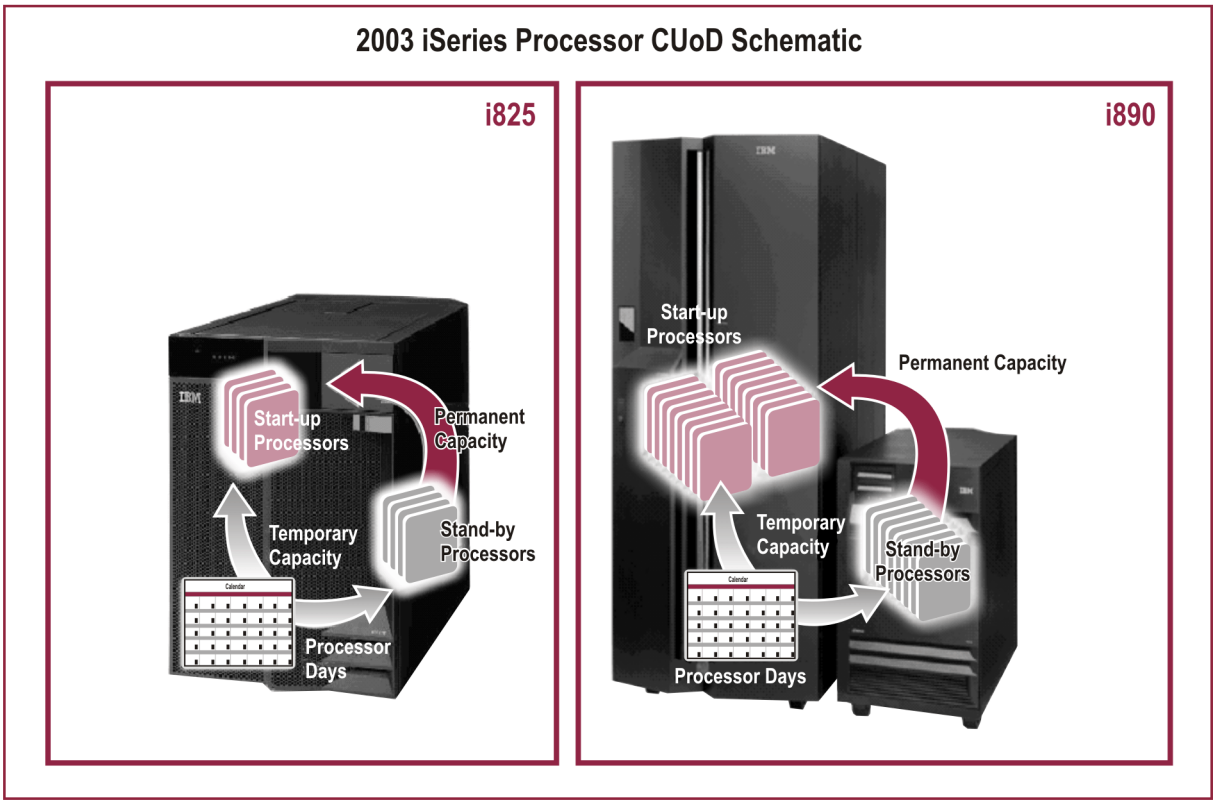

Figure 23 – iSeries CUoD Schematic

The Temporary CUoD facility costs from $1,100 to $1,300 per processor-day, which looks good value for many practical peak-load situations. Special promotional campaigns, end-of-month or end-of year peaks, Christmas or other special holiday peaks, etc., can all easily be accommodated using this invaluable, new iSeries option.

The financial break-even point between Permanent and Temporary CUoD is approximately 45 processor days, and the charge includes temporary OS/400 use on the enabled processor(s). 14 bonus processor days are credited when a new server is first enabled for TCUoD, and may be used by the customer before TCUoD charges apply. Under warranty, installed but un-activated CUoD processors may also be used to replace a failed customer processor, with just an IPL, a further benefit to ensure full purchased capacity is always delivered. IBM has also indicated that it may, in future, offer promotions, typically to encourage the take-up of new software applications, which will offer additional bonus processor-days.

With the new, single software tier-per-model in 2003 iSeries, activating Permanent or Temporary CUoD processors does not affect the system's software tier (*and hence the price of tier-priced IBM software*). Many ISV's also follow this model. IBM and ISV software charged on a per-processor basis will usually incur software upgrade charges for Permanent CUoD, but the position is not yet so clear for TCUoD. Hardware maintenance charges, which are based on the number of processors activated, increases with Permanent CUoD activation, but Temporary CUoD activation does not increase maintenance costs.

Vendors offering CUoD for processors are investing heavily, by shipping servers with costly unsold processor capacity, and hoping that customers will eventually activate all or most of the standby processors. The vendor is essentially funding these on-site standby-processor inventories. Before CUoD, customers would often pre-purchase processor headroom in order to be able to respond quickly to growth, so this is quite a drastic change in server economics for both vendor and customer. So far on iSeries, IBM reports that around 20% of the standby CUoD processors shipped to date have since been customer activated, in the relatively few months since it became available.

Storage Capacity Scaling On Demand

iSeries storage capacity is scalable over a wide range of capacities for each model, as we discussed in Section 7 on hardware. With this extensibility, both through on-board server disk slots, and via support for multiple HSL-connected I/O Expansion Towers, and with standardised HS HDD, simple user strategies for scaling iSeries storage capacity "On Demand" can easily be implemented.

These standardised HDD can almost now be regarded as stock items to be held for consumption, rather than as capital assets. The customer would hold a small, on-site inventory of relatively low-cost HS HDD units, and perhaps an Expansion Tower if near current slot limits. When needed, additional HDDs can be hot-plugged into the server or connected Tower slots by user staff, to immediately increase system disk capacity on-line. The planned addition of an I/O Expansion Tower could be implemented off-peak. Because OS/400 storage management immediately and automatically makes use of, and deploys, any additional physical storage capacity added to the system, the new drives are immediately put to full use, and are loaded, without any customer effort. By arranging a simple inventory replenishment order to the IBM channel, perhaps via an e-mail order, local HDD inventory can be quickly restocked in a matter of a day or two.

For large-scale iSeries customers using the IBM Enterprise Storage System, code named "Shark", a storage CUoD offering is already available, which provides pre-installed, standby storage capacity via ESS attached storage towers, which can be activated quickly on customer request, in a similar manner to processor Permanent CUoD.

I/O Capacity Scaling On Demand

The iSeries I/O capacity is equally as extensible as storage on the new iSeries, through the same on-board and off-board expansion slot and Tower options. With standardised PCI/PCI-X adapter cards used throughout the family, and hot-swap customer install supported, it is again straightforward for customers to hold a local inventory of adapter cards and Expansion Tower capacity on site. The locally held parts can quickly be added to the iSeries system when needed, into an on-line system in some cases, to support urgently needed additional network connections, cluster configuration ports, and similar I/O slot-consuming new requirements. Each iSeries server has ample internal I/O bandwidth to fully drive its maximum supported slot capacity, without loss of I/O throughput.

Memory CUoD – Not Yet, IBM Evaluating

With iSeries processor, storage and I/O resources already, in one form or another, available in On Demand forms, the obvious question is what about the other key server resource of memory? Expanding workloads and partitions need and consume additional memory, and it would be attractive if CUoD for memory were also offered. The challenges for vendors with this are both technical and economic. Although customer add, hot-swap memory has been implemented by IBM on other platforms, it is not really appropriate for mission-critical business servers, so a solution more akin to standby processor pre-installed CUoD memory is really required. The issue is more one of economics: large amounts of server memory are relatively costly, and its technology also advances quite briskly. To pre-install significant capacities of unsold memory would add a significant funding cost for the vendor, which would have to be recouped in higher charges for CUoD activated memory. However, at the iSeries Announcement, IBM stated that it is evaluating the issue, recognition that it would be appealing in general to customers, but well short of a 'Statement of Direction' commitment.

CUoD Software Pricing Challenges Resolved

IBM has made positive changes to new iSeries software pricing that were essential to enable "On Demand" system upgrades. We discuss these in detail elsewhere, but, briefly, the change to a single software tier per system, rather than a complex table related to CPW power, means that upgrading processors with CUoD does not affect the cost of layered licensed software charged by IBM software tiers. Permanent processor CUoD activation does require additional OS/400 processor licenses, as do other layered, CPU-priced software products in use, which is reasonable for these planned and scheduled upgrades. By allowing Temporary CUoD without additional OS/400 license costs, IBM is encouraging its usage.

Partitioning & Dynamic Resource Movement Key

The most powerful and flexible capability the new iSeries offers to match processing capability to changing workload demands is, however, the sophisticated dynamic logical partitioning capability of the systems, with strong, highly-granular, dynamic resource movements. A customer running multiple workloads on a partitioned iSeries can easily increase or reduce partition resources without restart, under operator control or by automated schedule, to make the fullest use of installed resources, and to deploy them where needed. By sharing resources across N workloads with just one shared set of headroom, normal peaks/troughs and workloads growth/decline patterns will tend to balance out, and allow normal underlying capacity planning, with far less wastage than on standalone dedicated servers per workload.

iSeries Utility Computing – Another "On Demand" Option

Though standardised, integrated hardware and software, scalability, the efficiency of its partitioning, high reliability and ease of management, the new iSeries platform also provides a first-class computing utility service engine. All these attributes mean it is now straight-forward and cost-effective for computing utility providers to operate iSeries-based services, ranging from small shared server/partition usage, to centrally operating multiple, dedicated iSeries systems for larger customers. The systems can be co-located in the utility provider's data centre, sharing infrastructure and specialist staffing across multiple customers. With the rapid increase in network bandwidths, the fall in network costs, and the universal adoption of Internet networking, the iSeries utility computing model has become not only feasible, but also attractive. For those customers not wishing to invest the capital, and bear the staffing demands, of dedicated in-house computing, utility service is the answer. Paying for use, typically on a monthly basis, provides another good method of relating IT cost directly to actual business usage.

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IBM Global Services, for example, offers a Virtual iSeries utility computing service, operated for it under contract by an experienced specialist firm. The iSeries PartnerWorld community also includes numerous other iSeries utility or applications service providers.

We expect to see growing interest in, and usage of, the utility computing model with iSeries, whose well-characterised workloads and operating advantages lend themselves particularly well to this On Demand computing service provision model. Customers, we expect, will also increasingly mix and match, complementing their in-house iSeries base systems, with utility service provision for fast-growing new workload, or for remote regions lacking local skills, and many other special cases.

iSeries & Grid Computing

Grid Computing is perhaps the newest, and most exciting, change in computing service provision models, and is rapidly emerging from research laboratories and universities out into the business world. Grid Computing proposes and enables the interconnection of multiple, separate computer systems into a federated, common computing resource, able to accomplish demanding tasks no single member system could achieve. Grids often making use of the considerable spare capacity found on most systems, especially when multiple time zones are involved. Open industry standards are naturally the key to enabling Grid Computing, and have developed quickly in the last several years, with IBM a key contributor/champion. Versions of the vital Globus Toolkit 2.0 (*Open standards Grid Computing tool/API/enabling software developers kit*) are available for the iSeries, where they can currently run in PASE under OS/400, or in an iSeries Linux partition, to interconnect applications in these iSeries environment into a Grid. In 2004, when AIX5L is scheduled to run in an iSeries partition, this Grid capability will move more centre stage. Sharing Grid resources within a company, across an industry or other business community, will come to be an important form of "On Demand" computing in the years ahead, and iSeries is already well-positioned to participate fully.

Our Analysis

With the new 2003 iSeries, IBM has taken substantial further steps to offering customers an On Demand computing environment, in which they can step up computing resources readily when needed, and pay for capacity nearer to the time it is used, rather than via pre-bought headroom. The showpiece capability is the appealing and well-thought-out processor Temporary CUoD, the first comprehensive On/Off CUoD solution in the industry, but most other systems resources can also be scaled quickly and easily through customer hot-add capabilities. The strong dynamic logical partitioning brings maximum efficiency in best using installed power across multiple workloads, and in responding dynamically in near-real time to peaks/spikes or sudden changes, within total installed capacity. Overall, this brings welcome flexibility and significant cost savings to new iSeries users.

10. The "Consolidation Hub" Role for iSeries

Introduction

As we reviewed in Section 3, most iSeries customer businesses have also installed numbers of Windows/Intel servers and some RISC UNIX systems over recent years, under the influence of the industry hype behind these platforms. Their iSeries almost invariably provides their core business transactional processing and business applications delivery, for which the platform is renowned. At the same time, these customers have begun their transitions towards e-Business, many already having implemented Web sites, and early or more advanced e-transaction services, some on iSeries, some on other platforms. Emerging slowly into the mid-business markets, still at an early stage, is also the open source Linux platform, with its low software costs attraction.

IT Consolidation Business Drivers

In many geographies and industry sectors worldwide, the 2003 business outlook is much harsher than in the peak boom years. Customers are universally looking hard at how they can deliver new generation e-Business and business applications that better support their new business priorities today. Their now-often diverse IT infrastructures had accumulated over the previous decade, but have now increasingly come under the microscope, as their high costs and support staff-intensive characteristics were revealed. All sizes of businesses, under this harsher climate, are actively seeking ways to adapt their IT infrastructures to achieve:

- Reduced costs and dramatically improve TCO.
- Improved service levels, simplified systems management and better resources utilisation.
- A foundation for future growth around new applications.
- Data sharing, and improved interoperability.
- Increased business continuity and recoverability.

The solution many are turning to as their top IT priority is the consolidation and integration of their infrastructure onto fewer servers and platforms, that can more efficiently support the changing workload mixes of today, and deliver a "better, faster, cheaper" service to their businesses.

These consolidation demands and needs are strong in the SMML business market sectors, where iSeries servers have long held a central role, and in similar firms using other solutions.

New iSeries – Ideal Multiple Workloads Consolidation Platform

For this major requirement and pressing business-driven need, IBM has skilfully engineered into, and refined the already highly-integrated and interoperable iSeries platform, to equip it better than any other class of system to directly support this workloads consolidation and management role. The giant now proposes that customers use the new iSeries as their "consolidation hub". The idea is to bring the platform's strong performance, tight hardware and software-integration, low staffing needs and excellent availability characteristics, all substantially enhanced, to bear on the wider portfolio of key workloads of today and tomorrow found in the medium business sector. This consolidation role is depicted schematically in Figure 24, and we discuss the key workloads proposed and supported next.

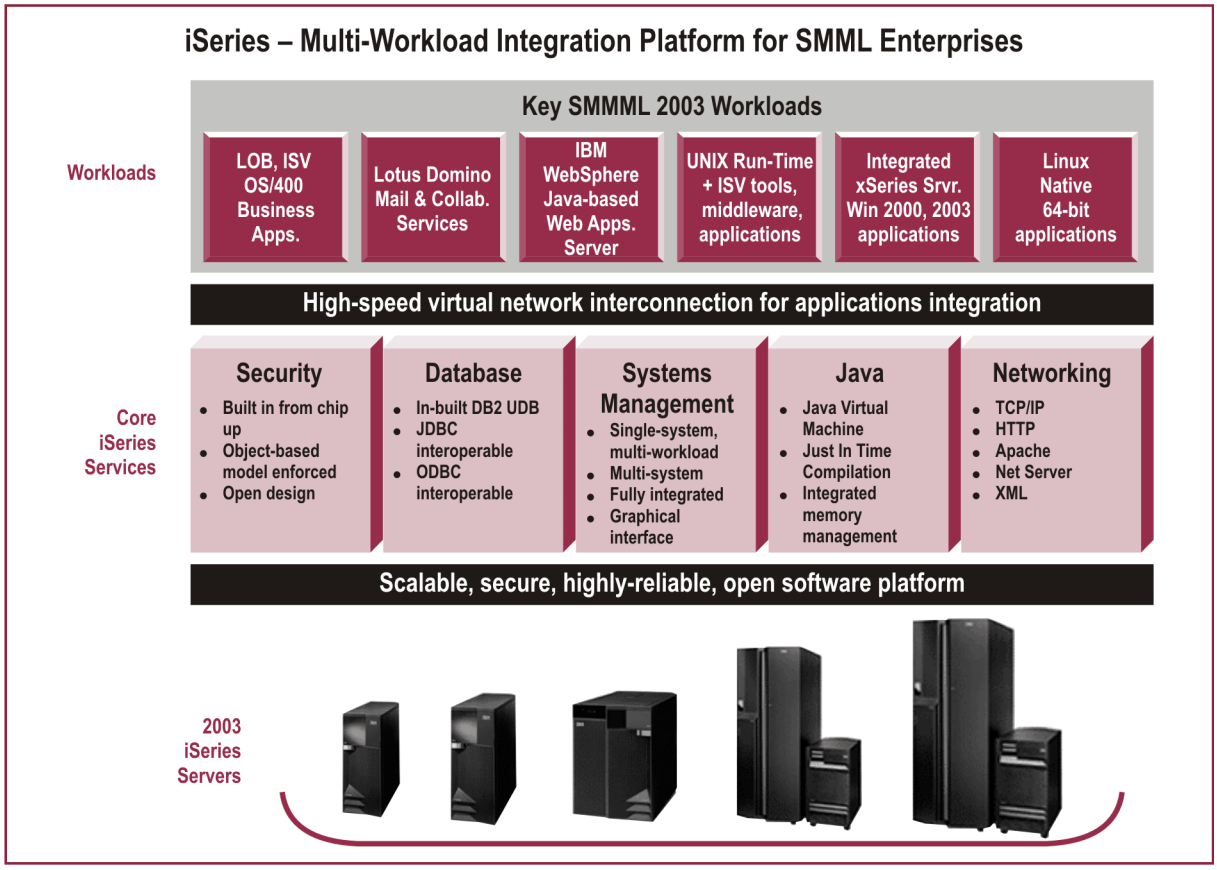

Figure 24 – iSeries: Multi-Workload Consolidation Platform for SMML Enterprise

The concept is very clear. Use efficient, reliable iSeries hardware, and the same scalable, secure, reliable, open OS/400 core software platform services shown in the centre layer of the chart, to concurrently support all the workloads (*shown in the top layer of the chart*), all on, or managed and supported from, a single server.

What Workloads Can Be Consolidated?

- **Traditional OS/400 Customer Workloads**

  Many iSeries/OS/400 customers have long developed and built their own business applications and databases on OS/400 systems, using RPG or COBOL. The accumulated customer inventory of these OLTP and batch systems, represents billions of dollars of development effort, and encapsulates much key customer business logic. Customers wish to continue to run, support and maintain these systems, but, at the same time, often want to connect the databases and core logic into new-generation applications. Many also wish to modernise their older 5250 "green screen" applications with modern Web browser user interfaces. Where customers are running multiple OS/400 systems, it is now easily possible to consolidate multiple system workloads onto a single, larger, partitioned iSeries system. Test/development/production images in the past often ran on separate servers, and are one prime candidate. Another is to centrally host multiple system images, in partitions on a larger iSeries, previously supported on separate regional or national server instances. There are large savings and benefits from such OS/400 workload consolidations.

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- **ISV OS/400 Applications**

  A high proportion of OS/400 systems were also bought to run ISV packaged business applications, such as those from J.D. Edwards and other integrated ERP, financial or distribution packages, and these provide long-term reliable service to their business users. Most of these packages are implemented in the traditional development technologies of OS/400, including the use of its in-built DB2 database. In earlier years, medium and larger AS/400 customers would often deploy multiple separate AS/400 servers to run such applications locally, each supporting a factory, warehouse, store, office or branch, and its needs. When communications were slow and costly, this made sense. With network bandwidth constraints now released, consolidating these OS/400 application images onto fewer, more central, larger, and more powerful systems, using partitioning, sharing storage, and staffing, etc., also brings large savings.

- **Lotus Domino Mail and Collaboration Services**

  Businesses of all sizes have come to depend on e-mail as a vital communications medium. Many have also already experienced the benefits which electronic collaboration technologies deliver, in bringing key employees groups, customer and partner staffs together electronically. Lotus Domino has been hugely successful amongst iSeries customers in fulfilling these roles, since it was made available on the system, and iSeries is now the second largest Domino platform after Windows NT. Other e-mail systems, such as MS Exchange, were also traditionally implemented on dedicated standalone servers, but with Domino on the new iSeries, there is no need for separate servers. Domino workloads can be easily and safely run in an iSeries partition (*or partitions*) alongside other mixed workloads, sharing the strong infrastructure, storage and management facilities of this single system. Where close integration is needed between mail/collaboration and traditional applications or database, or new Web and e-Business applications, this can easily be accomplished with the strong software integration facilities offered, supported "within the box" using high-speed internal virtual Ethernet links. In other cases, larger users can now easily consolidate multiple Lotus Domino images from separate physical servers into partitions on larger dedicated or shared workload iSeries systems, with similar major benefits.

- **New WebSphere e-Business and Web Workloads**

  Many iSeries customers moving up the e-Business curve are building new-generation Web and Java applications for the platform, which is efficient and tightly integrated for these key new workloads. We discussed this newer software environment, and the key iSeries products supporting it, extensively in Section 6. By running these applications isolated in their own OS/400 partition(s), other traditional production applications can run alongside in other partitions on a single system, without any interference. At the same time, close integration between the two, for example to harness and reuse existing business databases (*or wrapped existing business logic*) in the new Web applications, can easily be accomplished through the software integration and APIs provided, with the fast virtual Ethernet inter-partition network communications that the iSeries makes available.

- **New Linux 64-Bit Applications and Workloads**

  New with 2003 iSeries, 64-bit Linux now runs in a partition on the platform, with three leading distributions all using the 64-bit Linux iSeries kernel that IBM developed. With up to 10 Linux partitions per processor and 31 total (*on POWER4 models*), this capability enables popular Linux workloads, such as Web serving (*Apache*), firewall, mail, and other applications, etc., to be securely and efficiently run on an iSeries. The Linux partitions can share iSeries processor, memory, real or virtual storage, and real or virtual I/O resources, and benefit from the well-integrated iSeries management, security and other services. Whilst the spread of standalone Linux servers within the iSeries user base today is far lower than that of Windows/Intel, it is growing, as more users discover the appeals of the low software costs and high reliability of Linux itself. This new capability to consolidate Linux workloads on this much stronger business platform is appealing. The virtualisation facilities detailed in Section 8 are fully used in this case.

- **Consolidating and Managing Windows/Intel Workloads**

  Windows/Intel servers are ubiquitous, and most iSeries customer sites have 5-20 standalone NT or Windows 2000 servers installed, according to survey data. Used for file and print, small or medium ISV and customer applications, small databases, Web serving, e-mail and other popular roles, these servers are not reliable, are usually heavily under-utilised, and are costly to support and maintain. The new iSeries further strengthens its capability to integrate (*on board IXS or IXA attached xSeries Intel servers*) with the iSeries platform, sharing storage, and virtual networking links. All these standard Windows workloads can be run under the efficient, secure and manageable iSeries facilitates, to a much higher quality of service, with more efficient resource use, and considerably less support staff costs. This brings a compelling server/storage consolidation opportunity to at least the 90%+ of iSeries sites currently using standalone Wintel servers. We look more deeply at this powerful capability later.

- **Running Ported AIX UNIX Applications (*In OS/400 PASE 2003*)**

  Many valuable ISV applications have been written for the IBM AIX UNIX platform, and these are often of interest to iSeries users, who may not wish to add another hardware platforms to their infrastructure. PASE provides an AIX run-time environment under which relatively easily ported AIX 4.4 64-bit UNIX applications can run in an OS/400 partition on an iSeries, without the complete rewriting needed with a native iSeries port. In other cases, customer-written AIX applications could similarly easily be moved onto this environment, for better integration with other iSeries applications, or to cut the customer's platform count. This facility has been popular, with 50% of software ports onto iSeries made by ISV's at IBM Rochester in 2001 using the PASE approach. We look more deeply at this useful capability later.

- **Running Native AIX5L Applications in an iSeries LPAR, 2004**

  In an important Statement of Direction, IBM has also announced that the iSeries will support the AIX5L operating system and all its applications or packages, running in an iSeries partition, in 2004. At this point, iSeries customers will have full and direct access to the full inventory of AIX5L applications on their iSeries systems, without needed pSeries server hardware, or the porting effort needed to employ the PASE, a further important consolidation opportunity.

Advanced Virtualisation Supports Consolidation Hub Role

The core capabilities and technologies which enable the new iSeries to consolidate, integrate, manage, and share all its resources across mixtures of all the above workloads is the advanced virtualisation capabilities of the iSeries, which we discussed in detail in Section 8.

On Demand Scalability of iSeries Capacity Underpins Workload Consolidation

By sharing multiple workloads, with their different growth paths, peaks and troughs of demand on a single server, far higher capacity utilisation levels can be achieved than when each load is run on separate systems. Also, dynamic resource movement allows installed resource to be reallocated to the growing or peaking workload on-the-fly, to respond at once to demand changes.

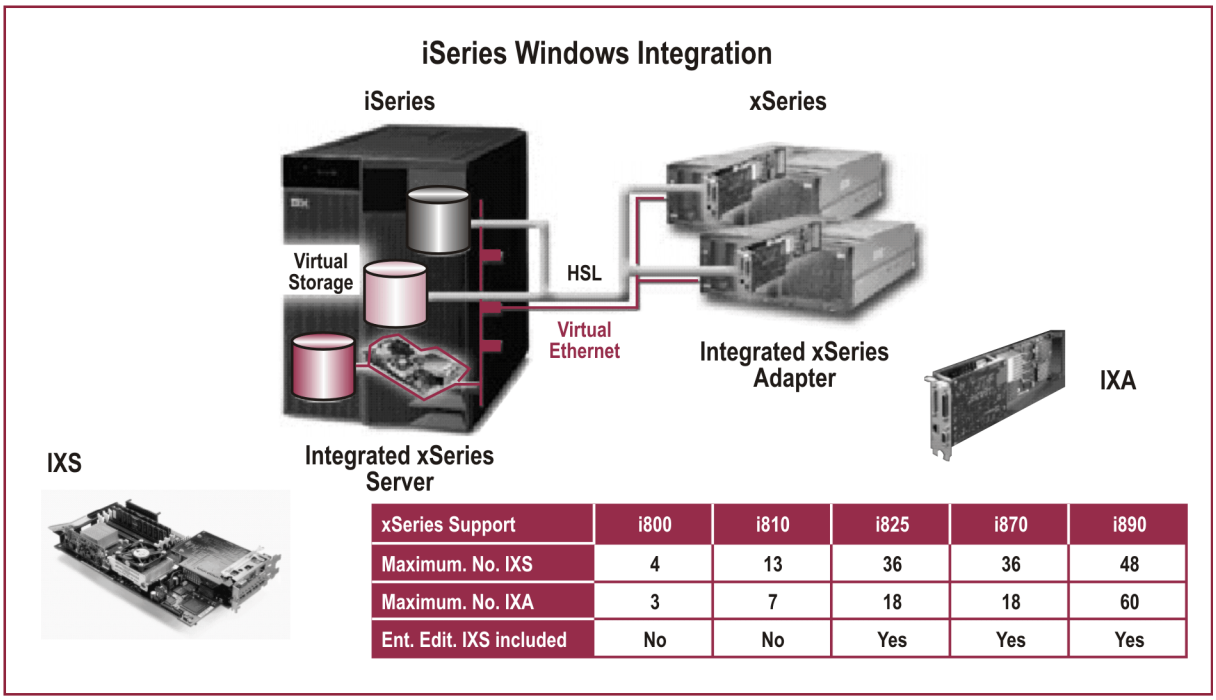
With increased consolidation of multiple workloads onto fewer iSeries servers, being able to incrementally increase overall system resources for the combined aggregate workload when actually needed, and not having to pay for that capacity ahead of time becomes even more important. As we discussed fully in Section 9, the new iSeries scores well in this regard with its advanced processor CUoD, and scalable storage and I/O capacity options.

Outstanding Windows/Intel Integration

Recent IBM surveys showed 90%+ iSeries customers were also running multiple Windows/Intel servers. 57% were using 1-5, 14% using 6-10, 10% using 11-20, and 19% using more than 21 such servers. The new iSeries extends its capability to manage, integrate with, provide shared storage, and virtual 1GB/s Ethernet network links for Windows/Intel workloads, under iSeries advanced manageability, reliability and security.

The new iSeries can house 4 (*i800*) to 48 (*i890*) on-board **Integrated xSeries Servers** (IXS) within the iSeries box, these being new 1.6GHz. Intel Xeon powered, <4GB memory servers with 10/100 Ethernet Adapters.

The other option, the **Integrated xSeries Adapter** (IXA), plugs into the latest IBM xSeries servers (*x235, x255, x360 and x440*), with 1GB/s High-Speed-Link connection to the iSeries host. From 3 (*i800*) to 60 (*i890*) external, IXA-connected xSeries Windows servers can be linked to an iSeries server.



xSeries Support	i800	i810	i825	i870	i890
Maximum. No. IXS	4	13	36	36	48
Maximum. No. IXA	3	7	18	18	60
Ent. Edit. IXS included	No	No	Yes	Yes	Yes

Figure 25 – 2003 iSeries Windows Integration

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Both options can run Microsoft Windows 2000 Server, Advanced Server, and the new, 2003 Server equivalents (*new name for .NET, when available*). The architecture and capacities of this invaluable Windows integration and consolidation capability are shown more fully in Figure 25. With the IXA and IXS servers essentially connected to the iSeries system bus directly, or via High-Speed-Links, this is a close, high-performance integration.

OS/400 can provide complete storage management service for these Windows/Intel environments, with all the capabilities discussed previously. The Windows storage is managed by OS/400; up to 32 virtual storage spaces can be dynamically defined and added to a Windows server without shutdown, each of up to 64GB in size, allowing up to 2TB of disk per server supported. Essentially, these iSeries storage capabilities provide the equivalent of a fully-virtualised SAN-like storage management capability for the customer's complete Windows environment, without any additional cost. All Windows storage management and back-up recovery can be easily managed by the iSeries operations team with little extra effort.

Virtual Ethernet 1GB/s links can also be defined between Windows servers, OS/400 or Linux partitions, as discussed in Section 10, for database access, clustering and other inter-system communication needs.

As Figure 25 shows, with the capacity to support up to 48 IXS servers, or up to 60 IXA external servers (*depending on model*), an appropriate new iSeries configuration can easily integrate all the Windows servers in most any customer site.

Customers running Windows via iSeries in these ways can gain substantial consolidation operating cost savings and bring dramatically improved QoS to their Windows applications. Specifically, they gain from reduced operations and staffing costs, simplified user administration (*all done on iSeries*), centralised management of multiple servers, storage consolidation and automation, and a higher availability Windows service.

Running UNIX Applications Under PASE on OS/400

Driven primarily by the need to make it easier for ISV's to port existing AIX applications to iSeries, IBM started to add AIX UNIX APIs to OS/400 as early as 1994. This process continued until over 1,000 UNIX APIs were supported. The "Private Address Space Environment", first introduced with V4R3, has now matured into an integrated OS/400 run-time environment for porting and running selected AIX UNIX applications on iSeries. The general architecture of the solution is shown in Figure 26. PASE is integrated with the OS/400 file system and management and runs in an OS/400 partition. The environment exploits the PowerPC processor's ability to switch runtime modes between 64-bit OS/400 (*Amazon 64-bit mode*), and PowerPC 64/32-bit mode, and supports ported AIX 4.3 supported 64-bit applications. PASE exploits the iSeries teraspace feature, whereby private process-local storage spaces of up to 1TB can be defined and supported. Each UNIX address space is a teraspace. PASE has proved a popular and useful way to bring ISV and customer AIX applications onto the iSeries relatively easily, and for them to run with excellent performance, essentially the same as on their native RS/6000 or pSeries original hosts. Recent PASE V5R2 enhancements include support for the Globus Toolkit 2.0 (*which supports Grid Computing*) and improved C/C++ compiler support, etc.

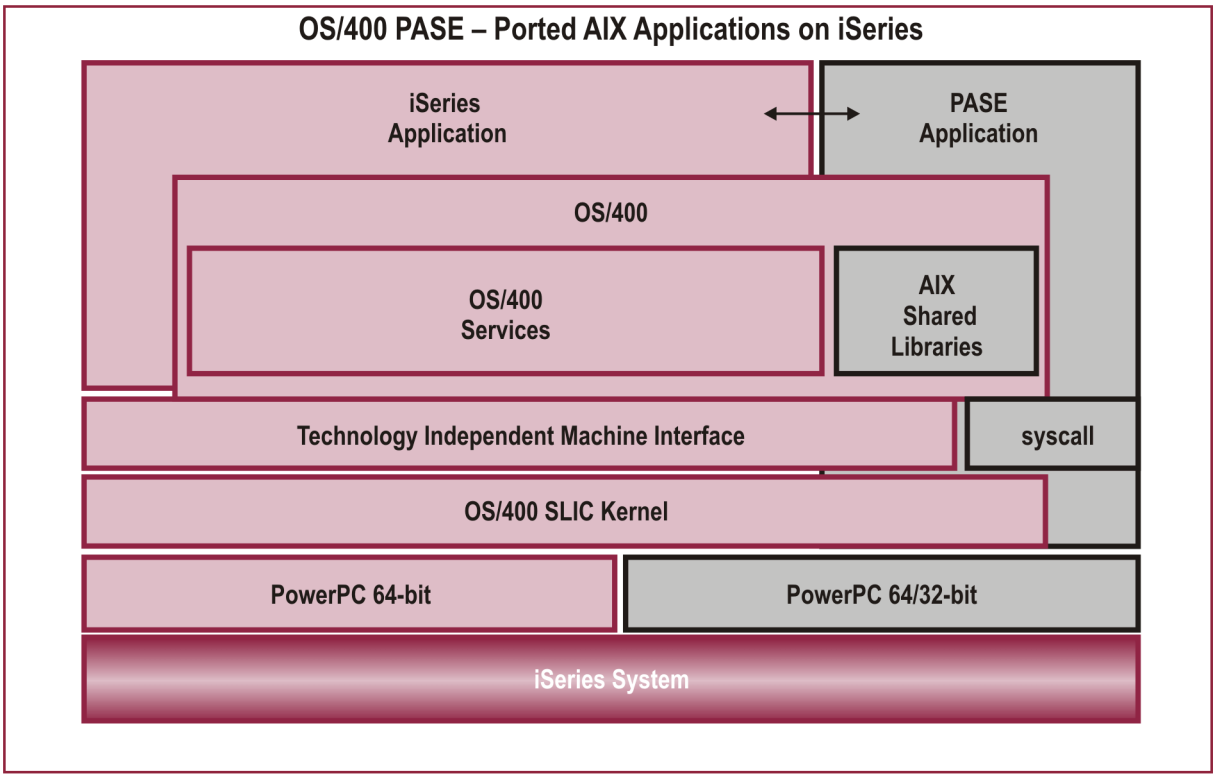

Figure 26 – OS/400 PASE: Ported AIX Applications on iSeries

Our Analysis

Consolidation of IT distributed infrastructures is today the highest priority for most IT user organisations, who all need to simplify, consolidate, improve utilisation, raise service quality, and, most important of all, cut costs in a tough business climate. The new iSeries now provides a strong "consolidation hub" capability, uniquely able to support all the workloads described above. This uses the advanced logical partitioning and virtualisation technology of the platform, described fully in Section 8, with the "On Demand" scalability to meet changing needs quickly and economically, discussed in Section 9.

The consolidated workloads can run on/be managed from an appropriate single new iSeries server, and deliver exceptional performance, high availability and reliability, and enhanced levels of iSeries' renowned manageability, sharing system resources efficiently and flexibly. This solution will enable these customers to greatly simplify and consolidate distributed infrastructure, eliminate numerous costly and lightly used distributed servers (*older AS/400 or iSeries, Windows/Intel, AIX-UNIX, Linux/Intel*), as well as roll out new-generation e-Business applications, on this robust single "hub" platform. The Return On Investment (ROI) of these consolidations is likely to be extremely high, with ROI in the range 35-75% per annum to be expected in many cases.

11. iSeries Systems Management Strength Extended

Introduction

The iSeries has a long-established record for its high-level of manageability and the closely integrated and inclusive management software tightly tied to the hardware. This has been a major contributor to the low levels of TCO we report from other analyst survey studies in Section 13. These facilities enable iSeries systems to be run and managed with much lower operations and administrative staffing than other mid-range systems, as these results clearly showed. The system management facilities have also been systematically extended, with each release of OS/400, to integrally support the newer capabilities of the systems as they were added. From the System/38 days, these facilities were originally presented as "green screen", command-line instructions for many years, new ones being added with each release, and many experienced users continue to find these fast and productive to work with.

However, to present a more modern, GUI management interface, the massive development of a complete GUI interface, known as Operations Navigator, was undertaken, with a first release with OS/400 V3R7, and followed by a major jump in coverage in V5R1. This provided the system with an all-new strategic, fresh Windows GUI client interface, with extensive use made of visualisation technologies, graphs and charts to aid understanding, with a highly-integrated design throughout, and with a strong collection of in-built wizards to guide users through the more complex operations. All new components, for some time, have been written in Java, consistent with its strategic role on the platform, and a plug-in architecture is used to allow different development groups to contribute components within a consistent and well-integrated whole. With the new 2003 iSeries, comes a further substantially extended version and a new name for these powerful facilities.

iSeries Navigator Overview

Now named iSeries Navigator, this strategic, interactive graphical system management interface now encompasses and supports all the previous V5R1 Operations Navigator capabilities, and a substantial number of further advances and new capabilities to support the enhanced new iSeries roles and capabilities. This analyst spent several hours in detailed demonstrations of iSeries Navigator and in examining its capabilities, and assessed this as a powerful, easy-to-use, well-integrated management interface that covers almost every systems management task well, and makes good use of wizards and visualisation techniques to simplify some key tasks. The iSeries Navigator provides a broad sweep of functionality, including:

- Real-time systems performance monitoring, with history summarisation to the day, week or month, for jobs, messages and files.
- Strong software fix management and installation services for OS, layered products and licensed products.
- Powerful database management and administration, including graphic visualisation of database structures, SQL generation from DB objects, and multiple-database management facilities.
- Comprehensive server hardware management, including LPAR partition configuration and control, dynamic resource movement support, graphical disk system management, tape drive and library management, and all the usual hardware status monitoring facilities.
- Extensive user guidance and support throughout, via the modern GUI, the visualisation techniques, and the collection of wizards for key functions such as security, Kerberos, Enterprise Identity Mapping, BRMS, hardware configuration and other functions. Strong help facilities and an extensive "Information Center" help portal, complete a strong ease-of-use, ease-of-learning base.
- With the new 2003 iSeries addition of Lotus Sametime instant messaging support, iSeries systems can be remotely managed via wireless connection from any location, as well as via the standard network connected PC client.
- Management of multiple iSeries systems from a single console is also supported.

IBM has incorporated many autonomic computing features and capabilities within iSeries Navigator, as well as presentation, interface, and functional capabilities seen in the strong Intelligent Resource Director of zSeries, and from the Intel server sector-leading IBM Director systems management suite for xSeries. We summarise overall eServer autonomic computing advances as a whole in Appendix C.

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iSeries Navigator Functionality, New Features

The most concise way to express the depth and spread of functionality of the new iSeries Navigator is through the table shown in Figure 27 below, which lists the key capabilities of the suite under the main areas of system management. The facilities new with V5R2 are marked with an *, and it can be seen that these cover a considerable list of areas.

Space limitations preclude further detailed discussion of specific features, but it can clearly be seen what a comprehensive and now elegantly presented set of systems management capabilities iSeries Navigator now provides.

Management Central Functions
- Performance Monitoring
- Run and Save Commands
- Create, Save, Distribute objects
- Hardware/Software Inventory Collection/Display
- Schedule/Manage Software Fixes(PTFs)
- Fixed Inventory-Manage Other Software Fixes
- Collect/Report System Performance Data
- System Values -Display/Change/Distribute
- Administer/Distribute Users & Groups
- Licensed Program- Create/Install/Fix/Distribute
- Monitor Job, Message Resources
- Monitor B2B Transactions *
- Monitor Files For Changes/Strings*
- Synchronise Time/Date over networked iSeries*

Network Functions
- Access Internet Applications
- Manage Point-to-Point Communications
- Set Up/Manage TCP/IP Interfaces
- Server Management – Set Up/Manage Server Applications
- DHS, DHCP,AS/400, NetServer, NFS,
- DCE, LDAP Directory Server
- Set Up/Manage IP Security
- Set Up VPN Networking
- Support Other IP Interfaces/Line Types
- - PPP, WAN, Circuitless IP, etc
- TCP/IP Quality of Service Management
- Manage Windows Servers – Start/Stop/Status
- Manage Windows Users and Disk Storage

Applications Administration
- Control User Access To Applications Functions
- Control User Access To iSeries Navigator plug-ins
- Centralised Applications Administration *

Basic Operations
- Manage Messaging
- Manage Printer Output
- Manage Printer Devices
- Drag/Drop/Cut/Paste Printer Output

Security Functions
- Set Resource Object Authority & Security Values
- Manage Object Permissions
- Manage Security & Audit Policies
- Security Configuration Wizard to Set Up Security
- Manage OS/400 Users & Groups
- Enterprise Identity Mapping*
- Kerberos Network User Authentication*
- Object Signing Signature Verification*

Work Management Functions
- Job Management
  - Work With User Jobs
  - Display Job Logs
  - Work With Server Jobs
- Work Management
  - Work With Active Jobs
  - Work With Job Queues
  - Work With Memory Pools
  - Work With Active Subsystems
  - Display Call Stack For a JOB
  - Work With Job Object Locks
  - Work With A Job's Open Files
  - Work With All System Output Queues*

Database Functions
- DB2 UDB for iSeries DB Administration
- Manage DB2 Objects
- Tables, Views, Journals, Indexes, Aliases
- Create, Save, Run SQL scripts
- Collect, View SQL Performance Data
- Work With DB2 UDB Complex Objects, Procedures, Functions
- Visual Explain On Queries
- Visual Database Navigator For DB Description
- Manage Multiple Databases With Independent Storage Pools*

Hardware Functions
- Configuration & Services
  - Work With All System Values
  - Show all System Hardware Inventory
  - Show All Software Inventory For System
- DASD Management
  - Display Disk Status, Capacity, ASP Pools, Balancing
  - Manage ASP, HSM, Add/Remove Disks
  - Graphical Disc Configuration Display
  - Set Up Independent Disc Pools (ASP)
  - Manage Parity Sets*
  - Start, Stop, Resynch., Optimise
  - Configure and Manage LPAR
  - Configure, Manage 2 Node Clusters
- Support Tape Drives, Libraries*

File System Functions
- Work With Integrated File System
- Enhanced File System GUI
- Cut, Copy, Paste, Rename
- Work With, List NetServer File Shares
- Display Object Attributes
- QSYS Drag, Drop, Cut, Copy, Paste

Backup
- Schedule Backups
- BRMS GUI (Plug-In)
- Set/Manage BRMS Policies*
- Move Policies. Wizard/Properties for Media Movement*

Other
- Graphical Command Line Prompter
- Advanced Function Printing Manager – Fonts, PSF, etc.
- Work With Application Development Tools

Plug In Function
- Add New or Enhance Standard Functions
- Create/Support Java Plug-Ins
- Create/Support Java Plug-Ins

Figure 27 – iSeries Navigator V5R2 Functionality & New Features

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BRMS

A key part of iSeries management infrastructure is the BRMS licensed product. Back-Up, Recovery and Media Services is the long established storage back-up planning, recovery, hierarchical storage and media management system that provides extensive functionality in these key areas. The enhanced iSeries GUI interface for BRMS integrates this widely-used, dependable subsystem under the iSeries Navigator's integrated interface, with improved wizards and interfaces for back-up policy, media library and media move policy management. It also supports a new Notes server point-in-time recovery. The product also provides native TCP/IP support for BRMS networks, performance enhancements for BRMS maintenance, and IASP support for library objects, all in a simple and quick to deploy environment. BRMS is inclusive with new iSeries Enterprise Editions on the i825, i870 and i890.

Enterprise Management Integration

An iSeries can also participate in the wider enterprise management networks that some large customers often also run, using enterprise management suites such as IBM's Tivoli, or Computer Associates' UniCenter. Tivoli has also strengthened its iSeries specific product line for the new iSeries, and select Tivoli products are now included in the packaged Enterprise Edition software set, discussed in Section 6. These are the Tivoli Monitoring – PAC for Web and the Tivoli Storage Manager Extended Edition, which are included with i825, i870 and i890 Enterprise Edition systems. Tivoli Storage Manager Enterprise Edition provides integrated data protection for client back-up and archive under centralised management, with comprehensive policy-based automation, and is complementary to BRMS.

Third-Party iSeries Systems Management Tools

A strong list of third-party IBM ISV partners offer complementary systems management tools for the platform, to provide additional functionality in security, performance and operations management, change management and event/problem handling. These include products from companies such as BMC Software, SafeStone, PowerTech, PentaSafe, CCSS, Help/Systems, SoftLandings, Aldon and Bytware.

Our Analysis

The iSeries Navigator is a first-class, comprehensive, modern interface for the wealth of in-built system management capabilities of OS/400. These have taken a further significant step forward with V5R2 in the many areas highlighted in Figure 27 on page 45. The functionality is well integrated and well presented though the all-GUI facilities, the graphical visualisation tools and the useful wizards. With these developments, iSeries has further advanced its class-leading manageability, one of the key drivers of the superior TCO this platform achieves in repeated comparative studies. These facilities now also bring these strengths to bear on supporting the wider portfolio of traditional and new workloads the platforms now supports, discussed in Section 10. Increased autonomic facilities have added to the level of automation in this attractive suite. Back-up, recovery and media management is well supported under the BRMS, and instant messaging communications now allows wireless remote management.

12. Radical Re-pricing, Re-packaging

Introduction

IBM has made striking price reductions, to bring Standard Edition base price levels down to equality with (*high-end*) pSeries equivalents, known to be the most price/performance competitive in the UNIX marketplace. The lower-end i800 and i810 systems are said to offer up to 80% price performance improvements over their predecessors. IBM claims that over 90% of new iSeries customers will see significant price/performance gains from the changes, when compared to 2002 equivalents. In this Section, we examine these striking claims in more detail to assess whether they are real.

Major Packaging Changes

In Section 5, we detailed the new 2003 iSeries family, and the new Enterprise and Standard Editions. The latter are positioned to provide price-competitive models at all power points. The former provides an inclusive bundle of high value IBM software for new-generation e-Business/Web applications deployment and development within the package, and other key features. Crucially, these Editions also provide unlimited Interactive CPW use (*this is a key advance that customers have long sought*).

Also, to encourage Linux adoption, i870 & i890 Enterprise Editions include a free processor activation for Linux, and (*currently a promotional offer*) Linux distribution copy. Systems from the i825 up also include an IXS Integrated Windows Server. Buyers get a choice of vouchers for start-up services and education, to help them to a quick start with one of these technologies, or WebSphere. Fuller details of Enterprise Edition system base prices, and main features, by model, were shown in Figure 6, on page 18, and full software details are given in Appendix A, Figure A3.

2003 iSeries Pricing

The planned base US $ list prices for the 2003 iSeries range are shown in Figure 28, for both Editions, with some other key factors. Base system price/performance, measured by Base Price $/Base CPW, and per-processor performance measured in CPW/CPU, are also shown. Base systems are 2003 standard minimum configurations, with entry/standard number of processors, minimum memory, and operating system, but excluding DASD.

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Mod.	Version	Max. No. Of CPU	Interactive CPW 5250	S/W Tier 2003	US List $ Base Price	Incl. Ent S/W Bundle Value	1 CPU Perm CUoD H/W	1 CPU Perm CUoD H/W +OS	1 CPU Per Day TCUoD	Price/Perf Base $/ Base CPW	Max. CPW/ CPU
i890	Enterprise Ed.	24-32	Unlimited	P50	$2,550,000	$467,000	$30,000	$60,000	$1,300	$87.03	1,175
i890	Standard Ed.	24-32	Charge	P50	$1,400,000	$0	$30,000	$60,000	$1,300	$47.78	1,175
i890	Enterprise Ed.	16-24	Unlimited	P50	$1,970,000	$364,000	$30,000	$60,000	$1,300	$98.50	1,221
i890	Standard Ed.	16-24	Charge	P50	$900,000	$0	$30,000	$60,000	$1,300	$45.00	1,221
i870	Enterprise Ed.	8-16	Unlimited	P40	$1,330,000	$229,000	$25,000	$50,000	$1,200	$118.22	1,250
i870	Standard Ed.	8-16	Charge	P40	$400,000	$0	$25,000	$50,000	$1,200	$35.56	1,250
i825	Enterprise Ed.	3-6	Unlimited	P30	$330,000	$128,000	$20,000	$50,000	$1,100	$94.29	1,100
i825	Standard Ed.	3-6	Charge	P30	$80,000	$0	$20,000	$50,000	$1,100	$22.86	1,100
i810	Enterprise Ed	1-2	Unlimited	P20	$230,000	NA	NO	NO	NO	$158.62	1,350
i810	Standard Ed.	1-2	Charge	P10	$120,000	NO	NO	NO	NO	$82.76	1,350
i810	Enterprise Ed	1-2	Unlimited	P10	$78,000	NA	NO	NO	NO	$76.47	725
i810	Standard Ed.	1-2	Charge	P20	$35,000	NO	NO	NO	NO	$34.31	725
i810	Enterprise Ed	1-2	Unlimited	P10	$18,000	NA	NO	NO	NO	$17.65	510
i810	Standard Ed.	1-2	Charge	P10	$12,000	NO	NO	NO	NO	$12.63	510
i800	Advanced Ed.	1	50	P10	$38,400	NA	NO	NO	NO	$128.00	950
i800	Standard Ed.	1	25	P05	$18,900	NO	NO	NO	NO	$63.00	300
i800	Value Ed.	1	25	P05	$9,995	NO	NO	NO	NO	$33.32	300

All pricing planned US list as advised to analysts at 14.01.2003. NA= Data not available. NO= Option not offered.

Figure 28 – 2003 iSeries Overall Pricing & Price/Performance

Standard Edition (*i800 to i890*) base prices thus range from $18,900 (*i800*) to $1,400,000 (*i890*). Enterprise Editions (*i810 to i890*) base prices also range from $18,000 (*i810*) to $2,550,000 (*i890*). Lowest entry point to the range is the $9,995 i800 Value Edition. We have already discussed the CUoD pricing, also shown in Figure 28, in Section 9, and so make no further comment on this here. For the larger systems, the list value of the inclusive IBM software bundle is also shown, and is worth up to $467,000 on a 24-way i890. Recall also that the Enterprise Editions include unlimited Interactive CPW, which was previously a costly additional charge. As can be seen, the difference in base prices between Standard and Enterprise Editions range from $17,000 or 94% (*i810*) and $1,150,000 or 82.1% (*i890*).

2003-2002 System Base Price Change Comparison

2002 Base Models						2003 Base Models						
Base No. CPU	Model/ Feature Code	Memory GB Disk GB Included	Base CPW	Base Price	Base $/Base CPW	Base No. CPU	Model/ Feature Code	Memory GB Disk GB Included	Base CPW	Base Price	Base $/Base CPW	03-02 % Base $ Cut
24	**i890-2488**	48GB/7,875GB	29,300	**$4,934,816**	$168.42	24	**i890**	8GB	29,300	**$1,400,000**	$47.78	-71.6%
16	**i890-2489**	64GB/9,450GB	20,000	**$3,909,657**	$195.48	16	**i890**	8GB	20,000	**$900,000**	$45.00	-77.0%
16	**i840-2354**	24GB/6,300GB	16,500	**$2,960,982**	$179.45	No directly comparable 2003 model						
12	**i840-2353**	16GB/4,725GB	12,000	**$2,278,540**	$189.88	8	**i870**	8GB	11,250	**$400,000**	$35.56	-82.4%
8	**i840-2352**	12GB/3,150GB	9,000	**$1,738,544**	$193.17	No directly comparable 2003 model						
4	**i830-2349**	8GB/1578GB	4,200	**$935,410**	$222.72	3	**i825**	1GB	3,500	**$80,000**	$22.86	-91.4%
4	**i820-2438**	4GB/964GB	2,350	**$621,082**	$264.29	2	**i810 2700**	512MB	2,700	**$120,000**	$44.44	-80.7%
4	**i820-2437**	2GB/526GB	2,350	**$406,443**	$172.95	2	**i810 2700**	512MB	2,700	**$120,000**	$44.44	-70.5%
No directly comparable 2002 model						1	**i810 1450**	512MB	1,450	**$35,000**	$24.14	
2	**i820-2436**	2GB/350GB	1,100	**$290,476**	$264.07	1	**i810 1020**	512MB	1,020	**$12,000**	$11.76	-95.9%
1	**i820-2395**	1GB/175GB	370	**$82,582**	$223.19	No directly comparable 2003 model						
2	**i270-2432**	1GB/175GB	1,070	**$85,914**	$80.29	1	**i800 AE**	256MB	950	**$38,400**	$40.42	-55.3%
1	**i270-2431**	1GB/38GB	450	**$61,914**	$137.59	No directly comparable 2003 model						
No directly comparable 2002 model						1	**i800 SE**	256MB	300	**$18,900**	$63.00	
No directly comparable 2002 model						1	**i800 VE**		300	**$9,995**	$33.32	
1	**i270-2248**	1GB/38GB	150	**$30,562**	$203.75	No directly comparable 2003 model						

Figure 29 – iSeries 2002-2003 Price, Price/Performance Changes

We researched the actual, 10th January 2002 iSeries model US $ Web list prices, for all 2002 iSeries processor Feature Codes from the IBM iSeries Web Site, just before the Announcement (*when they were removed*). In Figure 29, we set these alongside the nearest comparable 2003 system models, the planned US $ list base prices for which were announced to analysts on 14th January 2003. In these comparisons, it should also be remembered that all 2003 iSeries provide unlimited Interactive CPW for WebFacing modernised 5250 applications, including the Standard Editions, not the case in 2002 systems.

This approach expresses "minimum entry" list prices for models of approximately equal CPW power, rather than realistic, or fully-functionally equivalent configuration prices. In 2002, the packaging approach was for each model/feature code to be equipped with enough memory and disk capacity for realistic, average starter systems, as standard. For the 2003 models, in keeping with the new emphasis on delivering iSeries capacity "On Demand", this has been changed. Now base models prices include only the model minimum memory and no disk, so users can choose the lowest practical entry configuration needed, with the expectation of later "On Demand" upgrades being made only when needed in the field.

Processor CPW versus minimum entry system prices for these comparable systems are charted in the X-Y graph shown in Figure 30 below, which clearly and starkly shows the dramatic downshift in minimum prices that have been made quite uniformly across the line.

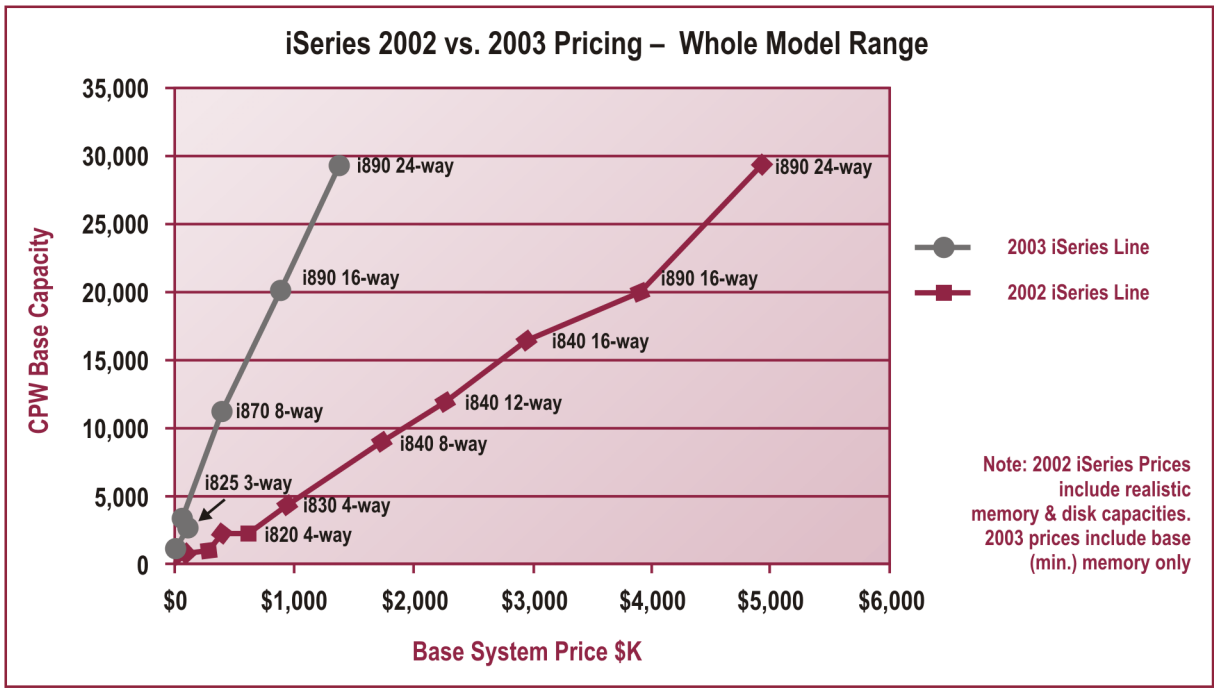

Figure 30 – Minimum System Prices vs. CPW Capacity 2003 & 2002 iSeries Systems

The result is truly dramatic price reductions in minimum entry prices across the whole 2003 range over the nearest comparable 2002 models, as can be clearly seen in both Figure 29 and Figure 30, ranging from -55.9% (*i800 Advanced Edition*) to -95.9% (*i810-1,020 CPW*).

2003 System Price/Performance

As can be seen from Figure 31 below, price/performance (*on the same basis as above*) for the new 2003 iSeries systems (*measured in base $ list price/base CPW capacity*) for Standard Editions ranges from $11.76/CPW (*i810-1,020 CPW*) to $128.00 (*i800 Advanced*), with the upper-range systems between $22.86 (*i825*) and $47.78 (*i890*). The equivalent range for the Enterprise Editions is from $17.65 (*i810-1,020 CPW*) and $158.62 (*i810-2,700 CPW*), with the upper models from $94.29 (*i825*) to $118.22 (*i870*). The variation comes from the differing inclusive features of each model.

2003 Model	No. Processors CPW Capacity	2003 Enterprise Edition Price/ Performance	2003 Standard Edition Price/ Performance	2002 Nearest Equivalent Price Performance	% Change Price/Perf. 2003-2002
i890	24/32-CPU	$87.03	$47.78	$168.42	-71.6%
i890	16/24 CPU	$98.50	$45.00	$195.48	-77.0%
i870	8/16 CPU	$118.22	$35.56	$189.88	-81.3%
i825	3/6 CPU	$94.29	$22.86	$222.72	-89.7%
i810	2,700 CPW	$158.62	$44.44	$172.95	-74.3%
i810	1,020 CPW	$17.65	$11.76	$264.07	-95.5%
i800	Advanced	NA	$128.00	$80.29	+59.4%

Figure 31 – iSeries Price/Performance of Base Models 2002-2003

We also show the nearest 2002 equivalent model price/performance, based on the detailed 2002/2003 comparison of Figure 30 above. (*In 2002, no Enterprise Edition equivalents were offered, so comparisons are with 2003 Standard Editions*). The right hand column shows again a striking improvement in price/performance on this metric from 2002 to comparable 2003 models, ranging from -71.6% (*i890 24/32-way*) to -95.5% (*i810 -1,020CPW*).

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Simplified Tiers Cuts Software Costs

Simplified and more favourable software pricing tiers now bring a single tier for each model, which eliminates the costly and complex Interactive CPW factor that previously uplifted software tiers.

These changes reduce the software tier by, on average, one tier level over comparable 2002 models. This important simplification/software cost reduction change is detailed in Figure 32.

Software Price Tiers	i890	i890	i870	i825	i810	i810	i810	i800	i800
CPU or CPW Capacity Interactive CPW (i800)	24/32 -way	i16/24 -way	8/16 -way	3/6 -way	2,700 CPW	1,450 CPW	1,020 CPW	950 50	300 25
2003 Standard Edition	P50	P50	P40	P30	P20	P10	P10	P10	P05
2003 Enterprise Edition	P50	P50	P40	P30	P20	P10	P10	NA	NA
2002 Software Tiers From: To: For nearest similar server Rising with Interactive CPW	P50 P60 i890	P50 P60 i890	P40 P50 i840	P30 P40 i830	P20 P30 i820	P20 P30 i820	P20 P30 i820	P10 P10 i270	P10 P10 i270

Figure 32 – New 2003 iSeries Software Price Tiers

2003 High-End iSeries Prices Now Down to pSeries Level

We have assessed IBM's pSeries POWER4 and POWER4+ RISC UNIX systems in several recent Software Strategies studies as the best-performing and the price/performance leaders in the RISC UNIX market, and they have gained share strongly as a result of these factors and their technology strengths.

With the above new iSeries price reductions, for the first time iSeries system costs have been brought down just below those of high-end pSeries equivalents, as can be seen in Figure 33, and are therefore price-superior to almost all other vendors' comparably-sized UNIX systems.

System	iSeries US $ List Standard Edition	pSeries US $ List With DB2 UDB License	iSeries/ pSeries %
8-way	$506K i870	$508K p670	99.4%
24-way	$1.5M i890	$1.7M p690	88.2%

iSeries prices include DB2 UDB RDBMS as standard. Prices for minimum systems.

Figure 33 – 2003 iSeries and pSeries Price Convergence

This bold move by IBM, completely eliminating the traditional price differential with UNIX, will greatly strengthen the new iSeries chances of gaining workloads and market share from competitors' RISC UNIX systems. It will provide a powerful incentive for iSeries customers to place a greater percentage of their total workloads on the platform, given its many other superior qualities.

Our Analysis

These are a major set of pricing and packaging changes that bring substantial initial and operating cost savings to new iSeries customers, and which greatly improve its already strong "Cost[3]" characteristics. We consider these changes to be good news for all new iSeries customers. The improvements in base systems price/performance do indeed average 80% across the range.

Naturally, customers will need to fully configure specific 2003 iSeries systems to their actual initial needs, and consider the value of inclusive features offered, particularly in Enterprise Editions, to determine actual prices to be paid.

However, these new prices make a hugely compelling argument for existing iSeries customers to upgrade to new iSeries systems. This is because they will also gain from substantial yearly savings on system hardware and software maintenance fees on these drastically reduced new iSeries system prices, as well as benefiting from the new capabilities and lower initial prices. The effect, we consider, will be that there will be many such upgrades amongst the customer base. These substantially lower pricing levels will also encourage uses to add additional workloads onto new iSeries systems, which are now very competitively priced against the market's best UNIX power equivalents.

Many of the other technologies in the new iSeries also contribute towards economic improvements and user cost savings, which we have covered elsewhere in detail: dynamic CUoD cuts the need to pre-buy unused processor headroom. Dynamic LPARs allow efficient usage of installed capacity under changing demands from multiple workloads. Windows and Linux consolidation onto iSeries can achieve major savings compared to current costly distributed deployments, and many more.

We consider IBM has certainly transformed the economics of this popular platform with these bold moves, which will undoubtedly help its resurgence.

13. iSeries Competitive Analysis

Introduction

Normally, when we review a new line or major model of servers, it is easy to identify two or three directly comparable and competitive systems. This applies in mainframes, RISC UNIX servers, Intel servers and blade servers, at every level. Direct comparison is then usually straightforward. With the iSeries, the situation is different, and the competition more diffuse, because the iSeries has long outlived, and seen the market departures of, most of its earlier, directly comparable, competitors. We charted the history of the mid-range business systems markets extensively in Section 3, and noted how some types of traditional competition for IBM's mid-range systems have fared:

- Earlier proprietary mid-range business systems, from traditional computer manufacturers, which originally competed with IBM's iSeries predecessor Rochester systems are virtually all long gone. (*HP's previously popular HP/3000 MPE business-orientated minicomputer systems were perhaps the last, significant-sized user base of this type. Sadly for their customers, HP has announced the planned termination of this architecture, as part of its commitment to Intel Itanium-based servers – see below.*)
- The minicomputer carved a 25-year trajectory through the small-medium business platforms market, but has now largely disappeared, leaving only one software architecture with still reasonably wide usage. (*HP's OpenVMS, the successor to the leading Digital VAX mini-computer software platform, being the premier example.*)
- Small mainframes, from IBM, Unisys, and others, have long sought to compete in the same medium enterprise business marketplace as the iSeries, and continue to do so in a small way. For those smaller or medium-sized business customers committed to, or with a large investment in, mainframe-architecture software applications, this approach still has some merit and following.

Over more recent years, the main, but indirect, competition to iSeries has really come from the much-hyped RISC UNIX and "Wintel" server platforms, which found their way, in turn, into today's quite widespread use of both in SMML enterprise business computing.

The RISC UNIX Competition

The primary indirect competition for iSeries came first from RISC UNIX systems. These promised high performance, and were widely associated and sold with ERP business software applications, through the late 1980s and 1990s. (*Indirect competition, because the attributes, focuses and capabilities of these of systems were initially so different to those of the AS/400 and iSeries.*) The original RISC UNIX sales proposition was processor-performance from RISC processors, later 64-bit, "open" through UNIX, and better price/performance than proprietary mid-range and mini-computer systems. Originally designed for scientific and technical computing, to replace proprietary mini-computers, RISC UNIX systems were later pushed hard into all levels of business computing by aggressive marketing from leading UNIX vendors, notably Sun Microsystems, HP and IBM, although often lacking many of the essential hardware and software attributes needed. I/O capabilities, for example, were often inferior and inadequate.

...the early UNIX systems were complex, hard to manage and operate, lacked database and transaction processing capability, and needed high levels of technical skills.

RISC UNIX systems were, for years, ill-adapted for small and medium businesses seeking a "plug-in-and-go", reliable and easily managed business system, because the early UNIX systems were complex, hard to manage and operate, lacked database and transaction processing capability, and needed high levels of technical skills. The words "raw iron" spring to mind, and the RISC UNIX customer was expected to assemble, integrate, test, and make work hardware and software components from numerous sources, before being able to deliver a business solution. For engineers, universities and laboratories, this approach worked fine, but was less successful with small and medium businesses, many of which continued to prefer the better-adapted AS/400 integrated business systems from IBM.

Only when RDBMS matured, and reliable ISV TP monitors for UNIX, such as BEA Tuxedo, became established, were the basic software infrastructures for business computing available on RISC UNIX. Many of these RISC UNIX systems also lacked the robustness, manageability, reliability and dependability of platforms like the AS/400, until well into the mid-1990s, by which time their weaknesses had been patched sufficiently to win a significant market share. The overall RISC UNIX server market peaked at around $20B in 2001/2002 and is forecast to decline slowly over the next few years.

RISC UNIX systems did pioneer the move to 64-bit server computing, and we return to this issue later. The computing model emphasised by RISC UNIX was "scale-up", with the development of larger and larger "SMP" systems, such as Sun's 64-way Enterprise 10000, HP's 64-way Superdome, or Sun's 72/106-way Sun Fire 15000, proposed for large centralised database, application serving, or technical computing roles.

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The "Wintel Wave" – Intel-Powered Standard Servers

Through the mid-1990s, PC technology-based, Intel 32-bit processor powered, low-cost, standard high-volume servers proliferated, and Microsoft's Windows NT operating system matured. Initially used for low-end roles such as file-and-print, workgroup server, desktop PC support, and departmental computing, these client/server-focused systems brought a lower server price point for hardware and software, and so created a far wider server market. During the late 1990s, Microsoft's operating and middleware software matured, scaled and became more reliable, particularly with the arrival of Windows 2000. The Intel server hardware also scaled up, began to add some basic enterprise computing attributes, and became capable of supporting mid-sized business applications and database work as well. SHV Intel servers were normally deployed one per application, and customers soon acquired many of these servers spread about their organisations. Their apparent low initial costs were the primary driver. By the late 1990s analysts TCO studies revealed the extremely high TCO exhibited by "distributed Wintel" configurations, stemming from low utilisation, low reliability, and the high staffing costs needed to support them. Microsoft and Intel championed first the client/server model, and later the "scale-out" model, where clusters of these low-cost, standardised servers were proposed to handle larger workloads, or to add higher-availability. More recently, a handful of larger "scale-up" Intel-based servers, first from Unisys, then IBM, have also appeared, using Microsoft's high-end Windows 2000 Datacenter Server OS, and these now compete directly with "scale-up" RISC UNIX systems.

With 85% by units of all servers sold in 2002, no one can doubt the power and appeal of the standard technologies, which have turned so much of the server market into a commodity. To date, the overwhelming majority of these were based on Intel-32-bit processors, which have continued to advance briskly in power, even after their 64-bit Itanium cousins first shipped in 2001. The rise of the open-source Linux operating system in recent years, most of it running on Intel-based servers, has been another driver for these platforms, and a threat to Microsoft's hegemony.

The result today is that 90% of iSeries SMML customers also run multiple Windows/Intel servers within their infrastructure, typically 5-20 servers for businesses in the 0-1000 employee size range.

Key Comparisons Reveal Wide Mid-Range Differences

With the above background, it became increasingly hard for mid-market customers to sort out the real truth as the comparative advantages of integrated business systems, such as the AS/400 or iSeries, and these RISC UNIX & Intel contenders. In 2001/2002, the analyst community looked deeply into these issues and published some fairly striking and definitive results, looking both at TCO and overall functionality of the main competing platforms. A "meta-analysis" high-level summary of the key definitive studies is given below:

Total Cost of Ownership – IDC & Meta Group Studies

IDC: In 2001, IDC published a seminal White Paper, comparing the real 3/5 year total costs of ownership of comparable mid-range ERP business applications solutions in actual use at 24 real customers, looking at AS/400/iSeries, SHV Intel, and RISC UNIX platforms. Our short summary of their results is shown in Figure 34. The key findings, shown in the right-hand columns, were that the AS/400/iSeries customers had 42-47% lower 5 year TCO/User than comparable standard Intel solutions, and 45-52% lower 5 year TCO/User than comparable RISC UNIX solutions, the ranges depending on the size of company. The study also found the key factors driving these wide iSeries TCO advantages were the iSeries: much longer service lives, lower operating/support staff requirements, ability to support many more users per server, and far higher reliability.

These differences can be seen clearly in the central columns of Figure 34.

Server Platform	Data From	Principal TCO Driving Factors				$ TCO/ 100 Users 5 Year Period	
		Average Server Life-Years	Actual No. Users/ Server	No. Of Servers/ Support Staff	User Down Time Hrs/ 100 Users/ Year	Small Firms Av. 330 users @ 5 yrs.	Large Firms Av. 5,150 users @ 5 yrs.
IBM iSeries*	IDC Actual	8.0 years	375	3.5	7	$149,546	$98,900
SIAS Servers	IDC Actual	4.5 years	113	1.3	7	$279,958	$169,165
UNIX Servers	IDC Actual	6.6 years	200	2.2	14	$274,081	$204,000
iSeries vs. SIAS	IDC Actual	+3.5yrs. +78%	+262 +232%	+2.2 +169%	14	-$130,404 -46.7%	-$70,265 -41.5%
iSeries vs. UNIX	IDC Actual	+1.4 yrs. +21.1%	+175 87.5%	+1.3 +59%	28	-$124,535 -45.4%	-$105,100 -51.5%

IBM iSeries (AS/400) integrated, packaged business mid-systems had
42-47% lower 5 year TCO/User than standard Intel solutions
45-52% lower 5 year TCO/User than RISC UNIX

Source: IDC TCO Study – ERP Applications – Data from 24 actual user sites 2001

Figure 34 – IDC 2001: Mid-Range ERP Apps. Platform TCO Comparison

Meta Group: In July 2002, Meta Group published the findings of similar, but rather more extensive TCO study. The analysts also looked at actual customer cost data, in this case from the 195 real US customers who provided sufficient information. These were all running ERP business applications. HP-UX, IBM AIX, IBM OS/400, Microsoft Windows NT & 2000 and Sun Solaris platform environments were compared in detail. The study collated all the actual hardware, software, staffing and operating costs incurred by these users, and reduced the results to an easily comparable "TCO per active concurrent system user" metric, with first year and three year cost analyses.

Their results are summarised in Figure 35 below, and showed IBM OS/400 platform sites exhibited considerably the lowest total TCO/concurrent user metrics over both the Year 1 and 3-Year time-periods. Windows NT, thought of as a "low-cost" platform, was 36% more costly, IBM AIX was much the lowest cost UNIX platform, but 43% more expensive than OS/400, Windows 2000 was 66% higher, HP-UX 133% higher, and Sun Solaris a staggering 254% higher, amply confirming a high-cost reputation.

This commendable study also provided a wealth of detail on the different cost-mixes found on the platforms. This study excluded any valuation of the costs of downtime (*which IDC included and which OS/400 scores well on*), and the shorter 3-year period Meta used is adverse to long-life platforms like OS/400.

Platform	No. Of Sites In Study	Total 1st Year TCO/ Concurrent ERP User	Total 3 Year TCO/ Concurrent ERP User	1 Year TCO Multiple Of Lowest	3 Year TCO Multiple Of Lowest
IBM OS/400 AS/400, iSeries	18	$39,000	$52,000	1.0	1.0
Windows NT On Intel	25	$72,000	$71,000	1.85	1.36
IBM AIX on pSeries RISC	9	$74,500	$74,500	1.91	1.43
Windows 2000 on Intel	3	$86,500	$86,500	2.22	1.66
HP-UX on PA-RISC	34	$121,000	$121,000	3.10	2.33
Sun Solaris SPARC RISC	20	$184,000	$184,000	4.72	3.54

Meta Group: The Impact of OS/Platform Selection on the Cost of ERP Implementation, Use and Management, Executive Summary, 25.07.2002. Publicly displayed at IBM Executive Briefing Centre, Rochester, MN

Figure 35 – Comparison of Mid Range Platform ERP TCO: 1st Year & 3 Years – Per Concurrent ERP User

Given the dramatic reductions in price, and substantial further improvements made in manageability, reliability and performance in the new 2003 iSeries, we have little doubt that, if these studies were repeated in 12 and 36 months time, based on new iSeries experience, the margins of advantage would be substantially higher than even these striking results.

Gartner Server Technology Functional Evaluations

Gartner has long analysed all leading business server platforms using a consistent evaluation model, looking at their technological strengths and at wider market factors. Figure 36 below shows Gartner's rating of leading platforms in terms of transaction processing technology (*first 3 columns*) and overall (*columns 4-6, which includes market momentum and ease of doing business with the vendor*). The former assessment rates iSeries OS/400 at # 2 rank for its transaction technology, behind only the zSeries mainframe, well ahead of the four principal UNIX platform (*By between 13.6% and 36.7% score differences*), and far ahead of 8-way Intel Windows by 132.7%. The 2003 iSeries technology and commercial advances will undoubtedly advance these iSeries rankings further when next published.

Platform	Transaction Server Technology Total Score[1]	Transaction Server Technology Ranking[1]	Platform	ERP Volume Leaders Overall Score [2]	ERP Volume Leaders Overall Score [2]
IBM zSeries Mainframe	290	1	IBM zSeries Mainframe	605	1.0
IBM iSeries OS/400	242	2	IBM pSeries AIX	557	1.85
Compaq Alpha Tru64	213	3	IBM iSeries OS/400	542	1.91
HP 9000 HP-UX	195	4	HP 9000 HP-UX	535	2.22
IBM pSeries AIX	186	5	Intel 8-way Windows	480	3.10
Sun SPARC Solaris	177	6	Sun SPARC Solaris	532	4.72
Intel 8-way Windows	104	7	Compaq Alpha Tru64	422	4.72

1. "Gartner's ASEM : Update and Future Directions", Transaction Server Technology, G. Weiss, Oct 2001.
2. Source: Gartner's "Decision Framework", DF-14-7256, A.Butler,14 November 2001. Presented in IBM iSeries Briefing Materials

Figure 36 – Gartner Large/Mid Business Server Technology & Overall Evaluations

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HP Users Face Costly Transitions

iSeries nearest comparable competitors were perhaps HP's OpenVMS systems (*inherited from Compaq, and acquired by Compaq with the purchase of Digital*), and its own HP3000 MPE business minicomputer line. The Compaq OpenVMS software/Alpha hardware systems were the software architecture successors to Digital's legendary VAX minicomputer line, in its day the most successful of that breed. The HP 3000 was a direct competitor to IBM's S/38 and AS/400.

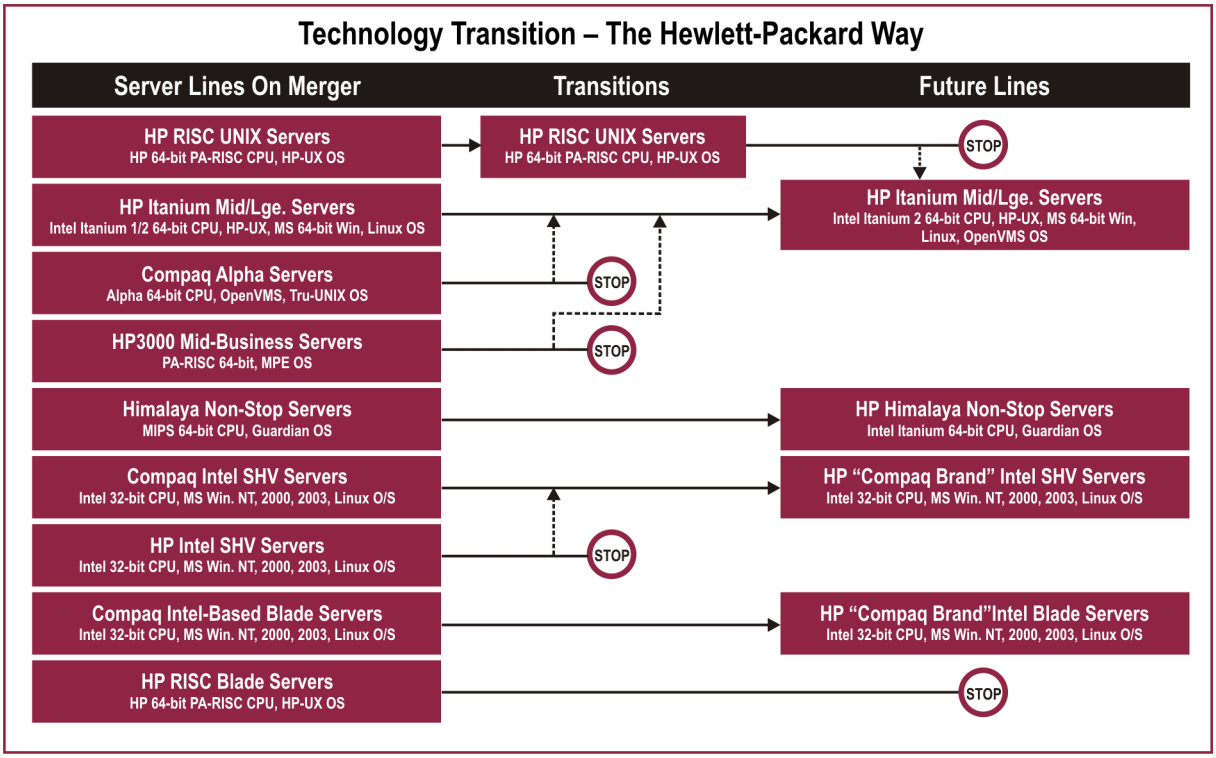

Figure 37 – Technology Transition: The HP Way

As part of the rationalisation of its server hardware and operating system lines post merger with Compaq, HP has announced a "bet the business" commitment to Intel Itanium 64-bit processor technology for all its higher-end systems. HP's server lines at merger, and transition plans, are shown in outline in Figure 37. Five HPQ server hardware lines and two operating systems (*MPE and Tru-64 UNIX*) are to be "sunsetted" in this roadmap.

Sadly, for the remaining users of both the HP3000 and Alpha platforms, HP has announced plans to terminate both, and other hardware lines, and has invited its customers to migrate to HP Intel Itanium-powered servers over a transition schedule. These loyal customer groups face complex cross-processor, cross-system architecture, and even cross-operating system migrations, if they decide to follow HP's recommended roadmaps. We expect numbers of these dismayed customers will decline this costly challenge, and many will move to iSeries, for a more secure future.

The 64-Bit Server System Wars Ahead – POWER vs. Itanium

All commentators and vendors agree that higher-end servers must all use 64-bit processor technology, to provide the address space and performance for the next generation of applications. Now, the war for high-end 64-bit server processor chip dominance is shaping up as a titanic industry battle. Several early 64-bit chip contenders, MIPS, Compaq Alpha, and HP's PA-RISC, have either gone, or are dropping out of the race.

The main contest is now shaping up between IBM with POWER-based systems, and Intel with Itanium2 (*with HP as its key server supporter and co-developer, wholly committed to the Intel chip for all its high-end servers*). Sun still continues to compete with its own SPARC chip-based systems (*although most analysts doubt it can maintain the pace needed*), and Dell is waiting in the wings, yet to make a real 64-bit effort. The wild card is AMD, with its upcoming 64-bit Opteron chip, which uniquely promises to run Intel IA-32 bit software efficiently, as well as new 64-bit software, the Achilles Heel of Itanium and Itanium 2. Microsoft is enthusiastic about this AMD chip, for obvious reasons, but no major server manufacture has yet committed to its use.

Intel's original Itanium flopped completely in the server market, due both to its limited performance relative to cost, and because software applications essentially needed complete rewriting to take advantage of the new architecture. Itanium2 has addressed the performance issue, but not the software issue, which is limiting Itanium uptake to a slow crawl. Itanium architecture focuses on exploiting instruction-level parallelism (*EPIC architecture*), whereas POWER4 focuses on thread-level parallelism and system bandwidth, which IBM convincingly argues are far more significant for all commercial processing workloads, with bandwidth also the key for HPC workloads.

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Benchmark performance results to date indicate POWER4 is currently well ahead. HP has therefore taken the biggest risk to its high-end server business, and needs Itanium2 servers to take off. Sun faces a difficult challenge to keep up technologically, both at the SPARC chip and at the systems level, and the signs of Sun falling behind in this race have been apparent for the last 12 months. Intel would love IBM to push Itanium2 in its high-end servers, as it effectively does with its 32-bit Intel xSeries, but this currently seems most unlikely to happen given the success of POWER4.

Our Analysis

IBM's iSeries already held a strong relatively competitive position against both its direct and indirect competition before the January 2002 new iSeries Announcement, whether measured in terms of having far the lowest TCO ratings in class, or in its technological strengths. Its main market handicap was its relatively lower visibility in the wider IT market, compared to the much-hyped RISC UNIX and Wintel platforms, that it convincingly outdoes, on most measures, in its target business market.

Now, with the new iSeries, the technology has greatly advanced, the software stack is much extended for e-Business, the role of the platform broadened to become the customer's mixed workload consolidation hub, and the initial costs and operating costs of the platform have been greatly reduced. At the same time, of the last remaining, directly competing platforms, the HP3000 is to be terminated completely, and the HP Alpha/OpenVMS hardware is also to go, and the software to migrate to HP Itanium2 servers.

These factors strengthen the mid-market, business system competitiveness of the already well-placed iSeries. In our view, they will stem base erosion from its customer community, then increase its share of customer footprints, and, over time, achieve share growth from new-name accounts, as the overdue re-rating of its strengths becomes better known in the business and IT communities.

14. iSeries Roadmap Aggressive

Introduction

The 2003 iSeries Announcement brought the biggest raft of improvements to the platform for over a decade. Both current users and prospective new customers are also naturally interested in the future development roadmap for the system, the degree of commitment IBM is putting behind it, and its likely future in the market. Customer renewing or making new commitments to a key business computing platform need to know whether their investment is safe for the medium and longer term, and whether the platform is likely to remain leading edge over this time span. With so many erstwhile iSeries competitor platforms dead and buried, or dying, this is a natural and reasonable concern, since to invest on a platform where this occurs is a disaster for the customer company and IT team concerned. On this count, we consider iSeries customers and partners can rest assured, at least for this decade.

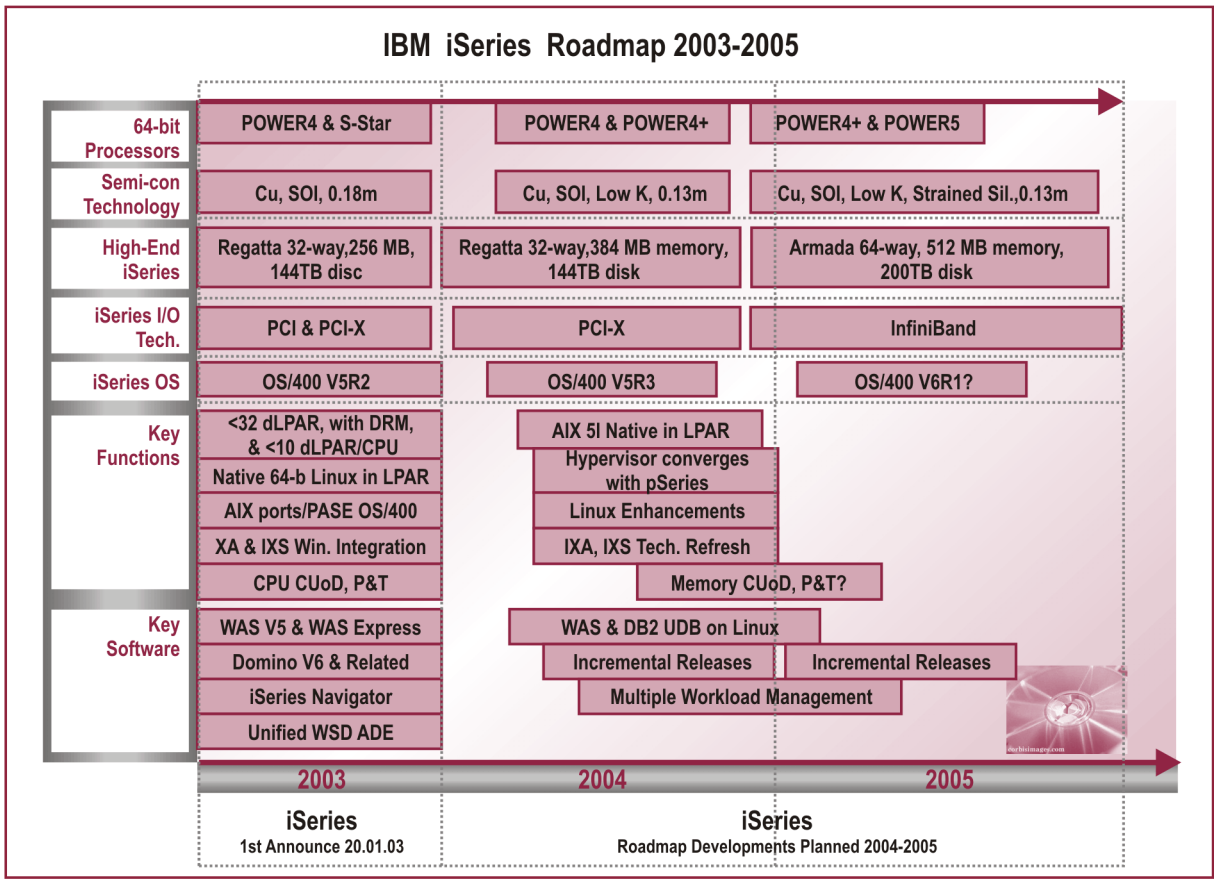

Figure 38 – IBM iSeries Roadmap 2003-2005

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IBM's Commitment Strongly Reaffirmed

IBM's clear, unequivocal message with the 2003 iSeries Announcement was of wholehearted and wide-ranging re-commitment to the platform and to its future success. To have invested over $500m in the developments behind the Announcement, as IBM has done, is one certain clear indicator. It was also quite clear that IBM feels strong loyalty and commitment to the large base of 250,000 iSeries customers, and to its thousands of iSeries partners, whose computing and business destinies respectively both depend on the iSeries platform. IBM, we assess rightly, can now show how fully applying its eServer strategies to the iSeries has already far-differentiated, brought to the technology leading edge, radically improved the price/performance/value factor, and opened up crucial, wider new roles for the system in its target customers' infrastructure.

It was also made clear from the forward-looking iSeries presentations, disclosures, and roadmap details shared with analysts at Rochester that IBM intends to deliver! The giant has the clear ability to execute an ambitious and aggressive path of continuing strong enhancement and extension of the iSeries hardware and software platform over the next several years. This, in our assessment, will further strengthen its already considerable advantages and widen its differentiation, at a rate we doubt any competitors can match. Our own broad overview and consolidation of some of these key roadmap strands is summarised in Figure 38.

iSeries Roadmap Strong

After these major advances with the 2003 iSeries, what is its future path? In fact, the Roadmap outlined by IBM for the platform looks extremely strong, as Figure 38 indicates. We select below a few of the more important directions to comment upon:

- **Processor Technology:** In core technologies, the next POWER processor, the POWER4+, is already shipping in the pSeries (*p650*), and will extend iSeries performance in 2004. The POWER5 successor is well through development, and will start sampling later in 2003, to debut in iSeries in 2005, with POWER5+ and POWER6 to follow. Each of these processors seems certain to hold 64-bit industry-leader status for their performance and system architecture, just as POWER4 has achieved through 2001/2003 to-date. The major success of the POWER4 processor chip, and its advanced systems architecture, had already won IBM 64-bit server performance and bandwidth leadership in high-end servers, with added levels of RASM and autonomic computing support, that no other server vendor could come near to matching. Today's high-end 2003 iSeries are already on the absolute leading edge, and future POWER4+ and POWER5 versions are certain to extend this lead. We comment specifically below on the next two processor chips due in the family:

  - **POWER4+** has extended POWER4's strong performance, running at higher-frequencies and providing correspondingly-scaled higher bandwidth. The chip also showed substantially reduced power consumption (*2 POWER4+ processors on a chip use just 100 watts, compared to the single processor Intel Itanium2's 130 watts*). POWER4+ is clearly the most powerful, highest performing 64-bit processor on the market from late 2002, and was the first implemented in 0.13 micron technology to ship in volume. The chip continues POWER4's complete applications compatibility with earlier Power software and can run 32-bit and 64-bit AIX, Linux 64-bit and OS/400 64-bit software. We expect select iSeries models to use POWER4+ from late 2003 to early 2004.

  - **POWER5** is near complete in design/development and will sample later in 2003, so the key features of this next-generation processor chip are already known. The chip will also be implemented in 0.13 micron technology, feature higher frequencies, and larger on-die cache. The chip is expected to deliver a big further increase in performance for commercial workloads through the first Power implementation of Simultaneous Multi-Threading (SMT), which essentially allows each processor core to run two application threads simultaneously. This has the effect of making a 2 processor POWER5 chip look to the operating system like a 4-processor SMP system, and will bring a substantial acceleration, particularly for commercial database workloads, where this thread-level parallelism means big returns. Technical workload acceleration and HPC features are also included, to enhance HPC performance/throughput. The chip's adaptive implementation will also allow rapid mode switches (*between workloads in partitioned environments*). Further improvements in dynamic heat dissipation, which link power used to customer workloads, to control heat generation, are used. As frequencies are raised, the directly linked bus bandwidths will be further increased. There will also be further integration, to cut size and cost, through an on-chip memory controller, and with the L3 cache to be integrated onto the Multi-Chip Module. Applications compatibility is maintained, as in POWER4+.

  These impressive 64-bit processor chips will carry the iSeries forward through 2004-2005 with further strong advances in system performance and capability.

- **Semiconductor Process Leadership:** IBM is exploiting its R&D, patent leadership and, in particular, its semiconductor process technology leadership to drive the POWER4, 4+, and 5 64-bit processors and beyond to these ever-higher levels of capability at a cracking pace. The POWER4 used IBM's copper interconnect wiring and Silicon On Insulator (SOI) technologies in 0.18 micron geometry to deliver its top-rank power and performance. POWER4+ took the jump to 0.13 micron geometry. IBM has already developed new Low-K- Dielectric, Strained Silicon, and NanoTube semiconductor technologies, which will successively be featured in these next POWER chips, to continue to increase frequencies, add more on-chip integration and reduce power.

- **POWER Systems Architecture Extended:** The high-end iSeries have benefited already from the balanced, ultra-high bandwidth, frequency scalable and "designed for reliability" aspects of the POWER4 systems architectures (*which we discussed in Section 7*), which complements the chip-level strengths with outstanding system-level performance and bandwidth. The roadmap indicates further substantial advances in the architecture's high-end capability, including:
  - **Up to 64-way "SMP" systems:** The current POWER4 top-end iSeries and pSeries systems support a maximum of 32 POWER4 processors, which proved ample to outperform competitor's 48 or 64-way systems from late 2001. Although practically speaking "SMP-like" the architecture is technically NUMA-based (*exploiting core expertise brought in from Sequent*). The next major step will be 64-way POWER5 systems, which the next top-end pSeries and iSeries systems will offer in the Armada box successor to Regatta from late 2004/2005. The underlying POWER NUMA architecture will scale well to support this major increase in top-end power.
  - **Memory Up to 512GB:** The current POWER4 high-end i890 can support up to 256GB of main memory. This will be increased, probably to 394GB in late 2003/2004, and again with the POWER5 Armada system to a massive 512GB in 2004/2005.
  - **DAS Support:** Direct attached storage capacity will increase from today's high-end systems 144TB, to c200TB with Armada in 2004/2005.
- **I/O Architectures:** The 2003 iSeries brought widespread support through much of the server family for the much faster PCI-X I/O technology, which is likely to be the primary iSeries technology used through 2003/2004. However, IBM has announced an iSeries commitment to using the InfiniBand I/O architecture, a high-bandwidth, channel-like, open standard I/O architecture, and we expect to see this debut in 2004/2005. InfiniBand will bring a very-high bandwidth, high-speed, point-to-point switched fabric replacement for the current iSeries I/O bus architecture, and further enhance the already strong I/O capabilities of the platform.
- **Native AIX5L on iSeries LPAR:** Convergence will bring a further major native workload to the iSeries platform in 2004, when support for running native AIX5L operating systems in an iSeries LPAR, will become available. This important further step in providing comprehensive support, on a single iSeries server, for the widest range of software workloads, will enable all existing AIX5L applications, customer or ISV, to be directly run in an iSeries partition without conversion or modification. With this move, the entire AIX5L ISV software catalogue becomes available to these iSeries customers, and AIX5L ISVs gain direct access to the iSeries customer market.
- **Linux Software:** A S.O.D has already committed IBM to deliver DB2 UDB and WebSphere Applications Server for 64-bit Linux for operation in an iSeries LPAR. This will provide the core foundation software products for substantial e-Business applications on Linux within iSeries. We also expect other enhancements to the workload and systems management arena of the Linux environment on iSeries, and the porting of other key IBM middleware products to this platform.
- **Windows Integration Enhancements:** With the 2003 iSeries, the strong Windows/Intel integration capabilities stepped centre-stage as one of the system's most important strengths. With over 90% of iSeries customers currently using multiple separate Windows/Intel servers, there is a huge business opportunity for IBM and its partners, to help customers consolidate these costly, hard-to-manage standalone systems. With proven iSeries high-availability, easy manageability and the automated storage environment, the ROI on these consolidations will be high. Users can also expect to see regular technology refreshes of the IXS and IXA servers and adapters, to keep up with the fast pace of Intel change, support for Microsoft Windows 2003, and further enhancements to iSeries workload management and monitoring facilities.
- **IBM e-Business Middleware:** With the 2003 iSeries, IBM completed the main delivery of the core e-Business, development, and enterprise management software from its IBM Software Group portfolio onto iSeries, as we discussed fully in Section 6. iSeries users will benefit from the strong rate of development on these multi-platform software foundation products, in the form of a steady flow of enhanced iSeries new releases over the period. We would also expect additional, secondary products to be ported to iSeries, to round out the suite.
- **Autonomic Advances Will Continue:** The e-Liza autonomic computing initiative, announced as part of 2000's eServer launch, has made large strides, with numerous, advanced self-healing, self-protecting, self-managing, and self-configuring technologies already developed and deployed on new eServer lines, including many on iSeries. These capabilities have already substantially improved the eServer value-proposition, and brought considerable cost-saving, QoS enhancements, staffing requirement reductions, and other benefits to users. Because these fundamental developments touch so many areas of the hardware and software, we have summarised the broad sweep of these developments to date, and into the future, in one place in this Report – Appendix C – which gives a concise overview of progress. The key future focus areas are: extending mixed workload self-management capabilities towards a more end-to-end coverage; enhanced, more comprehensive system monitoring and self-management; further security and identity management integration.

Our Analysis

We found that IBM can now show how fully applying its eServer strategies to the new iSeries has already further differentiated, brought to the technology leading edge, radically improved the price/performance/value curve of, and opened up crucial, wider new roles for the system in its target customer's infrastructure, with this major rejuvenation of the platform.

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Equally encouraging for iSeries customers, the future roadmap and path for iSeries is now clearly and strongly charted for some years ahead, and presents an impressive and attractive path. The technologies to be deployed in future iSeries over the next several years are strong, and will keep the platform at the forefront, even though its real focus remains on business integration, simplicity, solution delivery, and value, to mid-market customers.

The multiple workloads consolidation role plays a central part in the new iSeries future, so we anticipate continuing refinement and enhancement of the strong primary capabilities already delivered for this, plus the key addition of native AIX5L support.

Much of the other roadmap action will be focused on the systematic enhancement of all its key software elements, crucial with this "software machine".

Customers can also be sure of the strength of IBM's renewed commitment to this popular platform for the foreseeable future, after the strength of the 2003 Announcement and the scale of investment made behind it. There can be no possible doubt as to IBM's determination to drive this roadmap, or of its ability to execute it effectively.

Overall, we categorise this as a strong, compelling roadmap, which seems certain to help the iSeries in its quest to extend its loyal customer and partner bases, and to move outwards into new customers.

15. iSeries ISVs, Partners and Channels Lead "Take-to-Market"

Strong Partnerships – Key iSeries Asset

Applications solutions and local skills from knowledgeable ISV partners and resellers drive business server sales, particularly in the SMML heartland marketplace of iSeries. IBM's PartnerWorld program, acknowledged as the industry's strongest, includes low-thousands of iSeries partners. These range from the top applications software ISVs such as J.D. Edwards and SAP, through scores of strong industry-sector or regional ISVs and solution providers, to a large number of smaller and more specialist partners, resellers, distributors, integrators and consultants. With iSeries champion Buell Duncan leading IBM's Developer Relations effort, we expect this large partner base to renew their loyalty to iSeries, and seize the new opportunities the platform now brings them enthusiastically. Customers benefit from these close ISV-IBM relations, from applications optimised for iSeries hardware and IBM middleware software, and from partner implementation and support services. Space precludes any effort to list or cover the wealth of iSeries solutions in this Report, but Links to key sources are included in Appendix D.

iSeries Partners Enthusiastic

Many of the leading iSeries partners have already gone on record with enthusiastic endorsements and strong support for the 2003 iSeries Announcement, which they rightly see as a rejuvenating and milestone set of changes for this favorite platform which has been central to many of their businesses for years

In one important example of ISV support, Les Wyatt, Senior Vice President and Chief Marketing Officer of J.D. Edwards, the largest iSeries ISV worldwide, spoke directly to the Rochester analyst briefing. His summary view of the new iSeries and what it means to J.D Edwards' customers is worth repeating:

"The newest capabilities and options in the IBM eServer iSeries provide outstanding flexibility and price performance for J.D. Edwards' customers. IBM's new Temporary Capacity Upgrade on Demand feature augments the existing open architecture solutions in J.D. Edwards 5 and maximises the value that our software and services deliver to our customers."

With more than 85% of iSeries server sales going through partner sales channels, this enthusiastic welcome for the new family bodes well for the motivation and energy with which they will take the message to market.

Channel Training, Briefing Top Priority

To ensure this large global community of iSeries partners is quickly, effectively and deeply briefed and trained on all the new capabilities, hardware and software technology, pricing and packaging of the new iSeries, IBM has already rolled a large program of events running through the early months of 2003. These were designed to bring end customers, its own sales and technical staffs, and most particularly its iSeries partners, fully up to speed with all aspects of the Announcement. Several hundred events worldwide are scheduled, with the major PartnerWorld conference, of several thousand people, which was held in New Orleans during February 2003, as just one major example. This effort, plus an extensive set of materials, publications, and external marketing activities, are planned to support and spread the message to the market as fast as possible.

Rich Software Solutions Catalogue

The iSeries ISVs collectively provide an extraordinarily rich catalogue of business solutions and complementary software and services. Space constraints precludes any effort to list or cover the wealth of iSeries solutions in this Report, but Links to key sources are included in Appendix D.

Several key, strategic factors lie behind this richness of iSeries software solutions. One is that IBM, for many years now, has clearly and categorically excluded itself from participating in any applications software markets, and has restricted all its software efforts to the operating systems and the key enabling middleware layers of the solution stack, as we discussed in Section 6. This has encouraged thousands of ISVs to provide their applications on IBM platforms, both hardware and software, quite secure that they will not face competition from IBM for their software solution sale, and to recommend computing platforms from IBM. The iSeries, which has far the largest catalogue of third-party software solutions amongst IBM's platforms, has benefited most from this strategy.

Another is the high suitability of the iSeries platform as a delivery vehicle for robust, reliable, easy-to-manage, and easy-to-support business application processing for smaller or medium-size businesses. iSeries ISVs and resellers know their solution customers will be able to get the best from their software, and have a satisfactory ownership experience with the recommended iSeries platform, which consistently attains the highest customer-satisfaction ratings of all mid-range platforms.

A third driver is that over 85% of all iSeries systems are sold through the PartnerWorld channels of ISVs, reseller, and distributors, etc., rather than by IBM directly. Because these channels compliment and co-operate, not compete with IBM, they can build secure business models around their iSeries offerings, gain considerable help and support from the PartnerWorld program, regarded as the industry benchmark, and thus support their customers and solutions long term.

A fourth driver is the technical stability and "transition-cost-free" architecture of the iSeries software platform. The unique high-level Machine Interface of the systems, and a deep IBM commitment to stable long-term core APIs, has benefited ISV software solutions equally to iSeries customers' own applications, through the many changes in underlying hardware technology. This has meant ISVs have not faced the costly re-writes or re-architecting of their solutions on iSeries, such as those commonly required on other platforms, which reduced their business costs and risks greatly.

iSeries – A Better Software Partner Choice Than Microsoft?

One positive factor for iSeries software partners is this clear complementary approach from IBM. iSeries customers benefit from a wealth of good third-party solutions, whose providers can build a safer, more stable, long-term business model around iSeries, and thus continue to invest in their products and customer support.

The situation is quite different on the most popular Microsoft Windows platform, obviously now far the largest software marketplace. Firstly, independent vendors of complementary tools and utilities for Windows NT, Windows 2000 and soon Windows 2003, have long suffered a systematic process of disenfranchisement from Microsoft. Whenever ISV's prove significant tools or utilities niche markets exist around the standard platform, Microsoft has frequently developed its own competing software component, then either commoditised, or provided them inclusively within the platform, thereby excluded these ISV from their revenue, and thus forcing their customers to convert. This has occurred with numerous tool and utility niches, and makes addressing such gaps around the Microsoft platform a dangerous business for ISV's and their customers.

iSeries customers benefit from a wealth of good third-party solutions, whose providers can build a safer, more stable, long-term business model around iSeries, and thus continue to invest in their products and customer support.

Secondly, in their quest for new software revenue growth streams, Microsoft has now moved into applications software solution markets for the SMB sector itself. For example, Redmond's acquisitions of Great Plains (*US-focused*) and Navision (*EMEA-focused*), both leading volume ISV providers of integrated business and financial management software for smaller to medium businesses. In another area, Microsoft has developed its own CRM applications solution for SMB businesses. In these and other cases, Microsoft is now directly competing with its ISV partners in these segments, which will undoubtedly reduce the latter's business opportunities over time. It can be a fatal strategic mistake for a platform provider to compete directly with its own software partners, and Microsoft is now treading this path. Again, ISV customers in these segments may be put at long-term risk by these moves.

Thirdly, ISVs writing for the Microsoft platform (*as well as internal IT customers*), have long faced fairly frequent and costly changes to the software environment, and even to key APIs, requiring substantial re-writing of their applications at high cost. Currently, for example, the 64-bit versions of the Microsoft platform software are just emerging into the daylight. If ISVs want to fully exploit the enhanced capabilities of these 64-bit software environments, and of the Intel Itanium 64-bit processor-based hardware which they run upon, they must re-write, re-architect, convert and migrate their products to the 64-bit environment. Only then will they have a long-term, optimised solution on this new "Wintel" platform. This is a major, complex and costly undertaking. Their alternative is to use the 32-bit compatibility mode support, and run their applications as 32-bit on the 64-bit software and hardware platform, without exploiting any of its capabilities. The costs of this software migration are so high in this case, that the latter is exactly what many ISV's and customers plan to do. This "technology transition" barrier is also so high as to have clearly restricted the sales of Windows/Intel 64-bit platforms as a whole, because there are so few fully exploitative applications available, and thus few compelling reasons to move. The first generation Intel Itanium-based 64-bit servers flopped badly in the market, largely for this reason, and because their performance was insufficiently ahead of 32-bit Intel systems.

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Our Analysis

The iSeries has long boasted one of the widest and most loyal communities of partners, ISV's and resellers in the industry, who have suffered as the platform lost visibility in the market to the Wintel and UNIX juggernauts. This new 2003 iSeries has met with an enthusiastic reaction from this community, who are integral to the take-to-market approach IBM has long used with these systems. This channel clearly and rightly feels the new iSeries systems, hardware, software, workload capability, packaging and pricing give them a large new opportunity for new business in both established iSeries and new customer accounts, without the risks and challenges they would face if they focused efforts on the Wintel platform. It remains to be seen how effective the channel will be in transmitting the fairly sophisticated new iSeries messages to the target markets, and how long it will take this process to reach peak effectiveness. However, we expect the changes to arrest the slow decline in iSeries market share within 12 months, and show measurable gains over 24.

16. Our Analysis Conclusions, Recommendations

iSeries Stakes Powerful Claim for Wider Customer Footprint, Multiple Workloads Hub Role

Our assessment shows that IBM's January 2003 iSeries Announcement is, without doubt, the biggest and most far-reaching since the AS/400 launch. It reflects a wholehearted IBM commitment to the rejuvenation and future success of the iSeries platform over the long term, as a key element in the eServer strategy, and also brings much good news for both iSeries customers and business partners.

Our assessment shows that IBM's January 2003 iSeries Announcement is, without doubt, the biggest and most far-reaching since the AS/400 launch.

By strongly positioning and resourcing the platform as a strong "On Demand e-Business Operating Environment" and workload consolidation hub for its c250,000 small, medium and large business enterprise customers, IBM is staking a powerful and cogent claim for iSeries to occupy a much wider footprint in these customer sites. It extends long-proven iSeries strengths as the most reliable, efficiently manageable, TCO cost-effective, and now fully-virtualised, business systems server. It now far extends these benefits beyond traditional OS/400 OLTP workloads. Now the platform supports new e-Business Java applications built upon the WebSphere software infrastructure, can tightly integrate customers' Windows workloads under iSeries control, provides Linux under LPAR partitions, and can even support AIX UNIX applications (*ported and run under OS/400 PASE today, native under AIX 5L in an LPAR in 2004*).

Successful earlier customer experience with some of these capabilities (*LPAR deployment/Windows integration*) has already shown strong demand for, and good uptake of, these concepts, and these is no doubt these 2003 extensions will accelerate this process.

Bid for Growth Will Reassure Customers, Enthuse Business Partners

The Announcement highlights summarised previously, together with the extensive marketing and ISV/Partner re-energising plans disclosed to analysts, show that IBM is determined to preserve, enthuse, and extend its huge iSeries customer base and partner community. With this strong, new generation of the platform, we now consider this effort is likely to succeed, and that, over the next several years, we will see:

- Renewed enthusiasm, increased numbers of new application developments, and growing volumes of workload consolidation amongst the existing iSeries client base, with a renewed strength of connection to IBM.
- A major boost to the large iSeries ISV/resellers/partners community, certain to further increase their enthusiasm for, confidence in, and commitment to, the iSeries platform, versus others they support. We expect this will accelerate extended sales to the base, and lead to increasing numbers of new-account wins from partner business solution-led sales.
- In particular, we expect to see fast-climbing numbers of iSeries users managing multiple workloads and environments (*OS/400, WebSphere, Windows, Linux, and later AIX*) through this available, reliable and manageable platform. The technology is right up in the vanguard with (*or ahead of*) any in the industry. As users, and the ISV/partner community which supports them, fully appreciate, and learn to exploit, the strong savings, benefits, and new business edge, etc., that this iSeries "consolidation hub" can bring them, its reputation and sales will rise.

Over time, these trends will improve the overall market visibility, share and reputation of the iSeries, and, we expect, will achieve for it a similar re-rating as the mainframe has already gained. We expect the platform, with its strong Linux support, will gain share from the other fading mid-range business platforms, such as HP's terminating 3000/MPE & Alpha systems, and the aged OpenVMS community, but more broadly from UNIX business platforms, including Sun's Solaris. It will also embrace and enfold customers' Windows/Intel inventory, bringing the superior consolidation, integration and management these distributed systems so desperately need.

Radical Repackaging, Pricing Transforms iSeries Initial Costs – Cost³ #1 Falls Sharply

IBM has wisely also made a full-frontal attack on the traditional iSeries initial pricing models and constraints, which have perhaps hindered the platform in the past. At the base system hardware/OS level, price equality with the highly-competitive pSeries UNIX-systems has now been achieved with the higher-end iSeries, when the inclusive DB2 UDB relational database is considered. The disliked and complex iSeries software tiers, which were previously linked (*and priced*) to CPW capacity, have been swept away, with now just a single software tier per model, usually lower than the previous average, bringing important layered software cost reductions, and no future upgrade costs. The unlimited Interactive CPW provided on the Enterprise Editions will also be greatly welcomed by high-volume OLTP users.

The well-reviewed WebFacing software tool, together with the elimination of Interactive CPW charges on Web-adapted 5250 applications, will encourage a new wave of "green-screen" OS/400 application modernisations within the established customer base, which will prolong these applications' useful lives for many years at modest cost.

The extensive, packaged IBM e-Business middleware and systems management tools, provided inclusive in the Enterprise Editions, deliver good software value, encourage the development of new-generation Java e-Business applications on the platform, and further enhance its already strong manageability.

The scalability of, and incremental upgrades available for, all system resources will ensure long-service lives for iSeries systems. These, together with the sophisticated Permanent and Temporary CUoD, will allow customers to run their iSeries heavily loaded, without having to pre-buy large amounts of capacity. Yet they will also be able to respond quickly to demand steps or spikes with the dynamic addition of processors, dynamic changing of LPAR resources, or the physical, on-site, hot-swap addition of extra HDD, I/O and Intel server resources from inventory. This will enable customers to better match capacity and cost to their changing business needs.

These packaging and initial pricing changes are substantial and well judged. They will greatly help iSeries champions, both at customer sites, and in ISV/partners, make the iSeries case against the frequent (*and often spurious*) "Windows or Linux/Intel or UNIX are cheaper upfront" assumptions. These have been so prevalent in recent years, and were hard to combat before.

With an entry-level i800 Value Edition starting at only $9,995, initial cost can hardly be a barrier, for even very-small businesses, to begin to enjoy iSeries strengths and benefits.

Good Operating Cost Profile Further Strengthened – Cost³ #2 Lead Extended

The initial price changes above also translate directly to lower on-going operating costs of hardware and software maintenance. The many productivity, automation and manageability advances of new iSeries will also bring further operating cost reductions for customers, and improve the already superior staff/server ratio. The high reliability of the platform translates directly to low business downtime/interruption costs, and its high-technology specification and quality ensures a longer service life for new iSeries systems, providing lower depreciation costs on the investment than for other mid-range alternatives. iSeries consolidation of Windows and Linux workloads can also provide major ongoing operating cost savings over the notoriously high costs of distributed Windows and UNIX systems, which 90% of iSeries customers also use. These advances will bring a strong reduction in already favourable iSeries operating costs, and extend its lead in this vital aspect.

A "Technology Transition" Cost-Proof Platform – Cost³ #3 Continues Unrivalled

iSeries was already the only fully 64-bit system on the market, in which not only the hardware, the operating system, the middleware, but also, crucially, all migrated customer applications, were instantly fully 64-bit-enabled and exploitative, but which imposed almost no transition costs on the migrating iSeries users. Customers moving workload onto 64-bit iSeries were able to make this major transition without re-architecting or rewriting, or even recompiling, their OS/400 applications. Contrast this with the nightmare faced by HP sunset platform customers using the HP3000 proprietary, or Compaq TruUNIX Alpha systems, whose roadmap is to migrate to HP-UX, Linux or even Windows, on HP's Itanium-powered 64-bit servers. Their workloads will require almost complete re-design, rewriting and recompilation for these incompatible processor, server hardware, operating system, and software architectures, a cost and effort most of them could never face. Little surprise that many of the former group are turning to iSeries to escape from such nightmares.

What enables this remarkable technology independence in iSeries? The fundamental iSeries system architecture, of a high-level Machine Interface, to which all user application and OS/400 services communicate, supported by a large kernel (*the SLIC – System Licensed Internal Code*), which handles all interactions with the hardware, is the key. It means all the underlying hardware technologies can change, and provided the SLIC is modified to support them, customer applications are entirely unaffected. This truly unique capability has underpinned the 24-year life of the System 38/AS/400/iSeries family, through numerous hardware technology advances, without imposing high transition costs on customers. Such a claim cannot be made by any other platform.

For the future, iSeries customers can look forward to the benefits of InfiniBand, POWER4+, 5, and 6, etc., processors, and even a longer-term move to 128-bit architectures, with the absolute confidence they will be able to take advantage of these capabilities without almost no transition costs. They can avoid the crushing and unmanageable burdens faced by users of other architecture systems, which all require massive re-writing for each such technology discontinuity.

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Customer Recommendations

We can now strongly encourage existing iSeries customers to continue and extend their commitments to this most effective business platform, secure in the clear knowledge of IBM's long-term strategic commitment to its success. They can also be confident that it now offers an outstanding set of technologies, and an invaluable ability to bring its undoubted reliability and manageability to bear on the consolidation of problematic and costly-to-run Windows and UNIX distributed computing environments, which most are also using. It also offers an exceptionally attractive future roadmap, with substantial advances well charted, so the strategic risk is low. The new iSeries software infrastructure offers these enterprises a well-integrated, modern and powerful set of software to aid their transition towards e-Business and the Web, whether with simple WebFacing modernisation of traditional applications, or for the building of new generation, Java-based Web applications or services.

The platform is therefore ideally equipped to help users move up the e-Business curve shown in Figure 39.

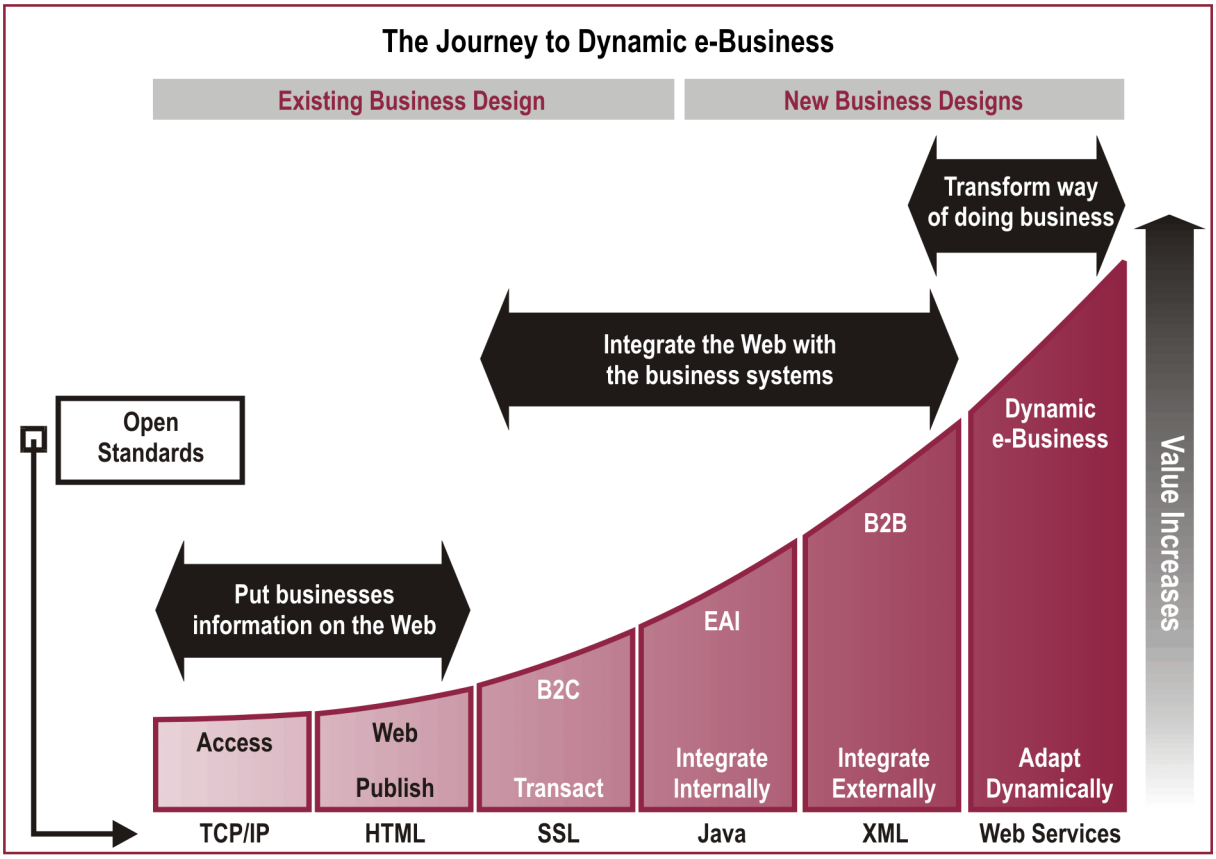

Figure 39 – The Journey to Dynamic e-Business

The radical re-pricing and repackaging will make the investment decisions to extend iSeries footprints, and to replace aging existing systems, most compelling. We strongly recommended users to evaluate/consider deploying new iSeries systems for such new requirements, for their upgrade or replacement needs, as well as for consolidation, in 2003.

Other business users and service providers currently planning upgrades or expansion of their distributed Windows/Intel, RISC UNIX IT infrastructures, or considering stronger deployment of Linux solutions, would be well advised to take a close look at what iSeries can now offer. The savings it could bring as a consolidation hub of unique strengths, even where no traditional OS/400 workloads are involved, are most attractive.

The "On Demand" features of the platform offer a compelling way to allow customers to match system capacity and cost to business demands as and when needed, which will help greatly in these cost-pressured times.

Will iSeries Stop the Intel/Windows Juggernaut?

Over 80% of servers by number shipped in 2002 used Intel processors, and some 45% of all servers sold ran Microsoft operating systems. The rise of industry-standard servers and software continues, driven by their increasing capability and "Wintel economics" price/performance gains. However, despite improvements, these systems still provide a relatively weak business systems platform, impose high hardware and software component-integration costs, usually deliver low QoS, and require much more staff, and staff-related, operating costs. These burdens almost invariably far outweigh their low initial costs, if measured over a system lifecycle. Linux is increasingly providing a real software platform alternative to the Microsoft hegemony, and at lower software costs, but when used on commodity Intel hardware, lacks many of the credentials of a real, fully-integrated business systems platform today. Against these statistics, new iSeries, however good, is not going to roll back the Intel juggernaut or the Microsoft titan. However, like the rejuvenated mainframe in its separate market, there is a large, continuing and growing market opportunity amongst the world's SMML business enterprises.

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They continue to need, and prefer, a business-optimised, fully pre-integrated, reliable and manageable core "e-Business On Demand" hub platform. When the base prices of an iSeries are now no higher than the best UNIX systems, the lifecycle costs are much better, the overall technology is superior, and the IBM brand assures best long-term support, the choice is clear. Expansion of the iSeries customer base will come mainly from new application solution sales by ISV partners as always. iSeries can also substantially expand its footprint in its large customer base with the new roles of "managing their Windows better than Microsoft" and "running their Linux better than Intel can."

Appendix A – New iSeries: Detailed Specification Tables

Figure A1 – 2003 iSeries Basic Hardware Specifications

Mod.	Detail	Max. No. Of CPU	64 Bit RISC Proc.	Dynam LPAR	CPU CUoD	Mem Min	Mem Max	DAS Disc Max Cap.	DAS Max No HDD	I/O Type	No. I/O Slots Stnd.	No. I/O Slots Max.	Max I/O Exp Towers	Max IXS.	Max IXA.	Max Comm Lines	DVD	Format
i890	24/32-CPU	24-32	POWER4	Yes	Yes	8GB	256GB	144TB	1-2047	PCI-X	14	672	47	48	60	NA	Yes	Mainframe
i890	16/24 CPU	16-24	POWER4	Yes	Yes	8GB	256GB	144TB	1-2047	PCI-X	14	672	47	48	60	NA	Yes	Mainframe
i870	8/16 CPU	8-16	POWER4	Yes	Yes	8GB	128GB	144TB	1-2047	PCI-X	14	672	47	48	60	NA	Yes	Mainframe
i825	3/6 CPU	3-6	POWER4	Yes	Yes	1GB	64GB	58TB	1-825	PCI-X	7	263	18	36	18	320	Yes	Mid Tower
i810	2,700 CPW	1-2	S-STAR	Yes	No	512MB	16GB	14TB	1-198	PCI	7	63	4	13	7	194	Yes	Sml Tower
i810	1,450 CPW	1-2	S-STAR	Yes	No	512MB	16GB	14TB	1-198	PCI	7	63	4	13	7	194	Yes	Sml Tower
i810	1,020 CPW	1-2	S-STAR	Yes	No	512MB	16GB	14TB	1-198	PCI	7	63	4	13	7	194	Yes	Sml Tower
i800	Advanced	1	S-STAR	Yes	No	256MB	8GB	4TB	1-63	PCI	7	21	1	4	3	62	Yes	Sml Tower
i800	Standard Ed.	1	S-STAR	Yes	No	256MB	8GB	4TB	1-63	PCI	7	21	1	4	3	62	Yes	Sml Tower
i800	Value Ed.	1	S-STAR	Yes	No	256MB	8GB	4TB	1-63	PCI	7	21	1	4	3	62	Yes	Sml Tower

Hardware Specifications Common across Standard & Enterprise Editions (*i810, i825, i870, i890*)

Figure A2 – 2003 iSeries Key Functional Capabilities, CPW, by Edition

Mod.	Version	Multiple OS Support	Dynamic LPAR Max.	LPAR Max. /CPU	Max. Linux LPAR	Processor CUoD				CPW Min.	CPW Max.	Interact. 5250 CPW	WebF. 5250 CPW	IBM Ent. S/Ware Bundle	Intel IXS Inc.	Linux CPU Activ. Inc.
						CUoD	Base CPU	CUoD CPU	CUoD Type							
i890	Enterprise	Yes	32	10	31	Yes	24	8	P & T	29,300	37,600	Unlimited	Unlimited	Full	Yes	Yes
i890	Standard Ed.	Yes	32	10	31	Yes	24	8	P & T	29,300	37,600	Charge	Unlimited	No	No	No
i890	Enterprise	Yes	32	10	31	Yes	16	8	P & T	20,000	29,300	Unlimited	Unlimited	Full	Yes	Yes
i890	Standard Ed.	Yes	32	10	31	Yes	16	8	P & T	20,000	29,300	Charge	Unlimited	No	No	No
i870	Enterprise	Yes	32	10	31	Yes	8	8	P & T	11,250	20,000	Unlimited	Unlimited	Full	Yes	Yes
i870	Standard Ed.	Yes	32	10	31	Yes	8	8	P & T	11,250	20,000	Charge	Unlimited	No	No	No
i825	Enterprise	Yes	32	10	31	Yes	3	3	P & T	3,500	6,600	Unlimited	Unlimited	Full	Yes	No
i825	Standard Ed.	Yes	32	10	7	No	3	3	P & T	3,500	6,600	Charge	Unlimited	No	No	No
i810	Enterprise	Yes	8	4	7	No	2	NA	NA	2,700	2,700	Unlimited	Unlimited	WAS	No	No
i810	Standard Ed.	Yes	8	4	3	No	2	NA	NA	2,700	2,700	Charge	Unlimited	No	No	No
i810	Enterprise	Yes	8	4	3	No	1	NA	NA	1,450	1,450	Unlimited	Unlimited	WAS Exp.	No	No
i810	Standard Ed.	Yes	8	4	3	No	1	NA	NA	1,450	1,450	Charge	Unlimited	No	No	No
i810	Enterprise	Yes	8	4	3	No	1	NA	NA	1,020	1,020	Unlimited	Unlimited	WAS Exp.	No	No
i810	Standard Ed.	Yes	8	4	3	No	1	NA	NA	1,020	1,020	Charge	Unlimited	No	No	No
i800	Advanced	Yes	4	4	3	No	1	NA	NA	950	950	50	Unlimited	WAS Exp.	No	No
i800	Standard Ed.	Yes	4	4	3	No	1	NA	NA	300	300	25	Unlimited	No	No	No
i800	Value Ed.	Yes	4	4	3	No	1	NA	NA	300	300	25		No	No	No

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Figure A3 – 2003 Series Inclusive Software by Model

Mod.	Version	OS/400	DB2 UDB	WAS V5.0 AS	WAS Expr. V5.0	WSDc	WebF. Tool	Lotus Same-Time	Lotus Quick-Place	DB2 Query Mngr.	SQL Devt. Kit	DB2 SMP	Data Prop.	DB2 Ext.	Perf. Tools	HA Switch Res.	Media Store Ext.	BR MS	Tivoli Monitor PAC WS	Tivoli Storage Manager
i890	Ent. Ed.	Yes	Yes	Yes	Yes	Yes	Yes	100	100	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
i890	St. Ed.	Yes	Yes	No	No	Yes	Yes	0	0	No	No	No	No	No	No	No	No	No	No	No
i890	Ent. Ed.	Yes	Yes	Yes	Yes	Yes	Yes	100	100	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
i890	St. Ed.	Yes	Yes	No	Yes	Yes	Yes	0	0	No	No	No	No	No	No	No	No	No	No	No
i870	Ent. Ed.	Yes	Yes	Yes	Yes	Yes	Yes	100	100	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
i870	St. Ed.	Yes	Yes	No	No	Yes	Yes	0	0	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
i825	Ent. Ed.	Yes	Yes	Yes	Yes	Yes	Yes	100	100	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
i825	St. Ed.	Yes	Yes	No	No	Yes	Yes	0	0	No	No	No	No	No	No	No	No	No	No	No
i810	Ent. Ed 2,700	Yes	Yes	Yes	Yes	Yes	Yes	0	0	Yes	Yes	No	No	No	Yes	No	No	No	No	No
i810	St. Ed 2,700	Yes	Yes	No	No	Yes	Yes	0	0	No	No	No	No	No	No	No	No	No	No	No
i810	Ent. Ed 1,450	Yes	Yes	Yes	Yes	Yes	Yes	0	0	Yes	Yes	No	No	No	Yes	No	No	No	No	No
i810	St. Ed 1,450	Yes	Yes	No	No	Yes	Yes	0	0	No	No	No	No	No	No	No	No	No	No	No
i810	Ent. Ed 1,020	Yes	Yes	Yes	Yes	Yes	Yes	0	0	Yes	Yes	No	No	No	Yes	No	No	No	No	No
i810	St. Ed 2,700	Yes	Yes	No	No	Yes	Yes	0	0	No	No	No	No	No	No	No	No	No	No	No
i800	Adv. Ed.	Yes	Yes	No	Yes	Yes	Yes	0	0	No	No	No	No	No	No	No	No	No	No	No
i800	St. Ed.	Yes	Yes	No	Yes	Yes	Yes	0	0	No	No	No	No	No	No	No	No	No	No	No
i800	Val. Ed.	Yes	Yes	No	No	No	Yes	0	0	No	No	No	No	No	No	No	No	No	No	No

Figure A4 – 2003 I/O Expansion Units Options & Capacities

I/O Expans. Unit	Type	Rack Version	Size	Fitment	Max. No. HDD	Max. No. PCI-X IOA	No. HSL Used	iSeries Servers
# 5095	PCI-X Expansion Tower	# 0595		Floor	12	7	1	i800, i810, i825, i870, i890
# 0595	PCI-X Expansion Rack Unit	Rack Unit		Rack Only	12	7	1	i800, i810, i825, i870, i890
# 5094	PCI-X Expansion Tower	NA	0.9M	Floor	45	14	1	i800, i810, i825, i870, i890
# 0588	PCI-X Expansion Rack Unit	Rack Unit		Rack Only	0	14	1	i800, i825, i870, i890
# 5294	PCI-X Expansion Tower	NA	1.9M	Floor	90	28	2	i810, i825, i870, i890
# 5088	PCI-X Expansion Unit	# 0588		Atop	0	14	1	i810,i825, i870, i890

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Appendix B – iSeries, a Distinctive, Enduring Architecture

Only iSeries Unique Architecture Allows

The distinctive iSeries capabilities this Report covers stem from the long-standing underlying architecture of the iSeries systems. For unfamiliar readers, this brief primer may help. Experts may wish to skip to the next section!

iSeries, and its predecessors, were all built to 5 "sacred principles":

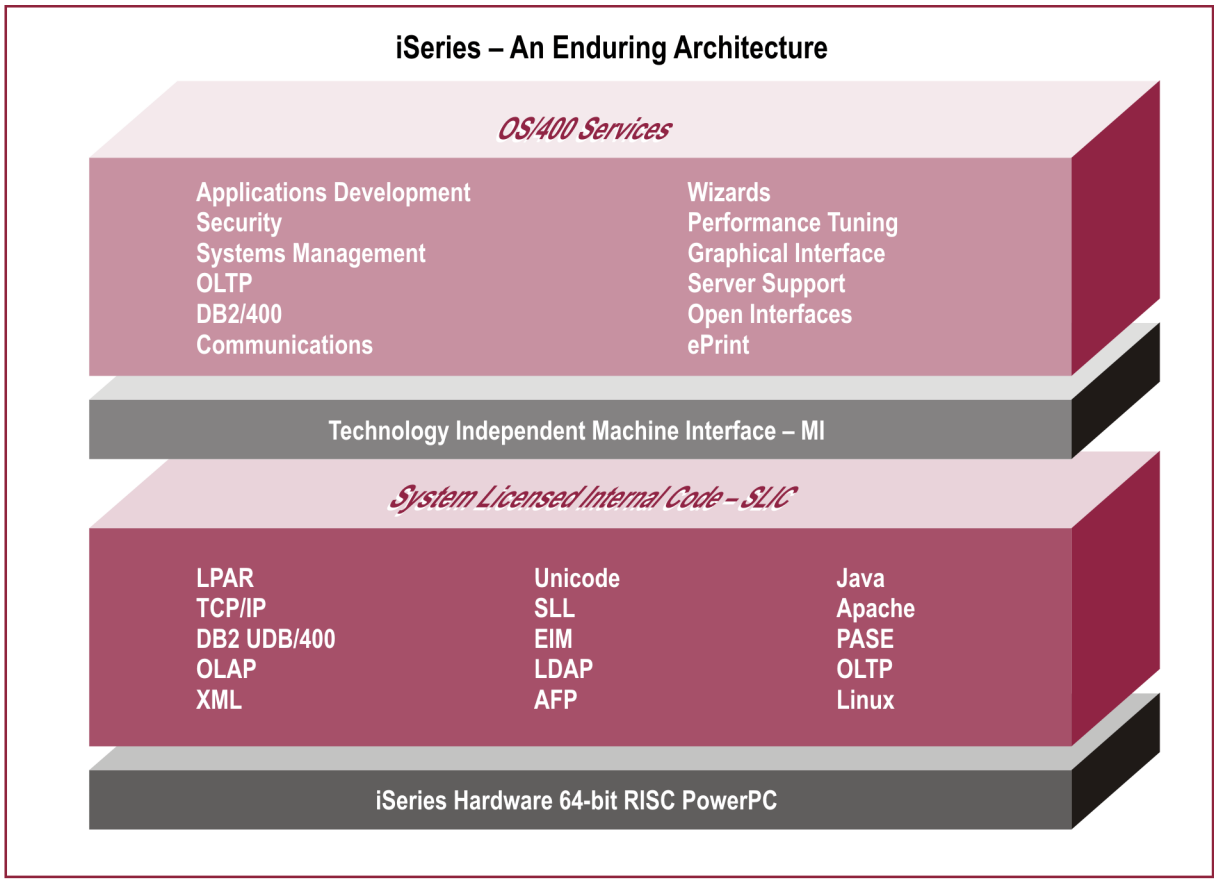
1. **Technology independence.**
2. **Object-based design throughout.**
3. **Hardware integration.**
4. **Software integration.**
5. **Single-level store for memory and disk.**

We briefly summarise how these principles are implemented, and why they are so important for customers, below:

1. Technology Independence

This is achieved by iSeries' high-level Machine Interface. OS/400, other middleware, and all customer applications, speak only to this MI, and are completely unaffected by any changes to underlying hardware. The MI speaks to the hardware through a large operating system kernel, called the Systems Licensed Internal Code (SLIC), which IBM modifies to support the latest hardware and kernel software functions. This software-defined architecture completely preserves customers' application investments, with near-zero user costs for hardware technology transitions, and we discuss a recent major example of this in Section 16 at the end of this Report. The architecture is depicted in Figure B1.

Figure B1 – iSeries: Enduring Architecture



It can clearly be seen that the SLIC is a "fat kernel", with internal support for many of the core services of the operating system, which do interact with the hardware. OS/400 by contrast really provides as set of high-level software services that are fully insulated by the MI. The combination of OS/400 & SLIC provides the overall operating system functionality.

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2. Object-Based Design Throughout

The architecture was also an early pioneer of object-based design, where everything within the system is treated as an object, each having a descriptive and a data part. The invaluable advantage is that only valid operations for an object of that type are permitted, which underpins the extraordinarily high security of the iSeries.

3. Hardware Integration

Hardware integration meant designing and optimising iSeries for its intended data-intensive, commercial computing and business systems role, with the strongly balanced processor power, high-bandwidth, strong I/O capability and rapid task-switching vital for such workloads. We discussed the current iSeries hardware integration in Section 7.

4. Software Integration

Software integration meant providing the entire key software infrastructure required for its designated business role with the system as standard, all optimised for its architecture, pre-tested, and well integrated. The best known example is the in-built, inclusive RDBMS, now called DB2 UDB for iSeries, which has been at the core of the design since the introduction of System 38.

5. Single-Level Store

With the single-level store, the iSeries treats all customer data and programs, whether physically held in memory or on disk, as logically held in its massive 64-bit address space of 10 quintillion bytes. The system automatically manages all aspects of accessing the underlying data wherever it is, with user references only by name. This has profound benefits in transparently automating many aspects of memory and storage management, that are visible and intrusive to users on other systems, and also brings the iSeries extraordinarily fast task switching (*essential for commercial workloads*). In Windows or UNIX, for example, task switching involves loading a new address space to execute a new task, a relatively large and slow operation. Single-level store also underpins the advanced storage virtualisation capabilities we discussed previously.

For fuller coverage, there are two outstanding books on the systems, written by their main architect – iSeries Chief Scientist, Dr Frank Soltis. Entitled *"Inside the AS/400", and "Fortress Rochester – The Inside Story of the IBM iSeries"*, this analyst and other reviewers rate these as two of the finest inside accounts of major computer systems development ever published and both are strongly recommended reading.

Appendix C – IBM eServer e-Liza Autonomic Computing Initiative

Progress and Plans Highlights 2000-2003

Many analysts were somewhat sceptical of the IBM eServer announcement of September 2000, and of the much-vaunted e-Liza autonomic computing initiative which accompanied it. The latter aimed to differentiate IBM eServers by making them self-optimising, self-healing, self-configuring, and self-protecting. The broad and ambitious goal was the automation of e-infrastructure, to drastically cut customer staff and operating costs, improve reliability and availability, make servers self-configuring and managing, and even more secure.

Now, in Q1 2003, just 30 months later, we can see that dramatic progress has actually been made to implement the e-Liza vision, with extensive autonomic capabilities already a reality in all four areas with the new eServer systems since delivered. The table below highlights some of these key developments, and their time-lines, with those supported in the 2003 iSeries marked with a *. These autonomic technologies are genuinely differentiating IBM eServer systems from their respective competitors by a rapidly increasing margin, through to the increasingly superior customer ownership experience these capabilities allow.

Figure C1 – Selected IBM Autonomic Computing Advances 2000-2003 (*those marked * on iSeries*)

2000/2001	2002	2003+
Self-Optimising = Dynamic Service Level Attainment > Goal: Heterogeneous Workload Management		
zSeries Intelligent Resource Director Clustering* Dynamic LPAR * iSeries LPAR Enhancements* Workload Management* Quality of Service* Smart DB2*, WebSphere* e-Business Management Services	Enterprise Workload Manager* Application Monitoring & Reporting Networking Policy-based QoS iSeries P4 dLPAR Enhancements* Intelligent Agent Support (ABLE) Storage Tank	Performance Management of Distributed Applications
Self-Healing = Business Continuance > Goal: End-to-End Automation:		
Virtual IP Takeover* LightPath Diagnostics (pSeries) Chipkill, ECC Memory, Dynamic bit Steering (pSeries) Automatic De-allocation CPUs (pSeries) Virtual Help Desk RAID, Flashcopy Linux Clustering	Automated System Health Monitoring* LightPath Diagnostics (xSeries) Online Replacement of Memory & Processors Chipkill, ECC Memory, Dynamic bit Steering (x & iSeries)* Automatic De-allocation CPUs (x & iSeries)* Kernel Hot Patching Hot Spare Support Linux Automation Manager*	End-to-End Automation Manager for eServer
Self-Configuring = Define "on-the-fly" > Goal: End-to-End Systems Management		
p Series Regatta Enterprise X Architecture Hot Swappable Disks, PCI, PCI-X* Wireless System Configuration - SNAP Auto discovery & update of firmware Fibre Channel login	iSeries Regatta* Integrated Linux and W2000 Support* Storage Tank HW & OS Monitoring (CIM)* Wireless/Web System Mgmt. Consolidated Monitoring	HW & OS Monitoring (CIM) Wireless/Web System Management Consolidated Monitoring InfiniBand
Self-Protecting = Safeguard Assets > Goal: End-to-End Security Management:		
Virtual Help Desk Self-protecting kernel* Digital Certificates* Enhanced encryption* LDAP enhancements* IBM Tivoli Identity Manager Security & Privacy Svc	Enterprise Identity Management* Security Wizards PAM & PKI Cross Platform Support* IBM Tivoli Risk Manager	Authenticated Identity Translation Services

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Links for Further Information

IBM Corporation:	www.ibm.com/us/
IBM iSeries Servers:	www-1.ibm.com/servers/eserver/iseries/
IBM 2003 iSeries Announcement:	www-1.ibm.com/servers/eserver/iseries/announce/
IBM iSeries Servers i800, i810:	www-132.ibm.com/content/home/store_IBMPublicUSA/en_US/eServer/iSeries/hardware/smallmed/
IBM iSeries i825, i870, i890:	www-132.ibm.com/content/home/store_IBMPublicUSA/en_US/eServer/iSeries/hardware/medlarge/
IBM iSeries Editions:	www-1.ibm.com/servers/eserver/iseries/hardware/editions/
IBM iSeries On Demand:	www-1.ibm.com/servers/eserver/iseries/ondemand/
IBM iSeries CUoD:	www-1.ibm.com/servers/eserver/iseries/ondemand/cuod/index.html
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IBM iSeries AD Tools Software:	www-3.ibm.com/software/ad/wdt400/
IBM iSeries Systems Management:	www-1.ibm.com/servers/eserver/iseries/software/#sys
IBM iSeries Domino:	www-1.ibm.com/servers/eserver/iseries/domino/
IBM iSeries Web Enablement/ Collaboration:	www-1.ibm.com/servers/eserver/iseries/software/#web
IBM iSeries Navigator:	www-1.ibm.com/servers/eserver/iseries/navigator/
IBM iSeries WebSphere Apps Server:	www-1.ibm.com/servers/eserver/iseries/software/websphere/wsappserver/
IBM iSeries DB2 UDB:	www-1.ibm.com/servers/eserver/iseries/db2/
IBM iSeries BRMS:	www-1.ibm.com/servers/eserver/iseries/service/brms/
IBM iSeries Services:	www-912.ibm.com/supporthome.nsf/document/18454618
IBM iSeries iNation:	www-1.ibm.com/servers/eserver/audience/Homepage.wss?view=ination
IBM eServer University:	www-1.ibm.com/servers/eserver/education/index.html?true/false/false/false/
IBM iSeries Red Books:	www.publib-b.boulder.ibm.com/Redbooks.nsf/portals/as400
iSeries Magazine:	www.eservercomputing.com/iseries/
IBM iSeries Information Center:	www-1.ibm.com/servers/eserver/iseries/library/
IBM iSeries ISV Solutions:	www-1.ibm.com/servers/solutions/iseries/
IBM PartnerWorld Program:	www-1.ibm.com/partnerworld/pwhome.nsf/weblook/sel_index.html
iSeries Analyst Papers:	www-1.ibm.com/servers/eserver/iseries/conslt/
IBM HP/3000 To iSeries Portal:	www.eservercomputing.com/iseries/
HP HP/3000 & MPE Servers:	www.hp.com/products1/mpeixservers/index.html/
HP OpenVMS:	www.openvms.compaq.com/l
HP Alpha Servers:	h18003.www1.hp.com/hps/
Software Strategies:	www.software-strategies.net

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Glossary of Terms

64-bit:	Computer word size of 64-bit, as in Intel IA-64 architecture or IBM POWER4.
5250:	5250 terminal, the standard "green-screen" terminal used on the iSeries & predecessors.
AD:	Applications Development, generic term for process of building applications.
ADE:	Applications Development Environment. Suite of software for AD process.
ADST:	(*IBM iSeries*) Application Development System Tools. An earlier AS/400 ADE.
AIX:	IBM UNIX operating system used on RS/6000 and pSeries servers.
AIX5L:	Latest generation of AIX, 64-bit operating system with strong Linux affinity.
Alpha:	(*HP/Compaq*) 64-bit computer processor chip series, developed by Digital.
Alpha Servers:	(*HP/Compaq*) 64-bit servers using Alpha chip, to be phased out for Itanium2 systems.
Apache:	Popular open source HTTP server, associated with Linux.
Armada:	(*IBM*) Code name for high-end POWER5 server box, for iSeries and pSeries expected by 2005.
AS/400:	(*IBM*) proprietary mid-range business computer system line (*now iSeries*).
ASP:	Applications Service Provider/Provision.
ASP:	Attached Storage Pool – iSeries storage term.
ATL:	Automated Tape Library.
Autonomic:	*(IBM*) term for intelligent systems with self-healing, self-monitoring, self-protecting and self-managing capabilities. See also e-Liza.
B2B:	"Business-to-Business". Form of e-business – between enterprises.
B2C:	"Business-to-Customer". Form of e-business – from business to customer.
B2E:	"Business-to-Employee". Form of e-business – from business to employee.
B2E:	"Business-to-Enterprise". Form of e-business – from business to enterprise (*Intranet*).
BI:	Business Intelligence.
BRMS:	(*IBM iSeries*) Back-up & Recovery Management Services. Standard iSeries back-up software suite.
CC:	Cache Coherence – A term describing the need and/or mechanism used in a multiprocessor system with processor cache memories to maintain coherence of what is in cache and main memory. See also L1/L2/L3 cache.
CC NUMA:	Server architecture. Cache Coherent Non-Uniform-Memory Architecture.
CAGR/CADR:	Compound Annual Growth/Decline Rate.
CEC:	(*IBM*) Central Electronic Complex. Term describing core electronics of a server/computer.
CEO:	Chief Executive Officer.
CFO:	Chief Financial Officer.
Chipkill™:	(*IBM*) Memory protection beyond ECC, reducing server outages from memory errors.
ClearPath:	(*Unisys*) lines of enterprise server/mainframe computers.
CIO:	Chief Information Officer.
Cluster:	A group of interconnected computer systems able to operate to some degree as a single image system.
CODE/400:	(*IBM iSeries*) Legacy ADE for AS/400 & iSeries.
CPW:	(*IBM iSeries*) Commercial Processing Workload. Standard benchmark test used to rate iSeries OLTP/DB capacity.
CPU:	Central Processing Unit – The brain of a computer, also known as the processor or central processor.
CRM:	Customer Relationship Management – Sales and marketing support applications.

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CUoD:	Capacity Upgrade on Demand. Capability whereby server customers may quickly purchase preinstalled extra resources when needed.
Cu:	Copper, used as a higher-performance chip connection metal, in place of usual aluminium.
DAS:	Directly Attached Storage, to a server.
DASD:	(*IBM*) Direct Access Storage Device, disk system.
DBA:	DataBase Administrator, support staff person managing databases.
DB2:	(*IBM*) Relational DBMS. DB2 UDB is the standard, built-in, inclusive RDBMS on iSeries.
DBMS:	DataBase Management System.
DDR:	Double Data Rate, term for newer type of faster SDRAM memory.
DIMM:	Dual Inline Memory Module. Standard package for memory.
dLPAR:	*(IBM*) Dynamic Logical Partitioning. Advanced LPAR technology where resources can be dynamically added/removed on-line.
DNS:	Domain Name Server or Service: Internet term.
DR:	Disaster Recovery. Business term used to refer to system configurations able to recover from disaster loss of key component, e.g. a data centre.
DSD:	(*IBM iSeries*) "Dedicated Server for Domino". Special packaged iSeries servers with Domino software for mail and collaboration.
DW:	Data Warehouse. A collection of data designed to support management decision-making. Data warehouses contain a wide variety of data that present a coherent picture of business conditions, often with history data.
ECC:	Error Collection and Correction, fault detection process usually applied to memory.
Eclipse:	Industry open AD workbench standard.
EE:	(*IBM iSeries*) Enterprise Edition packaged iSeries server (*2003*).
EIM:	(*IBM)* Enterprise Identity Mapping. New single-sign on security feature in 2003 iSeries.
EJB:	(*Sun*) Enterprise JavaBean. Java software component.
e-Liza:	*(IBM*) Long-range initiative to bring self-diagnosing, self-healing, self-monitoring and self-managing capabilities from high-end systems to other eServer systems. Also termed autonomic computing.
eServer:	(*IBM*) Generic new brand name for all IBM server lines, introduced September 2000.
Enterprise Server:	Large commercial computer of mainframe power, but built with lower cost technologies.
ERP:	Enterprise Resource Planning applications software.
ESS:	(*IBM*) Enterprise Storage System.
ESV:	Enterprise Systems Vendor.
Gb:	Gigabit. 1000 megabits.
Gbps:	Gigabit per second. As in Gigabit Ethernet, 1000 megabits per second.
GB:	GigaByte – 1,073,741,824 bytes (*1024 MegaBytes*), a measure of disk or memory.
GBps:	GigaBytes per second, a measure of bandwidth.
GHz.:	1,000MHz. A measure of frequency or clock speed, here applied to processors or buses.
Globus:	New open-industry standard for Grid Computing. As in Globus Toolkit 2.0.
Grid:	New type of federated, multi-system computer resource or utility.
HA:	High Availability. Generic term for system, service or component of above average reliability.
HDD:	Hard Disk Drive.
HP:	Hewlett-Packard.
HS:	Hot-Swap. Refers to system component, which may be added to a running system.

HSL:	(*IBM iSeries*). High-Speed-Link. High speed inter-iSeries systems interconnect link.
HTTP:	HyperText Transfer Protocol
HyperThreading:	(*Intel*) Enables the processor to run two threads simultaneously, or the OS to view the processor as two.
I/O:	Input/Output.
IA:	Itanium Architecture – The architecture of Intel's new generation of 64-bit systems, of which Itanium was first instance. (*Previously called IA-64.*) Can address up to 16TB.
IA-32:	Long established Intel architecture for its 32-bit processor families, including Pentium and Xeon™ processor lines. Can address <4GB.
IA-64:	See above.
IGS:	IBM Global Services Division.
InfiniBand I/O:	Next generation I/O and interconnect architecture. IBM a key supporter.
IOP:	(*IBM iSeries*) Input/Output Processor, specialised I/O processor.
IOA:	Input/Output Adapter.
IP:	Internet Protocol, the increasingly dominant networking standard(s) of the Internet.
IPF:	(*Intel*) Itanium Processor Family.
IPX:	Internetwork Packet eXchange.
iSeries:	(*IBM*) Popular mid-range integrated business server systems line.
ISS:	Industry Standard System or Server. Term normally used for Intel-based servers.
ISV:	Independent Software Vendor.
IT:	Information Technology, general term for computing, usually business computing.
Itanium2:	Newest Intel 64-bit server processor, second in a family of Itanium Architecture systems.
IXA:	(*IBM iSeries*) Integrated xSeries Adapter. Adapter to connect an iSeries to an xSeries Intel sever over a HSL link.
IXS:	(*IBM iSeries*) Integrated xSeries Server. An Intel server card which may be plugged onboard an iSeries.
J2EE:	(*Sun*) Java 2 Enterprise Edition.
Java:	(*Sun*) Programming language and environment for Web/e-Business applications.
JDBC:	(*Sun*) Java DataBase Connection. Java database access API.
JDK:	(*Sun*) Java Development Kit. Java toolkit.
JSP:	(*Sun*) Java Servlet Processing.
JVM:	(*Sun*) Java Virtual Machine. Virtual runtime environment for Java, for hardware independence.
JIT:	Just In Time.
L1 Cache:	Level 1 Cache (*On-processor, typically small (10's of K) amounts of high-speed SRAM cache*).
L2 Cache:	Level 2 Cache. Much larger (*few MB*) than L1 cache, L2 cache also comprises high-speed SRAM, but acts as buffers between the CPU chips and main memory. May be on- or off-chip.
L3 Cache:	Level 3 Cache. As more processors include L2 cache into their architectures, Level 3 cache (*typically 10's-100 MB*) is now the name for the large extra cache built into motherboards between the microprocessor and the main memory. Only used on some advanced systems. Sometimes called Level 4.
LAN:	Local Area Network – A computer network that spans a relatively small area.
LDAP:	Lightweight Directory Access Protocol. Open industry standard for directory services.
LPAR:	(*IBM*). Logical Partitioning, a form of system partitioning where partition boundaries are logically defined in groups of resources, and need not follow system physical boundaries.
Linux:	Increasingly popular UNIX-based operating system, maintained by a novel 'open source' process, whereby no one company owns the software code. IBM a key supporter.

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Mainframe:	Traditional, large, powerful business computer system, typically fast but expensive.
MCM:	(*IBM POWER4*) Multi-Chip Module. Carrier for up to four POWER4 chips in iSeries and pSeries high-end servers.
MHz.:	Million Hertz, standard measure of processor or bus frequency/clock speed.
MB:	MegaByte (*1,048,576 bytes*) – A measure of disk or memory.
MBps:	MegaBytes per second, a measure of data-transfer volume/bandwidth.
Mbps:	Megabits per second.
MIPS:	(*IBM*) Millions of Instructions per Second.
MP:	Multi-Processor or Multi-Processing.
MPE:	(*HP*) The operating system of the HP 3000 line of Hewlett-Packard business servers – to be phased out.
NAS:	Network Attached Storage.
NUMA:	Non-Uniform Memory Access – Computer architecture which combines several SMP building blocks into a single system, where processors may not have equally fast access to parts of the memory. Can scale to large processor counts in a single system.
Node:	Generic term in clustering for a cluster-participating computer system.
OEM:	Original Equipment Manufacturer – General term in computing and elsewhere for a manufacturer.
OLTP:	On-Line Transaction Processing – Widely used business-computing mode for processing transactions on-line.
OpenVMS:	(*HP/Compaq/Digital*). Operating system for HP Alpha servers (*being phased out*), derived from once popular Digital VMS minicomputer OS. OpenVMS will be available on HP Itanium2 servers.
OS:	Operating System. Suite of programs which operate and control a computer system.
OS/400:	(*IBM iSeries*) Systems middleware suite for iSeries, forms outer layer of operating system.
OnForEver™:	(*IBM*) marketing term expressing eServer direction towards “never stop” operations.
PASE:	(*IBM iSeries*) Private Address Space Environment. OS/400 runtime environment to support ported AIX applications on iSeries within an OS/400 LPAR.
PartnerWorld:	(*IBM*) Global business partners program, for all types of partners.
PCI:	(*Intel*) Peripheral Component Interconnect – A local bus standard developed by Intel Corporation. Modern PCs include a PCI bus in addition to a more general ISA expansion bus.
PCI-X:	(*Intel*) Peripheral Component Interconnect eXtended – New, higher performance local bus standard developed by Intel Corporation.
PCUoD:	Permanent Capacity Upgrade on Demand. As name implies.
POWER4:	(*IBM*) Powerful 64-bit RISC processor chip, 8th generation in PowerPC 64-bit line, used in higher-end iSeries & pSeries servers. Uses chip level SMP, with two processors on a single chip.
POWER4+:	(*IBM*) Powerful 64-bit RISC processor chip, 9th generation in PowerPC 64-bit line, used in pSeries servers at present. Uses chip level SMP, with two processors on a single chip.
POWER5:	(*IBM*) Powerful 64-bit RISC processor chip, 10th generation in PowerPC 64-bit line, planned to be used in 2004/2005 high-end pSeries and iSeries servers at present. Uses chip-level SMP, with two processors on a single chip. Also supports SMT, Simultaneous Multi-Threading, to make 1 chip appear to the OS as a 4-way system.
PPAR:	Physical Partitioning/Partition. Common form of system partitioning where partitions follow hardware physical boundaries, used on Sun & HP UNIX, and most Intel servers.
pSeries:	(*IBM*) family of 64-bit RISC UNIX server systems.
QIC:	(*IBM iSeries*) Quarter Inch Cartridge. Most popular tape format for iSeries.
QoS:	Quality of Service – Term used to denote measured computing service quality.
R&D:	Research and Development, the creation and improvement of new technologies and products.

RAS: Reliability, Availability, and Serviceability – Three key attributes of high-performance server systems.

RASM: Reliability, Availability, Serviceability and Manageability.

RAID: Random Array of Inexpensive Disks: family of techniques to create high-availability disk systems using standard HDD.

REGATTA: (*IBM*) Code name for the POWER4-based high-end server box introduced in 2001, and used in high-end pSeries and iSeries.

RIO: (*IBM*) Remote I/O Bus. High-performance I/O Bus. Also important technique to extend server I/O capacity via "remote" I/O enclosures, used on several IBM eServer lines, including iSeries.

RISC: Reduced Instruction Set Computer, a popular type processor architecture used in many UNIX servers and workstations.

ROI: Return on Investment.

RS/6000: (*IBM*) UNIX server computer and workstation line, now eServer pSeries.

S/390: (*IBM*) System/390 mainframe computer system line, now eServer zSeries.

SAP R/3: SAP's flagship ERP product.

SAP: SAP AG, leading vendor of ERP and e-marketplace software applications.

SAN: Storage Area Network, a dedicated storage network for sharing storage systems between servers.

SAN: Server Area Network, a dedicated network used to connect multiple servers, usually in clustering.

SCSI: Small Computer System Interface.

SDRAM: Synchronous DRAM, an older type of memory running at a max of about 133MHz., since replaced by newer types such as RDRAM and SLDRAM.

Shared Nothing: A clustering architecture in which the processors share neither memory nor storage.

SHV: (*Intel*) Standard High Volume Server. Standardised Intel design SMP commodity server, usually 2- or 4-way, using an Intel motherboard. Low cost, commonality of standards make it ubiquitous. May be used as a building-block for more complex system architectures.

SI: Systems Integrator.

SLIC: (*IBM iSeries*) System Licensed Internal Code. The operating system kernel for iSeries.

SME: Small-Medium Enterprises, market target group.

SMB: Small-Medium Business, market target group, synonym for SME.

SMT: Simultaneous Multi-Threading. See POWER5.

SMML: (*Software Strategies*) Small, Medium, Medium-Large, a category of business size excluding the largest enterprises.

SMP: Symmetric Multi-Processing – The most popular architecture for parallel multiprocessor computer systems. Widely used in all types of computer systems for 30 years.

SOD: (*IBM*) Statement Of Direction: publicly committed development direction.

Solaris: (*Sun*) Proprietary OS.

SP: Solution/Service Provider.

SPARC: (*Sun*) RISC processor family of 64-bit processors.

SPEC: System Performance Evaluation Council, an independent benchmarking organisation. Provides many benchmarks, all names prefixed by SPEC.

SPOF: Single-Point-Of-Failure. Reliability engineering term denoting weak point in system design.

SQL: Structured Query Language.

System/32: (*IBM*) Early, popular mid-range business computer.

System/34: (*IBM*) Successor to System/32.

System/36: (*IBM*) Successor to System/34.

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System/38:	(*IBM*) Innovative, new architecture mid-range business system, father of AS/400 & iSeries.
TB:	Terabyte 1,099,511,627,776 bytes (*1,024 Gigabytes*).
TCO:	Total Cost of Ownership.
TCUoD:	Temporary Capacity Upgrade on Demand. As name implies. Offered first on 2003 iSeries.
TCP/IP:	Transmission Control Protocol/Internet Protocol – The suite of communications protocols used to connect hosts on the Internet.
TP:	Transaction Processing.
TPC:	Transaction Processing Council – A server performance benchmarking standards body.
TPC-C:	TPC standard 'C' Performance Benchmark for client/server OLTP.
TRU-UNIX:	(*HP*) UNIX 64-bit operating system acquired by HP with the purchase of Compaq. Originally developed by Digital. Due to be phased out in favour of HP-UX by HP.
UNIX:	A family of computer operating systems built to 'Open Systems' standards, many incompatible variants.
V5R2:	(*IBM iSeries*) latest OS/400 release for iSeries.
VAR:	Value Added Reseller, channel partner of OEM supplier.
VAX:	Most popular minicomputer family of 1980s (*Digital*).
VLAN:	Virtual LAN.
VMS:	Operating system for VAX, lives on as HP OpenVMS.
VPN:	Virtual Private Network.
Virtual Ethernet:	(*IBM iSeries*). Virtual 1Gbps Ethernet links over system bus between partitions in iSeries.
WAS:	(*IBM*) WebSphere Applications Server.
WAS-Express:	(*IBM*) WebSphere Express for iSeries. Reduced function/price entry-level WAS for iSeries.
WebSphere:	(*IBM*) Main software brand name for key multi-platform middleware family.
Windows 2000:	(*Microsoft*) flagship operating system released February 2000, replacing Windows NT.
Windows NT:	(*Microsoft*) Windows 'New Technology', a popular, low-cost server and workstation operating system, mostly for Intel-based systems.
W2K DCS:	Windows 2000 Datacenter Server.
Wintel:	(*Microsoft and Intel*) from 'Win'dows and In'tel'.
WSDc:	(*IBM iSeries*) WebSphere Application Developer Client. Main iSeries developer client tool.
Xeon:	A line of Pentium II, III and 4 server processors from Intel introduced in first 1998.
x440:	(*IBM*) 2-16-way ISS xSeries server family, first to fully implement IBM EXA architecture.
xSeries:	(*IBM*) line of eServer industry-standard servers based on Intel-processors.
X-Architecture:	(*IBM*) Architecture for advanced ISS servers, introduced in 1998.
XML:	eXtensible Markup Language – Key, open, Internet standard for self-describing document exchange.
XSP:	"X" Service Provider – Where "X" prefix can be Internet, Application, Host, Wireless, etc.
zSeries:	(*IBM*) Newest IBM line of 64-bit mainframes, introduced 2000.

About Software Strategies

Software Strategies is a specialist analyst firm focused on e-Infrastructure platform strategies and issues. Since 1997, we have written dozens of key Reports and White Papers, and hosted or participated in scores of industry events, including our popular Focus Events, We have worked closely with industry leaders including: IBM; Microsoft; Intel; ICL; Unisys; CA; BMC; Stratus Computers; NetIQ; and many others. Specialist expertise on server platforms, operating systems, enterprise middleware, and the Windows 2000/Intel environments, has been a common thread. Several thousand enterprise IT users have benefited from our authoritative events, presentations, conferences, newsletters, journals, and reports.

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This Report was researched and written by Ian Bramley, Managing Director of Software Strategies, and first published in February 2003. The views expressed are those of Software Strategies, and are based on our proprietary research. Bramley founded Software Strategies in 1997, and is an experienced enterprise infrastructure analyst, a keynote speaker at many industry events, and has published many reports and papers. He was previously Director of Enterprise Platforms at Butler Group, and Founder/Chairman of the Enterprise NT Management Forum from 1998 to end-2000. Previously, he held a variety of executive positions with international software vendors over a 25-year industry career.

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