The future runs on System z

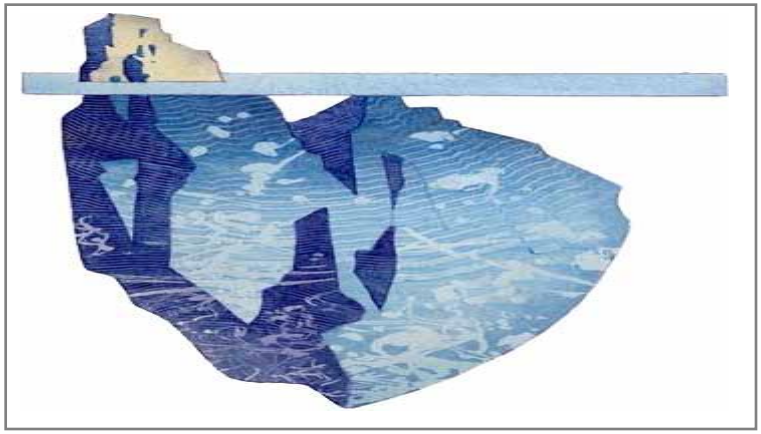
Positioning System z Strategy and Investments

Ray Jones
WW Vice President, z Software

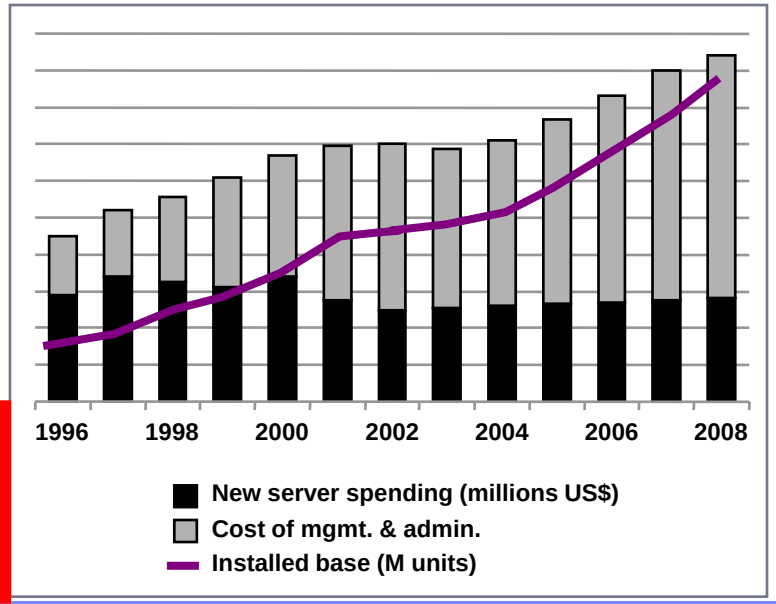
IT Complexity Drives Many Hidden Costs

This one just won't go away

- **Managing today's mixed IT platform environments can be complex and costly**
  - **Thousands of servers**
  - **Underutilized assets**
  - **Thousands of software licenses**
  - **Thousands of distributed control points**
  - **Ineffective costing methodologies**



- **The Result**
  - **Massive complexity**
  - **Spiraling people costs**
  - **Increased availability and downtime costs**
  - **Increased security breach costs**
  - **Sub-optimal investment choices**



Many infrastructure mgt industry Initiatives are focused on changing this direction but adoption has been slow & difficult !!

Data Centre on a truck

The z Software Strategy

- **Reinvigorate the System z Ecosystem:**
  - Attract New System z Customers and Application Workloads
  - Retain and Grow Existing System z customers
  - Make the Mainframe Relevant to a new IT Generation

- **Platform Modernization and Simplification are key:**

  - Evolve as a Modern Server
    - Systematic Reengineering of the Software Stack
    - More Open Standards Compliant and Common Middleware
    - Integration with the z Platform for Added Functions
    - Accelerate innovation on System z with new Application Development Capabilities

  - Deliver Extensive Data Management Services
    - Leading Edge Relational Function
    - Reinvigorated Data Warehousing Competitiveness
    - Autonomic Tooling to Augment Human Expertise

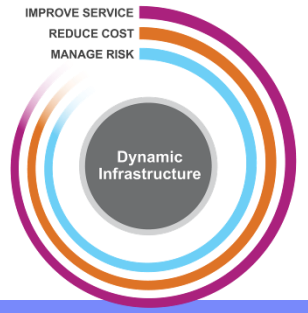
  - Bring Virtualization to a new Level
    - Logical as well as Physical Consolidation
    - Manage many Systems as if they were One
    - More End to End Management Capability from a z Central Point of Control

The road ahead for Dynamic Infrastructure with z

Our goal is to extend mainframe qualities to a heterogeneous Dynamic Infrastructure to Support Critical Applications

- **End-to-End Systems Management**
- **Policy based Automation Across the Applications Stack**
- **Mainframe Security**
- **Application Resiliency**
- **Consolidated Disaster Recovery**
- **Improved Economies of Scale and Efficiency**

VIRTUALIZATION + **ENERGY EFFICIENCY** + **STANDARDIZATION** + **AUTOMATION** =

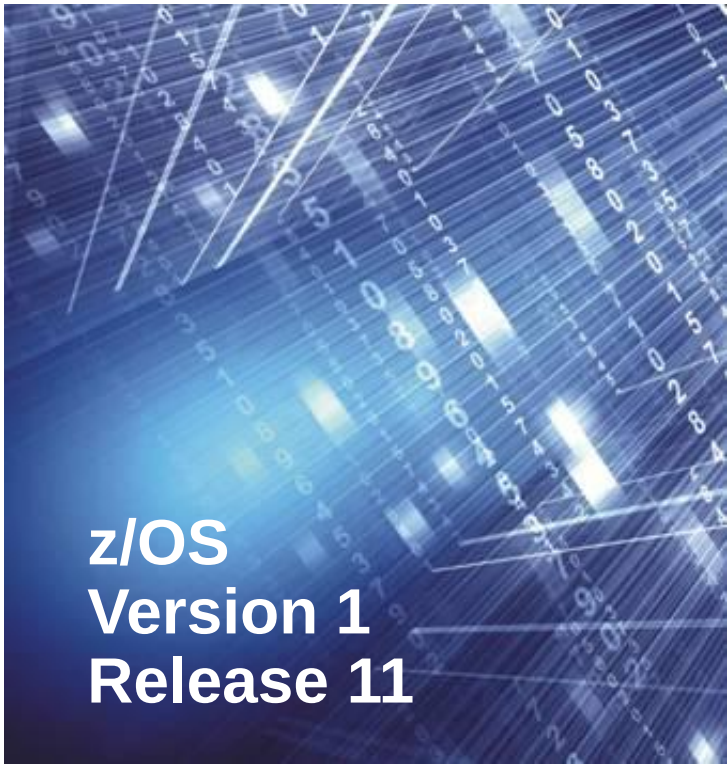


Data Warehouse Accelerator Features

- A special purpose, network attached x86 accelerator system
  - Offload typical DW queries from traditional database server
  - Based on research prototype
  - No changes to the applications
  - DB2 transparently exploits the accelerator for applicable queries
- Improving performance of typical DW queries 5-10 times
- Achieving linear scaling with the number of CPUs
- Reducing need for tedious tuning of DB2 (MQTs, indexes, etc.)
- Significant price/performance and TCO improvement
  - Offloading very CPU intensive operations from System z
  - Using commodity hardware
  - Order of magnitude performance improvement for offloaded queries
  - Reduced DBA effort for tuning offloaded queries
- Appliance-like form-factor
  - User/reference guide assisted installation, initial configuration
  - Hands free operations

Extending leadership capabilities for the Dynamic Infrastructure

- **A preview of z/OS Version 1 Release 11***
  - Synergies - with new IBM System Storage DS8000 Release 4.2
  - Trusted - the latest encryption technologies, centralized security certificates, and foundation for unified enterprise-wide identity and access management reduce risk of fraud.
  - Responsive - communications that improve network recoverability, availability, and reduce complexity and latency of transactions
  - Accountable - enhanced measurement to support comprehensive control, analysis, risk management, audit, and compliance plans
  - Smart - a system that learns heuristically from its own environment and is able to anticipate and report on potential issues for predictive analysis



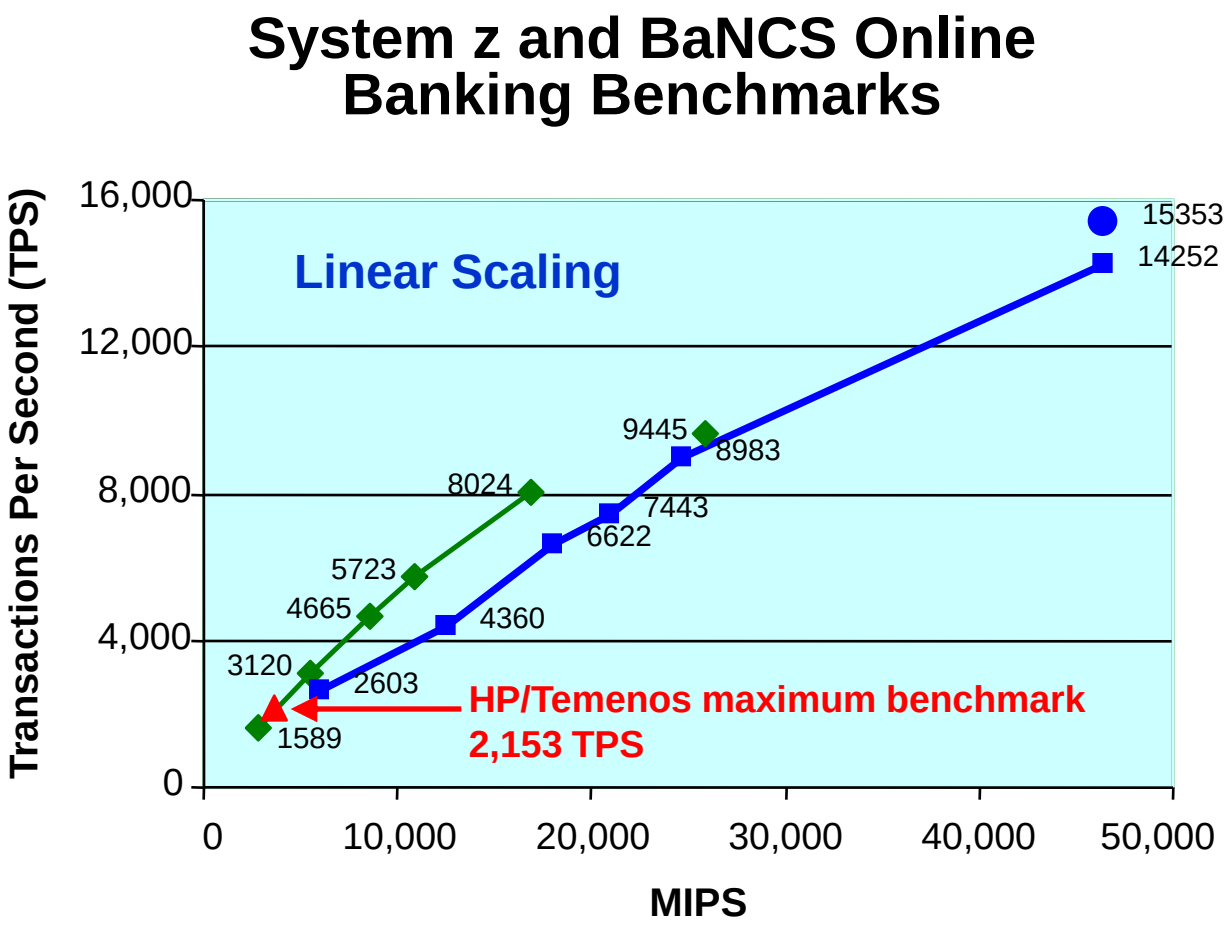
z/OS Version 1 Release 11*
Planned availability September 2009

System z With DB2 Scales Further Than Best HP Superdome Banking Benchmark

- Asian Bank
  - **IBM System z9 and DB2**
  - **TCS BaNCS (Cobol)**
  - **15,353** Transactions/second
  - **50** Million Accounts
  - IBM benchmark for customer

- Bank of China **
  - **IBM System z9 and DB2**
  - **TCS BaNCS (Cobol)**
  - **8,024*** ** Transactions/second
  - **380** Million Accounts
  - IBM benchmark for customer

- HP/Temenos *
  - **HP Itanium**
  - **Temenos T24 (Java)**
  - **2,153** Transactions/second
  - **13** Million Accounts
  - Largest banking benchmark performance claimed by HP



*** SOURCE**: TEMENOS BENCHMARKS; http://h71028.www7.hp.com/enterprise/downloads/TemenosBenchmark.pdf
**** SOURCE**:http://www.enterprisenetworksandservers.com/monthly/art.php?2976 **Source**: InfoSizing FNS BANCS Scalability on IBM System z – Report Date: September 20, 2006
******* Standard benchmark configuration reached 8,024 tps, a modified prototype reached 9,445 tps

System z With DB2 Scales Further Than Best HP Superdome Banking Benchmark, with Java

- Asian Bank
  - **IBM System z9 and DB2**
  - **TCS BaNCS (Cobol)**
  - **15,353** Transactions/second
  - **50** Million Accounts
  - IBM benchmark for customer

- IBM Benchmark
  - **IBM System z10, WAS, DB2**
  - **Temenos TCB (Java)**
  - Result of preliminary Temenos TCB optimization prototype

- HP/Temenos *
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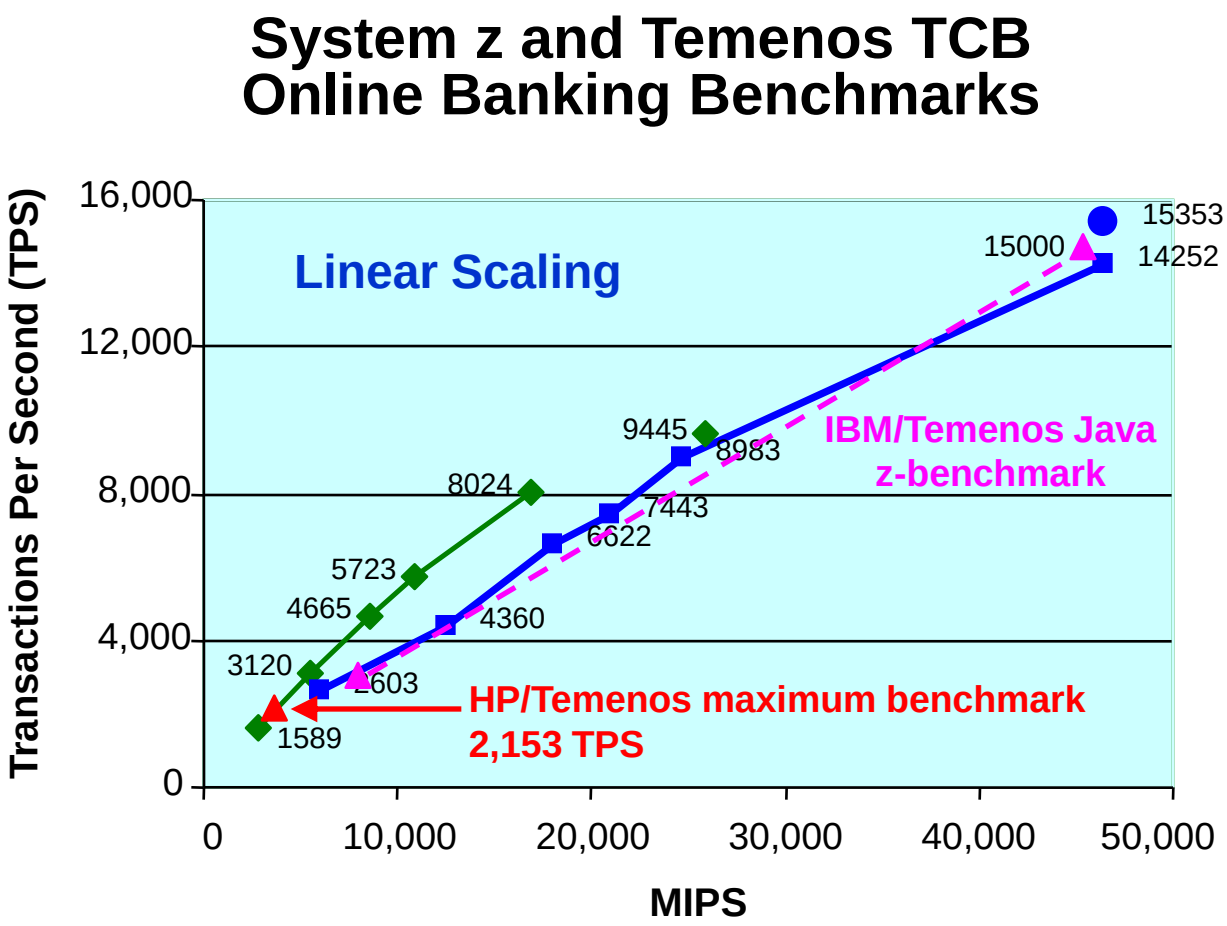


*** SOURCE**: TEMENOS BENCHMARKS; http://h71028.www7.hp.com/enterprise/downloads/TemenosBenchmark.pdf

Additional scalability/performance enhancements *Previewed with z/OS V1.11**

- **Improvement in storage response times**
  - DFSMS™ support planned for DS8000 R4.2 solid state drives (SSD, also called flash memory)
  - New SMS policies to gather usage information using SMF that is intended to help manage data placement to take the best advantage the new SSDs.
- **Performance improvements for XL C/C++ applications on System z10 servers**.
  - New prefetch capability can heuristically generate System z10 prefetch instructions as appropriate
- **Reduced memory management with large (1MB) page support**
  - Support for AMODE 64 XL C/C++ Language Environment applications, in addition to current exploitation by the 64-bit SDK for z/OS, Java® Technology Edition, V6
- **Performance improvements for large systems with many zIIPs**
  - Faster processors can actually spend more time waiting for memory access! HiperDispatch helps improve cache management and overall system performance.
  - HiperDispatch algorithms to be updated for zIIP processors.
- **Increase the efficiency of batch windows**
  - Use IEFBR14 to delete catalogue reference to unneeded data sets and avoids the lengthy process of recalling the DS just to delete it
- **Virtual Storage Constraint Relief !**
  - Removes constraints within the base z/OS operation system and can allow more work to be processed on a single z/OS system.

Storage Costs: DB2 Delivers More Storage Savings Than Oracle

- **DB2 for z/OS lowers TCO by reducing storage needed**
  - TPC-H Benchmark: DB2 compression of 62% vs 27% for Oracle RAC

- **Storage savings with DB2 vs. Oracle for a 10 TB data base**

	Oracle	DB2 for z/OS*
Storage System	**HP XP24000 Storage**	**IBM System Storage DS8100**
Overall database compression ratio (using TPC-H benchmark results)	**27%**	**62%**
For 10 TB uncompressed data storage needed	**7.3 TB of HP Storage**	**3.8 TB of IBM Storage**
Cost of storage (3 year TCA)	**$888,399 + $37,560 x 3** = $1,001,079	**$192,205 + $7,992 x 2**** = $208,189
With compression, storage for DB2 costs 79% less than for Oracle		

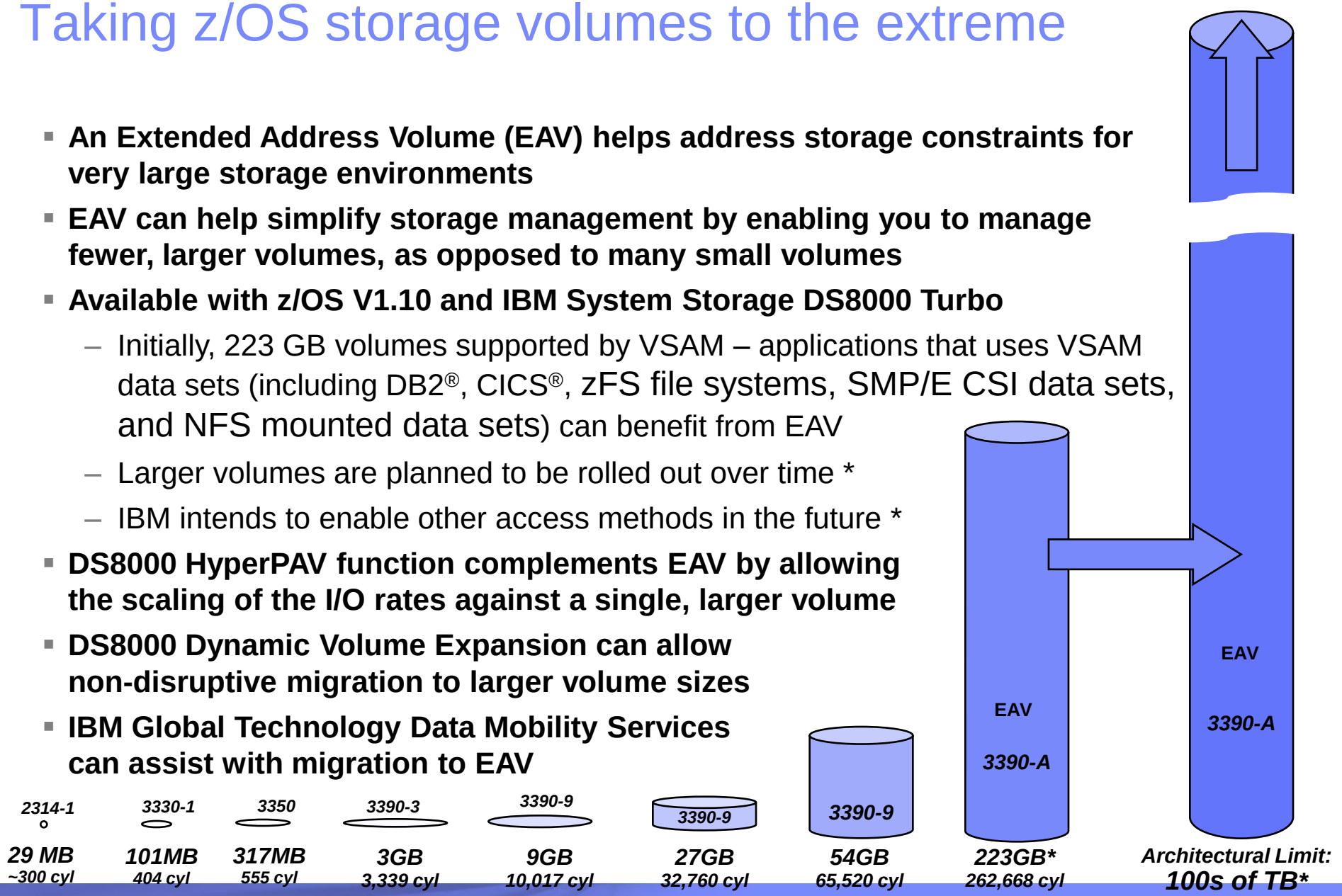
*DB2 for z/OS achieves similar compression ratios to those of DB2 for LUW
**IBM storage maintenance fee for the first year is included in the warranty

IBM System Storage DS8000
Scalability and Performance

- **Solid-State Devices for DASD**
  - Flash-based “drives”
    - RAID-based
    - Dynamic chip sparing
  - Improved DASD response times
  - Caching with controller-based prefetching means SSD probably best suited for:
    - Infrequently written data
    - Frequently read data
    - Random access data
    - Data with high read disconnect times
  - HDD probably a better choice for:
    - Sequential access
    - Frequently rewritten data
  - SMF records, DATACLAS support to help with data management
  - Support available on z/OS R9 and R10 with APAR OA25559, planned to be included in z/OS R11
  - Power consumption and cooling requirements markedly lower than for hard disk-based volumes

Taking z/OS storage volumes to the extreme

- **An Extended Address Volume (EAV) helps address storage constraints for very large storage environments**
- **EAV can help simplify storage management by enabling you to manage fewer, larger volumes, as opposed to many small volumes**
- **Available with z/OS V1.10 and IBM System Storage DS8000 Turbo**
  - Initially, 223 GB volumes supported by VSAM – applications that uses VSAM data sets (including DB2®, CICS®, zFS file systems, SMP/E CSI data sets, and NFS mounted data sets) can benefit from EAV
  - Larger volumes are planned to be rolled out over time *
  - IBM intends to enable other access methods in the future *
- **DS8000 HyperPAV function complements EAV by allowing the scaling of the I/O rates against a single, larger volume**
- **DS8000 Dynamic Volume Expansion can allow non-disruptive migration to larger volume sizes**
- **IBM Global Technology Data Mobility Services can assist with migration to EAV**



Fractional Availability Improvements Are Important

Example: Financial Services Company

- $300B assets, 2500+ branches, 15M customers
- Retail banking, loans, mortgages, wealth management, credit cards
- CRM System – branches, financial advisors, call centers, internet
- Number of users – 20,000+

	Unix/ Oracle	***System z DB2***
Availability %	**99.825 %**	**99.975%**
Annual outage	**15h 20m**	**2h 11m**
Cost of Downtime	$22.9M	$3.3M

Sources: ITG Value Proposition for Siebel Enterprise Applications, Business case for IBM System z & Robert Frances Group

Financial Impact of Downtime Per Hour

Industry segment	*Cost*
Energy	**$2,818K**
Telecommunications	**$2,066K**
Manufacturing	**$1,611K**
Financial	**$1,495K**
Information Technology	**$1,345K**
Insurance	**$1,202K**
Retail	**$1,107K**
Pharmaceuticals	**$1,082K**
Banking	**$997K**
Consumer Products	**$786K**
Chemicals	**$704K**
Transportation	**$669K**

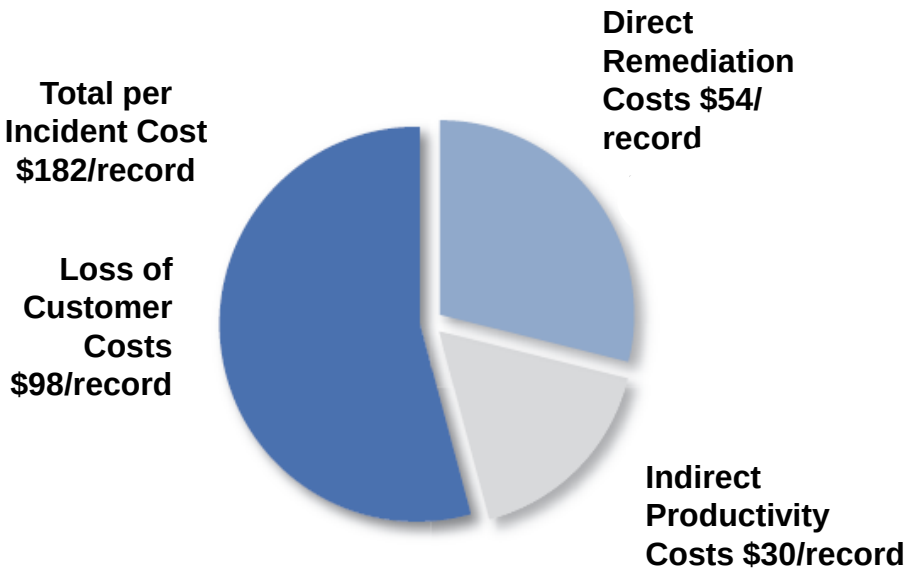
z/OS availability enhancements
*Previewed with z/OS V1.11**

- **z/OS V1.11 plans to extend predictive failure analysis -** z/OS system heuristically learns from its own environment and is able to anticipate and report on potential system issues (however rare) before they are an impact to your business.

- **z/OS UNIX® System Services with System Call (Syscall) Trace** - intended to gather more information about program processing history to facilitate application debugging.
- **New Allocation commands** - can help improve system availability by allowing you to change Allocation settings without an IPL.
- **New latch identity service for improved latch contention**
- **Improved serviceability,** including IPL restart improvements and improved dump management
- **Parallel Sysplex:**
  - **Networking** (Sysplex Distributor)
    - New WLM routing algorithms for better zIIP and zAAP workload routing
    - Connection routing accelerator for performance
    - Intelligent routing for multitier z/OS applications
  - **Availability**
    - New health checks for DAE and STP
    - Alternate Sysplex root file system support
    - Enhancement to XCF and XEC
    - Auto IPL (R10)

Cost of a Security Breach

- **Total costs per compromised record**
  - $182 per record or $4.8 million per incident
  - Incident costs reported ranged from $226,000 to $22 million
  - Total of $148 million in costs across the sample of 31 companies
- Average customer loss was 2 percent of all customers, with some reporting up to 7%

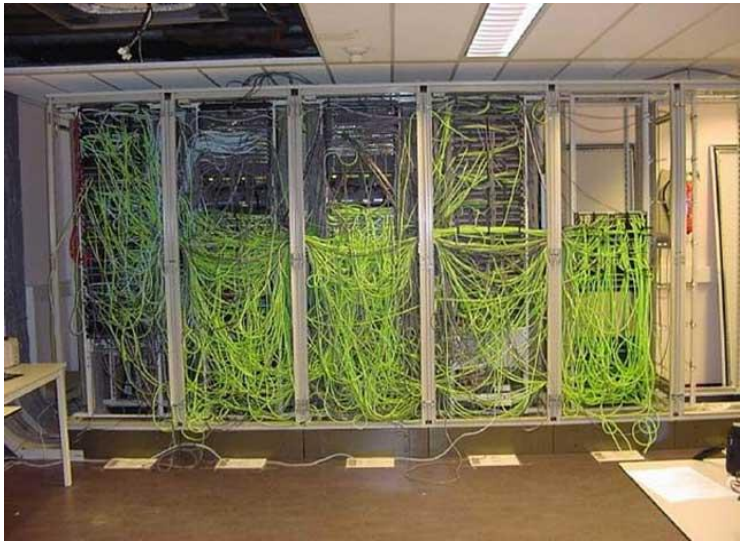


Ponemon Study: 2006 Survey Cost of a Data Breach

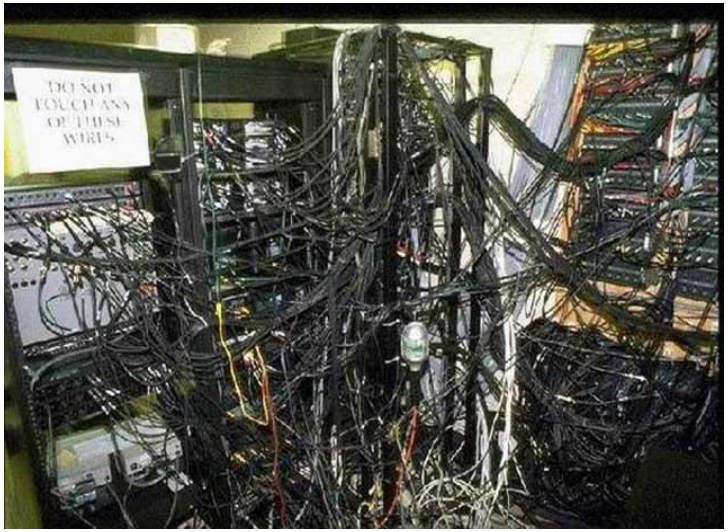
System z – Advancing security

- *Application Intrusion Detection*
  - "Defense in depth" with improved network and application network security through network security services provided by z/OS
  - DataPower and ISS appliances leverage System z Security and Crypto services for improved threat detection and centralized controls
- *Continued focus on z/OS Health Checks to help maintain best practice" configurations*
- *Continued focus on industry standard encryption algorithms and encryption standards*
  - Improved performance and security to address industry and compliance needs
  - FIPS evaluations expanded to include SW cryptography & protocols
- *Enterprise hub for key management*
  - System z cryptography & key management for heterogeneous servers and devices with open standards
- *Digital Certificate provisioning & management*
  - Centralized provisioning of certificates and keys with additional protocols to facilitate integration with applications and heterogeneous platforms
- *Improved Auditing and Compliance*
  - Reducing auditor workloads and Improved scope of enterprise-wide compliance reporting with end to end propogation of user identity for greater accountability
- *Cryptographic processing*
  - Increased scale and functionality to meeting emerging requirements

Network Simplification



- **Consolidation replaces cables and routers with internal connections**
- **Better performance and security**

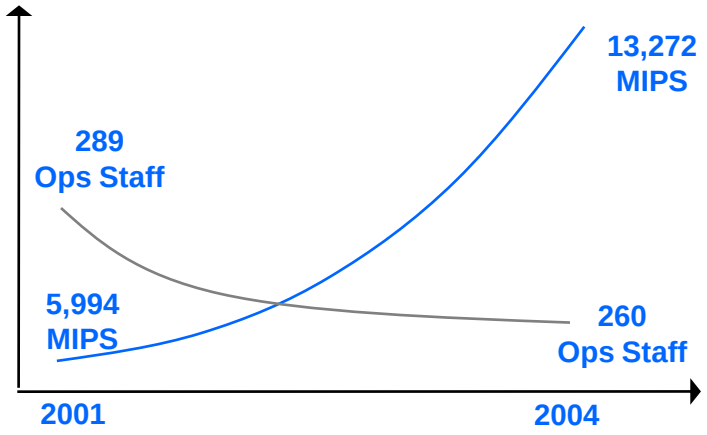


Enhancements in networking performance
*Previewed with z/OS V1.11**

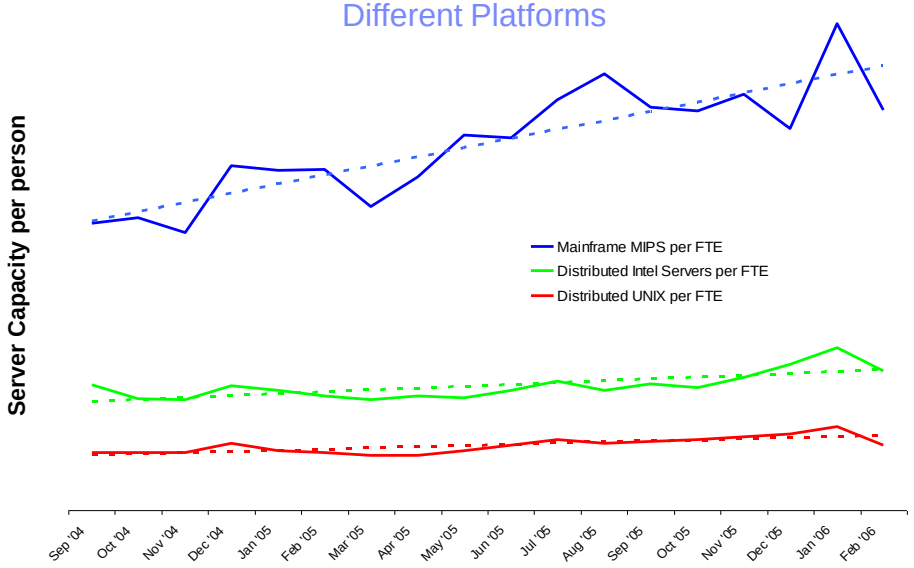
- **z/OS Communications Server designs for networking performance:**
  - Improved throughput in support of disaster recovery or global operations
    - Dynamic tuning of TCP window for bulk transfers over high-latency, long distance networks
  - More performance for Web-based applications
    - System-wide caching of domain name server (DNS) responses
    - Applications with frequent resolver queries can benefit.
    - Improved Fast Cache Accelerator function
  - Intelligent sysplex networking
    - The Sysplex Distributor plans to take into account the capacity, performance and health characteristics of both the tier 1 and the tier 2 z/OS server applications. This new function is intended to improve the quality of the load balancing decisions made by Sysplex Distributor in a multi-tier z/OS server environment
  - Many other performance improvements
    - New TCP/IP resolver improvements, Sysplex Distributor routing accelerators and WLM algorithms, socket error detection, QDIO accelerator function, Enterprise Extender and SMB improvements.

Mainframe Labor Costs Are Going Down

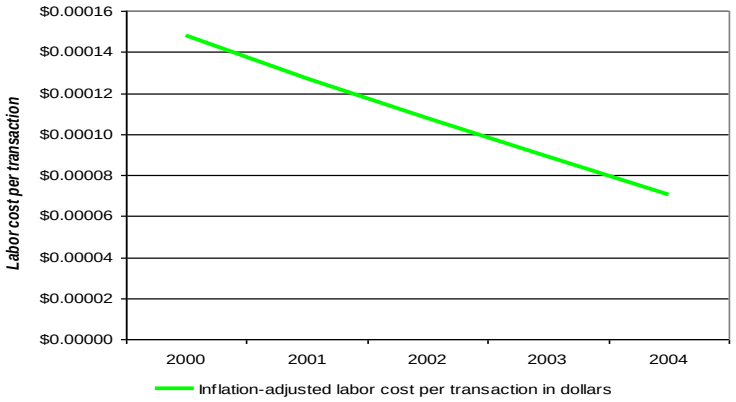
Data Center Staffing Levels for System z Have Not Increased Despite Large Increase in MIPS



Hardware Managed Per Person for Different Platforms



Labor Cost Per Transaction on System z is Decreasing



First National Bank of Omaha

	Servers	Reliability	Utilization	Staff
First move: Implemented distributed computing architecture that became **too difficult to monitor, maintain, upgrade and scale**	▪ 30+ Sun Solaris servers ▪ 560+ Intel ser	Un-acceptable	12%	24 people growing at 30% year
Next move: Consolidated back on the mainframe	z990	Much improved	84% with additional reserve capacity ***on-demand***	Reduced to 8 people

Staff growth reversed by consolidating to the mainframe

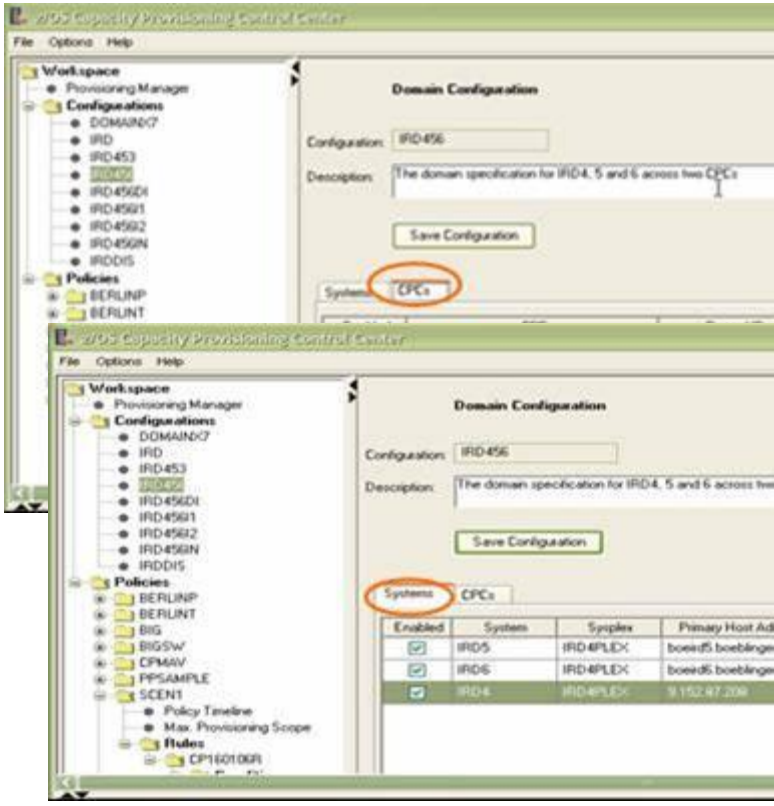
z/OS Simplifying operations and programming *Previewed with z/OS V1.11**

- A z/OS Management Facility (Statement of Direction)*
  - More easily manage system
  - Initial release to facilitate problem data management
- IBM Health Checker for z/OS
  - New health checks for:
    - Auto IPL best practices and device validation
    - DFSMS to detect IMBED and REPLICATE
    - Static resource manager
    - Dump Analysis and Elimination
    - SDSF using SAF
  - New migration checks for:
    - IPSec filter rules, BIND9 DNS usage, DFSMSrmm, STP/ ETR, Message Flood Automation
- Advanced Communications Facility Trace Analysis Program (ACF/TAP) is planned to be made a part of z/OS Communications Server element **(no need for use the Advanced Communications Facility Network Control Program (ACF/NCP)).**
- Faster and easier report generation for DFSMSrmm and RMF.
- Lots of ISPF updates
- Lots of DFSMSrmm updates

System z10 Capacity Provisioning Manager

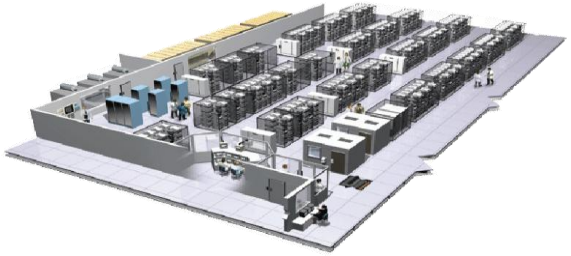
Efficient management of System z10 server capacity

- **Unpredictable or recurring workload spikes may exceed System z10 server capacity**
  - You may need to use On/Off Capacity on Demand frequently
  - BUT ... manual processes may be slow, inefficient, or complex
- **The System z10 Capacity Provisioning Manager can help provide:**
  - Autonomic management - supplementing or replacing manual monitoring of OOCoD
  - Flexibility - can activate OOCoD incrementally even in combination with CBU
  - Efficiency -strict adherence to policies can provide capacity on demand
  - Familiarity – CPM uses:
    - WLM and RMF – similar to other WLM-based capabilities
    - Modern graphic interfaces
    - CIM to communicate with other elements and System z subsystems
    - Available on z/OS V1.9 and later



An Inconvenient Truth!

Equivalent CO_2 Emissions in one year



10,000 sq ft at 125 watts/ft^2
@ $.10 per kWh

$1,095K per year

7,864 metric tonnes of CO_2 per year

= 1,268 Large SUVs

= 15,728 refrigerators

= 3,196 round trips JFK to LAX

= 1,787 acres of pine forests

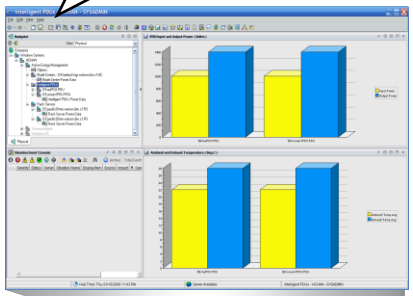
System z in the Green Data Center

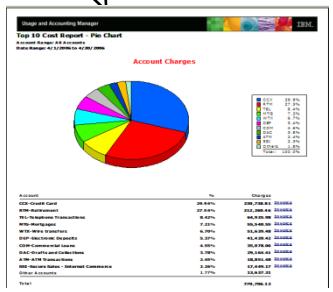
ITM Green Energy Agent augments performance data traditionally collected from performance managers and the OS with power and temperature data. All of these data are aggregated for consumption by **Tivoli Enterprise Portal** and **Tivoli Data Warehouse**.

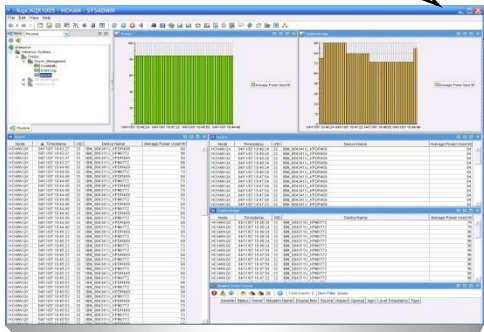
Tivoli Enterprise Portal: Visibility and Control for Energy Management

Tivoli Usage and Accounting Manager supports chargeback and provides accounting reports that help reduce energy costs

Tivoli Business Service Manager: Ensure service levels are maintained while optimizing energy consumption







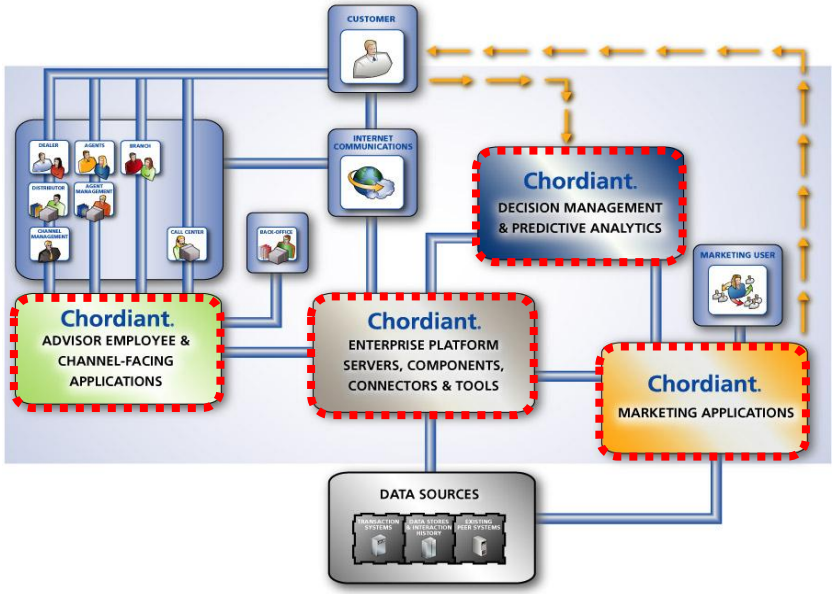
Power Temp Metrics & Controls

IBM Tivoli Monitoring

Tivoli Data Warehouse

Chordiant Solutions on System z

Customer Experience Front-Office Solutions



-Solutions that blend multi-channel interaction management with predictive decisioning
- Enabling enterprises to capture and effectively anticipate and respond to customer behavior in all channels, in real-time
- For global leaders in insurance/healthcare, telecommunications and financial services

- Decision Management now available & Enterprise Platform in Apr 09 on System z using WebSphere Application Server for z/OS and DB2 for z/OS
- Extensive design and use of SOA technologies resulted in very efficient migration to System z (services, XML, business objects, Java, etc.)

The Value of Chordiant Solutions on System z

- Applications co-resident with data

- High Availability

- Scale and Performance

- Improved Workload Management

- Virtualization on Demand

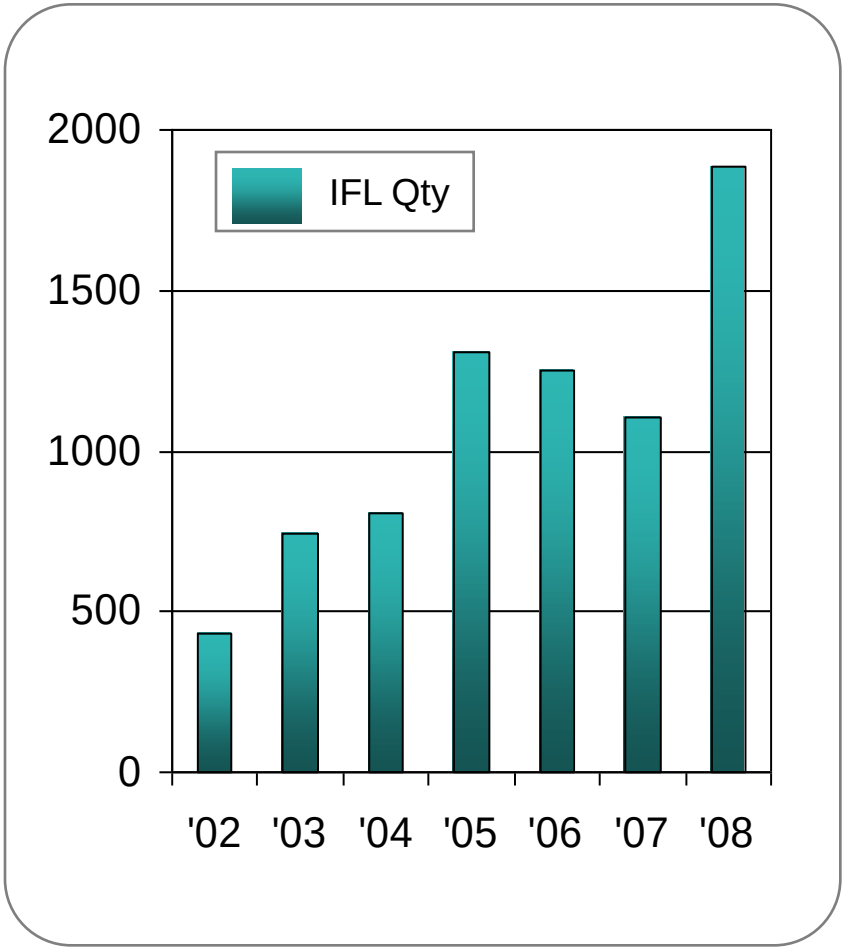
Application integration
*Previewed with z/OS V1.11**

- **C/C++ applications**
  - Continued adoption of language standards for skill commonality
  - Improved application portability
  - initial step in accepting gcc source in XLC assists in porting applications to systems z
  - Performance improvements
  - Improved debugging capabilities provide additional productivity

- **Java applications**
  - Performance improvements
- **System applications**
  - METALC improvements – embed Assembler into
  - SYSREXX™ improvements –
- **Decimal Floating Point Applications**
  - The third and final stage of DFP library functions are delivered in R11
- **Global application resources**
  - C/C++ Unicode enhancements
  - Additional codes page support in LE
  - Unicode System services enhancements

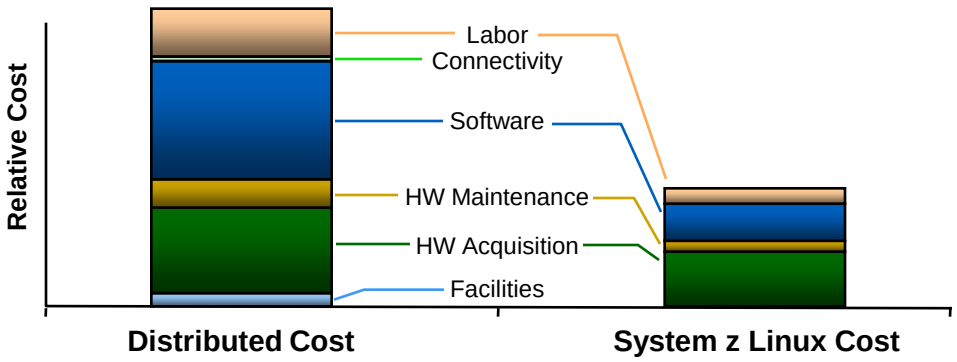
System z Linux: The momentum builds

- **2008 System z Linux MIPS:**
  - SW Europe: 150% YTY growth
  - N.A. 126% YTY growth
  - A.P. 124% YTY growth
- **New System z Clients: 22 of 54 new clients installed Linux**
- **~1300 System z customers are now using Linux on z**
- **Linux is 15% of the customer z install base (MIPS)**

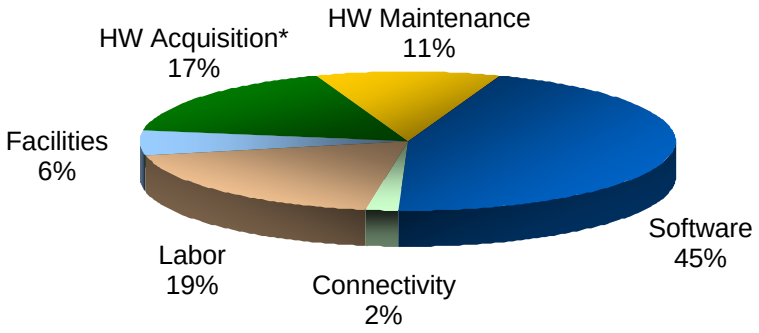


Client View of TCO Comparison for Similar Distributed Workload vs. System z Linux results in Potential 60-75% Gross Costs Savings / 5 yrs

Operating Cost: Distributed vs. Mainframe



Potential Savings: Categories as a % of Gross Savings



* HW Acquisition compares server/disk refresh of distributed environment to the cost of acquiring new mainframes/storage

Dramatic Simplification

Unit	Distributed	System z Linux	% Reduction
Software Licenses	26,700	1,800	93%
Ports	31,300	960	97%
Cables	19,500	700	96%
Physical Network Connections	15,700	7,000	55%

Results will vary based on several factors including # of servers and work load types

Summary

- **We have delivered a New Generation of z Software and Hardware**
- **The z Ecosystem Now Enables Leap Frogging to the Next Generation of Applications**
- **System z is Being Rearchitected for Enterprise Data Serving**
- **Evolving and Emerging Applications are Driving Hybrid Systems Approaches**
- **Its All About the Economies of Scale and How z Capability and Quality of Service makes a Difference – especially in hybrid topologies**