

Managing System z Mainframe SOA Environments – Strong IBM z/OS SOA Software Advances Key

About this White Paper

Service Oriented Architecture (*SOA*) adoption has spread rapidly since 2003/2004 through large (*and more recently medium*) enterprises, and bringing compelling business benefits to its users. In parallel, the strong market resurgence of the IBM System z mainframe, powered by its continuing transformation, and deeply superior, business value-generating attributes, has continued apace, expanding its large footprints.

This new White Paper recaps the strong 2006 mainframe hardware advances. It then reviews the rapid rise of SOA, and the reasons for its wide success. It closely assesses and pinpoints why the System z mainframe platform is a perfect fit for SOA, for fifteen strong reasons.

It reviews the major advances in IBM's overall SOA advances to end-2006, with particular reference to the now extensive IBM SOA Foundation middleware and tools software portfolio that has so dramatically expanded and advanced this year.

IBM's new approach to SOA Governance, and its supporting underpinnings of IT Infrastructure in Support of SOA, are reviewed. The latter is the "next frontier" for the more advanced SOA adopters, and so the White Paper extensively reviews the needs, IBM solutions, and benefits for its three main components:

- SOA Service Security Management on System z.
- SOA Service Management on System z.
- SOA Service Virtualization/Provisioning on System z.

We also assess and include four significant SOA mainframe customer success studies, revealing striking benefits from their deployments of IBM SOA solutions.

Finally, most of the main new and enhanced IBM z/OS or System z software products/releases are assessed individually, in moderate depth, to help users understand their roles and capabilities.

The White Paper thus provides a quite comprehensive overview of the "state of the art" of SOA on the System z9 mainframe, for enterprise IT users planning their SOA developments as we enter 2007.

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White Paper

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1. Executive Summary

The main findings from our new White Paper are summarized in this Executive Summary (*also published standalone*), to provide a quicker overview for busy executive readers.

- 1. Service Oriented Architecture (SOA):** SOA, the most important business application software architecture and technology advance ever, has enjoyed soaring adoption over the last three years.

...System z mainframe ...fast became host for 1000+ important/major SOA developments...

- 2. IBM Mainframe Top SOA Platform:** IBM's System z mainframe, host to \$1T+ of customer's business-critical applications assets, and 90% of the world's largest databases, fast became host for 1000+ important/major SOA developments at many hundreds of progressive enterprises.
- 3. Mainframe Resurgence/Transformation Enabled:** This decade, IBM's mainframe enjoyed major market resurgence powered by its dramatic transformation by years of intense IBM innovation, development, and \$B investment. These made today's System z9 the perfect enterprise SOA host platform for medium/larger enterprises.
- 4. Next Mainframe SOA Challenges:** Many mainframe SOA adopters are now well beyond initial deployments. They installed/mastered the IBM SOA Foundation servers/tools, and built/deployed first-wave SOA solutions. For next-stage SOA adoption/growth, how best to manage, secure, and virtualize/provision, in their operational SOA IT infrastructure, are now next top priorities. This raises questions like:
 - **How can enterprises best manage, monitor and automate** operation of their next-generation SOA?
 - **How can security be ensured, and identities be managed**, in the new, "extra-enterprise, ecosystem" SOA applications?
 - **How can flexible, virtualized IT resources be quickly provisioned** for SOA needs?

Our new White Paper addresses/answers these crucial SOA questions for IBM mainframe users. (*Points 1 to 4 are covered in Section 2.*)

- 5. Why Mainframe SOA?** The mainframe (*hardware and software stack*), in its latest System z9 incarnation, and with the IBM SOA Foundation suite, now offers unequalled, business-value delivering, attributes/characteristics (*that far outclass those of all distributed systems competitors*). These perfectly match requirements for an enterprise SOA host. (*We explain why fully in Sections 3, 4 and 5.*)

These perfectly match requirements for an enterprise SOA host.

- 6. Mainframe Hardware Advances Strong Through 2006:** Underpinning mainframe SOA success were a strong drumbeat of advances in mainframe server and storage hardware/operating, and base middleware software, continued strongly through 2006 again. We deeply assessed these in another Report, and summarize our findings in Section 3 and Appendix A here. Highlights included:
 - **New System z9 Business Class (z9 BC) entry-midrange mainframes**, ideal for SMP, from just \$100K, in 26-1786 MIPS capacity.
 - **New System z9 Enterprise Class (z9 EC) high-end mainframes**, for larger enterprises, up to 54-way CP, 17,800 MIPS capacity.
 - **New "Industry first" 4Gbps FICON I/O support**, for higher I/O performance/capacity on both above.
 - **New zIIP data-serving specialty engine**, for select DB2 data-serving workloads, greatly improves workload cost.
 - **New Enterprise-wide Roles for Mainframe**, extensive additional support delivered apace for the five new roles.
 - **Leadership Mainframe Storage:** IBM's winning storage portfolio fully refreshed (*August 2006*) with leadership DS8300/DS8100 Turbo high-end, and DS6000 mid-range, disk systems ideal for mainframes, and other gains.
 - **Major New Base Middleware Advances:** System z9 DB2, IMS, CICS, WAS, WebSphere MQ, NetView, etc., all saw further strong advances again through 2006, focused on J2EE™, open standards/Web services and SOA support.

Further strong price/performance gains, on these mainframe server, storage and middleware offerings, again continued this decade's sharp, prior 4-years, downward Total Cost of Ownership (*TCO*) trend, shown in Figure 1 on page 6. This includes crucial staffing costs, where the mainframe scores much the best. (*Point 6 is covered in Section 3.*)

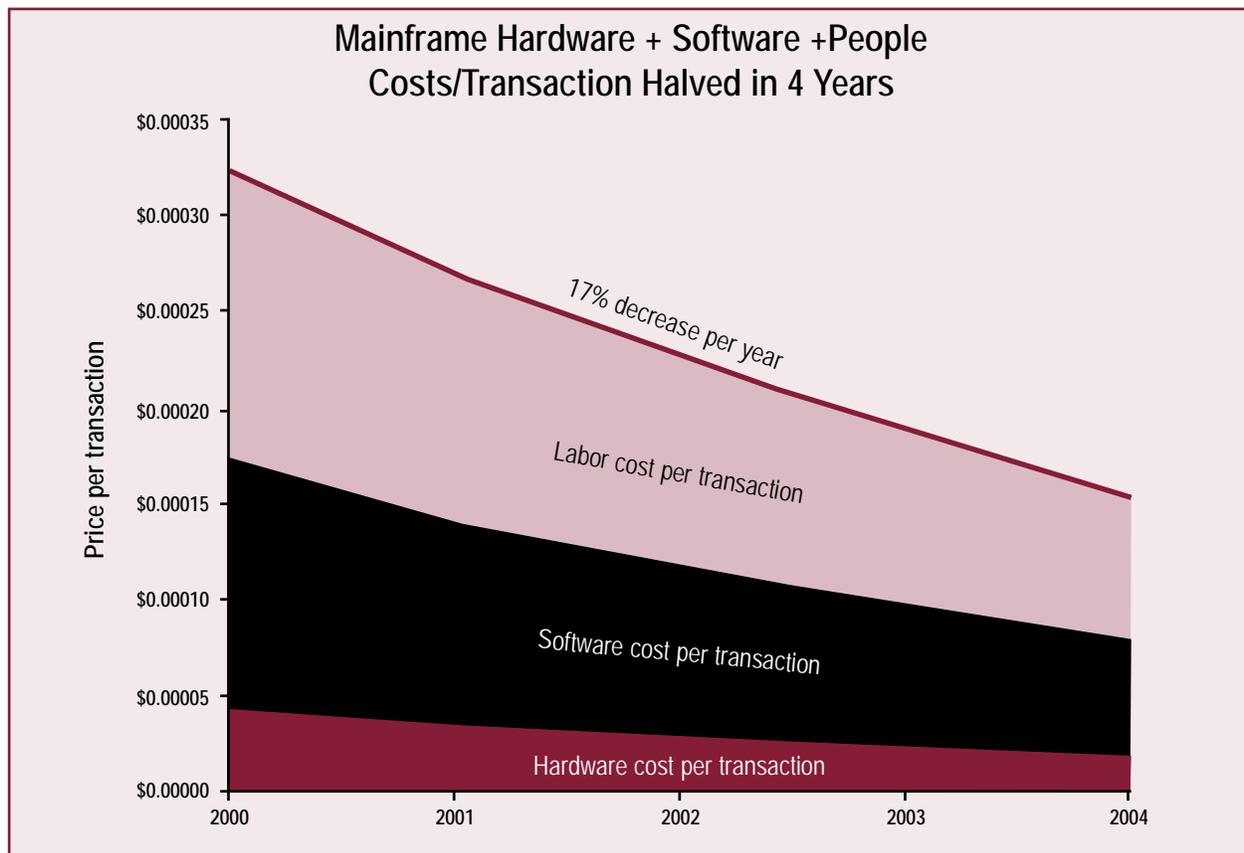


Figure 1: Mainframe Hardware + Software + People Cost/Transaction Halved in 4 Years

7. **Mainframe Central in Soaring SOA Adoption:** Many major SOA adopters rightly consider their mission-critical, new business processes, the newer SOA applications that support them, with their high transaction volumes, demand the unique Quality of Service (QoS) of the System z platform, which is fast becoming their "SOA Central" for Internet-based computing.

8. **SOA Business Case Compelling:** Rapidly mounting, and now compelling, real-world SOA business benefits evidence is now widely available. A recent IBV study, based on 35 actual SOA projects, showed the top six benefits were improved flexibility (100%), decreased cost (97%), reduced risk (71%), increased revenue (51%), enabling new products (43%), and enabling compliance (26%), for example.

...industry's most advanced, extensive SOA offering.

9. **IBM Leads Industry SOA Charge:** IBM carved commanding industry SOA thought/market-share leadership, adding major SOA advances through 2006, building out the industry's most advanced, extensive SOA offering. This included creating/now delivering:

- **SOA open standards creation process leadership**, creating today's vital SOA standards.
- **Now comprehensive IBM SOA Foundation** middleware/tools suite, today's premier SOA set, System z9 central.
- **IBM SOA Reference Architecture**, encompassing all-needed SOA service capabilities.
- **Powerful, Eclipse-based IBM SOA development tools** for all stages/roles in the SOA lifecycle.
- **Large and thriving SOA business partner ecosystem**, over 2,500 business partners using IBM's SOA approach.
- **SOA methodologies**, assessment tools, governance, and SOA lifecycle models.
- **Extensive, IBM SOA services capability**, over 100,000 IBM staff already trained on SOA aspects.
- **Industry-leading, new Information on Demand (IOD) capability**, for SOA "information as a service", with unique new IBM Information Server.
- **SOA Business Portfolio**, now with 3,100 reusable SOA assets/services, from IBM and partners.

- **WebSphere Business Services Fabric**, introducing new vertical industry SOA solution elements.
- **Numerous important acquisitions** were integrated, to round out this whole IBM SOA portfolio.
- **Trained 100,000+ IBM staff** in SOA aspects, helping over 3,000 IBM customers with SOA engagements.
- **100 SOA customer success story** references published.

These SOA developments support IBM's flagship System z mainframe as the pre-eminent SOA platform.

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10. Five SOA Entry Points Big Success: IBM defined five flexible SOA Entry Points, enabling incremental customer SOA adoption to solve common customer pain points, with fast ROI. These have been hugely successful, and are:

- **People entry point**, staff interaction/collaboration through SOA portal, collaboration application solutions.
- **Process entry point**, business workflow-based SOA Business Process Management (*BPM*) applications.
- **Information entry point**, delivering information as an SOA service enterprise-wide.
- **Connectivity entry point**, links people, processes and information under an SOA connectivity platform.
- **Reuse entry point**, leveraging existing software/data assets in new SOA composite applications.

Mainframe SOA adopters have especially embraced the "reuse", "connectivity", and "people" Entry Points to rapidly exploit their large mainframe application/data assets portfolios. For example, IBM SOA Foundation support for the "connectivity" Entry Point is illustrated by Figure 2. (*Points 7 to 10 are covered in Section 4.*)

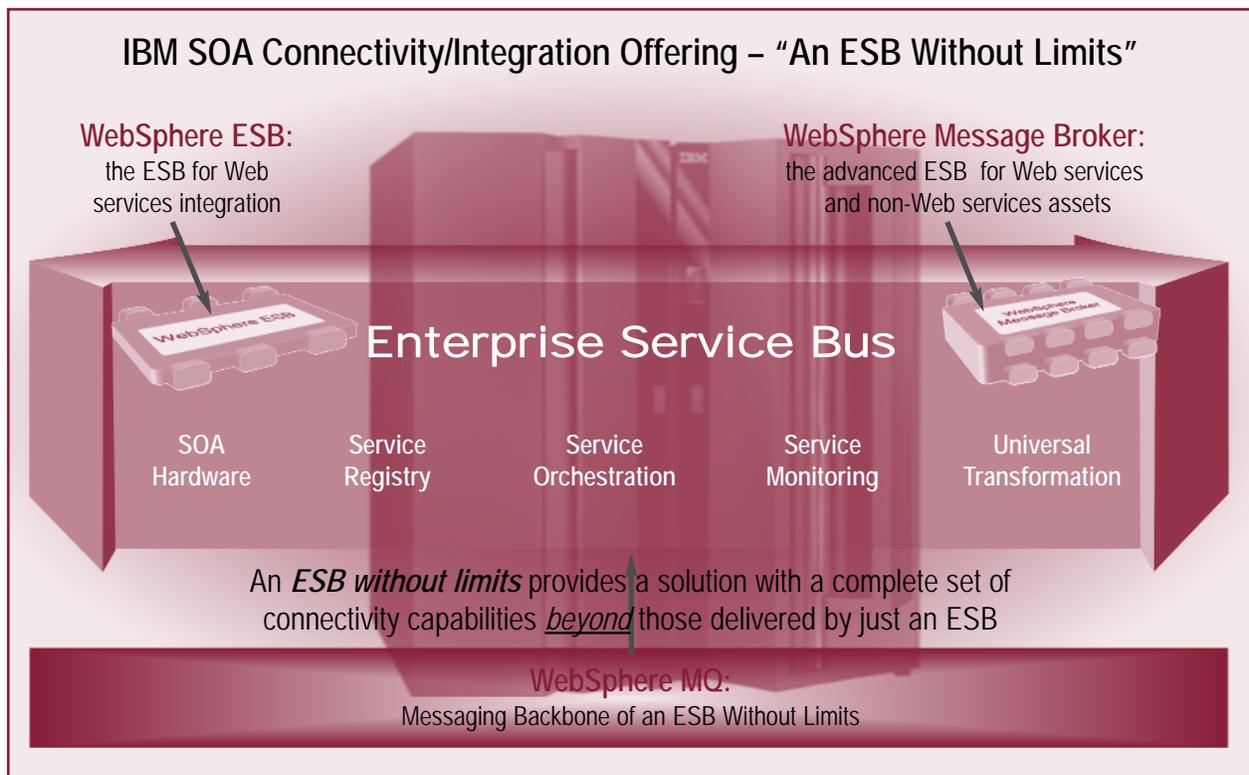


Figure 2: IBM SOA Connectivity/Integration Offering – "An Enterprise Service Bus (ESB) Without Limits"

11. SOA & the IBM Mainframe – Perfect Fit: We examined closely how the Top 15 unique business value advantages of the mainframe platform each specifically complement and support SOA better than any other. Our closely researched findings strongly confirm this conclusion. (*See Section 5.*)

12. Mainframe SOA Enables Most Application Asset Reuse: The global, 15,250-strong, mainframe-installed base hosts >\$1TB-worth of customer applications software/database assets, accumulated over decades, and now ripe for reuse/modernization/exploitation in new SOA composite applications. This alone makes the mainframe and SOA a natural fit.

IBM 2006 System z9 SOA Software Blitz Fills Stack

- **IBM WebSphere Process Server for z/OS, V6.0.02.** (new z product 06, GA 22.12.06) 
- **IBM WebSphere Enterprise Service Bus for z/OS, V6.0.02.** (new z product 06, GA 22.12.06) 
- **IBM WebSphere Portal Enable for z/OS, V6.0.** (enhanced z release, GA 12.15.06)
- **DB2 Version V9.1 “Viper” for z/OS.** (next-generation major z release, Beta 06.09.06, GA TBA)
- **IBM WebSphere Application Server for z/OS, V6.1.** (enhanced z release, GA: 06.30.06)
- **IBM WebSphere Application Server XD for z/OS, V6.0.01.** (new z product 06, GA 01.27.06) 
- **IBM WebSphere Service Registry & Repository for z/OS, V6.0.** (new z prod., GA 12.15.06) 
- **IBM WebSphere Message Broker for z/OS, V6.0.** (enhanced release, GA 10.28.05)
- **IBM WebSphere Developer for System z, V7.0.** (enhanced release, GA 12.15.06)
- **IBM WebSphere Integration Developer, V6.0.2.** (enhanced release, GA 12.22.06)
- **IBM WebSphere Business Modeler Advanced, V6.0.01.** (enhanced release, GA 03.31.06)
- **IBM WebSphere Business Monitor, V6.0.2.** (enhanced release, GA 22.12.06)
- **IBM Information Server.** (new strategic SW platform, GA 11.06.) 
- **IBM Tivoli Usage Accounting Manager for z/OS** (new z product 06, GA 06.08.06) 
- **IBM Tivoli Federated Identity Manager V6.1 for System z** (new z product 06, 6.15.06) 
- **IBM Tivoli Composite Application Manager for SOA, V6.01.** (enhanced product, GA 12.08.06)
- **IBM Tivoli Change and Configuration Management Database, V1.1.** (enhanced, GA ???)
- **IBM Enterprise Workload Manager for z/OS, V2.1.** (enhanced release, GA 22.12.06)
- **IBM WebSphere Business Service Fabric** (new product 06, GA 30.11.06)
- **IBM Rational Software Delivery Platform, V7 Desktop.** (enhanced suite, GA TBA) 
- **IBM Rational COBOL Generation Extension/Run-time for z.** (new z product, GA 05.06.06) 
- **WebSphere DataPower XML Security Gateway XS40** (New appliance, GA 04.03.06) 

Figure 3: IBM 2006 System z9 SOA Software Blitz Fills Stack

13. **Bumper 2006 Mainframe SOA Software Crop:** Over 2006, IBM has now delivered an absolutely bumper raft of major new/enhanced SOA software products for the System z mainframe, listed/shown in Figure 3. No further words are needed here, but much of this White Paper is devoted to assessing many in depth. (Points 11 to 13 are covered in Section 5.)
14. **SOA Lifecycle Management Now Needed:** As mainframe SOA business and system services portfolios expand rapidly, active **SOA Service Lifecycle Management**, and organized **SOA Governance**, both become mandatory. This requires well-defined and systematized:
 - **Service Development & Delivery Management processes:** SOA service lifecycle model-assemble-deploy-manage process. Important, but not covered here.
 - **IT Infrastructure & Management in Support of SOA:** To effectively monitor, manage, secure, and optimize their live, operating SOA environment. This White Paper's focus; see points 17 to 25 below.
 - **Organized SOA Governance:** The roles, responsibilities, processes, controls, metrics and tools needed to ensure best practices throughout the SOA lifecycle for the whole enterprise.
15. **IBM's SOA Governance and Management Method:** To help mainframe SOA adopters implement effective SOA governance, IBM introduced its SOA Governance and Management Method, based on its extensive, 3,100 SOA engagements to date-based best practices, supported by capable software tools, including:
 - **IBM Rational Method Composer:** Helps plan/document method rollout, roles/responsibilities, tasks and processes.
 - **IBM Rational Portfolio Manager:** Tracks compliance and governance process operations over service lifecycle.
 - **IBM WebSphere Service Registry and Repository (WSRR):** New enterprise service registry, and service metadata/details repository, for System z9 z/OS. (See point 16 below.)
16. **IBM WebSphere Service Registry and Repository Key:** WSRR for z/OS, V6.0, stores full details of all services throughout their lifecycle, and is used by both the IBM SOA Foundation development tools, and by several key WebSphere SOA servers at run-time. It also supports service security and service management tools at run-time; see points 19 & 22 below. It has thus now become a core IBM SOA Foundation element for all mainframe SOA adopters. (Points 14 to 16 are covered in Section 6.)

17. Preparing IT Infrastructures for SOA: Beyond initial SOA implementations, mainframe users need more structured, more programmatic approaches, to their SOA-supporting IT infrastructure/management, in three principal areas. These each now require such mainframe SOA customers' next attention/focus:

- **Service Security:** Consistently enforcing services security policy, ensuring appropriate access, maintaining full integrity, and attaining service governance/compliance.
- **Service Management:** Automating/simplifying IT processes, managing service/application Service Level Agreements (SLAs) levels, and predicting/managing change across linked services.
- **Service Virtualization:** Accelerating application and service performance, intelligently responding to business priorities, and automatically scaling to support services demands.

All are essential for large-scale, SOA production deployment long-term, and must now sit high on agendas of enterprises moving towards wider-scale SOA usage.

18. Service Security Vital for SOA Protection: Composite SOA applications spanning partner ecosystems bring new security management challenges only new service security technologies can address. These must provide federated identity and access control, need to secure all services/SOA applications, and ensure consistent security policy enforcement. The larger SOA deployments, multiplying fast on System z mainframes, especially demand such protection.

These must provide federated identity and access control, need to secure all services/SOA applications...

19. Impressive IBM Mainframe SOA Service Security Offerings: New/enhanced mainframe IBM products available to reinforce service security in mainframe SOA environments now include:

- **IBM Tivoli Federated Identity Manager for System z, V6.1:** Enterprise-class, full-function, large-scale FIM solution.
- **IBM Tivoli Federated Identity Manager Business Gateway, V6.1.1:** Entry-level, SMB-focused FIM solution.
- **IBM WebSphere DataPower XML Security Gateway XS40:** Appliance for XML security/acceleration.

These offer highly-scalable and manageable, federated identity management, the only viable approach for multi-partner SOA applications, plus powerful hardware appliance-enforced, wire-speed XML traffic security/acceleration. These important, newer SOA service security solutions are directly complemented and supported for mainframe users by:

- **IBM WebSphere Services Registry and Repository for z/OS, V6.0:** See 16 above.
- **IBM Tivoli Composite Application Manager for SOA for z/OS, V6.1:** Assessed fully in Section 8.

These are central SOA Governance and SOA service management components on the System z9 mainframe that underpin the service security facilities above.

20. SOA Service Security Implementation Mandatory: Business prudence/regulation means SOA adopters must implement full SOA service security across their expanding SOA environments, to ensure access control, integrity, and compliance end-to-end. Mainframe SOA user, to enforce security policy over their services (*affordably and consistently*), should now implement the ITFIM for System z, V6.1. FIM solution, and WSRR for z/OS V6.0, at least. Most will go further, adding ITCAM for SOA to manage service performance, and IBM WebSphere DataPower XS40 appliances to further strengthen XML security, as well as accelerate XML performance, infrastructure-wide.

Critical business processes depend on the performance, reliability and availability of the composite SOA applications that support them.

21. SOA Service Management Crucial for QoS: Critical

business processes depend on the performance, reliability and availability of the composite SOA applications that support them. SOA service management is thus now essential to mainframe SOA exploitation. This demands new SOA service management, change/configuration management, and service metadata access technologies able to accomplish:

- **Automation and simplification of IT processes.**
- **Managing service and application service levels.**
- **Predicting and managing change across linked services.**

22. Winning z/OS Service Management Solutions: To provide the needed deep insight, clear end-to-end visibility, and full control across all SOA services that run on their mainframes, and on heterogeneous platforms, IBM now offers:

- **IBM Tivoli Composite Application Manager for SOA for z/OS, V6.1:** Integrates with the IBM Change and Configuration Management Database (*CCMDB*) and WSRR.
- **IBM Change and Configuration Management Database v1.1.1:** Integrates with ITCAM above.
- **IBM WebSphere Services Registry and Repository for z/OS, V6.0:** Integrates with ITCAM.

23. Strong Service Management Benefits: ITCAM for SOA for z/OS, V6.1, is the prime weapon of choice for mainframe SOA adopters. It provides essential SOA application performance management to run SOA services to business objectives, raises productivity by process automation, alerts faster for bottlenecks, and delivers higher SOA QoS, working closely with WSRR. (*Points 21 to 23 are covered in Section 8.*)

ITCAM for SOA for z/OS, V6.1, is the prime weapon of choice for mainframe SOA adopters.

24. SOA Service Virtualization Needed: As customer SOA workloads expand, services must next be decoupled from specific SOA software server instances by a **service software virtualization layer**. This is needed for similar reasons to those that drove hardware server virtualization – automatic scaling, better utilization, improved performance, and better responsiveness to change – but now in the SOA middleware.

25. Strong IBM Service Virtualization Support on System z: Powerful IBM products supporting service virtualization, cross-platform workload management, and virtualized IT resource utilization and chargeback, on the mainframe have now been introduced:

- **IBM WebSphere Extended Deployment (XD) for z/OS, V6.0.1:** Service application-serving virtualization for WebSphere Application Server for z/OS, V6.
- **IBM Enterprise Workload Manager for z/OS, V2.1:** z/OS hosted, cross-platform, distributed, enterprise workload management and performance optimization, using technology similar to z/OS's legendary WLM & IRD.
- **IBM Tivoli Usage and Accounting Manager, v6.1:** Comprehensive, modern, IT resource usage accounting and chargeback solution for all System z mainframe workloads/virtualized environments. (*Based on CIM Labs.*)

26. Service Virtualization Set for Fast Growth: These advanced service virtualization, cross-platform workload management, and virtualized resource accounting technologies for the System z mainframe are well-timed to help support rapidly-growing SOA workloads for larger adopters, and move IBM's mainframe SOA platform well ahead of competing hardware/software offerings. The benefits they deliver, illustrated by TORN's experience, are strong. (*Points 25 to 27 are covered in Section 9.*)

27. Mainframe SOA Adoption Success Studies are Compelling: Dozens of diverse customer, mainframe-based SOA success studies have now been published. Covering many industries, geographies, and SOA Entry Points, each highlights how strong the benefits of SOA are, when complemented by System z mainframe platform unique strengths.

28. White Paper SOA Customer Studies: Our Paper's three customer cameos, and four fuller mainframe SOA success studies, highlight the diverse, compelling benefits achieved with varied IBM SOA Entry-Point, host-related solutions:

- **ING Group NV, Netherlands:** Financial services leader, IBM SOA service security solution, and \$20M 3-year benefits.
- **ACI Global, Italy:** Auto services, IBM SOA service management solution, and 20% faster customer responses++.
- **TORN Sp. z o.o., Poland:** IT services, IBM SOA service virtualization solution, provisioning new customers 15x faster.
- **Crowley Maritime, US:** Sea services, mainframe SOA "reuse", "connectivity" solution, \$0.25M integration saving+.
- **Grohe AG, Germany:** Top tap maker, SAP-to-mainframe z apps. SOA "connectivity" solution, 84% time cut++.
- **Xerox Corporation, US:** Copier icon, mainframe SOA "reuse", "connectivity", SOA CoE solution, \$720K p.a. saved+.
- **Nationwide, US:** Financial services leader, System z virtualized SOA infrastructure/consolidation, and \$15M 3-year benefits so far.

Our examples all indicate that strong SOA benefits and rapid ROI, across geographies, industries, and SOA Entry Points, are well obtainable with IBM SOA Foundation solutions/services. (*Points 27 to 28 are covered in Section 10.*)

2. Mainframe Resurgence, Transformation & “SOA Central” Role

SOA Explosion Meets Transformed/Resurgent IBM Mainframe

SOA, the most important advance in business application software architecture and technology ever, has enjoyed soaring adoption over the last three years. Leading enterprises across the globe, and from every industry, have rapidly expanded their SOA exploitation to bring much greater business flexibility, to respond faster to market needs, integrate their people, processes and information, and to better link enterprise applications with customers, collaborators and suppliers. SOA loosely links both new and traditional application components and databases, presented as business services over an ESB, using open Web services standards, to provide next-generation, SOA composite applications. These can be far more closely aligned to optimized core business processes, and can much more easily be changed to respond faster to new business needs.

The IBM mainframe, host to over \$1T-worth of customers' business-critical applications investments, and 90% of the world's largest databases, has now become the central platform for the most important SOA initiatives and developments at many enterprises. The IBM mainframe, through this decade, has also enjoyed swelling market resurgence, benefiting from a dramatic transformation through many years of intense IBM innovation, development, and \$B of new investment, reviewed below.

Next Mainframe SOA Challenges – Management, Security and Virtualization/Provisioning

As enterprises learned the extensive benefits of SOA, chose their entry points to begin SOA adoption, and rolled out their early new SOA applications, in many cases they have exploited SOA software capabilities, and the advanced enterprise IT platform attributes, of the modern IBM mainframe. For these earlier-adopter SOA users on the mainframe, their focus has now moved on from SOA concepts/building their first new applications, to address the next stages of SOA adoption. Questions of service management, service security and service virtualization/provisioning have now come to the top of their SOA priority list, as the next challenges to be mastered on their SOA journey. These users now need answers to important questions, including:

- **How can security be ensured, and identities be correctly managed**, in these new SOA applications, which now often extend outside the enterprise DMZ to embrace partners' and suppliers' systems?
- **How can enterprises best manage, monitor and automate** operations of their next-generation SOA applications in production, to ensure the right high-levels and QoS are delivered?
- **How can flexible, virtualized IT resources be quickly provisioned**, and their capacity easily flexed, to meet fast-changing business workload needs and demands?

These are the questions assessed, reviewed and answered in this new White Paper. (*In Sections 7, 8 & 9.*)

Analyst Credentials

Software Strategies, acknowledged mainframe experts, have researched/published many in-depth reports/white papers on the fast evolving IBM mainframe in recent years (*a partial list is available in the “Related Software Strategies Research” Section on page 65*). These covered mainframe hardware, storage, operating systems, SOA middleware, and software tool advances fully. Principal Ian Bramley (*author of this new White Paper*), has deeply analyzed all the SOA-related software, tools, methodologies, services and content developments that now enable the mainframe to play a crucial new role as Enterprise-wide Manager for SOA, providing the research base for this new study.

Strong Mainframe Resurgence – 2000 to 2006

The 42-year-established IBM mainframe saw real market resurgence, recapturing renewed industry-wide esteem and respect this decade. Nine new generations emerged since 1993, six CMOS G series, and three, post-2000, 64-bit z/Architecture generations, the result of several \$B sustained IBM investment/innovation. This massive, long-term IBM effort totally transformed the platform's technology, hardware, software and economics.

Market revival began with the 2000 zSeries 900 and 2002 z800 systems. It accelerated into a real resurgence with the z990 in 2003 and the z890 in 2004. Momentum was further increased by the high-end System z9 109 available from September 2005. The latest System z9 Business Class (*z9 BC*) and System z9 Enterprise Class (*z9 EC*) added further momentum from July 2006. The Mainframe Charter (*2003*) gave IBM's public pledges of continued advances in innovation, value and ecosystem development; these have been amply delivered on since, and continue apace. These massive advances fuelled strong mainframe market resurgence, with +20% p.a. MIPS growth this decade.

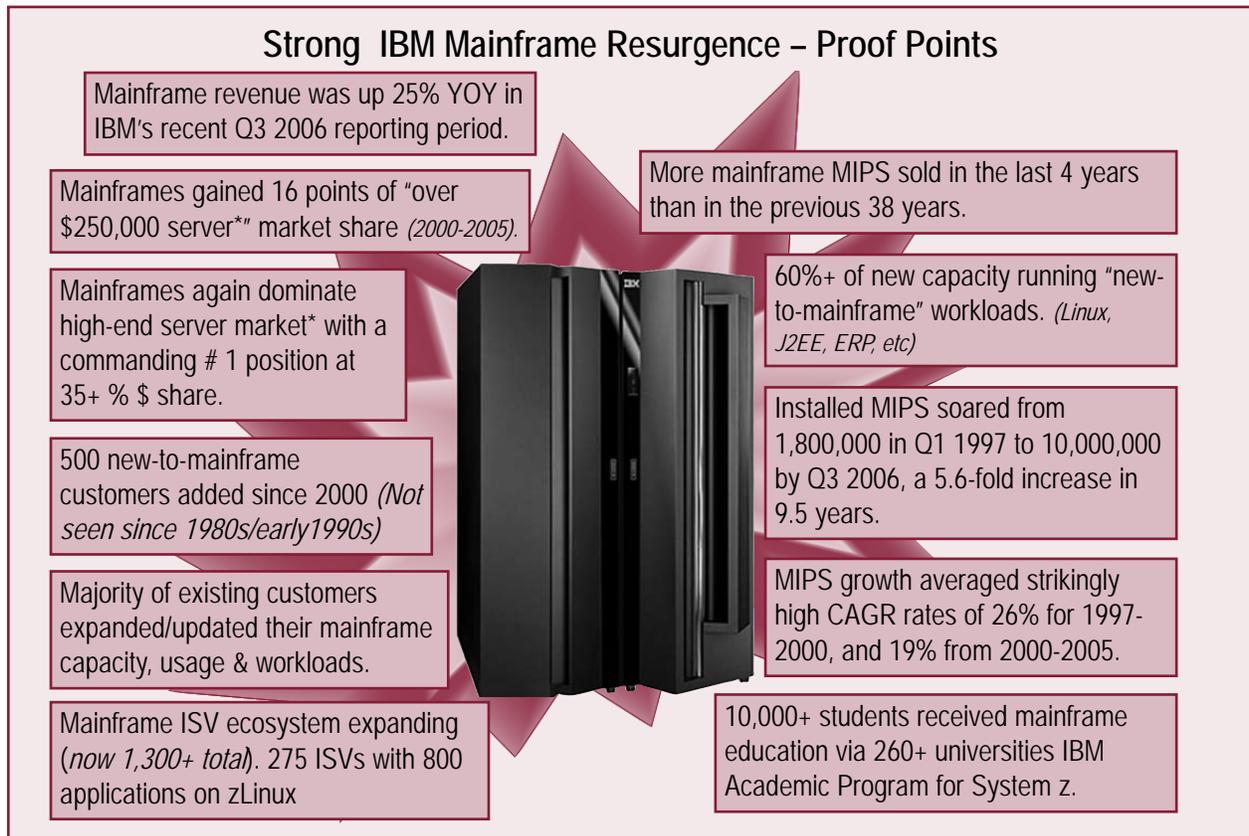


Figure 4: Strong IBM Mainframe Resurgence – Proof Points

Our concise summary of a range of mainframe market resurgence proof-points is given in Figure 4; these show a platform in robust health, enjoying renewed growth.

Dramatic Mainframe Transformation Powered Resurgence

IBM's long (since 1993), accelerating, and multi-\$B reinvestment in the mainframe platform delivered extraordinary innovation to the whole mainframe hardware and software stack, at far the fastest rate in its 42-year history. From advanced microprocessor technology to its balanced/optimized, commercial workload-focused z/Architecture, through advanced new storage system complements (DS8000/DS6000), were added major OS advances, extended enterprise middleware, and new-generation software tools, portfolios. These, plus wide-margin leadership/advances in virtualization/partitioning, self-optimizing policy-driven workload management, outstanding RAS, and greatly superior security/encryption capabilities, combined to bring/deliver dramatic advances/innovations to the whole mainframe stack.

Capacity/throughput doubled with each three last System z generations. Further sharp hardware cost reductions averaging 20% p.a., and software cost drops averaging 17% p.a. since 1997, plus many other cost improvements, were delivered. Combined, these gave 20% total mainframe price/performance gains per year. Adding to these large mainframe economic advances were:

- **Superb virtualization and automated workload management** (that enables up to 100% utilization of capacity).
- **Full slate of Capacity on Demand (CoD) options** (for greatest customer flexibility to meet varying workload needs).
- **Highest levels of system automation** (that has slashed support staff needs, now multi-fold lower than on all distributed platforms, and much lower than on pre-2000 mainframes).
- **Smallest data center footprint, lowest power and cooling costs** (per enterprise workload and/or per 1000 users, for these now huge, and the fastest-rising of IT costs).

These advances made today's mainframe the lowest TCO/TCU/Cost-Per-Transaction (CPT) platform for medium/large, mixed commercial workloads. These developments, along with the impressive advances in mainframe SOA middleware software, tools, methods, and standards, have also made the mainframe the pre-eminent SOA platform for medium/large enterprises.

May 2006: Latest z9 BC and z9 EC Mainframes Raise the Bar, Complete SOA Stack

We fully assessed the latest System z9 mainframes (*z9 BC & z9 EC*) in a recent in-depth study (see the *“Related Software Strategies Research”* Section on page 65, item 2). There we found them the most sophisticated, efficient, most completely virtualized, and most cost-effective, scale-up SMP systems for mixed commercial transactional and batch workloads (*traditional and new*) on the market. Using multiples fewer staff, less power, less cooling, less floorspace, and dramatically less hardware than equivalent, distributed systems, the latest mainframes also offer much lower TCO/TCU/CPT, but offer far higher reliability, availability, security and scalability.

...we found them the most sophisticated, efficient, most completely virtualized, and most cost-effective, scale-up SMP systems for mixed commercial transactional and batch workloads on the market.

A blizzard of major IBM 2006 SOA middleware software and tool advances (*both new and enhanced products*) were announced at the first “Mainframe Software Summit” for analysts/press in New York on May 5th 2006. These have now all been delivered, amplified by other important, more recent IBM SOA developments. Combined, these now fully equip the mainframe with the industry’s most complete SOA software environment, and enable it to shoulder a new enterprise-wide role as an ideal **“Enterprise-wide Manager for SOA”** platform.

New Workloads Drove Mainframe Resurgence

Most IT professionals know the mainframe for its traditional, commercial transaction processing and batch workloads (*CICS/COBOL, IMS, etc.*). For these, the mainframe’s optimized, balanced architecture, and massive I/O capacity, provides superb performance, reliability, availability, and throughput. However, since 2000, a fast-expanding range of new-technology mainframe workloads has actually absorbed the majority (*over 60%*) of the new mainframe MIPS capacity shipped. The main types of these fast-growing new workloads are shown in Figure 5.

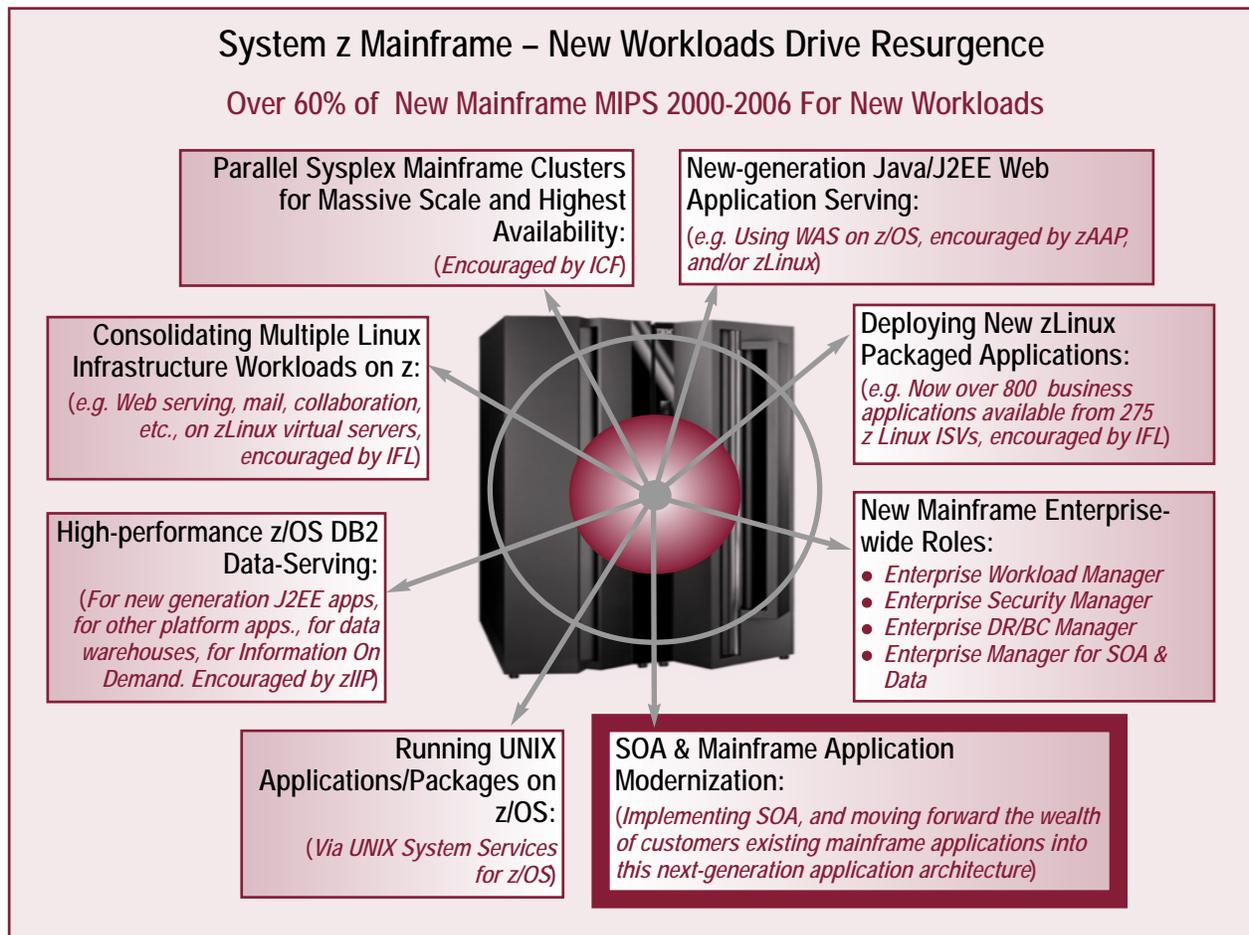


Figure 5: New Workloads Power Mainframe Resurgence

The modern System z9 mainframe has proved an ideal, fully virtualized, automated platform to run these high-growth new workloads, blended (*and often closely integrated under SOA*) with traditional applications (*components*). Specifically, today's mainframe remains the pre-eminent, heavy-duty, commercial, business **application serving and data-serving** (*transactional and batch, traditional and new workloads*) platform, best meeting demanding I/O bandwidth, and fast response-time requirements, for medium-sized to the largest global enterprise businesses. Increasingly, SOA is now at the heart of many of these new mainframe applications/workloads, and issues of how best to manage, secure, and virtualize/provision for these are our focus in this new White Paper.

Who Should Read This White Paper?

This White Paper was written for CIOs, CTOs, development directors, and senior IT/DP managers in enterprises (*large/medium*) already using IBM mainframes today, or considering (*as many now are*) a move onto the platform, and who are concerned with taking their SOA adoption to the next level. A majority of such users have begun adopting and deploying SOA on their mainframe platform, exploiting the hardware, OS, virtualization, security, RAS, new workloads, middleware/tool software, and price/performance-TCO advances the platforms deliver in the SOA environments. This White Paper gives our research-based advice on how to manage, secure and exploit virtualization more fully in mainframe SOA environments.

Our Analysis

Explosive SOA adoption growth amongst enterprise IT users shows that SOA must be ranked as the most radical advance in business application software technology ever. This major software advance has been widely adopted in parallel with the vibrant resurgence of the IBM mainframe platform, following on from its top-to-bottom transformation by IBM. The mainframe's massive advances under this transformation have clearly now made it once more the pre-eminent enterprise business applications platform, and the natural host for a large proportion of major SOA developments/deployments.

SOA must be ranked as the most radical advance in business application software technology ever.

The mainframe (*hardware and software stack*), in its latest System z9 incarnations, now offers an unequalled, business value-delivering set of attributes/characteristics that far outclass

those of all distributed systems competitors. In another of our recent Papers (*see the "Related Software Strategies Research" Section on page 65, item 1*), we pinpointed the top fifteen of these attributes, which are as shown in Figure 6. (*Our referenced Paper provides in-depth justification on each.*)

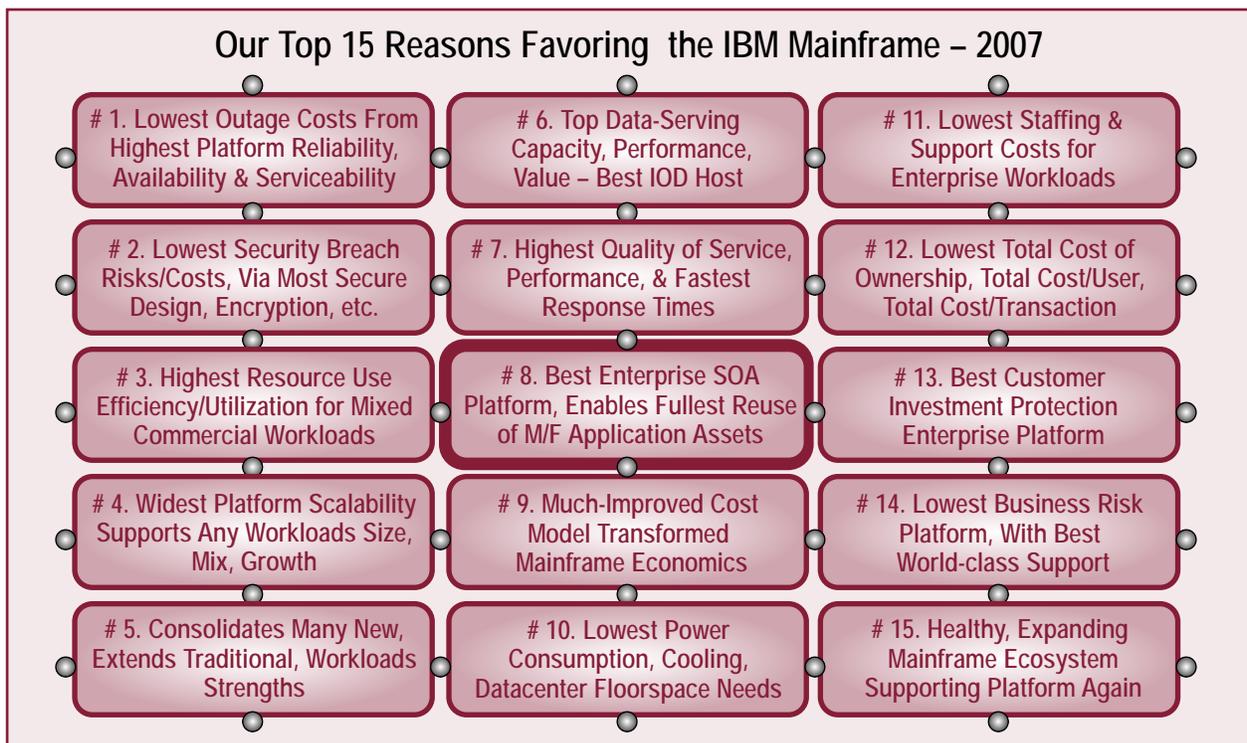


Figure 6: Our Top 15 Reasons Favoring the IBM Mainframe - 2007

For mainframe customers already now deploying production SOA applications, their next step is to establish and complement these (*and their future additional SOA applications*) with service security, service management and service virtualization/provisioning. All three of these are vitally needed to ensure SOA application performance/QoS, strong security across their business ecosystem, and optimized system resource utilization/rapid provisioning able to ensure responsive business solutions delivery.

These topics are the focus of this White Paper, where we review the latest System z9 software, hardware, methods and tools that can help mainframe SOA users deliver these vital functions for their growing SOA applications portfolios.

3. Strong Mainframe Hardware Advances – 2006 Overview

Introduction

Underpinning this rapid adoption of SOA on the mainframe have been the continuing, substantial advances in IBM mainframe server and storage hardware platforms we cameod briefly in Section 2. For readers who may not have followed these 2006 announcements/developments, we include here our brief overview and assessment of the main 2006 developments in the base IBM mainframe platforms. All were optimized to better support next-generation SOA application workloads, and IOD/mainframe data serving.

Mainframe Scales Down with System z9 Business Class (*April 2006*) – Ideal for SMB

On April 27th 2006, IBM unveiled a new line of System z9 BC mainframes (*pictured left in Figure A1 on page 53*), optimized for smaller and medium businesses. These offered the technologies, intrinsic strengths and capabilities of their larger brethren in much smaller, more affordably-priced systems, and were well-specified successors to their zSeries z800 and z890 forerunners. With a new, two-model line-up of entry to mid-range variants, the z9 BC line spans from 26 MIPS to 1,786 MIPS of capacity. It also now supports up to 7 customer System z9 specialty engines for more workloads, and comes in a lower-cost, single-frame, physical packaging format.

Replacing the z890, these two z9 BC models offer a 2.6-times wider capacity range, via 73 fine-grained setting options, a much lower \$100K US entry price-point, and up to 75% more specialty processor engines (*including the new zIIP*). They also double memory capacity, support 4Gbps FICON, and deliver across-the-board price/performance gains (*that we estimate reduce overall TCO by at least 20%*). Processor performance is up 37% over the z890. These value-enhanced, smaller mainframes deliver the same extreme reliability, security, manageability, and workload efficiency on (*almost all*) the same supported operating systems, as their larger z9 EC brethren. They were also pitched at attractive price points, for all smaller, modern and traditional mainframe workloads. We particularly welcomed the lower new z9 BC specialty engine price of \$95K US (*for zIIPs, zAAPs and IFLs – was \$125K US on z890*), for example.

The z9 BC systems, shipped from May 2006, have been well received in the market since launch, winning many medium enterprise sales, especially in emerging markets. Other highlights of these systems are described in Figure 7.

System z9 April 2006 Announcement Overview	
New System z9 Business Class Mainframes:	New System z9 Business Class (z9 BC) entry-mid sized mainframes, priced from a record low \$100,000 to expand the mainframe installed base in mid-market companies and emerging fast-growth markets. Two-model range, with a more granular 73-capacity settings, offers lower entry, higher top-end capacity, much higher specialty engine capacity, and 170% more I/O bandwidth (<i>see below</i>). Available May 2006.
New System z9 Enterprise Class Mainframes:	Refreshed and rebranded high-end System z9 Enterprise Class (z9 EC) mainframe family, with more granular entry capacity setting options, five-model range similar the to z9-109s, and new FICON Express4 4Gbps I/O (<i>see below</i>). Also provides all the capabilities and advances introduced by the System z9 109. Available May 2006.
Strong Appeal to Fast-developing Markets Like China/other BRIC Nations:	The new System z9 mainframes resonate with the rapid business growth, large-scale needs, and extensive modernization in progress in the emerging markets of the "BRIC" country grouping, and notably China, where the launch was announced.
New zIIP (<i>System z9 Integrated Information Processor</i>):	New System z9 specialty processor engine, available from May 2006 on both z9 BC and z9 EC families. Provides redirecting a portion of important select data-serving workloads (<i>such as DB2 business intelligence (BI), ERP and CRM</i>) to zIIP processors, greatly improving System z9 data-serving economics, and freeing-up general-purpose mainframe computing capacity. The zIIP also helps delivers on the mainframe's new " Enterprise Wide Role for Data-serving ".

continued on next page...

FICON Express4 4Gbps I/O, Supported by Full IBM System Storage Line:	Supported across the z9 BC and z9 EC families is new high-performance FICON Express4 4Gbps I/O, doubling link speed. Most of IBM System Storage disk arrays and tape now support 4Gbps FICON Express4, to exploit this important mainframe I/O advance. New CISCO, McDATA and Brocade-sourced 4Gbps SAN directors/switches also support this advance.
New Tape Encryption Security:	Delivering another important step for the “Enterprise Security Manager” , the System z9 provides an enterprise key management role for the new encryption capabilities on IBM tape devices. The first of these was the IBM System Storage TS1120 Tape Drive, that is now available. These encrypting tape drives can compliment the Encryption Facility for z/OS product that is available today.
Operating Systems Advances:	The System z9 line is supported by the current flagship z/OS V1.7 operating system, as well as by the z/VM, z/VSE 3, z Linux and z/TPF V1 operating systems, and select older OS. A further extended z/OS V1.8 release which shipped from September 2006.
Improved System z9 Price/Performance:	The new z9 BC and z9 EC continue the substantial and ongoing hardware and software price/performance increases consistently shown on the mainframe since 2000, averaging near-20% overall TCO reductions per annum.
Strong SOA Software Support:	The new z9 BC and z9 EC systems are supported by an extensive stack of advanced IBM SOA server middleware and development tools. All major mainframe SOA software advances are fully assessed, in Sections 6-7, and Appendix B, of this White Paper. These fully exploit the inherent, unique business values and QoS of the mainframe platform, and deliver on the newer role of the mainframe in the “Enterprise-wide Role for SOA” .
Low TCO – Power, Cooling, Space-Efficient, Less Staff – Vs. Distributed Platforms:	With this announcement, IBM is now increasingly quantifying and validating the significantly lower TCO and TCU that these new centralized, virtualized and self-managing System z9 platforms offer compared to scale-out distributed RISC-UNIX and Windows-Intel alternatives. Lower electric power, less cooling, much less data-center space, plus much lower staffing, as well as improved System z9 base price/performance, are the main sources of this mainframe advantage.

Figure 7: System z9 April 2006 Announcement Highlights

Refreshed High-end Mainframes – System z9 Enterprise Class (April 2006)

In the same announcement, IBM surprised with refreshed/rebranded high-end System z9 EC high-end mainframes (*pictured right in Figure A1 on page 53*) for large enterprise users, updating/renaming the z9-109 family. The System z9 EC offered increased capacity flexibility in entry systems, I/O enhancements via full support for 4Gbps FICON/FCP, and other worthwhile advances. The z9 EC was offered in new versions of the five (S08, S18, S28, S38, S54) model range first seen on the z9-109 in 2005. New subcapacity (*4 settings per CP on first 8 CPs*) setting options improve power purchase granularity, and apply to CP, specialty engines and Capacity Backup. Next-generation FICON Express4 4Gbps FICON/FCP I/O doubles FICON link speed (*on both the z9 BC and z9 EC systems*) and is now supported in most complementary IBM disk, tape, storage virtualization and SAN offerings. These, and further security advances in tape encryption, in z/OS centralized key management and key loading for ATMs and POS systems, and other innovations, further strengthened/advanced the already capable high-end System z9 line-up. These z9 EC systems, shipped from May 2006, have sold extremely well, contributing much to IBM's 25% YOY higher mainframe revenues in the recent Q3 2006 period.

Improved System z9 Price/Performance

Overall price/performance delivered by the hardware and software pricing and price/performance changes made with the z9 BC and z9 EC showed a continued (*around 20% overall p.a.*) improvement, and thus continued IBM's delivery on its Mainframe Charter value enhancement pledges. The z9 EC inherited similar levels of cross-generation price/performance improvement from the System z9-109 line of 2005 over their z990 predecessor. This downward price-upwards price/performance trend has continued steadily (*specifically since 1993 on hardware and 1997 on mainframe software*), contributing to the now compelling economic case for wider deployment and exploitation of the mainframe.

FICON Express4 4Gbps I/O, Supported by IBM System Storage Lines

With the z9 BC and z9 EC mainframes, IBM was the first vendor to provide a complete 4Gbps FICON solution, with IBM SAN, disk, and tape offerings that now support 4Gbps attachment to IBM System z9 FICON Express4 technology. The combination provides unprecedented throughput, with almost twice the bandwidth previously available. This higher bandwidth is designed to enable businesses, including SMBs focused on reducing overall business costs, to consolidate and simplify management, which will help them to reduce the costs of their storage infrastructures. The FICON/FCP links are also auto negotiating, so they can support an IT infrastructure with a mix of 4Gbps, 2Gbps, and 1Gbps technology at the same time.

IBM also announced an expanded range of 4Gbps FICON- and FCP-enabled SAN switches and directors for business and enterprise-class environments, with technologies from Cisco Systems, McDATA and Brocade. Also see the “New Storage Systems” subsection below.

Delivered New zIIP (*System z9 Integrated Information Processor*)

Both new System z9 lines (*z9 BC and z9 EC*) supported the zIIP, a new specialty processor engine that runs redirected eligible data-serving workloads. First announced in January 2006, and shipped earlier than expected, from the new System z9 GA dates, the zIIP frees-up general-purpose computing capacity, and initially supports DB2 mainframe data-serving workloads, such as Business Intelligence (*BI*), ERP and CRM, and DB maintenance. Earlier specialty processing engines on the mainframe (*zAAP for Java, IFL for Linux, and ICF for Sysplex coupling workloads*) have been widely adopted and highly successful in encouraging wider use of these workloads on the mainframe cost-effectively. We consider the zIIP will deliver the same advantages to mainframe data serving. It will thus encourage many more of these data serving (*initially select DB2*) workloads to be run on System z9 mainframes, alongside and closely proximate to transactional applications on the mainframe. This enables customers to reduce their need for duplicated data copies, provides better application and data security, and can considerably improve performance. The reality is that many distributed DB2/Oracle/SQL Server applications are out there currently unconnected to mainframes. The zIIP now makes it attractive for these to exploit mainframe DB2 data-serving strengths to complement their distributed client application strengths. The simplicity, performance and economy of this solution also breaks down barriers between transactional data stores on the mainframe, and BI, ERP and CRM applications that run on distributed computers.

When combined with the advanced new DB2 Version 9 (*first hybrid XML-relational database*) for z/OS, this combination now delivers on the mainframe's **enterprise-wide role for data**, see below.

Already apparent has been a substantial trend to consolidating databases from other platforms, especially Windows, onto the mainframe. One reported survey indicated that 28.2% of companies planned to transition databases onto the z/OS platform – a 'large percentage' moving from Windows. The advent of the new z9 BC and z9 EC systems, the zIIP, and DB2 V9 for z/OS will accelerate this growing trend.

New Enterprise-wide Roles for the Mainframe – Delivery Continues Apace Through 2006

In October 2004, IBM first announced five important new enterprise-wide roles for the mainframe platform to apply its unique strengths across entire enterprise IT infrastructures. IBM laid out roadmaps showing how it would extend/develop the platform to deliver these additional, high-value functions/roles/workloads. The five roles, shown in Figure 8, are broadly self-explanatory, and are self-evidently important to almost all major IT users. The vision was to harness/extend the unique business value/technology strengths of the mainframe (*summarized in Figure 6 on page 14*) to perform these new central roles, each much-needed in heterogeneous IT infrastructures. No other vendor/platform is addressing these needs.

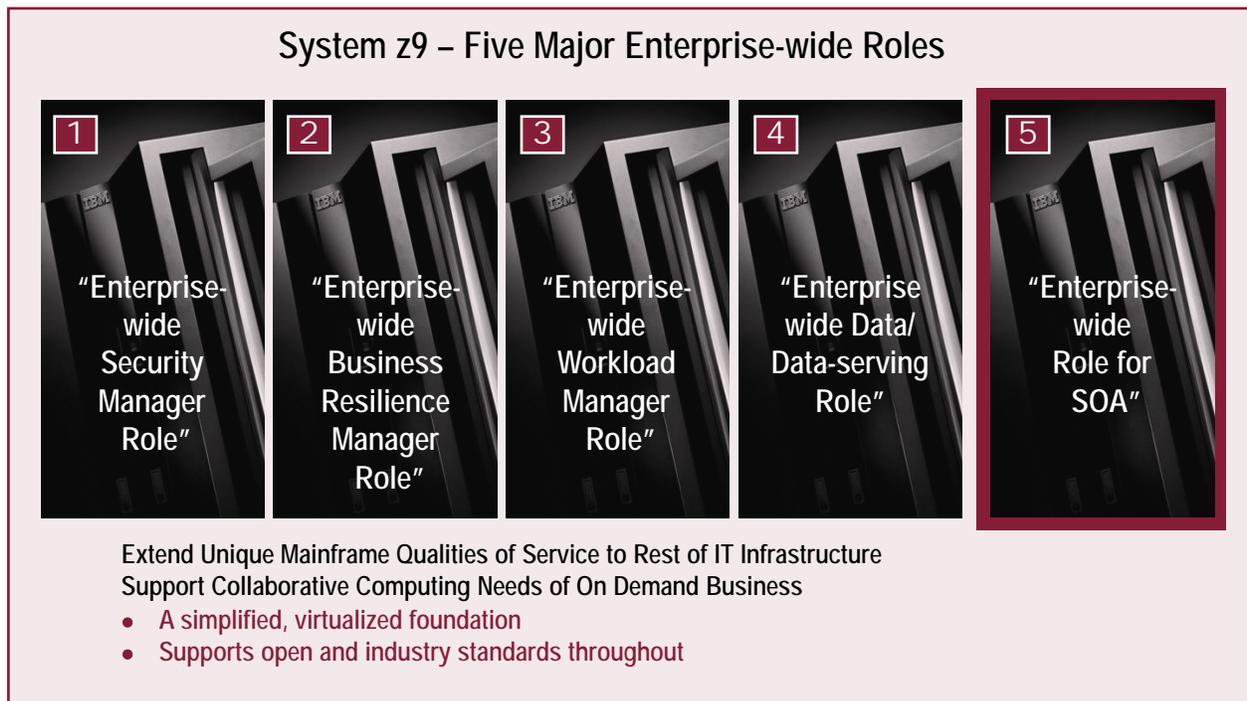


Figure 8: System z9 – Five Major Enterprise-wide Roles

Since then, IBM has aggressively delivered the technologies/capabilities that have now equipped the mainframe to assume these vital, newer "Enterprise-wide Manager" roles. Steps have included:

- **July 2005:** System z9 109 announcement, including first delivery towards the "**Enterprise-wide Security Manager**" role. Also saw debut of **Enterprise Workload Manager V2.0** (*part of the IBM Virtualization Engine 2.0*), main enabler for the "**Enterprise-wide Workload Manager**" mainframe role.
- **September 2005:** **IBM SOA Foundation Suite** announcement, a comprehensive set of enterprise SOA middleware servers/development tooling, methods, etc., including System z9-z/OS-optimized versions for 2005/2006 delivery, now completed/extended. These now enable the mainframe's "**Enterprise-wide Manager for SOA Role**".
- **January 2006:** Extensive **z/OS DB2 data-serving hub platform roadmap** unveiled. Included the new zIIP specialty engine for select DB2 workload redirection, and previewed the next-generation IBM flagship DB2 database, the V9 ("**Viper**") release (*the first Database Management System (DBMS) to integrate relational and XML data completely in a single, unified DBMS*), and other System z9 data-serving advances. These moves, now both delivered, further enabled the mainframe "**Enterprise-wide Manager for Data/Data-serving**" roles.
- **April 2006:** z9 BC and z9 EC announcement (*covered above*) including further security advances enabling additional "**Enterprise-wide Security Manager**" role functions.
- **May 2006:** An impressive press/analyst System z9 Software Summit (*the first for over 10 years*) highlighted the numerous IBM SOA and related software deliverables for System z9, including several key new elements, being delivered through 2006, extending/enabling the mainframe's "**Enterprise-wide Roles for Data-serving and SOA**".
- **August 2006:** Major enterprise storage announcements, covered below, that extend and enhance the mainframe's "**Enterprise-wide Business Resilience Manager**" role.
- **October-November 2006:** Extensive further set of IBM SOA announcements, some covered later in this White Paper. These further extended the mainframe's "**Enterprise-wide Role for Data-serving**" (*DB2 V9 GA, IBM Information Server for IOD*) and "**Enterprise-wide SOA Role**" (*Including WebSphere Service Registry & Repository, IBM Tivoli Usage and Accounting Manager, both for z/OS, and others*).

This intense mainframe development pace has rapidly delivered the capabilities that now enable the mainframe to fulfill these five important, new, enterprise-wide roles.

Leadership Mainframe Storage Portfolio Fully Refreshed (**August 2006**)

From their November 2004 debut, IBM's higher-end storage systems (*the DS8000 and DS6000*), that are widely used with its mainframes to provide high-performance enterprise storage, seized a commanding technology, performance and price/performance lead over their competitors. (*See the "Related Software Strategies Research" Section on page 65, item 7.*) Combined with the sophisticated IBM Metro & Global Mirror replication software, and IBM's long-standing tape systems market/technology leadership, these innovative, server-technology-based enterprise disk systems perfectly complemented IBM's mainframes, large and small.

On August 22nd 2006, IBM piled further pressure onto its main high-end storage competitors, EMC and Hitachi, with a major set of IBM System Storage announcements that included:

- **New IBM System Storage DS8000 Turbo models:** Two new models – the DS8100 Turbo and DS8300 Turbo systems – updated IBM's flagship DS8000 series. The new Turbo systems are based on POWER5+ processors/System p servers, and show up to 15% performance improvements (*on TP workloads*), over prior DS8000 systems. They also add 4Gbps Fiber Channel/FICON technology support, which enables reduced network resources, simplifies management, and reduces infrastructure costs, making IBM the first vendor to deliver 4Gbps FICON support. Other advances included:
 - **Improved tiered storage** options (*using FC or FC ATA drives for tier 1 and tier 2 storage respectively*).
 - **Three-site Business Continuity/Disaster Recovery** solutions (*using IBM Metro Mirror and/or Global Mirror*).
 - **New IBM TotalStorage Productivity Center (TPC) for Replication** software, giving a single-point-of-control for Metro Mirror, Global Mirror and FlashCopy functions, and improving replication process management.
 - **Improved Costs, Price/Performance:** The Turbo models cost 25% less (*base system US \$ list price*) than earlier, comparable DS8000 systems, and thus posts a compelling base 44% price/performance hike on TP workloads.

Starting US \$ list prices for the DS8000 Turbo are from \$213,400.

- **IBM System Storage DS6000 Enhancements:** The DS6000 was a real groundbreaker, the first true enterprise-class, mid-range storage server (*based on PowerPC server technologies*) but built in a small and dense, modular rack format. The DS6000 was much lower-priced to suit/support small/medium-scale mainframe, and/or open systems, storage workloads. Now the new DS6000s also supports low-cost Fiber Channel ATA drives (*FATA*), tiered storage options, and the new TPC for Replication software above. The enhanced DS6000 Series now also comes with a one-year-standard warranty, and a new, flexible Enterprise Choice warranty extension option, under which customers can add from one year to three years additional warranty (*at time of purchase*). Starting US \$ list prices for the enhanced DS6000 are from \$102,600.

These new IBM System Storage DS8000 Turbo models, and the enhancements for the DS6000 series, were both made available from September 9th 2006.

Rapid, Major IBM Mainframe Middleware Advances

Enabling its burgeoning new (*and traditional*) workloads, IBM offers a broad suite of leading-edge, foundation z/OS middleware servers, after rapid advances in recent years. The System z9 DB2, IMS, CICS, WAS, WebSphere MQ, NetView, and WebSphere SOA Foundation Suite IBM middleware engines all saw wide-ranging advances through 2004-2006. Deep support for J2EE™ and open standards, support for Web services and SOA, performance, availability, manageability, and supporting tool enhancements, were common to most. Mainframe customers today are upgrading to these new engine releases faster, both to enable their SOA projects and to exploit the mainframe hardware advances that these support.

...IBM offers a broad suite of leading-edge, foundation z/OS middleware servers, after rapid advances in recent years.

“Making the Elephant Dance”: Five-year Mainframe Simplification March Begins

On October 4th 2006, IBM announced a cross-company effort to make the IBM System z mainframe easier to use by more computer professionals by 2011. This five-year, \$100 million effort aims firstly to enable technology administrators and computer programmers to more easily manage, administrate and program mainframe systems. Secondly, it will increasingly automate application development/deployment in mainframe environments, leveraging IBM's automation and systems management expertise, using both hardware and software experts. Main areas of focus under the new strategy include:

- **Automated configuration checking:** To predict and avoid technical problems, simplifying mainframe IT administrator and programmer tasks.
- **Modernizing mainframe user interface:** Being designed to support both existing, skilled IT staff and new generations of IT workers, the new interfaces will cover network configuration, systems management, and data center hardware configuration.
- **Improved software asset management:** To help users more easily control software costs, and to simplify/automate software services acquisition.
- **Modernizing the mainframe's development environment:** With visual tools that novices can quickly learn how to program for the mainframe with.

The latest z/OS V1R8 on System z (*now available*) already boasts substantial mainframe simplification functionality (*via a growing number of important programs, features and tools*) supporting:

- **IBM Health Checker for z/OS:** “Personal trainer” actively monitoring z/OS and recommending configuration tune-ups.
- **Tivoli's IBM OMEGAMON z/OS Management Console:** Delivers a modern, GUI interface for z/OS management.
- **Hardware Configuration Manager (HCM):** With z/OS V1R8, HCM much simplified System z hardware configuration.
- **IBM Configuration Assistant for z/OS Communications Server:** Tool guides set-up of z/OS network features.
- **Application Development Simplification:** WebSphere, Rational provide strong sets of z/OS AD solutions/tools.
- **Open Standards:** Strong IBM support of cross-platform, open standards on System z include recent SOA standards.
- **z/OS Basic Skills Information Center:** New Web resource for “new to mainframe” IT professionals, extensive guidance.

The latest z/OS V1R8 on System z (now available) already boasts substantial mainframe simplification functionality (via a growing number of important programs, features and tools)...

Analyst Comment: The IBM mainframe offers outstanding virtues – detailed elsewhere. However, most experts agree that simplicity, ease-of-learning, and ease-of-use, were not amongst them. The mainframe environment is somewhat different, and its software quite complex, with many subsystems interacting. Traditional mainframe UI (3270), whilst fast and efficient for experienced users, requires considerable learning for younger staff trained on GUI-style interface systems. Substantial steps have already been delivered (*see above*) to reduce, simplify, automate, and provide better information/learning material to ease the path of new-to-mainframe users, which have been greatly welcomed. The biggest success this decade has been automated workload management that has massively simplified scheduling/workload tasks, greatly reducing operating cost. We warmly welcome IBM's important new simplification program and \$100M investment to make the very substantial further advances above. These will undoubtedly still continue to improve the attractiveness of the platform, and smooth new users' learning curves to the strong benefit of all customers. The "elephant will dance", and perhaps sooner than expected!

Our Analysis

2006 again saw aggressive, fast-paced and substantial advances in IBM mainframe server and storage hardware, and their associated operating systems/microcode load software. We assessed the new z9 BC server's lower entry point, higher processor capacity, improved granularity of capacity settings, increased specialty processor support, 37% faster processors, price/performance gains, and new zIIP specialty processor support, as major advances. The two-model z9 BC line-up enabled a much wider range of small-to-medium customer footprints to be economically supported, with the welcome and sharp entry price-point reduced to a milestone low \$100K for the first time.

Only nine months after the System z9 109 launch, the z9 EC high-end refresh/rename was unexpected, given the strength of the z9-109's advances over prior generation z990 mainframes. The improved flexibility/granularity of their new entry system sub-capacity options showed IBM responding fast to customer feedback. Their support for 4Gbps FC/FICON technology was a most important advance, amongst several other worthwhile gains. (*Also on z9 BC.*)

Storage is an important part of a mainframe environment, and IBM had already punched out a commanding technology, capacity, and price/performance leadership position with the late-2004-announced DS8000 and DS6000 enterprise arrays (*perfect storage complements for the z9 EC and z9 BC respectively*). The 2006 refreshes (*discussed above*) of both these crucial storage systems, plus extended replication and management software, further extended IBM's enterprise disk leadership, and show the compelling benefits of IBM's innovative, server-based/server technology-based storage systems approach.

Also striking is how far and how fast the mainframe platform has progressed (*by end-2006*), in delivering real support for the five new enterprise-wide roles for the platform, since their roadmaps were first outlined in October 2004. Bringing unique mainframe "goodness/QoS" to the whole heterogeneous IT infrastructures, to meet challenging enterprise-wide security, business continuity, cross-platform workload management, enterprise data/data-serving, and SOA needs, the platform now offers customers major new benefits never previously conceivable from any vendor.

...an extraordinarily broad, strong and impressive mainframe SOA software stack has also emerged...

Above these invaluable, enabling, 2006 mainframe hardware advances, an extraordinarily broad, strong and impressive mainframe SOA software stack has also emerged, through announcement to delivery, all optimized to exploit the unique mainframe business value attributes and QoS discussed in Section 2.

4. Why Rapid SOA Adoption? – IBM's Powerful SOA Approach

SOA Introduction

SOA is a distributed computing architectural style using **loosely-coupled** business **software services**. Business **software services** are interoperable, and are technology-agnostic, which permits greater business flexibility. An SOA business application is a set of **business services** (*a.k.a. a composite application*) linked in a **business process workflow** that realizes an end-to-end **business process**. Defining the **business process workflow**, and how the **business services** are linked, is termed '**choreography**' or '**orchestration**'.

Services are independent, and are accessed in a standardized way through a well-defined, self-describing, invocable **service interface**. Each service provides a **service description** (*interface-based*). This lets the service be invoked in flexible and dynamically re-configurable **business processes**, without needing understanding of its implementation. Services are defined using a **service description language**.

An SOA can also use **system services** providing underlying IT system operations: these are treated in the same architectural manner as business services. Services may be provided solely within one enterprise, or by all the partners in a business ecosystem. Ecosystem members may publish the services they will offer to other organizations to invoke/use in a **service registry**. Prospective **service consumers** may consult the public or closed community **services registries** of their business partners and prospective **service providers**, to discover what services are offered and how, and on what terms, they may be used. Open standards in Web services have developed rapidly and broadly, and crucially-enabled the rapid emergence of SOA.

Business software services can be likened to “Lego blocks” that can be plugged together through their sockets (*interfaces*), to create an infinite range of shapes or objects (*application systems*). In SOA, the blocks can be extensively copied and reused in many other projects, assembly is rapid, and the changes in shape are easily made. A more detailed primer on SOA may be found in our prior study. (See the “Related Software Strategies Research” Section on page 65, item 4.)

Soaring SOA Adoption – Mainframe “SOA Central”

IT users worldwide have adopted SOA widely and rapidly since 2003/2004. As their SOA applications make new demands for network performance and security, a high proportion of them have deployed their System z mainframe as the bedrock for building out their SOA.

They rightly consider their mission-critical, new business processes, SOA applications, and their transaction volumes, demand the unique QoS of the System z platform, which is fast becoming their “SOA Central” for Internet-based computing. The facts/assessments shown in Figure 9 indicate the fast pace and large scale of this transition to SOA, and the important role being played in it by the mainframe platform

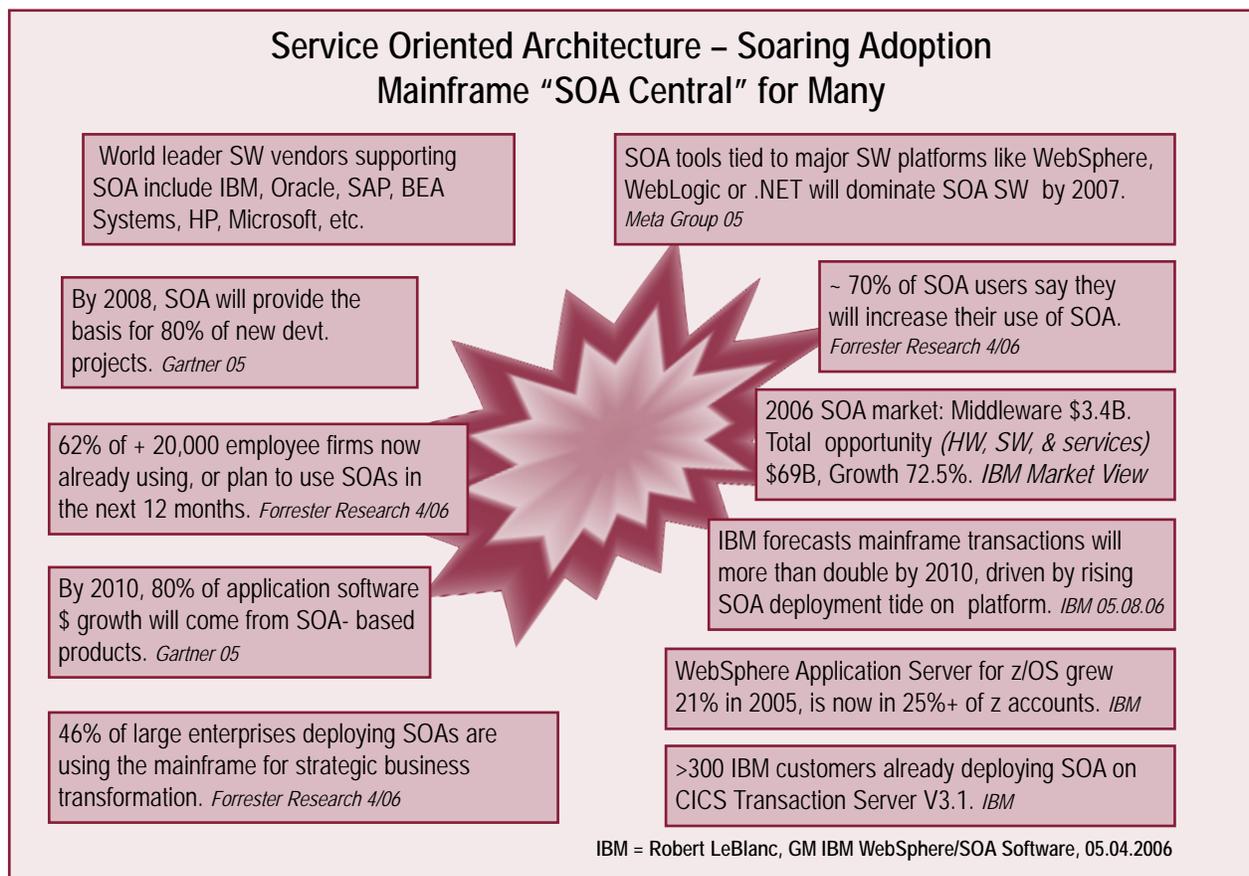


Figure 9: Service Oriented Architecture – Soaring Adoption – Mainframe “SOA Central” For Many

A recent IBM Institute for Business Value analysis identified the main drivers for SOA adoption (*based on an in-depth assessment of 35 actual worldwide SOA customer projects*). The top six drivers found were the need for technology change (54%), competitive pressures (49%), demands for collaboration (31%), supplier/distributor demand (26%), mandates such as regulatory compliance (11%), and to enter new markets (3%). These adoption drivers will resonate with thousands of other IT users. (*Figures are % of projects reviewed citing each reason.*)

Powerful SOA Benefits Quickly Being Realized

Our deceptively simple-sounding outline of SOA above has already widely demonstrated profound, far-reaching, and dramatic business and IT benefits for its adopters, as its soaring adoption (*reported above*) clearly attests. SOA brings within reach the long-elusive, close alignment of business and IT, around a common business process view that maps clearly and directly to the underlying business software services that support it. The SOA loose-coupling approach finally delivers the real flexibility and adaptability in application systems that had previously proved so elusive. As an SOA adopter extends their portfolio of business services over time, higher and higher levels of service reuse can be achieved, reducing new solution assembly/development time and costs sharply. Services can be created from existing software assets (*many on the mainframe*) and packaged applications, or be newly built in J2EE™ or .NET, or be any mixture. Such composite SOA applications are flexible, can easily be adapted to meet business changes, and make their enterprises more responsive to new market opportunities and competitive threats, etc. Software Strategies' high-level summary of the principal business and IT benefits of adopting a mainframe SOA approach are shown in Figure 10.

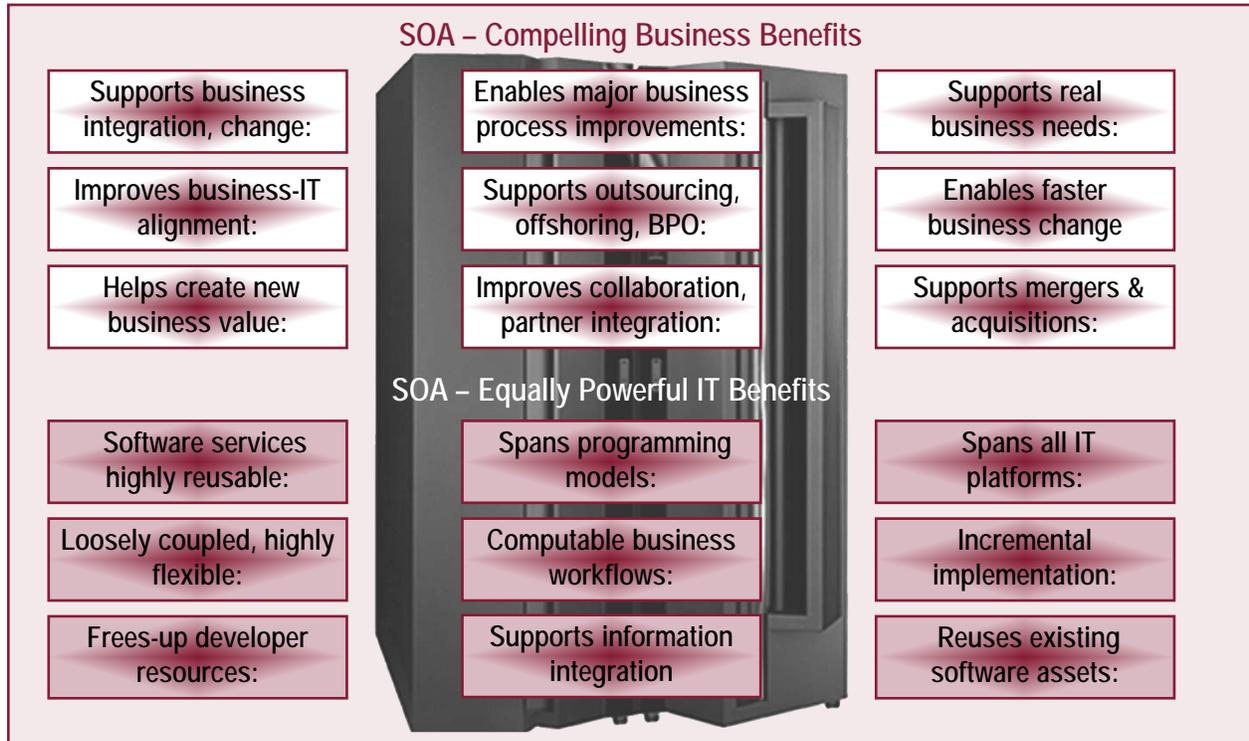


Figure 10: SOA – Compelling Business Benefits, SOA – Equally Powerful IT Benefits

The same IBM Institute for Business Value analysis quoted above found the top six benefits SOA adopters had actually achieved from their SOA project. These were improved flexibility (100%), decreased cost (97%), reduced risk (71%), increased revenue (51%), enabling new products (43%), and enabling compliance (26%). These high percentages, and the large proportion of the adopters experiencing several of these top benefits, are striking indeed.

It is already abundantly clear that SOA is the most important, most business transformative, application software architectural approach in IT industry history. The IBM System z9 mainframe's unique advantages (*we showed our top 15 in Figure 6 on page 14*) complement the SOA approach to perfection. SOA, in many ways, naturally mirrors, and benefits from, the intrinsic "shared-everything", "multiple services" architecture long-used by the mainframe platform.

IBM Leads Industry SOA Charge, Completes Most Extensive Offering

IBM has carved for itself a commanding industry thought and market share leadership in SOA, covering every aspect, and achieving an impressive 48% SOA middleware software market share for 2005. It has attained this commanding position through driving the broadest,

IBM has carved for itself a commanding industry thought and market share leadership in SOA...

most rapid, and most extensive software, standards, methods, services and SOA technology development and marketing program IBM has undertaken on a single theme in memory. The giant made massive, sustained SOA investments over at least the past four+ years, to deliver all of the following, and much more:

- In leading industry **SOA open standards creation process**, creating today's vital set of SOA standards.
- In building out its **now-comprehensive IBM SOA Foundation** suite of middleware software and tools, today far the premier SOA run-time environment across all main platforms, and the only realistic suite for the System z9 mainframe.
- Creating an elegant, **complete IBM SOA Reference Architecture**, encompassing all needed SOA service capabilities.
- In creating a **powerful, Eclipse-based set of SOA development tools**, now the most comprehensive, open standards-based tooling for all stages of the SOA lifecycle, and for all roles in the development process.
- Built out a now **large, thriving SOA business partner ecosystem** that follows this IBM SOA approach and helps customers adopt SOA faster.
- In creating **SOA methodologies**, assessment tools governance, and SOA lifecycle models.
- In the creation of **extensive, SOA services capability**, in SOA technology, vertical industry SOA applications and business consulting. Over 100,000 IBM staff have already been trained in SOA aspects.
- Created a **truly industry-leading new IOD capability** to deliver "information as a service" under SOA, including the powerful new IBM Information Server platform, this alone the result of over \$1B investment.
- Creating a rapidly-growing **SOA Business Portfolio of reusable SOA assets/services**, from IBM and partners, that customers can reuse to short-cut their development, and introducing a new WebSphere Business Services Fabric of vertical industry SOA solution elements.
- **Numerous important acquisitions** have been integrated, and contributed to rounding out this whole SOA portfolio.
- **In training 100,000+ IBM staff** in all these SOA aspects, as well as helping thousands of IBM customers through their early SOA engagements and projects (*3,100+ to date*).
- Publishing close to **100 SOA customer success stories** and references.

As a result of this literally "man-on-the moon" scale-effort that spanned across all parts of IBM, from its Software Group brands, across its Systems, Storage & Technology Group, throughout IBM Global Services (*IGS*), and IBM Research, to IBM Global Finance. The marketing/messaging of this SOA undertaking has also been superlative, undoubtedly the best marketing program seen from IBM in living memory, widely respected by analysts and commentators who followed it closely, welcomed by customers, and envied by competitors. (*Reportedly up to, and including, Steve Balmer, President & CEO of Microsoft.*)

The marketing/messaging of this SOA undertaking has also been superlative, undoubtedly the best marketing program seen from IBM in living memory..

IBM SOA Announcements Recap

For readers who may not have followed this related development, we summarize, briefly date-stamp, and recap the main waves of IBM's SOA announcements to date below:

September 2005:

- Announced **IBM SOA Lifecycle** and **SOA Reference Architecture**.
- Announced first-wave **IBM SOA Foundation** suite software, both servers and tools.
- Established value of **BPM enabled by SOA**, and introduced core BPM servers and tools.
- Launched, and accelerated enrolment into, **IBM SOA Business Partner ecosystem**.

1Q 2006:

- Introduced specific **SOA needs and solutions for vertical industries**.
- PartnerWorld announcement of the **SOA Specialty skills discipline**.

2Q 2006:

- Introduced **Business-centric SOA: The five flexible SOA Entry Points**.
- Previewed **SOA Business Catalog** of reusable SOA services. Rapid growth since, now 3,100+ assets in the Catalog at October 2006.
- New **System z9 Business Class and Enterprise Class mainframes**, optimized for SOA, announced.
- May 2005 first Mainframe Software Summit, SOA software focused, a sweep of major **System z9 SOA software advances for 2006** announced.
- **WebSphere Service Registry and Repository** introduced central software component for SOA service reuse.

August 2006:

- Acquired **Webify Solutions**, **Intent to acquire FileNet**, **MRO** announced.

October 2006:

- **IBM SOA Business Value (IBV)** research revealed, strong customer benefits validated. Over 3,100 SOA engagements by IBM and its SOA Business Partners have been completed to date.
- Building out the IBM SOA environment, introduced **new WebSphere Business Services Fabric**, extended **BPM** capabilities. *(Not covered in this White Paper.)*
- **Extended IBM SOA Infrastructure & Management** solutions for securing, managing, virtualizing/provisioning the SOA infrastructure, our focus in this White Paper. *(See Sections 7, 8 & 9.)*
- Introduced the **IBM SOA Governance approach**, method and solutions.
- Introduced the **IBM Information Server**, a new, first-of-a-kind, software platform that enables clients to deliver trusted, consistent and reusable information to SOA applications and business processes enterprise-wide. This seminal product is the result of a massive IBM multi-year development, incorporating multiple software acquisitions. The IBM Information Server delivers **IOD** under an SOA, and completes the SOA Reference Architecture product support. *(See Figure 11 below – fuller assessment also in Appendix B.)*
- **SOA Business Partner Ecosystem** expanding rapidly, over 1,300 partners added since April 2006, now totaling 2,500+. **IBM “Ready for SOA”** designation/mark introduced.

In this White Paper (see Sections 7, 8 & 9) we focus primarily upon the new **IBM SOA Infrastructure & Management solutions** for securing, managing, and virtualizing/provisioning the SOA infrastructure, from the perspective of the System z9 mainframe platform and its users. Many of these customers are now well advanced in their development/deployment of their early SOA applications. They have already proved the business and IT values of SOA adoption for themselves, and so the crucial operational questions of securing, managing, and virtualizing/provisioning the IT infrastructure for SOA efficiently, on a long-term basis, have come to the forefront of their attention as their next priority area.

IBM SOA Reference Architecture

Because it frames and articulates IBM's overall approach to SOA clearly and concisely, we recap briefly the IBM SOA Reference Architecture, which is shown in Figure 11.

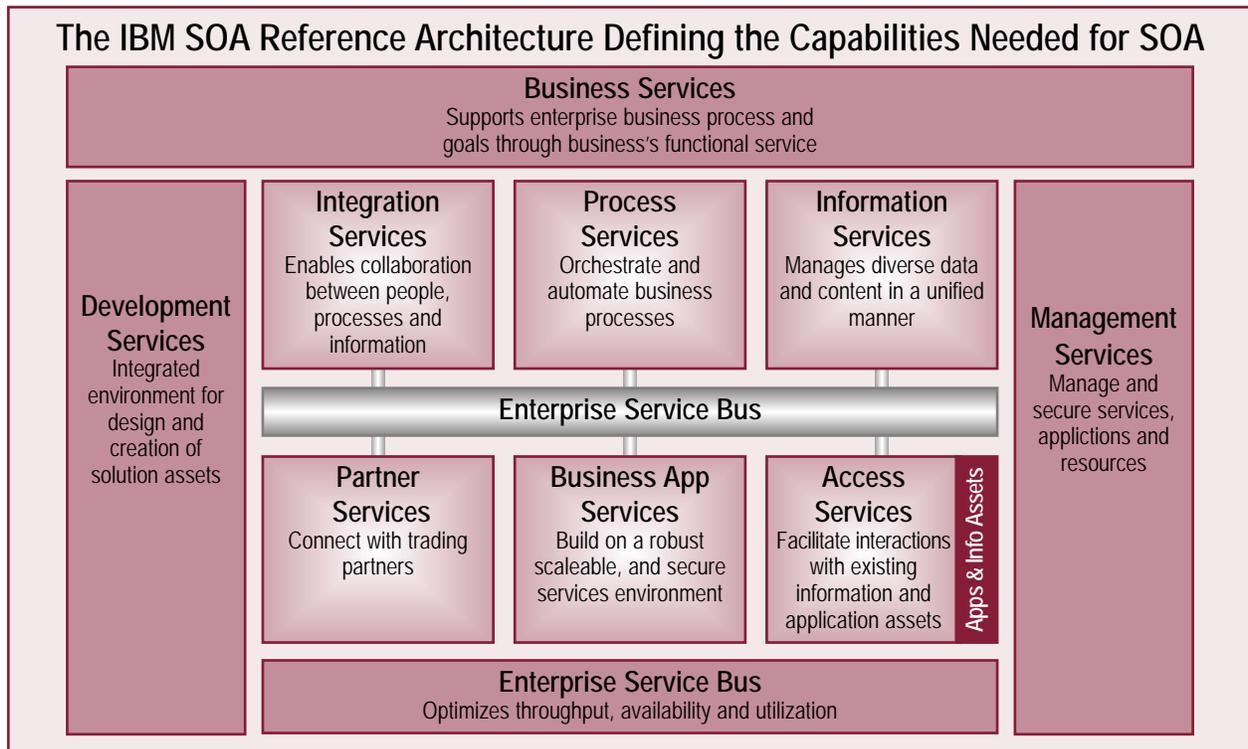


Figure 11: IBM SOA Reference Architecture – Defining Capabilities Needed for SOA

The Architecture defines all the classes of services required in a complete SOA environment. At the top are the customer's specific business services that support the business processes of the enterprise. On the left are the development services for the design and creation of services. To the right are the management services for operational management of the SOA. At the bottom are infrastructure services that optimize throughput, availability and utilization of the IT resources upon which the SOA is built. (*The latter two areas are our focus in this White Paper*). In the center of the chart are the six principal SOA service types needed for a complete SOA environment (*Interaction, Process, Information, Partner, Business Application, and Access Services – for Applications and Information assets*). These are all interconnected by the SOA environment's ESB connectivity platform (*which is built over a message-based middleware transport platform – WebSphere MQ Series*). This Reference Architecture provides a clear and helpful taxonomy, and indicates clearly where the specific servers, tools and products play in this overall architectural picture.

IBM's Business-centric SOA Approach – Five Flexible SOA Entry Points

Highly successful since its April 2006 introduction has been IBM's business-centric approach to SOA, and associated five flexible SOA Entry Points. The notion behind these is that customers all have different mixtures of immediate business pain-points, and should be able to begin their SOA adoption at any one or two SOA Entry Points that can each bring immediate/ early business benefits from SOA, and easily justify the modest initial investments needed. It allows a business-focused, incremental, step-by-step approach to enterprise SOA adoption that provides rapid business pay-back, immediate solutions to current problems, but also lays some foundations for a future, fully-comprehensive, customer SOA environment. The five flexible SOA Entry Points IBM has championed are shown in Figure 12, and explained below:

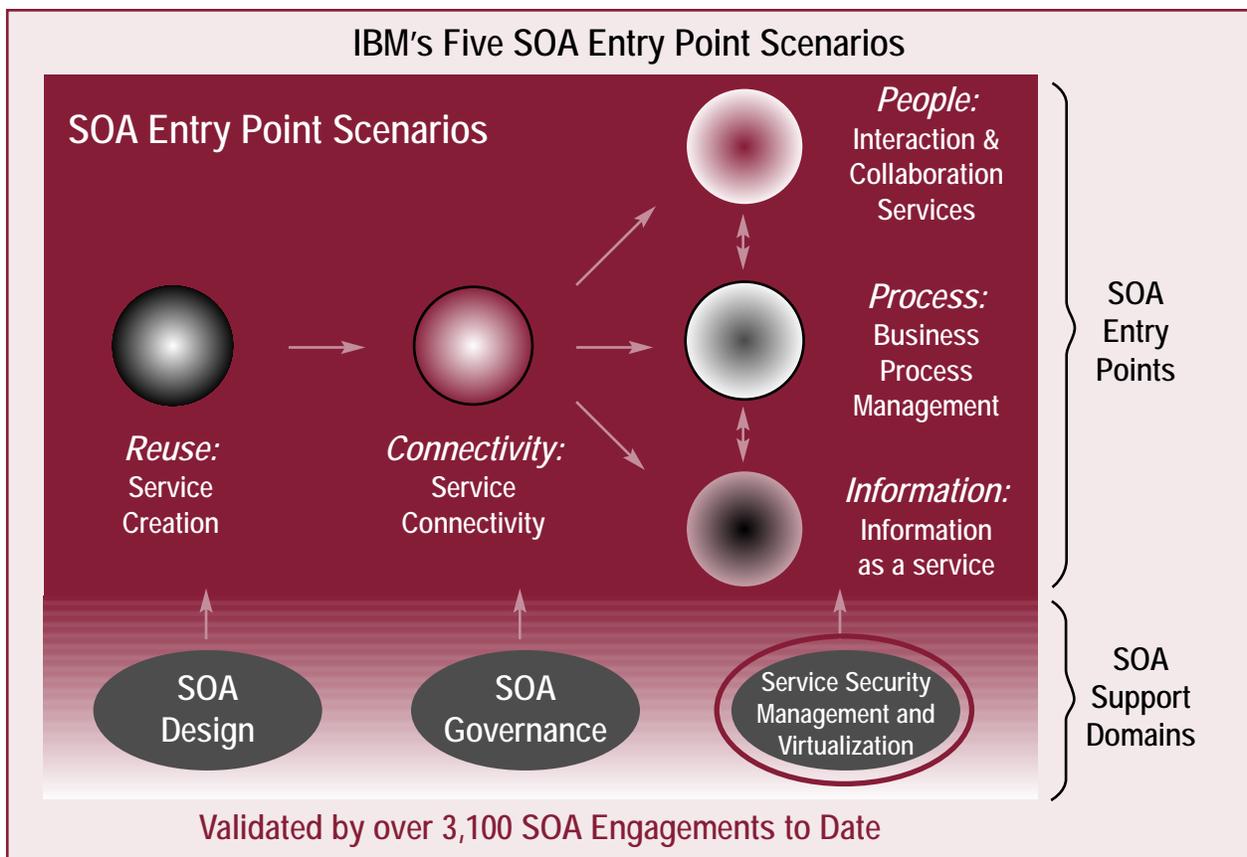


Figure 12: The Five Flexible SOA Entry Points

- **The people entry point** enables efficiency through staff interaction and collaboration with application and information services that support the business. Portals and collaboration application SOA solutions are delivered here.
- **The process entry point** offers tools and services to help streamline BPM for continuous innovation. BPM business workflow-based SOA applications, built with business process modeling tools, monitored in real time with business process monitoring tools, and deployed on a BPEL server, are the deliverables from this entry point.
- **The information entry point** enables access to complex, heterogeneous data sources within the company by delivering information as a service. Information integration across multiple applications, platforms, data types and data sources, are delivered as IOD under this scenario, using, for example, the new IBM Information Server.

- **The connectivity entry point** links people, processes and information in the business with a seamless flow of messages and information from virtually anywhere, at any time, using anything. This scenario is the SOA successor to traditional enterprise application integration, and exploits SOA ESB technologies supported on foundation message transports such as WebSphere MQ.
- **The reuse entry point** focuses on deriving continued value from previous software asset investments, identifying services to be outsourced, and designing new services to fill portfolio gaps. The reuse scenario is particularly relevant for mainframe customers who all have large portfolios of traditional mainframe application and data assets, the reuse of which in next-generation SOA applications is now well underway.

This incremental approach also avoids natural customer fears or concerns of needing a “big-bang” or “rip-and-replace” approach to get the benefits of SOA, and has rightly been extremely popular with customers.

In October 2006, IBM built on the success of the SOA Entry Points by introducing a new set of **SOA Entry Point Scenarios**, based on best practices and real customer implementations. These SOA Entry Point Scenarios provide solutions to the most common customer problems, “Realizations” that reflect typical implementations, broad sets of enablement materials, POCs to demonstrate value, pre-integrated IBM SOA product sets for faster deployment, and IBM professional services to support implementation. These rich scenarios will greatly speed, simplify and facilitate customer SOA adoption, and we expect them to be warmly welcomed by customers.

Also heavily promoted was the recommendation that customers should establish an **SOA Center of Excellence (CoE)** function to support and proliferate best practices across enterprise-wide SOA deployment, with new services now offered to help establish and charter the unit.

SOA Business Value Tools

Also introduced was a new **Online SOA Business Value Analyzer** (based on the IBV value research findings cited earlier), to enable customers to create their business case more quickly and easily. This self-service offering is complemented by a new, 8-week, full-scale **SOA Business Value Assessment** service from IGS. These complement the existing **SOA Maturity Assessment Tool** and the **SOA ROI Value Assessment Tool** to complete a full portfolio of support offerings that help customers understand, quantify and present their SOA business cases more effectively.

Our Analysis

SOA, a new architecture for distributed computing, is based on loosely-coupled, independent, reusable business software services. These are interoperable, technology-neutral, and can be choreographed into composite applications running on the Internet, to support a transformed or modernized business process workflow. Such a composite SOA application can integrate partners, customers and suppliers. Easy reuse of business services enable new applications to be assembled more quickly. Such business services can be carved from existing applications and/or packages, and/or be built in the J2EE™ or .NET programming models. SOA provides far greater business adaptability, and makes integration far easier because of open industry standards for connectivity through Web services. An ESB pattern allows each service to be connected to the bus with a single link, and each is then able to communicate with every other service in the SOA. SOA is a truly game-changing, new approach to the age-old challenges of business applications and integration.

SOA adoption has climbed rapidly since the first early customers began its use in 2003/2004, and today a significant proportion of leading-edge and larger enterprises are actively using and expanding the technology, as the data in Figure 9 reveals. For example, IBM recently reported that its global SOA customers included 8/10 of the largest banks, 9/10 of the largest telecommunications firms, 8/10 of the largest insurers, 10/10 of the largest auto makers, and 8/10 of the largest US health plans.

SOA is equally beneficial for SMB enterprises, because the barriers to entry are not high, and the firm has published over 80 SMB SOA references to date to prove it.

The business and IT benefits from SOA are profound, far-reaching and substantial...

The business and IT benefits from SOA are profound, far-reaching and substantial, and Figure 10 highlighted the main

generic benefits we have found most widely delivered. Customer successes have highlighted many of these benefits, and, for this reason, we include a select handful of actual SOA customer stories in Section 10. Business benefits, including improved customer satisfaction, business operational savings, increased competitiveness, IT cost improvement, and faster business cycle times, have been achieved in various combinations by most adopters.

IBM has carved itself a commanding thought and market-share leadership in SOA, having driven one of its largest ever, cross-company development, innovation, product, standards and services creation, and marketing efforts over the last three/four years. As a result, IBM today offers the industry's strongest SOA middleware and development tools software portfolio for all major IT platforms, extensive SOA methods, guidance and educational offerings, a large SOA Business Catalog currently containing 3,100 reusable services, vertical industry SOA offerings, and an extensive range of SOA professional services.

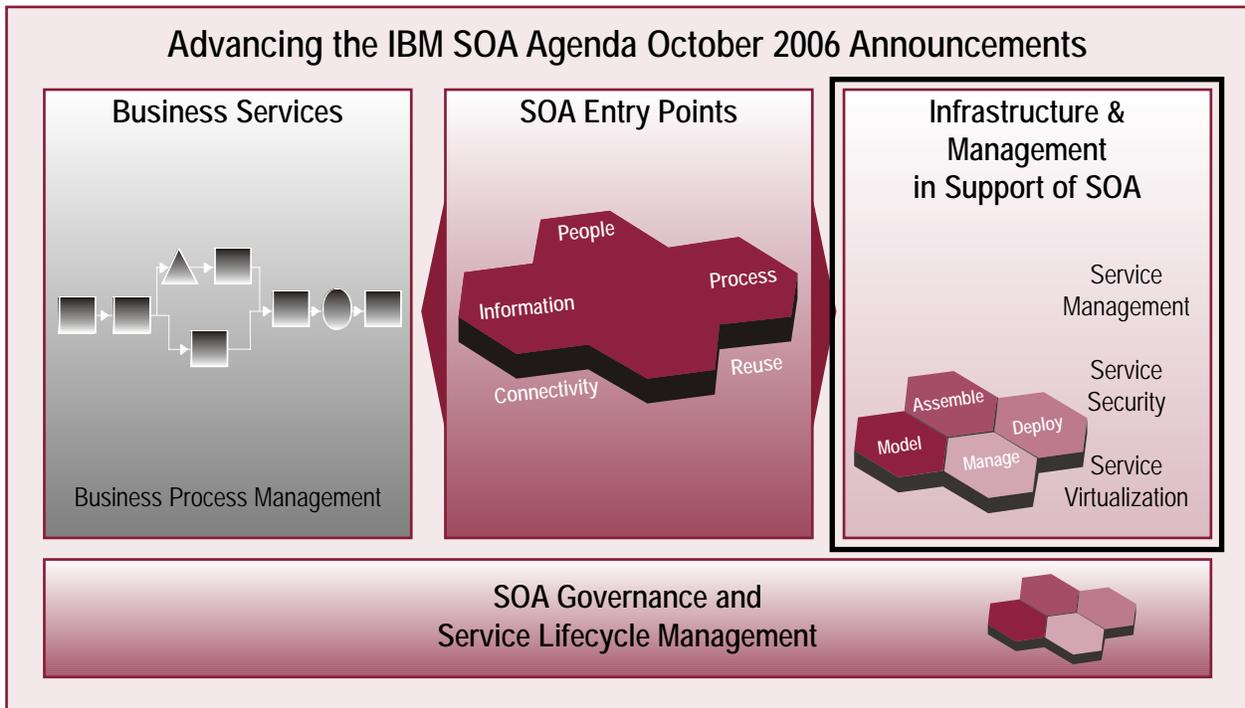


Figure 13: Advancing the SOA Agenda – October 2006 Announcements

The pace and breadth of IBM's SOA announcements, which began in September 2005, has been brisk and wide-ranging, as the timeline summary above reveals. Software Strategies has reviewed and assessed the earlier of these in our previous White Papers/Reports (see the "Related Software Strategies Research" Section on page 65). In this Paper, we focus on important parts of the October 2006 developments. These are shown in Figure 13, and our focus is on the advances in Infrastructure and Management in Support of SOA (including Service Security, Service Management, and Service Virtualization).

One of the great advantages of the SOA approach is that deployment can be incremental, step-by-step, in-line with current business priorities, with each incremental step individually delivering valuable benefits, as well as providing part of the foundation for more comprehensive SOA deployment. This means that ROI on such relatively-modest SOA incremental investments is usually high, and payback rapid. IBM's well-defined, five SOA Entry Points (*people, processes, information, reuse and connectivity*) have proved extremely helpful for customers, by grouping and clarifying these five main areas to begin SOA in clearly understandable and recognizable terms. Over time, the expectation is most SOA customers will exploit all five areas combined, for the fullest SOA benefits

5. SOA & the IBM Mainframe – A Perfect Fit!

Introduction – SOA on the IBM Mainframe

Our prior research found a compelling, multi-faceted case for medium/larger enterprises to center/host much/most of their new SOA application investments/developments on their IBM mainframe. The unique business values of the System z9 mainframe (*with its further advances of 2006*), have positioned the mainframe best amongst all IT platforms to serve as "SOA Central", and as the enterprise data server of choice, hosting most new enterprise SOA and IOD application solution deployments. The mainframe also contributes much additional value by its new ability to apply/extend its core strengths into five new enterprise-wide roles as Enterprise-wide Security Manager, Enterprise-wide Business Resilience Manager, Enterprise-wide Workload Manager, Enterprise-wide Manager for SOA, and Enterprise-wide Manager for Data/Data-serving. These allow the mainframe to add value by spanning across, and better supporting, all platforms in the enterprise participating in next-generation SOA applications. (*Discussed in Section 3.*)

Mainframe Advantages as "SOA-central" Platform

We previously summarized our top 15 powerful, general platform advantages of today's IBM mainframe. We extend this list to examine how each of these 15 main, business-value-generating platform advantages especially complement the system needs of an enterprise SOA software environment, and Figure 14 (*on page 28/29*) summarizes these findings:

Software Strategies Top 15-Rated Mainframe Business Value Strengths Q4 2006

Business Value Strength*	What this Means for SOA Applications on Mainframe
# 1. Lowest Outage Costs from Highest Platform Reliability, Availability & Serviceability:	Extreme mainframe reliability and availability means mainframe-hosted SOA applications are always available, yielding minimum outage costs. This is even more important than usual when core business processes, and whole partner ecosystems, are connected by, and dependent upon, these mainframe-based SOA applications.
# 2. Lowest Security Breach Risks/Costs, Via Most Secure Design, Encryption, etc.:	Bullet-proof, highly-defended security strengths ensure mainframe-hosted SOA applications are fully protected, require the lowest effort to keep secure, and eliminating the costs/risks of security breaches so challenging on distributed IT platforms. Powerful user identity management tools, central key management, powerful encryption, and leading-edge, federated identity management software on the mainframe, enable its Enterprise-wide Security Manager role.
# 3. Highest Resource Use Efficiency/Utilization for Mixed Commercial Workloads:	The mainframe easily attains the highest resource utilization of any commercial system, with 90%+ utilization commonplace. Achieved with the most advanced, optimized "all-resources virtualization", and the industry's most sophisticated, highly-automated, self-optimizing workload management. These share all system resources across all running workloads dynamically, to ensure delivery of policy-set QoS SLAs to each. This ultra-efficient resource utilization averages 20-fold higher than typical distributed servers, and contributes much to the mainframe's lowest TCO/TCU/CPT (see #12). For next-generation, mission-critical, SOA applications, using this highly-efficient platform makes strong economic sense, and alone can assuredly deliver the QoS they need. These mainframe strengths are now extended to other platforms under the mainframe's Enterprise-wide Workload Manager role.
# 4. Widest Platform Scalability Supports any Workloads Size, Mix, Growth:	The mainframe's granular capacity, and extreme scalability (<i>17,800 MIPS single system with System z9, far higher with Parallel Sysplex clusters</i>), allow it to manage/run the largest global enterprise SOA business applications portfolios, and the largest IOD/data-serving solutions. It runs these most reliably, securely, and cost effectively, alongside its traditional and other new workloads. This means the mainframe can better scale-up with SOA growth faster, more easily, and more affordably than any other platforms. Smaller z9 BC mainframes fulfill the same "SOA Central" role for small/medium business at modest capacity/cost levels.
# 5. Consolidates Many New, and Extends Traditional Workloads Strengths:	Traditional CICS, IMS transactional, batch, COBOL mainframe strengths now have been skillfully extended to embrace enterprise-scale, SOA-based, composite applications. Other new-to-mainframe workloads (see <i>Figure 5, on page 13</i>) are also burgeoning. Specialty processors (<i>ICF, IFL, zAAP & zIIP</i>) boosted these new workloads by slashing costs. Combining workloads from scores/hundreds of distributed servers onto mainframe-hosted virtual servers provides large savings in staffing, software, hardware, and power/cooling. It also allows easier SOA integration (<i>of their applications with</i>) mainframe applications, components, and databases on the same system.
# 6. Top Data-serving Capacity, Performance, Value – Best IOD Host:	The System z9 mainframe, z/OS and DB2 V9 combination offers the market's best-proven, highest-capacity, highest-performing and most robust enterprise data-serving platform. DB2 (<i>Version 9 "Viper"</i>) on z/OS pioneers the world's first hybrid relational/XML DBMS, offering immense advantages over database competitors for SOA applications, and defining new levels of XML & relational enterprise data-server capability. The zIIP specialty engine slashes mainframe software costs by re-directing, select DB2 data-serving workloads onto zIIPs. DB2 on z/OS is also complemented by IBM's complete, modern, value-priced, DB2 tools suite. The combo also underpins IBM's IOD strategy, based around the impressive, new, IBM Information Server platform, which unifies consistent, enterprise-wide delivery of business information under an SOA. The new enterprise-wide role of the mainframe as Enterprise-wide Manager for Data/Data-serving has now become a reality.
# 7. Highest Quality of Service, Performance, & Fastest Response Times:	Policy-driven, self-optimizing, mainframe workload management/advanced virtualization delivers business-prioritized, assured mainframe-hosted SOA application performance and QoS. This enables enterprises to meet demanding business SLAs standards for new-generation SOA business applications, and for the business processes they are supporting, better than on any other platform. Placing new SOA and other workloads co-resident/closely proximate on fully-virtualized mainframes gives much lower latency, higher performance /throughput, and higher availability than multi-tier, distributed solutions can provide, using virtual HiperSockets (<i>TCP/IP</i>) links for much faster "within-the-box" connectivity.
# 8. Best Enterprise SOA Platform, Enables Fullest Reuse of M/F Application Assets:	Our research found IBM's mainframe SOA/IOD middleware/tools portfolio now offers a superb, complete, world-leadership-class SOA software platform, far outranking competing SOA vendor software. The portfolio also fully exploits the unique QoS/capabilities of the System z9 mainframe, and makes it easy for customers to reuse their mainframe software assets in new SOA-based, composite applications, with full support for all five SOA Entry Points. Complemented by DB2 V9 (# 6), these major SOA advances now best equip the mainframe for its designated, enterprise-wide role as the Enterprise-wide Manager for SOA .

continued on next page...

<p># 9. Much-improved Cost Model Transformed Mainframe Economics:</p>	<p>Many, continued cost improvements/reductions on new the IBM System z9s/latest software pricing, specialty engines, memory, etc., further reduced mainframe costs, contributing strongly to the mainframe's lowest TCO/TCU/CPT leadership, see # 12 below.</p>
<p># 10. Lowest Power Usage, Cooling, Datacenter Floorspace Needs:</p>	<p>Electrical power, cooling, and data-center floor space costs have soared under distributed server sprawl. A mid-sized System z9 mainframe (1,750 MIPS*) uses 1/20th of the power / cooling energy (\$32/day vs. \$600/day cost), and 1/25th of the floor space (400 sq. ft vs. 10,000 sq. ft) needed by its distributed system capacity equivalent (100 rack servers*). Customers can both reap these large operating cost savings each year, and defer \$1Ms of new data-center investment, by moving from distributed server farm sprawl to virtualized, efficient mainframes for new SOA and IOD applications.</p>
<p># 11. Lowest Staffing & Support Costs for Enterprise Workloads:</p>	<p>People costs soared to become far the largest TCO component, averaging 45% in 2005. A System z9 mainframe requires <1/5 of the staffing needed by its distributed equivalent (< 5 staff versus # >25*), bringing the largest single financial saving from mainframe usage. Mainframe automation has driven staff productivity soaring in recent years, and continues. No such improvement has been seen with distributed systems. This contributes greatly to # 12 below. This means major new SOA applications require much lower systems operational staffing on the mainframe platform, improving their ROI whilst speeding payback.</p>
<p># 12. Lowest Total Cost of Ownership, Total Cost/User, Total Cost/Transaction:</p>	<p>Many analyst studies showed virtualized, multi-workload, ultra-efficient, System z9 mainframes now deliver far lower TCO/TCU/CPT than scale-out distributed platforms. (See # 1, # 2, # 3, # 5, # 9, # 10, # 11, # 13, and # 14 here for why). This holds for comparable workloads above ~150-200 users and above ~250 MIPS mainframe capacity. Much higher, TCO-dominating, people and software costs, dominate distributed costs that are far higher on these, and mainframe hardware is used many-fold more efficiently. Why deploy new enterprise SOA and IOD solutions on anything another than the clearly lowest TCO/TCU/CTP platform?</p>
<p># 13. Best Customer Investment Protection Enterprise Platform:</p>	<p>The IBM mainframe itself best protects all its customers' hardware, storage, software, applications, and skills investments, and for all workloads, as it has done for decades. It clearly follows that customers' new investments in enterprise SOA applications and solutions will enjoy their best total investment protection on this dependable, long-life platform, where many can clearly now best be deployed.</p>
<p># 14. Lowest Business Risk Platform, With Best World-class Support:</p>	<p>When early in such a major, decades-enduring, new enterprise application and business transformation as SOA, it makes absolute sense to base many/most SOA solutions on the IT platform that carries much the lowest business risk, which is clearly the IBM mainframe. IBM's legendary mainframe support/service further trims customer risks in the deployment of enterprise SOA on the mainframe platform.</p>
<p># 15. Healthy, Expanding Mainframe Ecosystem Supporting Platform Again:</p>	<p>The mainframe is again at the heart of its own, rapidly-growing, healthy industry ecosystem, with over 1,300 active System z ISV's, 260 universities teaching new mainframe skills, etc. Combine this with IBM-extensive, own SOA skills, and those of its now 2,500+ SOA Business Partners, and it becomes quite clear that, at their intersection, we find the industry's largest/strongest SOA solutions/IT platform ecosystem combination.</p>
<p>Figure 6 on page 14 provided "Our Top 15 Reasons Favoring the IBM Mainframe – 2007". Our White Paper on this topic (see the "Related Software Strategies Research" Section on page 65, item 1) provides fuller supporting details.</p>	

Figure 14: Top 15 Reasons Favoring the IBM Mainframe – SOA Perspective

Mainframe SOA Enables Fullest, Fastest Application Asset Reuse

The global, 15,250-strong (our Q3 2006 estimate) mainframe-installed base hosts an estimated >\$1TB-worth of customer applications software and database assets, accumulated over decades, that are business-critical to their companies. SOA has swiftly become the definitive, next-generation application software architecture, and adoption is progressing rapidly amongst the more advanced enterprise users. Extensive reuse of the priceless and irreplaceable business logic in these CICS, IMS, COBOL and batch applications, and their associated files and databases, is the fastest and cheapest way to rapidly extend SOA benefits to power business transformation. SOA offers long-term advantages in business flexibility, business process improvement, ease of adaptation, superior integration, faster development, and in allowing the extensive reuse of existing application/data assets. IBM has fully equipped its mainframe software stack to support this extensive modernization, and the wide-scale reuse, of mainframe application assets. It has now delivered on the largest ever set of mainframe software announcements through 2006, reviewed below.

Bumper New & Enhanced Mainframe SOA Software Crop Delivered in 2006

During 2006, IBM built upon the firm base of the **IBM SOA Foundation** suite software, underpinning/capabilities it had previously delivered for the mainframe by the end of 2005.

Over 2006, it has now added an absolutely bumper raft of major new and enhanced SOA software products for the System z mainframe. These have now essentially completed the rollout of its now comprehensive SOA platform of middleware servers, companion advanced SOA development tools, and related SOA management and security service offerings, amongst other main advances, for the System z9-z/OS platform.

The scale of this 2006 SOA product blitz, from a mainframe viewpoint, was amply illustrated in Figure 2 on page 7, which showed our list of the main new or enhanced SOA products for mainframe users delivered through 2006 (*or due*). New products were specially highlighted on the right, and GA dates were shown (*for most*).

Another useful view of these, most (*but not all*) of the mainframe SOA products now delivered (*or due soon*) is to map them onto the IBM SOA Reference Architecture (*of Figure 11 on page 24*).

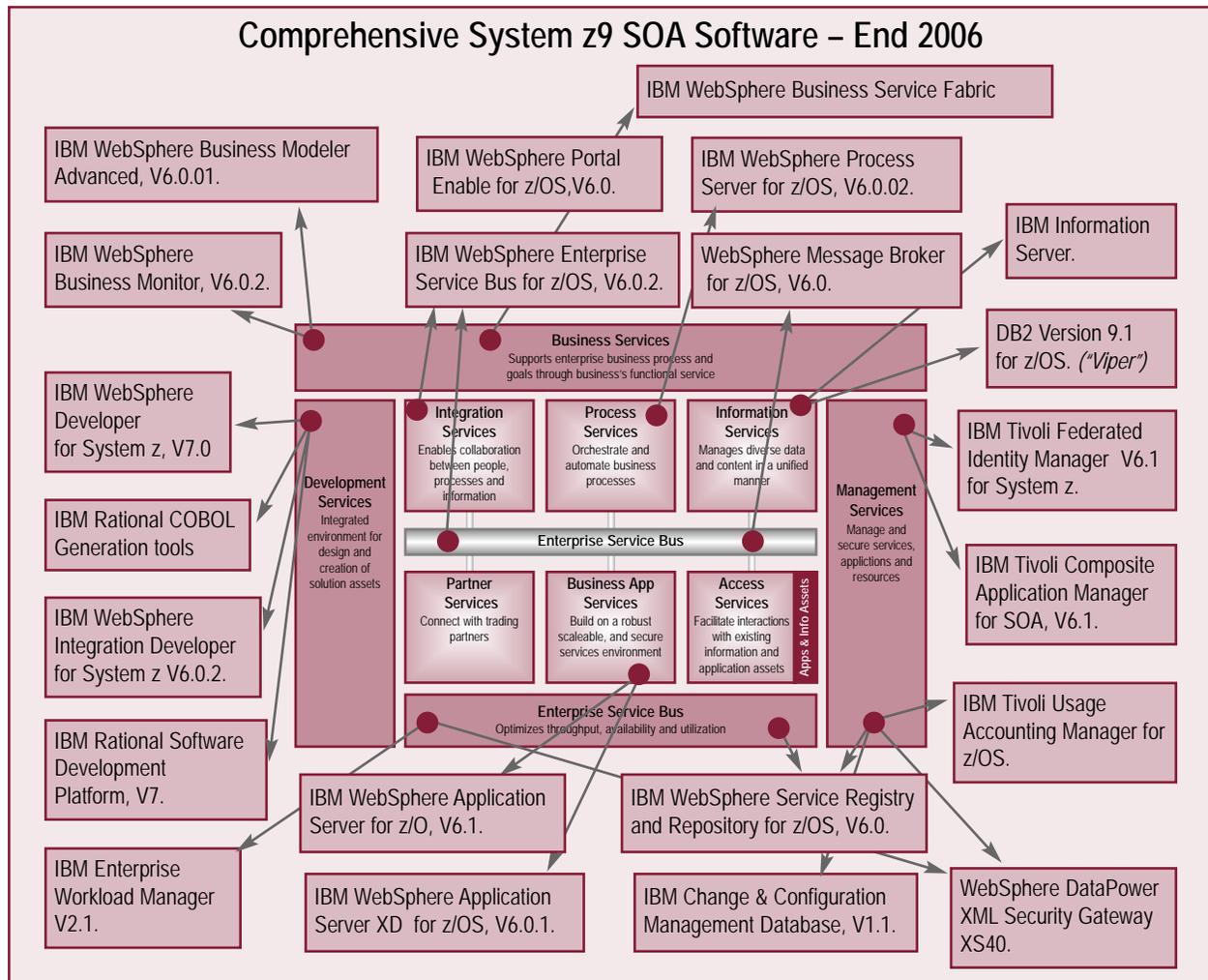


Figure 15: Comprehensive System z9 SOA Software - End 2006

We present this view in Figure 15, and readers can immediately see that this broad set of important, new SOA products, and major set of upgrades to core SOA servers and tools, essentially completes the planned IBM SOA platform for the System z9 mainframe. (*Note: some existing, important SOA-related mainframe products are not shown here, purely due to space limitations - we have assessed these in prior Papers/Reports; see the "Related Software Strategies Research" Section on page 65.*)

Our Analysis

From prior research, we identified the Top 15 reasons that most favor the IBM mainframe platform as the premier enterprise server overall. Above, we also showed (*in Figure 14*) why and how these mainframe strengths perfectly match the platform requirements of enterprise SOA applications. These compelling advantages are already reflected in the high-proportion of major enterprise SOA adopters that are already exploiting these strengths by basing their SOA applications upon their IBM mainframe platform. (*See Section 10 case studies.*)

Naturally, the primary enabler of the mainframe as the preferred enterprise-wide platform for SOA is the strength, depth, and comprehensiveness of the IBM SOA mainframe software. IBM had already laid a robust SOA software foundation for the mainframe by the end of 2005, but has surpassed itself through 2006, by delivering a truly impressive, comprehensive, and innovative further set of new products and significant enhancements, that complete the SOA jigsaw puzzle for System z.

...mainframe strengths perfectly match the platform requirements of enterprise SOA applications.

We found these together now offer mainframe customers a quite superb, now-complete, world-leadership-class, IBM mainframe SOA/IOD middleware platform that far outranks competing SOA vendor software, and fully exploits the unique QoS/capabilities of the System z9 mainframe. This software enables mainframe customers to take advantage of their existing mainframe software assets by deploying SOA-based, composite applications that reuse/modernize older components. These can now easily be blended/tightly-linked to new-generation J2EE™ or .NET service components, with full support for all five practical SOA Entry Points. This also delivers on the 2004-promised Enterprise-wide Manager for SOA role for the mainframe platform.

These advances are complemented by the groundbreaking, new DB2 V9 for z/OS database server, (*currently in beta, and due soon in GA*). The same applies to the extraordinarily impressive and important new IBM Information Server. Combined, these major, information management/IOD SOA software advances now equip the mainframe to serve in a new enterprise-wide role as the **Enterprise-wide Manager for Data/Data-serving/Information**. (*We assess the central SOA pillars in Appendix B.*)

6. IBM's New SOA Governance Approach Underpins Mainframe SOA

SOA Lifecycle Demands SOA Governance, Infrastructure & Management in Support of SOA

SOA business and system services clearly traverse a defined **SOA Service Lifecycle**, of model-assemble-deploy-manage, over their lifetime, from first conception to eventual retirement, which IBM pictures as shown top left in Figure 16. This requires a well-defined **Service Development and Delivery Management** process, supported by an appropriate set of development, and development management/lifecycle, tools. IBM first articulated this process of "plan-define-enable-measure" (*shown bottom left*) in 2005, and has actively delivered the WebSphere and Rational tools to support it through 2005 and 2006, the latter culminating in the Rational Software Development Platform V7 desktop products, just announced.

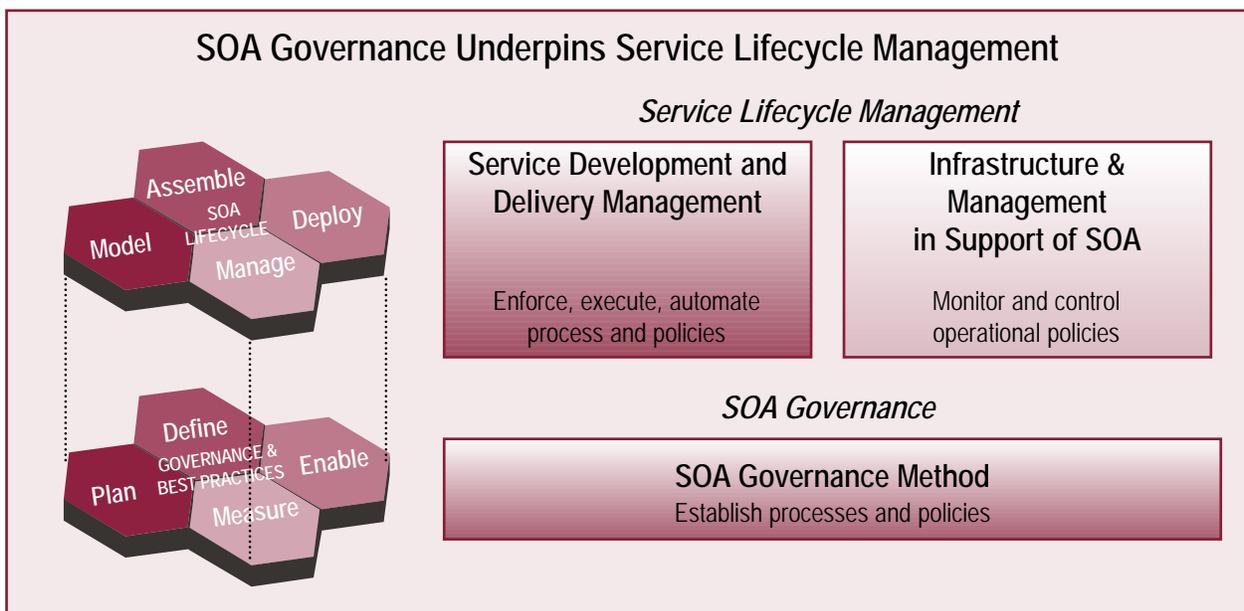


Figure 16: SOA Service Lifecycle Management and SOA Governance

SOA Service Lifecycle Management also demands **IT Infrastructure and Management to Support SOA** that enables SOA IT user organizations to effectively monitor, manage, secure and optimize their SOA environment in live operation. In System z9 mainframe environments, where the scale, business-criticality, and security demands upon new SOA applications are at their highest, these requirements are at their strongest.

SOA Governance Crucial

New software technologies, such as SOA, bring many changes to established business-IT interactions, to IT organizational roles and responsibilities, to how the above **SOA Services Lifecycle**, and, in particular, to how the **Services Development and Delivery** process should best be managed, controlled and optimized. This area has come to be termed SOA Governance, and becomes increasingly important to SOA-adopting users as the scale of their SOA deployment grows. **SOA Governance** includes the definition of the chains of responsibility, authority and communications to empower all the staff involved to fulfill their roles in the process. It must include policy, control, and measurement elements/processes to enable all these staff groups concerned to

SOA Governance can best be viewed as an important extension of overall IT governance that is focused on the lifecycle of services, and is aimed at ensuring the maximum business value from SOA.

carry out these roles and responsibilities. SOA Governance should also clearly embed all industry best practices, hard-won from real-world deployments so far. It must combine these staff roles and processes with appropriate software tools that enable all the above. SOA Governance can best be viewed as an important extension of overall IT governance that is focused on the lifecycle of services, and is aimed at ensuring the maximum business value from SOA.

IBM SOA Governance & Management Method Targets Business & IT Alignment

Based on extensive practical experience, in October 2006 IBM announced its **SOA Governance and Management Method**, a series of policies and processes for ensuring successful SOA projects. This Method provides SOA customers with a well-structured, pre-developed, SOA Governance model. Its processes are based on best practices and wide real-world experience, intended to be flexible enough to be applicable to almost every SOA customer situation, and yet be prescriptive enough to add significant value. It includes support for portfolio and process management, service change and release management, service release management, and service architecture management, overlaid by governance frameworks and dashboards displaying status. The new Method incorporates all the knowledge acquired at IBM's 11 Global Centers of SOA Excellence, and from the over 3,100 SOA IBM/partner SOA engagements completed to date. The Method is based around four main steps, summarized below:

1. **Establish the Need:** Document and validate business strategy. Lay out governance plan.
2. **Define the Approach:** Define/modify governance processes. Design policies and enforcement. Charter/refine an internal SOA Center of Excellence.
3. **Deploy the Model Incrementally:** Add governance mechanisms. Effect organization change to educate on, and deploy, expected behavior and practices. Deploy governance policies.
4. **Monitor and Manage the Processes:** Ensure compliance with policies. Manage compliance with governance arrangements. Introduce IT effectiveness metrics.

The new Method is also supported by capable IBM software tools, including:

- **IBM Rational Method Composer:** Helps with planning and documenting the customer's intended SOA Governance Method implementation, roles and responsibilities, tasks and processes. Part of the IBM Rational Software Delivery Platform, a major new V7 of which was announced in November 2006.
- **IBM Rational Portfolio Manager:** Helps with tracking of compliance, and the operations of, the customer's whole governance process. Also part of IBM Rational Software Delivery Platform, ditto above.
- **IBM WebSphere Service Registry and Repository:** Central, new enterprise run-time service registry, and service metadata/details repository, that stores full details of all services throughout their lifecycle, and is used by both other IBM SOA development tools and several of the key run-time WebSphere SOA servers. See below.

New IBM WebSphere Service Registry and Repository (*WSRR*) for z/OS

The new IBM WSRR for z/OS is an enterprise-wide service registry and repository that improves the visibility, reusability, adaptability, and manageability of services. It provides the crucial, central component for managing services enterprise-wide throughout their lifecycle on the mainframe platform (*and others*). The WSRR promotes service reuse, and helps eliminate service redundancies/duplication. The WSRR also provides a cohesive, common enterprise repository for service metadata, such as WSDL and XSD. It allows many types of client software to publish and find enterprise services and related metadata. The broad capabilities of the WSRR are depicted in Figure 17 on page 33.

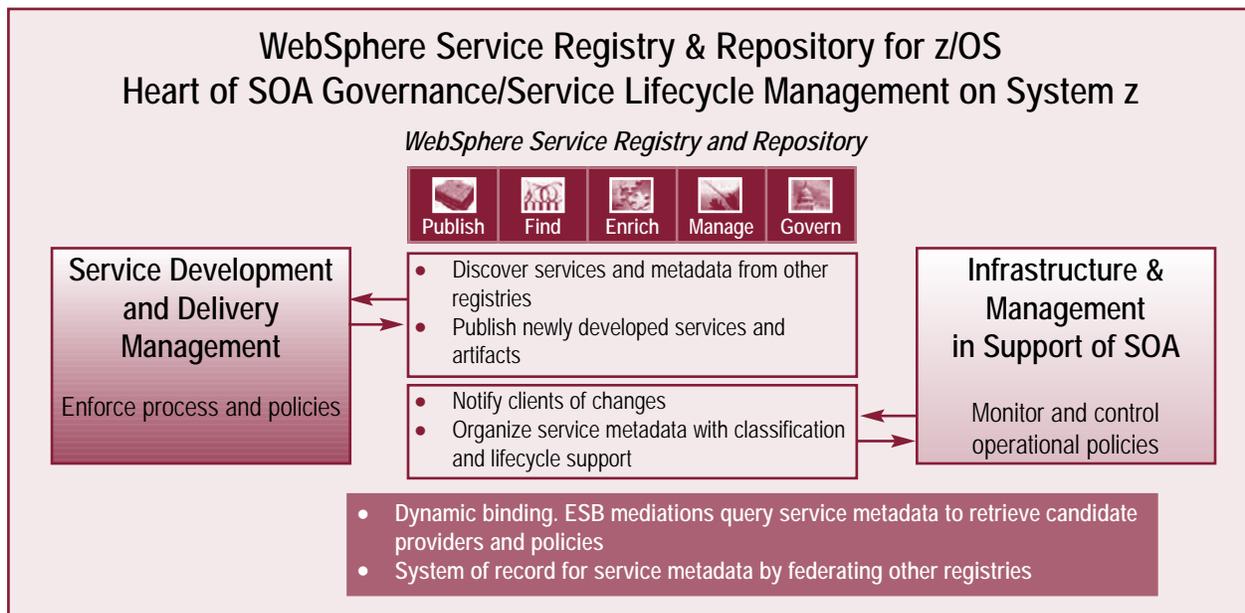


Figure 17: WebSphere Service Registry & Repository for z/OS

The WSRR clearly thus supports both the Service Development and Delivery Management process above, and the IT Infrastructure and Management to Support SOA functions. It enables the enterprise to publish the services they wish to make available (*for example, to customers, business partners and sales channels*) and to advertise their capabilities.

The WSRR provides a central reference point, through which developers can quickly find existing, suitable services of use in their new application, enabling greater, easier service reuse, and runtime agility. It also captures and documents service dependencies, helping to support change management when a service changes, which may impact its dependent services. The WSRR was built to provide an easily extensible framework that supports service validation and notification efficiently and centrally. It also supports integration and federation with other standard registries and repositories. To enrich SOA runtime interaction, the WSRR supports optimized access to service metadata, as well as managing service interactions and policies. To enable users to effectively implement SOA governance (*as discussed above*) for better control of their SOA, the WSRR facilitates service lifecycle management that enables customers to manage their Web services, and shared business processes, throughout their lives. It supports guards for state transitions, provides analysis of the impacts of service introduction, deletion or alteration, and manages role-based access to services, changes, versioning, and service retirement. First announced on May 8th 2006, WSRR for z/OS, V6.0, became available on 12.15.06.

Analyst Comment: The WSRR is a crucial IBM SOA Foundation server that is central to enterprise-wide service governance, management and security operations. It enables service reuse, and supports the SOA run-time environment with service metadata. For enterprise-level SOA adopters, deploying this vital server on the rock-solid, secure System z9 mainframe under z/OS is clearly highly desirable.

Preparing IT Infrastructures for SOA

As customers move beyond their initial SOA implementations, via the five flexible SOA Entry Points (*covered in Section 4*), many will realize they need to take a more structured, and a more programmatic approach to the IT infrastructure and management that supports their SOA projects. This includes an expansion of their initial focus to cover Service Security, Service Management and Service Virtualization aspects, the main requirements for which are shown in Figure 18 on page 34.

The chart shows that the three principal areas next requiring SOA customer attentions are now:

- **Service Security:** Ensuring scalable and sustainable security beyond user level, as businesses expand the use of SOA across the organization, and beyond. Requires means of consistently enforcing security policy for services, ensuring appropriate access, maintaining full integrity, and attaining governance compliance.
- **Service Management:** Automating and simplifying IT processes, managing service and application service levels, and predicting and managing change across linked services.

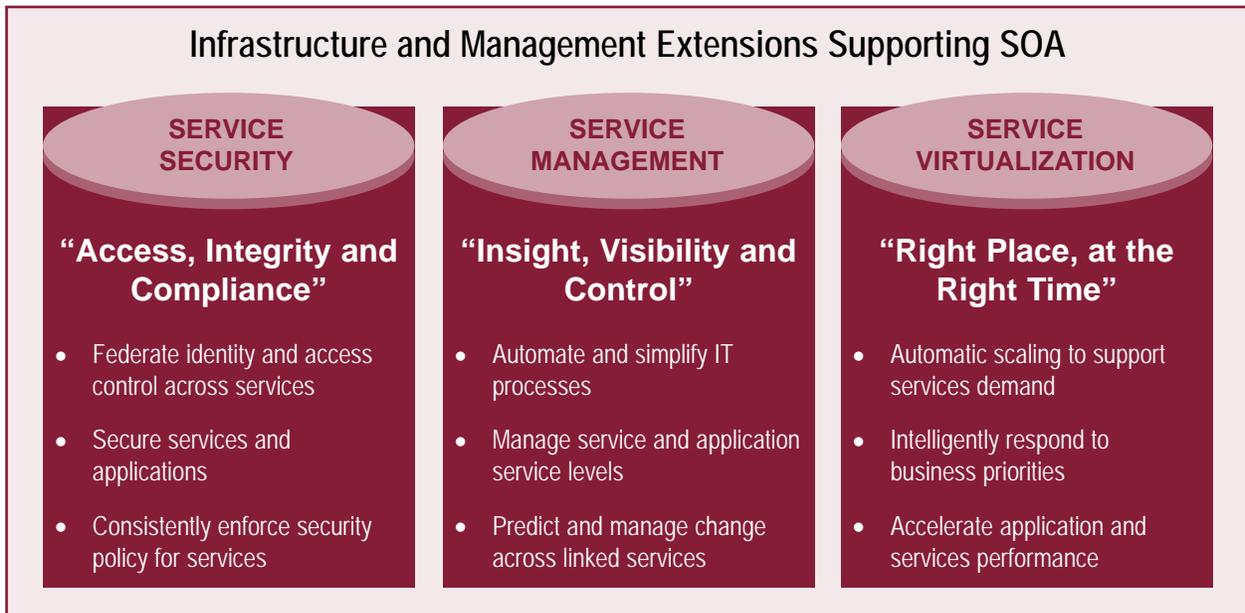


Figure 18: Infrastructure and Management Extensions in Support of SOA

- **Service Virtualization:** Accelerating application and service performance, intelligently responding to business priorities, and automatically scaling to support services demands.

These are essential for large-scale, long-term SOA production deployment, and are thus high on the agendas of enterprises moving beyond their early SOA application deployments and towards wider-scale SOA usage.

Our Analysis

Managing the SOA Services Lifecycle effectively demands effective SOA Governance methods and processes, for which IBM's new SOA Governance and Management Method provides a template that customers can adapt to their individual needs and situations, using the IBM Rational Method Composer and IBM Rational Portfolio Manager tools.

...the compelling need for a widely-accessible, central registry and repository of all enterprise services...

Central to SOA lifecycle management and governance, as well as to service management, is the compelling need for a widely-accessible, central registry and repository of all enterprise

services, a role fulfilled for mainframe SOA environments by the new **IBM WebSphere Registry and Repository for z/OS** product. Such a product stores and provides access to service metadata throughout the service lifecycle, and at run-time in live operations to the supporting, run-time server, security and management infrastructure environments.

The next step in SOA is the extension and refinement of IT infrastructure and Management to provide the new levels of service security, service management, and service virtualization, that are required in larger, dynamic SOA application environments.

"SOA is a fundamental shift in technology that will continue to significantly impact business. With the early adopter phase behind us, and SOA software capabilities deemed as table stakes, the next logical evolution in this market will be ensuring that vendors and customers have the resources and skills available to make the most of their SOA investments."

Steve Mills, Senior Vice President, IBM Software Group.

SOA applications have very distinct and different operational characteristics from those of traditional enterprise applications, including those listed on the left-hand side of Figure 19 on page 35, and need the different capabilities shown on the right of the chart.

Tomorrow's IT infrastructures supporting such larger SOA applications environments demand greater predictability of demand, performance and availability. They need controllability of service releases and changes. They must have enhanced security through federated identity management, and ensure compliance. Operationally, the new infrastructures must also provide clear end-to-end visibility of the QoS being delivered for each whole SOA application. Finally, the infrastructure must provide clarity and support for troubleshooting and problem determination, as well as providing accurate system resource usage accounting for recharge purposes that truly reflects dynamic resource utilization in the virtualized SOA environment.

In the three following Sections 7, 8 and 9, we review the latest advances in the IBM SOA offering set for the System z9 mainframe that now support these vital SOA functions.

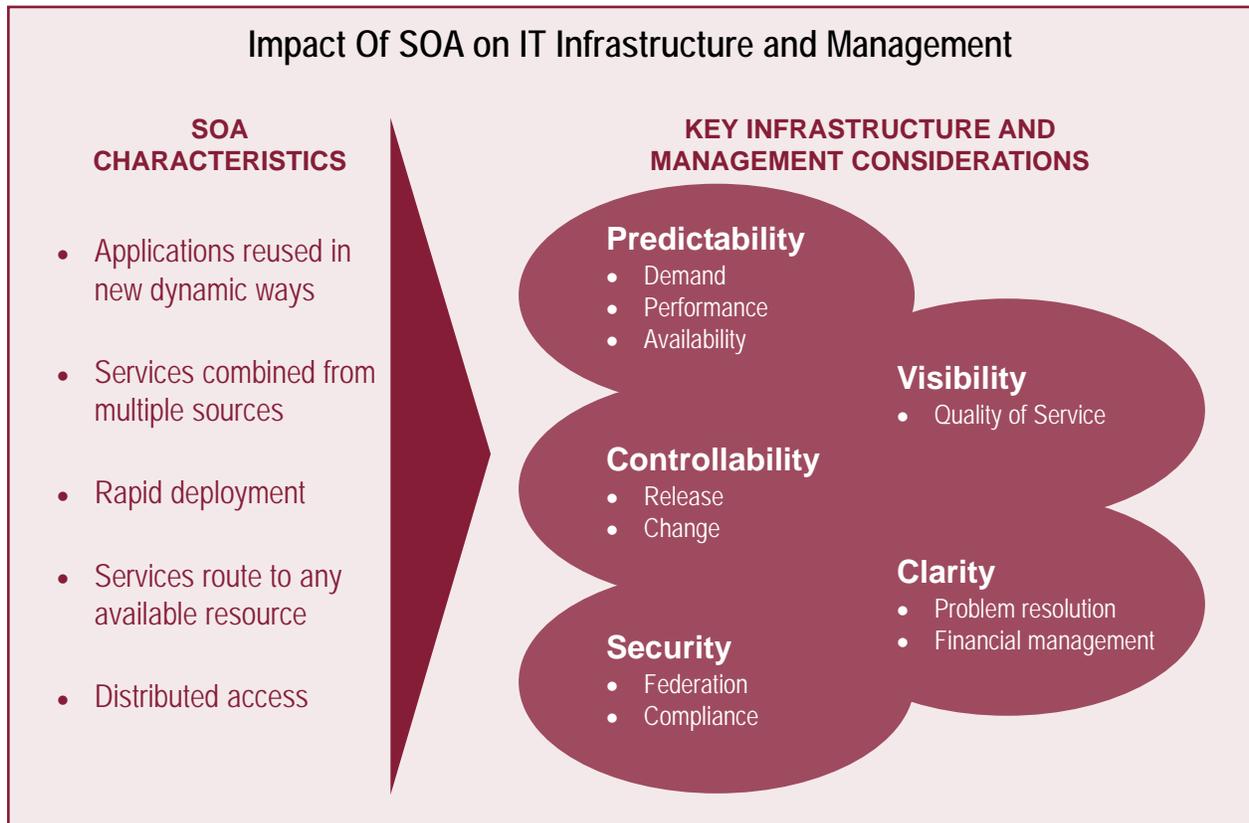


Figure 19: Impact of SOA on IT Infrastructure and Management

7. SOA Service Security Management on System z

Service Security Introduction

New SOA enterprise applications will often incorporate/use business software services both from within the enterprise and from numerous external service providers, and so demand much rethinking of the traditional notions of enterprise application security and identity management. Unlike previous generations of monolithic, in-house enterprise software applications that were used only by a closed, internal user community, SOA applications environments often involve several software service providers, and a number of service consumers, some far beyond the enterprise's normal security boundaries.

Service Security Requirements Under an SOA

At the most basic, SOA customers need full access, integrity and compliance, and to be able to consistently enforce security policy for services, end-to-end across their expanding SOA environments. Viewed more specifically, enterprise SOA adopters need three fundamental groups of service security capability to be able to fully defend and manage their SOA:

- **Federated identity and access control across services:** Customers need the means to provision user identities automatically for reduced costs. They also need to be able to control service access levels for improved security. For an improved user experience, Single Sign-On (SSO) is also essential.
- **Secure Services and Applications:** The service security infrastructure must secure data, applications and transactions across heterogeneous IT environments. It also needs to support unified trust management that enables secure user communities to be created. At the transmission level, secure XML messaging is also essential for packet-level security.
- **Consistently Enforce Security Policy for Services:** The infrastructure needs to offer policy-driven security that can be consistently enforced throughout the environment. This must include the ability to federate policy management to improve consistency. Enterprise-wide event management is also essential to improve security. Finally, automated user account validation is essential to enforce the defined access policies established for the enterprise SOA environment.

Delivering Service Security in a Mainframe SOA Environment

IBM's approach to SOA service security seeks to enable complete, end-to-end security solutions, with which customers can ensure the protection of information against accidental or malicious disclosure, modification or destruction. It provides innovative products that define and implement layers of security building blocks that can provide suitably-adequate degrees of protection, to the business information and processes that are exposed when services are enabled under a new SOA. In System z9 mainframe environments that now run many of the largest SOA portfolios, the scale and importance of meeting the security challenges are higher and the expectations more demanding. The new and enhanced mainframe products offered for reinforcing service security now include:

- **IBM Tivoli Federated Identity Manager for System z, V6.1:** Enterprise-class, full-function, large-scale FIM solution.
- **IBM Tivoli Federated Identity Manager Business Gateway, V6.1.1:** Entry-level, SMB-focused FIM solution.
- **IBM WebSphere DataPower XML Security Gateway XS40:** Appliance for XML security/acceleration.
- **IBM WebSphere Services Registry and Repository for z/OS, V6.0:** Assessed fully in Section 6.
- **IBM Tivoli Composite Application Manager for SOA for z/OS, V6.1:** Assessed fully in Section 8.

The first three of these are each assessed in detail below. The latter two are related, central components of IBM's SOA Foundation, and are assessed in detail in the other Sections cited.

Enterprise-class Product – IBM Tivoli Federated Identity Manager for System z, V6.1.

Federated Identity Management (*FIM*) provides a straightforward, loosely-coupled model to manage identity and access to resources across companies or security domains. Instead of replicating identity and security administration at both companies, IBM Tivoli Federated Identity Manager for z/OS, V6.1 (*ITFIM for z/OS*) provides a simple model to manage identities and provide access to information and services in a trusted fashion. This product is the enterprise-class, full-function, heavy-duty IBM FIM offering for the larger enterprise, and will be the prime choice for System z mainframe SOA adopters. For companies deploying SOA and Web services, FIM provides policy-based, integrated security management for federated Web services, based on trust, integrity, and data.

Through these, organizations can share identity and policy data about users and services without replicating these locally at the partner end. This trust allows firms to loosely couple their disparate identity management systems. Typical usages of ITFIM include:

- Simplifying integration between the firm and partners' Web sites.
- Improving business compliance by reducing security exposure.
- Improving end-user experience through Single Sign-On (*SSO*).
- Delivering "security as a service" to ease administration in cross-enterprise business processes.
- Delivering policy-based, integrated security management for SOA and Web services.
- Integrating security between new distributed applications and mainframe applications (*e.g. CICS*).

The product supports open standards/specifications, including Liberty, Security Assertion Markup Language (*SAML*), WS-Federation, WS-Security and WS-Trust. Firms can assume the roles of **identity provider** (*directly managing end-user identities*) and/or **service provider** (*providing services to end-users*). The identity provider in a federated identity scheme is the definitive source that can alone validate an identity for a service provider, and is trusted by the latter to do so. Within an SOA environment, there must be such an infrastructure service to simplify the management of security policies for the various Web service client requestors and Web service providers. A Web services requester, or a Web services provider, can be a MS.NET application or a

Java or WebSphere application. ITFIM V6.1 has been available on z/OS and zLinux for System z9 since 06.15.06.

ITFIM for z/OS, V6.1, is IBM's enterprise-class, full-function, high-end FIM solution...

Analyst Comment: The federated identity model delivered by ITFIM allows much simpler, less cumbersome administration, improves business compliance, and lets companies extend

identity/access management to third-party users and third-party services, and eases the user experience. These are all-important benefits in the collaborative systems world of cross-enterprise SOA and Web services. ITFIM for z/OS, V6.1, is IBM's enterprise-class, full-function, high-end FIM solution, and will be the natural foundation for SOA security for larger, mainframe-based, SOA deployments.

Entry-level FIM – IBM Tivoli Federated Identity Manager Business Gateway, V6.1.1. for zLinux

IBM Tivoli Federated Identity Manager Business Gateway (*ITFIM – Business Gateway*) is a practical, affordable entry-point for establishing federated Web SSO capabilities, but also offers a low infrastructure option for department/project-focused federation solutions. Targeted for small-to-midsize organizations, this collaborative security software uses open standards to bring together customers, partners and suppliers, with a single, easily-deployed application that also provides a smooth migration path to enterprise-level applications (*such as ITFIM above*) with little or no application changes, and with a consistent management user interface.

Implementing a federated SSO application not only helps improve user experiences – by providing a single password for logon to multiple business partners – but it also enables a firm to more effectively manage identities across its infrastructure while preserving the confidentiality of user data. With ITFIM – Business Gateway, the organization can leverage a single application that provides:

- **Simplified integration** with online customers, partners, agents, and providers.
- **Fast time-to-market** for e-business initiatives via accelerated SSO deployment, achieved through loose coupling between federation software and business applications.
- A **lightweight, small infrastructure footprint**, easily deployable application for straightforward SSO needs, with flexible identity and attribute mapping.
- **Audit logs, tracking and incident reports** – as well as security best practices – to meet corporate and regulatory compliance policies.

Collaboration with customers, partners, agents, and/or providers often plays a central role in BPM initiatives, and is thus a main driver for SOA. Browser-based integration with these external ecosystem members, and basing the integration on open standards for federated SSO, provides quick user productivity and experience gains, whilst also reducing user administration costs. Unlike competitive offerings, ITFIM-Business Gateway does not rely on proprietary APIs that tightly bind business applications to the federation software. Built on an embedded WebSphere Application Server 6.1, this stand-alone Web Federated-SSO solution also offers a simple, single installation (*for both IP & SP roles*), "out-of-the-box" identity stores integration (*Windows Desktop SSO or Enterprise Directory, via WebSphere options*) and application integration (*.NET and J2EE™*), permits easy manual replication for HA configurations, and provides SAML 1.0 and 1.1 support. ITFIM – Business Gateway for zLinux (*and other platforms*) is now available.

Analyst Comment: With low overall TCO from attractive pricing, ease of management, and lower user administration/provisioning costs, ITFIM – Business Gateway provides an excellent value FIM solution for SOA ecosystem integration, reduces security exposure, delivers SSO convenience, and helps smaller enterprises generate more revenue securely over the Web. However, the product is also architected for high availability and scalability, and has demonstrated its ability to secure federated users numbering in the millions.

Performance – IBM WebSphere DataPower XML Security Gateway XS40 appliance

The IBM WebSphere DataPower XML Security Gateway XS40 is a 1U (1.75^h) rack-mounted network appliance that simplifies, accelerates, and helps secure, SOA environments. It provides a security-enforcement point for XML and Web services transactions, including encryption, firewall filtering, digital signatures, schema validation, WS-Security, XML access control, and XPath. The XS40 provides comprehensive XML security at the wire-speed performance needed for enterprise-scale, SOA applications. It offers not only an XML firewall, but also provides an XML proxy with carrier-grade features that can parse, filter, validate schema, decrypt, verify signatures, access-control, transform, sign, and encrypt XML message flows. The appliance offers robust service-level management, policy management, and Web services management support, as well as detailed logging and auditing facilities. The XS40 enables this high-performance, XML Web services security, with entirely non-proprietary, XML-based, fine-grained security controls, adaptable to changing standards.

The XS40's AAA framework offers numerous methods of extracting user passwords, security tokens, and other identity information from incoming requests, and incorporates fully modular authentication and authorization steps, based on either on-board, or off-board, repositories. Its AAA framework is fully extensible, which allows XS40 customers to integrate proprietary, in-house SSO systems with their Web services security architecture. The XS40 offers an award-winning, intuitive Web GUI interface, allowing easy definition of even sophisticated access control policies and security architectures, without complex configuration or custom code.

The XS40 embeds comprehensive Web services standard (*WS-**) support, including full support for SAML, the standards-based solution for federated identity management, and for Web services access control. It allows the security context, the credentials, and the subsequent audit information, to be bound to the transaction request, and also consumes SAML assertions, produces SAML assertions, and makes SAML queries to SAML servers.

The XS40 also incorporates the wire-speed XML parsing, XML Schema validation, XPath routing, Extensible Stylesheet Language Transformations (*XSLT*), XML compression, and other key XML processing functionality, of the IBM WebSphere DataPower XML Accelerator XA35.

The XMS40 hardware appliance brings wire-speed throughput and acceleration to these vital message flows...

Analyst Comment: As enterprise SOA applications scale up in size, volume, and numbers of ecosystem participants, securing and accelerating the XML traffic volumes generated over the ESB becomes challenging. The XMS40 hardware appliance brings wire-speed throughput and acceleration to these vital message flows, ensuring robust security and higher overall application performance.

New SOA Security Services From IGS Complement

IBM's service security software products above are complemented by a comprehensive set of IGS SOA infrastructure management and governance services now offered, developed on the basis of IBM's extensive experience of hundreds of customer SOA security projects. These services enable policy-driven security decisions, the realization of WS-Security standards, and the establishment of federated identity and authorization capabilities. They also cover the protection of SOA and Web services implementations and messaging, security administration & management, auditing & compliance. To help SOA customers get started with SOA security, IGS has introduced new SOA service security offerings. These include:

- SOA Application Security Assessment.
- SOA Security Architecture.
- SOA Security Requirements.
- SOA Security Implementation.

These services are designed to help customers with every aspect of SOA security planning, including managing user identity and access control; securing transactions across multiple, distributed systems, and developing consistent security management policies.

SOA Service Security Customer Example – ING Group NV

Since 2005, Europe's sixth largest financial institution by market value in 2005 – Netherlands-based ING Group – jumped six places up the league in just one year. ING executives credit this success to its innovative, low-cost, customer-focused services, delivered through many channels. These include Web services, call centers, intermediaries and branch offices. Figure 20 shows highlights.

ING's IBM SOA service security solution, helped by IGS services, projected 3-year €15M/US\$20M total savings, enabled a 50% reduction in security administrators, cut help desk costs 25%, and slashed new user turn-on time from a week to 24 hours.

ING Group N.V – Service Security



Challenge

ING needed to reduce the time and cost of managing employee access to information while ensuring staff could quickly respond to business change.

Solution

Launched automated identity integration services and an entitlement program to substantially improve staff productivity and reduce the cost of identity management.

Benefits

- Projected savings of €15million (US\$20 million) a year.
- 50% reduction in administrators in just 18 months.
- Reduce help desk costs by 25% through the self service of password resets.
- Reduce the turn on time for new users from one week to less than 24 hours.
- Reduce the time and cost associated with regulation compliance.

“Using IBM Tivoli Access Manager and IBM Tivoli Identity Manager together enables us to reduce costs and simplify processes even further. Now we can manage multiple user and authorization administrations from a single point of control.”

Henk Veerman
Information Security Architect,
ING Entitlement Program

- IBM Tivoli Identity Manager
- IBM Tivoli Access Manager

Figure 20: ING Group N.V. – SOA Service Security

Our Analysis

Most SOA adopters will begin their SOA deployment using classic DMZ and perimeter security techniques, but will want to rapidly move up to the next level of fuller application and services security, as their SOA usage expands. Ultimately, these users will also want rigorous, end-to-end security processes, and the fullest possible automation of security operations.

In the multiple-participating-organizations world of ecosystem SOA applications, only federated identity management technology provides a workable identity management and user authentication approach.

At the enterprise level, for System z9 mainframe SOA users, the full-scale, full-function, identity management solution for SOA is offered by the comprehensive **IBM Tivoli Federated Identity Manager for z/OS** product, available in the V6.1 release since 06.15.06.

For smaller/medium enterprises, or first-step SOA projects, the **IBM Tivoli Federated Identity Manager – Business Gateway**, available now in the V6.1.1 release, provides a simpler, lower-cost, easily-manageable FIM solution, ideal for collaborative ecosystem SOA applications.

Where higher volumes of SOA-generated XML message traffic are flowing or planned from larger SOA applications portfolios, the IBM WebSphere DataPower XML Security Gateway XS40 appliance offers extensive, wire-speed XML security support and acceleration, and can make a major contribution to overall SOA application performance and QoS.

A well-proven range of IGS service security are now offered to help customer define, establish, architect and deploy an effective enterprise service security solution appropriate to their needs and deploying the most appropriate IBM products above.

8. SOA Service Management on System z

Introduction

With many transformed, new critical business processes being built on top of new SOA composite applications, at a rapidly increasing rate by so many enterprise SOA adopters, managing these end-to-end, when they may span mainframe and non-mainframe platforms, for performance, reliability and service-level delivery, has become vital. This is the domain of service management for SOA, a logical complement to the service security for SOA assessed in the previous Section. Below we highlight the essential requirements for effective SOA service management, review and assess the IBM mainframe software products that now support service management, and outline the professional services now offered by IGS to support customers in becoming established with this important new SOA discipline.

Service Management Requirements for SOA

When considering SOA service management, customers require deep insight, clear visibility, and full control across all the services running on their mainframes, and across heterogeneous platforms, end-to-end. In more detail, the three principal requirements for service management in an enterprise SOA environment are:

- **Automation and simplification of IT processes:** This must include release management for rapid service deployment, performance management across all services, and overall availability management for the applications these services are supporting.
- **Manage service and application service levels:** Customers need the improved flexibility offered by services dashboards for service-level reporting. They also require services to be monitored end-to-end, to enable them to isolate and fix problems. Finally, for productivity and speed, automated provisioning and control of services to meet SLAs are also required.
- **Predict and manage change across linked services:** Customers need facilities to discover relationships that enable them to improve application availability. They require support to track and predict change to reduce costs and downtime. They also need to be able to map and manage configurations to streamline operations.

These are new and demanding SOA service management requirements.

Delivering Service Management in a Mainframe SOA Environment

The principal product from IBM that supports many of the above requirements is the IBM Tivoli Composite Application Manager (*ITCAM*) for SOA, V6.1. This sophisticated software helps SOA users manage all their services to meet business objectives, by monitoring and adjusting resources to make sure they are used most efficiently. It mediates services, enforces policies, and enables users to trace transactions and accurately diagnose problem root causes. ITCAM for SOA is supported and complemented by the new IBM CCMDB product.

- **IBM Tivoli Composite Application Manager for SOA for z/OS, V6.1:** Integrates with CCMDB and WSRR.
- **IBM Change and Configuration Management Database v1.1.1:** Integrates with ITCAM above.
- **Tivoli Monitoring Family:** Extensive range of related PA/PM tools, not covered here.
- **IBM WebSphere Services Registry and Repository for z/OS, V6.0:** Assessed fully in Section 6. Integrates with ITCAM.

The first two of these products are each assessed in detail below.

IBM Tivoli Composite Application Manager for SOA for z/OS, V6.1

IBM Tivoli Composite Application Manager for SOA (*ITCAM for SOA*) for z/OS, V6.1 monitors, manages and controls SOA applications. The component services of these applications may be deployed on a wide range of IBM and third-party systems, including upon the System z9 mainframe, where many of the largest SOA deployments are hosted, and upon which this SOA service management product runs. ITCAM for SOA can proactively recognize, and quickly isolate, Web service performance problems anywhere in the composite application. It can verify that all Web services are available, and are performing to their specification, alerting administrators when Web service performance is degraded. ITCAM can also perform automated service mediation (*for example, to reject/re-route select requests during heavy load periods*). The product also reports service performance results against their committed SLA requirements. ITCAM provides tools to enable administrators to visualize end-to-end service flows, across the enterprise and beyond. For this, the product includes the Web Services Navigator, an IBM Rational/other Eclipse-based tool plug-in, for deeper understanding of service flows, patterns, and relationships, using operational data from the IBM Tivoli Data Warehouse. The product offers built-in and extensible alerts, mediations, situations and workflows which help maintain service performance automatically, without operator intervention, reducing management costs and giving faster response to problem situations. ITCAM thus helps pinpoint and isolate service bottlenecks in the SOA environment, and to highlight their impact on business processes of such service bottlenecks.

The latest ITCAM for SOA for z/OS, Version 6.1 release adds these important, additional capabilities:

- **IBM DataPower SOA Appliance Support:** To monitor appliance Web service traffic in the context of other enterprise WS traffic. Supported environments now added are CICS TS, WebSphere CE, SAP NetWeaver and JBoss Application Server. (*The important DataPower XS40 appliance is assessed in detail in Section 6*)
- **System Component Architecture (SCA) Support:** New SCA initial support allows IBM WebSphere Process Server 6.0.02 and IBM WebSphere ESB 6.0.02 users to monitor SCA-created messages for enhanced SOA performance insight.
- **WSRR Integration:** Now integrates with the IBM WSRR, updating the registry with service execution-time status information, which enables published services to be compared with dynamically-discovered actuals.
- **Extended Automation:** Service automation support is extended to dynamically control WebSphere Process Server and WebSphere ESB-based mediation modules.
- **CCMDB Integration:** ITCAM for SOA, V6.1, adds fine-grained service relationship information to the IBM CCMDB to help manage service dependencies and give a more detailed SOA view.
- **New SOA Graphical Views:** Including graphical service topology and service metadata from WSRR displayed in the Tivoli Enterprise Portal, for faster problem identification, diagnosis and resolution.

ITCAM offers wide heterogeneous SOA software platform support, including WebSphere Application Server, WebSphere Process Server, WebSphere ESB, IBM DataPower SOA Appliances, Microsoft .NET, BEA WebLogic, and SAP NetWeaver, plus the new additions above.

It is therefore the prime weapon of choice for mainframe SOA adopters to manage their SOA service environment.

Analyst Comment: This new release of ITCAM for SOA considerably strengthens this important service management product, with tight integration to other central parts of IBM's SOA Foundation, such as the WSRR, and to the IBM CCMDB, assessed below. It is therefore the prime weapon of choice for mainframe SOA adopters to manage their SOA service

environment. ITCAM for SOA is thus a core component of the IBM SOA Foundation, and of IBM's IT Service Management (*ITSM*) solutions designed to deliver services based upon a best practices framework.

New IBM Tivoli Change and Configuration Management Database, V1.1.1

At the core of any Service Management strategy is change management and configuration management. The new IBM Tivoli CCMDB provides an enterprise-ready platform for storing deep, standardized data on configurations, and change histories, to help integrate people, processes, information and technology. CCMDB features a non-intrusive, agent-free, discovery approach provides fast and automated application discovery, deep configuration details, enterprise-class security, and easy integration with other data sources. Discovery includes a variety of computer systems, network devices, applications, middleware, and databases. CCMDB offers a convenient portal interface, through which users can create, assign, monitor, notify, act upon and report on change requests and configuration items using a best practice ITIL process. The CCMDB data integration capability enables existing operational management products, from IBM and other vendors, to be integrated with the CCMDB, providing a consolidated view of the infrastructure, and preserving existing investments. The product also includes a toolkit that allows users to create custom discovery library adapters and integration modules specific to their environment needs. Advanced capabilities, and their benefits, include:

- **Automated application mapping:** Agent-free discovery of configuration items, and transactional relationships, helps identify/manage resources, in the context of the services they support.
- **Best Practices (BP) change management process:** Out-of-the-box BP value built on years of expertise, gives faster time to values, and reduced change implementation risks.
- **Integrated configuration management:** Enables an organization to manage desired states of configuration item, application, and service configurations, which helps validate compliance with internal and external policies.
- **Process integration platform:** CCMDB allows additional ITSM processes to be easily integrated, supporting higher organizational automation and productivity.

CCMDB thus provides a scalable change and configuration management platform to underpin most ITSM initiatives.

Analyst Comment: The new CCMDB is an important advance that helps user organizations assess change impacts, reducing business/service risks. It also helps ensure compliance (*internal and regulatory*) by tracking all changes and by enforcing change policies enterprise wide. The CCMDB also simplifies architectural complexity and reduces incident and problem management costs. By integrating, automating and optimizing data, workflows and policies, the CCMDB helps users better align IT infrastructure management with business priorities. When used in conjunction with ITCAM for SOA for z/OS, V6.1, above, it completes a comprehensive service management foundation for enterprise SOA.

New SOA Service Management Professional Services From IGS Complement

IBM's service management software products above are complemented by the comprehensive set of IGS SOA infrastructure management and governance services now offered, developed on the basis of IBM's extensive experience of hundreds of customer SOA security projects.

IGS now offers four, new, service management professional services offerings, and each designed to help customers gain greater insight, visibility and control of these systems. These new professional services are:

- **Management of Services for SOA.**
- **SOA Management Planning.**
- **Business of IT Dashboard.**
- **Testing Center of Excellence for SOA.**

These services help customers prepare to better manage IT processes, manage transaction workflows, manage and automate processes, and predict and manage change. The Business of IT Dashboard service, for example, helps customers to manage IT like a business as they seek to realize the fullest benefits from SOA deployment. Its CIO IT Dashboard delivers real-time visibility of IT performance metrics to the business, based on real business priorities, for example.

SOA Service Management Customer Example – ACI Global

ACI Global is the roadside assistance service business, formed in 2001, of the long-established dell'Automobile Club d'Italia motoring organization that dates back to 1905. ACI Global delivers a wide range of services to its several million members, including roadside assistance, recovery, breakdown, and medical, etc. It therefore operates large-scale call-center operations to provide these critical services for members in trouble. Figure 21 (*on page 42*) shows highlights.

ACI Global – SOA Service Management



Challenge

ACI Global needed to create more flexible and responsive operations to maintain competitive advantage. They sought a better way to manage control and track all call center activities.

Solution

Implemented a flexible SOA based call center system called "Centrale Operativa." The environment facilitates the creation of smoother, more efficient processes for providing customer assistance through the call center.

Benefits

- 20% improvement in response times to customer calls.
- 30% increase in call center productivity.
- 25% reduction in the time taken to deliver new commercial products.
- Complete view of system health enables keeping the solution running efficiently.

"The IBM software that we now use has encouraged better business practices throughout our organization, making our company as well as our customers more profitable."

ACI Global

- IBM Rational Software Architect
- IBM Tivoli Monitoring
- IBM Tivoli CAM for SOA
- IBM Tivoli CAM for WebSphere
- IBM WebSphere Message Broker
- IBM WebSphere Process Manager

Figure 21: ACI Global – SOA Service Management

ACI Global's IBM SOA Foundation-based SOA service management solution delivered 20% faster customer call response times, raised call-center productivity by 30%, and reduced time-to-market for launching new products by 25%.

Our Analysis

Most SOA-adopting customers will begin their service management adoption with SOA application performance management as their first important step. Moving up, to add change and configuration management, will be their next step, bringing many additional benefits. The third step, implementing automated process managers, will complete their service management environment for enterprise SOA on their mainframe platform, and will increase productivity, alert faster for bottlenecks and enable higher QoS to be delivered for the SOA environment. The principal IBM products that support this are ITCAM and the new IBM CCMDB,

...IBM now provides a first-class service management capability for SOA environments...

integrating closely with the other IBM SOA Foundation products noted above, many assessed elsewhere in this White Paper. A valuable, new set of complementary IGS services are now also offered to guide, help and assist customers to progress down this service management path faster and more smoothly.

Overall, IBM now provides a first-class service management capability for SOA environments that its thousands of mainframe customers now advancing along their SOA adoption path would be well advised to start implementing through 2007.

9. SOA Service Virtualization/Provisioning on System z

SOA Deployment Brings New Workload Patterns – Mainframe Best Matches

New SOA business applications supporting transformed business processes across the Web, and across partner ecosystems, will naturally often have more variable, faster-changing, less-predictable, and less regular, patterns of workload peaks/troughs than the more bounded, traditional, internal, enterprise applications IT users are all familiar with. This places stringent new demands upon the whole IT infrastructure supporting these new SOA applications, both hardware and software. This SOA software/hardware infrastructure must be able to cope with much faster demand changes, with sharp swings in end demand, whilst maintaining high standards of service at all times.

The System z9-z/OS platform, as we highlighted in earlier Sections, provides the ideal base platform for SOA because it is clearly, and by a large margin, far the world's most scalable, reliable, available, and dynamically-responsive, server hardware/operating system combination. It employs the industry's most advanced, flexible and dynamic virtualization of all mainframe server resources, and adds sophisticated, automated, policy-based workload management to meet business policy-driven SLA goals, for all supported workloads. These unique capabilities make the mainframe far the pre-eminent enterprise SOA hardware/operating system platform. Strong though these mainframe SOA base capabilities are, however, alone they are not enough for the large-scale, production SOA of tomorrow.

New Need – Service Virtualization – Introduction

In an enterprise SOA software architecture, we now also need **service virtualization and workload management** driven by business service policy. This must now be provided **within the enterprise SOA middleware software infrastructure** itself, as well as on the supporting hardware. These software service virtualization capabilities are closely analogous, in aim, scope and function, to the server virtualization and workload management of the mainframe base platform itself. This vital, quite new, area is termed **SOA service virtualization**. Its underlying concept is that a user's running business and system software services should be further decoupled from specific SOA middleware software server instances, by a service software virtualization layer. This is similar conceptually to how server virtualization operates, in its most advanced form on the mainframe, isolating whole server workloads from the specific physical hardware resource running them.

Once service middleware software is virtualized, more automated workload management, and dynamic software server resource provisioning, also becomes possible within the SOA middleware software stack (*as well as at the mainframe hardware and OS level*). These, in turn, can allow the SOA middleware stack itself to respond faster in real-time to service workload demand changes, and can help assure service QoS and SLA delivery. It can do this by increasing/decreasing **software server resources** where needed, or by redirecting incoming requests to less loaded software servers. Using service software virtualization enables customers to actively manage a virtualized, SOA application middleware software hosting environment that is able to increase the utilization, flexibility and resiliency of the overall SOA business environment, and also more fully exploit the underlying, server virtualization capabilities of the host mainframe hardware platform.

SOA service virtualization therefore helps to ensure that customers using an SOA can dynamically apply the right software resources to services and business processes.

SOA service virtualization therefore helps to ensure that customers using an SOA can dynamically apply the right software resources to services and business processes. The new service virtualization products and services for SOA augment capabilities originally created to shift processing power in IBM servers.

In addition, as SOA growth drives the use of more complex, highly-virtualized software and hardware environments, the issues of recording, tracking, allocating and charging back users for the now-virtualized IT software and hardware resources their applications are consuming, become much more difficult. This is especially true in mainframe environments that share all their resources over scores or hundreds of applications/workloads. Most IT users, and especially every commercial IT outsourcing provider, thus now requires a new, and more sophisticated, generation of IT resource usage accounting and chargeback software able to cope with this more dynamic, virtualized, SOA-driven environment, with its higher data volumes.

Service Software Virtualization Requirements for SOA

The new user requirements/needs of service software virtualization for SOA are that the SOA middleware software infrastructure supporting the user's portfolio of business services (*and thus of composite business applications*) and system services, should offer the three primary new capabilities shown and amplified below:

- **Automatic scaling to support services demand:** As service workloads grow, users need to be able to simplify and consolidate the number of SOA middleware software server instances as much as possible. They also need to be able to orchestrate software server resources to scale-up or scale-down dynamically, under changing service demand levels.
- **Intelligently respond to business priorities:** To attain business service goals, users need the means to intelligently place incoming service demands upon the SOA middleware software servers best able to support them. They also need dynamic service workload management, using the resource virtualization of the SOA middleware, so that software resource allocations can be increased or decreased where needed automatically. Service mobility, to enable services to be dynamically moved from heavily loaded to lightly loaded servers, is also desirable.
- **Accelerate application and service performance:** Not all incoming service demands have equal business priority, so users require means of categorizing their priority, and of dispatching them to software server resource appropriately. Service lifecycle management disciplines also require that our SOA run-time infrastructure can validate that the right version of a service is being called in an incoming service request, for example.

In ultimate form, this service software virtualization layer would ideally also directly drive the supporting server resource virtualization; for example, to dynamically add processor or I/O resources to a mainframe LPAR partition supporting heavily-loaded WebSphere Application Server instances that are slowing under their load.

Service Virtualization, Workload Management Products for Mainframe SOA

IBM's flagship **WebSphere Application Server (WAS) for z/OS, V6.1**, has, for some time, been the most advanced, sophisticated and robust J2EE™ applications server for enterprise workloads available. It already uses a sophisticated architecture that fully exploits the unique capabilities and QoS of the System z9 mainframe and z/OS operating system platform, and will be the core foundation for SOA deployment for every SOA-adopting mainframe user. We have reviewed the WAS for z/OS strengths in depth elsewhere (see the "Related Software Strategies Research" Section on page 65, item 4.)

IBM has now delivered a powerful extension for WAS for z/OS, that encompasses and delivers service virtualization for SOA for a WebSphere environment, called WebSphere XD for z/OS (named in full below). This important and innovative new core product combines with a new release of Enterprise Workload Manager for z/OS, and with the new IBM Tivoli Usage and Accounting Manager, V6.1, together to meet most of the service virtualization requirements above.

- **IBM WebSphere Extended Deployment (XD) for z/OS, V6.0.1:** Assessed in depth below.
- **IBM Enterprise Workload Manager for z/OS, V2.1:** Assessed in depth below.
- **IBM Tivoli Usage and Accounting Manager, v6.1:** Assessed in depth below.
- **IBM Tivoli Dynamic Workload Broker, V1:** Other platforms.

WebSphere XD for z/OS helps mainframe SOA users maximize the cost-effectiveness, scalability, and performance, of their WebSphere environment on z/OS. XD dynamically manages application server workloads across a pool of shared software server resources according to service-level goals, provides enhanced service workload management, and delivers improved performance and scalability.

IBM WebSphere Extended Deployment for z/OS, V6.0.1:

Now available on z/OS, WebSphere XD, V6.0.01, provides a dynamic, goals-directed, high-performance environment for running mixed application types and workload patterns in a single WebSphere environment. It provides the ability to optimize the QoS delivered to the core mainframe J2EE™ application layer. It operates by seamlessly integrating into an existing WebSphere Application Server for z/OS platform installation, extending its strong existing core functionality, and is easily accessible using the same administration console as WAS for z/OS. WebSphere XD for z/OS, V6.0.1, provides improved:

- **Business flexibility:** Run/support WebSphere Java batch workloads and OLTP work in the same application server, whilst enabling centralized management for a heterogeneous IT infrastructure of both WebSphere and non-WebSphere application servers.
- **Extended manageability:** Offers simpler, improved management of complex system operations with real-time visualization tools, application versioning, and gradual, controlled implementation of autonomic capabilities, such as health management, that help reduce costs and complexity of IT resources managing.
- **Intelligence:** Enables the J2EE™ application environment to support a focused configuration of WebSphere resources, and increases enterprise speed of adaptation to business change.
- **High-performance computing:** Optimizes business-critical applications performance, supporting near-linear scalability for high-end transaction processing.

Mainframe customers can now optimize resource utilization and management of z/OS WebSphere infrastructures, and deliver enhanced QoS to business-critical applications. WebSphere XD essentially provides a "Business Grid", or application virtualization service, in which-long running workloads (*J2EE™ batch processing and compute-intensive workloads*) can run simultaneously with OLTP workloads under advanced scheduling algorithms, reducing resource duplication. It can also improve transactional application performance with near-linear scalability and high availability, via an advanced object caching framework and partitioning. WebSphere XD can also enable continuous WebSphere application availability, and simplify complex software infrastructure management, with its in-built monitoring and display facilities. WebSphere XD for z/OS, V6.0.01, became available 01.27.06.

*...bringing new levels of greater manageability,
responsiveness...*

Analyst Comment: WebSphere XD for z/OS is an industry breakthrough advance in application server technologies that delivers on the service virtualization imperatives for large SOA environments that we outlined above. It provides a major extension to the rock-solid, high-performing WAS for z/OS, V6.1

that powers mainframe users' SOA environments, bringing new levels of greater manageability, responsiveness to business change, and high-performance to their fast-growing enterprise SOA workloads.

IBM Tivoli Usage and Accounting Manager for z/OS, V5.1

First made available on 06.06.06, IBM Tivoli Usage and Accounting Manager (*ITUAM*), V5.1, is a new type of computer resource metering and usage accounting software. It measures, analyzes, reports, and bills, based on usage and costs of shared, mainframe-computing resources. This important new product helps both mainframe enterprise users and IT outsourcing providers track and bill for all mainframe computing usage, and to better meet their SLAs. The product incorporates technology from IBM's January 2006 acquisition of CIMS Lab and provides a Web-based interface that meters and bills technology use. ITUAM lets customers measure their virtual server, storage, network, software, middleware and e-mail "consumption" by company, department, or even individual, and supports billing of that usage to either outsourcing clients, or to individual departments inside a company.

With today's more complex, virtualized IT environments, it is essential that shared and virtualized IT resources can be accurately tracked, and costs fairly allocated to users. Traditional computer usage accounting has lagged behind this change, and cannot support the virtualized system models now in widespread use today, especially on the mainframe. ITUAM for z/OS collects mainframe usage information from Tivoli Decision Support for z/OS, and allocates costs to the appropriate user and/or department. These two products combined support a wide range of z/OS, 390 data sources, including z/OS, CICS, NPM, IMS, MQSeries, RMF, DB2, Linux/390, and WebSphere Application Server for z/OS, to name but a few.

Many clients have struggled with the issues of how to account for usage and bill departments, essential if the many separate departmental infrastructures are to be consolidated through virtualization onto shared mainframe server resources, or multiple outsourcing customers are to be supported from shared mainframe systems fairly. ITUAM solves this long-standing problem, and offers extensive functionality, including:

- Evaluation of computing usage trends and applying actual, billable costs to each computation and department.
- Providing outsourcing service providers with a simple way to show clients how exactly the SP is measuring and meeting SLAs in IT outsourcing jobs.
- Helps guide decisions on where dedicated or shared IT resources should be placed, for customers with multiple geographical locations, based on actual resource usage trends.
- Measures utilization across all the main hardware, operating system, applications, and other technology resources, providing ideal insight to guide consolidation planning into a single, seamless infrastructure.
- Provides comprehensive, customizable usage and trend reports on server and storage use, database transactions, printer outputs and network traffic, plus others.

ITUAM is one of IBM Tivoli's ITSM offerings, which automate/simplify the way companies manage their IT infrastructures. ITUAM is priced from \$75,000 (USA) for mainframe customers.

...ITUAM will be widely welcomed by customers wrestling with the limitations of ancient chargeback solutions...

Analyst Comment: With the many multiple, mixed workloads run on today's highly-virtualized mainframes, usage accounting and chargeback is a crucial need in expanding SOA environments, and ITUAM will be widely welcomed by customers wrestling with the limitations of ancient chargeback solutions designed decades ago for a physical systems age.

IBM Enterprise Workload Manager for z/OS, V 2.1.

First announced as the IBM Virtualization Engine Enterprise Workload Manager (*EWLM*) for z/OS, V2.1.0, this EWLM release extends dynamic, policy-based workload management to improve resource optimization in multi-tiered heterogeneous application environments. Today, customers commonly have multiple servers/storage devices running a variety of operating systems/middleware. EWLM offers simplified workload management across these diverse IT infrastructures, with automatic monitoring of multi-tiered, distributed, heterogeneous or homogeneous workloads, to better achieve defined business goals for end-user application services. As business units of work traverse these multiple operating environments, the EWLM for z/OS extends mainframe-style workload management technologies outwards, allowing businesses to monitor and manage their applications and resources across heterogeneous computing environments.

With EWLM for z/OS, application performance is measured against predefined goals by end-to-end data collection and reporting from/to all parts of the application on all platforms running it. Both IBM, and select non-IBM, platforms/operating systems are supported. This release expanded the OS platforms supported (*as EWLM Domain Managers, and as EWLM Managed Servers*), for wider coverage of heterogeneous applications. This now includes the capability to manage from z/OS, and from all current IBM servers running most current Linux OS releases. (*As the EWLM Domain Manager platform*). EWLM Managed Server platforms now include all IBM servers running Linux, and servers running AIX, OS/400-i5/OS, MS Windows, Sun Solaris, and the HP/UX HP-UX, operating systems.

On z/OS (V1.6 & V1.7), EWLM users can correlate EWLM reporting with z/OS WLM reporting, and can define specific goals for EWLM end-to-end work requests. This EWLM release, running on z/OS, can also apply new, dynamic, goal-oriented EWLM server resource optimization algorithms to help optimize LPAR CPU management on P5 servers (*p5 or i5*) running AIX, i5/OS, or Linux on POWER (*if applicable EWLM Managed Server components are licensed*). Both ARM-instrumented (*e.g. DB2, WebSphere Application Server*), and un-instrumented software applications, can benefit from EWLM. However, ARM-instrumented applications benefit more, with finer-grained controls, and better end-to-end-based management.

EWLM self-tuning autonomic technology can also redirect work, using EWLM-enabled routers, to achieve specific performance goals for each service class, and can directly adjust IBM P5 server partition resources to better meet these goals. It also influences network traffic routing decisions by network load balancers, to achieve improved application performance. EWLM enables users

EWLM for z/OS thus brings better performance management to distributed systems, helps administrators monitor workloads across the mixed infrastructure, check performance, and ensure business service levels are met.

to identify work requests based on service-class definitions, and to track the performance of those requests across server and subsystem boundaries, across the supported set of servers, routers, and other devices (*which must each be enabled with Java™ virtual machine support*).

EWLM for z/OS thus brings better performance management to distributed systems, helps administrators monitor workloads across the mixed infrastructure, check performance, and ensure business service levels are met. It can also help pinpoint which

components/servers are causing an application problem, and identify the users affected. It can also apply performance goals specific to defined user classes. EWLM also helps administrators to track where the time is being spent in a complex, distributed, multi-tier application, and identify the servers supporting each application, as well as what applications are running on each server.

EWLM uses similar advanced workload management technologies to those of the System z mainframe itself. Mainframe users will be familiar with the longstanding z/OS Workload Manager (*WLM*) function. This allows z/OS to perform automatic sense and response management of multiple, diverse, mainframe-resident workloads, based on business policies and workload performance objectives. WLM's scope extends from the network, with intelligent TCP/IP and SNA routing, within a single z/OS image, out to the disks where the data is stored. WLM can also manage priorities across multiple systems in a Parallel Sysplex. The Intelligent Resource Director (*IRD*) function extends z/OS WLM capabilities to automatically balance CPU and channel resources across LPARs on a System z9 or zSeries server, again based on business priority. These superb, well-proven, industrial-strength facilities are central to the mainframe's high utilization, QoS, and efficiency.

EWLM for z/OS extends similar capabilities across multiple platforms to monitor applications and resources. Thus, a z/OS customer can continue z/OS management with WLM, and add EWLM to intelligently monitor and manage application workloads, workflows, and allocation of system resources, across heterogeneous environments (*including AIX, OS/400, Linux, Windows, Solaris, and HP/UX*) based on business policy and priority. EWLM and z/OS WLM can run simultaneously, and EWLM monitoring does not affect z/OS management and monitoring.

Analyst Comment: EWLM is a breakthrough technology that brings self-optimization, in the form of performance and response time management, to an entire EWLM-enabled, distributed IT environment from z/OS. It allows system administrators to define business-oriented performance objectives for workloads running across different platforms, and then monitor and manage actual performance against those objectives. This second major release significantly expanded its scope and capabilities. The fullest evolution of this sophisticated technology is likely to take several more years, with function, platform, instrumentation, autonomic and other further advances likely.

Service Virtualization Professional Services

To help SOA adopting customers to exploit service virtualization, IGS now offers a new Web infrastructure optimization and virtualization professional service designed to help these customers optimize their resource utilization and management of their SOA-supporting IT infrastructure. This service seeks to help customers facilitate the seamless distribution of WebSphere applications, enable continuous availability of these applications, and to dynamically optimize application resources and availability to user workloads.

- **Web Infrastructure Optimization and Virtualization Services (*new*).**
- **Server Virtualization Services.**

This new service is complemented by an existing portfolio of IGS Server Virtualization Services. These focus on how customers can best exploit advanced IBM System server virtualization technology, found at its most advanced and extensive on the System z9 mainframe.

Service Virtualization Customer Example – TORN Sp. z o.o.

TORN Sp. z o.o. provides strategic consulting services to a variety of companies in Poland. Founded in 1997 and headquartered in Warsaw, TORN designs and implements complex IT systems for its customers, many of whom require high security in their business processes. TORN's successful experience with an IBM SOA service virtualization solution is summarized in Figure 22

TORN Sp. Z o.o. – SOA Service Virtualization

Challenge

- Support the company's rapidly growing internet services business in a cost effective manner.
- Align clients infrastructure costs with revenue.
- Business and infrastructure continuity within minutes.
- Reduce complexity in the IT environment to streamline operations.

Solution

A virtualization solution from IBM that allowed rapid scaling to meet demand while enabling the ability to have fine grained accountability of usage.

Benefits

- “We can increase the computing power available to our clients internet services on demand, enabling them to respond precisely to transactional peaks.”
- “We can now respond very quickly to new requirements, potentially setting up entirely new systems within days or hours, without sacrificing availability or security.”




- IBM Dynamic Resource Virtualization
- IBM WebSphere Application Server

Figure 22: TORN Sp. Z o.o. – SOA Service Virtualization

The IBM SOA Foundation-based service virtualization solution cut TORN's new customer service provisioning time from 30 days to 48 hours, helped TORN support an increase from 100 customers per day to 4000 per day, and enabled new channels for subsidiaries and co-operatives to be introduced.

Our Analysis

Service virtualization for SOA is perhaps the least widely-understood, new SOA technology of those we have discussed in this White Paper, but is of increasing importance as the size and sophistication of customer SOA environments grow rapidly with increased adoption. For this reason, we devoted more coverage to it here than to the previous SOA Service Security and SOA Service Management topics, but only because these are the new SOA equivalents of long-familiar IT technologies most users already understand well, and so are perhaps easier to understand.

Most SOA customers will begin their SOA service virtualization adoption with considerations of service placement (*which server platforms and where to use for SOA*), and of how to achieve SOA infrastructure scaling as their SOA environment and workloads expand. Many mainframe SOA users are now reaching the levels of SOA workload where these scaling needs are becoming important to resolve. Adding **WebSphere Extended Deployment for z/OS, V6.0.1**, will provide an important solution that answers these needs.

We foresee steadily-increasing emphasis on fully managing the entire service lifecycle also becoming widespread amongst larger SOA adopters, as their service portfolios rapidly grow. We reviewed the case for SOA Lifecycle Management, and the strong SOA Governance it requires, fully in Section 6. Many of these users will find it helpful to adopt **IBM's SOA Governance & Management Method** to guide their efforts. We also assessed there the central **IBM WebSphere Registry and Repository for z/OS** server software that provides the hub for Service Lifecycle Management. The WSRR also provides important run-time service metadata access to support the whole IBM SOA run-time server software infrastructure. For example, the application server can check with the WSRR whether the service it is being asked to run is the correct production version, or to determine what its published service level is.

Longer-term, advanced SOA users will wish to take advantage of service mobility, where they will be able to dynamically move services between servers, to better adjust their performance and service levels.

Managing multi-tier, distributed applications across heterogeneous, distributed environments and the mainframe has long been a nightmare challenge for many enterprise users. It was long extremely difficult to monitor, manage, optimize, deliver assured service levels, and to troubleshoot performance bottlenecks in such environments. Frequent “finger-pointing” meetings between all the IT teams involved have been widely reported to us by many CIOs. SOA will drive further, wider, and more granular forms of distributed computing across multiple platforms, within and beyond the enterprise. To the rescue, here comes the **IBM Enterprise Workload Manager for z/OS V2.1**. This is a true industry-first leadership innovation. Based on technology similar to the sophisticated, long-proven mainframe workload management technology, EWLM running on z/OS now brings some real relief to these challenges. It also enables the new **Enterprise-wide Workload Manager** role for the mainframe platform. Now in its second major release, EWLM holds high promise, and many future extensions can be expected.

Being able to account accurately for all computing resource usage on sophisticated, virtualized platforms, such as the System z9 mainframe, especially when running a large SOA workload, is vital for recharging the business for IT service usage. We expect most mainframe users will seek to modernize their older, often outmoded, chargeback approaches. Here **IBM Tivoli Usage and Accounting Manager, V6.1**, provides a much-needed, modern solution that we consider most mainframe SOA users should review/adopt.

10. System z SOA Customer Success Stories

We include here four recent SOA adoption success stories of diverse IBM SOA Foundation software customers, whose experience illuminates many of the assessments and findings of this White Paper.

1. Crowley Maritime Reduced Application Delivery Time/Costs, Improved Efficiency/Productivity with SOA Solution from IBM/Ultramatics

October 13th 2006: Crowley Maritime Corporation (*headquartered in Oakland, California, logistics center in Jacksonville, Florida*) is a global maritime service provider, employing 5,000 people. Founded by Tom Crowley in 1892, and family-run ever since, the firm offers maritime services, from tugs and barges to container ships, with operations from Central America and the Caribbean to Alaska's North Slope. Crowley needed to reposition its business operations to meet the challenges of its second century of operations – including reducing operating costs; increasing profits and ROI from existing routes/platforms; and addressing legacy application modernization. Crowley selected an IBM advanced ESB/SOA based-solution, designed/implemented by Ultramatics, Inc. (*IBM Premier Business Partner – “SOA Specialty” certified, Tampa, Florida*) that included:

- IBM WebSphere Message Broker.
- IBM WebSphere MQ.
- IBM eServer zSeries 890 mainframe.
- IBM WebSphere Process Server.

Crowley was heavily dependent on many hand-coded, point-to-point, custom-built integration links between its legacy applications, each typically taking 300 hours of IT development. Ultramatics recommended an IBM advanced ESB SOA solution that quickly showed a reduction (*by at least half*) of the usual time/costs incurred in tying new, third-party applications into the Crowley core infrastructure, which included a 30-year-old, heavily-customized, mainframe-based, customer-information system.

Business/strategic benefits were even more important. In 1H 2006, Crowley implemented a new transportation management application for inter-modal transportation, to automate the routing of its cargo containers (*hundreds per day*) to dozens of terminals across North America. This major new application easily “plugged into” the IBM advanced ESB/adaptor SOA framework, quickly integrating this major addition with existing systems. This delivered unprecedented efficiencies, with the routes chosen proving better, cheaper and faster, and delivering much-improved customer service/satisfaction.

The Crowley/Ultramatics team has now built at least 20 major interfaces with its advanced ESB by way of the adaptor framework – including interfaces to equipment control systems, the legacy Accounts Receivable system, Customer/Vendor information system, and others. The IBM advanced ESB solution now provides Crowley with a robust middleware backbone for all its future corporate, business and AI.

“This [SOA] solution directly translates to \$225,000 in savings for Crowley over our previous practices. Not to mention the soft dollar implications on resource utilization costs and efficiency as those resources can now focus their efforts on other fronts.”

Jerry Dresch, Director of Application Services, Crowley Maritime Corporation

The IBM/Ultramatics SOA solution reduced application delivery time and costs by half, saved \$15,000 per integration interface, and showed an anticipated \$225,000 saving over previous practices. It also gave significant improvements in business efficiency, productivity, and business flexibility, whilst reducing errors and omissions. It also added years of productive life to Crowley's legacy applications.

The IBM/Ultramatics SOA solution... showed an anticipated \$225,000 saving over previous practices.

Analyst Comment: This excellent, mid-sized customer, mainframe SOA adopter example clearly shows the high ROI and early payback obtainable from, in this case, beginning SOA adoption through the "connectivity" SOA Entry Point. Crowley significantly improved its long-standing mainframe software applications with rapid, quantified, and substantial benefits from its SOA, based on IBM SOA Foundation products and partner SOA services.

2. GROHE AG Enjoys Integrated Solutions on Tap with IBM Service-enabling SOA Software

September 13th 2006: GROHE AG is the largest water technology solutions provider in Europe, is the largest exporter of faucets, bath mountings and other household/commercial fixtures worldwide, and is renowned for its highly-functional, well-designed, attractive fixtures. The 5,600-employee company is based in Hemer, Germany, and has 20 subsidiaries and 12 sales offices across more than 130 countries. Annual 2005 sales were €865 million (*US\$1.1 billion*), 80% exported.

GROHE needed to integrate its new SAP ERP modules with its existing System z mainframe application. These included duty and plant applications, delivery, invoice and product catalog systems, barcoding, logistics and inventory management software. They identified that 14 new interfaces were needed between these and the new SAP ERP modules, which were needed quickly to meet a launch deadline. The options were to implement these with hand-coded, point-to-point links or to purchase/deploy an SOA integration platform to speed this vital task. After considering several vendor proposals, GROHE implemented an IBM advanced ESB solution for SAP integration, using IBM SOA Foundation software, aided by experienced AD/SOA services from SerCon GmbH (*an IBM company*). The solution uses the following IBM SOA Foundation/integration software:

- IBM WebSphere Adapters.
- IBM WebSphere Adapter for JDBC.
- IBM WebSphere Adapter for mySAP.com.
- IBM WebSphere Message Broker.
- IBM WebSphere Adapter Framework.
- IBM WebSphere MQ.

It also used a high-performance IBM System p 670 server running the WebSphere Message Broker that controls message flow, distributes incoming business objects to the right queues, and transforms messages into the format required by recipient systems. WebSphere MQ provides scalable, assured delivery of messages over the company's Gigabit LAN. Passing/transforming between 5,000 and 25,000 messages per day, the IBM advanced ESB solution enabled a global exchange of information via services between decoupled front- and back-end applications. Their SOA used standardized interfaces with common message formats (*XML and SAP Intermediate Documents*), ensuring GROHE business services remain stable and well-defined, yet easy to change for new business needs.

Their SOA used standardized interfaces with common message formats, ensuring GROHE business services remain stable and well-defined, yet easy to change for new business needs.

"Using the older method of point-to-point integration, it would have taken up to six months to program one interface. With the IBM WebSphere SOA integration solution, it took two months to complete all 14 projects. This was a stunning success for our team and our company. In fact, we have now SOA service-enabled our legacy systems, which will facilitate all future business integration projects."

Armin von Dolenga, Software Manager, GROHE AG

With the new approach, von Dolenga estimates that his IT group can now bring a new service online within just two to four weeks. The IBM solution decreased average integration time by up to 84% (*two-to-four-weeks versus up-to-six-months*), and reduced total time/cost of integrating the legacy applications with new SAP modules (*compared to hand-coded, point-to-point integration techniques*). It also provided more reliable and highly-available data transfers, and SOA-enabled GROHE's legacy systems for reuse of its software assets on demand. The IBM solution also decreased average integration time by up to 84%.

Analyst Comment: This successful, medium-sized manufacturer faced the common problem of needing to more quickly integrate long-standing, in-house mainframe applications, with its new SAP ERP application. By implementing an advanced ESB-based SOA solution using IBM SOA Foundation products, the firm achieved dramatically faster and cheaper integration, and gained much greater flexibility to meet future business needs as they change.

3. Xerox Enhances Productivity with IBM SOA Foundation Solution

October 28th 2005: Xerox Corporation (*Xerox*) revolutionized office work, and made its name synonymous with its flagship product, the copy machine. Xerox research is also credited with many innovations that define personal computing today, including Ethernet, the graphical user interface and the mouse. Based in Stamford, Connecticut, Xerox (*www.xerox.com*) has 58,100 employees worldwide.

While copying has been good to Xerox, the widespread duplication of efforts to custom-code new business applications for its many product divisions became a bottleneck that hampered productivity. These divisions need a steady flow of new business applications to automate manual processes, serve customers better and achieve demanding marketing goals. However, building each from scratch was a waste of effort, since many shared common company back-end databases, ERP, and CRM systems.

Xerox sought an ESB-enabled SOA software solution from a vendor fully able to support its software with deep R&D-backed future product development. It evaluated middleware from IBM, BEA Systems and webMethods. IBM showed the SOA leadership, stability and commitment to the market that Xerox required, and helped Xerox implement an advanced ESB-enabled SOA environment. This allowed easy integration of Xerox back-end databases with a new, decoupled front-end application without custom development.

To centralize its new programming efforts, and bring costs under control by using this more efficient method of application development and integration, Xerox created its Integration Competency Center. This group dedicated to integrating Xerox's business applications with back-end systems, built an SOA architecture that would enable them to reuse coding assets and leverage a common infrastructure for integrating a large number of applications.

To provide this universal connectivity solution, Xerox implemented an advanced ESB SOA platform with full failover capabilities using the message-oriented, event-driven and Web services capabilities of IBM SOA Foundation software, including:

- IBM WebSphere Message Broker.
- IBM WebSphere Application Server Network Deployment.
- IBM WebSphere MQ.
- IBM WebSphere Integration Developer.

IBM Business Partner Software Spectrum provided the software solution in a timely manner to help Xerox meet its target project deadline.

"With IBM's help we have moved forward with a service-oriented architecture that helps us respond to today's challenges and gives us a flexible architecture to respond to future challenges. Not only did IBM meet our requirements for scalability, availability and performance, it differentiated itself from the competition with its ability to follow through with R&D that continuously enhanced its portfolio of offerings."

Ram Sunkara, Manager, Integration Competency Center, Xerox

Among the 50 applications that now run on Xerox's WebSphere SOA Foundation infrastructure are Web services for looking up service providers for Xerox's customer support teams, performing credit authorizations, managing customer problem calls, fulfilling parts orders, and capturing user profiles for printers. WebSphere MQ, which provides assured delivery of more than two million messages monthly, provides an essential part of the solution and contributed to its 7*24 availability. Xerox also uses IBM WebSphere Integration Developer to build modular applications that are designed to adapt quickly to changes.

With its new advanced ESB-based SOA solution based on IBM WebSphere software, Xerox estimates that it is saving \$720,000 annually in the cost of making changes to its applications...

Analyst Comment: With its new advanced ESB-based SOA solution based on IBM WebSphere software, Xerox estimates that it is saving \$720,000 annually in the cost of making changes to its applications, which formerly required custom coding to reintegrate with back-end systems. Following the "reuse" and "connectivity" SOA entry points, Xerox has been able to extensively reuse its (*mainframe*) back-end systems under an SOA to assemble new business solutions quickly, for major benefits.

4. Nationwide Deploys Virtualization/SOA Solution on IBM Mainframes, Linux – \$15M 3-year Saving

August 15th 2006: Nationwide, based in Columbus, Ohio, USA, is one of the world's largest diversified insurance and financial services organizations, with more than \$158B in assets and \$21B in revenues, ranking # 98 on the Fortune 100 list. The company provides a full range of insurance and financial services, including auto, motorcycles, boats, homeowners, life, commercial insurance, administrative services, annuities, mortgages, mutual funds, pensions and long-term savings plans, through its various subsidiaries that are leaders in their marketplaces. With 30,000 employees, Nationwide's entire business portfolio is completely dependent upon its IT systems, and the firm employs 6,000 (20%) of its staff in IT-related functions.

Like many other large enterprises, Nationwide had long used both traditional-style, centralized IBM mainframe computing and a burgeoning population of distributed servers (*UNIX and Windows*). Specifically, Nationwide had already deployed a total of 5,000+ distributed servers. Its own detailed studies showed these were, on average, just 10% utilized, and that 78% of them never exceeded 50% utilization even at their highest workload peaks. Consequently, the company was spending valuable resources and time maintaining costly physical servers that took up expensive data center space, consumed energy, and used only a small fraction of their available computing power. Just to provision and bring up a new distributed server for a new application took several weeks of elapsed time, and each was of fixed capacity, so had to be heavily over-specified for peaks.

More critically, Nationwide's existing data centers were rapidly running out of floor space, power and cooling capacities. If the firm's past distributed server growth rates had been allowed to continue, the company faced spending several \$10Ms of investment on data center expansion. Nationwide chose another path to overcome these severe distributed computing problems.

In a LinuxWorld (08.16.2006), keynote presentation, Nationwide announced (*and shared details of*) the successful completion of a large-scale virtualization/SOA solution deployment, running SUSE Linux (*SLES9*) from Novell on IBM zSeries mainframes. The solution has helped Nationwide dramatically reduce the TCO of this part of its IT environment, with 3-year savings projected at a minimum of \$15M.

...with 3-year savings projected at a minimum of \$15M.

At that date, two IBM System z900 mainframe servers had been added, deploying over 350 virtual servers, by means of IBM's sophisticated z/VM 5.2 mainframe virtualization software, each running Novell SLES9 Linux, dramatically reducing the costs of data center floor space, power, and Web hosting. Then, these 350 virtual servers were already supporting 12 new mission-critical Nationwide business applications that were heavily accessed/used by more than 100,000 users per day. This number of virtual servers was expected to have climbed to 600 by end-2006. One of the z900 mainframes (*7 IFL processors*) ran all the production workloads, and the second z900 (*8 IFL processors – at a second remote site*) ran all the associated development and test workloads. This second system also provided a complete Disaster Recovery/Business Continuity (*DR/BC*) capability, able to take over and run the entire production workload quickly, should the primary production site go down, using enterprise storage mirroring to replicate data to the secondary system/site. This dual-site/system design alone provided a superior level of DR/BC for these critical applications, one either not achievable at all, and/or completely unaffordable, with distributed systems technologies. Implementing this entire impressive solution took only 4 months.

Nationwide enforces strict SOA architectural standards on all new applications built, demanding they be written in Java J2EE™, utilize the **IBM WebSphere Application Server SOA platform**, Oracle or IBM DB2 database, and the Linux operating system. All the twelve new mainframe applications above used these standards, and employed classic 3-tier architecture (*Web server, application server and database server*). In this case, all of these were virtual servers on the IBM mainframe, not the standalone, physical, distributed servers normally used. Virtualizing all three tiers of these modern SOA applications into virtual servers, all running and intercommunicating within a mainframe z/VM partition, is the essence of a modern, highly-efficient, virtualized SOA infrastructure.

...demanding they be written in Java J2EE™, utilize the IBM WebSphere Application Server SOA platform...

"Virtualizing Nationwide's IT environment on IBM mainframes running Linux has allowed us to significantly reduce the total cost of ownership of our Web hosting environment by leveraging open source technology, such as SUSE Linux, instead of getting tied to proprietary solutions."

Guru Vasudeva, AVP and Enterprise Chief Architect, Nationwide

This new mainframe SOA virtualization solution now enables Nationwide to quickly create/provision new, virtual Linux-based servers in minutes, making it far more responsive to business needs/changes. The resources allocated to each virtual server can also quickly and easily be changed, to meet workload demand changes far more quickly. The company is now supporting/consolidating additional workloads and running a dozen plus major applications on just two IBM mainframe computers, rather than on the 350 physical servers it would have otherwise purchased. 80% less data center floor space (*and a fraction of the power and cooling*) is needed with this mainframe solution, deferring the \$10Ms of data center expansion investment that would have otherwise been needed.

Supporting the new virtual servers has also proved far more productive. Nationwide previously found one Systems Administrator/Systems Engineer (*SA/SE*) was needed to support every 30 of its physical distributed servers. With the mainframe virtual server solution, they found one SA/SE could easily support 100 virtual servers, a more than 3-fold support productivity improvement and a large cost saving, given that the staff support costs of distributed systems are by far the largest source of TCO. Equally striking were the software license savings. Enterprise middleware products are usually licensed according to the number of CPUs they run on. This mainframe solution used only 15 z900 CPUs to run the production/test/development/DR/BC workloads that otherwise would have needed 350 distributed servers/over 500 processors (*using typical mix of 1-way and 2-way servers*). Even given higher per-CPU license costs for mainframe software, the software license savings were also substantial, another compelling argument favoring mainframe-based SOA.

The company now also has far greater flexibility to boost its computing capacity to handle spikes in demand. For example, Nationwide promoted its re-branded Web site by advertising heavily during the 2006 Super Bowl XL event, and was able to use IBM's mainframe Capacity On Demand to rent an additional mainframe CPU to easily cope with the resulting workload spike for a two-week period.

It was also able to defer \$10M of new data center capacity investment otherwise needed.

Analyst Comment: This is a dramatic example, showing a projected 3-year savings of over \$15M, just from “sweeping 350 distributed servers off the data center floor” up into just two mid-sized, fully-virtualized, IBM z900 mainframes. Nationwide had already gained far greater agility, added full

DR/BC coverage, seen many-fold faster virtual server provisioning, enjoyed an 80% data center floor space reduction, and claimed a 3-fold server support staff reduction, all accomplished in just four months. It was also able to defer \$10M of new data center capacity investment otherwise needed. It is thus not surprising the firm plans to rapidly extend this SOA software/mainframe virtualization solution to many of its applications, to further slash its originally 5,000 distributed server pool. With such massive benefits quickly obtainable, many other distributed server farm customers are certain to follow this route.

Appendix A: Our Assessment: New System z9 Business Class & z9 Enterprise Class

Our May 2006 Mainframe Spotlight Report provided an independent, in-depth assessment of the latest System z9 BC and System z9 EC mainframe hardware, software (*especially new SOA software*) and storage, highlighting their significance/value to enterprise IT users and vendors worldwide. This Report's Executive Summary, reproduced below, provides a concise synopsis of our findings/assessments. This provides a useful baseline for this current White Paper's study of how customers can best manage their SOA environments on the System z9 mainframe.

- 1. Mainframe Transformation Brings Resurgence:** IBM's mainframe underwent transformation in technology, economics, capacity/capability, openness, and in its software stack, from 1993 to 2006. The result was a market revival from the 2000 zSeries introduction, swelling into full market resurgence from 2004.
- 2. Unrivalled Business Value & Technology Strengths:** With this continuous innovation/investment, by 2004 the zSeries mainframe offered unrivalled business values and technology strengths, superior mixed and new workload capabilities, now-favorable economics, deep open standards support, plus an excellent middleware/development tool software portfolio. (See Figure 6 on page 14 for these.)
- 3. Mainframe QoS Ideal for On Demand/SOA:** As enterprises streamlined business models, and integrated their people, processes, and information in this dynamic On Demand era, the mainframe's unique QoS has become ever more relevant and desirable. Compared to costly, sprawling, distributed IT infrastructure, the mainframe now offers truly compelling benefits.
- 4. New Workloads Drive Resurgence:** Modern new-to-mainframe workloads, including Linux, J2EE™, SOA, ERP and BI, have been the resurgence drivers, accounting for 60%+ of mainframe MIPS sold since 2001.
- 5. Lowest Cost Platform:** Over a decade of sharp IBM hardware and software cost reductions, plus extensive new automation that slashed staff needs, made mainframes the lowest-cost, mixed commercial workloads platform today. Contradicting old cost myths, we overview these findings in point 25 below.
- 6. System z9 Generation Extends:** Today's System z9 mainframe generation was first announced in July 2005, and shipped from September 2005, with the System z9 109 high-end systems bringing further large hardware/software advances, and further improved business values.
- 7. New System z9 April 2006 Overview:** This April 2006 new systems announcement was the latest big advance for the mainframe, introducing:
 - The **System z9 Business Class (z9 BC)**, new mainframes for small/medium business.
 - The **System z9 Enterprise Class (z9 EC)** an early refresh/enhancement of the high-end System z9 109.
 - New **zIIP (System z9 Integrated Information Processor)** specialty processors available on the above.
 - New **FICON Express4 4Gbps channel speeds**, for improved I/O capacity and performance on both.
 - Further steps in delivering “**Enterprise-wide Roles**” for System z9.

These new systems are pictured in Figure A1.



Figure A1: New System z9 Mainframes – April 2006

8. **Beijing China Launch:** Reflecting China's soaring economic growth, these new System z9s were announced in Beijing, capital of the # 1 fastest-growing mainframe market. The venue highlighted the good fit that today's mainframes offer for the needs of large and smaller enterprises in the rapid-growth "BRIC" emerging markets, all unburdened with the West's distributed IT legacy sprawls.
9. **Low & High End – Same Technology & Investment Protection:** Notable strengths were the identical technologies, and the excellent investment protection/upgrade paths, offered equally on the new small/medium z9 BC, and by the larger z9 EC systems, without any compromises. These are both unique to the mainframe and mean lasting value, and no disruptive discontinuities, for their customers.
10. **ISV Portfolio Expanding Rapidly:** Now 1,300+ active System z ISVs, 750+ of them in PartnerWorld Industry Networks. Includes 275 ISVs with 800 applications on z Linux for System z, growing 30% YOY. An extensive new IBM "z for ISVs" program was launched at the System z9 Software Summit.
11. **System z9 Business Class Posts Strong Advances:** The new z9 BC mainframes for smaller and medium businesses offer:
 - The same advanced technology as the larger System z9 mainframes.
 - In smaller, more affordable, single-frame packages with sub-capacity processor pricing.
 - 26-1,786 MIPS capacity range with 73 granular capacity settings, 2.6 times the z890's range.
 - 37% more powerful processors than the z890.
 - \$100,000 (USA) new low entry price and two models range.
 - Full set of z9 CUoD options, and comprehensive upgrade paths.
 - Specialty engines – all System z9 types, including the new System z9 Integrated Information Processor (zIIP).
 - Up to 75% more specialty engines, at a lower \$95K price (for zIIPs, zAAPs and IFLs) and with 37% more power.
 - Same extensive OS support as on the larger z9 EC, plus low-cost z/OS.e for new workloads.
 - Strong price/performance actions, brings TCO down by 20% overall.

12. z9 BC – Strong Consolidation Platform for SMB: With these extended capabilities and complete System z virtualization/workload management, the z9 BC provides an excellent systems/workloads consolidation platform to integrate, simplify and make IT infrastructure more manageable, for smaller/medium enterprises.

...z9 BC provides an excellent systems/workloads consolidation platform to integrate, simplify and make IT infrastructure more manageable, for smaller/medium enterprises.

13. z9 BC – Application Solutions Platform: With the above z9 BC strengths plus the rapidly growing System z ISV applications portfolio, these systems provide an excellent, manageable and affordable platform for new customer ISV application solutions.

14. z9 BC – Excellent z890, z800 Upgrade: With higher capacity, finer granularity, improved price/performance, etc., the z9 BC provides a first-class, rapid payback upgrade for zSeries z890 and z800 users. Already firmly committed to z Series, these users will, we forecast, upgrade and migrate to the z9 BC in considerable numbers to obtain these valuable gains.

15. System z9 Enterprise Class, High-end Refresh: Updating the high-end z9-109 announced in July, and available from September 2005, the new System z9 EC systems features:

- **Five-model line-up**, up to **8-, 18-, 28-, 38- and 54-way SMP**, up to **17,800 MIPS** and similar to z9-109.
- **37% more powerful processors** than on the z990.
- **24 new real capacity settings**, subcapacity priced, providing more granular entry points. Subcapacity is available on up to an 8-way CP model.
- **Supports new zIIP** System z9 Integrated Information Processor specialty engine.
- **New FICON Express4 4Gbps channels** for improved I/O capacity and performance.
- Carries all other z9-109 technology advances forward.
- Carries all z9-109 price/performance advances forward.

16. Improved I/O With FICON Express4: New 2X faster FICON Express4 4Gbps channels provides significantly improved data access, and increased I/O scalability, extending the mainframe's data-serving enterprise data hub strength. New z9 MIDAW facility technology helps applications exploit these faster, more efficient channels for improved throughput.

...the z9 EC offers significant capacity, performance, I/O bandwidth, availability, security and price/performance gains, and the fuller range of System z9 specialty processors.

17. z9 EC – Compelling z900 and z990 Upgrade: For customers running earlier z900 (2000 on) and z990 (2003 on) large mainframes, the z9 EC offers significant capacity, performance, I/O bandwidth, availability, security and price/performance gains, and the fuller range of System z9 specialty processors. These benefits combine to make early upgrading to the z9 EC compelling for most of these larger mainframe users already on z/Architecture.

18. Enterprise-wide Roles Rapidly Being Realized: In October 2004, IBM showed roadmaps to equip the mainframe for **Enterprise-wide Roles** in security, resiliency (*business continuity*), workload management, SOA, and data serving across heterogeneous platforms. With these z9 EC advances, these **"enterprise-wide roles"** capabilities are now providing unifying central services to bring back control to complex infrastructure. More are still to come.

19. New zIIP Specialty Engine Boost DB2 Workloads: New System z9 zIIP specialty processor engines add a welcome boost, running a portion of redirected, qualified DB2 workloads on z9 BC and z9 EC with significant cost savings, encouraging wider System z9-z/OS-DB2 enterprise data-serving usage.

20. Important Information Processing Workloads Redirected by zIIP: z/OS automatically redirects a portion of three important System z9 DB2 workloads to the new zIIP, freeing up more costly, general-purpose CP processors:

- **Host DB2 data-serving** workloads generated by remote SQL calls.
- **Star schema parallel query** workloads.
- **Select DB2 tools database maintenance operations** workloads.

The zIIP (*priced at now \$95,000 on the z9 BC and at \$125,000 on the z9 EC – these same prices also apply to the zAAP and IFL specialty engines*) will, we consider, swing more DB2 data-serving workloads for SOA applications onto the System z9 in its "enterprise-wide data-serving role". See also Point 21 below.

21. Impressive System z9 SOA Software Summit: A full-force, bravura May 4th 2006 System z9 Software Summit in New York pre-briefed 50 leading analysts/journalist on IBM's extensive new 2006 mainframe SOA software announcements. (See *Point 22 below*.) This high-powered event demonstrated the major effort/investment behind IBM's new mainframe SOA software, with a "full court press" of top hardware and software executives presenting.

...major effort/investment behind IBM's new mainframe SOA software...

22. IBM Completes System z9 SOA, Data Serving Stack: In one of the biggest-ever sweeps of new mainframe software, IBM completed the IBM SOA Foundation suite for the System z9, and unveiled its next-generation flagship database, with 2006 availability for:

- IBM WebSphere Process Server for z/OS (*new z product*).
- IBM WebSphere Enterprise Service Bus (ESB) for z/OS (*new z product*).
- IBM WebSphere Portal V6.0 for z/OS (*enhanced z release*).
- DB2 Version 9 "Viper" for z/OS Beta (*next-generation major new z release*).
- IBM Tivoli Federated Identity Manager for System z9 Linux (*new z product*).
- IBM WebSphere Application Server for z/OS V6.1 (*enhanced z release*).
- IBM WebSphere Application Server XD Version 6 for z/OS (*new z product*).
- IBM WebSphere Service Registry and Repository (*new z product*).
- IBM WebSphere Message Broker for z/OS (*enhanced release*).
- IBM Rational COBOL Generation tools (*new z release*).
- IBM Tivoli Usage Accounting Manager (*new z product, June 8th 2006*).

Also, new IBM SODs on Rational Software Development Platform parity for System z, enhanced SOA support in CICS, and XML enhancements for IMS were made. This phenomenal set of software advances delivers the industry's most advanced and complete SOA and data-serving technology, for the System z9 mainframe, within 2006.

22. DB2 for z/OS Version 9 "Viper" Raises RDBMS Bar: The next-generation DB2 for z/OS (*Version 9 "Viper"*) raised the RDBMS bar, adding breakthrough native XML support. Its new hybrid relational-XML model offers large advantages over IBM's database competitors for SOA applications, plus many other improvements, defining a new level of data-server capability. Generally available for z/OS from end 2006/early 2007.

23. IBM Tivoli Federated Identity Manager for z/OS: Milestone new product, essential for cross-enterprise, mainframe-based SOA deployment, provides federated identity management, the only viable approach to cost-effectively manage identity/access control across collaborating organizations.

24. IBM Tivoli Usage Accounting Manager for z/OS: Advanced, new-generation computer resource usage/chargeback accounting for virtualized IT environments like modern mainframes. Based on acquired CIMS Labs technology; provides the "missing link" for fair, accurate IT usage chargeback.

25. Mainframe Often Lowest Cost Platform Today: Mainframes today provide lower TCO than scale-out, distributed platforms for mixed commercial workloads, because:

- **System TCO Sources Much Changed:** People (45%), software (28%), and hardware (18%) new top three.
- **Sharply Falling z9 Labor Costs:** 16.7% CAGR reduction 2000-2004. One-fifth the staffing costs of distributed.
- **Sharp Decline in z9 Software Costs:** Cost/transaction down 57% in last five years, or 17% p.a.
- **Hardware Price Falls Continue:** Exponential fall – \$0.5M/MIPS (1980) to \$1.5K/MIPS (2005) continuing.
- **Lower Power/Cooling Costs:** One-twentieth the energy use of distributed equivalents.
- **Less Space:** One-twenty fifth the data center floor space of distributed equivalents.
- **Pre-integration Savings:** "Out-of-the-box" System z "everything integrated" aspect means large savings.
- **Higher Utilization Rates:** 80-100% utilization, many-fold higher than the 15% absolute best for distributed Intel, often much lower.

- **Less Networking Equipment:** One-quarter of the networking gear of the distributed equivalent.
- **Plummeting System z Transaction Cost:** Hardware, software & people costs/transaction halved in 4 years, 17% p.a. decline, now barely \$0.00020/transaction or 5,000 transactions/\$1.
- **Lower Marginal Cost for Added Workloads:** System z cost/transaction falls sharply with added workload, whereas distributed is linear.

Figure A2 summarizes some of the principal advantages IBM now claims for the System z9 mainframe platform.

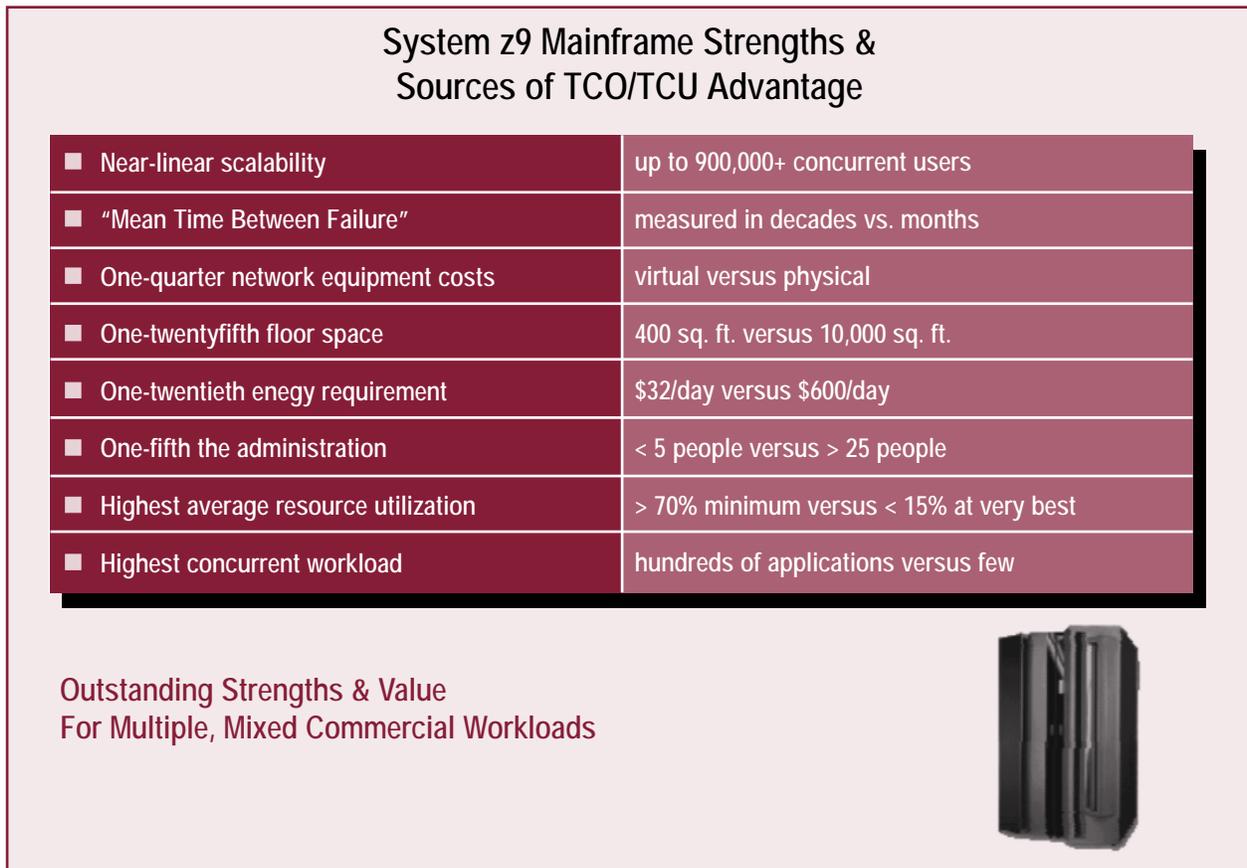


Figure A2: System z9 Mainframe Strengths & TCO/TCU Advantage Sources

26. **Mainframe Ecosystem Expanding Again:** The vital community ecosystem around the System z9 mainframe is once again expanding as IBM's programs gain traction, providing new staff skills, applications and tool software, and SI services and support. IBM has also much expanded its mainframe education/training, technical support, and services capability.
27. **Academic Initiative for System z a Winner:** Today, over 250 universities/colleges and over 300 professors worldwide are actively participating in the IBM Academic Initiative for System z, using a wide range of courseware. 10,000 students have received education in mainframe technologies as reported by educators enrolled in the Academic Initiative.

Note: This Executive Summary was drawn from our Mainframe Spotlight Report entitled "**New System z9 Mainframes Hit Mid-market, Refresh Top End – Powerful New SOA & Data-serving Software Delivers New Enterprise-wide Roles**" published in May 2006. (See the "Related Software Strategies Research" Section on page 65, item 3 for details.)

Appendix B: IBM SOA Foundation Software for Mainframe – Advances 2006

Below we include our reviews/assessments of a selection of 2006 System z9 SOA-related software advances that we consider of particular importance/significance to mainframe SOA users, or those planning to become so soon:

WebSphere Developer for System z, V7.0

WebSphere Developer for System z (*WDz*), V7.0 is the latest version of IBM's comprehensive, feature-rich, Eclipse-based enterprise application development tool for all types of mainframe development. The product is claimed to speed the efficiency of traditional mainframe, Web development, and integrated mixed workload development. This strategic tool therefore helps mainframe customers accelerate the development of new Web applications, traditional COBOL and PL/I applications, Java applications, Web services and XML-based interfaces for SOA, and for high-level Enterprise Generation Language.

WDz, V7.0, consists of a common workbench and an integrated set of tools that support end-to-end, model-based application development, run-time testing, and rapid deployment of on-demand applications. It offers Integrated Development Environments (*IDEs*) with advanced, easy-to-use tools and features to help WebSphere, CICS, and IMS developers rapidly design, code, and deploy complex applications. WDz provides an interactive, workstation-based (*Windows*) environment with quick access to z/OS datasets. It supports the fullest imaginable range of mainframe development areas, including:

- Web development.
- Java development.
- J2EE™ platform support.
- Java application analysis & performance profiling.
- z/OS and UNIX System Services development.
- Windows development (*of mainframe-like applications*).
- Globalization support (*Multilingual version supports 9 main languages*).
- Web services and XML development.
- Integrates relational databases and XML.
- Testing and deployment.
- Web services deployment.
- Relational database support.
- Composite application development.

The latest V7.0 release, now generally available, includes significant enhancements claimed to increase efficiency of traditional mainframe, Web development, and services or composite SOA application development, making them faster and more efficient. WDz also supports and enables business service integration for the CICS applications that are almost universal at nearly every mainframe site.

The WDz media come with several mainframe software technology previews, to provide mainframe developers insight into these newer mainframe software services: IBM File Manager for z/OS, Asset Analyzer, and XXL enterprise services PL/I technology preview (*SOA-based Web services integration to CICS and IMS-based PL/I processing*). It also includes complementary bundled offerings of related IBM mainframe software. These include: IBM Rational Application Developer for WebSphere Software V7; IBM WebSphere Application Server for Developers V6.1; IBM WebSphere Portal Enable for Multiplatforms V6.0; IBM CICS Transaction Gateway for Multiplatforms V6.0.2; and IBM TXSeries for Developers V6.1.0.1, in limited-use license form for developer exploratory usage, an added bonus.

We assess WDz as offering incredibly rich functionality, full breadth of mainframe environment support, and tremendous value...

Analyst Comment: We assess WDz as offering incredibly rich functionality, full breadth of mainframe environment support, and tremendous value for all the above types of mainframe development work. WDz now provides the single, primary, integrated, and complete main IDE the mainframe has needed for decades.

WebSphere Integration Developer (V6.0.02)

WebSphere Integration Developer (*WID*) is IBM's common tool for building SOA-based integration solutions across **WebSphere Process Server**, **WebSphere ESB**, and all **WebSphere Adapters**. It simplifies integration, offering rich features that accelerate the adoption of SOA by rendering existing IT assets as service components, encouraging reuse and efficiency. It thus enables assembly (*choreography or orchestration*) of new, composite SOA applications. WID enables integration developers to assemble even complex business solutions from existing assets, whilst needing only minimal skills. Such components can include processes, mediations, adapters, or code components. Process and integration solutions can be constructed using drag-and-drop without needing a working knowledge of Java™, enabling a business-driven development approach. The tool also integrates testing, debugging, and deployment for service-based solution development. On-line modules and libraries are available that help speed development and reduce costs to facilitate reuse.

WID also supports advanced constructs for dynamic processes, including business rules, business-state machines and selectors, events, and role-based tasks capabilities, to represent and support complex process flows and behaviors of all types (*human, automated, rules, etc.*) that are supported in **WebSphere Process Server**. WID is fully integrated with the **WebSphere Business Modeler**, importing its BP models for rapid implementation. **WebSphere Business Modeler** itself takes advantage of the capabilities of WID, and provides a business-centric view of process modeling.

The output code from WID deploys on the **WebSphere Process Server** (*see below*). An Eclipse-based GUI tool, the product also integrates closely with the other Eclipse-based SOA tools in the suite, such as the **WebSphere Business Modeler** above, **WDz**, and **Rational** products. The integration developer needs to learn only one set of skills, applying one tool to many uses.

New in V6.0.02 are WID integration to feed **WebSphere Business Monitor**, faster BPM solution authoring with easier integration to external services, and built-in e-mail, FTP, Flat File, and JDBC adapters for development and production use. New re-factoring means changes made ripple to dependent places, reducing errors. The release also bundles the IBM packaged application adapters (*SAP, PeopleSoft, Oracle E-business, JD Edwards, and IBM WebSphere Adapter for Siebel Business Applications*) for development use. WID now includes event sequencing construct support, and adds rapid Web client generation tools for human tasks. Ease-of-integration is significantly extended for **WebSphere Business Monitor** and **Rational RequisitePro**, and the new

...represents a significant further advance on its forerunner, and complements the new WebSphere Process Server...

WebSphere Service Registry and Repository is supported. This also includes WSDL and XSD integration, usage, and compatibility improvements, and other significant integration advances. Finally, substantial mediation tooling support for **WebSphere ESB** enhancements is included. The latest version, WID V6.0.02, became generally available 12.22.06.

Analyst Comment: We found WID V6.0.02 forms a core component of the IBM SOA Foundation, represents a significant further advance on its forerunner, and complements the new **WebSphere Process Server** and other essential IBM SOA Foundation products very well.

WebSphere Portal Enable for z/OS, V6.0.

WebSphere Portal Enable (*WPE*) for z/OS, V6.0 combines full, industry-leading, enterprise portal flexibility with the unsurpassed reliability of z/OS, adding centralized document storage that allows users to easily share, view, and organize files ranging from documents to spreadsheets within a portal context. WPE for z/OS delivers a complete set of portal services. The product enables mainframe users to improve operational efficiency and productivity by linking the right people, process, and information, making their business more responsive. WPE for z/OS is optimized for z/OS, and exploits the platform's high availability, security, serviceability and scalability, providing a more efficient and secure means of access to mainframe DB2, CICS, and IMS data, and other enterprise transaction systems. WPE for z/OS provides a fast route to modernizing legacy applications, enabling secure access to backend mainframe systems, data and applications through a consistent, integrated and personalized enterprise portal. The included **IBM WebSphere Portlet Factory** accelerates portal application development, and **IBM Workplace Web Content Management** reduces portal implementation time and maintenance costs by putting content creation/management directly in the hands of content experts for "author once, publish everywhere" control. WPE for z/OS, V6.0, became generally available on 12.15.06.

Analyst Comment: Creating enterprise portal interfaces incorporating rich mainframe host data and application access, for each class of user, brings rapid and widespread benefits. Incorporating document content extends this enterprise portal's content delivery value. WPE for z/OS is thus one of the main solution elements of the "people" SOA Entry Point, along with the collaboration solutions that are usually front-ended by the enterprise portal. WPE for z/OS provides a premier SOA portal capability for the System z environment.

WebSphere Process Server for z/OS, V6.0.02.

At the center of the IBM SOA Foundation on the mainframe is **WebSphere Process Server for z/OS, V6.0.02**, open-standards-based software powered by **WebSphere ESB for z/OS** (see below) that helps simplify the integration and automation of business processes that span people, systems, customers and business partners. WebSphere Process Server reduces the time, cost, and risk of integration projects, because it simplifies the movement of information between applications based on business rules. Together with **WebSphere Integration Developer** (from which business process models can be imported), WebSphere Process Server provides a robust platform for building and deploying service-oriented, component-based, business process composite applications. WebSphere Process Server now provides a single, unified programming model (*Service Component Architecture*) to connect and use IT resources as service components that are easily reused. Process Server provides all the required constructs for dynamic processes, including business rules, business-state machines and selectors, events, and role-based tasks capabilities.

WebSphere Process Server reduces the time, cost, and risk of integration projects, because it simplifies the movement of information between applications based on business rules.

WebSphere Process Server provides a comprehensive runtime for long and short running processes, human workflow, and role-based tasks, incorporates **WebSphere ESB for z/OS, V6.0.02**, to extend the reach and connectivity of business processes, and also includes select **WebSphere Application Server, V6.1**, functionality, the leading J2EE™ application server. The product provides a high-performance and QoS run-time environment, with advanced fault-tolerance and error-detection capabilities. Other principal capabilities include:

- **Business Process Engine:** It includes a full-function WS-BPEL-compliant business process engine, a simplified process editor, and generic business process support, including operations/parameters, transactions/compensation, and full XPath 1.0 support, with service implementation details hidden.
- **Business State Machine:** A business state machine implementation, based on the UML 2.0 State Machine, supports event-driven business processes, creates WS-BPEL under the covers, and handles simple or complex states (*entry and exit*), and transitions (*guards, actions and timeouts*).
- **Human Task Manager:** A human task manager component allows applications to use human tasks, to invoke humans as services (*the 'classic' staff activity scenario*) and to allow humans to invoke services (*both services implemented by software, e.g. business processes or arbitrary Web services, and services implemented by humans*). It supports role-based staff assignment rules that can differ for editors, readers, administrators and potential owners, and both Web and portal-based clients. Multiple-level escalation mechanisms are supported, including e-mail, staff assignment (*work item notification*), and priority aging.
- **Business Rules Engine:** WebSphere Process Server also includes a business rules engine that enables business logic and rules to be abstracted and externalized from applications representing the business process. This enables business rules that may change to be easily and centrally altered without modifying the underlying software services, and allows the rules to be dynamically updated on-the-fly on the run-time server via a Web interface. Rules are presented in a natural language form. Business rules functionality supported includes the most popular approaches of multi-dimensional decision tables, rule sets (*If/then rules*) and rule templates.
- **Common Event Infrastructure:** WebSphere Process Server is based on CEI (*Common Event Infrastructure*) to handle events, which are whenever something significant occurs in an application, such as processing a new order, or a failure occurring. Event data is captured in a standardized event object format (*Common Base Event*), with business data supplied by the application, and with WebSphere providing the run-time details like server name, J2EE™ component, and business context. Event objects are handled by the event infrastructure to allow tracking of business process progress, audit trails, coordination of work between independent business processes, and the monitoring for exceptions in a business process (*e.g. processes not completing within time limits*).

New features in WebSphere Process Server, V6.0.2, include integrating more out-of-the box Web services, application adapters, and advanced messaging capabilities (*including WebSphere MQ and WebSphere Message Broker, using the same JMS bindings as WebSphere MQ to reach MQ's 80+ supported platforms*). **WebSphere Service Registry and Repository** integration now provides true end-to-end governance for all services, dynamically finding and invoking services and service metadata information at run time. The release has also added a comprehensive advance in easy-to-use support for human-centric BPM scenarios (*too numerous to cover here*). Substantial advances in run-time administration improvements centered on dynamic reconfiguration, without needing to rebuild or re-deploy, are also included. The release also adds a number of business rule design time, run time, and operational improvements. The Server also now has support for IBM DB2 on z/OS as a remote DBMS.

...now provides a rich and fully-featured, leadership, enterprise-class, business process server for the mainframe...

Analyst Comment: In our assessment, WebSphere Process Server for z/OS, the culmination of several years of intense IBM process server development, now provides a rich and fully-featured, leadership, enterprise-class, business process server for the mainframe, integrating all the strengths of the WebSphere ESB and WebSphere Application Server technology. This latest

release is a major advance, reflecting a rapid maturing and broadening of this central IBM SOA Foundation platform.

WebSphere Enterprise Service Bus for z/OS, V6.0.02.

WebSphere ESB (*WESB*) for z/OS provides mainframe SOA connectivity and integration capabilities for Web services-focused applications and services built on the proven messaging and Web services technologies of **WebSphere Application Server, V6.1**. It delivers robust and easy-to-use connectivity, JMS™ messaging and service-oriented integration for Web services-focused applications and services to power an SOA. Use of WebSphere ESB reduces the number, size, and complexity of interfaces between the applications and services that must connect.

WESB performs the routing of messages between services, the conversion of transport protocols between requestor and service, the transformation of incoming message formats between requestor and service, and the handling of business events from disparate sources. The capabilities of WESB are summarized in Figure B1. WESB therefore provides Web services support, message transport & protocol switching, intelligent routing and message logging, and event-driven processing capabilities in a simple-to-install, easy to configure, build and manage ESB at competitive prices.

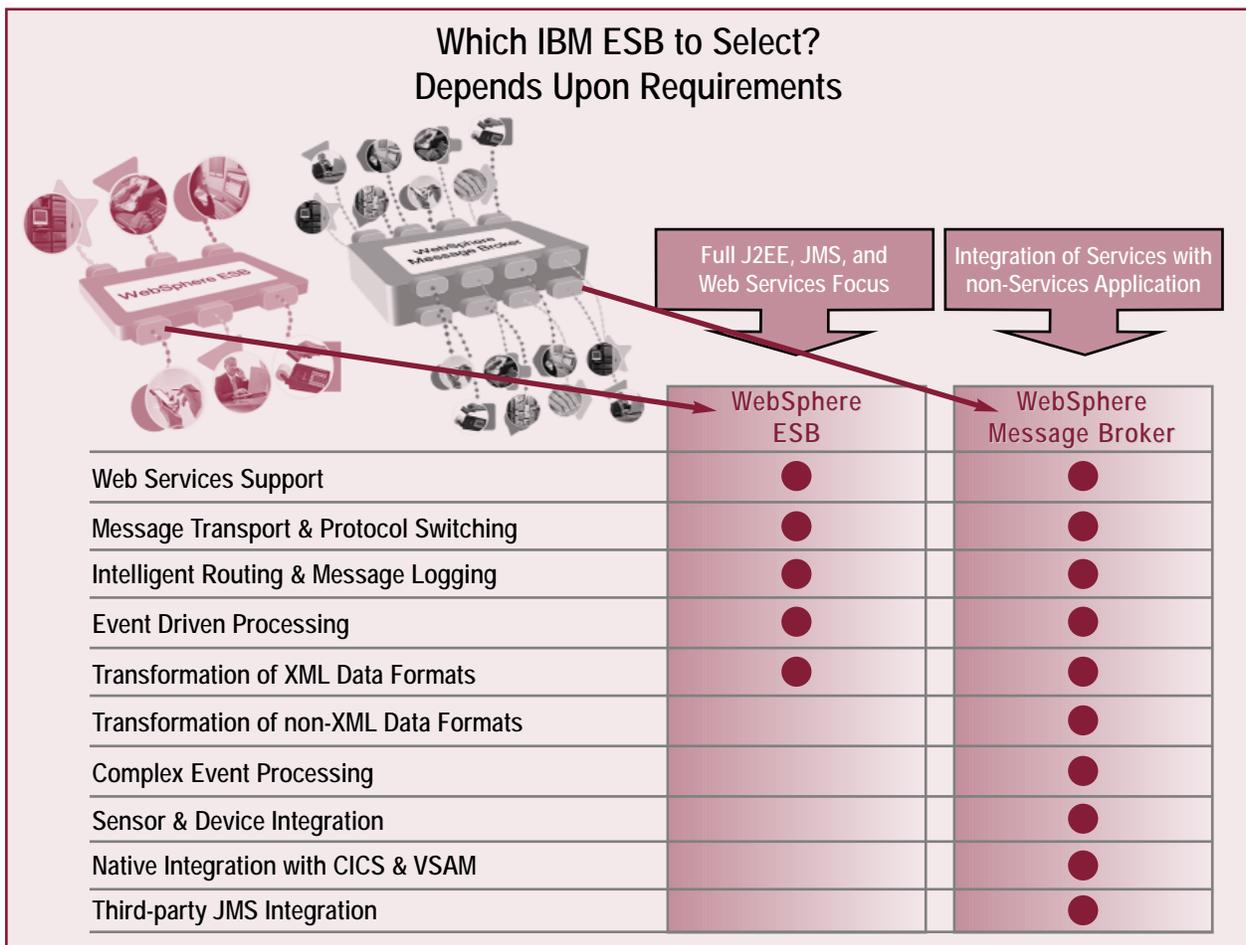


Figure B1: Which IBM ESB to Select? – Depends on Requirements

Fully integrated with **WebSphere Process Server**, and **WebSphere Integration Developer** (*above*), WESB exploits WebSphere QoS (*clustering, failover, systems management and security*) and improves application flexibility by adopting service-oriented interfaces. The product is claimed to be easy to use, with tools requiring minimal programming, simplifies the handling of integration logic, and speeds up time-to-value in service integration scenarios.

Pre-built mediations are also available to save time and development costs. The product can be dynamically re-configured whilst running to meet changing business processing loads. WESB for z/OS supports **WebSphere Process Server for z/OS, V6.0.02** (*in which product an instance is embedded*), and tightly integrates with IBM Tivoli service security and service management offerings. (See Sections 7 & 8.)

New in this release is greatly enhanced integration over the whole SOA lifecycle, including the crucial integration with **WebSphere Service Registry and Repository** for end-to-end service governance. WESB can now use WSRR metadata to govern its operations. New administration features enable dynamic reconfiguration, for increased business flexibility and responsiveness. Flexible and dynamic service consumability is enhanced. Time to market is reduced. The **ITCAM for SOA** service management product (*see Section 7*) feeds service performance information to WSRR, giving WESB better control for its dynamic selection of service end points. BAM flexibility is improved with the CEI to define and feed events into **WebSphere Business Monitor**. These advances, and numerous usability advances, represent a substantial latest release of WESB. This latest version was made available from 12.22.06, and is also available for zLinux (*and other platforms*).

WebSphere Message Broker for z/OS V6.0

For advanced ESB functionality, IBM offers WebSphere Message Broker for z/OS, V6.0, which has been a leader in providing universal connectivity and advanced data transformation for applications, whether or not they comply with open standards. WebSphere Message Broker fulfils all the attributes of an ESB plus, and can therefore be considered as an “advanced ESB”, meeting all and more of the extensive requirements customers may have as they extend their ESB to connect to all their existing business-critical systems. It offers advanced integration capabilities such as universal connectivity, any-to-any transformation, and supports a wide range of adapters to many other common software packages:

- **Provides universal connectivity:** WebSphere Message Broker provides Web services connectivity and non-standard interface connectivity, with the ability to also integrate many systems, platforms, devices and APIs. The product also facilitates service-oriented integration.
- **Provides universal data transformation:** WebSphere Message Broker also provides advanced message transformation, enrichment, and routing, full support for numerous industry-standard data formats (*AL3, HL7, SWIFT, HIPAA, EDI, etc.*), and supports the option to use the new WebSphere DataStage TX product for sophisticated transformation/aggregation of data. These capabilities transform and enrich in-flight information from disparate sources of information to provide a level of intermediation between applications that use different message structures and formats.
- **New & improved pre-built capabilities:** WebSphere Message broker takes advantage of existing skills with rich Java and XML support, allows the implementation of complex event processing with no programming, and provides simple, easy-to-use tools; all of which help speed time-to-value and improve ROI.

The capabilities of WebSphere Message Broker are summarized in Figure B1, alongside those of **WebSphere ESB**, showing the complementary capabilities offered by the duo. WebSphere Message Broker also offers the high performance of traditional transactional processing environments. WebSphere Message Broker includes the WebSphere Event Broker functionality. The latter is also available separately for customers who need only to publish and subscribe/use other distribution capabilities using multiple protocols, and who do not need the full-power transformation features provided by WebSphere Message Broker. WebSphere Message Broker is therefore essential where advanced ESB capabilities are needed for the parts of the business where the applications are not compliant to service-oriented standards, complementing the pure standards-based integration provided by WebSphere ESB. WebSphere Message Broker for z/OS, V6.0, became generally available 10.28.05.

WebSphere Message Broker is therefore essential where advanced ESB capabilities are needed...

DB2 for z/OS V9.1 – Next-generation DB2 for z/OS:

On May 8th 2006, beta-availability of the next-generation DB2 for z/OS V9 (*“Viper”*) for the mainframe was announced, following a five-year development. This major release leapfrogs IBM’s competitors with substantial advances that will help DB2 customers manage and access all types of data across an SOA with much greater flexibility and speed. In a major breakthrough, DB2 V9 is the industry’s first and only hybrid, multi-structure database designed with both native XML data and relational data management capability. Through patented “pureXML” technology, it is able to seamlessly manage both conventional relational data and XML data without requiring the XML data to be reformatted or placed into a large object within the database. This advance enables customers to increase information availability, speed and versatility, while reducing the costs associated with existing XML data management techniques. It also significantly reduces the complexity, time and effort developers need to spend creating applications that access both relational data and XML repositories.

The DB2 “Viper” multi-structure database model combines hierarchical management of XML content (*accessed with XQuery/XPath*) with traditional relational database management (*accessed with SQL*) within one unified, high-performance, highly-available DB2 database. Now that XML plays an ever-more pervasive role in enterprise SOAs, this native XML database support has become essential for data fidelity, asset utilization, performance optimization, and to exploit the mature data management services found in an industrial-strength DBMS like DB2.

These DB2 V9 native XML capabilities will benefit SOA implementations that must access a myriad of data stored across multiple formats. Currently, only two alternatives exist. One is to run a dedicated XML database (*capable of managing hierarchical XML data structures*) alongside the main RDBMS, which complicates the infrastructure. The other is to force XML data unnaturally into a relational database with XML “shred” technologies, or to hold XML documents in the RDBMS as large objects. The former loses much of the value and structure of XML message information, and the latter does not allow message content processing, so neither are real, long-term solutions.

DB2 V9’s native XML technology will also provide XQuery support. XQuery is an emerging industry-standard language that extends XPath and is specially designed for processing XML data. Applications can use XQuery, standard SQL, or both, to retrieve documents from either, or both, underlying storage formats.

In addition, DB2 V9 is also the first database that can support all three common methods of database partitioning simultaneously – a major innovation in improving data management and information availability. By simultaneously supporting range partitioning, multi-dimensional clustering and hashing, Viper will enable organizations to arrange and order their information in the way that best suits their individual business requirements and demands.

It will also support handling increasing regulatory compliance, adding enhanced auditing and privacy capabilities, support for trusted security contexts, and for defined database roles in the compliance environment (*Label-based Access Control*). To reduce risks, the new release will also support native SQL stored procedures, will provide default databases and tablespaces, and will provide automatic unique indexes to support and define primary keys.

To decrease complexity and reduce database administration costs, it will also provide autonomic storage management capabilities such as fast table replacement, the ability to partition a database by growth, index compression, and a new Optimization Service Center, as well as automated memory management. DB2 V9 also includes disaster recovery improvements, including the ability to restart interrupted recovery operations, and enhanced support for redirected restore operations, completing DB2’s robust and versatile database recovery capabilities.

Additionally, DB2 V9 developer enhancements reduce complexity and cut the time developers need to spend creating applications that can now access both relational data and XML repositories.

These include:

- A new **DB2 Developer Workbench** (*a comprehensive AD tool for creating, editing, debugging, testing, and deploying DB2 stored procedures and user-defined functions*).
- **Enhanced support for Visual Studio 2005** (*Web services and native XML data store support, etc.*).
- An **updated DB2 Driver for JDBC and SQLJ** (*JDBC 3.0 compliant*).

The scale of this DB2 release advance can be gauged by the fact that over 750 IBM developers, from eight countries, contributed to the creation of DB2 V9, designed and tuned to be the preferred information engine for SOA environments.

DB2 V9 represents the most substantial leap in database technology in two decades, provides a new level of native XML support essential for SOA, and offers many other important innovations. General availability of the DB2 Version 9 “Viper” enterprise version implementations for Windows, Linux and UNIX platforms was from July 28th 2006, and these also incorporate another first in their use of IBM’s “Venom” mainframe-style storage compression technology that brings significant disk, I/O and memory savings. IBM also broke new

ground by simultaneously unveiling the other versions of DB2, for small and medium businesses (*DB2 Express*), and for developers (*DB2 Express-C*), all based on common DB2 V9 technology. The scale of this DB2 release advance can be gauged by the fact that over 750 IBM developers, from eight countries, contributed to the creation of DB2 V9, designed and tuned to be the preferred information engine for SOA environments.

Analyst Comment: With its Beta program coming to a close, general availability of DB2 V9 for z/OS is now expected early in 2007. Mainframe DB2 users can now begin testing and planning how to migrate their host DB2 applications up from DB2 V8 to DB2 V9. DB2 V9 for z/OS is a central pillar of the IBM SOA Foundation for System z9 on z/OS, the underpinnings for the mainframe’s “**Enterprise-wide Data-serving**” role, and a prime foundation for IBM’s SOA IOD strategy, exemplified by the new **IBM Information Server** software, assessed below.

IBM Information Server for z/OS

IBM Information Server, announced on October 16th 2006, is IBM's new industry-first, new-class defining, software platform designed to allow customers to deliver trusted, consistent and reusable information to applications and business processes. Unveiled at IBM's first Information on Demand Global Conference, IBM Information Server combines technologies developed in the company's 55 global software development labs, software from multiple key acquisitions, including Ascential, Venetica, Unicorn and CrossAccess, and more than 20 years of IBM information integration expertise.

Highlighting the importance and scale of this major new platform's opportunities, IBM said that it expected IBM Information Server to be a catalyst for its cross-company Information on Demand initiative, and to accelerate its drive to capture an emerging growth opportunity, estimated to reach \$69B by 2009 (18% CAGR). IBM Information Server was also designed to be an essential foundation for SOA, providing consistent, reusable information services, improving business flexibility and speeding time to market for new applications enterprise-wide.

IBM Information Server is undoubtedly the first unified software platform able to deliver all of the functions required to integrate, enrich and deliver trusted information for key business initiatives, and will enable customer organizations to use information as a strategic business asset. It will help enterprises wring greater value from their complex, heterogeneous information spread across their diverse systems by enabling them to understand disparate data sources; cleanse data to ensure consistent quality; transform and restructure information for the intended use; and deliver data in the form needed. It will support major business initiatives like creating a single view of the customer, business intelligence and compliance that require complete, accurate and up-to-date information. However, because most organizations often have hundreds of disconnected systems deployed at different times by different people, making it a challenge to find important information when needed, verify content, and understand how to interpret data. IBM claims the IBM Information Server will bridge this immense current gap.

IBM Information Server is undoubtedly the first unified software platform able to deliver all of the functions required to integrate, enrich and deliver trusted information for key business initiatives...

The IBM Information Server underwent two extensive beta programs at 75+ clients and partners, and IBM reports this beta testing enabled it to refine the high levels of productivity and scalability the platform now offers. Over 30 industry partners (*ISVs, SIs, SVs, etc.*) announced plans to integrate with/support/service IBM's new flagship software platform at launch.

IBM Information Server became available worldwide through IBM and IBM Business Partners in November 2006. No GA date for a System z9-z/OS mainframe version has yet been made public.

Software Strategies published a major White Paper on IBM's Information on Demand strategy from a mainframe perspective, covering the IBM Information Server in more depth, earlier in 2006. (*See the "Related Software Strategies Research" Section on page 65, item 3*). For this reason we limit our coverage and comment here to the above.

WebSphere Business Service Fabric

WebSphere Business Services Fabric (*WBSF*) is an end-to-end SOA platform for modeling, assembly and deployment of business services. WBSF was one of IBM's major October 2006 new SOA announcements, and had been built out rapidly through IBM's Webify acquisition. In view of its major future importance to IBM SOA adopting customers, we include this short introduction here, but cannot do full justice to this extensive and ambitious element of IBM's SOA offering in such limited space.

WBSF provides design-time tooling, run-time environment, industry reference models, and pre-built SOA business service assets, that combine to enable rapid development of loosely-coupled, composite business services. It can provide policy-driven, dynamic business service personalization and delivery, based on the context, content and contract of the service request.

WBSF includes optional IBM Industry Content Packs to reduce time to market for industry SOA solutions. Industry Content Packs include reference industry models and pre-built industry common services to simplify interoperability, facilitate service reuse, and drive industry standards compliance. The product provides lifecycle management of business services, including the sourcing, modeling, assembly, deployment, management and governance of local and remote business services. It also supports and enables federated discovery and assembly of business services across service registries, asset repositories, and file systems. WBSF provides governance of multi-author, multi-geography, collaborative, composite business service design, assembly and delivery. It also automates and controls multi-entity and multi-domain entitlement of business services for service consumers. WBSF includes **WebSphere Process Server** and **WebSphere Integration Developer** for the composition and deployment of flexible, service-oriented business processes.

...significant addition to the IBM SOA offering, focusing on enabling the rapid development of a wider and more vibrant business services ecosystem...

Analyst Comment: WBSF is a significant addition to the IBM SOA offering, focusing on enabling the rapid development of a wider and more vibrant business services ecosystem, and kick-starting many SOA deployments with access to pre-built business services content. It also supports the whole lifecycle and governance of business services. As the richness of WBSF

business services content grows, IBM SOA customers will be able to source increasing proportions of their new business services from these resources.

IBM Rational Software Development Platform, V7

Completing its 2006 blitz of SOA-related major software announcements, on December 5th 2006 IBM announced its new IBM Rational Software Delivery Platform (RSDP) 7.0 desktop products aimed at helping global development teams better design, deploy and manage the delivery of software and systems architectures with higher lifecycle quality. The new IBM RSDP 7.0 products help customers exploit reliable architectural design to deliver software/services more efficiently, particularly in the geographically-diverse and de-centralized environments often found in SOA. The IBM RSDP 7.0 desktop products are a comprehensive set of Eclipse-based tools and best-practices processes that help customers govern the process of software and systems delivery and tighten the relationship between IT and line of business. IBM argues that these can accelerate SOA results with sound architectural design/automated service delivery, ensure global architectural integrity, and simplify modular systems development with improved hardware and software modeling and standards support. These products complement the January 2006 release of Rational Systems Developer, and the June 2006 release of IBM RSDP 7.0 Team tools. The new and enhanced IBM RSDP V7.0 desktop products revealed included eight new and enhanced products and three product bundles.

Some integration between select IBM RSDP V7.0 desktop, and IBM SOA Foundation products, including WebSphere Service Registry and Repository, Tivoli Composite Application Manager for SOA, and WebSphere Business Modeler, to help SOA development, were also announced. Rational RequisitePro is now also integrated with WebSphere Business Modeler for improved efficiency. Rational Unified Process guidance (*RUP for SOMA*) improves design of the services architecture, and the Rational Method Composer SOA Plug-in allows for integration with an SOA governance infrastructure. (*See Section 6.*)

Our Analysis

These, plus the new/enhanced products assessed in previous Sections, comprise an absolutely formidable set of mainframe SOA middleware software advances that brings the System z9 SOA and data-serving platform to completion, and to world-leading-edge functionality and comprehensiveness. These have been released at just the right time to blend well with the many System z9 mainframe platform advances discussed in Section 4 and Appendix A.

...absolutely formidable set of mainframe SOA middleware software advances...

The extensive IBM SOA middleware software and tools suite for the System z mainframe platform, long a central contributor to the value proposition of the platform, has seen its most intense, ambitious period of development/innovation ever over the last two-to-three years. All the existing middleware engines saw

major new releases, with substantial advances implementing extensive support for SOA. These enhanced, and the many new, middleware products complete the whole 2005-promised IBM SOA Foundation suite for the System z9 platform. Now with their 2006 arrival, supplemented with further new additions, they complete a comprehensive set of open-standards, SOA-supportive run-time middleware, supported by an extensive set of advanced, modern, Eclipse-based development tools, and the industry's most powerful information management platforms, DB2 V9 and the new IBM Information Server. These advances combined deliver on IBM's vision of the mainframe as the ideal platform to assume Enterprise-wide Roles for Data-serving and SOA.

When first announced, we also assessed DB2 for z/OS Version 9 "Viper" to be a truly landmark industry advance. There are substantial advantages to its new hybrid relational/XML multi-structure database model. This allows developers to store and handle both relational tabular data and XML data within a single data management infrastructure much more easily, with equivalent access via SQL and XQuery, without any loss of the richness of XML content, and with good performance. This advance places IBM far ahead of its RDBMS competitors – Oracle and Sybase – who offer limited XML support, and still further ahead of Microsoft's SQL Server. IBM executives say that around 20% of enterprise data today resides in relational databases, but 35% is already in XML, so extending the database to be able to natively manage this XML data provides a major potential expansion of database usage.

Our detailed analysis found the IBM SOA Foundation suite (*and the related products, methods and services covered in this White Paper*) now provide the most comprehensive SOA composite application building and deployment support available, all optimized for (*and fully exploiting*) the unique QoS of the System z9 mainframe platform (*and supporting most others too*).

Steve Mills, Senior Vice President and Group Executive, IBM Software Group, speaking at the Mainframe Software Summit event on May 4th 2006, summarized the case for mainframe SOA well, and we conclude with this quote from his remarks:

"Mainframes – which process much of the world's most strategic information and applications – are now finding second careers as the base for enterprise-wide SOA. Customers today are just beginning to scratch the surface of what a services-oriented approach to software can do to make their businesses more responsive and opportunistic. By using mainframes to free up, connect and use information that's stored in applications, companies can bring products to market faster, make quicker connections with global business partners, deliver better service to customers and streamline their IT operations."

Related Software Strategies Research

1. **"Top 15 Reasons Users Should Stay on/Upgrade/Move on to the IBM Mainframe."** Software Strategies White Paper, December 2006, 30 p.p., 6 charts and tables. *(Presents this analyst's top 15 reasons why mainframe users should stay on, and reinvest in/upgrade the platform. Advocates that users of older, distributed SMP platforms should now also move onto the mainframe. Includes 3 case studies. Dissects mainframe attacker competitors.)*
2. **"New System z9 Mainframes Hit Mid-market, Refresh Top End – Powerful New SOA & Data-serving Software Delivers New Enterprise-wide Roles Software Strategies."** Software Strategies Mainframe Spotlight Report, May 2006, 62 p.p., 30 charts and tables. *(Executive Summary from this Report included in Appendix A here.)*
3. **"Information as a Service Unfolds – System z9 Mainframe/DB2 Premier Data & Information Server for SOA."** Software Strategies White Paper, February 2005, 74 p.p., 30 charts and tables. *(In-depth assessment of IBM's "Information as a Service (IAAS) strategy, supporting extended information management product portfolio, and the role of the System z9 mainframe as the enterprise SOA data serving and information delivery hub.)*
4. **"SOA Takes Off – New WebSphere SOA Foundation Extends IBM's Lead with New System z9 Mainframes as the Hub of the Enterprise."** Software Strategies White Paper, 2nd Edition, November 2005, 56 p.p., 20 charts and tables. *(In-depth assessment of the case for adopting SOA, evaluation of the IBM SOA Foundation software, methods and services, and the role of the System z9/zSeries mainframe as the enterprise SOA hub.)*
5. **"Spectacular System z9 Mainframes Leap Ahead with Doubled Power, Enterprise Hub Roles – Virtualization, Security, Availability, SOA & Value Advances."** Software Strategies Enterprise Server Spotlight Report, September 2005, 72 p.p., 28 charts and tables. *(In-depth assessment of new IBM System z9 109 mainframe platform hardware, operating systems, middleware, storage and virtualization capability, first new system to emerge under IBM Systems' new "Systems Agenda" strategy for the emergent era of collaborative computing.)*
6. **"Maximizing Business Value With Resurgent zSeries Mainframes – Platform Readiness Key in 2005."** Software Strategies White Paper, September 2004, 56 p.p., 26 charts and tables. *(Focuses on key business values delivered by resurgent zSeries mainframe platforms, and assesses main advances in the 2005 mainframe software stack that combine to provide compelling advantages of adopting platform-readiness strategies exploiting these mainframe advances fully.)*
7. **"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.)*

Software Strategies

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This White Paper was researched, written by Ian Bramley, Managing Director of Software Strategies, and published in January 2007. 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 2001. Previously, he held a variety of executive positions with 4 international software and services vendors over a 30-year industry career.