IBM®

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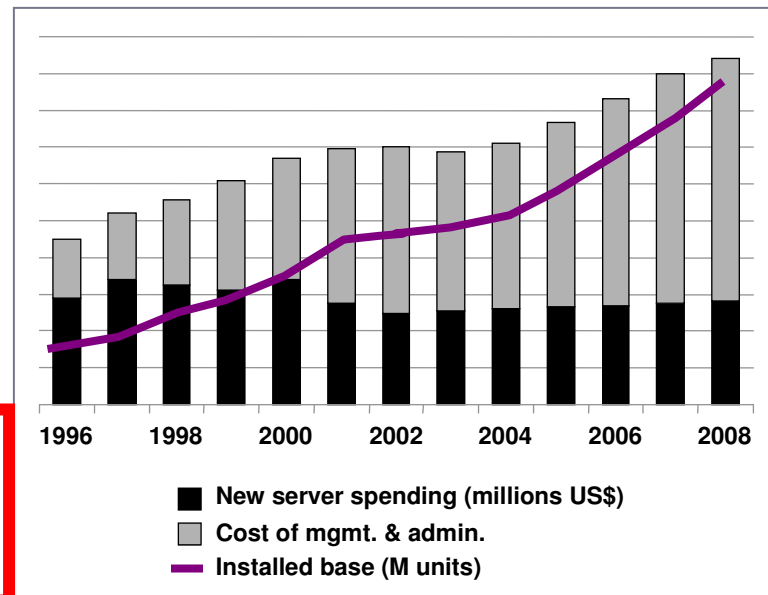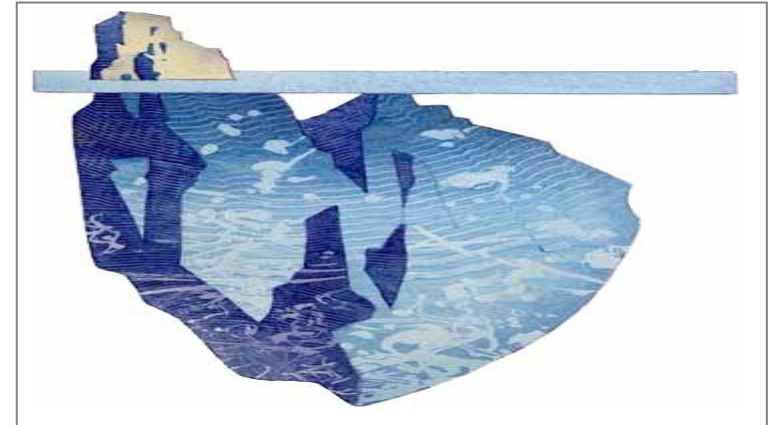
Many infrastructure mgt industry Initiatives are focused on changing this direction but adoption has been slow & difficult !!

1996 1998 2000 2002 2004 2006 2008

■ New server spending (millions US$)
■ Cost of mgmt. & admin.
— Installed base (M units)

Data Centre on a truck

Clients increasingly depend on IBM z to run and safeguard their business

- **System z total installed MIPS[1] has grown 20% CAGR since 2003**

  – Specialty engine capacity growing at an astonishing 93% rate

  – Since IBM launched the z900 in 4Q 2000, System z has *nearly doubled its share*, from 17% to 33% in the enterprise server segment[2]

- **Since the introduction of the z10 in February 2008, System z has grown revenue by 10% and increased market share**
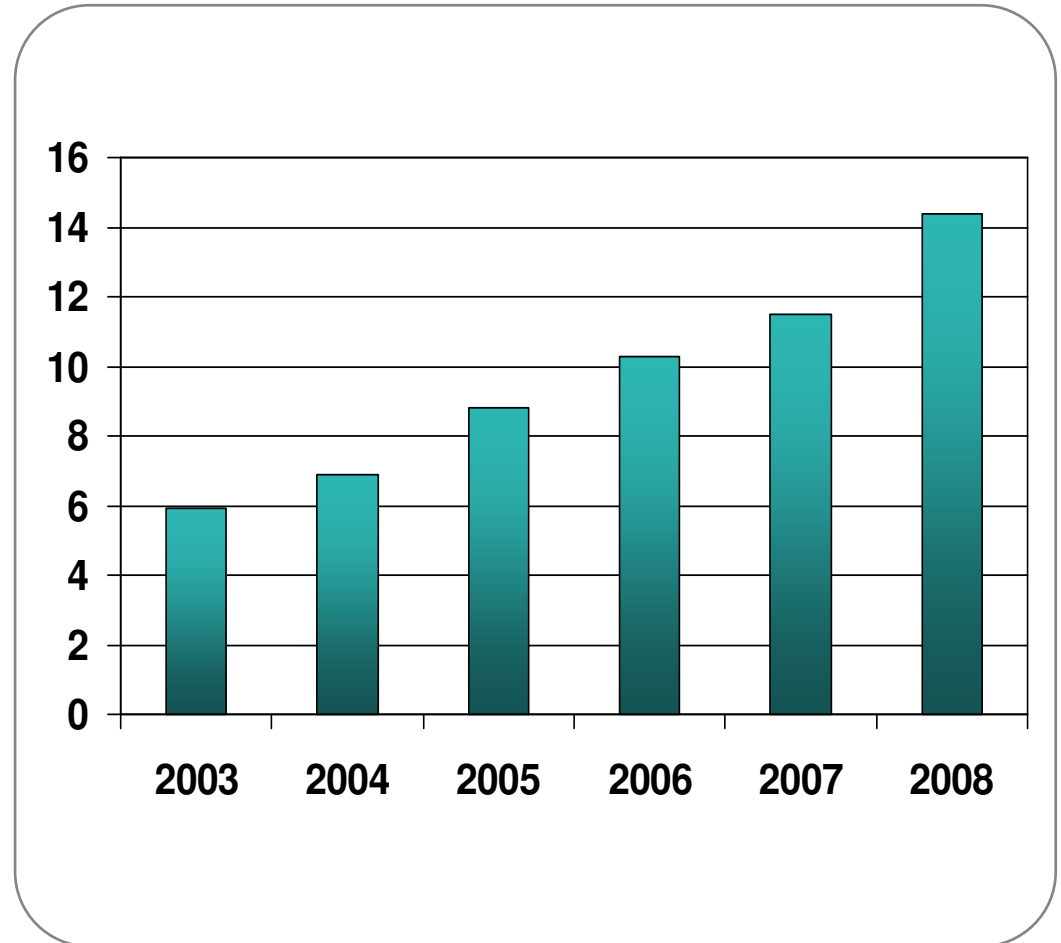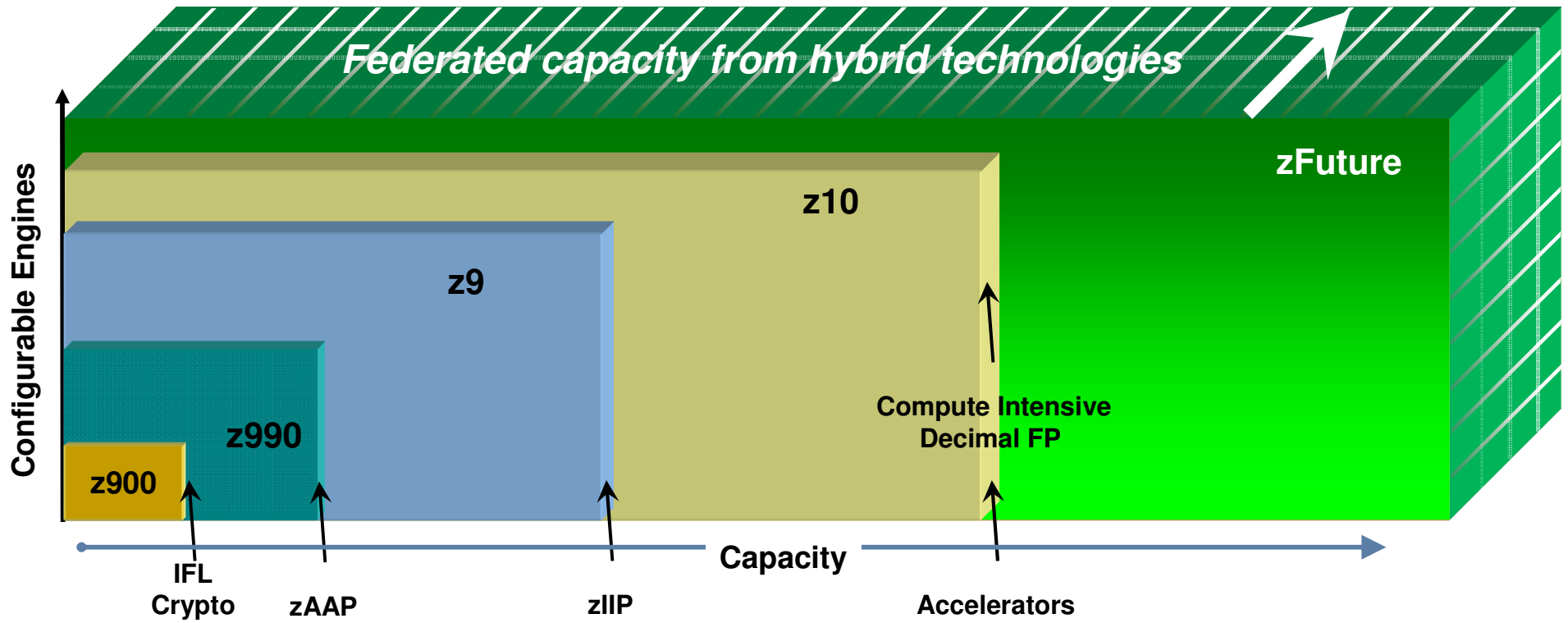

[1] IBM internal MIPS inventory numbers, Sept 08; HP wins based on internal IBM Sales tracking data
[2] IDC server tracker, Nov 08, , $250K+ servers

Processor performance and future scalability

The business capabilities from leveraging the "z" dimension

- Performance increase with enhanced engine capacity
  - Specialty Engines technology dividend
- Sub-capacity engine sizes available for smaller configurations
- z/OS image size will grow with Hardware

- Performance objectives for equivalent n-way configurations:
  - Traditional workload = 1.3x predecessor
  - New workload = 1.7x predecessor

Federated capacity from hybrid technologies

zFuture

z10

z9

Compute Intensive
Decimal FP

z990

z900

Configurable Engines

Capacity

IFL
Crypto

zAAP

zIIP

Accelerators

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
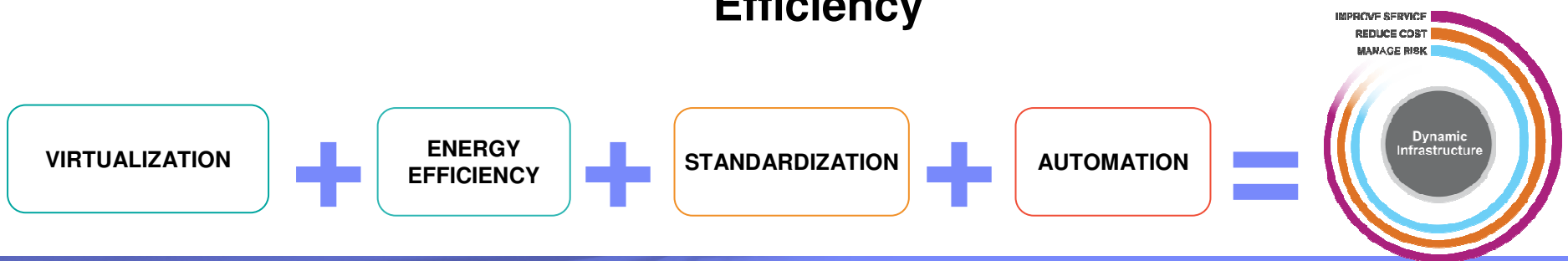
The road ahead for Dynamic Infrastructure with z

Our goal is to extend mainframe qualities to a <u>heterogeneous</u> 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 | **=** | IMPROVE SERVICE / REDUCE COST / MANAGE RISK — Dynamic Infrastructure |

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

z/OS Version 1 Release 11*
Preview Announcement February 2009
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
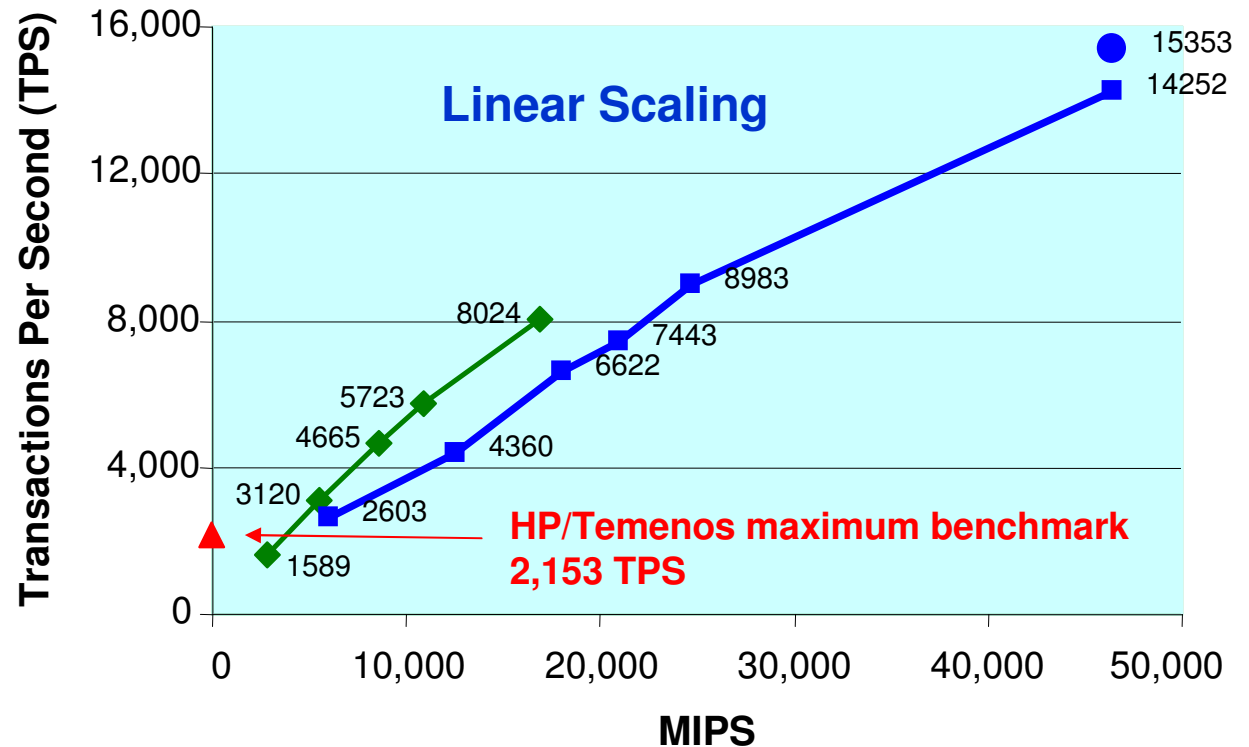 - ▶ **50** Million Accounts
  - ▶ IBM benchmark for customer

- Bank of China **
  - – **IBM System z9 and DB2**
  - – **TCS BaNCS (Cobol)**
  - – **8024*** 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

System z and BaNCS Online Banking Benchmarks

Chart — Transactions Per Second (TPS) vs MIPS

Linear Scaling

Green series (System z9 / BaNCS): 1589, 3120, 4665, 5723, 8024

Blue series: 2603, 4360, 6622, 7443, 8983, 14252, 15353

HP/Temenos maximum benchmark 2,153 TPS

* **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 8024 tps, a modified prototype reached 9445 tps

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 <u>79% less</u> 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
Improve service, reduce cost, manage risk

- **IBM System Storage DS8000 R4.2**
- **Full disk encryption for data protection**
  - Simplified, highly secure and cost-effective key storage, key serving and key management with Tivoli® Key Lifecycle Manager

- **Solid state drive (SSD) option for high priority, time-sensitive applications**
  - Increased performance for some transactional applications
  - Faster data replication and recovery from outages
  - Absence of mechanical moving parts makes SSDs significantly more reliable
  - Fraction of the energy consumed, fraction of heat dissipated

- **FlashCopy® and Metro Mirror for more effective two-site business continuity**
  - Helps improve data synchronization and availability

- **z/OS**
  - Tivoli Key Lifecycle Manager (planned to be available for z/OS in March) is an unpriced product that leverages z/OS security, management, and reporting capabilities (W/ V1.9)

  - Define new z/OS SMS policies for the allocation of new data sets on volumes backed by SSD technology and to gather usage information using SMF that is intended to help you manage data placement to take the best advantage of this new feature (w/V1.9)

Fractional Availability Improvements Are Important

Example 1: 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	zSeries/ DB2
Availability %	99.825%	99.975%
Annual outage	15h 20m	2h 11m
Cost of Downtime	$45.188M	$3.591M

Sources: ITG Value Proposition for Siebel Enterprise Applications, Business case for IBM eServer zSeries, 2004 & Robert Frances Group, 2005

Financial Impact of Downtime Per Hour

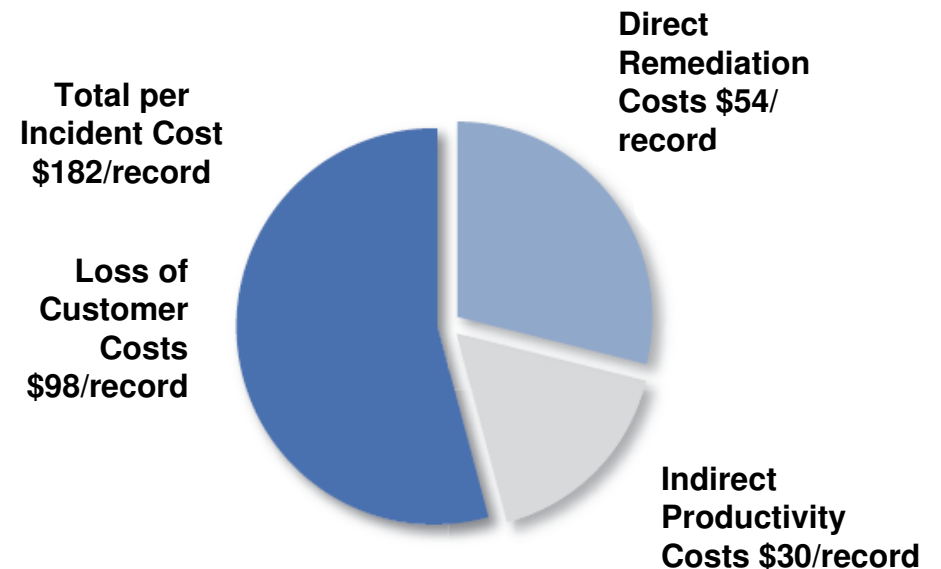| Industry segment	Cost
Energy	$2,818K
Telecommunications	$2,066K
Manufacturing	$1,611K
Financial	$1,495K
Information Technology	$1,345K
Insurance	$1,202K
Retail	$1,107K
Pharmaceuticals	$1,082K
Banking	$997K
Consumer Products	$786K
Chemicals	$704K
Transportation	$669K

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%

Total per Incident Cost $182/record

Loss of Customer Costs $98/record

Direct Remediation Costs $54/ record

Indirect Productivity Costs $30/record
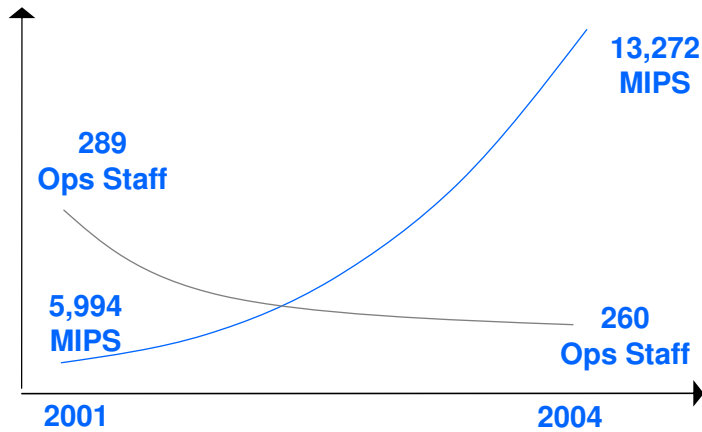
Ponemon Study: 2006 Survey Cost of a Data Breach

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*
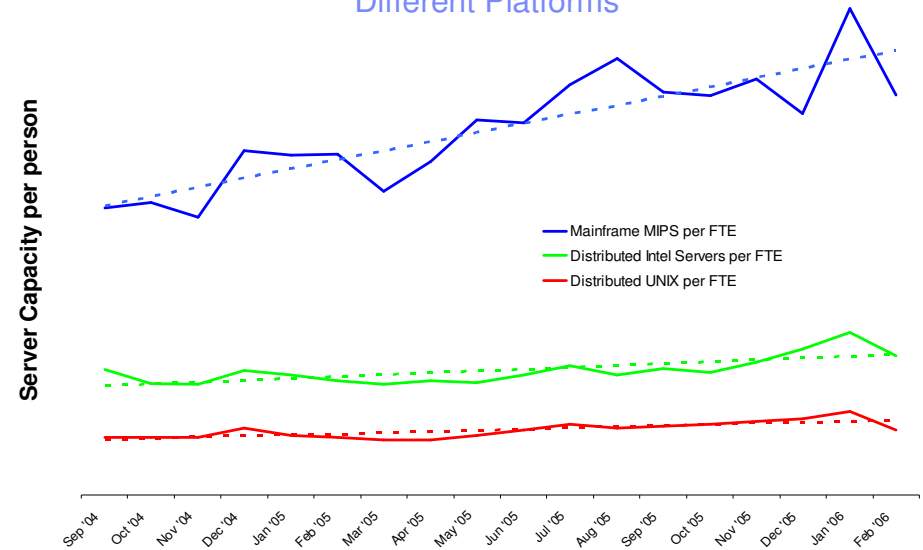 - Increased scale and functionality to meeting emerging requirements
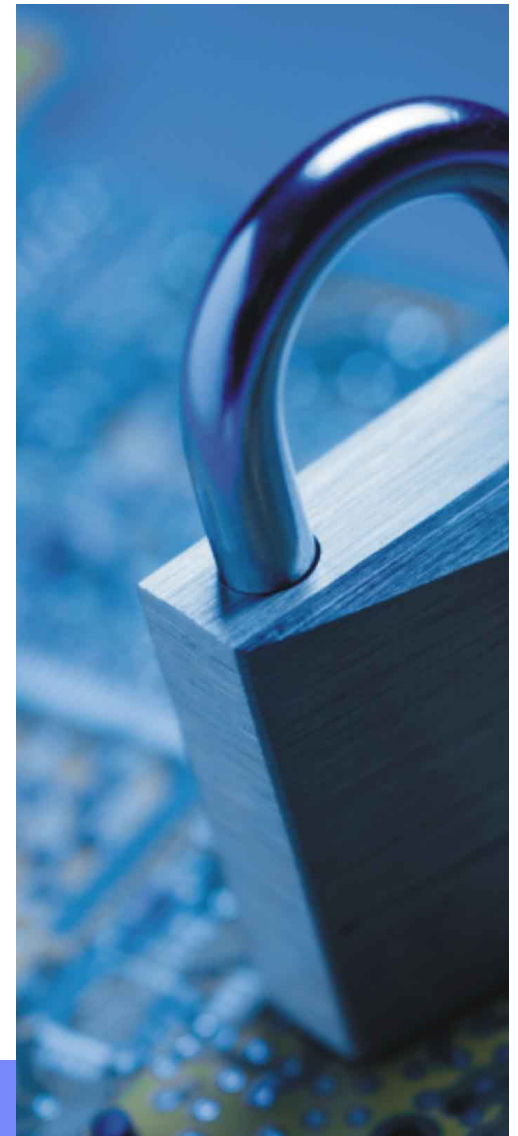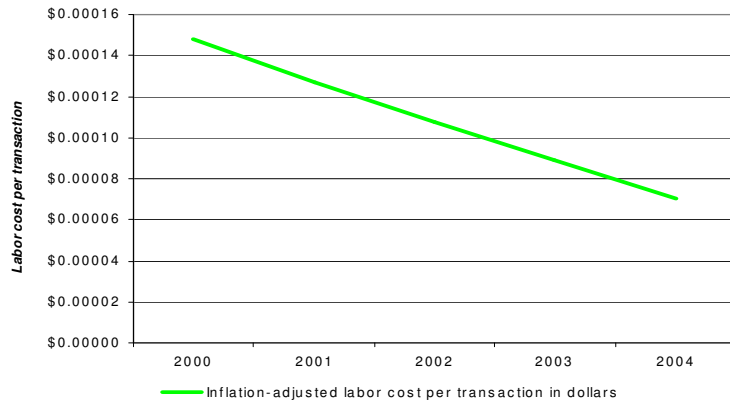
Mainframe Labor Costs Are Going Down

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

13,272 MIPS

289 Ops Staff

5,994 MIPS

260 Ops Staff

2001

2004

Hardware Managed Per Person for Different Platforms

Server Capacity per person

- Mainframe MIPS per FTE
- Distributed Intel Servers per FTE
- Distributed UNIX per FTE

Sep '04 Oct '04 Nov '04 Dec '04 Jan '05 Feb '05 Mar '05 Apr '05 May '05 Jun '05 Jul '05 Aug '05 Sep '05 Oct '05 Nov '05 Dec '05 Jan '06 Feb '06

Labor Cost Per Transaction on System z is Decreasing

Labor cost per transaction

$0.00016
$0.00014
$0.00012
$0.00010
$0.00008
$0.00006
$0.00004
$0.00002
$0.00000

2000 2001 2002 2003 2004

— Inflation-adjusted labor cost per transaction in dollars

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
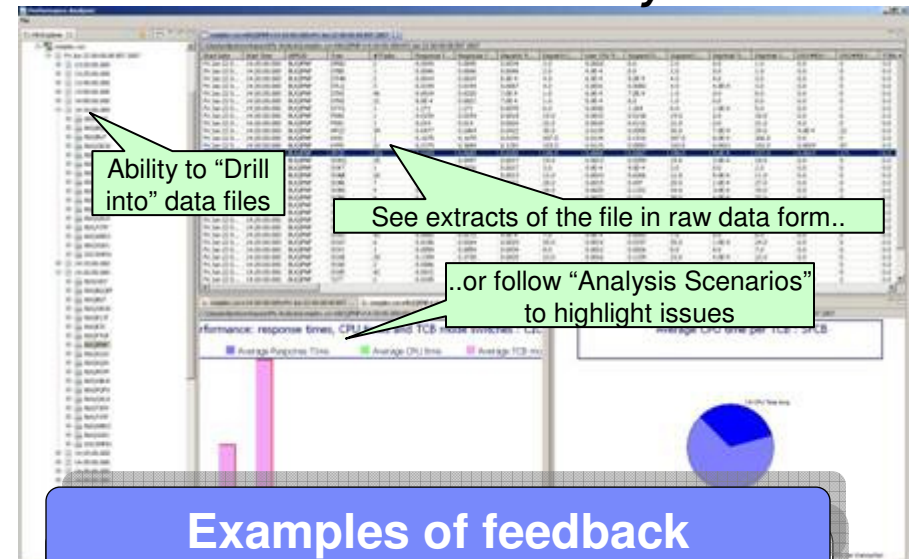   - Available on z/OS V1.9 and later
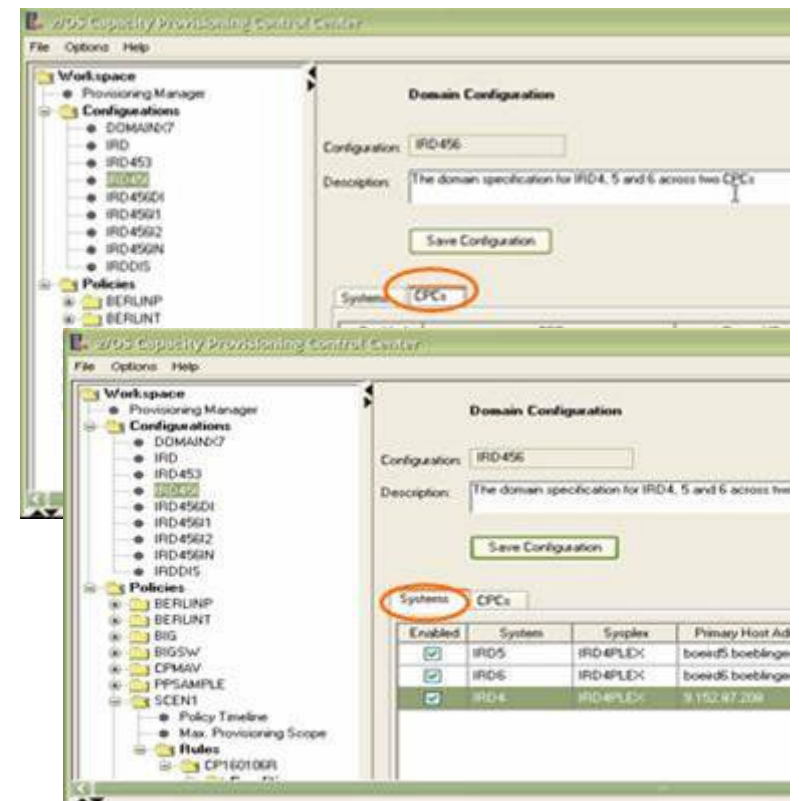
IBM CICS Explorer* - The New Face of CICS

Value, planned to....

- Enable shorter development cycles, faster time to market, and reduced cost of ownership for key CICS applications
  - Allow enterprises to build a highly flexible and efficient IT skill pool where specialists can collaborate with broadly-skilled personnel, to build and administer future IT systems
  - Common, intuitive, Eclipse-based environment for architects, developers, administrators, system programmers, and operators
  - Task-oriented views provide integrated access to broad range of data and control capabilities
  - Powerful, context-sensitive resource editors
  - Also planned to be packaged with Rational® Developer for System z
  - Integration point for CICS TS, CICS Tools, CICS TG, PD Tools, and Rational, extensible by ISVs, SIs, and customers

Example, CICS Explorer with CICS Performance Analyzer

Ability to "Drill into" data files

See extracts of the file in raw data form..

..or follow "Analysis Scenarios" to highlight issues
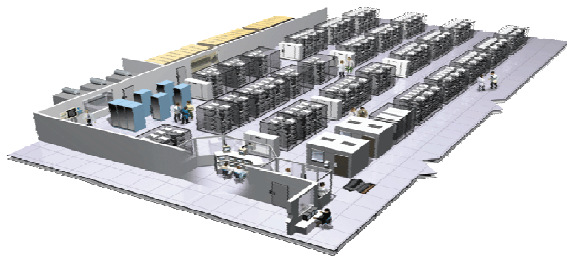
Examples of feedback

- 1000 times better than the previous UI
- It will be greatly received with development groups keen to try it as soon as it becomes available.

DEMO AVAILABLE
http://www-306.**ibm.com**/software/sw-library/en_US/detail/U563920Z67087U17.html

An Inconvenient Truth!

Equivalent CO_2 Emissions in one year

= 1,268 Large SUVs

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

$1,095K per year
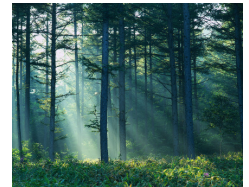
= 15,728 refrigerators

7,864 metric tonnes of CO_2 per year

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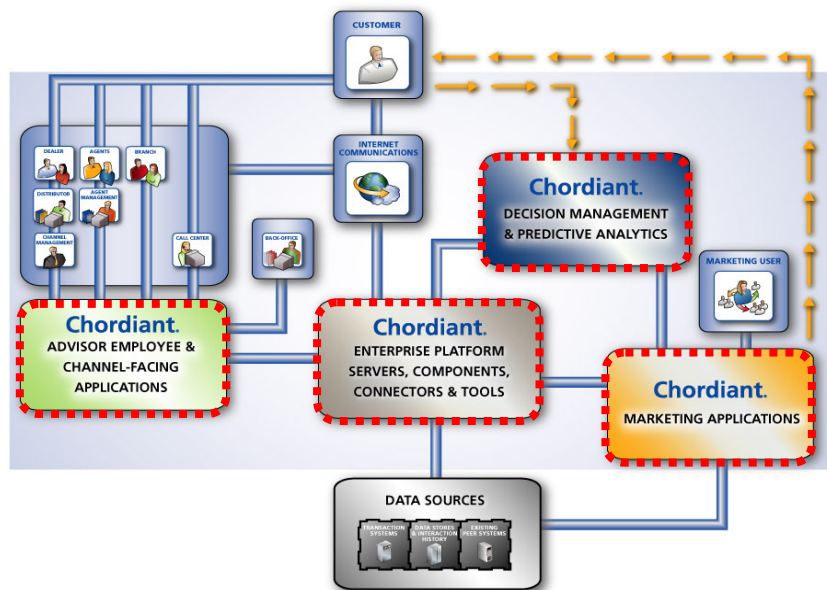
Tivoli Business Service Manager: Ensure service levels are maintained while optimizing energy consumption

Power Temp Metrics & Controls

IBM Tivoli Monitoring

Tivoli Data Warehouse
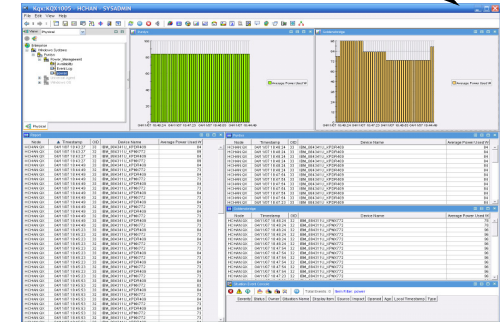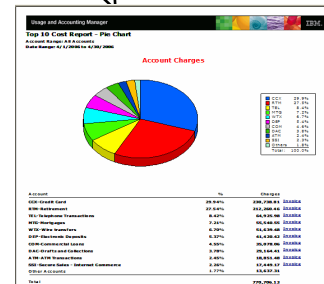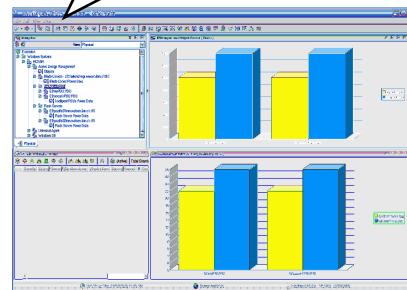
Chordiant Solutions on System z

Customer Experience Front-Office Solutions

- 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

-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

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
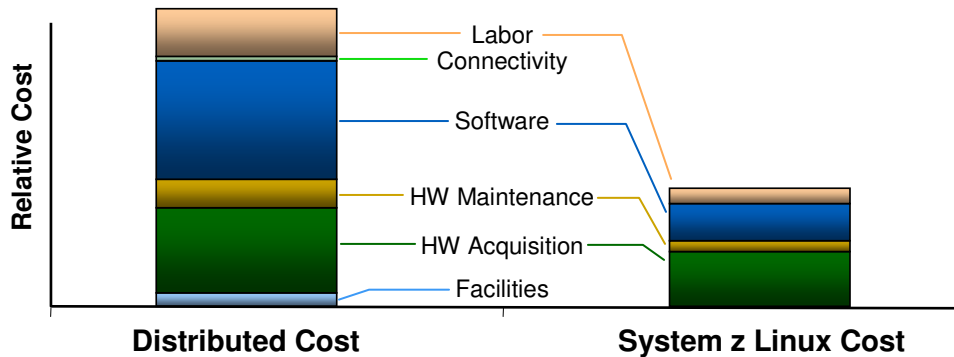
System z Linux: The momentum builds

- **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**

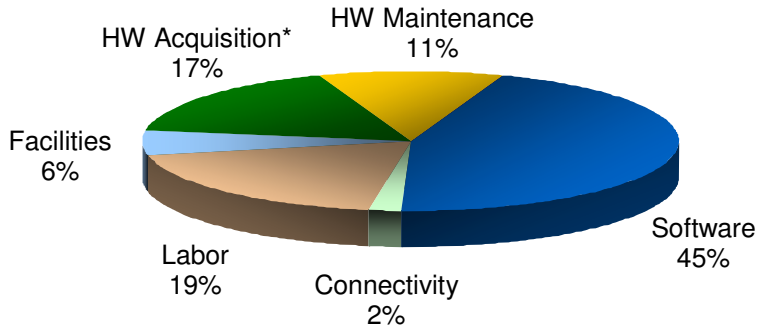- **Linux is 15% of the customer z install base (MIPS)**
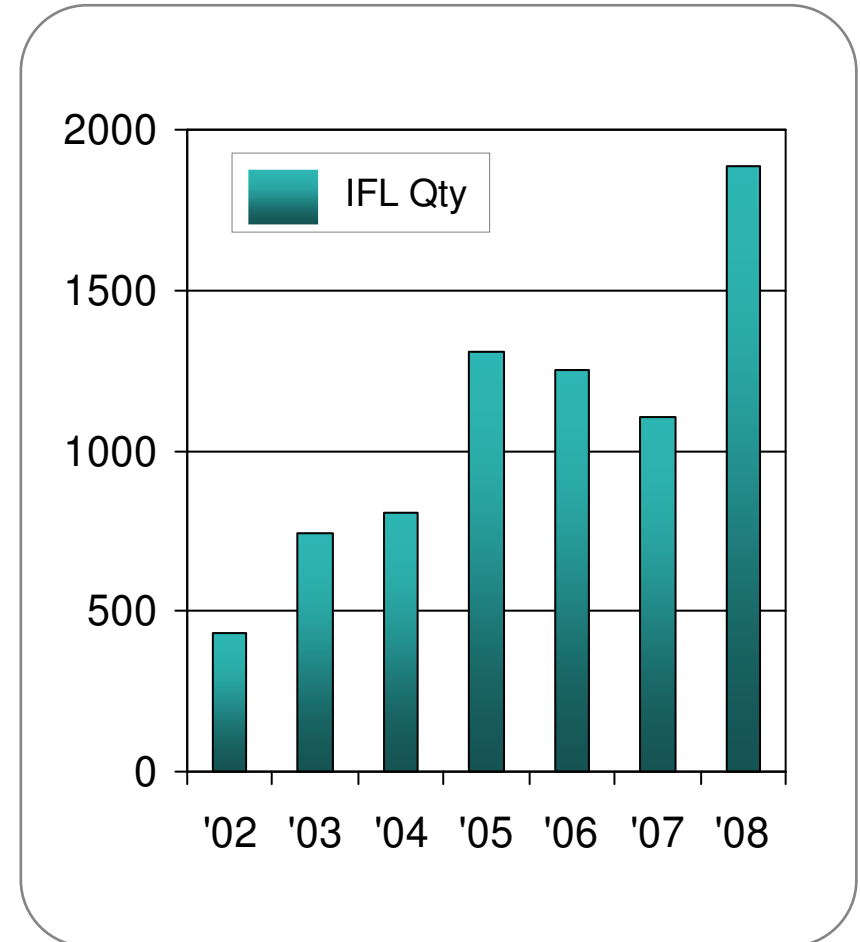
Client View of TCO Comparison for Similar Distributed Workload vs. System z Linux results in Potential 60-75% Gross Costs Savings / 5 yrs

Operating Cost: Distributed vs. Mainframe

Labor
Connectivity
Software
HW Maintenance
HW Acquisition
Facilities

Relative Cost

Distributed Cost   **System z Linux Cost**

Potential Savings: Categories as a % of Gross Savings

HW Acquisition*
17%

HW Maintenance
11%

Facilities
6%

Labor
19%

Connectivity
2%

Software
45%

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

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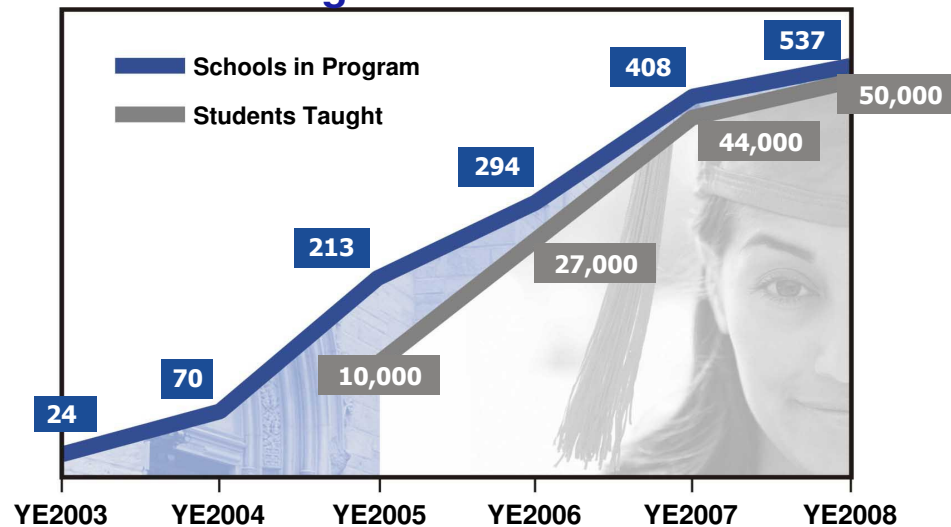
Unit	Distributed	System z Linux	% Reduction
Software Licenses	26,700	1,800	93%
Ports	31,300	960	97%
Cables	19,500	700	96%
Physical Network Connections	15,700	7,000	55%

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

Adding mainframe skills for the community

Growing Academic Initiative

Schools in Program

Students Taught

- 24 — YE2003
- 70 — YE2004
- 213, 10,000 — YE2005
- 294, 27,000 — YE2006
- 408, 44,000 — YE2007
- 537, 50,000 — YE2008

EnergiZed — DEVELOPING SKILLS FOR THE MAINFRAME COMMUNITY

Large Systems Thinking

Profiles of **28** schools from around the globe teaching mainframe skills

- **System z Academic Initiative by the numbers:**
  - Participation – 537 schools registered, >50,000 students attended mainframe education
  - Courses – 30 (plus more under development) & Mastery Exam Certifications
  - zCommunity – 25 z Roundtables events with Clients / Schools / ISVs / Business Partners
  - Resources – Access to Mainframes worldwide for teaching (6 Univ hubs)
  - Student MF Contests – 9 contests with 8,180 students, 1,136 schools…more planned WW
  - IBM zSkills Help Desk (zskills@us.ibm.com) + over 300 IBM Mainframe ambassadors
  - Assist Professors – Fourth annual Professor Summer Seminar, 5 Faculty awards &, education
  - More examples of clients linking with schools in the program

- **Web site - www.ibm.com/university/systemz**

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**

thank you!