Maximizing Business Value With Resurgent zSeries Mainframes

Platform Readiness Key in 2005

About this White Paper

The IBM mainframe underwent a sustained, dramatic and radical platform transformation of technology, economics, capacity, capability, open standards support, and software stack enrichment. Since its dark days of 1993, cumulative changes have transformed the mainframe platform in every dimension. This in turn sparked a growing revival and revaluation, from the 2000 zSeries introduction onwards. By 2004, the revival had swelled worldwide to become a full-on market resurgence. Now in 2005, the mainframe offers unrivalled mixed and new workload capabilities and capacity, economics that are superior to distributed alternatives, deep open standards support, rapid and continuing hardware and software technology advances, and delivers unique qualities of service that no other platform can approach.

In two seminal and widely read earlier Software Strategies White Papers (*see the "Other Related Software Strategies Research" Section for more details*) this analyst charted and assessed these dramatic changes. We also explored the now extensive zSeries mainframe software stack that provides much of the new levels of business value the platform offers today.

In the faster-moving era of On Demand, enterprises are radically changing their business processes to respond more quickly to customer demands and integrating their people, processes and information. The resurgent zSeries mainframe has a central role to play in this new era, and can now deliver new levels of unique business value.

And yet, whilst many large enterprises have rapidly adopted and implemented these mainframe innovations, some other users have been slow to upgrade to the newest hardware, z/OS operating systems, and main middleware software engine releases that have undergone continual and rapid advancement. This White Paper explores and assesses the business case and arguments for a new "Platform Readiness" strategy that advocates more systematic and rapid adoption of the new mainframe hardware, operating system releases and major software subsystems. The rate of advance of the platform on all these fronts has, and continues to be, more rapid and substantial, (*under continuing high IBM R&D investments*) than in earlier years, and has brought numerous advances that support the On Demand enterprise with superior business value.

White Paper

Maximizing Business Value With Resurgent zSeries Mainframes

Platform Readiness Key in 2005

CONTENTS

TABLE OF CHARTS

1. Executive Summary

This new Software Strategies White Paper evaluates and assesses the business value of the "Platform Readiness" strategies now advocated to mainframe/zSeries customers by the vendor and others in 2005. It was written for C-level executives in medium and large enterprises and for their senior IT executives. This Executive Summary provides a concise summary of our findings, assessments and recommendations, which are detailed and developed more fully in the White Paper sections following.

● **zSeries "Platform Readiness" Strategies Championed:** "Platform Readiness" advocates that more zSeries mainframe customers should take-up/deploy the newest zSeries hardware, operating systems and principal middleware software subsystems faster, to become and remain "current" with their rapid advances. Is this just obvious vendor self-interest to push sales, or are the customer benefits real?

● **Large Business Benefits Claimed:** "Platform Readiness" exponents argue a powerful case that adopting this strategy enables those enterprises to gain significant business value. It claims they can more rapidly exploit their large inventory of zSeries mainframe software applications, databases and skills in the new On Demand business world of rapid change and closer integration (*see below*). We assess and evaluate these claims.

● **On Demand Business Takes off:** On Demand enables enterprises to become more responsive and flexible. They can detect and react quickly to changes in supply, demand, pricing, and competitors' moves, shifts in customer preferences and other marketplace dynamics. Computing architecture advances enabling greater variability and interoperability among previously disconnected IT systems are needed for On Demand. Technical integration allows new end-to-end business integration, both among internal operations and with external ecosystem partners historically kept separate. On Demand has taken off rapidly, with thousands of enterprises en route with their transformation. A radically improved IT infrastructure, called an On Demand Operating Environment, is needed to support this. The zSeries mainframe and its software has been continually re-engineered and developed. These developments are claimed to have made zSeries the most advanced On Demand Operating Environment available, and have also fuelled market resurgence, see below.

● **40th Birthday Sees Strong Resurgence:** 2004 saw the 40th anniversary of the IBM mainframe (*latest models shown in Figure 1*). The platform had been transformed by radical changes, investment and development, and saw a market revival beginning from the 2000 zSeries introduction. By 2004, this revival became strong market resurgence. Today, the mainframe is again widely recognised as the "Gold Standard" enterprise-computing platform, because of the leadership and value it now offers in supporting transformed On Demand businesses.

**Today's zSeries Mainframes – Accelerating
Resurgence Marks Mainframe's 2004 40th Birthday**

*IBM eServer
zSeries z890*

*IBM eServer
zSeries z990*

Courtesy of International Business
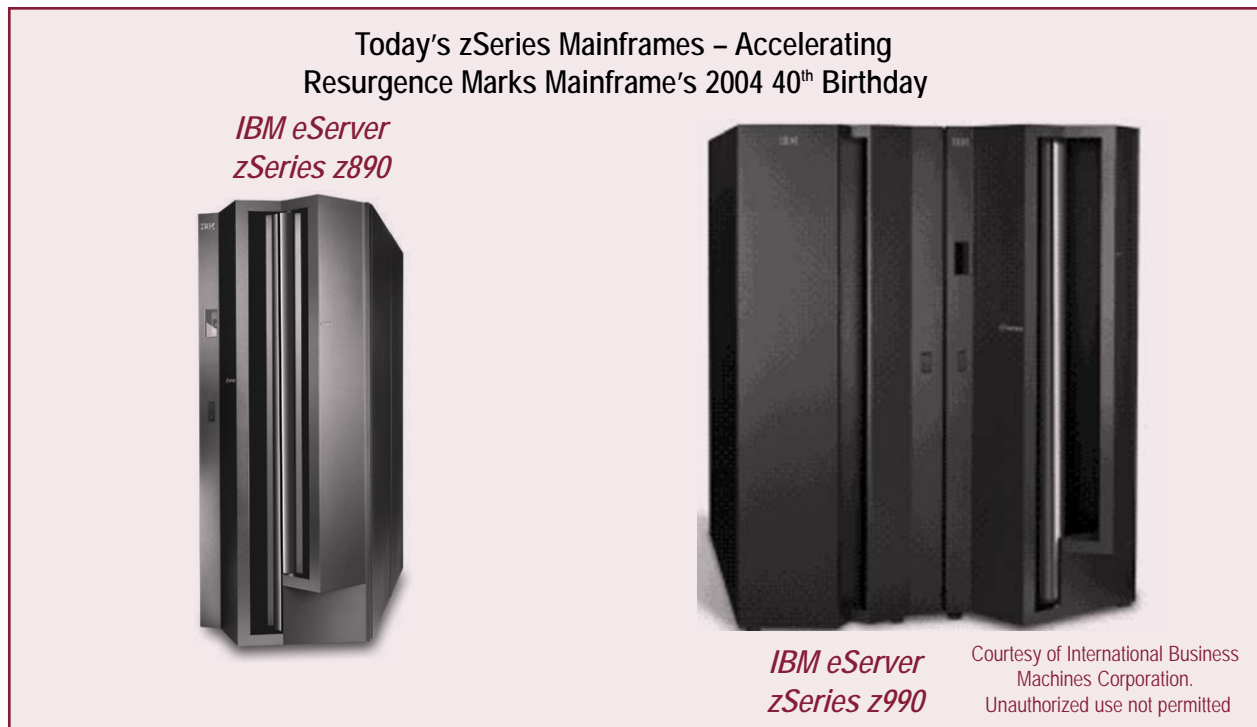Machines Corporation.
Unauthorized use not permitted

Figure 1: Today's zSeries Mainframes – Accelerating Resurgence Marks Mainframe's 2004 40th Birthday

- **Unique Business Value Advantages:** The sustained investments IBM made in transforming mainframe technology has delivered differentiated capabilities unmatched by any other IT platform. Customer-based research and our analysis identified the highest business value-generating advantages these systems now offer as:

  - Lowest Cost of Outages.
  - Lowest Security Breach Risks/Costs.
  - Highest Resource Use Efficiency/Utilization.
  - Highest Scalability & Capacity.
  - Lowest Total Cost of Ownership (*TCO*) & Cost/User.
  - Low Risk Via World-class Support.
  - Facilitates Reuse/Modernization of Mainframe Application Assets.
  - Highest Performance & Quality of Service (*QoS*).
  - Much-improved System Costs.

These leadership business value factors are explained and analysed in Section 3.

- **Business Value Gains Available Argue Platform Readiness:** With these important business value advantages obtainable from the latest mainframe technologies, many more enterprise mainframe users should now rethink their practices and policies. Accelerated adoption of newest hardware, operating systems and middleware software releases under Platform Readiness brings large gains from these business values, and speeds users' On Demand transitions.

- **Latest Findings Show Mainframe Lowest User Cost Platform:** A useful proof point (*fully reported in Section 3*) underlines one of the above mainframe advantages. Fellow analyst Arcati's latest 2004 study found the total cost per user over five years (*the fairest measure*) of UNIX systems was almost three times higher (*$19,650*) than for the mainframe (*$6,750*), and that for Windows-Intel platforms almost 4 times higher (*$26,750*) for 2005. These dramatic differences highlight the major cost advantage the zSeries mainframe now offers over its main competitors for enterprise workloads.

- **Lowest Staffing Levels Drive Cost Advantage:** The same study found operating and support staffing levels and costs on distributed platforms (*UNIX and Windows/Intel*) average 2.5 to 3 times higher than those needed on today's mainframe for equivalent workloads. Intensive development of autonomic self-managing capabilities, the study found, have resulted in a 10-fold reduction in mainframe staffing levels per MIPS over the last seven years, whereas distributed improvements have been small. Ongoing mainframe developments are expected to halve today's level in the next five years, further extending this huge advantage.

- **Foundation Technologies Bring Mainframe Platform Readiness Advantages:** Our analysis identified ten foundation technologies/capabilities, most advanced in the mainframe platform, which underpin and deliver the business values above. These are:

  - Deep, Optimized Support for Java/J2EE™ and Open Standards.
  - Resource Virtualization.
  - Continuous Availability.
  - Security & Business Resiliency.
  - Intelligent Workload Management.
  - Business Integration Support.
  - 64-bit z/Architecture.
  - Special Designated Workload Processors.
  - Software Workload and Sub-capacity Licensing.
  - Extensive Support for Composite Applications, Web Services, and Service Orientated Architecture (*SOA*).

We detail and explain how these factors drive the business value strengths of the platform in Section 4. These work hardest for Platform Readiness adopters benefiting from latest hardware and software release advances.

- **Platform Readiness in Action?** With the above business value gains obtainable from the rapidly advancing foundation technologies of the mainframe, what are the main changes customers wishing to benefit fully from these should implement? As readers might expect, the calls are that they should:

  - Add New Workloads on the Mainframe.
  - Upgrade Hardware to the Newest zSeries & TotalStorage Platforms: z990, x890, DS8000, and DS6000.
  - Upgrade zSeries Operating Software to z/OS 1.6 and/or z/OS 1.7 (*expected later this year*).
  - Upgrade Main z/OS Middleware Subsystems to: DB2 UDB V8, IMS V9, CICS TS V3.1, Tivoli NetView V5.2, WebSphere Application Server V6, and WebSphere MQ V6.
  - Utilize the Now-extensive zSeries Software Tools Portfolio Fully.

In Sections 4, 5, and 6 we examine the individual cases for migrating in each of these areas in detail. The overall bottom line we found is that there are considerable additional business values yielded by recent advances in each of these areas.

- **Hardware Case Strong:** In Section 4 and Appendix A we have summarized and reported our findings on the newest mainframe server and enterprise storage hardware (*based on our other, in-depth White Paper and Report studies*). We found that the zSeries 990 and 890 high-end and entry-midrange mainframe servers offer many advances that combine to enable these systems to deliver much higher workload throughputs at significantly lower costs. The DS8000 and DS6000 high-end and mid-range enterprise storage systems are complementary to the new mainframe servers. They bring a new enterprise storage continuum with much lower entry and top-end scale points, offer multi-fold advances in scalability and capacity, and performance, at much lower costs, and are bristling with significant On Demand innovation.

- **Operating Systems Enabler:** Operating systems are often seen as a necessary evil; less exciting than the gleaming new hardware or the middleware software engines that perform more easily-recognizable functions. However, their role in exploiting and supporting the latest hardware advances, open standards, programming models, and networking, etc., are all crucial to achieving an On Demand Operating Environment. Significant and important advances, in all these areas, and others, were found in the z/OS 1.6 and forthcoming 1.7 releases and we recommend customers accelerate their migration to these, to enjoy the combined benefits they support with the newer hardware beneath and middleware above.

- **Middleware Subsystems Central Pillars of Platform Capability:** In Section 5 we review the six main middleware software pillar product new releases that support zSeries On Demand capabilities, with our assessments and findings on each. Although the advances vary, support for J2EE™ and open standards, support for Web Services and SOA, performance, availability, manageability and supporting tool enhancements were common to most, and were substantial or very substantial in each product. Accelerating rate of adoption of these new middleware releases (*where already deployed by customers*) makes good sense in most cases, given their additional business-value leverage. Again, cross-exploitation by the middleware of the hardware and operating system advances above shows higher synergistic benefits when all are combined in a holistic Platform Readiness strategy.

- **Software Tools Portfolio Makes Productive:** IBM has now built, refined, and continually enhanced a comprehensive, modern, attractive, well-integrated and entirely current portfolio of mainframe software tools, covering nearly all requirements and supporting all the main software subsystems on the platform. Attractively priced, supporting open standards, and including a lot of innovation, this portfolio has now become a real asset and advantage for the platform, rather than the weakness it was five years ago. We now rate this portfolio as more advanced, better integrated, more productive and more comprehensive than the equivalent on UNIX platforms (*for example*).

- **Existing Assets and Skills Contribute Strongly:** IT organizations whose mainframe assets and staff skill bases are centred on traditional development models s*uch as (CICS/COBOL or IMS DC COBOL or PL/1)* are fully supported by, and included in, the new software infrastructure and AD tooling of Platform Readiness described above. Development staff with these skills can therefore play an invaluable role in extending their traditional-language-based applications assets into new SOA-based composite applications, using their traditional language skills, with the middleware providing the integration with newer programming model components. The primary development tools, such as WebSphere Studio Enterprise Developer, provide a common advanced development environment for both the long-proven traditional programming models, as well as the new J2EE™ developments, which also helps traditional developers acquire the new skills over time. Evolution, and exploiting these valuable software assets and people skills, are therefore integral to the strategy.

- **Platform Readiness Has Powerful Appeal:** If enterprise users are already using the mainframe, there seems little merit in not systematically exploiting, in full, the many advances that have been made in the hardware, operating system and middleware; and that are continuing at a rapid rate today. These all offer substantially enhanced business value, and are further extending the already leadership technology strengths of the platform. Whilst not every main advance will apply to every customer, we now consider a switch to Platform Readiness is merited for all but the few, most disaffected and heavily-lagging mainframe users. "Get current or get off" would be our advice to the latter. New mainframe customers, without question, should begin only on the latest levels of hardware and software, and stay current with future developments.

2. Introducing "Platform Readiness" Strategies for the Resurgent IBM Mainframe

Platform Readiness Strategies – White Paper Focus

This new Software Strategies White Paper examines **Platform Readiness** strategies for enterprises employing the IBM zSeries mainframe platform. **Platform Readiness** advocates that more zSeries customers should take-up/deploy the newest zSeries hardware, operating systems and principal middleware software subsystems faster, to become and remain "current" with their rapid advance. Many zSeries enterprise users are already enthusiastically following this track, and have reported reaping significant business gains from their investments. However, the majority of mainframe users are still moving more slowly, often in a piecemeal fashion, and are thus taking only partial advantage of the widespread development advances that have been, and are being delivered, at faster rates than we have seen on the mainframe before.

...has now made the zSeries mainframe once again the pre-eminent "Gold-Standard" of high-volume commercial computing.

Behind this call for Platform Readiness stands a massive, sustained R&D investment, measured in several $B, that IBM has made since the late 1990s, and is continuing to make in the zSeries hardware, operating systems, middleware software systems and software. Our two earlier studies (*see below*) found this effort has clearly now made the zSeries mainframe once again the pre-eminent "Gold Standard" of high-volume, commercial computing. In our considered assessment, it has become clearly the most advanced On Demand Operating Environment, best able to support the new business models that enterprises are rapidly adopting.

IBM naturally wants all its mainframe customers to benefit faster from the fruits of these investments by more rapidly deploying its newest and most advanced mainframe offerings.

- So, is "Platform Readiness" merely a marketing slogan to help the giant sell more zSeries hardware and software upgrades to its customers?

- Is the case for this approach compelling in bottom-line business value?

- Just what are the advances embodied in the most current zSeries hardware and software technology releases and what are the additional business values that they provide?

- Why should many more top enterprise executives and their IT leaders change their existing approaches and embrace this vision more widely, more fully and more quickly?

These questions are addressed and answered in this White Paper, and we look in more detail at what Platform Readiness means in Section 4.

Software Strategies Research Sources

Software Strategies has closely studied the mainframe and server operating systems and middleware software segments for some years, and has researched/published numerous studies on these topics. Some of these are referenced in the "Other Software Strategies Related Research" section on page 45. We have drawn on these in developing this White Paper. In particular, two widely-read, 2004-published, and more detailed/technical studies, covering the major changes and developments in the zSeries mainframe environment, were prime sources:

- **"zSeries Mainframe Resurgence Beyond Question – Software/Costs See Major Advances: IBM Tools Break USV Grip."**

  This 50-page White Paper, published in January 2004, charted and assessed how the IBM mainframe had staged a dramatic comeback from the "Death Threats" of the early 1990s, after being radically transformed by new technologies, economics, and an extended software stack over the past decade. It assessed the z990 high-end system and IBM's Mainframe Charter pledge for continued advances. It reviewed how unfair licensing of third-party ISVs tools, long widely used on mainframe, and had become a roadblock to revival, now overcome by the maturing of a broad suite of more modern IBM mainframe tools. The changes in mainframe software licensing, implemented over recent years, did much to encourage this resurgence by steadily and continually reducing mainframe software costs, and these were also reviewed in detail. The Paper also provided in-depth reviews of the scope, coverage, and recent advances of the mainframe software stack that provided much of its advanced functionality. Customer cameos illustrated how diverse enterprise users had successfully exploited these advances in their On Demand solutions using the zSeries platform. Over 6,500 people to date have downloaded this influential and widely-read Paper.

- **"Enterprise Transformation, Modernization & Integration Top Priority Today – Resurgent zSeries Mainframe Stakes Powerful Claim for Expanded Role."**

  This 56-page White Paper, published in September 2004, evaluated how and why enterprise modernization and integration has become central to the journey towards On Demand, with improved business and systems integration and alignment at its heart. It detailed and explained how most new-generation applications to support the On Demand enterprise will be a new breed of composite applications, assembled from both new and existing software assets using Web Services standards under a SOA. The Paper reviewed the $T inventory of mainframe-based customer software and data assets that form a vital source for this modernization. It highlighted the high costs and unsuitability of the sprawling distributed computing infrastructures (that came into widespread use over the last decade) for the On Demand era. It summarized the dramatic comeback and resurgence of the mainframe, including our assessments of the newest z990 and z890 systems. It also looked deeply into the factors that should now guide enterprise IT platform selection for new and On Demand applications for the next decade. In particular, it presents and explains the 12 most significant QoS today's zSeries mainframes offer that bring most business value to customers, and which sharply differentiate the platform from distributed alternatives. The software tools and support now provided for enterprise modernization and transformation on the mainframe are assessed, and an in-depth look at the WebSphere software platform that is core to the new mainframe applications and integration is provided. Finally, the new zAAP-dedicated Java processing offload engine for zSeries was assessed, and its effect in sharply reducing the costs of large mainframe e-business workloads was presented through a real example, where the mainframe solution cost 37% less than the Sun Microsystems alternative.

Who Should Read This White Paper?

This White Paper was written for C-Level business executives in large and medium enterprises, and also for their CIO, CTO and Senior IT Managers who are responsible for the enterprise's IT platform strategies. Our focus is on how organizations can best deliver higher business value by fully exploiting advances now available with the zSeries mainframe. We review the business case for Platform Readiness (*IBM's recommended new customer strategy that calls for moving up to being fully current on the latest zSeries hardware and software releases*).

We expect IT executives will find the Paper helpful themselves, but also useful in educating and convincing their C-level business executive colleagues to better appreciate the business value of today's IBM mainframes. From this, greater executive support for new mainframe Platform Readiness investments are more likely to be endorsed (*than has often been the case in recent years*), based on the real business and economic value these systems now deliver.

The Paper will also be useful for other audiences concerned with enterprise platform strategies and the mainframe. These include ISVs (*considering what software platforms to build their next-generation applications solutions upon*), Services and Systems Integration firms (*undertaking platform and infrastructure development for enterprise users*) and IT press and media representatives covering enterprise platform and mainframe options.

The Mainframe Transformation 1993-2005

Figure 2 shows our summary of the timeline of the mainframe's transformation milestones and changes.

IBM Mainframe – Dramatic History – Resurgent Again Today!

Massive Growth   **Turmoil, Decisions, Attacks**   **Transformation Begins 1993**

| Golden Days of Growth 1964-1988 | Dark 1988-1993 Days Survival In doubt | PCM & RISC UNIX Attacks | Dramatic 13-year Transformation Begins | 1964 to 1993 |

| H/W Technology, Capacity, Performance, Price/Perf., Reliability & Openness Transformed | 1994 CMOS Move Key. G1-G6 Fast Advances. 2000 64-bit z/Arch. z900 2003 z990 | Software Stack Breadth / Depth Explodes | Mainframe Becomes "Software Machine" | 1994 to 1999 |

Transformation Unfolds 1994-1999

| "Software Machine" Enables New Workloads | New Workloads ● J2EE & Web ● Linux ● Enterprise Apps. ● Collaboration | Software Pricing Adapts | IBM S/W Tools Hit Critical Mass. ISV/USVs tamed | Accelerating, Unquestionable, Mainframe Resurgence | 2000 to 2005 |

Market Revival Ramps 1999 on   **Revival Becomes Full-on Resurgence 2003 on**

Figure 2: IBM Mainframe – Dramatic History – Resurgent Again Today!

As we recounted in our first White Paper mentioned above, the IBM mainframe underwent the most sustained, dramatic and radical platform transformation of technology, economics, capacity, capability, open standards support, and software stack enrichment ever seen. From the dark days of 1993, these cumulative changes totally transformed the platform in every dimension. This in turn sparked its growing revival and revaluation from the 2000 zSeries introduction onwards (*which brought the 64-bit z/Architecture technology that lifts mainframe headroom for another generation*).

A brief summary of the main changes that wrought this transformation is shown in Figure 3.

Radical Mainframe Transformation Behind Today's Resurgence

- **Semiconductor Technology:** Transitioned from costly bipolar to CMOS. Enabled drastic H/W price cuts, soaring performance. Leveraged IBM's chip-making leadership.
- **Uniprocessor Gains:** Mainframe CPUs climbed from 65 MIPS (1993) to 450 MIPS (*2003*).CAGR 31.6% p.a., a 7-fold increase.
- **Mainframe Capacity Soars:** High-end mainframe capacity soared from 485 MIPS (*1993*) to 9,000+ MIPS (*2003*).CAGR 47.7% p.a., a 19-fold increase.
- **H/W Costs Plummet:** Mainframe hardware fell from $115,000 per MIPS (*1993-USA*), to $1,650 by 2002, a CAGR of 30.5% p.a., a 70-fold reduction.
- **Parallel Sysplex Clusters:** Refined/perfected world's most powerful/mature commercial clusters. Link <32 zSeries mainframes into a single image of incredible reliability and < 288,000 MIPS power.

- **Open Standards:** Transformed mainframe into amongst most open standards-based platforms today.
- **Highest Reliability:** Engineered in extraordinary reliability (*in chip, system, OS and middleware*). Highest "RAR" of any standard commercial system. MTBF now 55-60 years. Customers routinely achieve 99.999% availability.
- **Software Machine:** zSeries now sports comprehensive, leading-edge middleware & tools software portfolio for today's workloads & composite applications.
- **Tamed Software Pricing & ISV Tools Issues:** Since 1997, drove sustained 15%+ S/W price/performance gains, & created modern IBM tool suite.

Figure 3: Radical Mainframe Transformation Behind Today's Accelerating Resurgence

Mainframe Revival and Resurgence 2000-2005 – z990, z890

By 2003, this revival had swelled worldwide to become a full-on market resurgence, and the zSeries mainframe has again become the recognized, pre-eminent, high-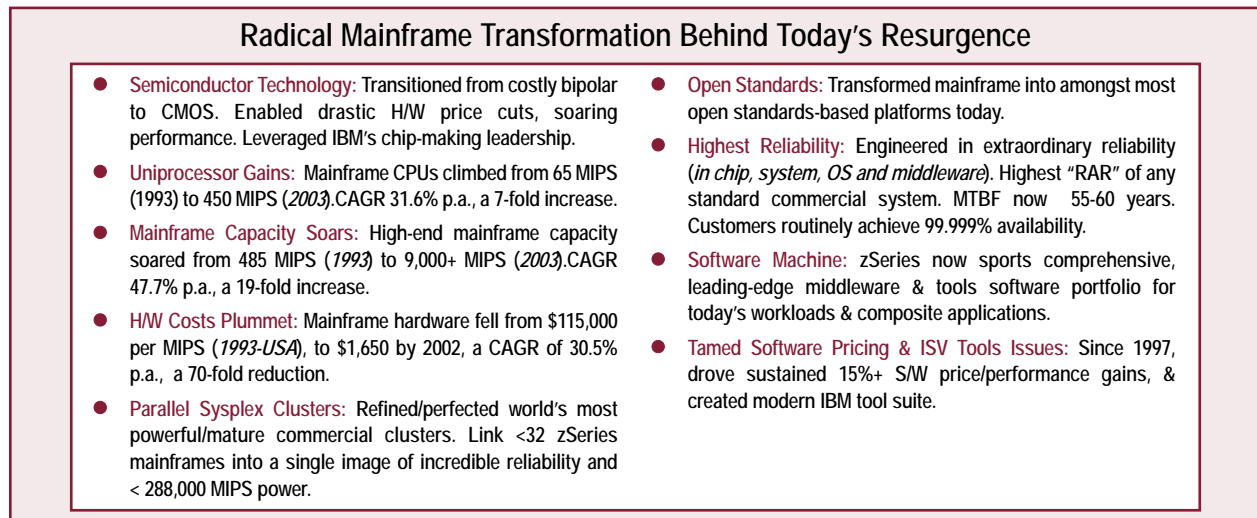end commercial computing platform for medium and large enterprises. We assessed the newest z990 high-end (*first introduced in 2003*) and the z890 entry -to -mid-range mainframes (*first introduced in 2004*) as technological tours de force. Now in 2005 the mainframe offers mixed and new commercial workload capabilities and capacity, economics greatly superior to distributed alternatives, deep open standards support, rapid and continuing hardware and software technology advances, and truly unique QoS that no other platform can provide.

Business Recovery/Renewed Growth 2004/2005

After three harsh years (*from 2000 through 2003*), the global business climate finally brightened in 2004. IT investment began growing again (*but at single-digit percentage rates*). Enterprises have restarted and launched new IT projects at an increasing rate in every market. Business transformation to new business models, with high focus on intra- and extra-enterprise process optimization and integration, are the top priorities, along with long-delayed IT infrastructure updates, security and compliance efforts. Encouraging these new moves, e-business itself has now amply proved itself (*since the late 1990s*) to be a true engine of transformation, as hundreds of real and large-scale successes are reported without the hype and exaggeration of the dot.com boom days.

Towards On Demand – What Customers Need Today

On Demand, the next major step, has taken hold to rapidly become a major trend, as enterprises globally transform their business models and core processes to cut their costs, increase speed, and become more flexible and responsive. Enterprises all need higher levels of business flexibility. This alone enables them to be more responsive to changing market conditions – including exploiting new opportunities, better serving customers, and taking competitive actions quickly when needed. Such improved business flexibility can best be achieved by standardizing, automating and integrating key business processes, and by then managing the performance of these processes. Business applications software portfolios must support this, and cost structures be more closely aligned with changing business needs. Getting to this desirable position requires enterprise transformation. In this, far closer business and systems integration between people, processes and information, across the enterprise and all of its partners, are needed. This is driving IT ever closer to core business processes at the hundreds of leading companies and public sector organizations already en route to becoming On Demand enterprises. Leading "early adopters", such as General Electric, eBay, Charles Schwab, Cisco Systems, and IBM itself, are all well-advanced in transforming their own businesses and systems, and all endorse this vision and direction.

Our Analysis

The original three-decades-long rise, dramatic 1990s fall, and now resurgence of the IBM mainframe has been confused and obscured by the many persistent myths and legends that, even today, still have some currency in business executive and IT leader circles. Fuelled for years by aggressive UNIX and Intel-based competitors, these portrayed the mainframe as a costly, closed and proprietary dinosaur. Finally, these myths and legends were decisively demolished over the last 2-3 years, evidenced by climbing mainframe capacity sales, the rapid spread of new workloads onto the platform, and the addition of several-hundred brand new customers to the mainframe-installed base (*for the first time since the 1980s*). Numerous studies by other leading analysts, and our own, have confirmed the mainframe as today's unrivalled "Gold Standard" enterprise computing platform, and have assessed many of the dramatic advances in capability, capacity, price/performance, software functionality and their

Numerous studies by other leading analysts, and our own, have confirmed the mainframe as today's unrivalled "Gold Standard" enterprise computing platform.

resultant business value. The heavy and sustained IBM investment of several $B in making these advances lies behind this transformation, and is continuing to extend the mainframe's lead at a rapid pace in 2005, pledged to continue for the future under the Mainframe Charter manifesto that IBM announced in 2003.

Given this robust and healthy position, should many more mainframe user enterprises now rethink their practices and policies for adopting and embracing new mainframe hardware, operating systems and middleware software releases and advances? Whilst many mainframe customers have actively and enthusiastically embraced the "Platform Readiness" strategy fully, and are briskly exploiting these mainframe advances across the board, the majority have yet to do so. These users have updated more slowly and cautiously, and are therefore not current with the latest mainframe hardware and software advances. In our assessment, these now have a major opportunity to make a large and positive business value impact by doing so, which we explore, explain and assess in this White Paper. We summarize the differentiating business value advantages that today's zSeries mainframe now offers in Section 3 below.

3. Business Value Drivers of the Mainframe – A Primer

Introduction

Readers less familiar with the mainframe's wholesale transformation will find it useful to understand where and why the business value delivered by the zSeries mainframe has reached a new high-point in 2005. In this primer, we synthesize a large body of research, including our own, that has highlighted and ranked the compelling business value sources/drivers, and broad competitive advantages which today's zSeries mainframes offer to their users. Leading-edge customers exploiting the platform most fully (*those already following Platform Readiness strategies*) already understand and appreciate these business value strengths, but others have clearly not yet understood their magnitude and value.

Mainframe Business Value Drivers from Unique QoS

The most reliable and valuable source of trustworthy information on the real, differentiating business value drivers that today's zSeries mainframes can now offer must come from real-world customer experience and assessment. A recent major survey-based study performed by Mercer Management Consulting interviewed a substantial sample of zSeries mainframe customers in diverse industries and geographies, to determine which QoS they considered delivered the greatest business value to their organisations. In our second referenced White Paper (*see above*), we further analysed, categorized and drilled much more deeply into the findings of this study, and also linked the business values customers valued most highly with the technologies and capabilities that allowed the mainframe platform to deliver these. We have reanalyzed and summarized this material, to provide a concise, high-level view of these findings in Figure 4 below

The most reliable and valuable source of trustworthy information on the real, differentiating business value drivers that today's zSeries mainframes can now offer must come from real-world customer experience and assessment.

---

zSeries Mainframe Business Value Leadership* Areas – Customer Rankings+

Ranked # 1 Value

Lowest Outage Costs:
- Highest reliability 99.999%+
- Highest, availability, recoverability, data integrity
- Strongest disaster recovery

Ranked # 2 Value

Lowest Security Breach Risks/Costs:
- Never broken security
- Highest security ratings
- Dramatic SSL performance

Ranked # 3, # 9 & # 10 Values

Highest Resource Use Efficiency/Utilization:
- Best mixed workloads
- Complete resource virtualization
- Highest automation

Ranked # 4 Value

Highest Scalability & Capacity:
- On big commercial workloads
- Now low entry, small steps
- Non-disruptive growth

Ranked # 6 Value

Lowest Total Cost of Ownership & Cost/User:
- For mid-large workloads/user populations
- <50% TCO/TCU, of UNIX or Windows

Ranked # 7 Value

Low Risk Via World-Class Support:
- For hardware & software
- Stable environment
- Dependable, global, long-term
- Preserves customer investment

Ranked # 8 Value

Reuse/Modernization Of M/F Application Assets:
- $TB customer SW assets on mainframe
- Excellent tools for modernization, integration, reuse

Ranked # 5 & #11 Values

Highest Performance & Quality Of Service:
- Fastest response times
- Business policy driven QoS
- Highest commercial workload throughput, I/O capacity

Ranked # 12 Value

Much-Improved System Costs:
- Dramatically lower hardware prices
- Improved software price/ performance and "pay for use"
- Dedicated zSeries engines slash new workload costs

* Source: Software Strategies "EMI" White Paper, Sept 2004 analysis. Based on Mercer Management Consulting Survey

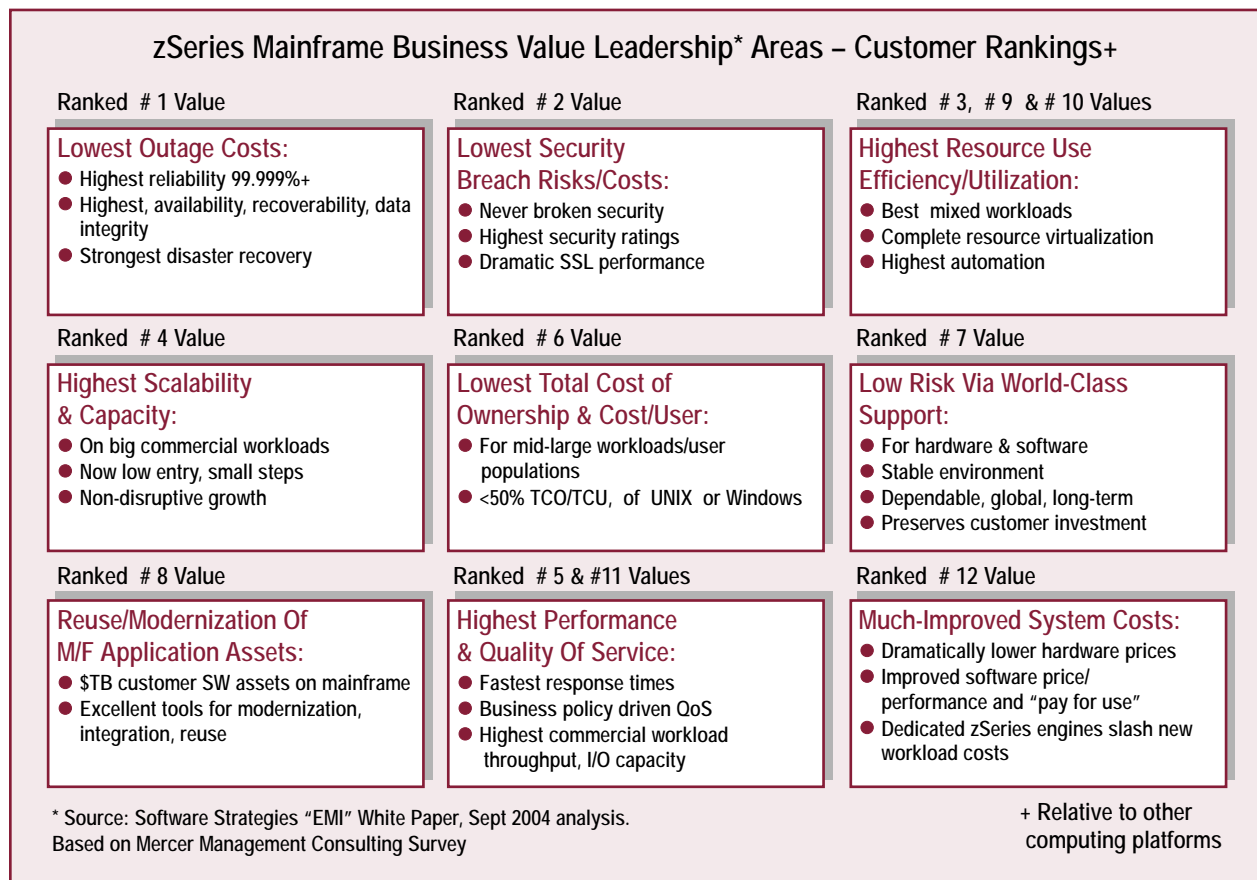\+ Relative to other computing platforms

Figure 4: zSeries Mainframe Business Value Leadership Areas – Customer Rankings

The chart groups and identifies the nine broad mainframe business values customers rated most highly. We discuss these below:

- **Lowest Cost of Outages (*Ranked # 1*):** On Demand business brings information systems more central to the operation of core enterprise business processes. Those processes and systems must be always available and rarely or never go down. Depending on the industry and application, the business loss cost of system downtime may range from $10K, to $100K or, in some cases, to $1M or more per hour of interruption. Customers' near-universally rated the extremely low business losses from outages on mainframe systems as their highest ranked business value. zSeries systems routinely achieve 99.999% availability, even higher in clustered Parallel Sysplex complexes, which is some two orders of magnitude better than distributed UNIX and Windows-Intel-based systems can sustain in normal environments.

- **Lowest Security Breach Risks/Costs (*Ranked # 2*):** Business and technology media report new cases of unauthorized use, service attacks, viruses, spam, fraud attempts, etc every week. Enterprises are now forced to spend many $10B to secure and defend their systems against these threats and risks. The sharp growth of phishing and identity fraud is just the most recent of these damaging issues to emerge. The direct financial losses, costs of defense and repair, and the much larger brand or reputation damage cost of falling victim to such threats, are now major business/financial considerations. Mainframe customers valued second highest the platform's lowest risks and costs of security breaches. Security is deeply engineered and architected into the zSeries mainframe, at every level of its hardware and software, which enables it to achieve the highest security classification levels amongst commercial systems, and accounts for its unblemished "never broken" security record.

- **Highest Resource Use Efficiency/Utilization (*Ranked # 3*):** For larger workloads, customers rated the extreme efficiency and high resource utilization routinely achieved by zSeries mainframe as of significant advantage and value to their businesses. Whilst mainframe hardware costs have fallen dramatically (*70-fold since 1993*), they are still relatively costly per unit of capacity compared to other platforms at first glance. However, this is far outweighed by the long-proven ability of the mainframe to use its resources with great efficiency. This is typically in the 80-90% utilization range, on the most demanding, large-scale, mixed commercial and transaction workloads, whilst delivering assured QoS driven by business policies to each workload. By contrast, distributed RISC UNIX and Windows-Intel systems typically attain an average of around 25% and 10% prime-time overall server utilization respectively. These systems thus require several-fold more installed hardware and software (*up to 10-fold more*) and operating/support staff (*between 2.5 to 4-fold more*) to support a comparable workload. One real case we evaluated in our EMI White Paper found a large enterprise J2EE™ application workload's application and database serving development, tests and production workloads could be supported on just part of one z990 mainframe, in place of 42 separate Sun UNIX servers needed with that alternative. Even then, distributed platforms cannot assure a guaranteed QoS level, or cope seamlessly with substantial peak demand fluctuations that mainframes can easily accommodate. Managing just one, or a few, automated and efficient mainframes requires far fewer staff, much less space, and proves substantially less expensive when all these factors are considered. (*See also "Lowest TCO & Cost/User below".*)

- **Highest Scalability & Capacity (*Ranked # 4*):** The era of On Demand business has brought much faster rates of change, and often dramatic increases or decreases in business demand and transaction levels. These trends have made it harder to provision the right amount of IT capacity to support the business with good service quality, but without costly and wasteful initial over-provision. Today, zSeries mainframes can be sized in a far wider range of models/capacities to exactly fit initial needs. They can later easily be expanded via numerous upgrade paths to accommodate planned expansion, and be almost instantly upgraded with permanent or temporary pre-installed (*but not charged until used*) "capacity on demand" resources to meet rapid changes. A single zSeries system can now scale up to 32 standard processors (*48 total*) capable of handling huge workloads using up to 9,000 MIPS. In a Parallel Sysplex cluster, up to 32 such systems can be coupled and operated as a giant, single-image, commercial computing resource, more than capable of handling the largest workload mixes of the largest global enterprises. Customers rate and rank this fine granularity, high scalability and wide capacity range of the mainframe highly in business value, evidenced by its # 4 ranking.

- **Lowest TCO & Cost/User (*Ranked # 6*):** Driving down core process costs remains a universal priority for businesses around the world. Mainframe customers recognize and acknowledge that TCO and, in particular, Total Cost per User (*TCU*), for medium to large workloads are, in fact, now considerably lower on mainframes compared to those on distributed platforms. They rate this factor highly in its business value for the cost savings it brings to their enterprises. This actual experience contradicts still widespread misconceptions that the mainframe remains an expensive platform, as it undoubtedly was a decade ago. In fact, radical falls in mainframe hardware costs, sustained reductions in unit software costs, and the efficient use of resources achieved deliver the lowest TCO/TCU in many cases. Most of all, the far smaller number of operating and support staff now needed to support a mainframe environment (*achieved by the automated and self-managing capabilities now provided*) have made the platform the most cost-effective by a wide margin. In a subsection below, we summarize the latest independent analyst study of this topic, which validates and quantifies these advantages, and discusses the underlying sources of this strong ranking.

> *In fact, radical falls in mainframe hardware costs, sustained reductions in unit software costs, and the efficient use of resources achieved deliver the lowest TCO/TCU in many cases.*

- **Low Risk Via World-class Support (*Ranked # 7*):** Mainframe customers cited and valued what they categorized as world-class support for mainframe hardware and software as a real business value to their organizations. They clearly saw this as greatly reducing their risks and giving them high confidence in the long-term dependability of the platform and its vendor. They knew that, if ever needed, no effort would be spared to help them rapidly resolve any key issues. They were also, for example, positive about the recent 1,000+ person expansion of IBM's zSeries technical staffing. It is well known that zSeries hardware and software maintenance services and support are of exceptional quality. Less widely known, but equally important, is the systematic preservation of customer investments by deeply engineered-in upward compatibility. This is assisted by the long-term stability of mainframe programming interfaces, which has protected customers from the disruptive discontinuities often seen on other platforms. (*For example, HP's server roadmap migrations and Microsoft's several core programming model changes; each of which wrote-off large customer investments and caused costly, large-scale rework/migration.*)

- **Facilitates Reuse/Modernization of Mainframe Application Assets (*Ranked # 8*):** The business and process transformations of On Demand require many new workflows supported by new information systems that better integrate people, processes and information. The immense enterprise applications software and databases inventory on the mainframe (*built up over more than 30 years and representing $T of past investment*) is now rapidly being modernized, repurposed and linked to other new functionality and package software components to provide solutions supporting these new workflows. With a substantial majority of enterprise business logic, transactions and databases running on mainframes, the platform is the natural hub and host for these developments and new initiatives. The software tools and middleware for the mainframe now fully support such modernization and reuse. Customers report high business value from how these capabilities already allow them to quickly create new On Demand solutions that re-purpose and extend long-established assets.

- **Highest Performance & QoS (*Ranked # 5 and others*):** In On Demand, system performance and user response times have become crucial business differentiators between enterprises. Today, retail customers, partners and channels will no longer tolerate poorly performing systems that are slow or unpredictable in response, and will often go elsewhere. Through an optimized, balanced system and software architecture, the zSeries mainframe clearly delivers the best levels of performance and response times, and the highest workload throughputs, of any commercial systems. Not only that, but it also enables QoS for each workload to be defined at a business policy level, and then dynamically adjusts and reallocates system resources to consistently deliver these. No other type of system can do this. Just one example illustrates the advantage: almost all e-business applications require SSL encryption to secure financial transactions. The mainframe offers dedicated SSL hardware and software that

> *Through an optimized, balanced system and software architecture, the zSeries mainframe clearly delivers the best levels of performance and response times, and the highest workload throughputs, of any commercial systems.*

outperforms other platforms by up to 100 times, and can deliver up to 11,000 SSL transactions per second. Clearly, merchants handling millions or billions of such transactions can deliver dramatically higher throughput and performance with the mainframe platform. Customers recognized these performance and QoS characteristics as of high value to their business.

- **Much-improved System Costs (*Ranked # 12*):** Behind the lowest TCO/TCU advantages of the mainframe, described above, lie the dramatic reductions in the cost of mainframe hardware, and also software, that have been achieved in the transformation of the platform. Customers recognize this as an important business value because it enables the exceptional QoS of today's mainframe to be applied to a wider range of new workloads. In fact, it is these new workloads (*i.e. ERP and CRM enterprise applications, new J2EE™ applications, mainframe consolidation, and Linux virtual servers on mainframe, etc.*) that have driven the mainframe resurgence and increased capacity shipments of recent years. Figure 3 on page 9 quoted figures for this cost reduction; for example, the 70-fold hardware price reductions delivered in 1993-2002, and the 15% p.a. compound software price/performance gains introduced from 1997-2003, increased to 20-25% p.a. from 2003 onwards. An important contributing technology advance, for example, is now also the popular dedicated workload processors offered on zSeries (*for Sysplex Coupling, Linux (IFL) and Java (zAAP) workloads*) that offload these common workloads onto low-cost, dedicated, software cost-free, on-board processing engines.

These customer business value advantages underpin and explain the resurgence of the mainframe that has occurred in the market over the last several years. In the following subsections we comment on three specific areas of mainframe business value enhancement to illustrate some of the prime drivers at work here.

Mainframe – Lowest Cost Platform – Arcati Findings

The most recently published fellow analyst study (*Arcati Research Note – "Dinosaur Myth 2004 Update – January 2005*)" to focus on the comparative total system costs of mainframes compared to UNIX and Windows-Intel distributed systems lends a useful proof-point to the myth-breaking, customer experience-based findings above. Arcati updated and extended its earlier comparative costs analysis, rightly arguing that the most appropriate metric for comparison should be the TCU over a five-year period. Figure 5 shows our summary of these recent findings. These comparisons are for equal new workloads on all three platforms, and do not include any migration costs.

TCU Metric	zSeries Mainframe Platform	UNIX Server Platforms	Windows-Intel Server Platforms
A. 2005 basic platform total cost per end user over 5-year period. (*Hardware and systems software initial costs and maintenance over 5 years.*)	$4,500	$5,400	$8,000
B. 2005 basic platform total cost per end user over 5-year period as A above, plus allowance for application software costs.	$5,250	$6,150	$8,750
C. 2005 total platform cost per end user over 5-year period as B above, but also including operating/support personnel costs.	$6,750	$10,650	$17,750
D. 2005 total platform cost per end user over 5-year period as C above, but also including end-user response time delay costs.	$6,750	$19,650	$26,750
Relative cost multiple 2005:	1.00	2.91	3.97
E. As for D projected forward to 2010, taking into account main trends on all three platforms.	$6,250	$19,000	$24,000
Relative cost multiple 2010:	1.00	3.04	3.84
Arcati Research Note – "Dinosaur Myth – 2004 Update" – Published January 2005			

Figure 5: Platform Total 5-Year Cost Per User – Mainframe vs. Distributed Platforms (*Source: Arcati*)

The most relevant overall comparison is line D, where Arcati found the cost per user for UNIX was almost three times higher (*$19,650*) than for mainframe (*$6,750*), and that for Windows-Intel platforms almost 4 times higher (*$26,750*) for 2005. The figures change only slightly looking ahead for 2010, factoring in the main trends and developments expected. These dramatic differences highlight the major cost advantage the zSeries mainframe now offers over the main current competitors.

Arcati provides well-argued assessments of the sources of these wide differences, which those interested can find in its full Paper. Most notably, as can be seen from comparing lines B and C, the biggest cost factor in the difference is the much lower operating/support staffing levels and costs incurred today on mainframe platforms than on UNIX or Windows, which we discuss further below.

We note that this analysis does not include the full business costs of downtime or outages (*far lower on mainframe*), nor the costs of security vulnerability or breaches with their necessary patching and protection (*also much lower on mainframe*). When these important-to-customer factors are also considered, the true advantage is still wider.

It must be said that these comparisons apply to medium to large enterprise-type workloads with user populations in the mid-high hundreds or thousands: no one would recommend buying a mainframe for a 20-50-user file/print server role alone, which "good-enough" Windows or Linux Intel servers can best support.

Lowest Staffing Levels Also Key Value Contributor

Staffing costs for operations, software, systems and user support are often the largest lifecycle cost element overall. Distributed platforms, with their profusion of separate server and storage hardware and software, as Arcati found and can be seen in the costs above, often require 2.5 to 3 times more overall staff than today's mainframe to support similar workloads, and are still unable to approach mainframe QoS levels. Behind this lies the dramatic reductions in mainframe staffing levels that have been achieved through IBM's systematic, years-long development of self-healing, self-managing, self-protecting, autonomic technologies for the mainframe that have reached high levels. Arcati reports that these have resulted in a 10-fold reduction in mainframe staffing levels (*operators and systems programmers*) per MIPS in the last seven years, and are expected to halve this again in the next five years under the sustained and continuing developments being made.

"The Software Machine" – Central Role of Mainframe Systems and Middleware Software

One of the most important changes in the transformation of the mainframe was the evolution from earlier focus on hardware to one centred much more on software. Today, a high proportion of the functionality and benefit of the mainframe platform is provided by the operating system, the main middleware subsystems, and the extensive range of software tools that support the platform. This swing is also reflected in the reversal of proportions of total cost from the hardware to the software side. In addition, numerous significant changes have been introduced to regularly and substantially improve the price/performance of the software, which had become a mainframe handicap by the mid 1990s. In most of the rest of this Paper, we therefore focus more on the advances and business value of the software stack.

This is not to down-rate today's mainframe hardware technology, which is absolutely leading-edge in every aspect. It also includes sophisticated, advanced firmware to support capabilities such as virtualization and partitioning. Indeed, we briefly highlight the principal strengths of today's mainframe server and storage hardware systems in Appendix A.

Our Analysis

The mainframe's sophisticated and optimized hardware and software technology today definitively delivers high business value to customers/users in the important areas discussed above, and offers clear superiority over alternatives. Most of the lingering "legacy platform" mainframe misconceptions widespread in the market in the late 1990s have now been fully demolished by the transformation and advances mainframe technology and economics has undergone since then. Many medium-large enterprises with experience of the platform recognize and value these strengths, and have voted with their feet by increasing their mainframe investments, and by placing the new workloads on the platform which have fuelled its market resurgence and renewed growth.

The rate of mainframe technology advance and improvement has been substantial, effective and productive in extending these business value-generating strengths, and is continuing through 2005 and beyond (*pledged to do so by the Mainframe Charter*) under IBM's sustained R&D investment.

4. zSeries Mainframe Platform Readiness Strategies – Maximizing Business Value

"Platform Readiness" Overview

In Section 3, we discussed the mainframe business value advantages customers rated as of highest importance to their enterprises. These business values derive from the unique QoS and system attributes engineered into the mainframe platform hardware and software stack through many years of transformative development fuelled by the continuing application of large, sustained IBM R&D investments. The goal was to make the mainframe the premier **"on demand operating environment"** best able to support the new era of On Demand, and this effort has been quite successful, as the previous section attests.

For customers to fully reap these business value benefits, better integrate their business processes, people and information, improve their IT infrastructure management, and control their costs, adopting a mainframe **Platform Readiness** strategy offers real and substantial benefits. Platform Readiness calls for keeping the customer's mainframe hardware, operating system and middleware software stack current and up-to-date with the latest advances and generations of the principal hardware and software subsystems.

Figure 6 shows the elements and layers of the mainframe environment that combine to synergistically support and deliver the overall Platform Readiness attributes, and thus offer the highest business values now obtainable on the platform.

IBM zSeries Environment – Platform Readiness is Key

Platform Readiness
(*Technology, Sub-capacity pricing (WLC), Web Services/SOA*)

Integrated Mainframe Software Tool Set

| IMS V9 | DB2 V8 | CICS V3 | NetView V5.2 | WebSphere V6 | WebSphere MQ v6 |

Operating System z/OS 1.6 (*1.7 in 2H 2005*)

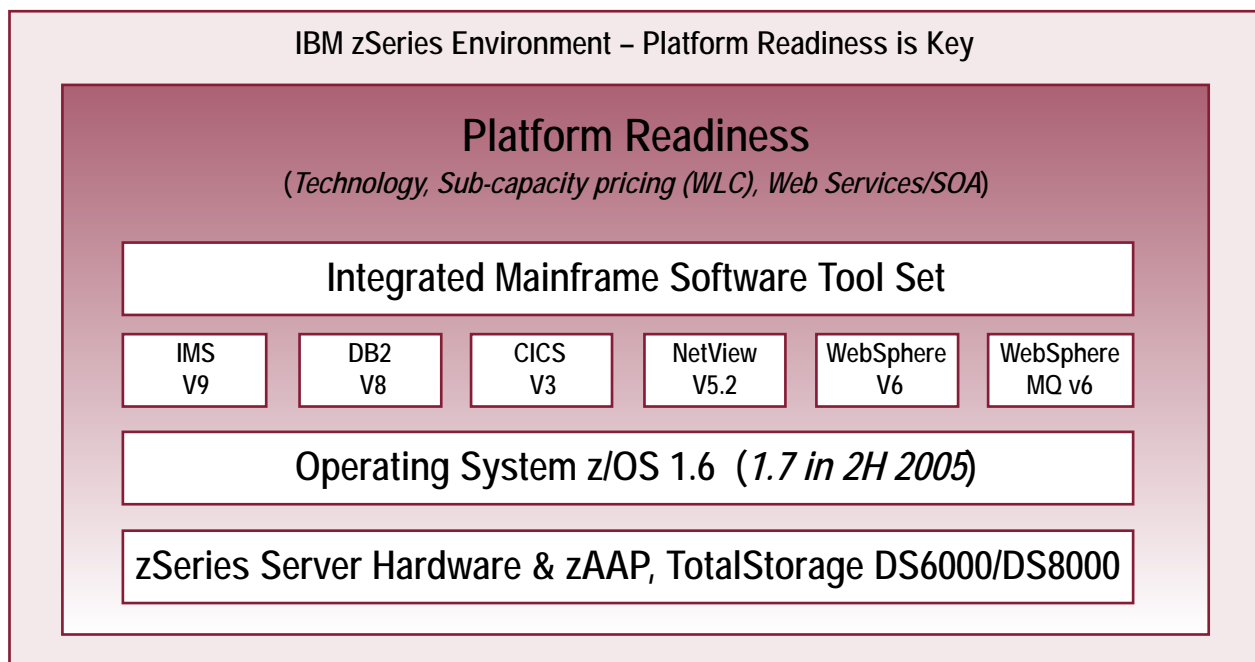### zSeries Server Hardware & zAAP, TotalStorage DS6000/DS8000

Figure 6: IBM zSeries Environment – Platform Readiness is Key

The Four Layers of zSeries Platform Readiness

Platform Readiness considers the mainframe environment as a four-layer architecture:

- At the base are the mainframe server and storage hardware platforms themselves, discussed below and in Appendix A.

- The second level is the z/OS operating system native to, and fully exploiting, the z/Architecture 64-bit zSeries hardware platform, and providing the foundation for the other software layers, which we discuss in more detail in Section 5.

- The third level comprises the principal middleware software subsystems that combine to provide much of the advanced workload capabilities, support for SOA and Web Services, and the application and data integration of the platform. We discuss the specific advances and new business values contributions of each of these zSeries pillars in Section 5. Reuse of the decades-long inventory of mainframe "heritage" application and data assets in new business process workflow systems is a common theme across these main subsystems.

- The fourth layer is the extensive range of mainframe software tools that IBM now provides to support all stages of the enterprise modernization, application and data integration lifecycle, and to monitor and manage the environment efficiently. We have extensively covered the advances in this tools portfolio in earlier White Papers (*see the "Other Software Strategies Related Research" Section on page 45: items 1, and 4*) and refer readers to these studies for fuller assessments.

There is close integration, synergy, and incremental value-add not only in the components within each layer, but also between each of these layers, and between individual components and the others. The newer releases of the operating system support the most advanced capabilities of the hardware. The newest middleware subsystems provide much of the On Demand integration, support for new workloads, enterprise modernization capabilities, as well as fullest middleware software platform exploitation of unique zSeries hardware and operating systems capabilities. The software tools portfolio fully supports, and makes it easier and faster to deploy, the main middleware subsystems, to develop and deploy new-generation business applications on the platform, and to monitor, manage and optimize performance at all levels of the whole system. Much of the enhanced business value of the whole mainframe platform comes from the combined synergies that are fully obtainable only under an active Platform Readiness strategy.

Platform Readiness – The Hardware Layer

Whilst this White Paper focuses mainly on the two middle layers of zSeries software, recent hardware advances are also compelling and significant, and we provide below (*and in Appendix A*) our concise assessments of these, based on our other published research, to provide a complete platform picture here:

- **Newest zSeries Servers:** Established assets of zSeries servers include their strong, mixed commercial workload handling capability, extreme availability, rock-solid hardware security, and wide scalability range. This Platform Readiness layer demonstrates the value of running the latest zSeries 990 and zSeries 890, along with z/OS. These systems now come in a wider and more granular range of models (*from a far lower entry point to a 3-fold higher capacity top-end system*). They also support sub-capacity pricing, support larger numbers of virtual servers per system, introduce the dedicated zAAP Java offload processing engine facility (*that runs Java workloads with no additional software costs*), and provide 2X-4X higher I/O capacities. These advances combine to enable these systems to deliver much higher workload throughputs at significantly lower costs. We summarize our assessment of the principal advances of the z990 high-end, and the z890 entry-mid-range, zSeries servers in Appendix A, Figures A1 and A2, based on findings in our previous White Papers.

- **Newest TotalStorage Enterprise Storage Systems:** The other enterprise platform hardware component needed is enterprise-class storage. Late 2004 saw IBM introduce two groundbreaking, innovative, enterprise-class storage systems based on advanced server technologies. These are complimentary to the zSeries mainframe server platform (*but also support iSeries, UNIX open systems and Windows/Intel platforms*). The new DS6000 brings enterprise-class storage capabilities at a radically lower price point, in the smallest-ever form-factor, and is an ideal complement to the entry to mid-range z890 server. It also provides a lower-cost second-level platform in tiered enterprise ILM storage hierarchy configurations. The high-end DS8000 provides the storage complement to the high-end z990 mainframe servers. It offers 6X the capacity/performance of its predecessor (*ESS Base*), massive scalability up to 192TB, and the industry's first implementation of storage systems LPARs (*which allows two separate storage images to be run concurrently on a single DS8000*). The DS8000 uses dual-clustered POWER5 processor-powered pSeries server engines in the initial 2-way and 4-way models introduced so far to deliver its striking scalability and performance gains.

    We published an in-depth Enterprise Storage Spotlight Report on these two systems and their software (*see the "Other Related Software Strategies Research" Section on page 45: item 2*), in November 2004. We summarize our assessments of the principal advances offered by these TotalStorage DS8000 and DS6000 enterprise-class storage systems in Appendix A, Figures A3 and A4, based on our findings in this Report.

Foundation Technologies Enable Mainframe Platform Readiness Advantages

So what are the technologies and capabilities that combine to deliver the highly-rated business values (*highlighted and ranked in Section 3*) that customers so appreciate on the mainframe, and which are the most advanced for Platform Readiness adopters who benefit fully from the latest hardware models and software releases?

- **Optimized, Deep Platform-wide Support for Java/J2EE™:** The Java™ programming language, and specifically Java™ 2 Enterprise Edition (*J2EE™ – its high-end model*), is now the definitive programming model/software platform for building/deploying new enterprise-class, Web-based server applications. Today it holds a substantial 80% market share of such developments. Supported on most enterprise server platforms/operating systems, J2EE™ provides high-level facilities for building new-generation applications that are completely portable. The J2EE™ platform simplifies enterprise applications by basing them on standardized, modular components, by providing a complete set of services to those components, and by automatically handling many details of application behavior without complex programming.

> *The zSeries mainframe hardware, operating system, middleware software subsystems and software tools have been continuously extended and developed to support and enable wider use of J2EE™ on the platform.*

The zSeries mainframe hardware, operating system, middleware software subsystems and software tools have been continuously extended and developed to support and enable wider use of J2EE™ on the platform. J2EE™ is thus a vehicle and enabler for software integration, modernization and standardization, both within the mainframe environment itself, and across the multiple platforms that most enterprises use. We assessed and reviewed the compelling case for J2EE™ as a "software platform" for integration in a September 2004 White Paper. (*See the "Other Related Software Strategies Research" Section on page 45: item 3*).

Extensive, native J2EE™ run-time support is provided on zSeries (*z/OS and Linux*). On z/OS this is provided by WebSphere Application Server for z/OS (*see Section 5F for details*), offering mature, robust and optimized support that fully exploits the unique QoS of the zSeries platform, with a 100% common, compatible programming model. J2EE™ support on z/Linux is provided by the WebSphere Application Server for Multiplatform distributed version, which uses the same J2EE™ programming model and IBM AD tooling as on z/OS and all other supported J2EE™ platforms.

- **Resource Virtualization:** The zSeries mainframe provides undoubtedly the most advanced, comprehensive resource virtualization of any IT platform. All zSeries resources – CPU, I/O, memory and network paths – are fully virtualized, which means that they can be shared dynamically over many workloads. The virtual resources assigned to each LPAR partition (*z/OS*) or virtual server (*z/Linux under z/VM*) can be increased or decreased dynamically, under manual or workload management software control. This enables the systems to automatically achieve business policy predefined workload QoS SLA levels for each partitions and/or virtual server active on the system. With these capabilities, a single, large and scalable physical zSeries system can be "virtualized" into a number (*up to 30 main LPAR partitions on z/OS, and/or up to hundreds or thousands of virtual servers on z/VM with Linux*) of different logical environments. Virtual

> *The zSeries mainframe provides undoubtedly the most advanced, comprehensive resource virtualization of any IT platform.*

servers/partitions can be also be brought up just when needed, and staged down when no longer required (*e.g. for development and test environments, or periodic processing operations*).

These virtualization facilities are a prime enabler of the highest resource utilization/efficiency amongst all platforms zSeries regularly achieves. This efficiency makes the platform considerably more cost-effective than distributed UNIX or Windows-Intel systems. Analyst studies suggest the latter often require 10-times more hardware than a zSeries alternative to deliver a given service. Mainframe hardware costs per unit of capacity have fallen over 70-fold between 1993 and 2002. Although they remain more costly than distributed system resources per unit of capacity, this up to 10-fold higher resource usage efficiency translates to the significantly lower TCU, as shown in Figure 5 on page 14.

- **Continuous Availability:** On Demand requires continuous availability, and the zSeries has the highest availability of any standard commercial system. Advanced engineering, unique reliability technologies, high quality hardware components, and using part of their raw power to detect and correct errors accounts for the 99.999%+ availability levels that these systems deliver. Unplanned outages and their business disruption costs are therefore low. In addition, continuing software development has greatly reduced or eliminated most of the sources of unplanned downtime. Most operations that would previously have required a system shutdown can now be run with the system online, minimizing planned downtime and taking the pressure off ever-narrowing offline windows.

- **Security & Business Resiliency:** The zSeries is the most secure commercial computing platform available by architecture, design, and through many years of development. We are currently in the midst of the worst period in IT history for viruses, worms, service attacks, e-fraud and other related electronic security threats, and this situation is rapidly getting worse. These issues are now costing businesses scores of billions of dollars in costs and losses. These threats all mainly impact distributed systems (*Windows particularly, also UNIX & Linux*), which are architecturally vulnerable to such attacks, and which therefore cannot be rigorously protected against them today (*by any known or available add-ons*). Conventional perimeter defenses are failing under the flood of Web and e-mail access, leaving these systems hugely vulnerable to all such forms of "malware". The zSeries mainframe, by contrast, offers deeply engineered-in and architecturally enforced protection against almost all these threats, and has never been the subject of successful attacks.

  In addition, the systems can support sophisticated business continuity and disaster recovery solutions that can maintain secondary or tertiary recovery sites, either within the region or across the globe, that can take over workloads if the primary system is lost. These solutions include Metro Mirror and Global Mirror, and these are considered the most advanced and high performing of the BC/DR solutions available.

- **Intelligent Workload Management:** Perhaps the most unique zSeries capability is the advanced, self-managing and self-optimizing workload management capabilities of the system that combine with the advanced virtualization described above to deliver zSeries' extreme high-resource utilization, and also its uniquely high QoS levels driven by business policies and priorities. These capabilities are provided by the Work Load Manager (*WLM*) that optimizes the execution of all the tasks within one logical partition, and Intelligent Resource Director that optimizes the allocation of resources across logical partitions, to ensure business SLA goals for all partitions/workloads are met. These outstanding capabilities are automated, and can run without operator involvement. Indeed, recent developments (*for example, the Enterprise Work Load Manager – EWLM*) are now extending these native zSeries capabilities so that the zSeries mainframe host can also begin to optimize and manage distributed workloads across the multiple platforms involved in multi-tier, multi-platform enterprise applications, a high-value new role for the platform.

- **Business Integration:** Achieving On Demand benefits calls for closer integration of people, processes and information horizontally across functions, and across the "extended enterprise" business network and ecosystem. Only by closely integrating all groups in their business models, processes and IT systems can enterprises become On Demand. zSeries mainframes support a majority of enterprise, mission-critical applications and most of the largest databases, which places them at the heart of On Demand business and application integration efforts. The WebSphere Business Integration middleware software suite on zSeries, the reference architecture shown in Figure 7, provides comprehensive support for all these aspects of business integration. We reviewed and assessed WebSphere Business Integration fully in a previous White Paper. (*Please see the "Other Related Software Strategies Research" Section on page 45: item 3 for more details.*)
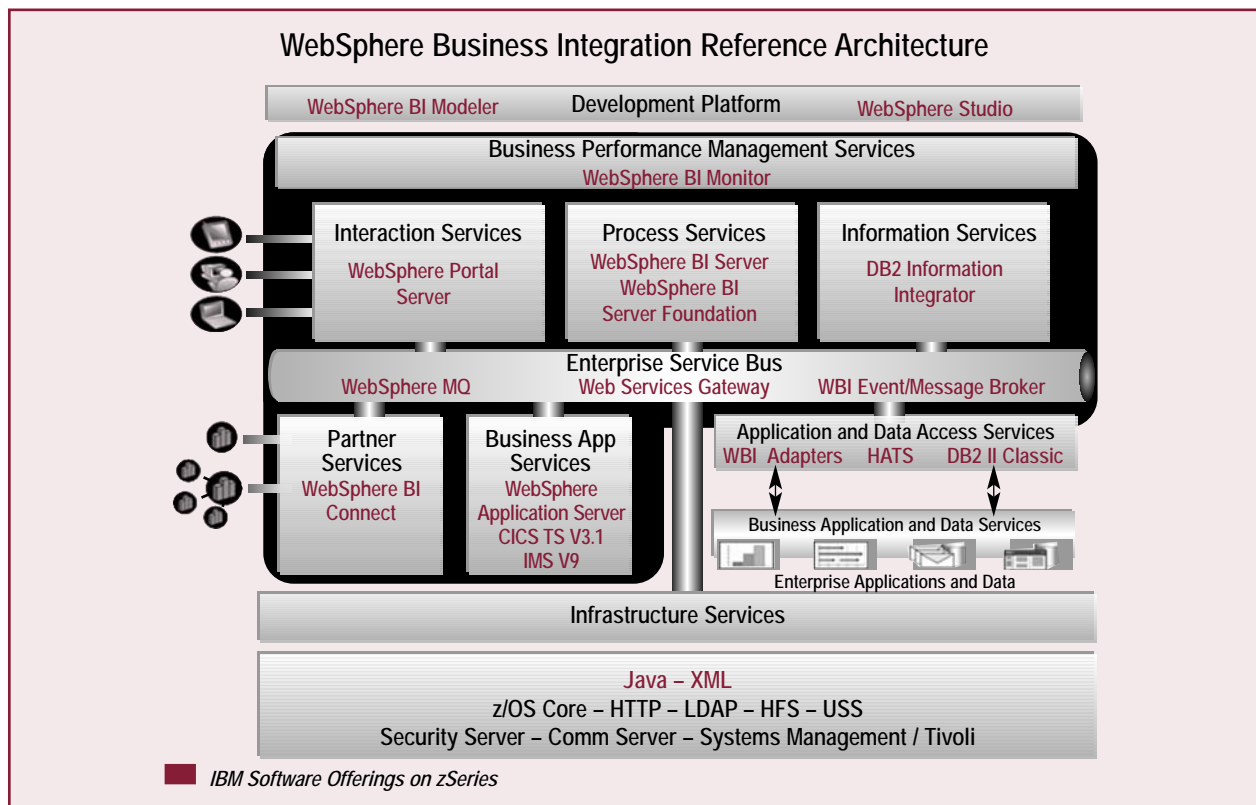

Figure 7: WebSphere Business Integration Reference Architecture on zSeries

The suite provides extensive support to integrate important mainframe software assets into new On Demand applications, based on the core J2EE™ software technology described above.

- **64-bit z/Architecture:** The transformation of the mainframe from the 31-bit S/390 G6 generation to the 64-bit z/Architecture zSeries, first introduced in 2000, was one of the most fundamental technology advances. 64-bit architecture gives magnitudes more headroom and addressing capability for decades of system enhancement and expansion. 64-bit headroom and performance benefits have been increasingly exploited and optimized since then, to significantly extend the limits of mainframe capability. One important recent example, discussed more fully in Section 5, is the DB2 UDB Version 8 for z/OS release of IBM's market-leading database management system, which has been completely rewritten to exploit 64-bit z/Architecture.

- **Speciality Designated Workload Processors:** To encourage the migration of newer workloads to the zSeries platform, IBM now offers three types of dedicated workload processors on zSeries. Installed CPUs may be designated as any of the low, fixed-price offload processor types. The system then automatically offloads these workloads onto the dedicated processors, which releases capacity of the more costly, software charge-carrying, general-purpose IP CPUs. The ICF provides Parallel Sysplex cluster coupling processing in these high-availability, highest scalability zSeries configurations. The Integrated Facility for Linux (*IFL*) provides offload for Linux workload processing, has been extremely popular, and contributed greatly to the rapid growth of Linux workloads on the mainframe. Most recently, in 2004, the most strategic of these offerings – the zSeries Application Assist Processor (*zAAP*) dedicated offload processor for Java workloads – was introduced. Given the strategic importance of the Java/J2EE™ workloads described above, the zAAP is a crucial development that slashes the cost of deploying large-scale J2EE™ applications on the zSeries platform. Typically, around 50% of a WebSphere application's processing is offloaded automatically and transparently to the zAAP facility. In our assessment, the zAAP is one of the most significant milestones in the continuing resurgence of the mainframe platform. The operational advantages of single-tier (*all on zSeries*) or two-tier (*application and database serving on zSeries*) mainframe deployment were already hugely compelling, and now the zAAP brings much improved economics. We expect the zAAP to be the spark that ignites further growth in mainframe-based J2EE™ deployment.

- **Software Workload and Sub-capacity Licensing:** Software pricing methods were long a serious inhibitor to wider mainframe use, because software fees were traditionally linked to the overall power of the system. This important issue was solved by the introduction of the Workload License Charge (*WLC*). This links software cost to the capacity/resources used within just the logical partition that product runs in, not that of the whole system. Extended and refined several times since introduction, this so-called sub-capacity software-licensing model brings customers much more affordable and variable mainframe software costs. WLC now allows customers to pay only for what they actually use; payments can vary month by month depending upon usage levels directly linked to business volumes. This has been a fundamental and important enabling advance that has greatly encouraged mainframe resurgence.

- **Extensive Support for Composite Applications, Web Services and SOA:** The next emerging generation of On Demand business applications are being assembled and choreographed to support enhanced new business processes from three main sources. These are "wrapped" existing application components, newly developed (*mostly J2EE™*) software components, and ISV application components, loosely coupled using the maturing Web Services open standards over the Internet, in what is now known as a SOA. Our explanations of these terms are shown in Figure 8.
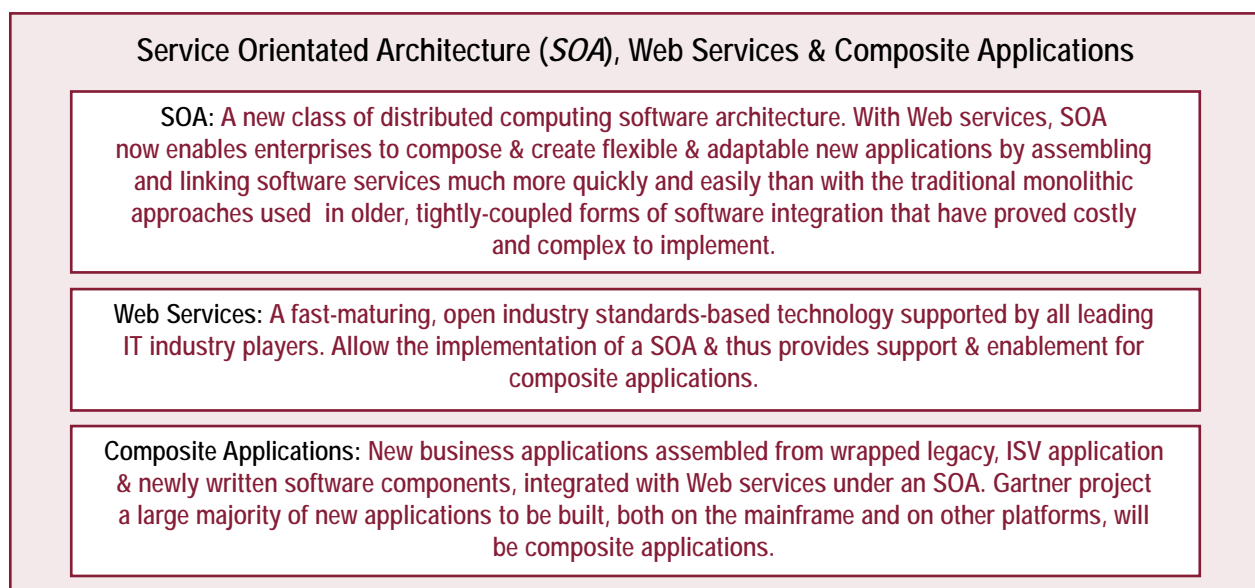

Service Orientated Architecture (*SOA*), Web Services & Composite Applications

> **SOA:** A new class of distributed computing software architecture. With Web services, SOA now enables enterprises to compose & create flexible & adaptable new applications by assembling and linking software services much more quickly and easily than with the traditional monolithic approaches used in older, tightly-coupled forms of software integration that have proved costly and complex to implement.

> **Web Services:** A fast-maturing, open industry standards-based technology supported by all leading IT industry players. Allow the implementation of a SOA & thus provides support & enablement for composite applications.

> **Composite Applications:** New business applications assembled from wrapped legacy, ISV application & newly written software components, integrated with Web services under an SOA. Gartner project a large majority of new applications to be built, both on the mainframe and on other platforms, will be composite applications.

Figure 8: Composite Applications, Web Services and SOA

With so much of the world's enterprise applications, transactions and databases residing on mainframes, they are now the primary hub platform for these new business solutions. We highlighted above the deep support for J2EE™ now offered on zSeries. The zSeries middleware software subsystems, reviewed in detail in Section 6, now offer extensive support for deploying composite applications under the latest Web Services standards in a SOA, and the tools portfolio now provides extensive support for such new applications, development testing and performance monitoring and management.

Getting to Platform Readiness – Roadmap

With the business value leadership today's mainframes now offer, and the continuing technology advances extending these regularly, Platform Readiness suggests mainframe customers should plan and implement systematic, regular and timely steps to take full advantage of these developments. This means:

- **Adding New Mainframe Workloads:** Mainframe customers should plan to move a higher proportion of their total IT workload onto mainframes, to enjoy these undoubted business value benefits more widely. Many customers are, of course, already actively doing just this in addition to continuing to run traditional systems there. The most popular of these new workloads include: new J2EE™ e-business applications, Linux workloads which include both infrastructure functions and the fast growing portfolio of Linux business applications, application and database serving for large enterprise applications such as ERP (*SAP*) and CRM (*Siebel*), etc.

- **Upgrading Hardware to newest zSeries & TotalStorage Platforms:** Customers still running older generations of mainframe systems (*such as the S/390 G5 and G6 larger systems*), and older operating systems such as OS/390 (*as well as smaller mainframes*), are missing out on the significant advances and the improved business value the newer mainframe hardware and software provides. With their substantial improvements in capacity and headroom, performance, reliability and price/performance, the economic, as well as the functional enhancement case, for upgrading is now persuasive. Delays in making the move up to zSeries hardware, the z/OS operating system that exploits their 64-bit hardware technology, and the associated latest releases of the middleware subsystems, are deferring substantial business value that they could enjoy. Similar comments apply to enterprise storage, where the advances provided for zSeries customers by the new DS6000 and DS8000 storage systems are compelling and complementary.

- **Upgrading zSeries Operating Software:** zSeries customers still running earlier releases of z/OS should be planning to upgrade to the current z/OS Release 1.6 level, or to z/OS Release 1.7 expected later this year. These newer releases have added significant further exploitation of the zSeries hardware and middleware software advances, improved performance and communication, extended support for standards, and brought other important advances.

- **Upgrade the Middleware Subsystems:** New releases of all the main zSeries middleware software subsystems over 2004/2005 have brought extended support for Web Services, composite applications and SOAs, performance gains, new zSeries hardware exploitation and optimization, improved software licensing price/performance, plus other advances, which we evaluate in Section 5.

Our Analysis

With the strength of its overall business value proposition (*Section 3*), the leadership technologies that support it (*described above*), and this decade's much faster rates of advance under heavy R&D investment, we consider more/most mainframe users should accelerate adoption by implementing a Platform Readiness strategy. Supporting the new world of On Demand business is a compelling driver for keeping IT environments up-to-date with new technology and enhancements, but many specific and tangible benefits also flow.

Rather than evaluating and justifying each individual hardware or software enhancement in isolation, we recommend a more holistic approach, because of the synergistic benefits of the combined advances in all the above.

This argues for brisker adoption across the board and for Platform Readiness again becoming the default approach (*as it was for most mainframe users up to the late 1980s, but when the pace of advance was much slower*), justified by the overarching business value the whole mainframe environment now provides.

5. Mainframe Software Stack Advances Build Business Value

Software Stack Key to Mainframe Strength

In this Section we review and assess the latest advances in the core mainframe software environments, comprising the z/OS operating system bedrock and the six primary middleware pillars that are the foundations of the mainframe's On Demand software operating environment today. Covered are:

- z/OS Operating System.
- DB2 UDB for z/OS – Information Management.
- IMS – Information Management.
- CICS Transaction Server – Transaction Management.
- WebSphere Application Server for z/OS.
- WebSphere MQ for z/OS Applications Integration.
- Tivoli NetView for z/OS Network Management.

Already available, or scheduled for 2005 delivery, are major new releases of all these important software engines that combine to provide considerable advances in the business value they can deliver for mainframe users, especially when used with advanced zSeries server and TotalStorage enterprise storage systems hardware (*Summarized in Appendix A*). What is apparent is the scale, breadth, and depth of developments, and the speed at which they have been delivered, which reflects the large investments IBM has made, and continues to make, in the zSeries software environment. This investment and development is providing much greater opportunities and business value increases for mainframe users than in the 1990s, when a much lower, slower pace of advance prevailed.

5A. z/OS Operating System – z/OS Releases 1.6 and 1.7

Introduction/Positioning: z/OS, the native operating system for zSeries mainframes, is a secure, scalable, high-performance enterprise operating system on which to build and deploy Internet and Java-enabled applications, providing a comprehensive and diverse application execution environment. z/OS is designed to deliver the highest QoS for enterprise transactions and data, to extend these qualities to new applications using the latest software technologies. z/OS is also designed to create an operating environment that delivers customers' On Demand benefits, including autonomic capability, integration, virtualization, and openness. The current production z/OS 1.6 Release became available on 24.09.04, and the next z/OS Release 1.7 is scheduled to become available in September 2005.

Business Value Enhancement Themes:

- **z/OS Release 1.6:** The main business value enhancement themes for the current z/OS Release 1.6 were to further extend z/OS scalability and to enhance and extend the application integration the operating system supports. IBM also aimed to make z/OS' already strong security capabilities easier to use, to augment the operating system's self-optimizing capabilities, further increase its availability, and to improve TCP/IP network management. An important area of advance in z/OS 1.6 was completing the 64-bit exploitation support. This release provides the capability to exploit 64-bit virtual in developing and deploying applications that require significantly more data addressability. This was provided through enhancements to UNIX Systems Services, 64-bit Language Environment® run-time support, existing C/C++ compiler 64-bit support, and Program Management Binder 64-bit support, completing the major steps of the z/OS 64-bit virtual roadmap.

  Significant new capabilities for using zSeries to support a heterogeneous infrastructure include incorporation of Common Information Model (*CIM*) instrumentation, and support for the first version of the new Enterprise Workload Manager (*EWLM*). This release also provides support for the zAAP-dedicated Java workload processor capability. z/OS 1.6 and above run only on zSeries servers (*z900, z800, z990, z890*) as the OS increasingly exploits z/Architecture features.

- **z/OS Release 1.7:** z/OS is designed to deliver world-class computing for On Demand business, and in Release 1.7 adds facilities that extend the positioning of the zSeries platform as the enterprise data vault and interconnect point for business logic. These extensions to the role of the mainframe will apply its core strengths to managing enterprise data and the deployment and execution of business logic not only on the zSeries itself, but also to the other connected hardware platforms in the enterprise infrastructure. Other business value enhancement themes for z/OS Release 1.7 include further scalability improvements, application integration enhancements, further security improvements, enhanced TCP/IP networking availability, additional self-optimization features, and enhanced ease-of-use. Included are enhancements to deliver increased availability of z/OS UNIX® System Services (*z/OS UNIX*), to support new security standards, and to improve enterprise-wide workload management. Ease-of-use is enhanced by the integration of the Health Checker within z/OS that provides checking of, and "best practices" for, z/OS components and can be used by ISV and middleware products as well. In the EWLM, new interfaces now allow customers to measure transaction performance across multiple tiers of a heterogeneous infrastructure – an IBM Virtualization Engine™ capability. The concept for EWLM is shown in Figure 10 on page 22. This is a large step towards the end-to-end, distributed workload optimization goal, and a major benefit right now in tracing hard-to-identify performance issues in complex, multi-tier environments. In our view, the latter is amongst the most significant advances.

The business value enhancement themes for these two significant z/OS releases are summarized in Figure 9.

z/OS Main Enhancement Themes	
z/OS Release 1.6 Delivered	z/OS Release 1.7 Planned
● Increased Scalability/Capacity for z/OS Workload – MIPS & Data Growth	● Further Increases In Scalability in z/OS, Unlocking the Headroom
● Security Enhancements	● Further Security Improvements
● Enhanced New Applications Integration and Open Standards Support	● Improved z/OS Ease-of-use
● Improved Availability	● Improved Application and Network Availability
● Simplified z/OS Security Feature Management	● Further Security Enhancements
● Extending and Improving TCP/IP Network Management	● Extending the Network
● Extend Self-managing Capabilities	● Further Self-managing Capabilities
● Usability Improvements	● Further Usability Improvements
● Supporting Heterogeneous Infrastructure	● Extending Heterogeneous Infrastructure Support

Figure 9: z/OS Releases 1.6 and 1.7 – Main Enhancement Themes

Key Features: Behind each of these enhancement themes in each release are numbers of significant individual advances. Space limits do not permit detailed discussion of each of these here; instead, we include our overview tables of these advances in Appendix B, Figures B1 and B2. The purpose of including these is less to focus on the specific individual items, but rather to show the overall breadth, depth and value of the substantial progress that has been made/is planned in extending the capabilities of z/OS for the On Demand world. We provide rather more details of the next Release, z/OS 1.7, since many customers will already be more familiar with the current z/OS 1.6.
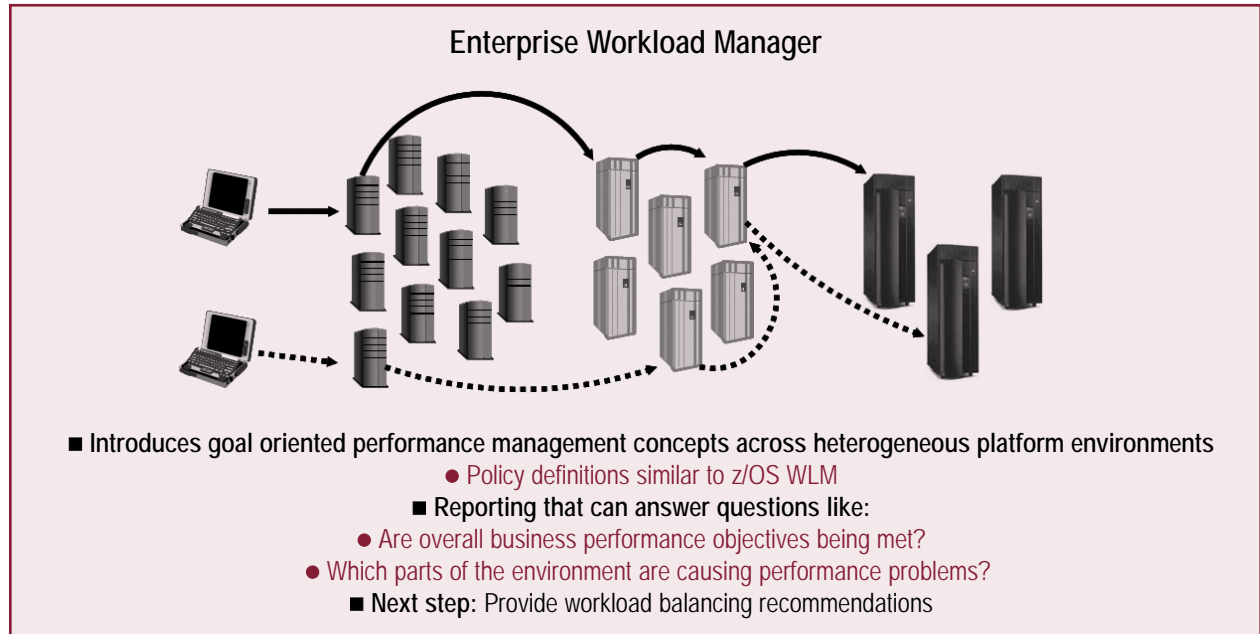

Enterprise Workload Manager

■ Introduces goal oriented performance management concepts across heterogeneous platform environments
● Policy definitions similar to z/OS WLM
■ Reporting that can answer questions like:
● Are overall business performance objectives being met?
● Which parts of the environment are causing performance problems?
■ Next step: Provide workload balancing recommendations

Figure 10: Enterprise Workload Manager Concept

z/OS.e: This subsection focused on the mainstream z/OS full-function version of the operating system. Also offered is the attractively-priced z/OS.e operating system, which provides largely the same functionality and advances, but the use of which is restricted to all-new designated e-business workloads on a new zSeries server only. z/OS.e comes at a small fraction of the cost of the unlimited usage z/OS, and has proved a major encouragement to completely new mainframe sales, where the designated e-business applications/workloads are concerned.

Assessment: These are substantial and wide-ranging z/OS advances, already delivered in the current z/OS 1.6 release and scheduled for the next 1.7 release in September 2005. They show solid progress and considerable advances in extending the on demand-operating environment of zSeries systematically across the board, and in relieving many constraint areas. Full exploitation of 64-bit virtual addressing, support for the zAAP Java offload processor that brings large cost savings on zSeries Java workload processing and extensions to enterprise workload management are notable advances. This brisk pace of advance, with just one year between them, also indicates the robust health of the platform and shows many deliverables from the continuing, sustained operating systems investments being made. In our assessment, this picture argues a good case for z/OS users to upgrade to these newest OS levels sooner.

5B. Information Management Business Value with DB2 Version 8

Positioning/Introduction: DB2 for z/OS is IBM's flagship relational database management system and is the hub of a comprehensive information management environment for the mainframe. DB2 UDB is also supported on most other significant IT platforms. DB2 manages a high proportion of the world's largest databases on the zSeries platform, and is equally suited to supporting large online transaction processing/databases, major enterprise applications packages (*such as SAP and Siebel*) and handling business intelligence and data warehousing applications. DB2 is the global market share leader in the overall database market, with over one million server licenses deployed, and an estimated 40 million end users, according to IBM. DB2 Version 8, which became generally available on 03.26.2004, is the most significant advance of DB2 on the mainframe for many years. The middleware underwent a complete rewrite to extend scalability by fully exploiting 64-bit z/Architecture, and to greatly increase its commonality with the distributed platform implementations, now on a common code base. DB2 solutions also include data warehousing, data mining, content management and information integration solutions, tightly coupled with the industrial-strength, multimedia, Web-enabled, high-performance, flexible and reliable/available database engine. These capabilities, combined with the now extensive set of advanced DB2 tools, combine to enable DB2 UDB Version 8 to support the most sophisticated and demanding enterprise-scale On Demand applications and the core business processes of national and global enterprises.

Business Value Enhancement Themes: The main business value enhancement themes of DB2 UDB Version 8 (*shown and amplified in Figure 11*) were to substantially extend integration of DB2 with the hardware, other key IBM software elements and enterprise applications. Also sought were scalability advances to provide headroom for applications growth with flexibility, and increasing availability by enabling more on-line changes without shutdown in an important move further towards the continuous availability at the database application level needed in On Demand.

Available Since March 2004!

DB2 UDB for z/OS Version 8

- **Integration:** Synergy between DB2 V8, zSeries hardware, and IBM software (z/OS, WebSphere, tools) provides more granular security, improved support for Java and web applications, and enhanced tools support from GA

- **Flexible growth & scalability:** Current workloads grow on demand and new workloads deploy more easily with much-expanded system constraints

- **Availability:** Increased uptime through new functions like database design changes without outages and faster backups with system point-in-time recovery

"With the introduction of DB2 for z/OS Version 8, we saw our opportunity: we could gain the long term availability and stability benefits for our core transaction processing system and realize hard cost savings…."
Kevin Campbell, Univar's Application Architect

Significant DB2 Tools Advances

- QMF
- WebSphere II Classic Federation
- DB2 Performance Expert/ OMEGAMON XE for DB2
- DB2 Query Monitor
- DB2 Automation Tool
- WebSphere II Replication
- Fault Analyzer

Figure 11: Business Value Enhancement Themes – DB2 UDB for z/OS version 8

In addition, DB2 UDB for z/OS Version 8 provides important advances that render it far easier and faster to port database applications from other platforms and relational database management systems. (*Notably longer table and column names, longer SQL statements, etc.*) This is a particularly important advance, given the market resurgence of the zSeries mainframe, and the number of new workloads customers are deploying to the platform. It makes it much easier and faster to migrate a customer's Oracle-UNIX or MS SQL Server database application on Windows to take two popular examples, onto the more robust, scalable and cost-effective zSeries mainframe platform with DB2 UDB Version 8.

DB2 UDB Version 8 also provides comprehensive database support for building and deploying new composite applications under SOAs, both through closer integration with the WebSphere software platform, and through DB2 support for XML and Web Services open standards.

IBM executives stress that DB2 UDB for z/OS, the twelfth version of the mainframe product, delivers more advances and improvements than any previous release of DB2, and is a real landmark in the evolution of the platform. They argue that, as the IBM first middleware product to break the bonds of 31-bit computing and that exploits the enormous scalability within 64-bit zSeries machines, DB2 UDB for z/OS Version 8 allows customers to drive greater workloads through their systems and "do more with less".

Key Features:

In addition to the deep and wide overall Version 8 improvements that broadly enhanced scalability, application porting, security, architecture, and continuous availability, our selection of some of the main, specific advances are briefly highlighted below:

- **Enhanced SQL:** More functions, better diagnostics, tighter DB2 UDB family compatibility, extending DB2's SQL beyond its current boundaries.

- **Schema Evolution:** "Alter a table and go" – no need to drop and redefine. This important change brings less system downtime and more data availability.

- **64-bit Virtual Storage Support:** Simplifying main storage, increasing system availability and scalability.

- **Longer Names for Tables & Columns and Longer SQL Statements:** Enhancing DB2 family application portability and increasing database functionality.

- **Enhanced Java™ and Unicode Support:** Improving application support and reengineering for international business.

- **Enhanced Utilities:** Full utility support for the extensive changes in DB2 for z/OS, plus greater DB2 family compatibility.

- **Multilevel Security at Row Level:** Enables finer-grain database security at row level.

DB2 Tools:

Also offered is a comprehensive portfolio of modern DB2 tools on z/OS that support high-productivity database administration, recovery and performance management, application management, and replication and utilities management. These tools are all aligned to support the DB2 UDB for z/OS Version 8 release, and provide support for building, optimizing and managing the whole DB2 infrastructure on zSeries cost-effectively. These are shown fully in our chart in Figure 12.

DB2 UDB for z/OS Version 8 - DB2 Tools Portfolio

Database Administration
- IBM Data Encryption for IMS & DB2 Databases
- IDB2 Administration Tool
- IDB2 Object Comparison Tool

Utilities Management
- DB2 Automation Tool
- DB2 High Performance Unload
- DB2 Utilities Migration Toolkit
- DB2 Utilities Suite

Recovery Management
- IBM Application Recovery Tool for IMS & DB2 Databases
- IDB2 Archive Log Accelerator
- IDB2 Change Accumulation Tool
- IDB2 Log Analysis Tool
- IDB2 Object Restore Tool

DB2 DBMS For z/OS V8

Performance Management
- DB2 Buffer Pool Analyzer
- DB2 Performance Expert /OMEGAMON XE for DB2
- DB2 Performance Monitor
- DB2 Query Monitor
- DB2 SQL Performance Analyzer

Replication Management
- DB2 Data Propagator
- DB2 RepliData
- WebSphere Information Integrator Replication

Application Management
- DB2 Bind Manager
- DB2 Data Archive Expert DB2 Path Checker
- WebSphere Information Integrator Classic Federation
- DB2 Table Editor
- DB2 Test Database Generator
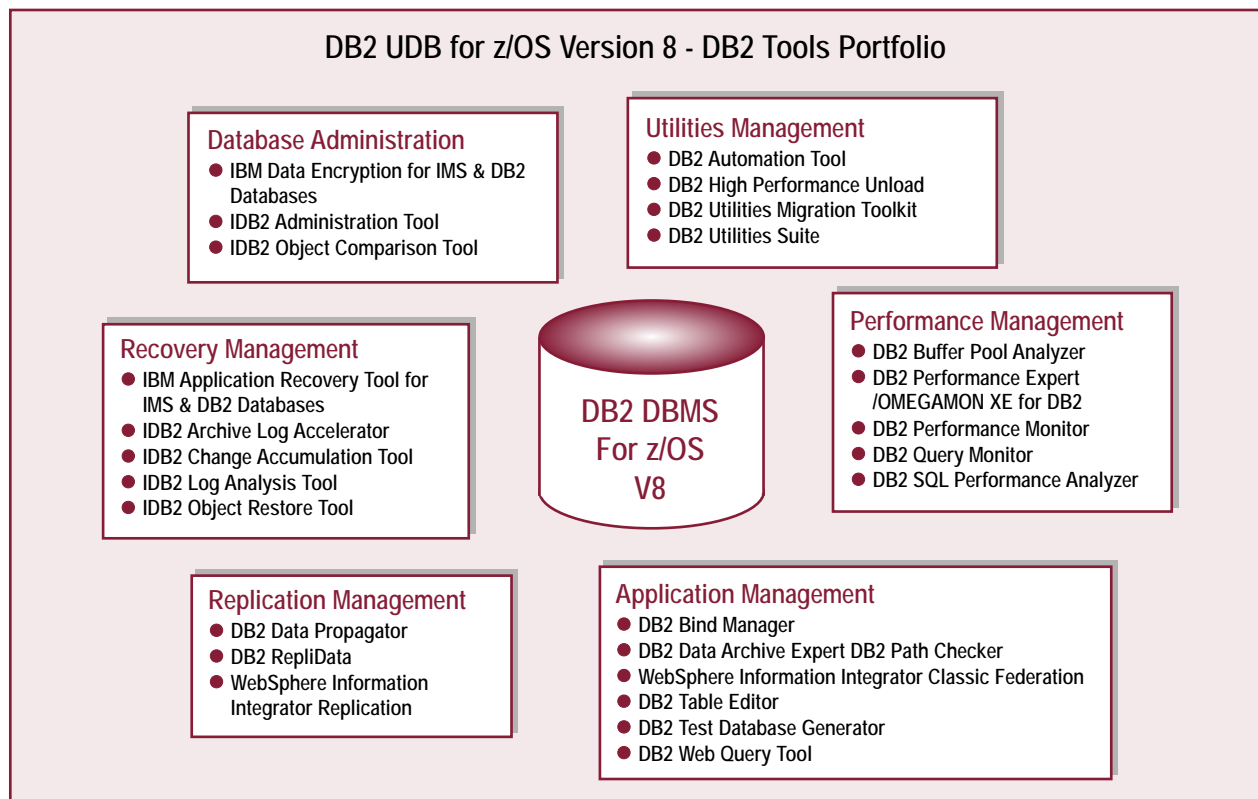- DB2 Web Query Tool

Figure 12: DB2 UDB for z/OS Version 8 – DB2 Tools Portfolio

Assessment: DB2 UDB for z/OS Version 8 makes a compelling and persuasive case for itself. Long in the making, this was the most important upgrade in DB2's history, has now been generally available for one year, customer/adopter feedback has been uniformly positive, and stability and robustness is strong. The business value of the advances offered, with the widely superior support offered for On Demand applications that must run 24x7, argues for early migration. The performance enhancements drive down the total ownership cost for DB2 applications, making each transaction cheaper to execute and allowing a given server to handle greater workloads.

Another advantage of DB2 UDB for z/OS Version 8 is that a large number of the earlier barriers and system limitations within the product have been greatly extended or removed, enabling much larger applications. Just two examples illustrate this: table name sizes have increased from eighteen to 128 characters; and the number of database partitions in a database has increased from 254 to 4,096.

By removing barriers that prevent non-DB2 applications from being easily ported to DB2 on the zSeries platform, Version 8 also opens the way for compelling cost cases to be built around server consolidation and new "to the mainframe" migration projects.

In addition, the increased automation and intelligence built into the product and the supporting DB2 tools significantly increases productivity, allowing skilled DB2 administrators and developers to spend less time on routine tasks and devote their efforts to adding value with better-written, more efficient applications that can save money.

Migration must be from DB2 UDB for z/OS Version 7, so users not yet on that level need to get there first and, we would argue, soon move up to Version 8. Version 6 end of service is set for June 30th, 2005, which "sets a line in the sand" for the move. z/OS Version 1.3 executing in 64-bit addressing mode is the minimum prerequisite operating system level.

With its heavy exploitation of, and tight integration with, the latest zSeries hardware, operating system releases and other key middleware products such as WebSphere, which produce synergistic additional benefit when used together, DB2 UDB Version 8 illustrates and delivers the fullest value of Platform Readiness.

5C. Business Value from High Transaction Volume Information Management with IMS Transaction and Database Servers Version 9

Positioning/Introduction: IMS (*Information Management System*) is z/Series' long-standing (*36-years*) and respected high-performance, high-volume database and transaction server, used for the most demanding and highest volume OLTP applications. IMS Version 9, the latest major release, which became generally available on 10.29.2004, was developed to deliver the highest QoS for enterprise transactions and data, and to extend these qualities to new composite applications under a SOA using the latest software technologies. IMS is almost alone in being able to reliably support literally tens of thousands of users or terminals with sub-second response times and processing more than 100M transactions per day at some customer sites. It can also access multi-terabyte-sized databases, and run near-continuously with as little as 2-3 hours of planned and unplanned outage per year. Transaction rates exceeding 21,000 transactions per second have been posted on a single mainframe IMS system. It is therefore not surprising that IMS usage has again been enjoying robust usage growth in recent years. The largest financial, transportation, utility and manufacturing firms worldwide, who have long used IMS, are experiencing e-business-driven growth, and new customers, such as the banking sector in China, utilize this engine for their surging business transaction growth. IBM reports that 95% of Fortune 1000 companies use IMS, that some 50B transactions per day are processed on the software, serving 200M end users, and supporting in excess of 15B GB of production data.

Business Value Enhancement Themes: IMS Version 9 provides a database and transaction environment able to manage large and unpredictably growing volumes of data. It takes further important steps towards offering continuous availability, and is optimized to deliver consistent, rapid response times for critical transactions with customers, suppliers and partners. The business value enhancement themes for IMS Version 9 are shown in Figure 13. A comprehensive range of IMS tools (*highlights shown on the right of Figure 13*) add extensibility and integration, development and deployment support, performance monitoring and management, and system optimization, as well as increasing staff productivity to support the core servers and their applications more easily and at lower cost. The tool suite products were aligned to support IMS Version 9 from day one; to enable customers to immediately exploit the significant advances made in this major release.

This version of IMS takes large steps forward in supporting high-performance and transparent access to IMS transactions and data from any other application environment, including Linux. The middleware now provides native XML-based interchange that can readily enable all parts of the enterprise, partners and customers to interact and exchange data with the core IMS servers. It also provides Web Services standards support to enable traditional IMS applications to be published and choreographed into new composite applications under a SOA.

IMS Version 9

Available Since October 2004!

- **Virtually unlimited:** Capacity and continuous availability for business-critical information

- **High performance:** And transparent access from any application environment, including LINUX

- **Native XML information interchange:** Throughout the enterprise and with partners and customers

- **Publish:** Legacy IMS applications via Web Services in a Service Oriented Architecture

"IMS V9 continued in the tradition of recent IMS releases by proving to be reliable and robust from the outset."

Royal Bank of Canada

Comprehensive Tools Portfolio:

- Connectivity
- Deployment
- Application Integration
- Application Management
- IMS Connect Extensions
- WebSphere II Classic Federation
- OMEGAMON XE for IMS
- IMS Performance Analyzer
- WSAM

Figure 13: Business Value Enhancement Themes – IMS Version 9

Key Features: Highlighting our selection of just some of the enhanced features incorporated in IMS Version 9:

IMS Version 9 Database Manager:

- **Broadened Access:** Java™ and XML enhancements and storage of XML data in IMS databases.

- **Integrated IMS Connect Function:** Provides fast-to-install, easy-to-use, high-performance/high-volume and secure transparent access to IMS applications and data from any application environment, including Linux. Offers network environment management and workload balancing commands for better resource utilization. Reduces design/coding effort for client applications and provides easier access to IMS applications.

- **Ease-of-use/Extended Access:** Expanded, autonomic, user-friendly commands and interfaces that are accessible across environments.

- **Easier to Handle, More Secure:** Easier installation and system generation, as well as enhanced security and serviceability.

- **Improved Availability and Recovery:** Fully-integrated online reorganization for High Availability Large Databases (*HALDB*), which provide concurrent online updates and availability of data.

- **Improved Performance and Capacity:** For Virtual Storage Constraint Relief (*VSCR*), Database Recovery Control (*DBRC*), and Fast Path.

IMS Version 9 Transaction Manager:

- **Integrated IMS Connect Function:** See above.

- **Enhanced AD & Deployment:** Broadened AD and execution tools, with XML and Java enhancements.

- **Extended Autonomic Network Switchover Capability**.

- **Easier to Handle, More Secure:** Easier installation and system generation, as well as enhanced security and serviceability.

- **Improved Performance and Capacity:** Improved system availability, performance, and capacity for VSCR, DBRC, and Fast Path message handling.

IMS Tools:

Supporting IBM Version 9 itself, IBM offers a comprehensive, modern suite of IMS tools that are fully aligned with the new version, and which themselves encompass many further advances. OMEGAMON XE for IMS, for example, provides advanced performance monitoring for IMS environments and applications, and is one of the fruits of the 2004 acquisition of Candle Corporation by IBM. This extensive IMS tools portfolio supporting IMS Version 9 are summarized in our chart in Figure 14. These provide high-productivity support for IMS database administration, performance management, recovery management, application management, transaction management and utilities management and replication.
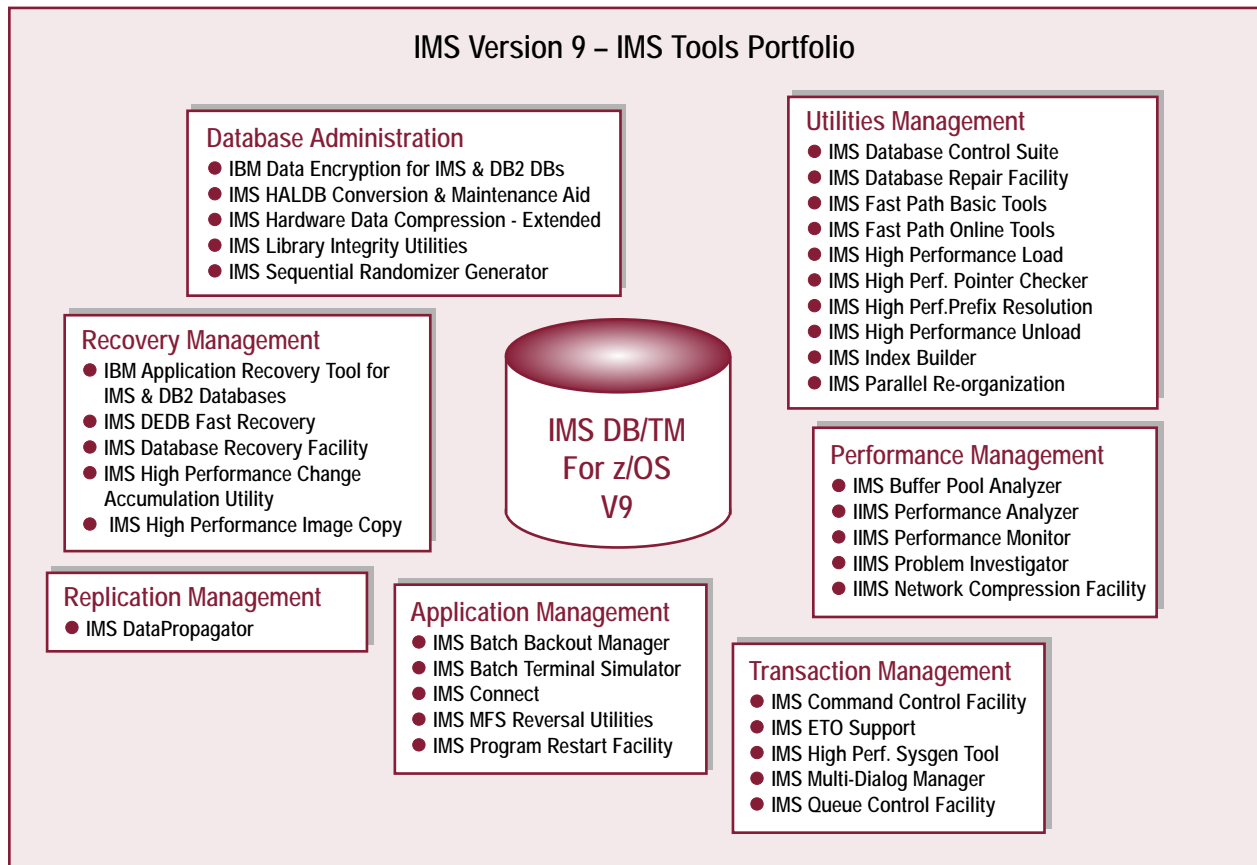
IMS Version 9 – IMS Tools Portfolio

Database Administration
- IBM Data Encryption for IMS & DB2 DBs
- IMS HALDB Conversion & Maintenance Aid
- IMS Hardware Data Compression - Extended
- IMS Library Integrity Utilities
- IMS Sequential Randomizer Generator

Utilities Management
- IMS Database Control Suite
- IMS Database Repair Facility
- IMS Fast Path Basic Tools
- IMS Fast Path Online Tools
- IMS High Performance Load
- IMS High Perf. Pointer Checker
- IMS High Perf.Prefix Resolution
- IMS High Performance Unload
- IMS Index Builder
- IMS Parallel Re-organization

Recovery Management
- IBM Application Recovery Tool for IMS & DB2 Databases
- IMS DEDB Fast Recovery
- IMS Database Recovery Facility
- IMS High Performance Change Accumulation Utility
- IMS High Performance Image Copy

IMS DB/TM For z/OS V9

Performance Management
- IMS Buffer Pool Analyzer
- IIMS Performance Analyzer
- IIMS Performance Monitor
- IIMS Problem Investigator
- IIMS Network Compression Facility

Replication Management
- IMS DataPropagator

Application Management
- IMS Batch Backout Manager
- IMS Batch Terminal Simulator
- IMS Connect
- IMS MFS Reversal Utilities
- IMS Program Restart Facility

Transaction Management
- IMS Command Control Facility
- IMS ETO Support
- IMS High Perf. Sysgen Tool
- IMS Multi-Dialog Manager
- IMS Queue Control Facility

Figure 14: IMS Version 9 – IMS Tools Portfolio

Assessment: IMS Version 9 was designed and developed as a key building block for the now-and-future On Demand Operating Environment, and now offers significant additional customer value for this demanding new world. IMS has been a bedrock information management technology for its customers for a long time (*36 years*), reliably supporting many of the industry's highest demands for DB/TP performance and availability. IMS Version 9 extends this heritage with much-improved interoperability, increased flexibility, and support for new and emerging technologies, as well as availability, performance and manageability improvements.

Java has become central for new enterprise applications, and so IMS Version 9 and the IMS Connector for Java offer enhanced Java support for the latest in standards and ease-of-use. They allow customers to take advantage of the latest tooling, as well as providing enhanced performance for this environment. As increasing numbers of IMS customer extend and modernize their existing software assets in new, On Demand business solutions, these advances provide IMS support for the vital applications, information and operational integration needed. They help provide a seamless end-to-end capability for IMS application use and data access, enabling applications to talk to others in new ways that are essential to support changing core business processes. The enhanced development tools support offered also makes this extension and reuse of core IMS application assets faster and easier, improving developer productivity and project time-to-business value. With IMS Version 9, almost any other IT environment, Linux included, can access and integrate with IMS assets.

With many improvements that also make IMS itself easier to install, easier to use and manage, extended environment management commands and tools improve resource utilization and performance, as well as increase operations productivity.

IMS Version 9 can also be used with IBM WebSphere Application Servers (*discussed later in this Section*) and the WebSphere Studio tools to rapidly transform static Web sites into sources of dynamic Web content. This can help users improve their marketing effectiveness and customer service. In particular, Version 9 also allows customers to transform IMS transactions into Web Services that can be reused in composite applications for SOAs, enabling quick response to new customer requirements, business opportunities and competitive threats.

In our assessment, these advances present a convincing business case for IMS users to migrate up to IMS Version 9 as part of their Platform Readiness strategy to fully exploit their zSeries platform.

5D. Enhanced Business Value from Popular Transaction Environment with CICS Transaction Server Version 3.1

Positioning/Introduction: CICS Transaction Server is one of the world's most widely-used and longest-established middleware software products, and provides a robust and versatile transaction processing environment for over 10,000 of the world's larger businesses. CICS is almost ubiquitous in being installed and used at almost every mainframe site, and has been evolving and serving this base for 35 years. CICS Transaction Server Version 3.1, which became generally available in March 2005, advances CICS to the heart of the New World of composite applications linked by Web Services standards under SOAs. It therefore enables active participation, reuse and extension of the massive inventory of CICS transaction applications in new On Demand solutions, not only as a service provider as previously, but now also as a service requester.

These important developments help CICS Version 3.1 meet the widespread business needs for process adaptation and reshaping. It reduces the software development burden by adopting more efficient development approaches, exploits the industry-wide adoption of Web Services as the standard for loosely-coupled applications integration, and helps businesses cut costs and improve their business process management. These advances enable CICS TS V3.1 to play a full part as a Business Application Service in the WebSphere Reference Architecture (*shown in Figure 7 on page 18*), not only as a Service Provider, but now also as a Service Requester. CICS TS V3.1 can work closely with WebSphere Application Server for z/OS V6.1, the advances in each providing synergistic incremental value to customers employing both engines.

These gains are of great importance and value in helping businesses become much more flexible, and better able to respond quickly to changes in their environment, and to meet new customer and partner demands with adaptable information systems.

Business Value Enhancement Themes:

Business value enhancement themes for CICS Transaction Server Version 3.1 are highlighted in Figure 15. These are to significantly extend CICS applications integration via Web Services, increase development productivity through support for modern languages and tooling, improve application performance for faster response and lower cost, and to improve the manageability of CICS environments through the provision of modern tools and interfaces.

Figure 15: Business Value Enhancement Themes – CICS Transaction Server Version 3.1

In addition to these important developments in CICS Transaction Server Version 3.1 (*and in the companion CICS Transaction Gateway Version 6 product*) further advances have also been made with the growing and maturing suite of IBM CICS tools, highlights of which are shown on the right of Figure 15.

Key Features:

CICS Transaction Server Version 3.1

- **CICS Applications as Web Services:** Provides capabilities to enable CICS-based applications to be exposed as Web Services, as a Web Services service provider and now also as a service requestor, enabling the fullest CICS participation in the Business Integration world.

- **Standards-based Connector Architecture:** Enables new levels of interoperability between CICS applications and new J2EE™ and .NET applications loosely coupled under Web Service standards.

- **Full SOA Support:** Provides standards-based interfaces to CICS software component functionality that enables service consumers to use a CICS service without detailed prior knowledge of its internals, and enabling developers to focus on the business issues rather than technology details as they construct new solutions.

- **Increased Ease of Integration:** Web Services to extend CICS capabilities to a SOA and support of the industry-leading Secure Sockets Layer (*SSL*) protocol to provide standards-based security.

- **CICS Web Services Assistant:** Supports and enables simple transformation of CICS functionality into a Web Service, whether written in COBOL, C/C++ or PL/1, which speeds and simplifies the preparation of new CICS-based Web Services for incorporation into new business process workflows.

- **Enhanced Application Transformation:** The ability to leverage a single, productive development tool (*WebSphere Studio Enterprise Developer*), plus optimized CICS data exchange capabilities. These overcome previous 32KB limitations, pass data in a more structured way, simplify program design and reduce storage needs, and provide a suitable deployment environment for C++ and Java programs.

- **Major Advance Over the SOAP for CICS Feature Delivered on CICS TS V2:** These developments represent a major advance on the popular and well-received SOAP for CICS capability first offered in the previous CICS Transaction Server Version 2.1, offering significant overall enhancements in workload distribution and resource management.

- **Improved CICS Workload Throughput:** Delivered via an enhanced Open Transaction Environment (*OTE*).

- **Enhanced CICSPlex System Manager:** A comprehensive Web user interface now provides the full functionality of the traditional TSO interface in this strategic CICS system management capability, as well as extensions and enhancements. Screen displays are denser with less white space, user favorite views are supported for rapid navigation, user profiles can be set up to configure role-based views, and extended selection lists simplify option selection. These advances improve productivity in managing CICS environments, provide a simple, integrated single view, and can now replace the use of TSO interfaces.

- **CICS Information Center:** Provides all CICS documentation in a consistent, open-standards, Eclipse platform-based information center application that offers a task-oriented structure, with learning guides provided on the new features. This makes it faster and easier for developers to access CICS guidance and usage information, and to link quickly to the product documentation for a growing number of other IBM products (*such as DB2 and z/OS itself*) that use the common Eclipse-based information center platform. (*Available on the workstation, and other platforms now including z/OS itself.*)

CICS Transaction Gateway Version 6

CICS Transaction Gateway Version 6 provides high-performing, secure and scalable access to CICS. It is supported by a number of tools within the IBM Software Development Platform, enabling a complete end-to-end solution. This new release focuses on enhancement of QoS (*through performance enhancements via optimization of the product and exploitation of the latest Java/Linux standards*), improved systems management (*with improved connector administration through a more functional, integrated interface – it also offers enhanced problem determination*), and security improvements (*support for Secure Sockets Layer (SSL) protocol and further advanced z/OS security feature exploitation*).

Assessment: CICS Transaction Server Version 3.1 provides a further substantial advance in enabling CICS customers to extend their existing, proven, core CICS applications to new audiences and opportunities in On Demand. It provides both enhanced functions for traditional programming-style applications, and new functionality using now strong support for industry-standard Web Services that enable CICS to play fully in composite applications under SOAs, both as a service provider and as a service requester.

CICS provides a range of access options to support modern connectivity architectures, such as Web Services and J2EE™ standards-based and other standard transport mechanisms. With the right external connectors and internal adapters, customers can maximize the reuse of mission-critical CICS assets. By enabling customers to re-energize and transform these existing applications, customers can reduce the costs, risks and time-to-market of delivering new applications to address and satisfy On Demand requirements.

The release is supported by essential tools that now enables CICS users to transform business-critical legacy processes into reusable, shareable business components, integrate traditional zSeries CICS applications with new Java and .NET applications, whilst making full use of existing CICS skills at increased levels of developer productivity.

Whilst providing these new technologies and improved capabilities, the approach is evolutionary and minimizes customer risks in adoption, whilst exploiting and updating their substantial existing CICS skills base, and can thus be easily and safely deployed by CICS users in a smooth, incremental, manner.

With today's business focus now back on revenue growth whilst maintaining the bottom line, IT departments must do more with less, and engineer much greater flexibility and responsiveness into their infrastructure. CICS Transaction Server Version 3.1 provides a vehicle for realizing these goals. It can undoubtedly create substantial new business value by leveraging customers' large existing investments in CICS applications, help deliver new solutions that generate new sources of revenue, extend competitive advantage, improve customer service and time-to-market, and increase overall profitability.

5E. Network Management Business Value with Tivoli NetView for z/OS Version 5.2

Positioning/Introduction: In the On Demand environment, the enterprise network and its connections to the Internet play an ever more important role in enabling and supporting the integration of people, processes and information. Today, TCP/IP is the near-universal open enterprise network standard, mirroring its central role as the Internet standard on the external Web. Monitoring and managing the enterprise TCP/IP network, which is often centered on zSeries mainframes, has therefore assumed new levels of important and criticality in maintaining high availability and responsiveness throughout the enterprise communications network infrastructure. For many years, NetView has been the industry-standard network management software tool on the IBM mainframe and now the zSeries. It offers network and systems management through graphical display and automation. It is available not only on the mainframe, but also on the main distributed environments. Tivoli NetView for z/OS provides comprehensive enterprise management, eliminating the need for point-products, and providing a broad solution for network management, delivered to a single console. Tivoli NetView for z/OS can be used within the enterprise as a centralized global network manager, a mid-level manager, or an OS/390 or z/OS specific management endpoint. Tivoli NetView for z/OS Version 5.2, expected to become available in October 2005, is the next release of this widely used stalwart.

Business Value Enhancement Themes: The main themes of NetView Version 5.2, highlighting principal new features that increase its business value, are shown in Figure 16. A most important advance is increased interoperability with other performance monitoring and enterprise management products. IBM's acquisition of Candle Corporation and the integration of the Candle OMEGAMON XE architecture products, widely used on zSeries mainframes, into the IBM Tivoli systems management line-up has been a substantial advance. Therefore, interoperability between NetView and OMEGAMON XE performance monitoring tools, as well as other Tivoli enterprise management products (*such as Tivoli Service Advisor and Tivoli Business Systems Manager*) used in managing the enterprise environment is an important advance. As is also being able to directly pass issues detected by NetView Version 5.2 to trouble ticket products that track actions on the issue through to resolution.

<table>
<tr><td colspan="2">

Available October 2005!

NetView for z/OS, Version 5.2

- **Interoperability:** 1) Share TCP/IP availability and performance data between NetView and OMEGAMON for mainframe networks. 2) From NetView, open incident records in leading Trouble Ticket products.
- **Enriched TCP/IP management capabilities:** Packet trace capture and formatting, intrusion detection, and connection management
- SNMPv3 support and IPv6 capabilities
- Automated message attribute handling
- **Manage larger networks:** Increased RODM capacity
- **Accelerate time to value:** Simplified style sheet migration and reporting
- **Enhanced Web interface:** Consistent look and feel with other Tivoli products

Unmatched TCP/IP Management and Automation

Key V5.2 Features

- Inter-operate with OMEGAMON, TSA, TBSM, and Trouble Ticket products
- Richer TCP/IP Network Management
- Expanded automation
- Manage growing networks
- Improved Customer Time-to-Value
- Improved Ease of Use

</td></tr>
</table>

Figure 16: Business Value Enhancing Features – Tivoli NetView for z/OS Version 5.2

Included in this release is support for SNMP v3 and IP v6, significant advances that were needed for the product to remain at the leading edge of new standards in TCP/IP. The core role of NetView is the management of TCP/IP networks, so this release adds enriched and strengthened TCP/IP management capabilities in the important areas of packet trace capture and formatting, intrusion detection and connection management.

Removing constraints to enable support for larger networks, making the product easier and faster to use, and bringing the Web user interface of NetView Version 5.2 into alignment with that of other Tivoli products, extend the capacity and speed the time to value of using the new version.

Key Features:

Principal capabilities of Tivoli NetView for z/OS, which the above new release value enhancement now augment, include:

● **TCP/IP and SNA Network Systems Management:** Tivoli NetView for z/OS focuses on network manager productivity with graphical displays and embedded automation capability for both TCP/IP and SNA networks.

● **Eases z/OS TCP/IP Deployment:** Familiar NetView tools allow easier TCP/IP deployment, including exploiting all the sophisticated z/OS TCP/IP capabilities (*including DVIPA*) across virtually any Sysplex.

● **Reduces Downtime, Speeds Issue Resolution:** Integrated business-critical network management functions enable rapid network problem isolation and can automate corrective actions.

● **Bridges Mainframe/Distributed Network Management:** Tivoli NetView for z/OS provides direct central support for both distributed and mainframe environments, breaking barriers previously isolating these two islands of management.

● **Comprehensive Set of Tools:** Enabling an enterprise to maintain and manage complex, multi-vendor, multi-platform networks and systems from a single point of control with lower effort.

● **Java-based Management Console:** Provides a modern single point of control and management for enterprise networks. The NetView Web Application provides a simple Web interface and SNMP services that can provide easy access to console information from any location.

● **Production-ready Automation/Ease of Install:** Reduces manual resource definition and complex automation set-up through production-ready automation, allowing simpler and easier customization through the NetView style sheet that speeds NetView installs and time-to-value.

● **Standalone/Collaborative:** NetView provides management functions that can inter-operate and integrate with other management products, but can also function alone as a network management end-point.

● **Supports Linux on zSeries:** Increased platform flexibility through Linux support for IP resource discovery and management, **SNMP services** and NMC Topology Server (*all on Linux on zSeries*), and NMC Topology Console (*Linux on Intel*).

Assessment: Tivoli NetView has long been a bedrock middleware product for most mainframe users, and provides the, enterprise-class TCP/IP network management service layer required to monitor and run national or global enterprise networks from the rock-solid zSeries host platform. Tivoli NetView for z/OS Version 5.2 provides a solid and substantial advance in a number of important areas, which keep this faithful workhorse up to the newest standards. It improves its integration and interoperation with other essential enterprise management and problem tracking tools, as well as extending core network management function and capacity. Improved ease-of-use and consistency of user interface with other Tivoli family products helps improve productivity and reduce systems management effort when staff switch between these products from day-to-day.

IBM officials claim migration to NetView 5.2 is considerably easier than for earlier releases, which makes the above benefits relatively easier to obtain. These important and worthwhile advances show NetView moving forward to meet the increasing challenges of large-scale TCP/IP Network management in the new mainframe world of On Demand.

5F. Enterprise Modernisation Business Value with WebSphere Application Server for z/OS Version 6.0

Positioning/Introduction: WebSphere Application Server (*WAS*) for z/OS is the full-function, industrial-strength, J2EE™ application server optimized for, and fully exploiting all the unique QoS of, the zSeries mainframe under z/OS. WAS for z/OS Version 6.0 is also the heart of the WebSphere software platform for business integration on z/OS. The reference architecture and supporting z/OS products for this are shown in Figure 7 on page 18. The WebSphere Application Server family is the global market-share leader in the J2EE™ application server marketplace. WAS for z/OS Version 6.0, which became generally available in March 2005, shares a largely common code base, and the same functionality, behavior and interfaces as the distributed versions. However, it uses a unique internal architecture to fully exploit zSeries capability to give the highest scalability, extreme reliability, and the closest integration with zSeries services and applications. The advent of the zAAP dedicated Java offload processor on zSeries, which slashes the cost of deploying large WebSphere workloads on the zSeries platform, is already fuelling more deployments and migrations from less scalable or reliable distributed platforms. In addition, the companion superset product, WebSphere Business Integration Server Foundation for z/OS Version 6.0, will provide business workflow support, with its BPEL capabilities, that will enable the choreography of the new workflows supported by integrating composite applications linked by Web Services standards under a SOA.

We reviewed and assessed WebSphere Application Server Version 5.1 and WebSphere Business Integration Server Foundation Version 5.1 for z/OS extensively in a previous White Paper (*see the "Other Related Software Strategies Research" Section on page 45: item 1*). There we examined the unique architecture and service qualities these products offered on zSeries in considerable depth. Readers needing such in-depth understanding are referred to that Paper.

Business Value Enhancement Themes: This new release of WebSphere Application Server for z/OS is designed to increase the speed of development and deployment, enable faster and more flexible delivery or new e-business solutions that fully leverage and exploit the existing substantial infrastructure and application assets on zSeries mainframes. The main themes to extend the business value supported by Version 6 are shown in Figure 17.

Available March 2005

WebSphere Application Server for z/OS, V6

- **Create an integrated foundation:** Including IMS, CICS, and new Java applications by enabling a Service Oriented Architecture for fast and flexible delivery of IT resources
- **Accelerate Time to Value:** For new J2EE projects with rapid development and deployment and improved ease of use with integrated, standards-based tools
- **Leverage data securely:** And on demand through tight integration with DB2 for z/OS
- **Keep pace with your business:** With a high performance, secure, flexible deployment environment that will enable business growth while removing security vulnerability and threats

- WebSphere Studio Enterprise Developer
- WebSphere Studio Asset Analyser
- WebSphere Studio Workload Simulator
- WebSphere Studio Application Monitor

"We are excited about the new WebSphere Application Server V6.0 management features which gives us easy manageability of our large and mission critical J2EE systems...."
Makoto Hashimoto, IT Architect
Osaka Gas Information System (OGIS) Research Institute

Improve total cost of ownership by up to 30%

Figure 17: Business Value Enhancements in WebSphere Application Server for z/OS Version 6.0

As the foundation of the WebSphere software platform, WebSphere Application Server Version 6.0 is claimed to be the industry's premier Java™-based application platform, integrating enterprise data and transactions for the dynamic e-business world. The flagship z/OS implementation delivers a rich application deployment environment with application services that provide enhanced capabilities for transaction management, as well as the security, performance, availability, connectivity, and scalability that fully exploit unique zSeries capabilities and QoS.

Key Features:

- **New Messaging Engine:** WebSphere Application Server Version 6 has a brand new messaging engine built into it. It is now a Java Messaging Services (*JMS*) engine that has been completely written from scratch. In some cases, it runs five-times faster than the messaging in Version 5 and it integrates better than previous versions with enterprise backbone products like WebSphere MQ.

- **SOA Building-block:** WebSphere Application Server for z/OS Version 6.0 delivers a SOA today. It allows zSeries customer businesses to increase their return on investment and lower their TCO by reusing existing zSeries IT assets using standards-based messaging, and the latest Web Services standards. This translates into reduced costs, reduced time-to-value, and increased business flexibility

- **Secure, Optimum Resource Utilization:** WAS for z/OS Version 6.0 provides a secure, dynamic platform for e-business that fully exploits zSeries' unique capabilities. Businesses are able to do more work with less resource with WAS for z/OS when combined with the zSeries platform's unique scaling abilities and ultra-high security features.

- **Full J2EE™ V1.4 Compatibility:** Supports the full J2EE™ 1.4 programming model and extensions including Servlets, JSPs, EJBs, and Web Services, as well as additional programming model enhancements to provide a secure foundation for a SOA. In addition, this support:

  - Dramatically simplifies the task of connecting applications to an ESB with JMS 1.1.

  - Enables more demanding business applications by leveraging SDK 1.4.2.

- Facilitates easier connection to multiple, back-end data sources through a standard interface with Service Data Objects (*SDOs*).

- Allows dynamic Web user interfaces with drag-and-drop development using standards-based JavaServer Faces (*JSF*).

- **Rapid Development and Deployment:** WAS for z/OS Version 6.0 enables fast time-to-value with enhanced development and deployment capabilities that reduce development cycle time. Businesses can improve time-to-value and make the most of existing skills with features enabling ease-of-use and high out-of-the-box performance.

- **Tight Integration With IBM Rational Tools:** Provides a productive development environment built on Eclipse, the open systems development environment.

- **On Demand Infrastructure:** WAS for z/OS Version 6.0 provides the scalable, robust, flexible and manageable environment that businesses today need. It helps them virtually eliminate lost business opportunities with near continuous uptime for mission-critical applications.

- **Tight Security:** Integrates closely with Tivoli offerings and z/OS security services, including embedded Tivoli Access Manager, for centralized security management among J2EE™ and Web resources, and supports the Web Services Security open security model for easy interoperability with third-party, customer-created, or legacy security solutions.

Assessment: Combining the latest core J2EE™ application server capabilities and standards support as on distributed versions, WAS for z/OS Version 6 adds deeply embedded exploitation of, and optimization for, the zSeries environment, the most scalable, reliable, available, automated and manageable commercial computing environment available. WAS for z/OS Version 6 is another significant step that enables the integration and reuse of the wealth of mainframe software assets in new, Web-based, On Demand solutions.

WAS for z/OS Version 6 is another significant step that enables the integration and reuse of the wealth of mainframe software assets in new, Web-based, On Demand solutions.

Business executives who need to deliver better customer service, and increase their ability to quickly adapt to changing business priorities should consider the product. WAS for z/OS Version 6.0 provides a dynamically scalable IT environment capable of handling variable transaction volumes, provides increased IT application responsiveness and performance, along with near-continuous availability, to meet the most challenging business demands.

Efforts have been made to enhance the distributed WebSphere environments (*WebSphere Network Deployment and Extended Deployment (XD)*) to provide some fundamental attributes more comparable with mainframe. These capabilities, we assess, are today embryonic and relatively unproven, compared to the battle-hardened mainframe environments, where these capabilities have been optimized and refined for years.

5G. Application Integration Business Value with WebSphere MQ Version 6

Positioning/Introduction: Business and application integration is a central enabler of the new On Demand world we have discussed above. In this environment, integrating and connecting applications securely, reliably and manageably over network connections is a universal requirement. With so much of the world's largest and most demanding transactional applications and data sources residing on zSeries mainframes, software to loosely couple and transfer data and messages between the different environments and platforms, to and from the mainframe, is crucial. The prime technology that accomplishes this goal is Message-Orientated Middleware (*MOM*), and in this category, IBM's WebSphere MQ has, for almost fifteen years, been the unambiguous world market-leading software. WebSphere MQ ensures reliable delivery of messages, including XML documents and SOAP messages, connects applications and Web Services, spans environments such as J2EE™ and Microsoft .NET, and bridges over 35 platforms. Now, WebSphere MQ for z/OS Version 6, to become generally available in April 2005, extends this record with other significant advances.

Business Value Enhancement Themes: The focuses of enhancement in the new release are shown in Figure 18. These centre on enabling customers to better leverage existing z/OS investments through integration, to maximize the availability and visibility of the WebSphere MQ integration infrastructure, and to be able to configure and manage this infrastructure more responsively and efficiently. More specifically, WebSphere MQ for z/OS Version 6 provides the robust, scalable and secure integration backbone for making much wider use of mainframe software assets, such as CICS, IMS and DB2 transactions and data in new e-business applications, and connecting these to other components in these solutions. New Eclipse open development, standards-based configuration tooling makes the setting up of MQ easier and faster on all platforms. Further improvements lie in the level of WebSphere MQ service availability on z/OS through shared queues, larger message size limits (*100MB*) and improved z/OS system configuration capabilities.

WebSphere MQ Version 6 for z/OS

Available April 2005

- **Get more from existing z/OS investments:** In CICS, IMS, and DB2 by reliably integrating these with other applications
- **Easier to Configure:** With new Eclipse-based configuration tools that can connect to, and configure MQ, on all platforms including z/OS
- **Improved Availability:** For z/OS with shared queues, support for messages up to 100MB, and improved z/OS system configuration capabilities
- **Improved Problem Determination and Alerting:** With extended status information and support for common request

"With WebSphere MQ, we estimate it's as much as 80 percent faster to bring new customers online. Plus, in the WebSphere MQ environment we can make changes quickly, without having to support such a diverse skills set. We expect we'll reduce our development and maintenance time 30 percent."

Tom Kindred, Vice President, Information Technology. CUETS, Canada

Companion Products:

- **WebSphere Business Integration Message Broker**
- **CICS BEP**
- **WebSphere Business Integration Server Foundation**
- **WebSphere MQ Workflow**
- **WebSphere Business Integration Monitor**
- **WebSphere Business Integration Modeler**
- **Tivoli Access Manager for Business Integration**

Figure 18: Business Value Enhancements in WebSphere MQ for z/OS Version 6

Enhancements in WebSphere MQ problem determination and reporting aid and assist in the efficient management of integration services and of more rapid issue resolution.

Key Features:

- **Improved Usability:** Enhancements to methods in which WebSphere MQ can be configured, operated and managed, focusing on simplicity and ease-of-use.

- **Enhanced Management Capabilities:** Improving visibility of information flowing across On Demand business by logging and outputting additional operational data and statistics, used by WebSphere MQ tooling or other system management applications, to help deliver on SLA commitments.

- **Better Performance:** Meeting growing enterprise performance needs by further improving on the already enterprise level of performance and scalability that WebSphere MQ provides today, and delivering higher availability and greater throughput.

- **Extended Connectivity:** Adding new ways in which applications can be connected together, making use of the strengths of WebSphere MQ across networks.

- **Open Standards Support:** WebSphere MQ is in the forefront of supporting key, open industry standards – for example, the Java™ Messaging Service interface standard JMS v1.1, including publish-and-subscribe messaging – making it the leading JMS provider.

- **Speeding Time-to-value:** Enabling faster and easier deployment of new application integration links and connections, with less development efforts through standardization and tooling.

- **Complementing zSeries QoS:** WebSphere MQ for z/OS provides the high scalability, reliability, availability and manageability for the applications integration infrastructure as the z/Series platform itself provides to its workloads, and is complementary to these platform strengths.

- **Strong Security:** WebSphere MQ offers comprehensive security options using SSL; the Internet standard for secure communication.

Assessment: Underpinning and enabling the whole notion of SOAs is the logical concept of an ESB, which is the underlying communications infrastructure needed to support loosely-coupled application integration that connects different types of software running on different types of platforms into new e-business application solutions. This ESB must provide message communication and event services based on open-industry standards that enables all of these disparate software components to communicate with each other through the ESB in a standardized manner through well-defined standard interfaces. So message and event broking services, secure message transmission, QoS, and applications integration management services must be provided by the ESB. Publish and subscribe, and assured message delivery are base services, as are sophisticated event handling and brokering to trigger business activities in defined circumstances.

WebSphere MQ is the leading product that provides the services of an ESB, although its history long predates the concept. WebSphere MQ for z/OS therefore plays a central role because of the scale, importance and depth of software and data assets held on mainframe platforms. Version 6 substantially extends and strengthens this key engine that is central to the whole application integration and industry-wide migration to SOA-based, composite applications that reuse existing software assets combined with new components written in modern languages like Java connected through Web Services standards.

WebSphere MQ is also a central component of IBM's overall WebSphere Business Integration suite. Some of the other key complementary products that play in this overall integration infrastructure are shown on the right-hand side of Figure 18, and the overall architecture was shown in Figure 7 on page 18.

As can be seen from the features summary above, WebSphere MQ for z/OS Version 6, is a substantial and significant advance in this central, and already widely-used foundation of enterprise application integration and communications infrastructure. In our view, for the large proportion of zSeries users migrating towards the SOA approach, upgrading to this next level of WebSphere MQ for z/OS should be an early priority.

WebSphere MQ for z/OS Version 6, is a substantial and significant advance in this central, and already widely-used foundation of enterprise application integration and communications infrastructure.

Our Analysis

The above, wide-ranging and impressive software developments on the zSeries operating system and primary middleware software pillars were strategically aimed at extending the mainframe platform's already considerable leadership as the premier enterprise hub platform for On Demand. These zSeries software developments, available now or later in 2005, have been coordinated, focused and targeted at substantially extending the integration, support for SOAs and Web Services and J2EE™, and at enhancing the manageability, performance and security of all the platform's main pillars. They also aim to fully exploit and complement the considerable and impressive recent hardware advances in the z/Architecture mainframe servers, including, for example, the important new zAAP Java offload processor option. Whilst many leading-edge mainframe users have recognized the considerable business values of these mainframe hardware and software advances, and have adopted the new systems and software relatively quickly and consistently, others have been more cautious and slow. The latter have often advanced on a more piecemeal or case-by-case basis, and are therefore some way behind being current with these latest advances in mainframe hardware and software. History habits, the constraints on spending of the 2000-2003 downturn, and the effort and cost of upgrading are all factors in this.

The specific business value enhancements that each of these latest primary software pillar releases offer, summarized above, are important, but the synergistic benefits of faster, multiple adoption are still more compelling. We consider that Platform Readiness is therefore a real case of "two plus two equals five", where these substantial incremental advances in hardware, operating system, database, application server, integration and network management software interplay and multiply the individual benefits from each.

6. Platform Readiness – Call for Action?

Introduction

Heavy investments have continued to advance mainframe hardware and software at a rapid rate. These investments and innovations are pledged to continue under the Mainframe Charter declaration. The business value from these developments has been substantial and is increasing with successive advances. This position points to the value and benefits of adopting a Platform Readiness strategy.

Platform Readiness – Steps to Take

We recommend enterprise IT users take the following steps along this journey for best results:

● **Rationalize Mainframe Software Portfolio:** Many shops have an accumulation of mainframe software products and tools installed over many years, both IBM and third party, that incur significant costs, and yet now may be little used or adding little value. Some ISV products, in particular, trigger large license fee charges on hardware changes, may not be current with recent releases, and so are often prime candidates for retirement or replacement by modern, often less expensive IBM tools. This rationalization will usually significantly cut software costs, reduce support effort, and provide better functionality and productivity going forward.

● **Update, Upgrade and Automate:** Cost savings, performance gains, enhanced functionality and many other benefits are derived from moving up to currency with recent hardware, OS and software subsystems, as we argued above. In addition, fully exploiting the advanced autonomic management tools and capabilities supported on zSeries will allow many customers to further automate more of the operations and support needed by the platform today, freeing up valuable staff resources for new initiatives.

- **Enhance/Extend Mainframe Legacy Applications:** The recent releases of the zSeries middleware software engines and tools provide enablement for rapidly reusing, enhancing and extending mainframe-based application, transaction and database assets in new e-business solutions. Many of these projects can often bring high-returns for relatively modest efforts.

- **Simplify to 2-tier Infrastructure:** Many enterprises today are operating complex 3- or *n*-tier IT infrastructure for many of their enterprise-level e-business, ERP or CRM solutions. These infrastructures usually involve several different platforms, are costly, hard to manage, hard to troubleshoot, and provide variable performance that may often fall below SLA standards. The enhanced capabilities and economics of today's zSeries mainframe enable considerable simplifications, large cost reductions, improved performance and more reliable service to readily be achieved by placing more application and database serving workloads closer together, on mainframe "virtual servers", where they benefit from all the technology advances cited earlier. We amplify this important option below.

- **Review Chargeback Model:** We also strongly recommend that mainframe users should now carefully review, modernize and update the mainframe usage chargeback system or model they are using, to ensure it accurately and fairly represents the very different realities of the virtualized and dynamic modern mainframe environment. Some older, time-expired chargeback implementations may have become inhibitors to the fullest current exploitation of these newer mainframe capabilities, and should certainly be changed.

Each of these steps offer substantial incremental business and economic benefits towards fully enabling and unleashing the full potential of the zSeries mainframe for On Demand, but requires Platform Readiness for fullest benefit.

Re-examine Platform Readiness Inhibitors

About one quarter of the approximately 11,000 total mainframe users are today already actively and enthusiastically embracing and benefiting from Platform Readiness strategies, by deploying most or all of the newest zSeries hardware, operating system and middleware software releases relatively quickly and systematically as these become available. These users are already convinced of the mainframe business values discussed and identified in Section 3, and need little further encouragement to follow this path actively and briskly.

Another larger group of mainframe users, probably around half of the user population, are also positive and committed to the platform, but have usually been slower, more cautious, and more partial in their rate of adoption of zSeries advances. This group has typically made piecemeal and less systematic upgrades and enhancements to the platform, where they can see individual business justification for each item in isolation.

For this latter group, and the remainder of the mainframe installed base, what are the inhibitors and roadblocks that are holding them back from taking full advantage of these compelling Platform Readiness benefits? From our discussions and work with many enterprise IT users and mainframe customers, we have identified seven principal inhibitors:

- **Incomplete Appreciation of the Benefits:** Old misperceptions about the IBM mainframe die slowly and hard amongst C-level business executives, and even amongst some IT executives. Those who have not followed or yet understood the dramatic transformation, accelerating business value and technology leadership of the platform over the first half of the 2000-decade, do not yet appreciate the benefits obtainable today. A prime goal of this White Paper was to help more of these groups to understand these business benefits.

- **Habit:** During the mainframe heyday of the 1970s and 1980s, most mainframe users followed a path equivalent to Platform Readiness today. They regularly and almost automatically adopted and implemented newer mainframe hardware, operating system and software subsystem advances, although the rate and pace of such advances was much slower. Safe and steady progress was expected and delivered, and confidence in the platform was high, so such investments were seen as safe and justified. During the uncertainty and turmoil over the future of the mainframe in the 1990s, many users restrained and limited their mainframe investments in fear of its future. They became more cautious, requiring stronger ROI and business cases for each advance. At the same time, many hedged their bets by adding distributed computing platforms to their infrastructure.

- **Downturn Cost Savings Hangover:** After a burst of Year 2000 investment, this habit was accentuated by the business downturn of 2000-2003, when business and IT cost cutting and staffing reductions were widespread. During this period, deferring upgrades and migrations as long as possible was widespread, the centrally located and easily identified mainframe often being one of the easier items to cost control, and hence a prime target.

- **Distributed Computing Bigots:** Through the 1990s, many IT professionals grew up as, or became, distributed computing enthusiasts (*putting it kindly*) or bigots (*harsher view*). They championed the UNIX or Windows-Intel platforms, often as the solution to all IT ills. Often of a younger generation, these groups helped drive the complex, multi-platform, distributed infrastructures found in so many enterprises today, the downsides of which only emerged from around 2000 onwards. Most of these advocates knew little of the mainframe, and built their careers around their chosen distributed platforms. Such thinking can be found in many enterprise IT shops today, where disputes between the "camps" are still common. Rational organizations should not tolerate such extreme positions any longer.

- **Silo Thinking:** Another inhibitor arose from the divided organization structure and decision-making roles in many larger enterprises and their IT organizations. Separate teams and managers are responsible for servers, storage, operating systems support, storage networks, and database management, applications development, operations and networking. These groups often evaluate and assess proposed developments only from their own silo viewpoint, and therefore miss the fuller, holistic case of which their element is just a part.

- **Migration Time, Effort, and Cost:** Depending on the specific upgrade, the time, effort and costs involved will vary considerably, but can be substantial, although the hardware moves are normally easiest. In a mainframe environment running mission-critical workloads, careful planning, preparation, testing and validation, and parallel running before final cutover are normally essential to eliminate risks. These efforts and their cost are clearly an inhibitor to busy IT groups, but the wider overall business benefits of Platform Readiness will usually outweigh these.

- **Diffused IT Governance:** Centralized IT governance was near universal before the 1990s, when diffusion of accountability for their own systems to line-of-business executives became quite widespread. This resulted in the wasteful profusion of disparate, distributed systems. This decade has seen some movement back to more centralized governance, and also saw widespread efforts to consolidate and integrate IT infrastructure into more manageable, cost-effective structures. The zSeries mainframe is again playing a central role in this consolidation, and indeed has much to offer. The business value of such robust, cost-effective, efficient central infrastructure, maximized when Platform Readiness is adopted, needs and deserves support from the lines of business whose systems it supports.

- **Dis-functional Chargeback Schemes:** Some old mainframe chargeback schemes fail to accurately and fairly reflect the qualities of service and business value delivered today by the radically different, virtualized and dynamic modern zSeries mainframe. These chargeback schemes act as a serious inhibitor to wider mainframe usage by wrongly allocating resource usage costs unfairly or inaccurately to applications or LOB groups, and should be changed.

Enterprise C-level executives and CIOs should ask themselves how many of these inhibitors are still influencing their organizations, and whether the original motivations behind each of them are applicable today. In many cases, they will find few rational grounds for still allowing these inhibitors to constrain their plans.

Important Mainframe Platform Readiness Drivers

In our assessment, four specific drivers argue particularly for the adoption of mainframe Platform Readiness strategies, and for moving up faster to full currency with the latest hardware and software releases. Some have been mentioned earlier in this White Paper. We highlight them here as amongst the most important changes and developments to have occurred, which greatly encourage and enable wider use of, and growth in workloads on, the mainframe platform, and for using its latest technologies to the full. These are:

- **2-tier Architecture Benefits:** Complex three-tier or multi-tier distributed IT Infrastructure became commonplace from the mid-1990s. These environments have been repeatedly found to lead to a profusion of servers, complex networking and infrastructure, high support costs, and poor overall reliability and QoS that are intrinsic to such solutions. These environments are also hard to manage, and even more difficult to troubleshoot for performance or failure issues. With the transformation of the mainframe, with strong new workload capability, resource virtualization, support for the latest software standards, and hugely superior economics, the need for such multi-tier environments has been drastically reduced.
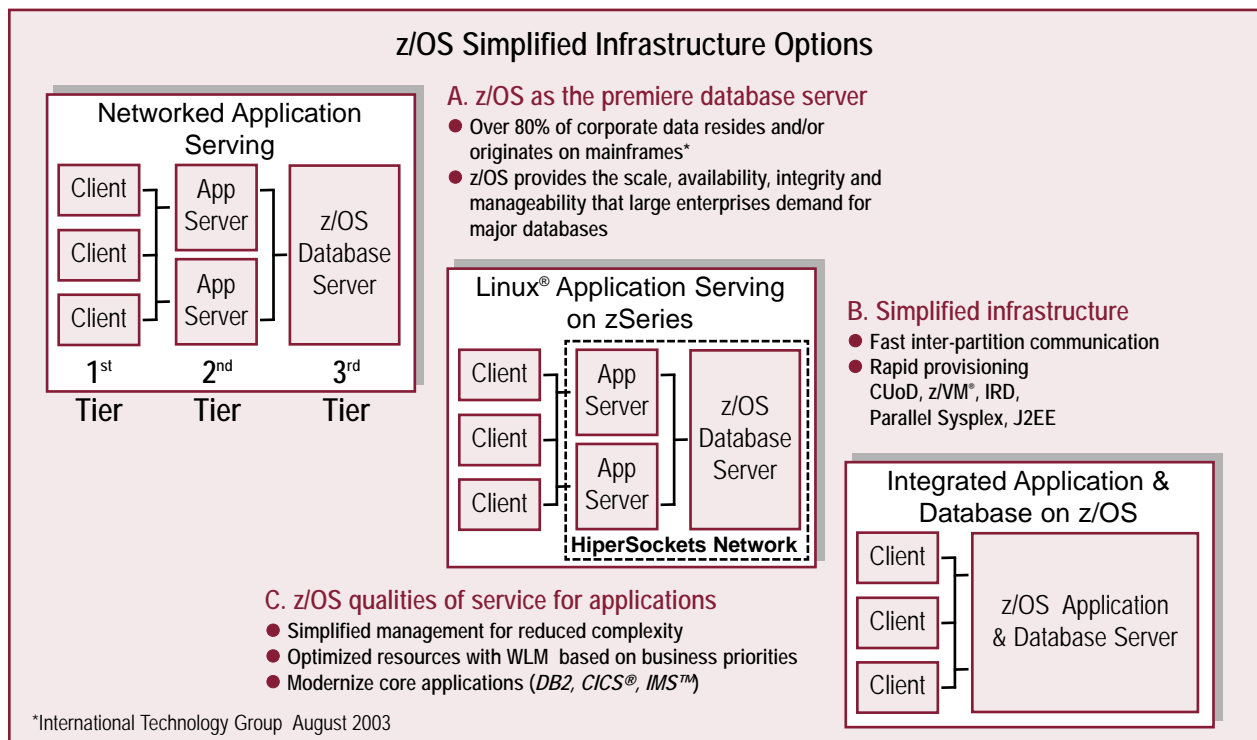

Figure 19: z/OS Simplified Infrastructure Options

Many customers have now found it more cost-effective, manageable and reliable to collapse their major enterprise applications infrastructure back down to two tiers, with much more of their total workload on the mainframe.

Many customers have now found it more cost-effective, manageable and reliable to collapse their major enterprise applications infrastructure back down to two tiers, with much more of their total workload on the mainframe. Three of the main variations of this are shown in Figure 19. In some cases they have moved front-tier edge-of-network and Web serving workloads, traditionally run on commodity scale-out servers, to Linux virtual servers on the mainframe. More frequently, the heavier-duty, middle-tier application serving workloads often run on UNIX or Intel SMP servers have been migrated. For heavy back-end database serving, the mainframe has always remained pre-eminent. Some customers have successfully combined all three workload types on their mainframe. Performance is usually considerably better, reliability far higher, hardware resource utilization much higher, and TCU significantly lower. In addition, the QoS delivered is higher and can be assured, and many fewer staff are needed to support and operate the platform.

● **zAAP Transforms Mainframe J2EE™ Workload Economics:** J2EE™ is now the predominant open industry standard for enterprise server-side applications, and, as can be seen in Section 5, the mainframe software environment now provides rich, mature and complete support for J2EE™ applications throughout the stack. Programming models with a high level of abstraction, such as J2EE™, provide high productivity, functionality and portability, but do use more computing resources in execution (*typically 2.5 times in a comparable 3GL program*). With zSeries mainframe hardware resources relatively expensive per unit of capacity, this effect inhibited some customers from hosting all their larger J2EE™ applications on the mainframe. Specifically, the real inhibitor was that adding hardware capacity on a mainframe (*for J2EE™*), in the past, drove up software license costs, rather than just the hardware capacity cost itself. The introduction of the zAAP dedicated Java offload processor for zSeries has been a breakthrough solution to this issue.

zAAP Concept Overview: A Simplified Example

Consider a new WebSphere transactional application that requires 1000 MIPS today on zSeries.

General purpose processors

General purpose processors

Java execution powered by zAAPs

zAAP
zAAP
zAAP
zAAP

1000 MIPS for WebSphere App

500 MIPS for WebSphere App + 500 MIPS now available for additional workloads

In this example, zAAP can reduce the standard CP capacity requirement for the WebSphere application to approximately 500 MIPS or up to a 50% reduction.
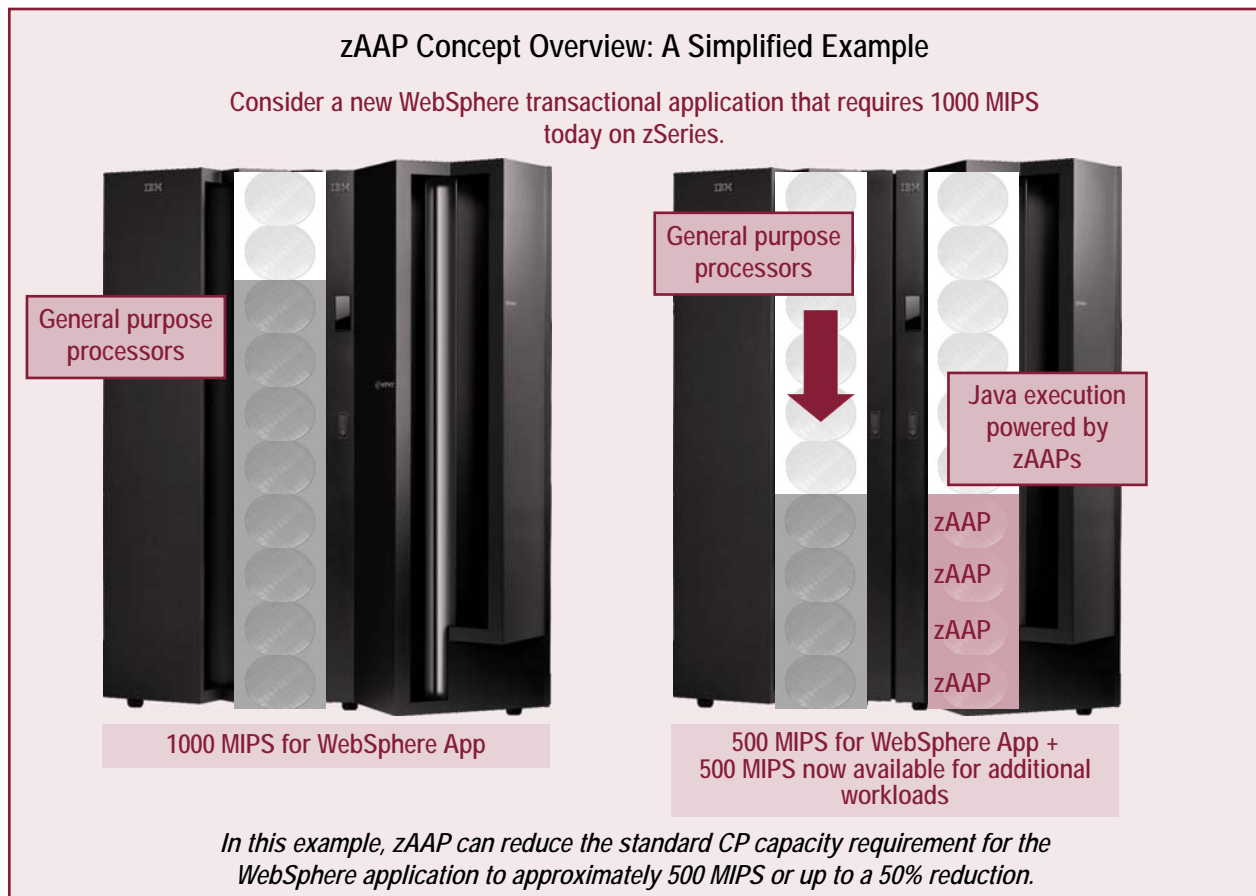
Figure 20: zAAP Concept Overview: A Simplified Example

The fixed cost zAAP processors cost much less than standard mainframe processors and do not trigger any increased software charges. On average around 50% of a WebSphere workload can be offloaded to the zAAP, halving the standard capacity needed, as can be seen in the Figure 20 example. This makes for dramatic cost reductions in supporting large J2EE™ workloads on the mainframe, and, with their other advantages, is spurring a faster growth in this type of deployment.

- **Workload License Charge/Sub-capacity Licensing Cuts Software Costs:** Perhaps the largest inhibitor to the resurgence of the mainframe was the traditional software licensing models on the platform. These generally linked software charges, whether IBM or third-party ISV software, to the overall capacity of the mainframe installed, rather than to metrics based on the actual usage of the software. This obstacle was smashed three years ago, with the introduction of the Workload License Charge, subsequently refined and extended to most of the software portfolio. In this so-called sub-capacity software pricing, fees are linked to the actual capacity used by the software only within the LPAR where it runs, measured on a monthly basis. This dramatically changes the position, and ensures customer pay only for software licensed this way for what they actually use.

- **Mainframe Software Tools Portfolio Strengths:** Five years ago, the software tools available to support the mainframe were a somewhat mixed bag. Third-party ISV products had always held a majority share of this software market, IBM's product portfolio was patchy, and many of the tools from both sources were old. Investment had been low because of the uncertain future of the platform in the late 1990s. The ISVs had made matters worse by exploiting the old software price models to demand large upgrade fees whenever hardware changed. Many of the third-party products had also failed to stay current with new mainframe enhancements. In 2005, the picture is entirely different. IBM has now built, refined, and continually enhanced a comprehensive, modern, attractive, well-integrated and entirely current portfolio of mainframe software tools covering nearly all requirement, and supporting all the main software subsystems on the platform. Attractively priced, supporting open standards, and including a lot of innovation, this portfolio has now become an asset and advantage for the platform, rather than the weakness it was in the past.
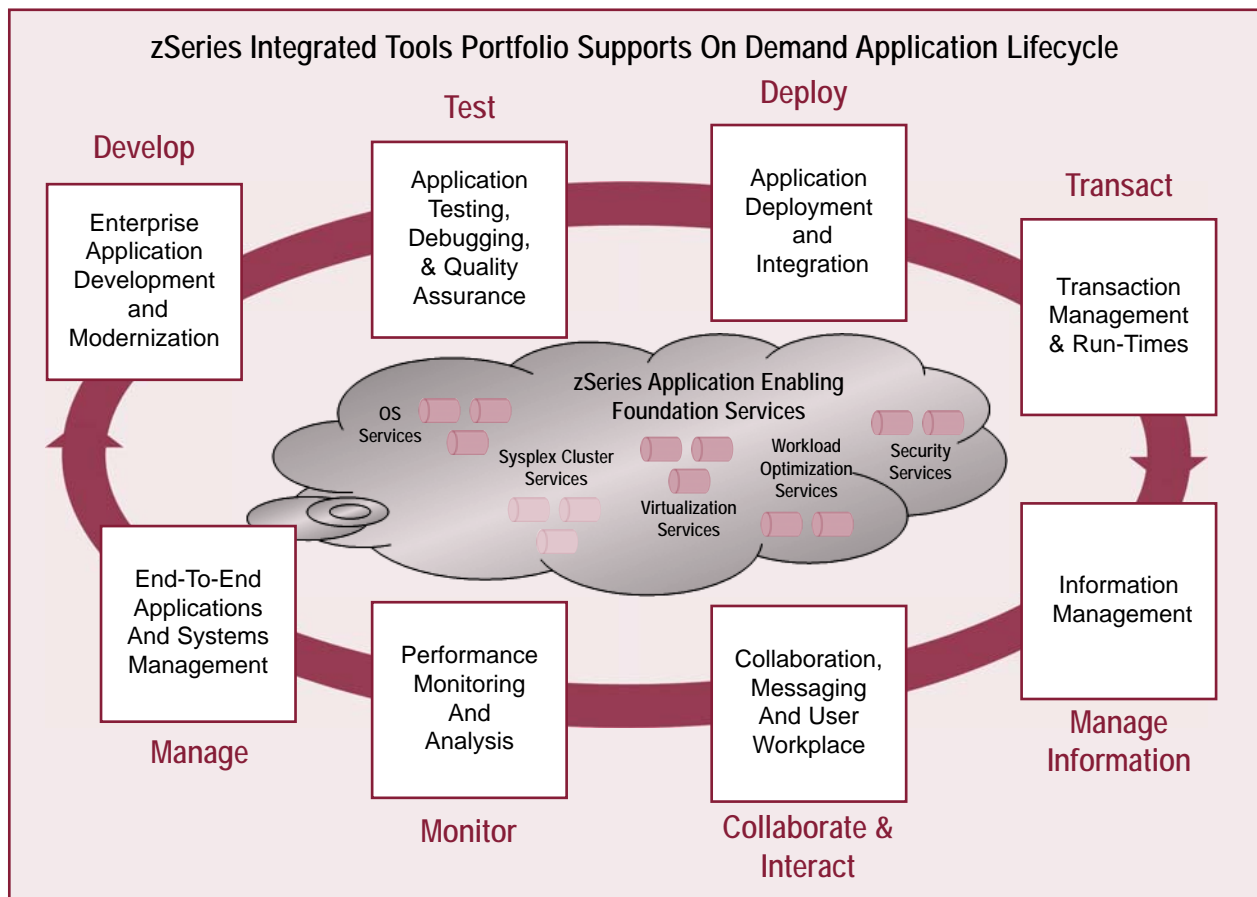
Figure 21: zSeries Integrated Tools Portfolio Supports On Demand Application Lifecycle

This has given customers real choice, driven down prices, and forced third-party ISVs to raise their game. We examined this tools portfolio in considerable detail in our two earlier White Papers. We consider that the portfolio is now more complete, up-to-date, and better integrated that that of UNIX platforms (*although many of the IBM products are available on both*), and ongoing investment and R&D is now starting to extend this strength towards a clear leadership position. Tools are extremely important to make a computing environment productive, manageable, and tuneable, and the mainframe today offers a good value proposition in this essential area. Our view of the main categories of software tools now offered on the mainframe to support the whole applications lifecycle is shown in Figure 21.

Appendix A – Mainframe Hardware Highlights

Mainframe Hardware/Systems Advances

There have been striking advances in IBM's mainframe server and storage hardware 2003-2005 that underpin many of the capabilities and Platform Readiness business value strengths discussed in the main body of this White Paper, but an in-depth discussion of these falls outside the scope of this White Paper. However, Software Strategies has analyzed these developments fully elsewhere (*see the "Other Related Software Strategies Research" Section on page 45: items 1, 2, 4*), and has developed four simple graphic charts summarizing our findings. These cover the most recent high-end and entry/mid-range zSeries mainframe servers and the newest high-end and mid-range TotalStorage enterprise storage systems that are usually deployed alongside the zSeries mainframe to provide their storage infrastructure, the two primary classes of hardware

> *There have been striking advances in IBM's mainframe server and storage hardware 2003-2005 that underpin many of the capabilities and Platform Readiness business value strengths...*

involved. These four charts are included in Figures A1 to A4 below. These provide executives with a high-level overview of the primary recent advances in the mainframe hardware platforms that deliver the increased business value levels of the platform today, realizable if a Platform Readiness strategy is adopted.

2003: z990 High-end Mainframe

IBM eServer zSeries z990

Mainframe Charter

Massive Scalability, Capacity:
- <32-way SMP systems, 2X
- >3X capacity, <9,000 MIPS

Flexible CPU Designation:
- <48 total processors, <32 IPs
- >Can designate CPUs as IPs, IFLs, ICFs, or zAAPs.
- 450-500 MIPS per CPU

Extensive CoD Options for Flexibility
- Perm., Temp. & Reserve CoD
- Processors & memory

Massive I/O Capability:
- <512/1,024 I/O channels
- < 4X I/O capacity, network b/width

Strong Business Integration:
- Deployment environment choice
- Full enterprise integration
- Business process modeling & monitoring

z/Software Stack Advances
- Richer function
- New OS & middleware releases
- Higher performance & $/perf
- More autonomic automation
- Much extended S/W tools suite

"Gold Standard" Virtualization:
- <30 dynamic LPARs
- Virtualised CPUs, I/O, Memory, Net
- 2X more virtual servers
- More secure, manageable

Strongest Systems /Workload Management
- IRD & SWLM
- Optimised, policy-driven WLM
- Smoothly runs mixed workloads

Optimised for On Demand:
- Strong new workloads support
- J2EE & traditional Composite apps. & SOA
- Business Integration

More Software Savings
- WLC enhancements
- Industry leading tools portfolio
- 20/25% SW $/performance gains

*X = Comparisons with z900

Our Assessment: z990 an innovation & technology tour de force….

Figure A1: zSeries 990 High-end Mainframe Server – Our Highlights Summary

GA May 2004: zSeries 890 Rejuvenates Mainframe Low-end

All The Advanced Technology of the z990:
- But in smaller, well-priced low end
- >28 granular models from only 4 MSU

Increased Capacity:
- X2.28 processing power
- 8-32GB memory
- X2 I/O capacity
- <420 ESCON channels
- 32% lower entry point

Flexible CPU Designation:
- <5 CPUs on 1 MCM
- Can designate <4 as IPs, IFLs, ICFs, or zAAPs. 1 CPU as SAP
- $125K/IFL or zAPP, no S/W costs
- Up to 140% $/perf. over z800 IFL/ICF

Extensive CoD Options for Flexibility:
- Perm., Temp., & Reserve COD Processors & memory
- +50% $/perf. for On/Off COD vs. z990

IBM eServer zSeries 890

Mainframe Charter

Same z/Software Stack Advances as z990:
- Richer function
- New OS & middleware releases
- Higher performance & $/perf
- More autonomic automation
- Much extended S/W tools suite

"Gold Standard" Virtualization:
- <30 dynamic LPARs
- Virtualised CPUs, I/O, Memory, Net
- 2 LCSS, 16 HiperSockets (*4X*)

Same Strong Systems /Workload Management:
- IRD & SWLM
- Optimised, policy-driven WLM
- Smoothly runs mixed workloads

Optimised for On Demand:
- Strong new workloads support
- J2EE & traditional Composite apps. & SOA
- Business Integration

More Software Savings
- EWLC cost enhancements
- Stronger tools portfolio
- 20/25% SW $/performance gains
- -10% maintenance $/perf.

*X = Comparisons with z900

Our Assessment: Feature/function of z990 in affordable entry-mid mainframe

Figure A2: zSeries 890 Entry to Mid-range Server – Our Highlights Summary

---

DS8000 – Setting New Enterprise Storage Standards

Dramatic Performance:
6X Increase over ESS 800 base. POWER5-driven.

Exceptional Consolidation Capability:
Industry-first Storage System LPARs. IBM Virtualization Engine™. 2 LPARs per system at initial availability.

Common Code Base:
97% common with DS6000. 5-year proven on ESS. 75% common with ESS.

Technology:
Leverages IBM advanced technologies. Can adapt to new developments.

4 Year Warranty:
Industry-first. Further cuts TCO. 24*7 on-site.

All-New, High-End Enterprise Storage System:
New cost/effectiveness level.

Enhanced Manageability:
All new management tools. Interoperable with DS6000.

Breakthrough Scalability:
Supports 1.1 to 192TB. Up to 640 HDDs. Architected to exceed 1PB. Field upgradable model-to-model. Linear scalability.

Server-based Architecture:
1.5 or 1.9GHz. POWER5 chip. p570 Server-based. 2-way and 4-way models. Dual SMP clustered configurations.

Enterprise Resiliency & BC:
Dual SMP clustered engines. Mainframe-inspired RAS. Greater than five 9s availability. Global & Metro Mirroring interoperable with DS6000 and ESS. Designed for 7*24 environments.

Flexibility/Extensibility:
Near-infinite addressing. Larger models following (*SOD*).

Much Lower Prices:
50-60% below comparable ESS 800. DS8100 list prices beginning at $250,000.

Figure A3: TotalStorage DS8000 – High-end Enterprise Storage System – Our Highlights Summary

DS6000 – Enterprise-class Storage for Customers of All Sizes

Supports All Server Types:
Mainframes, iSeries and Open Systems.

All the Capabilities of Enterprise Storage Systems:
At half the price.
Fraction the size.

Highly Scalable:
To 67.2TB physical capacity.
Up to 224 HHD.
Up to 13 expansion units of 16 HDD each.

Dense Modular Packaging:
Start small.
Pay as you grow.
Fraction the size, weight, power usage of competitors.

Compatible Copy Services:
With DS8000, ESS 800 & 750.

Common User interfaces:
With DS8000, ESS 800& 750.

Excellent Performance:
2X EMC CX700.

Ultra Competitive vs. EMC DMX800:
4% of size, 10% of weight at 5TB.
1/15 of the entry point.
2X scalability at half the price.
DS6000 controller $86,500 US.

Enterprise-class Resilience:
Redundant power, cooling, RAID.
Autonomic self-healing.
4 paths to each HDD.

Common Code Base:
97% common with DS8000.
5-year proven on ESS.

Easy to Install & Service:
Customer self-install/configure.
Customer repair/service.
Extensive hot-swap.
All non-disruptive.
4-year warranty, NBD 9-5 M-F.

Common Management:
Same interface as DS8000, ESS.
Same CLI, runs same scripts.

Advanced Server-based Technologies:
Dual clustered PowerPC750 engine.
Linux operating system.
Calibrated Vector Cooling™.

Figure A4: TotalStorage DS6000 Low-cost Enterprise Storage System – Our Highlights Summary

Appendix B: z/OS Operating System Releases 1.6 and 1.6 Key Advances/Features

z/OS Release 1.6 Main Enhancements Delivered	
Increased Scalability/Capacity for z/OS Workloads	**Further Security Enhancements**
24-way single image supported at general availability. 32-way single image in z990 logical partition (*planned for 2005*).	- WLM enhanced for DB2 stored procedures. - DFSMS improved placement of critical datasets on ESS/PAV.§ Allows sharing of a single tape inventory across multiple Sysplexes.
Enhanced Integration of New Applications	**Improved Availability**
Increased scale and performance: 64-bit C/C++ application development and deployment. 64-bit Java™ (*available as separate product*). **Improved performance:** - New C/C++ compiler options to exploit z890 and z990 servers. - Unicode performance improvements in z/OS UNIX. **Improvements to z/OS UNIX:** - New commands supported (*clear, uptime*). - Enhanced Euro symbol support. - Pre-built Unicode environment.	**Resource Recovery Services (*RRS*) restart enhancements in Sysplex:** - Exploiting resource managers (*e.g. DB2*). - Can be restarted on another z/OS 1.6 system without necessarily impacting other applications. **Reduced need to IPL (*restart*):** - PDSE restartable address space. - Can reduce need to re-IPL system due to a hang, deadlock condition, or out of storage condition. - Rename LPAR without IPL (*requires z890 or z990 server*). - Add and update most RACF classes without an IPL.
Simplified z/OS Security Feature Management	**Improved TCP/IP Network Management**
RACF enhancements: - Support for recoverable passwords. - Improved interoperability with LDAP change log. - Ability to update most RACF classes without IPL. **LDAP 64-bit and IPv6 support.** **SSL enhanced certificate management.**	**Sysplex support for IPv6 industry standard.** **High availability – TCP/IP Sysplex enhancements:** - Automatic take-over when TCPIP stack is not healthy. - Monitor important heath indicators. - Option to manage TN3270 in separate address space from CP/IP. **Enterprise Extender enhancements for SNA over TCP/IP.**

Figure B1: z/OS Release 1.6 Main Enhancements Delivered

z/OS Release 1.7 Main Enhancements Planned

Increased Scalability in z/OS

- **32-way single image** in z990 logical partition with good scaling (*planned for June 2005 in z/OS 1.6 initially*) will be consolidated in z/OS 1.7.
- **VSAM RLS 64-bit virtual** allows continued growth for applications using VSAM RLS.
- **DFSMShsm™ scalability enhancements to:**
  - Extend Tape Table of Contents (*TTOC*) records to raise limit on the number of data sets per tape to over 330,000 data sets per volume, to better exploit new larger capacity tape cartridges by allowing over 1,000,000 data sets per migration or backup tape volume.
  - Support data sets over 65,535 tracks (*journal, journal backup, and some temporary data sets*). Allows more removable media activity between journal backups and avoids journal full conditions.
- **DFSMSdss™ virtual storage constraint relief** by enabling to use storage above 16MB line in EXCP processing. Can process more volumes in COPY and DUMP operations and improve performance.
- **Hardware Configuration Def. (*HCD*) Input Output Def. File (*IODF*):** Support larger configurations of IODF with new file format, using less space and processing. An upgrade function to change to the new IODF is provided.
- **XES locking constraint relief:** Support many more locks per lock structure connector. Provides constraint relief for workloads that obtain and hold large numbers of Sysplex locks, such as SAP workloads using DB2. (*Support also to be made available via PTF for z/OS V1.4, z/OS V1.5, and z/OS V1.6*).

Further Security Improvements

- **NAT Traversal:** Resolves problems between IP Security (*IPSec*) and Network Address Translation (*NAT*) that occur when IPSec is used to protect traffic traversing a NAT device. New IETF standards address IPSec/NAT interaction. NAT Traversal support, to be provided in z/OS Communications Server, allows IPSec protected data to traverse a NAT device.
- **Application Transparent TLS support in z/OS** Communications Server will provide Transport Layer Security (*TLS*) and Secure Socket Layer (*SSL*) as a function of the TCP/IP stack. Application Transparent TLS eliminates the need to provide support in each z/OS application, cutting development/maintenance cost. To be provided for C/C++, High Level Assembler (*including z/OS UNIX support*), COBOL, PL/I, REXX, CICS C sockets, and CICS and IMS™ CALL instructions. z/OS applications using this support are intended to communicate with TLS/SSL-enabled partners on z/OS and other OS.
- **CICS Sockets and Application Transparent TLS:** Applications that use IP CICS Sockets enabled to use application Transparent TLS support. A new CICS Listener configuration allows listeners using this support to obtain the user ID of connecting clients, using its client's digital certificate and a security manager, such as Security Server (*RACF*). Remote clients can be authenticated without passing user IDs and passwords in application data streams. Client's user ID can also be associated with the child server transactions started by the CICS Listener, allowing access control to CICS resources to be performed based on the client's user ID.

Improved z/OS Ease of Use

- **DFSMShsm enhancements:** Make more efficient and easier to use with:
  - Faster subsequent migrations to apply to data sets that were migrated to ML2 without a valid backup copy. Tape Mount Management candidates are often in this category.
  - Allow an ABARS Aggregate to be defined without an INCLUDE statement.
  - Eliminate multiple error messages sometimes issued when attempting to migrate already-migrated data sets.
  - Change RECYCLE processing for connected sets so the first volume of the connected set need not meet the PERCENTVALID requirement, as long as the average for the connected sets meets the requirement.

  These features increase storage administrator productivity, and increase DFSMShsm space and availability management. efficiency.
- **Unicode dynamic table loading** Unicode support enhancements to dynamically load conversion tables on demand. This eliminates set-up tasks previously required for Unicode, including the CUNUNIxx parmlib member IMAGE statement updates. A new operator command will allow tables to be added, removed, and replaced.
- **OAM volume management stage 2:** Helps improve efficiency and ease-of-use of tape management in OAM environments. It provides a new dynamic exit point that can be used to notify tape management systems such as DFSMSrmm each time an OAM object tape volume has expired and can be returned to the tape scratch pool.

Improved Application and Network Availability

- **z/OS UNIX dynamic service activation:** Many customers' need 24x7 availability for all system components, including the z/OS UNIX kernel. Previously, an IPL was always required to refresh the kernel after installing maintenance. A new dynamic service activation function provides continuous availability even when certain maintenance is applied (*a function not typically found on other UNIX platforms*). In some cases this will allow installation of a z/OS UNIX service without an IPL.
- **JES2 checkpoint problem recovery:** JES2 enhancements to detect and correct more checkpoint control block corruption issues on JES2 restarts, reducing/preventing cold starts.
- **Unicode control block problem recovery:** Unicode Services will maintain a copy of critical control blocks, and compare them periodically to those in use. When a problem is found, Unicode Services will be repair the in-use control blocks automatically without needing an IPL.
- **New DADSM/CVAF address space:** A new direct access device space management/Common VTOC Access Facility (*DADSM/CVAF*) device support address space is can be started during a system IPL. This recoverable and restartable address space can also support component trace for the DADSM and CVAF components, supporting First Failure Data Capture, and improving availability and serviceability.
- **IDCAMS FROMKEY/TOKEY support:** In REPRO MERGECAT will facilitate moving catalog entries from one catalog to another, easing catalog splitting and reducing damaged catalog recovery times.

Improved z/OS Ease of Use (*continued*)	Networking Improvements
• **System Managed Storage (*SMS*):** New operator command to change the SMS status of a volume, supplementing the current method of changing an inactive configuration and activating it using ISMF. SMS will also provide new volume selection analysis messages for successful and failed allocations. These help storage administrators to more effectively maintain an efficient SMS environment. • **DFSMSrmm enterprise enablement:** In z/OS V1.6, support was provided for a z/OS client and server and for class libraries for using the RMM API to issue RMM subcommands. In z/OS V1.7, this function will be enabled via Web Services to allow it to be used on behalf of any application or platform in the enterprise. This enables DFSMSrmm to manage all the removable media in an enterprise, including tapes, helping to make better overall use of tapes and other removable media. • **New Hardware Configuration Manager (*HCM*) Check Configuration File Function** will allow HCM users to check configuration files for structural consistency for improved serviceability.	• **IPv6 advanced socket API:** IPv6 advanced socket API support to be expanded to include additional API options defined in RFC3452, including interfaces that allow applications to read and change information in IPv6 headers and extension headers, where low-level controls over communications are needed. Services are provided in z/OS UNIX assembler callable services and C/C++ programs using the z/OS Language Environment. • **z/OS Communications Server FTP:** Enhancements are planned. • **FTP Client API support for C/C++:** New C/C++ header files and functions will be provided to let C/C++ applications use the FTP Client API. • **FTP confidence of success level reporting:** For some types of transfers the z/OS FTP client and server can be configured to perform additional checks and report a level of confidence that transfers have completed successfully. This is designed to provide an additional safeguard against data loss by including checks not provided for in the FTP protocol. • **Enterprise Extender (*EE*) and SNA:** Planned to offer serviceability improvements. • **Autologon:** will provide a new VTAM operator command to initiate autologon sessions for LUs with pending autologon requests. Additionally, enhancements to the Display Autologon command are planned to allow operators to determine which controlling applications and LUs no longer have sessions. These new operational enhancements can help provide a VTAM operator with an efficient way to determine whether autologon LUs have lost sessions with controlling applications, and can help make it easier to initiate logons for such applications. • **Model Cross-Domain Resource (*CDRSC*) support:** Will provide functional support for a CDRSC definition to be configured in a CDRSC major node. This will extend previously available, predefined and dynamic CDRSC definitions. Support for models can provide many configuration benefits; for example, it can allow you to use fewer predefined CDRSCs. • **A new Display EEDIAG command:** Will display performance-related information about EE connections, including the ability to display those experiencing excessive retransmission rates. This information will be able to be displayed on an interval basis, and can be helpful in determining whether problems exist in the network. It will also provide statistics that can help tune EE timer operands (*LIVTIME, SRQRETRY, and SRQTIME*). • **Command to remove a generic resource:** A new MODIFY GR operator command will be provided to delete the generic resource representation from the coupling facility. This can allow a USERVAR of the same name to be created. • **An update to an IBM SOD on SNA support in 2005:** A SOD was issued in Software Announcement 204-180, dated August 10, 2004, describing IBM's intent to introduce a SNA solution in 2005 that uses NCP (*Network Control Program*) software running within Linux™ on zSeries. This statement of direction is planned to be fulfilled in the first half of 2005 with the availability of the IBM Communication Controller for Linux on zSeries product.

Figure B2: z/OS Release 1.7 Main Enhancements Scheduled (*September 2005*)

Other Related Software Strategies Research

1. "Enterprise Transformation, Modernization & Integration Top Priority Today – Resurgent zSeries Mainframe Stakes Powerful Claim for Expanded Role." Software Strategies White Paper, September 2004, 56 p.p., 20 charts and tables. (*Enterprise transformation, modernization and integration with resurgent zSeries. Software stack-centered in-depth assessment of the mainframe as an enterprise platform as at Fall 2004.*)

2. "New Power-driven, High-end and Modular Enterprise Storage Systems – Game-changing Server Technologies/Advances Supercharge IBM's Storage Market Leadership Bid." Software Strategies White Paper, 2nd Edition, November 2004, 42 p.p., 21 charts and tables. (*In-depth technology assessment of IBM's new DS6000 and DS8000 enterprise storage systems.*)

3. "IBM WebSphere Business Integration Leads the Way with Fullest J2EE™ and Eclipse Support – Business Integration Software Swings to Open Standards." Software Strategies White Paper, 2nd Edition, September 2004, 24 p.p., 16 charts and tables. (*Comparative evaluation of WebSphere Business Integration Suite & open standards support.*)

4. "zSeries Mainframe Resurgence Beyond Question – Software/Costs See Major Advances: IBM Tools Break USV Grip." Software Strategies White Paper, January 2004, 50 p.p., 18 charts and tables. (*zSeries resurgence and software stack assessment.*)

5. "New POWER5-based eServer i5 Systems & i5/OS™ – Will Fuel Resurgence of IBM's Evergreen SMB Computing Platform." Software Strategies Server Spotlight Report, 2nd Edition, July 2004, 42 p.p., 23 charts and tables. (*New i5 line review.*)

6. "e-business on demand™ IBM's New "Grand Challenge" – Re-invention to Lead On Demand Business Era." Software Strategies Report, October 2003 110 p.p., 68 charts and tables. (*Strategy review.*)

7. "Big Blue Blasts into Bubbling Blade Server Battle – Powerful eServer BladeCenter Looks Set for Technology/Market Leadership." Software Strategies Server Spotlight Report, 2nd Edition, November 2002, 48 p.p., 21 charts and tables. (*BladeCenter fundamentals.*)

Software Strategies

Software Strategies is a specialist analyst firm focused on e-Infrastructure platform strategies and issues. Since 1997 we have published reports, white papers and newsletters, hosted and spoken at numerous successful industry events, and have worked closely with industry leaders, including: IBM; Microsoft; Intel; ICL; Unisys; Computer Associates; BMC; Stratus Computers; Misys Plc; Notability Solutions; and many others.

Specialist expertise on mainframes, servers, storage, processors, Microsoft technology, Intel environments and enterprise middleware has been a common thread. Many thousands of enterprise IT users have benefited from our authoritative events, presentations, conferences, newsletters, white papers, and reports.

About the Author

This White Paper was researched and written by Ian Bramley, Managing Director of Software Strategies, and was published in April 2005. The views expressed are those of Software Strategies, and are based on our proprietary research. Bramley founded Software Strategies in 1997, is an experienced enterprise infrastructure analyst, a keynote speaker at many industry events, and has published many reports and papers. Before this, he served as Director of Enterprise Platforms at Butler Group and was 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.

Ian Bramley
Managing Director – Software Strategies
ian.bramley@software-strategies.net