

Mainframe operational superiority - for business applications

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IBM STG

May, 2007

From a Mainframe Forum.....

1. The world's transaction volumes will never stop growing.
 2. The world's data access needs will never stop growing.
 3. Nobody will figure out how to work around the speed of light as a physical constraint.
 4. Labour costs will keep rising.
 5. Energy costs will keep rising.
 6. Security will keep growing in importance.
 7. In a world with instant, competitive market access and global news, service qualities increasingly matter.
 8. There will always be business value in code written yesterday.
 9. The number of business functions within the average organisation that are fulfilled by computers will keep growing.
 10. Scale economies will grow in importance.
-
- *If even half those assumptions are true, I don't see any way around having a healthy degree of centralised computing infrastructure. And as long as that's true, you're going to have the IBM mainframe.*



2007 key themes and messages

Energy Efficiency

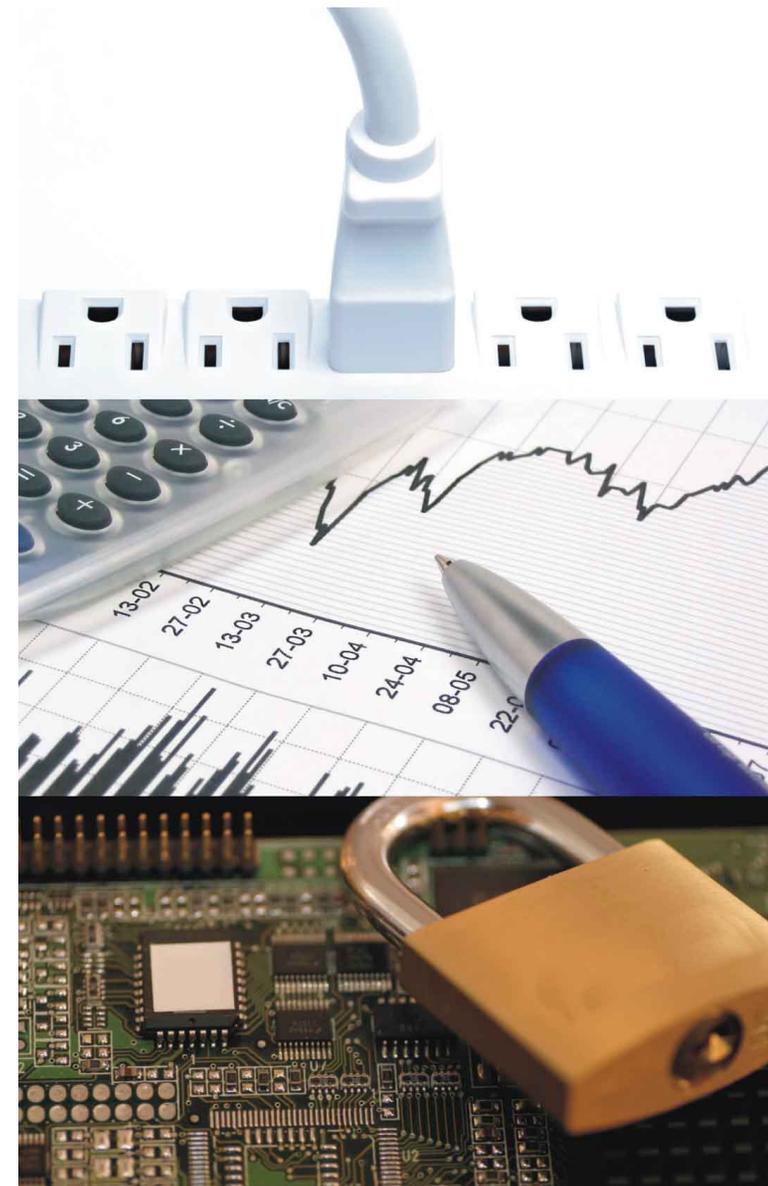
- ▶ IBM System z enables hundreds of mixed workloads to be run on a single energy efficient server at very high utilization levels, reducing both power and facility related costs.

Economics

- ▶ IBM System z' industry leading technologies and broad industry experience combine to help you implement the solutions that meet your changing business demands while delivering the efficiencies necessary to continuously take cost out of the business.

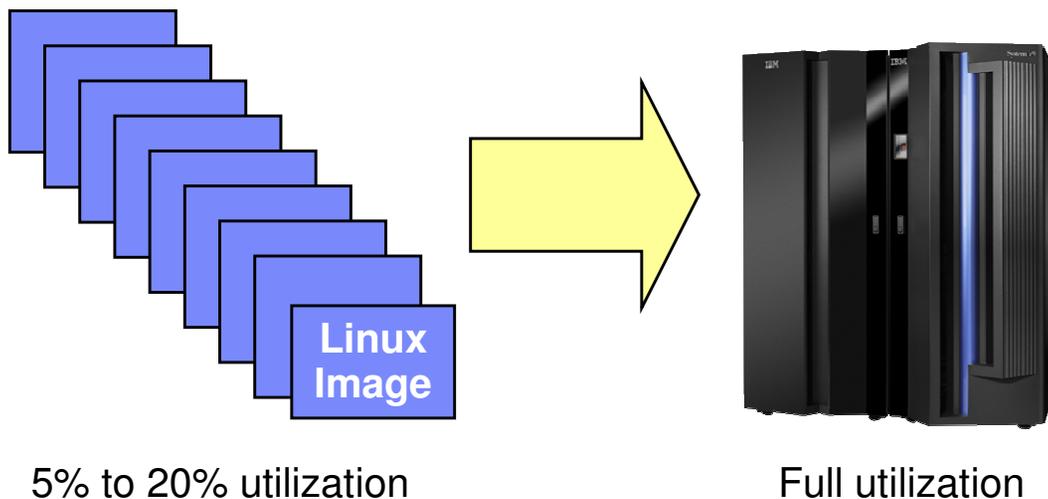
Security

- ▶ IBM System z' industry leading security capabilities are designed to provide your business with the protection it requires while also providing a flexible IT environment to that is responsive to innovation within the business.



The economics of workload consolidation

- **Distributed servers typically run at utilization levels in the range of 5% to 20%**
 - ▶ Production servers, development servers, test servers
- **Virtualization and workload management enable consolidation on the mainframe**
 - ▶ run multiple images on fewer processors
 - ▶ achieve utilization levels of 85% or more



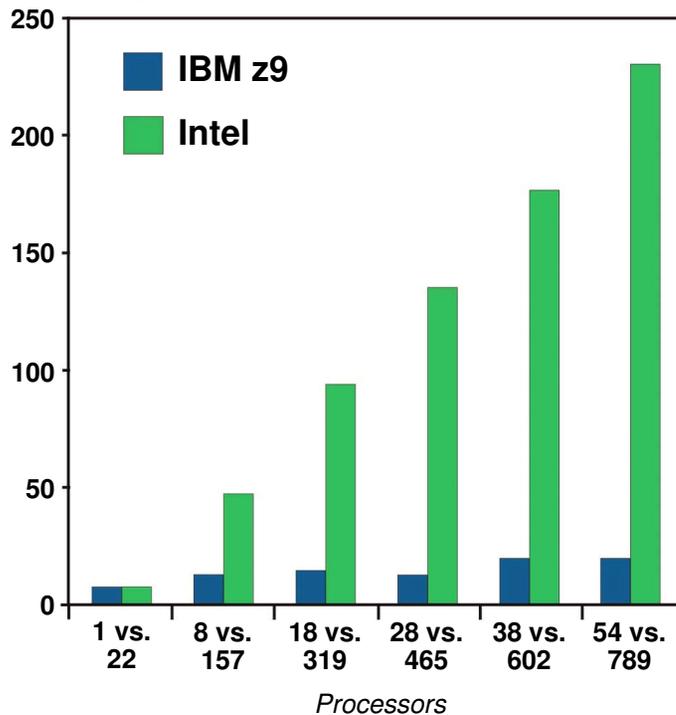
- **Consolidating workloads to a mainframe can help:**
 - ▶ **Lower cost of ownership**
 - ▶ **Lower energy consumption and facility costs**
 - ▶ **Reduce complexity and management costs**

Mainframe's high utilization capabilities may reduce both power and facility costs

Power and Space Consumption

POWER:

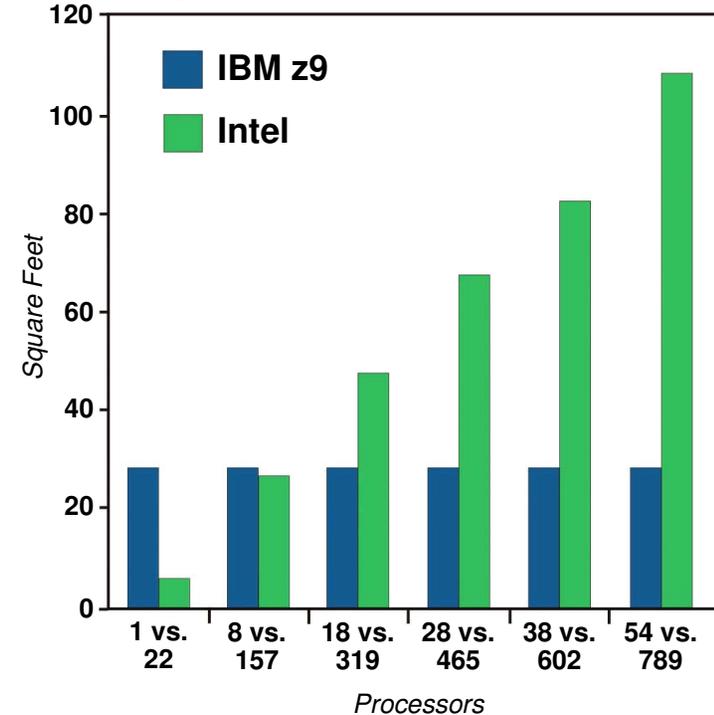
System z9 vs. Linux on Intel



In a consolidation, the IBM System z9 Enterprise Class (EC) may provide up to 4 times the same work in the same space and may provide up to 12 times the work for the same power consumption!

SPACE:

System z9 vs. Linux on Intel



The Linux on Intel servers selected in this example are functionally eligible servers considered for consolidation to a System z running at low utilization such that the composite utilization is approximately 5%. The utilization rate assumed for System z EC is 90%. This is for illustration only actual power and space reductions, if any, will vary according to the actual servers selected for consolidation.

Today's Mainframe:

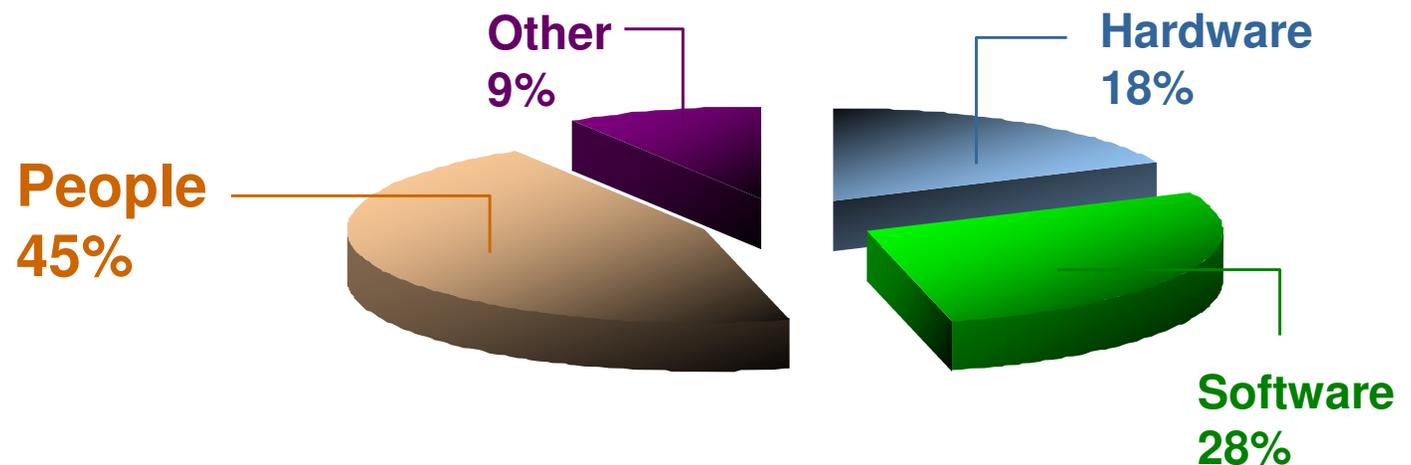
More powerful, less power – simply an energy efficient solution for multiple workloads

Addressing complexity and people costs

Too many servers, too much complexity –increasing staffing requirements

■ SMART SYSTEMS – built in virtualization, management and automation:

- ▶ Tens or hundreds of applications on a single server
- ▶ Design point that shares all key resources across ‘virtual servers’
- ▶ Inter-server communication at memory speed
- ▶ Automation of many systems operations to reduce management and administration overhead
- ▶ IT resources allocated on the fly
- ▶ IT resources allocated according to business priorities



Today's Mainframe:

A benchmark for virtualization and systems management

System z9 Advantage for SAP Applications

Value:

- Provide SAP customers with IBM System z9's premier server technology for secure data with superior economics and utmost availability, backed by \$40M of investment over 5 years!

Key Messages:

- *Ultimate* availability and security
- *Ultimate* flexibility of implementation
- *Ultimate* System Manageability

Solution Components:

SAP applications

- IBM System z9 BC or IBM System z9 EC
- IBM System z9 Integrated Information Processor (zIIP)
- Integrated Facility for Linux
- z/OS version 1.6 or higher
- Application Servers from System x and System p
- DB2 Universal Database (UDB) for z/OS version 8 or higher
- DB2 Connect
- DB2 Utility Suite
- DB2 Toolkits such as DB2 Performance Toolkit for z/OS
- IBM Tivoli System Automation, for high availability
- IBM Dynamic Infrastructure for mySAP Business Suite
- Service offerings for SAP and DB2 implementation



System z9 and Oracle Solutions on Linux

Customer Value:

- Mission-critical reliability for the Oracle E-Business Suite Database-tier delivered by Linux on IBM System z
- Reduced management costs through System z server consolidation

Key Messages:

- Superior economics
- Simple management and growth
- Optimization from Oracle and IBM

Solution Components:

- Oracle eBusiness Suite*
- Oracle PeopleSoft Enterprise*
- Oracle Siebel CRM*
- Oracle Fusion Middleware
- Oracle Database
- IBM System z9 BC or IBM System z9 EC
- IBM Integrated Facility for Linux (IFL)
- z/VM®
- IBM Director and Enterprise Workload Manager
- Tivoli Storage Manager™ and Systems Automation
- IBM System p™, System x™ or Blades as Application Server
- IBM TotalStorage®

The Oracle logo is displayed in red, bold, uppercase letters within a white rectangular box. The letters are slightly shadowed, giving it a 3D appearance.

*Split configuration

IBM/Oracle/i-Flex Announcement



Customer Value:

- Large Banks now have the ability to run i-flex retail core banking solution on the System z platform. Clients also benefit from collaboration between i-flex, Oracle and IBM to deliver additional solutions.

Key Messages:

- Banking applications for CRM, ERP, risk management, and core banking
- An i-flex retail core banking solution on the System z platform
- Opportunity to partner with Oracle and i-flex to grow our business

Solution Components:

IBM System z9 BC or IBM System z9 EC
 IBM System p and System x Application services
 IBM DB2 Universal Database
 IBM WebSphere
 IBM Tivoli System Automation
 i-flex FLEXCUBE
 Reveleus
 Daybreak
 Oracle PeopleSoft
 Oracle Siebel

| Applications | |
|------------------------|--|
| CRM | |
| Analytics | |
| Channels | |
| Financial | |
| Human Capital | |
| Retail Co | |
| Corporate Core Banking | |
| Risk Management | |

ACI / IBM Payments Framework

Customer Value:

- Realize benefits of ACI Payments Framework on an IBM Infrastructure

Key Messages:

- Low Risk due to market leadership of both ACI and IBM
- Complete, end-to-end electronic payments solutions using open systems technology
- SOA ready-
 - ▶ **Object Oriented Architecture (ESB) combined with IBM SOA / CBM**
- Industry leading capabilities for Reliability/Availability / Scalability / Performance

Solution Components:

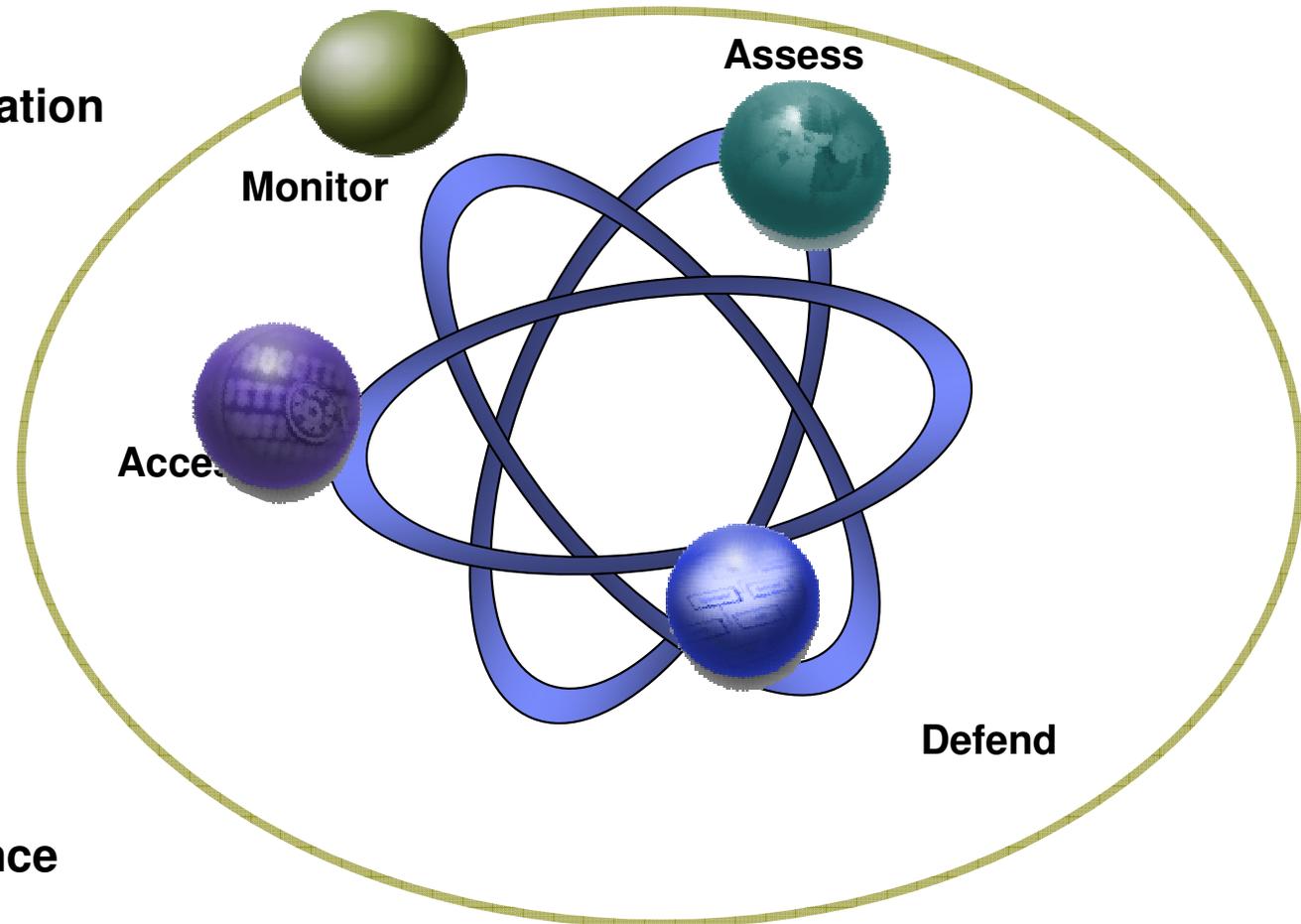
SAP applications

- IBM System z9 BC or IBM System z9 EC
- IBM System z9 Integrated Information Processor (zIIP)
- Integrated Facility for Linux
- z/OS version 1.6 or higher
- Application Servers from System x and System p
- IBM GBS offerings for Oracle Solutions



System z robust security

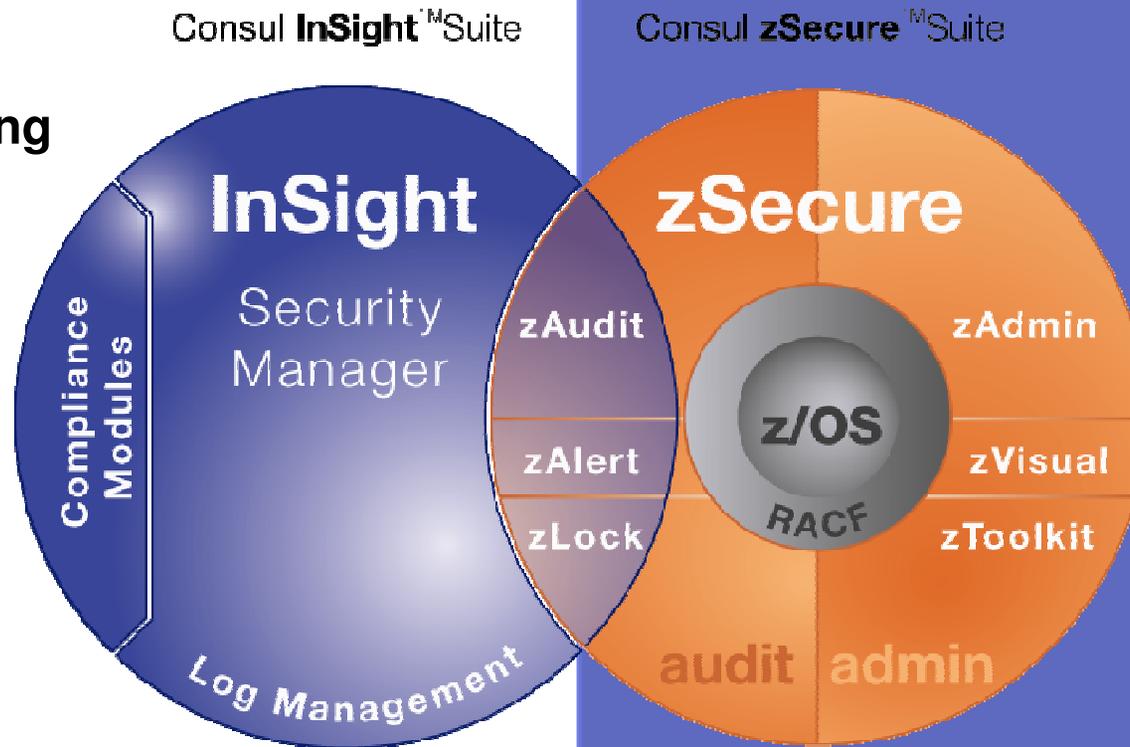
- Security features built into all system layers
- Consolidation and simplification of security management
- Encryption options for protecting sensitive data
- Cryptographic acceleration and centralized key management
- Internet security features
- Collaborate with Tivoli for enterprise-wide identity and access management
- Monitor, audit and compliance tools with enterprise view



Regulatory Reporting

Spanning distributed compliance and mainframe administration

Distributed log management, access monitoring and compliance reporting capabilities



Integrated mainframe audit, monitoring, compliance and administration capabilities

Consistent view across the enterprise

No need for mainframe specific skills for auditors

Reduce administration time, training, effort and cost

Pass audits more easily, improve effectiveness and security posture

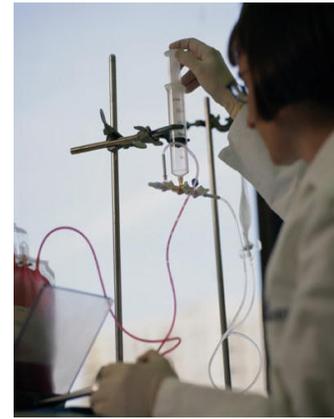
DB2 9 for the Mainframe



“The new security and compliance tracking capabilities of DB2 9 for z/OS will allow us to simplify our existing

process for the management reporting of changes to our production database systems. In addition, we have evaluated the new native XML support that DB2 9 provides and view this as a major technological advancement to help us to integrate XML data into a format that will allow for more robust and efficient usage by applications.”

Bob Perih, Senior Vice President, Citigroup



“By using the System z platform, and by using portal technology, we’ve been able to introduce the concept of always-on

information, anywhere that you want, at any time. Just like the body needs the heart, information systems need information management — DB2 on System z is a vital part of the whole architecture. If you have Web apps and they’re not available, they’re really not any good to anyone.”

*Gary Weckwerth,
Director of Technical Systems and Operations,
Aurora Health Care*

Key 2006 Announcements



On April 27th, IBM System z™ announced the new **IBM System z9™ Business Class** (z9 BC) mainframe for small and medium businesses and the **IBM System z9 Enterprise Class** (z9 EC) for large enterprises.

Plus...

- System z9 Integrated Information Processor (zIIP) - January 17
- System z9 Advantage for SAP Applications - August 8

Software pricing for new workloads

Helping Driving down the cost of IT

- **Specialty engines – addressing more new workloads:**
 - ▶ **NEW: IPSec, XML(SOD)***
 - ▶ **Linux, Java, Data-serving**
- **Specialty engines – designed to offer financial benefits now and in the future:**
 - ▶ **Technology investment protection**
 - ▶ **Lowering the cost of future growth with ‘extra capacity at no extra cost’**



Integrated Facility for Linux (IFL)



System z Application Assist Processor (zAAP)



IBM System z9 Integrated Information Processor (IBM zIIP)

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Simplifying z/OS pricing for new workloads

IBM System z New Application License Charge (zNALC) March 16, 2007

zNALC plans to offer a reduced price for z/OS operating system on dedicated LPARs where you are running qualified 'new workloads' such as WebSphere® Application Server, Lotus® Domino™, SAP, PeopleSoft, Siebel and others



- To replace both the z/OS.e operating system and the NALC pricing metric with the zNALC pricing metric. IBM intends:

- For z/OS.e Version 1 Release 8 to be the final release of the z/OS.e operating system.
- To allow ordering of z/OS.e V1.8 until the planned withdrawal from marketing in October 2007. IBM intends to provide service for z/OS.e V1.8 until its planned end of service in Sept. 2009.

zNALC Value

- For customers interested in consolidating distributed applications and co-locating them closer to your core z/OS systems to help increase control and improve TCO ...
- or
- for customers with z/OS NALC or z/OS.e ...
- then, zNALC may be of benefit.

zNALC simplifies new workload pricing on z/OS by offering:

- One new workload pricing for full range of z/Architecture servers
- Wider choice of qualifying applications
- Sub-capacity granularity
- Improved pricing performance
- No need for additional z/OS products or product numbers

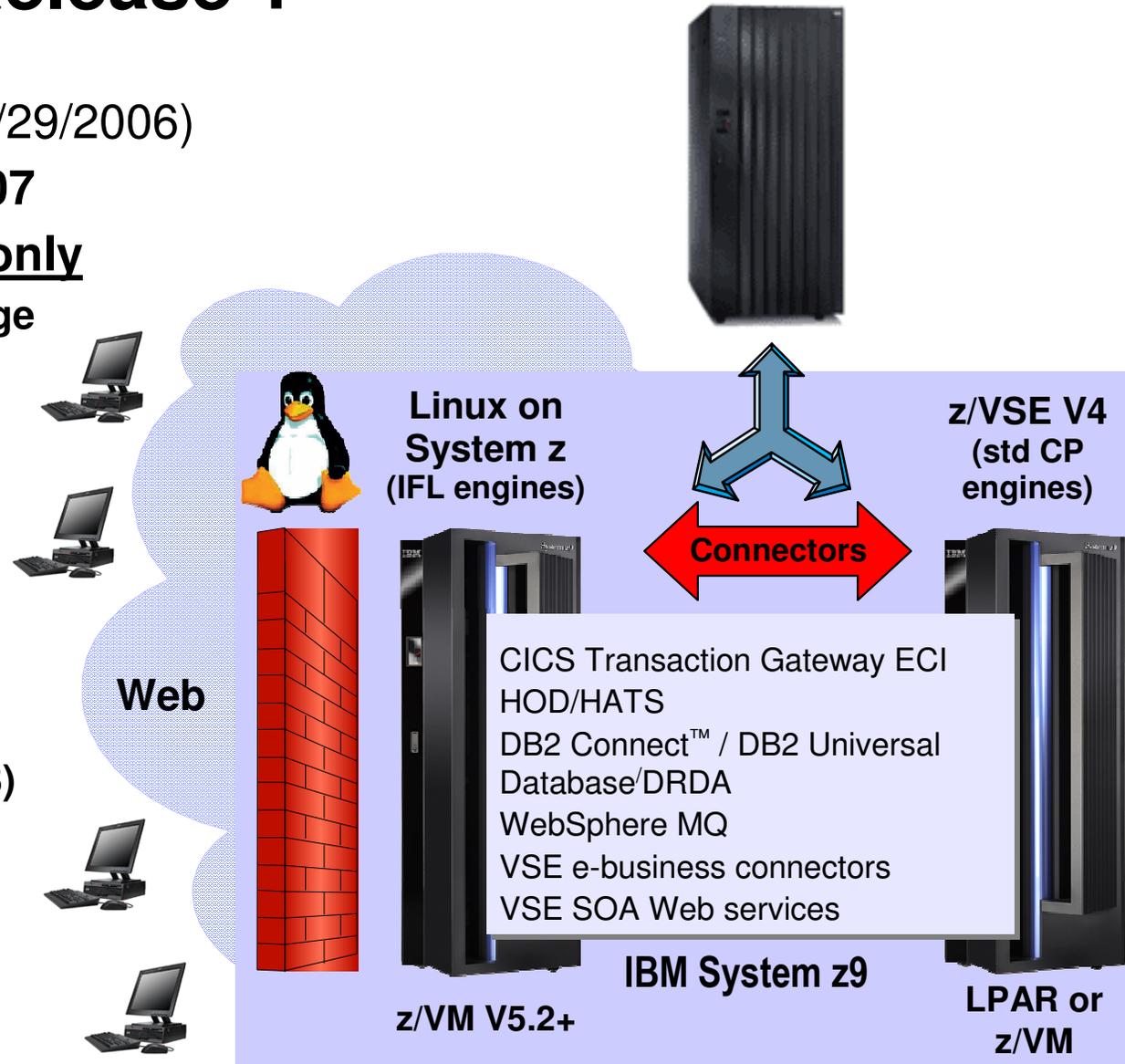
z/VM V5.3 on System z9

- Unify the infrastructure
 - ▶ Larger “Scale out” and “Scale up” support for hosting even more virtual server workloads*
- Leverage the mainframe data serving strengths
 - ▶ HyperPAV support is designed to reduce the number of alias-device addresses needed for parallel I/O to allow more base subchannels available for additional data storage volumes
 - ▶ Enhancements to z/VM FlashCopy® support to help improve capability and usability
 - ▶ System Storage SAN Volume Controller (SVC) Model 2145 support to access the DS4000™ and other OEM SCSI disk devices
- A secure and flexible business environment
 - ▶ Enhanced networking bandwidth and availability with Virtual Switch (VSWITCH) support for OSA-Express2 IEEE 802.3ad link aggregation
 - ▶ More comprehensive security with a new LDAP server and RACF Security Server feature, including support for up to 100-character password phrases (passphrases)
 - ▶ Enhanced tape data protection with support for 3592 Model E05 encryption
- Leverage strengths across the infrastructure
 - ▶ Systems management of z/VM guests from the Hardware Management Console (HMC)
 - ▶ Support for IBM System z specialty engines (processors) for z/OS guests
 - ▶ Enhanced memory management for Linux guests



z/VSE Version 4 Release 1

- Announce 1/9/2007 (Preview 4/29/2006)
- **General Availability 16/03/2007**
- **z/Architecture (64-bit) mode only**
 - ▶ Up to 8 GB real processor storage
 - ▶ System z9 EC *and* z9 BC
 - ▶ zSeries 990, 890, 900, 800
- **New MWLC pricing metrics (for System z9 only)**
 - ▶ Low full capacity price points
 - ▶ Sub-capacity option
- **Encryption enhancements**
 - ▶ CPACF enhancements (AES-128)
 - ▶ Crypto Express2 (configurable)
 - ▶ SecureFTP
 - ▶ TS1120 encrypting tape
- **SOA and interoperability**



System z9 BC GA2 and EC GA3 Enhancements

(GA May 11, 2007)



LPAR Group Capacity Limit

Hardware Decimal Floating Point

CFCC Level 15

System-Initiated CHPID Reconfiguration

I/O Availability Enhancements

OSA and FCP Performance Enhancements

z/VM Integrated System Management

TKE Workstation LIC 5.1 and Smart Card Reader

OSA Dynamic LAN Idle

OSA Layer 3 VMAC

OSA-Express2 Link Aggregation for z/VM

OSA-Express2 Network Traffic Analyzer

QDIO Diagnostic Synchronization

Frame Bolt Down Kit Features

Power Monitoring, Power Planning Tool

HMC and SE Enhanced Function

On/Off CoD Enhancement

z9 BC CBU Enhancement

z9 BC Single Processor Crypto Express2

z9 BC 2 port FICON Express4 SX

Preview/SOD for XML exploitation of zIIPs and zAAPs

System z9 LPAR Group Capacity Limit

- **Adds capability to define a z/OS LPAR as a member of a group of LPARs**
 - ▶ Group can cross sysplex boundaries
 - ▶ Group can include LPARs not participating in a sysplex
- **Adds capability to specify capacity of the group of LPARs in MSUs per hour**
 - ▶ Synergy with LPAR defined capacity
- **PR/SM™ and WLM work together to help:**
 - ▶ Enforce the capacity defined for the group
 - ▶ Enforce the capacity optionally defined for each individual LPAR
- **May provide better control of CP resource consumed for WLC pricing**
- **Exclusive to System z9**
- **Requires at a minimum:**
 - ▶ z/OS or z/OS.e Version 1 Release 8 (1.8)

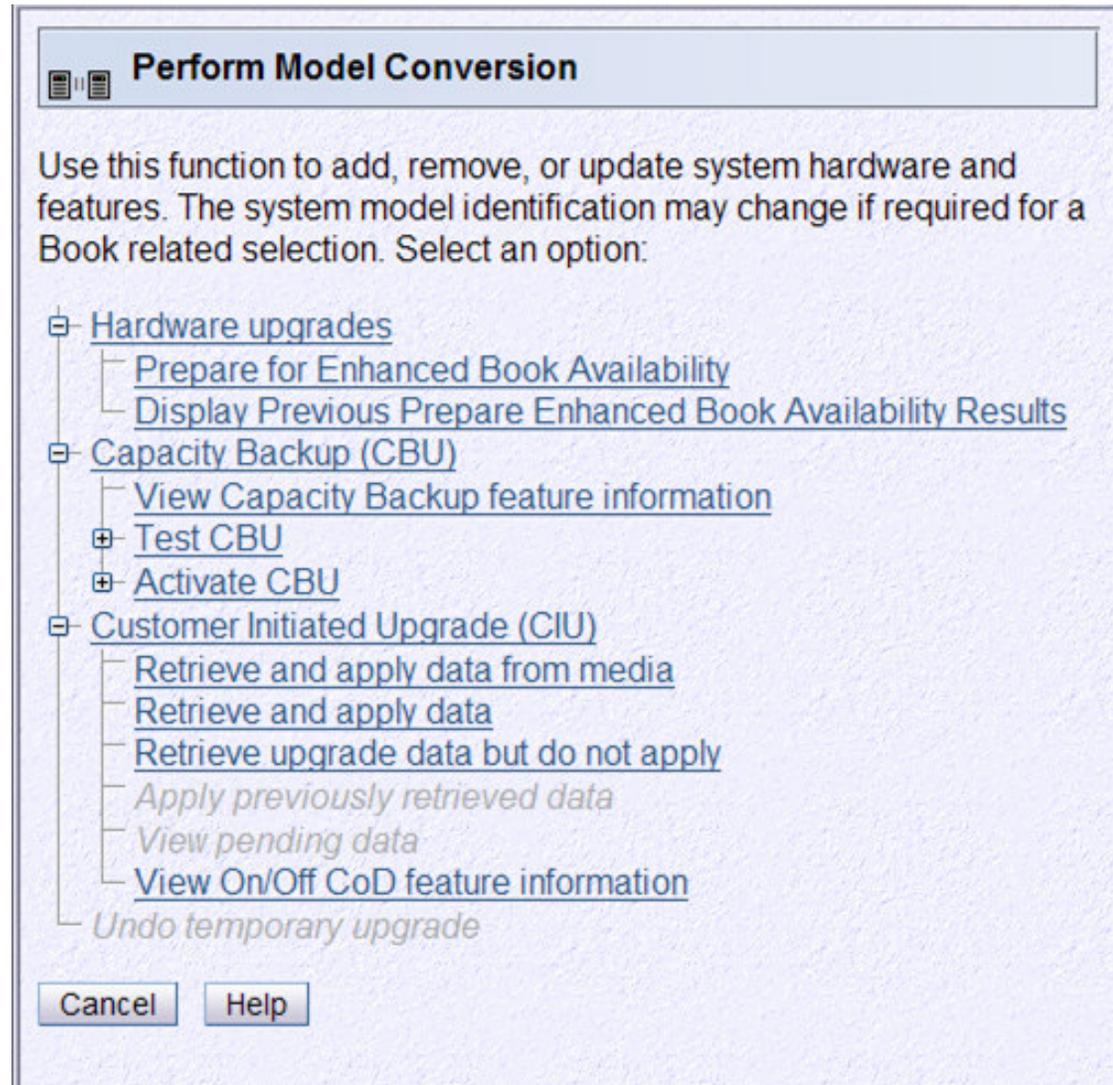
Hardware Decimal Floating Point facility

- **Provides a new z/Architecture® Hardware Decimal Floating Point facility providing 4, 8, and 16 byte data formats, an encoded decimal (base 10) representation for data, instructions for performing decimal floating point computations, and an instruction which performs data conversions to and from the decimal floating point representation.**
- **Exclusive to System z9 EC and BC**
 - ▶ No emulation or simulation support is provided for earlier machines.
- **Requires at a minimum:**
 - ▶ z/OS or z/OS.e 1.6 with PTF UA26136
 - ▶ z/VM 5.2 for guest support
 - ▶ IBM High Level Assembler V1.4 or higher plus applicable service for PTF PK18170
- **Additional Information**

<http://www.research.ibm.com/journal/rd/511/duale.html>

On/Off Capacity on Demand Enhancement

- **Download one or more On/Off CoD LIC CC records to the System z9 Support Element without application of the capacity**
 - ▶ Multiple records can have same or different capacities
 - ▶ Each record can have customer assigned description name
- **May provide more responsive activation of temporary capacity**
- **Billing begins at activation**
- **Similar to current function for Customer Initiated Upgrade (CIU) LIC CC records**
- **Exclusive to System z9**



System z9 Power Planning and Monitoring

■ Power Planning Tool

- ▶ Resource Link™ Web site tool designed to estimate power consumption of a specific System z9 machine configuration
- ▶ Required Input: Model, memory size, number of I/O cages, and quantity of each type of I/O feature card.
- ▶ Designed to be more accurate than estimates provided in existing physical planning documentation
- ▶ For installed Systems, Resource Link can obtain input from VPD file

■ System Activity Display (SAD) Power Monitor

- ▶ Additional function for SAD on the HMC
- ▶ Designed to display Watts and BTUs per hour of power consumption
- ▶ Designed to display cooling air input temperature

■ Exclusive to System z9

- **Designed to help verify power consumption for currently installed System z9 servers and to help power and cooling planning for new System z9 servers or for upgrades to currently installed System z9 servers.**

Preview – zIIP assisted IPSec

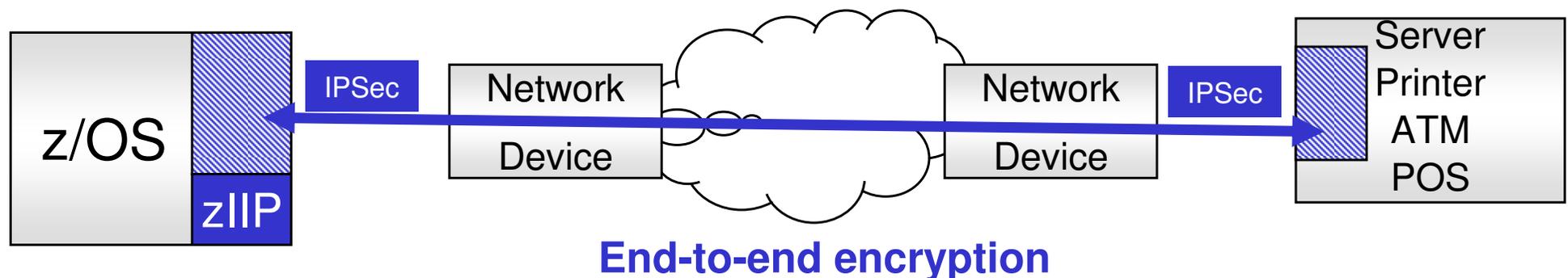
- **IBM is previewing an enhancement to the z/OS Communications Server that allows the IPSec processing to take advantage of zIIPs**
 - ▶ This zIIP Assisted IPSec function moves most of the z/OS IPSec processing from the general purpose processors to the zIIPs.
 - In addition to performing the encryption processing, the zIIP will also handle cryptographic validation of message integrity, and IPSec header processing.
 - Specifically, the z/OS Communication Server (z/OS CS) is designed to interact with z/OS Workload Manager to have all of its enclave Service Request Block (SRB) work made eligible to run on the zIIP.
 - ▶ This capability is planned to be available August 2007 via z/OS 1.8 and PTFs, and native on z/OS 1.9 when available.



zIIP Assisted IPsec on z/OS

- z/OS IPsec support provided in z/OS Communications Server
- IBM intends to deliver monitoring of IPsec in OMEGAMON® XE for Mainframe Networks V4.1 in 2007*
- zIIP specialty engine support to assist with IPsec workload
 - ▶ zIIP engine provides the same encryption acceleration (CPACF) as general purpose engines
 - ▶ Offloads most IPsec processing to the zIIP
 - ▶ Supported on System z9 Business Class and Enterprise Class servers
 - ▶ zIIP support is planned to be available August 2007 via z/OS 1.8 and PTFs
 - ▶ Materials for workload sizing and capacity planning are also planned for April 2007

<http://www.ibm.com/software/network/commserver/zos/security/>



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IBM is announcing its intent to enable the z/OS XML component to take advantage of zAAPs.*

- **Middleware and applications requesting z/OS XML System Services will have this z/OS XML System Services parsing eligible to execute on the zAAP.**
- **Specifically, all z/OS XML System Services parsing executing in TCB mode will be eligible for the zAAP.**
 - ▶ Example: DB2 9 SQL/XML processing via local connection
- **DB2 9 utilizes z/OS XML System Services for a portion of its SQL/ XML.**
 - ▶ Example: DB2 9 SQL/XML processing via local connection – executing in TCB mode
 - 1) Applications (queries) running locally on z/OS
 - When DB2 9 inserts or updates XML data, the data has to be parsed and therefore DB2 invokes z/OS XML System Services (and zAAP, when present)
 - 2) Utilities
 - When XML data is loaded into tables, then the XML data needs to be parsed and therefore DB2 9 invokes z/OS XML System Services (and zAAP, when present)
 - How much DB2 9 work is eligible for the zAAP will depend on amount of XML data being processed.

Why enable z/OS XML to zAAP and zIIP?*

- **Did we run out of new engine names? I thought zAAP was for a Java execution environment and zIIP for workloads like DB2?**
 - ▶ The zAAP is the System z Application Assist Processor designed to help implement new application technologies on System z – Java was the first exploiter
 - ▶ The zIIP is the System z9 Integrated Information Processor designed to help integrate data and transaction processing across the enterprise – DB2 V8 was the first exploiter.
 - ▶ The self-describing nature of XML lends itself to both application and information processing environments.

- **z/OS XML System Services enabled for zAAP and zIIP means that you can have the advantages of XML processing on z/OS with TCO benefits of either the zIIP or the zAAP processor, regardless of the invocation environment.**

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z/OS 1.9 Preview*

Scalability & Performance

54-way support, 64-bit GRS, SMF to Logger, TSO/E support for large sequential data sets, Message Flooding Automation, XCF CDS Performance, Heappools, VSCR...

Improving Usability and Skills

Health Checker improvements, more health checks, ISPF improvements, DFSMSrmm™ usability improvements, Improved Configuration Usability for Communications Server, ...

Improving Availability

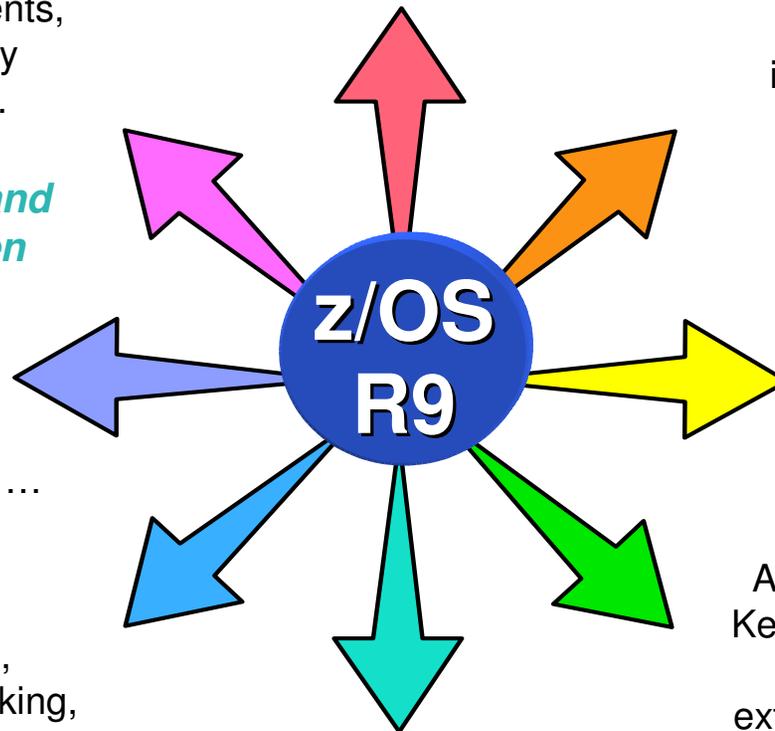
Improved latch contention detection, CF duplexing enhancements, SFM improvements, New RRS options

Integrating new Applications and Supporting Industry and Open Standards

System REXX, pthread enhancements, debugging improvements with dbx, Binder improvements, PKCS#11 support, ...

Extending the Network

Policy-based TCP/IP Routing, Centralized Policy-Based Networking, Expanded Network Encryption, FTP Unicode support, ...



Self-Managing Capabilities

WLM support for cross-system routing of zAAP workloads, WLM “Trickle” Support, Promotion of canceled jobs, Start servers in parallel, ...

Enhancing Security

Additional password phrase support, Kerberos AES support, Enhanced CRL support, PKI Services & RACF extensions, better z/OS UNIX® System Services auditability, Java user and group SAF admin classes, ...

Enterprise-Wide Roles

CIM monitoring enhancements, Updated Pegasus server

* All statements regarding IBM future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only.

Statements of Direction (1)

- **Dynamic ICF expansion**
 - ▶ IBM intends to remove the Dynamic ICF expansion function from System z and zSeries processors
- **Server Participation in a Parallel Sysplex cluster**
 - ▶ The IBM System z9 Business Class (BC) and Enterprise Class (EC) servers will be the last servers to support active participation in the same Parallel Sysplex with IBM eServer zSeries 900 (z900), IBM eServer zSeries 800 (z800), and older System/390 Parallel Enterprise Server systems
- **Support for System Storage TS3400 Tape Library**
 - ▶ IBM plans to enhance the IBM System Storage TS3400 Tape Library by adding autoloader support for the library with System z (z/OS, z/VM, z/VSE and TPF). Additionally, IBM plans to support system-managed encryption in a System z environment with the TS3400
- **IBM Tivoli OMEGAMON® XE for Mainframe Networks**
 - ▶ To support customers who are moving to secure data transmission across open networks using IPSec, IBM Tivoli intends to deliver the ability to monitor IPSec in OMEGAMON XE for Mainframe Networks V4.1. IBM Tivoli OMEGAMON XE for Mainframe Networks will provide users the ability to monitor the use of IP filters and the performance of IPSec tunnels for the TCP/IP stacks on a z/OS system. Users will be able to identify potential network attacks or configuration problems with IP filters and IPSec security associations (SAs). The information provided may be used to perform problem determination and to identify possible corrective actions

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Statements of Direction (2)

- **z/OS XML enabled for both zAAP and zIIP specialty processors**
 - ▶ IBM is announcing its intent to enable the z/OS XML component to take advantage of zAAPs. This future enhancement means that middleware and applications requesting z/OS XML System Services (for example DB2 processing via local connection) will have z/OS XML System Services processing execute on the zAAP. Specifically, all z/OS XML System Services parsing executing in TCB mode will be redirected to the zAAP.
 - ▶ In addition, IBM is announcing its intent to enable the z/OS XML component to fully take advantage of zIIPs, when present. With respect to DB2, z/OS XML processing may be partially directed to zIIPs when utilized as part of a distributed request (like DB2 DRDA). The future enhancement will further benefit DB2 by directing the full amount of the z/OS XML System Services processing to zIIPs when it is utilized as part of any zIIP eligible workload (like DRDA). Specifically, all z/OS XML System Services parsing that is executed in SRB mode from zIIP-eligible enclaves will be redirected to the zIIP.
 - ▶ As part of a comprehensive plan, IBM intends to extend and expand on the use of z/OS XML System Services enabled for zAAP specialty processors as the basis for future enhancements:
 - IBM intends to enhance the XML Toolkit for z/OS so that eligible workloads may exploit the z/OS XML component - this extends zAAP exploitation to the XML Toolkit for z/OS.
 - IBM intends to add validating parsing to the z/OS XML component - this extends zAAP exploitation for XML validating parsing as well.

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Statements of Direction (3)

■ **Common Criteria Certification for z/VM V5.3**

- ▶ IBM intends to evaluate z/VM V5.3 with the RACF Security Server optional feature for conformance to the Controlled Access Protection Profile (CAPP) and Labeled Security Protection Profile (LSPP) of the Common Criteria standard for IT security, ISO/IEC 15408, at Evaluation Assurance Level 4 (EAL4). This new SOD represents a modification to IBM's previously expressed Statement of Direction of July 27, 2005, which stated IBM's intent "to evaluate z/VM V5.2 with the RACF for z/VM optional feature for conformance to the Controlled Access Protection Profile (CAPP) and Labeled Security Protection Profile (LSPP) of the Common Criteria standard for IT security, ISO/IEC 15408, at Evaluation Assurance Level 4 (EAL4)." Based on additional assessment of requirements, IBM no longer intends to evaluate z/VM V5.2.

■ **OSA-Express2 link aggregation and failover support**

- ▶ IBM intends to provide virtual switch (VSWITCH) support for IEEE Standard 802.3ad Link Aggregation in z/VM V5.3. This support is designed to allow all OSA-Express2 features that are associated with a virtual switch to be grouped and used as a single "fat pipe", helping to increase bandwidth and provide near-seamless failover in the event of a link failure. This z/VM support requires associated OSA-Express2 support that is planned to be available on IBM System z9 servers.

System z z/OS and z/OS.e Support Summary



| | | z800 (WdfM) | z900 (WdfM) | z890 (WdfM) | z990 (WdfM) | z9 EC | z9 BC | End of Service | Coexists with z/OS | Ship Date |
|------------------------------|-------------|------------------------|------------------------|------------------------|------------------------|------------------|--------------|---------------------------|-----------------------------------|----------------------|
| z/OS & z/OS.e | 1.6 | x | x | x | x | x | x | 9/07 | 1.8 | 9/04 |
| -"- | 1.7 | x | x | x | x | x | x | 9/08* | 1.9* | 9/05 |
| -"- | 1.8 | x | x | x | x | x | x | 9/09* | 1.10* | 9/06 |
| z/OS | 1.9* | x | x | x | x | x | x | 9/10* | 1.11* | 9/07* |

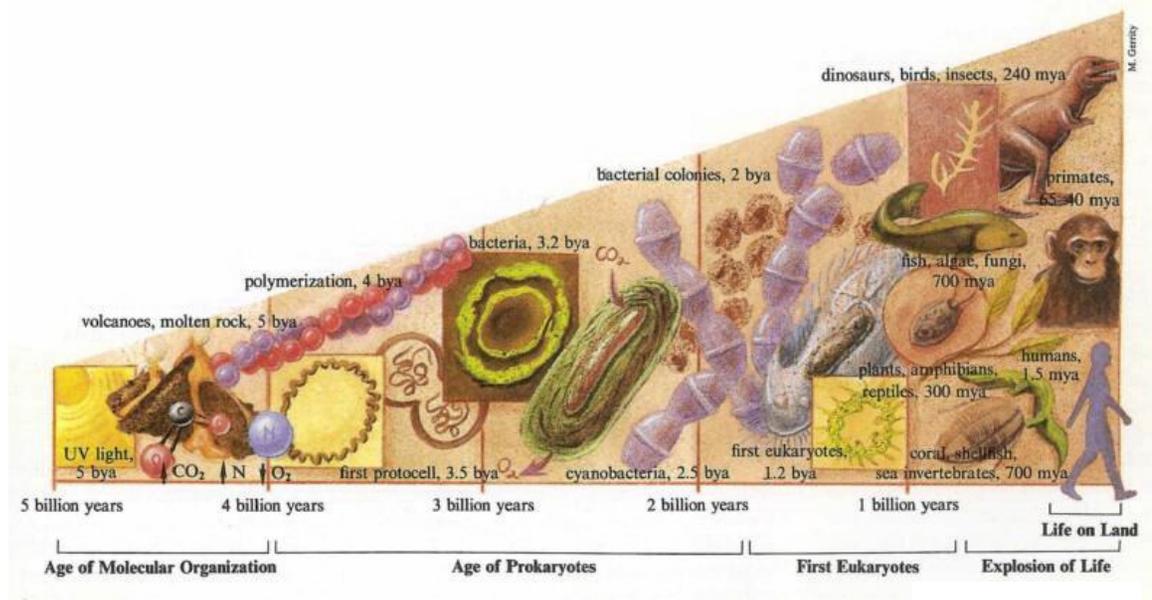
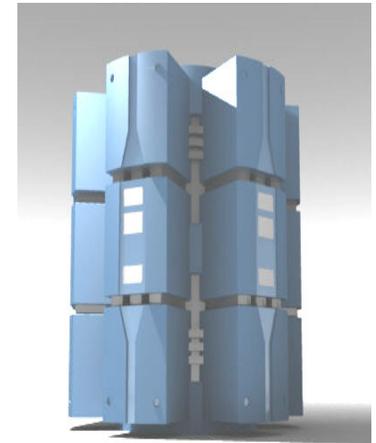
z/OS.e - z800, z890 and z9 BC only. Release 1.8 will be the last release of z/OS.e.

z/OS 1.6 and 1.7 are no longer orderable.

Only service-supported releases can coexist in the same sysplex

* Planned. All statements regarding IBM's plans, directions, and intent are subject to change or withdrawal without notice. Any reliance on these Statements of General Direction is at the relying party's sole risk and will not create liability or obligation for IBM.

Growing mainframe workloads plus new opportunity areas.



All EVOLUTION in thought and conduct must first appear as heresy and misconduct.

George Bernard Shaw