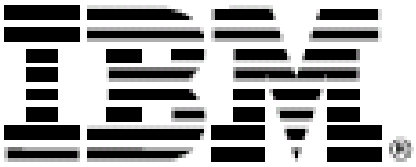

Unleashing the Business Value of Today's Mainframe

Contents

Introduction

Over the past four decades, the reliability, security, and performance of the mainframe, or System z platform and its associated subsystems, has led it to become the backbone for much of the world's corporate data. For example, more than ninety four percent of Fortune 1000 companies use IMS for their most critical IBM System z data management needs with more than 50 billion transactions running through IMS databases on a daily basis.

The System z platform has evolved to provide new compatibilities helping the platform play well in a distributed environment and compete favorably with other servers in the market. Continued advancements in the platform's architecture provide customers with the traditional capabilities that have been proven throughout its existence in addition to offering the new capabilities that are expected in today's highly dynamic Internet age.

Many System z enterprise users have employed a "currency" strategy whereby they have upgraded to the latest in mainframe technology advancements, and have reported reaping significant business gains from such investments. However, a significant number of mainframe users may not be fully aware of the benefits that have been experienced by so many, and thus may only be taking partial advantage of the widespread development advances being delivered at faster rates than ever previously seen. It may be that these users are hindered by historical inhibitors such as upgrade/update deferral habits, downturn cost savings, or migration time and effort fears. With the significant arguments for keeping current on today's System z platform, customers may find there is little merit left to continue allowing these inhibitors to constrain their plans.

System z – Proven Business Level Benefits

Climbing System z capacity sales are quickly illustrating that the persistent myths and legends, fuelled for years by aggressive UNIX and Intel-based competitor marketing portraying the platform as costly, closed and a proprietary dinosaur, no longer hold the same merit they once did. Admittedly, until recently, many questioned the future of the System z platform during which time some considered and even tried migrating to "open" systems instead of upgrading their existing System z platforms. While distributed servers appeared to be less expensive to acquire and maintain than the System z platform on an application to application basis, the real value of the System z platform becomes apparent when dealing with more typical scenarios; multiple applications on multiple servers compared to the same applications on a single System z.

Specifically, the requirement for additional servers to address increasing processing needs leads to server sprawl across the data center. Further, each server must be configured and maintained separately, usually resulting in management headaches for IT administrators. As servers proliferate, differences in architecture and features can demand a broader understanding of hardware than the System z platform. For that specific reason, many data centers are now implementing server consolidation and server virtualization to attain the simplicity of centralized management and high utilization that the System z platform offers by its very nature.

Business Value

Thousands of enterprise customers continue to reap the benefits from the legacy they have built on the System z platform, with existing assets representing significant investments. This legacy has been built on a foundation that has historically provided customers with lower costs associated with outages, lower risks and costs associated with security breaches, higher resource efficiency and utilization, the highest scalability, the highest quality of service, and much more.

The System z platform continues to evolve, providing customers not only with refinements to its traditional business value, but also with enhancements to address the needs of today's enterprise requirements. Customers who stay current with the latest in System z platform enhancements may experience significantly greater rewards compared to others. While there are several business level considerations

that should not be overlooked when considering a mainframe investment the following offers some perspective.

- *Modernization of applications* – In the past, many organizations tended to opt for a replacement strategy if a new technology had to be added; otherwise, they simply left the application alone. The risks of changing a business-critical application in any way were perceived as too great, and the task so daunting, that not touching existing applications was the preference. However, over the last few years, tools for upgrading applications in place (as opposed to migrating, regenerating, or replacing), especially for web service enablement on System z, are available and field proven. Through modernization, terminal application tasks can be extended as web services, and inserted into business processes. Similarly, an entire transformation host application can be inserted as a human task within a process flow.

  System z applications and related data represent significant investments to customers. The ability to utilize these existing assets can provide great value to customers. For example, even after almost four decades, IMS customers continue to exploit the offerings value added abilities. IMS has incorporated new features and capabilities to remain relevant to customers. Through modernization, organizations can leverage their existing investments to address today's changing business needs without migration expenses.

- *Decreasing software costs* – The costs associated with additional distributed servers are effectively linear. IBM's pricing policies are designed to favor the addition of more workload. On the System z platform, as workloads increase, the cost per transaction decreases. Customers migrating applications from the System z platform in attempts to reduce workloads may not realize the intended cost savings.

  TCO Comparisons - Many total cost of ownership analyses between mainframe and distributed environments look at single applications, which typically favor a distributed environment. For a realistic assessment, multiple applications and servers vs. a single mainframe running the same applications needs to be examined. According to some analysts, from a pricing perspective, approximately 100 distributed servers is where the cost per unit of work between the System z platform and a distributed infrastructure meet. Beyond this point, as System z related workloads increase, the cost per unit of work decreases. If a typical large organization runs between 2000 to 4000 applications, the System z platform holds a significant pricing advantage.

- *Maintenance reductions* – The movement to the distributed platform lead to a profusion of servers, complex networking and infrastructure, high support costs, and increased difficulty when troubleshooting performance and failure issues. The System z platform, with its resource virtualization, support for the latest software standards, and superior economics, has reduced the need for multi-tier environments. Specifically, web serving workloads traditionally being run on commodity scale-out servers, are being consolidated to Linux virtual servers on System z. Similarly, the heavier middle-tier application workloads are being migrated. Some System z customers have successfully combined all their workload types on the mainframe. In addition to considerably better performance, higher reliability, higher hardware resource utilization, and higher quality of service, fewer staff are needed to deal with distributed maintenance issues.

- *Reduced personnel requirements* – Thanks to many years of development, the self-healing, self-managing, self-protecting, and autonomic technologies of the System z platform have reached new levels. Not only are fewer personnel required compared to sprawling distributed platforms, there are also lower personnel requirements compared to the System z platform from years past. The addition of these autonomic capabilities has resulted in a reduction in System z staffing levels (operators and system programmers) per MIPS over the last several years.

- *Increased productivity* – The increased automation and intelligence built into System z products and supporting tools significantly increases productivity. For example, the updated System z user has access to newer visual system tools, more productive development tools, tools for provisioning virtual servers, and updated software that provides the ability to convert existing applications making them available through web services.

- *Security and Compliance employment* – System z can act as the central coordinator of an enterprise's effort to meet regulatory requirements and to leverage business-compliance solutions for

corporate benefit. For example, the zSecure suite complements RACF to help simplify security management, addressing auditing, monitoring, compliance and administration. Similarly, the InSight suite focuses on compliance across all enterprise platforms, including System z.

- *SOA Enablement* – In order for businesses to be responsive, they must be able to transform applications to address new opportunities and requirements. As a modernization strategy, many organizations are moving towards Service Oriented Architectures (SOA), with which the System z platform plays an active role. For example, with the release of CICS Transaction Server 3.1, IBM added the ability to use existing BMS maps (interface between CICS programs and terminals) and CICS programs, and make them available through a web services interface.

IBM continues to provide innovative solutions for System z that address today's changing business requirements, including SOA enablement, security and compliance, and extensive master data management. Through advancements in the System z platform, customers who keep current have realized significant business value, and continue to increase the workloads they deploy on System z; a fact illustrated by the growth in related System z purchases and licensing.

System z – The End to End Mainframe Platform

More than just the hardware itself, the System z platform is considered a four-layer architecture that includes:

- ⇨ The server and storage hardware platforms themselves;
- ⇨ The z/OS operating system native to, and fully exploiting, the z/Architecture 64-bit System z hardware platform, and providing the foundation for the other software layers;
- ⇨ 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; and
- ⇨ The extensive range of mainframe software tools that IBM provides to support all stages of the enterprise modernization, application and data integration lifecycle, and to monitor and manage the environment.

While there is a close integration and synergy between the components within each of these layers, this symbiosis also exists between each of these layers and their components. For example, new operating system releases support new enhancements of the hardware. Similarly, the newest releases of middleware subsystems exploit the unique attributes of the hardware and operating systems. Finally, the software tools portfolio address the main middleware subsystems with respect to the development, monitoring, management, and optimization of all levels of the whole. Therefore, the increasing business value of the System z platform can more fully be obtained when these combined synergies are updated.

System z Hardware

System z hardware remains a cheap alternative compared to the linear pricing associated with large distributed environments. Instead of being viewed as an expense item, the purchase of updated System z hardware can actually be used as a strategy for cost savings. Upgrading System z hardware can provide customers with cost savings through technology dividends, recoverable trade-in value, specialty engines, and new software pricing models in addition to the typical performance improvements. For example, specialty processors are upgraded to next generation free of charge. Growing customers typically receive credit for existing MIPS, and full trade-in value is applied to upgrade and growth MIPS.

System z hardware upgrades and replacements can be selected to improve processing for specific operating environments, for new desired capabilities, or for new application releases. Some considerations for upgrading System z hardware can include, but not be limited to:

- *Decreasing MSUs* – While some vendors still price based on Millions of Instructions Per Second (MIPS), examining System z costs on this metric does not tell the whole story. Surprising to some, upgrading between System z machines can help reduce costs. IBM and many ISVs license software

on the basis of consumed millions of service units (MSU) per hour or total MSU capacity. Newer, "beefier" System z machines typically have lower MSU ratings than their predecessors. As a result, organizations can run their existing z/OS applications on upgraded hardware and actually save money.

Each generation is seeing a technology dividend reduction of approximately 10% MSU. Specifically, new hardware is cheaper for the same number of MIPS. In other words, customers are receiving more MIPS per MSU. For example, on the z900, 1 MSU was equivalent to about 5.9 MIPS. The z990 provided approximately 6.6 MIPS per MSU. Similarly, today, the System z9 provides about 7.3 MIPS per MSU. Therefore, software for a 580 MIPS machine will be charged at a rate of 81 MSUs. Purchasing the latest hardware can actually help decrease software costs, offsetting software upgrades.

- *Specialty Processors* – To help combat the costs associated with server software, System z also supports specialty processors for Linux, Java, and business intelligence related workloads. These processors help reduce costs by virtue of shifting execution to these processors, away from billable CPU totals.

  Currently available specialty processors include:

  - ⇨ *The Integrated Facility for Linux (IFL)* is effectively a normal processor with one or two instruction sets (used only by z/OS) that are disabled. Linux does not use these instructions and can be executed by an IFL. While Linux can be executed by a central processor, an IFL can make a substantial difference in reducing software costs.
  - ⇨ *System z Application Assist Processors (zAAP)* are used to execute Java code (and possibly other similar code in the future). While the same Java code can be executed on a standard central processor, this specialty processor exists to not only control software costs but also to reduce the demands and capacity requirements on general purpose processors, which may then be available for reallocation to other mainframe workloads.
  - ⇨ *System z9 Integrated Information Processor (zIIP)* is specialized for processing database workloads. This helps reduce software costs associated around workloads such as business intelligence, enterprise resource planning, and customer relationship management.

  For example, in an effort to reduce the load and cost associated with data servers on System z, some customers have attempted to move these workloads to distributed systems. While this initially appeared to provide cost savings, it has created additional issues that easily negate any cost savings. Multiple copies of data have created issues with respect to security, backup and recovery, storage, administration and management, and consistency. Today, with no code changes to applications and no configuration changes to DB2, zIIP specialty processors are activated automatically without any tuning requirements, significantly reducing workload by redirecting it to the zIIP.

- *On Demand* – Distributed environments have witnessed significant proliferation thanks to peak-to-average provisioning and additional provisioning for expected growth in out years. Additionally, customers will typically have separate servers for production, failover, development and test environments, and disaster recovery. Distributed environments require customers to purchase servers that can handle predicted spikes while generally yielding low utilization rates of 15 – 30% capacity on a regular basis.

  In contrast, the System z hardware provides "on demand" processing facilities to help decrease idle costs allowing processing power to be turned on (or activated) when needed and turned off when no longer necessary. Specifically, customers can pay for general purpose processors priced per MIP, and pay for zAAP, zIIP, and IFL processors at a reduced rate (approximately 9% of price per MIP). Customers however, do not pay for pre-installed capacity on demand processors until used. This allows customers to operate at 80%+

Workload License Charge provides sub-capacity software pricing where fees are linked to the actual capacity used by software within the LPAR where it runs. This ensures customers pay only for software they actually use.

capacity and still have processing power to address unexpected processing requirements.

Similarly, customers can address fast failover for disaster recovery at significantly reduced costs. At an alternative site, customers can have a second System z with enough capacity to handle the first's workload in the event of a system failure. To achieve fast failover, customers are required to pay regular price for only one active processor, with all other processors dormant until required. This provides the potential for a significant cost savings compared to distributed implementations where additional licenses are required for standby servers.

- *Energy Savings* – According to some analysts, roughly "50 cents is spent on energy for every dollar of distributed computer hardware. This is expected to increase by 54 percent to $0.71 over the next four years."[1] The System z requires significantly less energy in comparison to its distributed counter parts, even with its ever increasing processing performance.

  In August of 2007 the Environmental Protection Agency asked server manufacturers to develop "miles per gallon" ratings for their equipment that would provide users with accurate assessments of energy efficiency. Usage ratings for IBM were developed using data collected from more than 1,000 z9 systems deployed to customers since May of 2007, when IBM added a "mainframe gas gauge" feature that monitors energy usage and cooling statistics of the platform. Based on this gathered information, the typical energy use of the System z platform is normally 60% less than its maximum energy ratings.

  Additionally, by consolidating distributed machines to System z, customers can reduce their power consumption and cooling costs by up to 40 percent, in one-fourth of the physical footprint. For example, given an average 25,000 square foot data center, customers should be able to achieve 42 percent energy savings. Based on the energy mix in the US, this savings could equate to 7,439 tons of carbon emissions saved per year. In August of 2007, IBM announced, as part of its Project Big Green, that it was working to consolidate about 3,900 mostly x86-based servers onto about 30 mainframes running the Linux operating system. IBM anticipates the new environment will cut energy consumption by about 80%, and save more than $250 million over five years in energy, software, and system support costs.

  Tivoli management software can help customers monitor power consumption, allowing users to set power policies, and can track energy usage to provide an accurate charge back to departments' power consumption in a data center.

- *New Functionality* – In some cases, customers may also choose to update their System z hardware to benefit from specific capabilities that have been added to the platform. For example, the z9 integrates an encryption feature based on the SHA-256 hashing algorithm. By encrypting all data at the hardware level, there is no performance penalty imposed by encryption software, and any tapes are natively secure.

In the distributed world, a server life expectancy of 3-5 years is typical. While advancements in technology may provide better price/performance, upgrading to the next generation of distributed systems requires customers to repurchase any existing processor capacity plus any growth. Thanks to technology dividends, increasing performance, trade in value, on demand capabilities, dedicated specialty engines, energy savings, and increasing functionality, upgrading to the newest System z hardware can provide customers with significant cost savings.

System z Software

While the latest in System z hardware updates continue to demonstrate the value of the platform, so too do the enhancements that come with the latest version of the z/OS system software. Not only are updates to the z/OS system software intended to take advantage of new hardware enhancements, they often include additions and enhancements of their own. The operating system has been updated to capitalize on hardware advances, open standards, programming models, networking, and more. While many of

[1] Worldwide Server Power and Cooling Expense 2006–2010 Forecast, IDC, Dec 2006.

these upgrades may be modest, there are also significant improvements which may be substantial for customers who might have functional needs in specific areas.

Updates to the z/OS system software allow customers to take advantage of increased performance, efficiencies and flexibility. Some examples might include the move to exploit the power of the 64-bit architecture, better real-time balancing of batch workloads across a sysplex, workload manager self-optimizing capabilities, and better self tuning/granular performance reporting of WebSphere processing. Other examples driving customers to update their system software might also include:

- *Security Features* – Already discussed are the encryption capabilities that have been added to the System z hardware platform. Similarly, z/OS has added security features such as Public Key Infrastructure (PKI) services to provide for life-cycle management of digital certificates.

  Digital certificates can be a basic building block of a trusted infrastructure supporting secure transactions over the Internet. Through PKI services built into z/OS, customers have the ability to create and manage their own certificates without a requirement to purchase services through third-party Certificate Authorities. Included with the licensing of z/OS, PKI services can provide an attractive alternative. For example, a large banking customer realized an estimated savings of $14 million (US) per year as compared to buying third party certificates.

- *Specialty Processors* – In z/OS V1.8, IBM introduced a z/OS component, z/OS XML System Services (z/OS XML). z/OS XML is a system-level XML parser integrated with the base z/OS operating system designed to provide services for parsing XML documents. While the initial beneficiaries of this system component were middleware and applications requiring high-performance non-validating XML parsing, IBM announced that in z/OS 1.9 this component would be enabled to take advantage of System z Application Assist Processors (zAAPs). This enhancement means that middleware and applications requesting z/OS XML System Services (for example DB2 processing using a local connection) will have the capability for a portion of z/OS XML System Services processing to execute on a zAAP. A perfect example of how existing customers, who have experienced cost savings through hardware updates and the addition of specialty processors, could see additional savings simply by keeping their z/OS system software current.

Middleware Solutions

IBM middleware solutions support the changing role of the System z platform. These solutions continue to evolve to address changing business and technology requirements, not only remaining relevant, but continuing to provide customers with significant value. For example, CICS is nearly ubiquitous in being installed and used at almost every System z customer site, and has been evolving and serving this base for almost 40 years.

IBM middleware solutions have enabled the System z platform to become a full-fledged, active participant in SOA implementations. In addition to performance, availability, manageability, and supporting tool enhancements, new releases have added support for Java EE, open standards, Web Services, and more.

CICS

Customer Information Control System, or CICS, is IBM's transaction server for developing, running, and managing transaction applications on the mainframe, very commonly found in financial institutions. In fact, it is nearly ubiquitous being installed at almost every System z customer site. Like many other middleware solutions, CICS continues to be updated to take advantage of new system capabilities and introducing new standards support providing customers, who stay current, with significant value. In fact, thanks to the value of the CICS Transaction Server 3.1 release, it saw the fasted version-to-version upgrade rate compared to any other previous version.

With the release of CICS Transaction Server for z/OS V3.1, IBM introduced the ability for CICS applications to be used as Web service providers or requesters within an SOA (Service Oriented Architecture) infrastructure.

Complementary tools such as WebSphere Studio Asset Analyzer (WSAA), Asset Transformation Workbench and Rational Developer for System z now make it possible to discover core CICS and other applications and to analyze their relationships. The tools also make it possible to enhance applications to interoperate with other applications and components within an SOA. Together, these tools provide customers with the facilities to better understand their core CICS applications, build Web services from them, and aggregate multiple CICS transactions into high-level business processes through visual modeling.

With the recent release of CICS Transaction Server for z/OS v3.2, IBM has further enhanced the Web services capabilities of CICS with optimized HTTP transport for better performance and manageability. The new CICS release also includes additional processing capabilities for XML documents and attachments such as graphics files or other binary large objects that are being transmitted within SOAP packets. In addition, IBM has also released various APIs (Application Programming Interfaces) that can integrate with system management software products such as IBM Tivoli and HP OpenView. This capability allows customers to monitor the state of their CICS applications and the components with which they interoperate within an SOA. While the most vocal updates may relate to new and enhanced standard support, new enhancements also address more traditional core users. For example, v3.2 offers a different style of data transfer as an alternative to the COMMAREA that has no such 32k restriction. With every release CICS makes more commands thread safe, thus reducing bottlenecks and CPU cycles, and addresses simplicity through a graphical user interface that provides a holistic view of complex environments from a single point of control.

Data Servers

As much as 70% of the world's data is on the System z platform. IBM data servers, such as IMS and DB2, are home to a significant investment with respect to important and valuable information. IBM continues to update and enhance its data server family, including IMS and DB2, providing new valuable capabilities to address today's organizational requirements.

Information Management System (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 of more than 100 million transactions per day at some customer sites. It can also access multi-terabyte-sized databases, and run near-continuously with as little as two or three hours of planned and unplanned outage per year. Transaction rates exceeding 21,000 transactions per second have been posted on a single System z IMS system.

Even with such a committed and established following, IBM continues to introduce additional value added capabilities with each new release. For example, the newest release of IMS, version 10, provides a new hierarchical database management and transaction system that delivers enhanced XML and Web Services capabilities, allowing existing business critical applications to evolve to SOA. With IMS 10, standard XML Query language is available to hierarchically structured data for the first time. IMS also provides a new zQuery, enhanced XML and Web Services support, opening IMS data to off-the-shelf third party tools, and offers a standard, sharable integration point with IMS. These types of additions can significantly help customers simplify their development environments.

Through the IMS Connect solution, users can access all of their core business applications (such as retail banking, customer information, and relationship and deposit systems) on the IMS system. The IMS SOAP Gateway, which enables web services IMS transactions for interoperation with client applications independent of location, programming language, and platform, has also been enhanced to provide z/OS environment, PL/I applications and Asynchronous Callout support.

Similarly, the updated release of DB2 also addresses issues associated with storing, converting, and querying XML based information. Through its true support for XML, DB2 eliminates the requirements for storing XML data as a single record (Character Large Object – CLOB) or shredding the data to fit relational tables. With the introduction of pureXML, IBM DB2 9 supports both XML and relational data in a single database management system. Handling XML as a new data type stored in a hierarchy structure – different from relational data – that reflects the structure of XML, pureXML provides integration of XML with relational data, speeding application development, improving search performance with optimized XML indexes, and is capable of both SQL and XQuery queries on XML data.

DB2 now also provides compression for reducing costs associated with storage requirements. Customers who have upgraded to DB2 V9, have reported anywhere from 50 – 80% in storage savings. For example, one banking customer saw compression ranges of up to 83% on its data warehouse, projecting a cost savings of more than $2 million initially with an ongoing savings of $500,000 a year.

IBM System z Data Servers (DB2, IMS, etc.) are trusted platforms and provide the necessary support for today's business including SOA, dynamic warehousing, and OLTP requirements. While data servers on the System z platform may not see the same level of competition in comparison to data servers on distributed environments, customers need not be concerned that their investments in System z platforms will become stagnant as a result of competitive complacency. Customers continue to see new value through additional capabilities, enhanced management and analysis tools, and support for new and upcoming standards. Exemplifying this fact are the new 2007 releases of both DB2 V9 and IMS 10.

Productivity Tools

Gone are the days of the requirements for more traditional mainframe tools through green screen, ISPF, and command line tools. IBM offers System z customers comprehensive and modern tool suites that are fully aligned with new versions of middleware and system software. Similar to updates to system and middleware software, these tools continue to bare witness to refinements and enhancements.

For example, complementary product tool advancements provide easier management for more productive development. For example, CICS TS 3.2 provides complementary tools for Application Lifecycle, Data Management, Performance and Tuning, and Operations Management. Tools such as IBM CICS Interdependency Analyzer identify candidate applications that are suitable for exposure as web services, Workload Simulator provides application stress and regression testing, and Application Performance Analyzer helps isolate application performance bottlenecks.

New system tools such as the IBM OMEGAMON z/OS Management Console, a no-charge monitoring product, provides an advanced graphical user interface with real-time health-check information (provided by the IBM Health Checker for z/OS) and configuration status information for z/OS systems and sysplex resources. IBM has been delivering significant enhancements to help simplify mainframe administration including new point-and-click controls to help administrators manage system performance, tighter SOA integration, and improved monitoring of z/OS health.

Developer Tools

The IBM Rational Software Delivery Platform comprises products in four lifecycle categories: architecture management; change and release management; process and portfolio management; and quality management. Modern tools are based on the eclipse platform and provide a shared development environment for both System z and distributed environments. A similar tool set for both architectures helps eliminate a duplication of tools and processes, skills can be leveraged across the organization, and end-to-end communication and traceability are improved across the entire lifecycle.

Admittedly, even with graphical user interfaces, existing System z applications can involve a maze of intertwined relationships and dependencies that can prolong the maintenance and development of existing and new applications. Tools such as WebSphere Studio Asset Analyzer (WSAA) help organizations understand these existing assets and interdependencies. With a significant reduction in effort, WSAA helps new developers get up to speed quickly on existing application relationships, while experienced developers can remove obsolete and dead code, restructuring or simplifying applications to lower future maintenance costs. WSAA helps developers understand dependencies within and across applications and associated data across the organization; supporting both System z related as well as Java EE application related programs.

Through interactive textual and graphic reports, WSAA captures the relationships between z/OS and distributed application assets whether they are in partitioned data sets (PDSs) or partitioned data sets extended (PDSEs) on System z, directories on Windows or AIX systems, or in one of a number of source configuration management systems. Through the web services interface provided by WSAA, Asset Transformation Workbench can download the artifacts identified by the WSAA impact analysis to perform a more in-depth interactive analysis. Application visualizations help identify application artifacts (such as

programs, screens, and transactions) that might otherwise be affected by proposed code or operational changes.

Rational Developer for System z (RDz) adds to Rational Application Developer in providing an environment for developing, testing, and preparing existing software for inclusion in a SOA. RDz provides an interactive, workstation based environment for COBOL, PL/I, Assembler, C/C++, Java, JSF, HTML, and others. It makes System z application development, web development, and integrated mixed workload or composite application development faster and more efficient. Developers can build web services from existing CICS applications and IMS transactions, aggregating multiple transactions into a high-level business process through visual modeling. RDz helps bridge new and existing technology by including all of the Java EE web development tools. Developers can generate JSF/Java EE web front ends and a COBOL backend running on System z, through the same tool, reducing learning curves for multiple tools.

SOA Modernization – Rational Developer for System z offers three methods for web service generation from COBOL or PL/I through Enterprise Service Tools:

- "Top down" web services generation uses an existing web service definition (WSDL) and generates a skeleton application that would be completed by a developer.
- "Bottom up" web service generation uses an existing application, generating the necessary converters/wrappers and standard web service artifacts (WSDL, WSBind, etc.).
- "Meet in the middle" web service generation takes an existing web service definition and an existing application, mapping the inputs and outputs of the web service to those of the application.

IBM Problem Determination Tools deliver cost-effective and market-leading application performance analysis, source code debugging, application-abend analysis, and data management. The latest version (V8) further increases the level of integration with Rational Developer for System z. Workstation-based developers and testers can now access many frequently used functions in IBM Debug Tool Utilities and Advanced Functions, IBM File Manager, and IBM Fault Analyzer directly from their development environment. This removes the requirement to access 3270 panels, simultaneously opening System z to a broader development community.

These updated tools are more productive for building robust System z and web based applications with a reduced development effort. Today's tools help decrease time for compiling, testing, and debugging applications compared to traditional mainframe development tools.

Management and Administration Tools

Where the System z platform was once considered the center of enterprise infrastructures (z-Centric), this is no longer the case. Instead, today's infrastructures are z-Inclusive. As such, IBM continues to upgrade its management and administrative tools to incorporate the System z platform in this light. Specifically, IBM Tivoli provides customers with end-to-end operational management solutions including System z and distributed environments.

Solutions for availability, security, and service management help extend the secure, resilient and continuously available System z platform to the whole enterprise. For example, Tivoli Enterprise Portal provides a consistent, simplified, modernized user experience for an organizations entire infrastructure including System z and distributed platforms. Requirements for unique and specific System z skills are reduced.

The Tivoli Integrated Service Management platform provides solutions for auto discovery of IT infrastructures and relationships, eliminating manual entry of resource and relationship information. Integrated Change and Configuration Management enables change control, impact analysis and change integrity verification. For System z resources, the z/OS Discovery Library Adapter includes discovery of resources such as LPAR, z/OS, IMS, DB2, CICS, MQ, and WebSphere.

OMEGAMON XE monitoring solutions help diagnose IT issues across applications, middleware, and SOA-enabled systems or traditional computing infrastructures. OMEGAMON XE agents for Sysplex, z/OS, IMS, DB2, and CICS will be discovered via IBM Tivoli Monitoring Discovery and map to classes that have been added for z/OS Discovery.

Keeping monitoring tools up to date means that support for all of the major System z new releases, such as z/OS 1.9, CICS Transaction Server 3.2, and IMS 10 are supported. Similarly, for customers who are

consolidating through z/VM and Linux, OMEGAMON XE for z/VM and Linux provide rich performance analysis to optimize the value customers get from System z Linux and the virtualized z/VM capabilities.

New releases of IBM tools continue to focus on extending the integration and support for SOAs, Web Services and Java EE, while also enhancing the manageability, performance and security of all the System z platform's main pillars. They also aim to fully exploit and complement the hardware advances in the System z architecture. Many leading-edge System z users have recognized the considerable business value of these System z hardware and software advances, and have adopted the new systems and software relatively quickly and consistently. The specific business value enhancements that each of these releases offer are important, but the synergistic benefits of faster, multiple adoption can be significantly more compelling.

Upgrade Considerations

The System z platform is once again returning to an ecosystem where customers update and implement newer hardware, systems, and software on a regular basis. During the economic readjustment in the early years of 2000, and the once uncertainty of the System z platform, deferral habits were formed. Upgrades and migrations were postponed as long as possible as one method used to address IT cost cutting and staffing reductions.

A new generation of distributed systems also proliferated, initially viewed as less expensive to implement. These distributed systems also allowed organizations and departments to evaluate and manage servers, storage, operating systems, database management, applications development, etc. from their own stand point in efforts of reducing central IT expenses. With the renewed surge in computing requirements, distributed customers are realizing that these "cost cutting" measures are having long term expense consequences.

Many organizations are still constrained or influenced by these types of inhibitors. Customers may need to examine if the rational grounds originally behind each of these motivators are still applicable today. Instead of deferring upgrades as a cost savings strategy, keeping current likely provides a more effective strategy for long term cost savings. Some considerations related to keeping current on the System z platform could include:

- *Cost Cutting* – Examine, and if possible eliminate little used, yet highly priced, software entirely or replace it with cheaper IBM alternatives. Some of these products and tools incur significant costs, and may be little used or add little value. IBM has continued to develop and sell new System z management and software development tools to help drive down costs per MIPS. Some third party vendors continue to charge very high prices per capacity, potentially adding tens of millions of dollars a year to budgets.
- *Migration Concerns* – Choosing to maintain instead of improve an application means that the application continues to age. This not only increases maintenance, opportunity, and inefficiency costs, but also increases the gap between the legacy application and current technologies. This age gap can make improvement more costly, which in turn makes the organization more likely to choose the "as is" strategy.

  Many experts agree that migration can be complex and sometimes costly, especially for organizations that do not update often. Instead, for those customers who perform upgrades on a regular basis, migrations typically come with ease. To many System z customers, the process of migrating or updating becomes fairly commonplace when performed on a regular basis.

  To minimize disruptive migrations, requiring less time, skill, and resources, IBM provides customers with the necessary tools, documentation, and procedures. Customers can integrate migration into their normal set of system health and maintenance activities. However, with longer time periods between version migrations, may come increases in planning and testing times.
- *New Workloads* – Customers are seeing significant savings when increasing workloads on System z compared to offloading these additional workloads to distributed environments. For example,

electrical costs increase dramatically for distributed environments compared to System z. Similarly, as workloads increase, pricing curves that favor growth see cheaper per transaction costs compared to linear costs for distributed environments.

Linux on System z can also provide customers with an attractive consolidation target. Tens or hundreds of Linux instances can run on a single z/VM host – potentially providing serious savings in terms of time and resources. When Linux is run as a guest of z/VM, the mainframe's power and resources are utilized as needed, so organizations do not need to purchase and maintain separate dedicated hardware for each Linux server. Support for IFL specialty processors is designed to run Linux workloads without increasing the IBM software charges for z/OS and applications running on System z standard processors.

New releases in the System z platform layers have brought extended support for web services, composite applications and SOA, performance gains, and more. There is close integration, synergy and value-add not only when updating individual components, but potentially more when updating all levels of the System z platform including hardware, system software, middleware solutions, and development and administration tools. Ultimately, customers need to consider that advantages such as new System z hardware exploitation and optimization, improved software licensing price/performance, and more, come from the combined synergies and are only fully obtainable through remaining up to date.

Summary

For enterprise customers already using the System z platform, there seems little merit in not systematically exploiting, in full, the many advances that have been made into the hardware, operating environment, middleware solutions, and tools. Today's System z platform provides significant cost savings through decreasing software costs, a reduction in personnel requirements, minimal electrical requirements, and the ability to modernize existing applications to address new business opportunities.

Instead of migrating performance-critical and similar existing applications towards distributed environments, System z makes it easier for enterprises to web enable applications in place, adding cost effective internet connectivity and application deployment with minimal impact on existing production environments. New tools increase developer productivity through a unified enterprise and distributed development environment, and eases the ability to compose multiple CICS transactions into high-level business services through visual modeling.

Not only have advancements helped customers keep existing workloads on the System z platform (as opposed to migration from the platform), they have also given customers significant reason to consolidate distributed applications to the platform with a significant cost savings.

Given the integrated and synergistic value between the System z layers and their components, instead of evaluating and justifying each individual hardware or software enhancement or update in isolation, customers should consider a more holistic approach. Capitalizing on cost savings in one area may offset costs for additional upgrades, ultimately helping customers capitalize on the synergistic benefits of the combined advancements of the entire System z platform.

For More Information

Contact your local IBM representative today for more information about how you can achieve business results well ahead of your competition.

Visit http://www.ibm.com/software/os/systemz/en_US/index.html for more information about IBM System z software and solutions.

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