System z Enables Solutions For A Smarter Planet

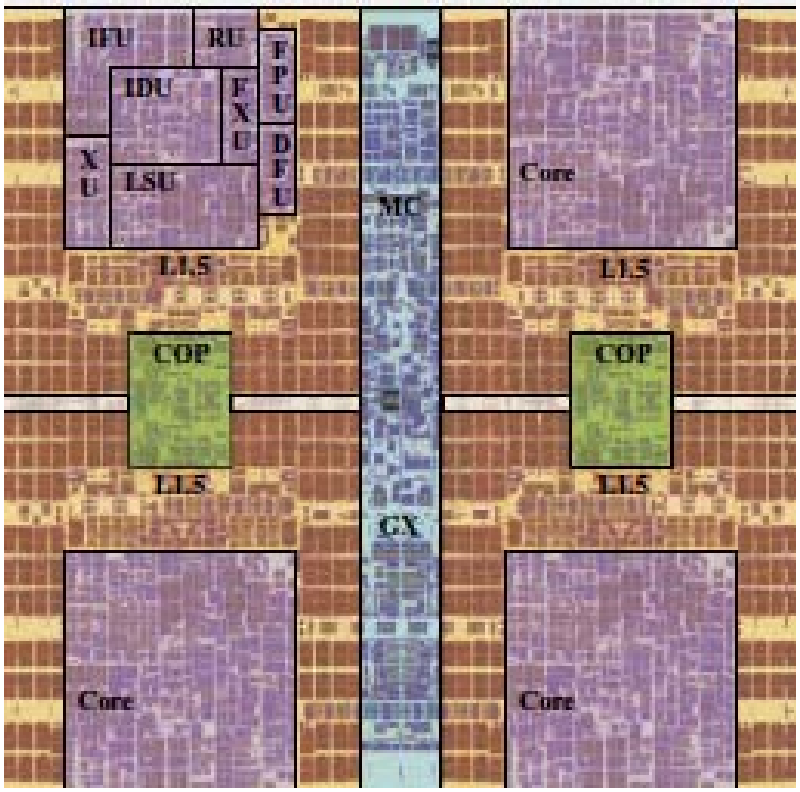
The Smart Platform

Smarter Planet Solutions Need Platforms With The Right Qualities Of Service

- Unprecedented levels of availability to support new services
- On demand capacity to expand and contract as needed
- Scalability to meet the most demanding workloads
- Security to protect processes and information
- Operationally friendly
- Green, lowering energy costs
- Has smart software to enable smarter solutions

Secure and Agile

Good Hardware Designed For Reliability

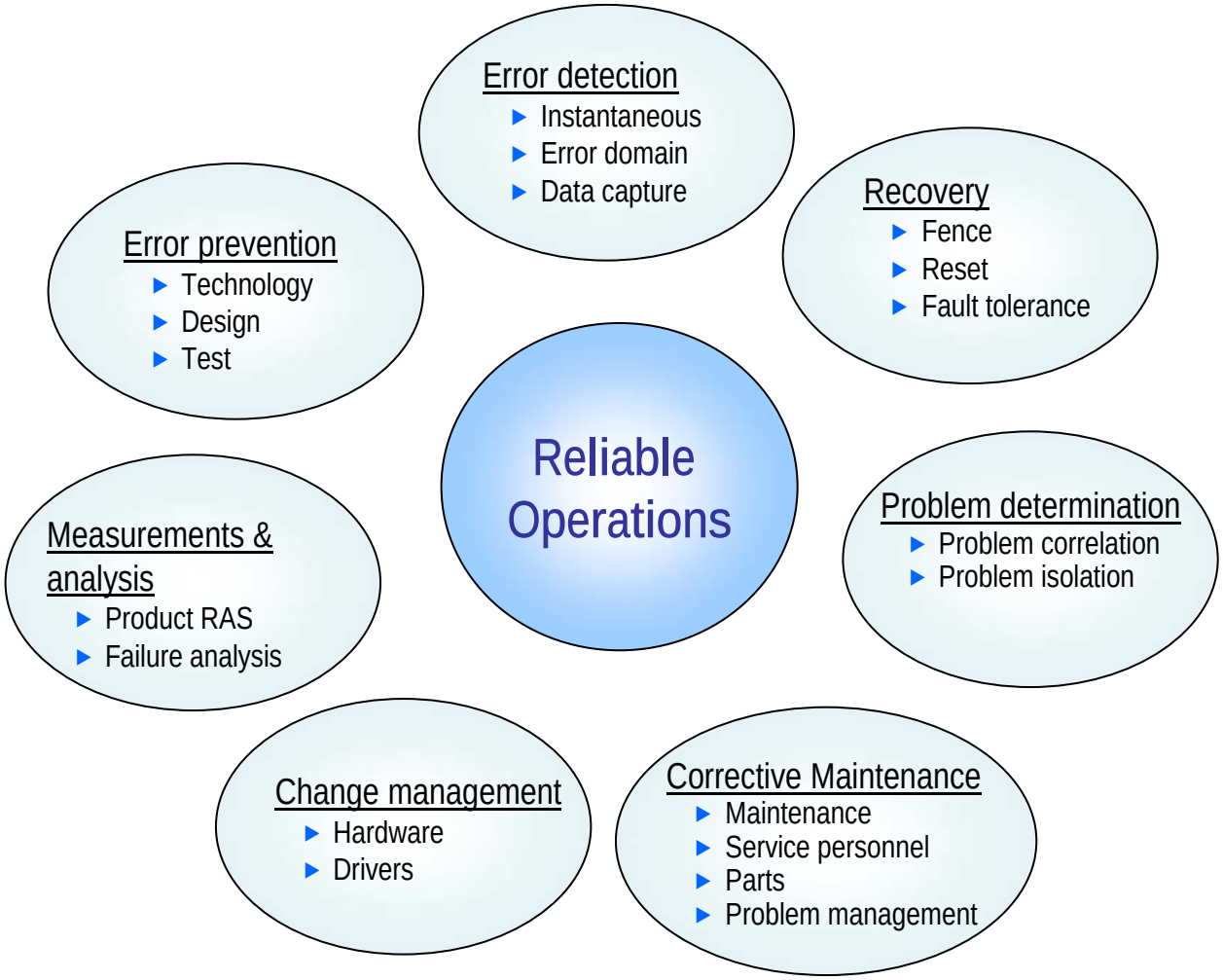


35% of the chip is dedicated to availability management

- Chip real estate
  - Logic units 65%
  - Redundancy 15%
  - Checkpoint Maintenance 8%
  - Error checking 5%
  - Containment Logic 5%
  - Recovery Logic 1%
  - Error Reporting 1%

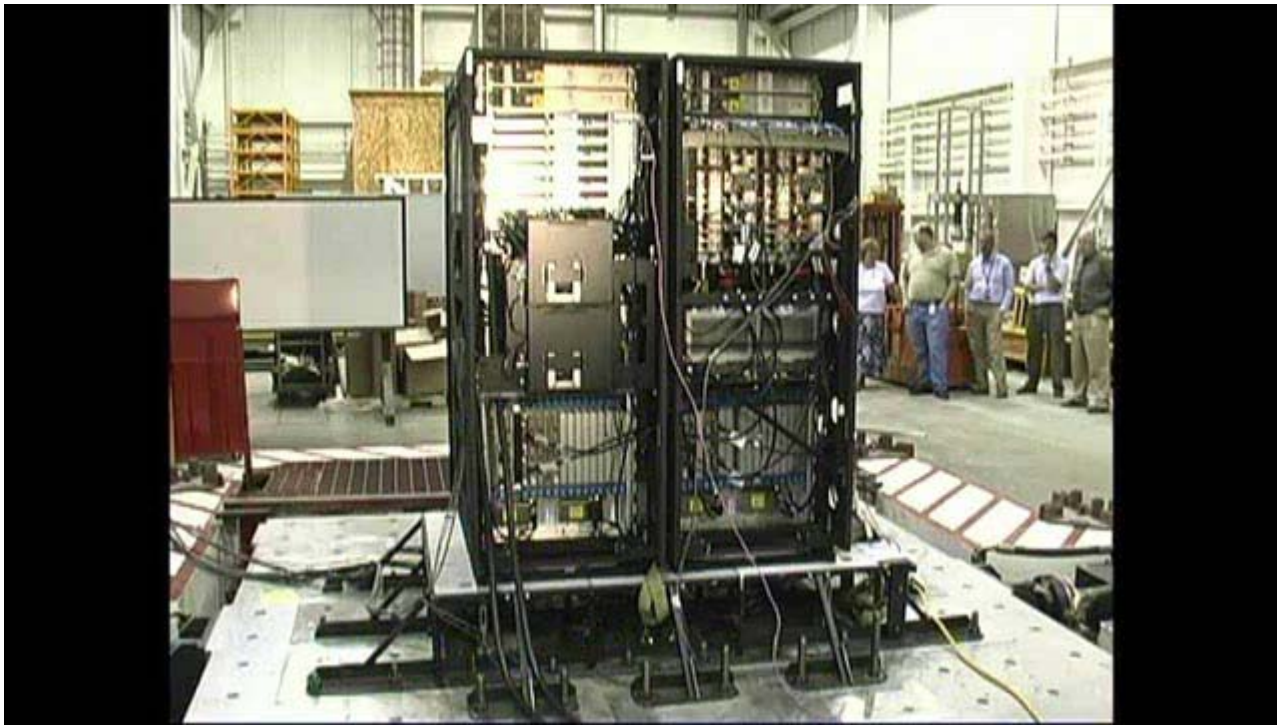
Good Hardware Designed For Reliability

Examples of hardware reliability and serviceability features

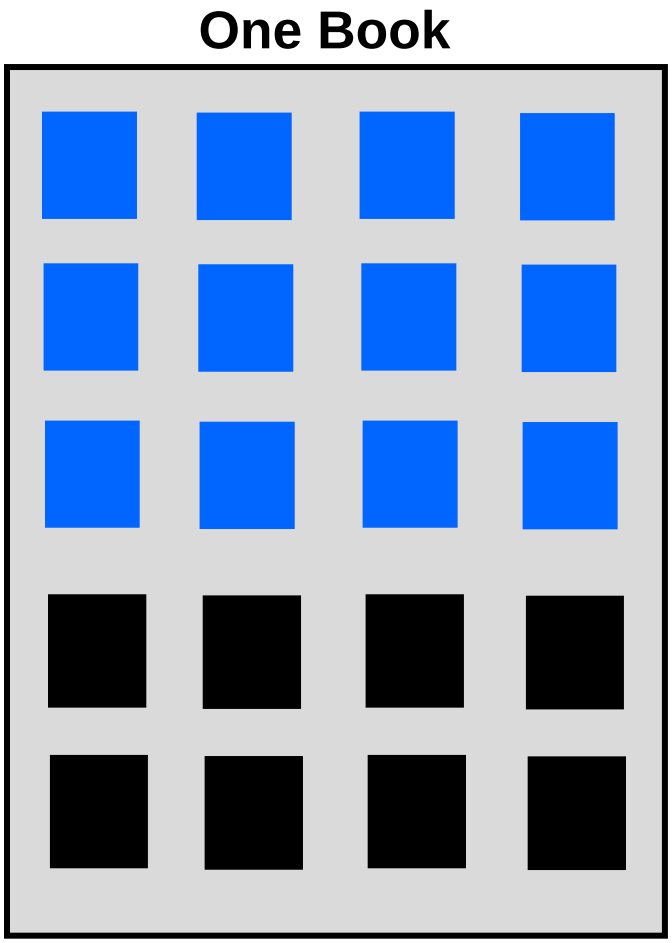


System z - Built To Last

- Hybrid cooling
- Redundant Power
- Thermal protection
- Resists earthquake damage



Capacity On Demand – Fast Growth To Scale When You Need It

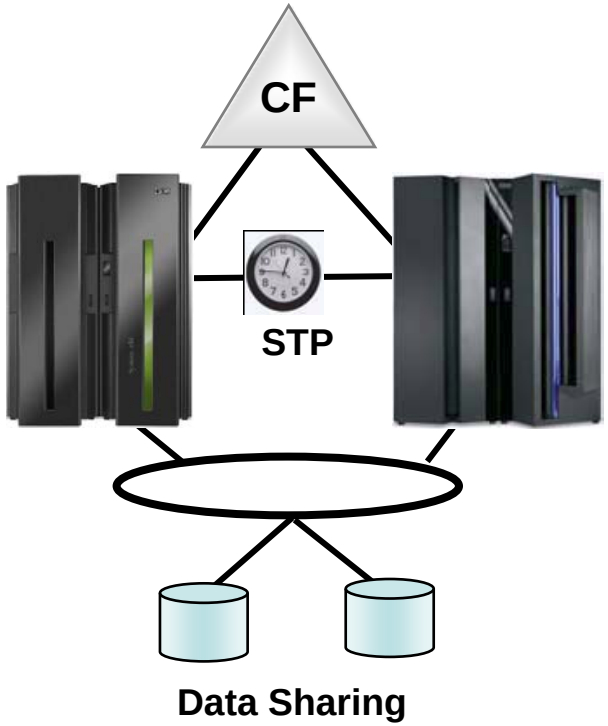


Pay for 12 active processors
Do not pay for 8 dark processors needed

- Each System z can be configured with as many as 64 processors
- Comes with capacity on demand processors already installed
- Ship fully populated books (20 processors per book)
- On-line or remote turn on
- System automatically takes advantage of activated processors

The Parallel Sysplex Design Is Unique

- Unique combination of hardware and software designed for clustering
- Systems can be clustered up to 32 nodes
- Entire cluster functions as a single system image
- Middleware designed to use coupling facility hardware



- Resulting in:
  - **Unmatched linear scalability**
  - **Superior 99.999% availability**
  - **Business-driven workload management across cluster**

No other vendor offers this!

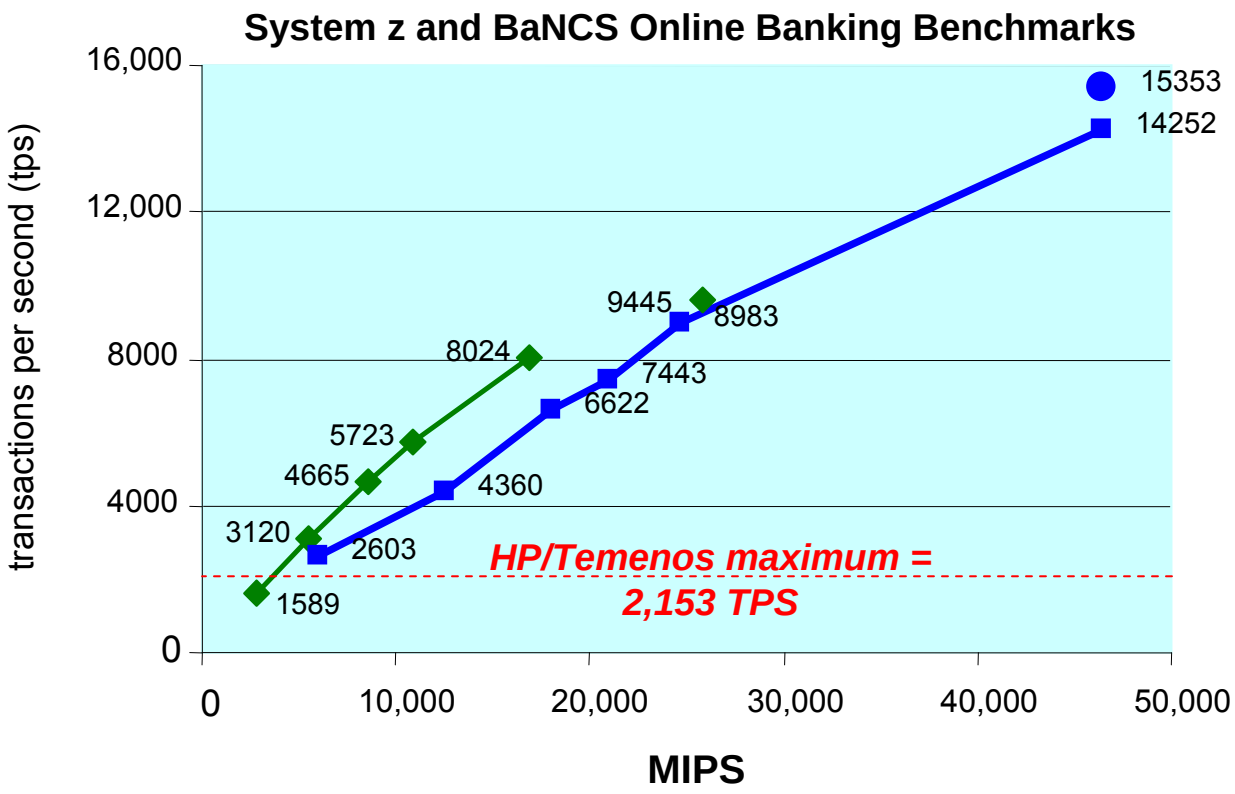
System z Parallel Sysplex With DB2 Scales Further Than The Best HP Superdome Banking Benchmark

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

- **Bank of China** **
  - IBM System z9 and DB2
  - TCS BaNCS
  - **9,445*** ** Transactions/second
  - **380** Million Accounts
  - IBM benchmark for customer

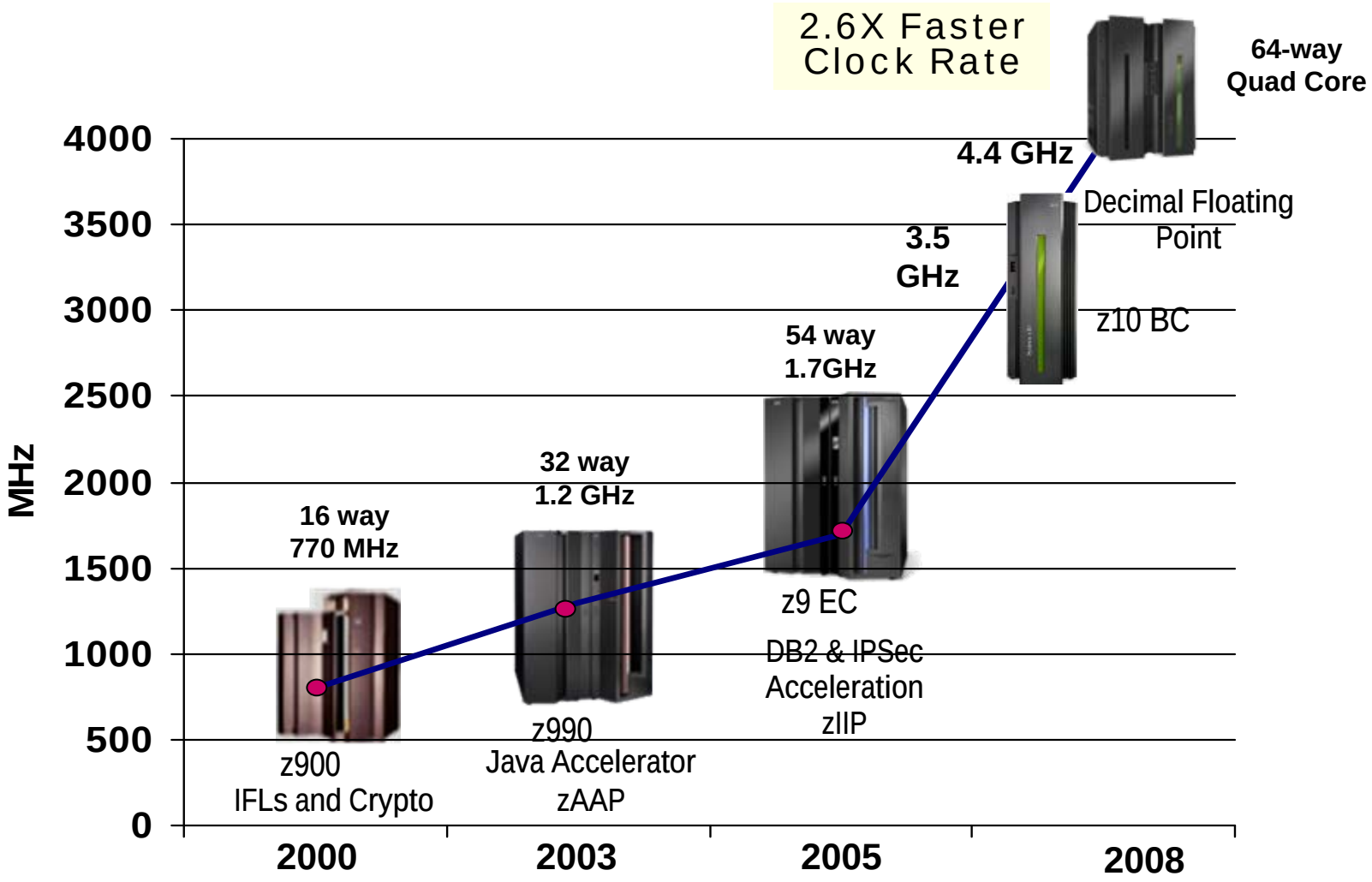
- **HP/Temenos** *
  - HP Itanium
  - Temenos T24
  - **2,153** Transactions/second
  - **13** Million Accounts
  - Largest banking benchmark performance claimed by HP

30 Million transactions completed in less than an hour. Supports 380 Million accounts

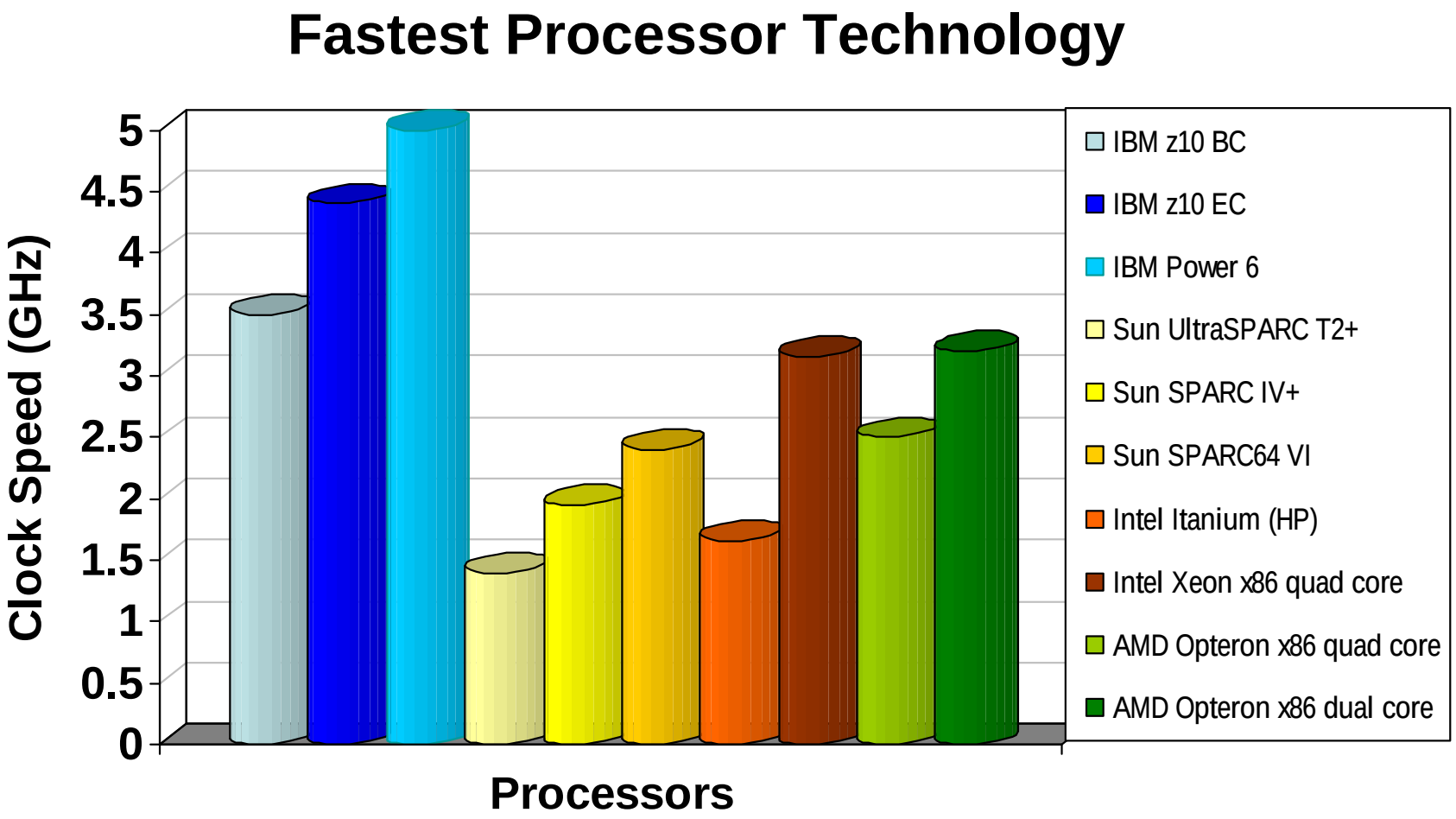


* **SOURCE**: TEMENOS BENCHMARKS; http://h71028.www7.hp.com/enterprise/downloads/TemenosBenchmark.pdf
** **SOURCE**:http://www.enterprisenetworksandservers.com/monthly/art.php?2976 **Source**: InfoSizing FNS BANCS Scalability on IBM System z – Report Date: September 20, 2006
*** Standard benchmark configuration reached 8024 tps, a modified prototype reached 9445 tps

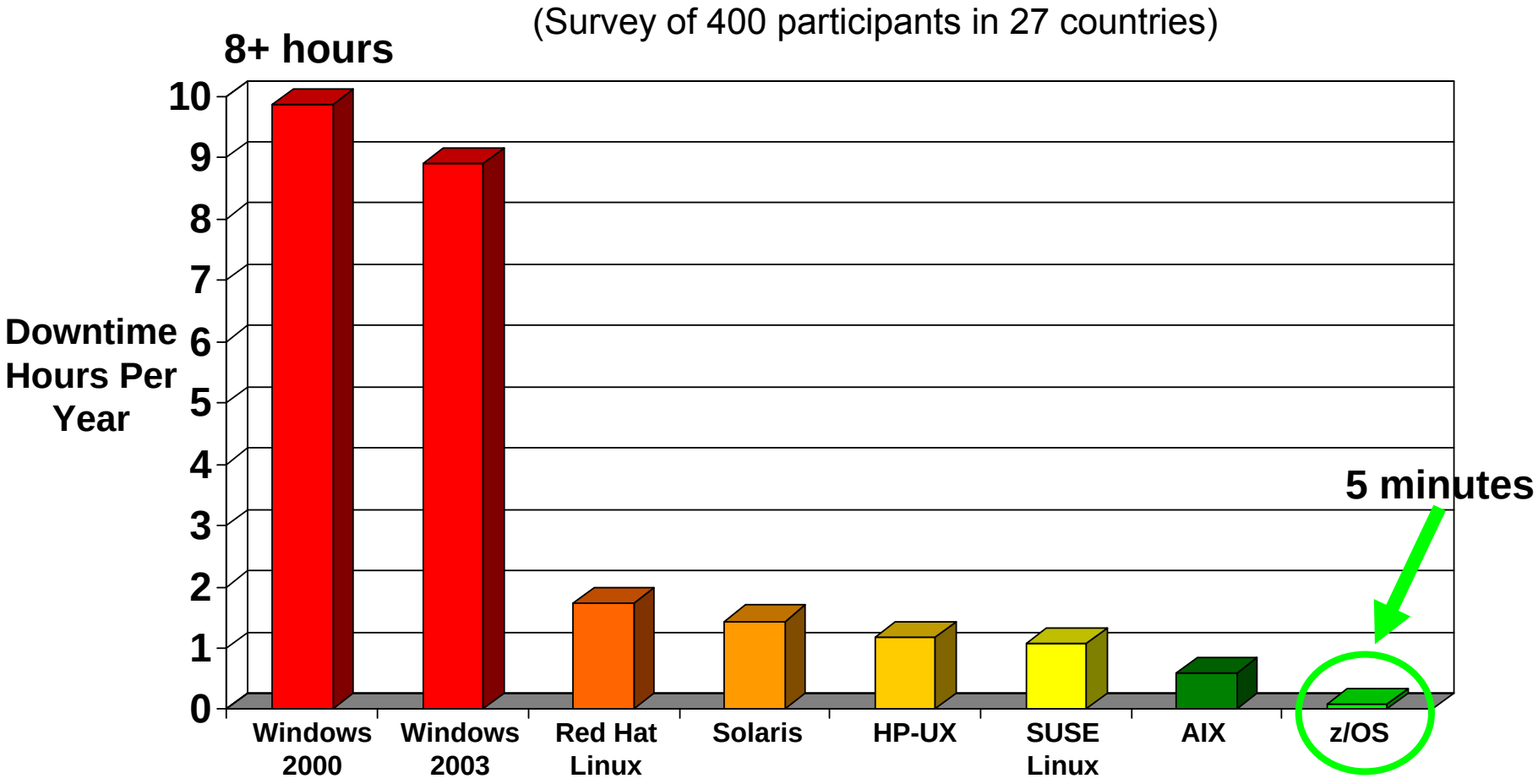
IBM System z10 Scalability Extends Mainframe Leadership Even Further



IBM Clock Speed Eclipses All Others



System z Has The Best Availability



Source: 2007-2008 Global Server Operating Systems Reliability Survey, Yankee Group, March 2008. As quoted in "Windows Server: The New King of Downtime" by Mark Joseph Edwards at www.windowsitpro.com/article/articleid/98475/windows-server-the-new-king-of-downtime.html, March 5, 2008 and in http://www.sunbeltsoftware.com/stu/Yankee-Group-2007-2008-Server-Reliability.pdf. Measured in hours per year.
Source: IBM Internal Study

TD Bank Achieves 99.999% Availability

- **Background**
  - TD Bank has been running Parallel Sysplex
    - No Sysplex-wide outage for **13 years**
  - System z is used for Customer Account Data for applications supporting Tellers, Internet Banking and ATMs

- **TD Bank Recommendations**
  - Keep sysplex up – do not bring it down
  - Practice Rolling IPLs
  - Exploit concurrent hardware upgrades
  - Use automation
  - Configure your sysplex for availability
    - IMS/DB2 Data-sharing
    - Transaction routing
    - Sysplex Distributor for TCP/IP
    - Online database reorganizations
    - Clone each image
    - Ensure applications exploit parallel sysplex

- Client Environment
  - **System z**
  - **z/OS**
  - **DB2**
  - **IMS**
  - **WMQ**
  - **GDPS**

Parallel Sysplex Deployment consists of five System z across two sites running 42 M business transactions a day

TD Bank Financial Group

With Other Platforms, Businesses Can Be At Risk

London Stock Exchange Suffers .NET Crash On Fannie and Freddie Bailout Day

Sequence of events	
9:00am	Traders unable to route orders to LSE
9:21am	LSE notified clients and FTSE-100 largely froze
3:50pm	LSE notified clients trading would resume soon
4:00pm	After 6 hours 45 minutes downtime trading platform finally back up

"Microsoft .NET Framework is simply incapable of performing this kind of work, and SQL Server 2000, or any version of SQL Server really, can't possibly handle the world's number three stock exchange's transaction load on a consistent basis"

Leaving Billions of Dollars in Business undone!

Steven J. Vaughan-Nichols
Computerworld Blogger

http://blogs.computerworld.com/london_stock_exchange_suffers_net_crash

http://online.wsj.com/article_email/SB122088611707510173-lMyQjAxMDI4MjAwOTgwODk2Wj.html

HP "Non-Stop" Delivers Nine Hours Downtime At Bursa Malaysia

Sequence of events	
5:30 am	One had disk fails
5:35 am	Faulty disk replaced
6:00 am	Replacement disk faces problems; triggers failure of other disk and CPU
6:30 am	System restarts; several brokers unable to connect to central trading system
8:00 am	Over 50% of brokers fail to connect
8:30 am	Suspends trading; activates back up site
1:00 pm	Back-up site start-up process takes longer than expected
1:20 pm	Decides to start afternoon session from primary site
3:15 pm	Pre-opening orders keyed-in; connectivity problem crops up
3:30 pm	Unable to resolve connectivity with brokers in time; extends trading suspension

BURSA MALAYSIA

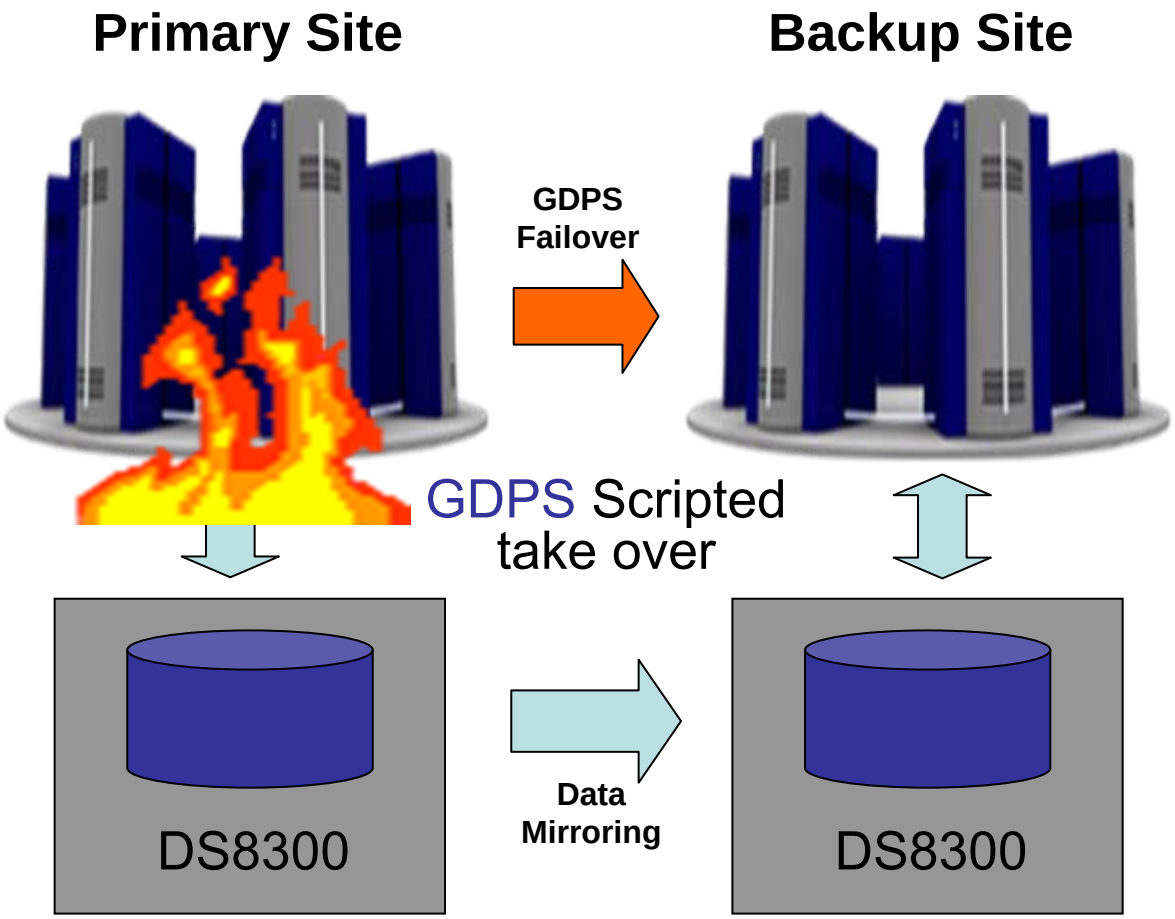
Estimated opportunity loss of about RM450,000

"After spending millions of Ringgit, their information technology (IT) people still haven't got their act together. The IT system should be fail-safe but (in this case) the back-up system also failed."

Jimmy Vong
EquitiesTracker Founder

http://biz.thestar.com.my/news/story.asp?file=/2008/7/4/business/21738638&sec=business
http://biz.thestar.com.my/news/story.asp?file=/2008/7/5/business/21748124&sec=business

The Mainframe Keeps The Business Running Even In the Event Of Data Center Disaster



- Site Failover
  - Failover to secondary site in case of complete site failure
- Data Mirroring
  - Protect data in the event of a disk system failure

Disaster Recovery Solution Helps Achieve Continuous Availability

- iT-Austria is Austria's largest data processing center
  - Three data centers running System z9s located 10 km apart
- Objectives
  - Recover from an outage within an hour, with no data loss
  - Under 5 minutes disruption for unplanned outages
  - Preserve business continuity for online transactions
- Results
  - Used HyperSwap for near continuous availability and no data loss
    - Planned disk recovery of 12-19 seconds with no application outage
    - Unplanned disk recovery was under 8 seconds
  - Automated mirroring dramatically simplified recovery time
  - Leveraged parallel sysplex for high redundancy and availability

".. Using the GDPS/PPRC HyperSwap technology is a significant step forward in achieving continuous availability…"

" Without HyperSwap, planned and unplanned reconfigurations had resulted into a service outage of almost 2 hours. …"

Wolfgang Dungl, Manager of Availability, Capacity and Performance Management

Security Is Becoming A Critical Issue

consumeraffairs.com
knowledge is power!

TJX to Pay Mastercard $24M for Data Brach

Will set aside money to provide restitution for victims

CHICAGO SUN-TIMES
suntimes.com Member of the Sun-Times News Group

June 28, 2008 Associated press

Hackers breach Wards.com

A established Chicago retailer experienced a hack of credit card numbers but did not inform customers, despite notification laws

AXcess News
News for the X generation

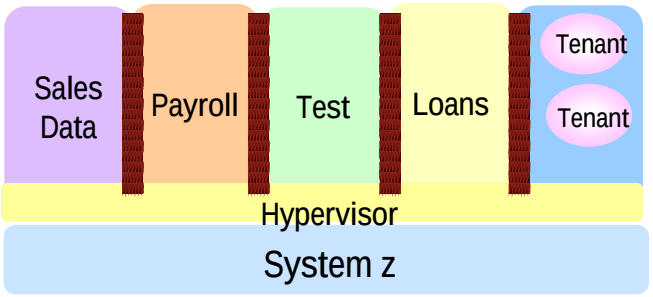
USDA admits data breach, thousands of social security numbers revealed

17 April 2007- (AXcess News) Washington

The US Department of Agriculture admitted a security breach allowing 63,000 social security numbers to be made available on a public website

System z Provides A Secure Foundation

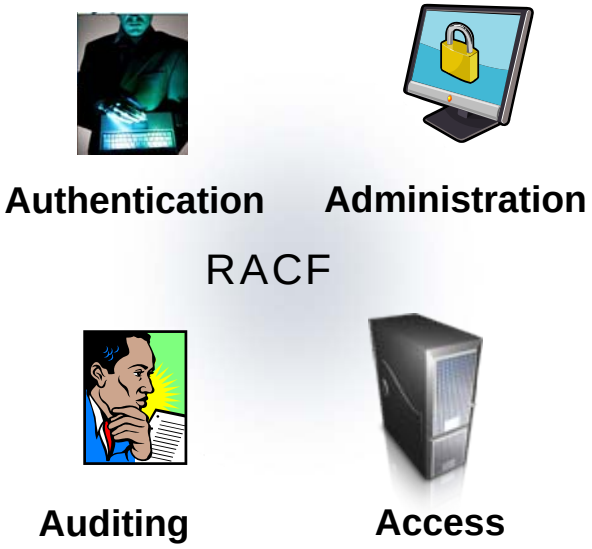
- Workload isolation
  - Processing integrity with LPAR separation
  - Isolation of users in separate address spaces
  - Storage protect keys to isolate system programs from user programs and memory
  - Virtual machine cannot circumvent system security features and access controls
  - Hipersockets provides secured communications between z/OS partitions
- Highest Common Criteria ratings of all commercial operating systems
  - PR/SM certified at EAL 5
- Isolation protects against malware



Isolates each workload for protection

Integrated Access Control Eliminates Loopholes

- RACF* controls authorization and authentication
  - Identity management and user authorization
  - Controls access to resources
  - Authentication
  - Centralized auditing and logging
- Can reduce security complexity
  - Centralized administration and management
  - Consistent policies across workloads
- RACF protection enforced automatically
  - System blocks unauthorized attempts
  - You cannot bypass RACF
- RACF is integrated with System z Middleware
  - DB2 CICS, IMS, WebSphere
  - Multi level security provided



*** Resource Access Control Facility**

Encryption Protects Data At Rest And In Motion

Protect operational data with data masking

Protect integrity of data read by business partners

Protect tapes leaving your enterprise* with Tape Encryption (TS1120, TS1130)

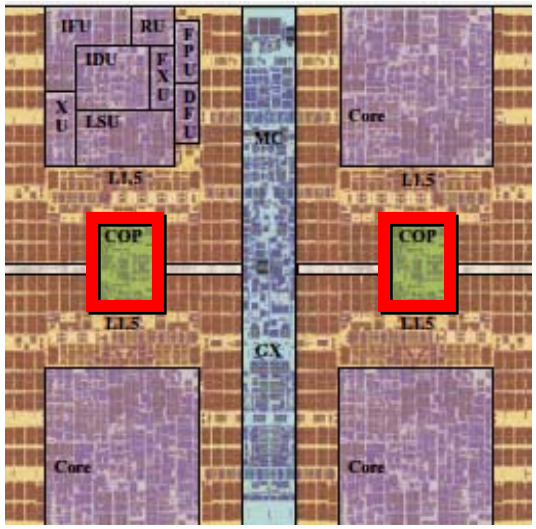
Secured key serving

Highly secure crypto cards

Protect data on the wire with network encryption

Protect archived data with storage encryption

System z Provides Built In Encryption



- **CPACF- Central Processor Assist For Cryptographic Function**
  - Each two cores share a CP Assist for Cryptographic Function (CPACF)
  - Provided free of charge
- **Crypto Express2 Card**
  - High performance cryptography
    - 10,000 SSL handshakes per second
  - Tamper proof
  - Secure key cryptography – key never exposed
  - Dynamically configurable as either a co-processor or accelerator
  - Supports automatic tape encryption
  - FIPS 140-2 Level 4 compliant

The Mainframe Provides Defense Against Network Intrusions

- Many vulnerabilities come from network attacks
- Preventative intrusion defense with z/OS Communications Server
  - Determines network intrusions in real time
    - Integrated firewall filtering functions
    - Detects port scans and suspicious access patterns
    - Helps prevent denial of service attacks
    - Blocks future intrusion attempts from suspect sites
- Automatically applies defensive mechanisms
  - Policy controls limit number of connections
  - Issues notifications to take corrective action
    - Shut down ports, send alerts, discards packets
- Network encryption options using industry standards
  - SSL, IPSec for VPNs
  - AT-TLS for transparent application access to transport level security reduces maintenance costs

Operationally Friendly

- System z keeps running during repairs and upgrades optimizing operational ease
  - Memory can be upgraded when system runs
  - Books can be replaced without disruption
  - Patches can be applied online without taking systems down
  - Parallel sysplex enables rolling release upgrades, one node at a time
    - Allows for non intrusive upgrades of systems
  - Operations enables coexistence of multiple versions of systems software
    - Useful for testing of new system software versions

Concurrent Operations With Hardware Repair And Upgrade Helps Protect Against Outages

Capability	System z10 EC
ECC on Memory Control Circuitry	Transparent While Running
Oscillator Failure	Transparent While Running
Core Sparing	Transparent While Running 2 Pre-installed per System
Microcode Driver Updates	While Running
Book Additions, Replacement	While Running
Memory Replacement	While Running
Memory Bus Adaptor Replacement	While Running
I/O Upgrades	While Running
Concurrent Driver Maintenance	While Running
LPARS Added, Removed	While Running
Redundant Service Element	2 per System

DEMO: How Does Hardware Repair And Upgrade Work?

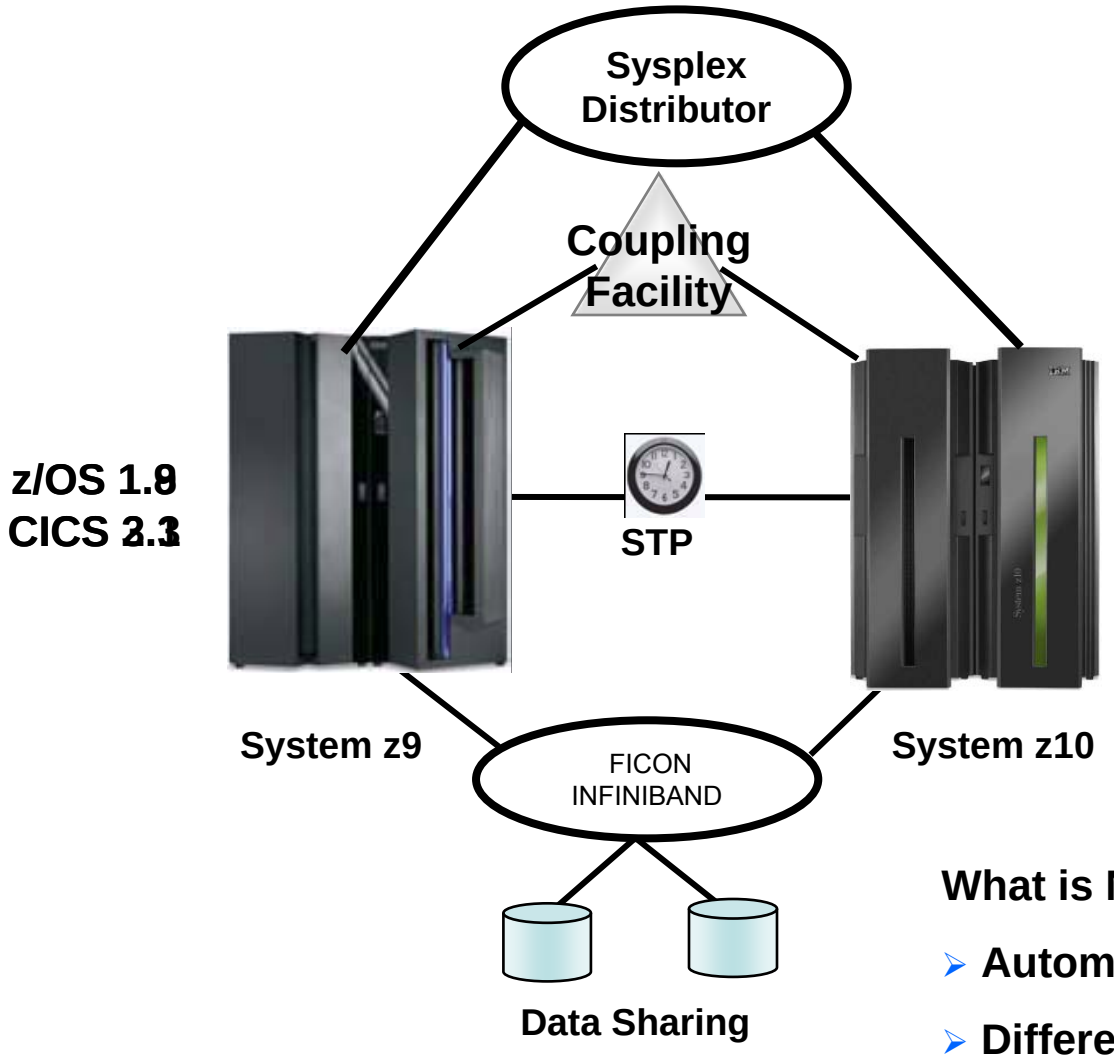
- Perform a memory upgrade while the system continues to run
- Service engineer dispatched automatically through “phone home”
- Parts already ordered through IBM global parts replacement program
- The book is removed while the system is operational
- Memory cards can be added easily similar to servicing a PC
- Even the service tray is included

Play

Types of Replacements:

1. In z10 EC, add a single book for processors, memory, and I/O Connections
2. Remove and replace a book
3. Allocate physical resources on other books

System z Supports Rolling Software Updates

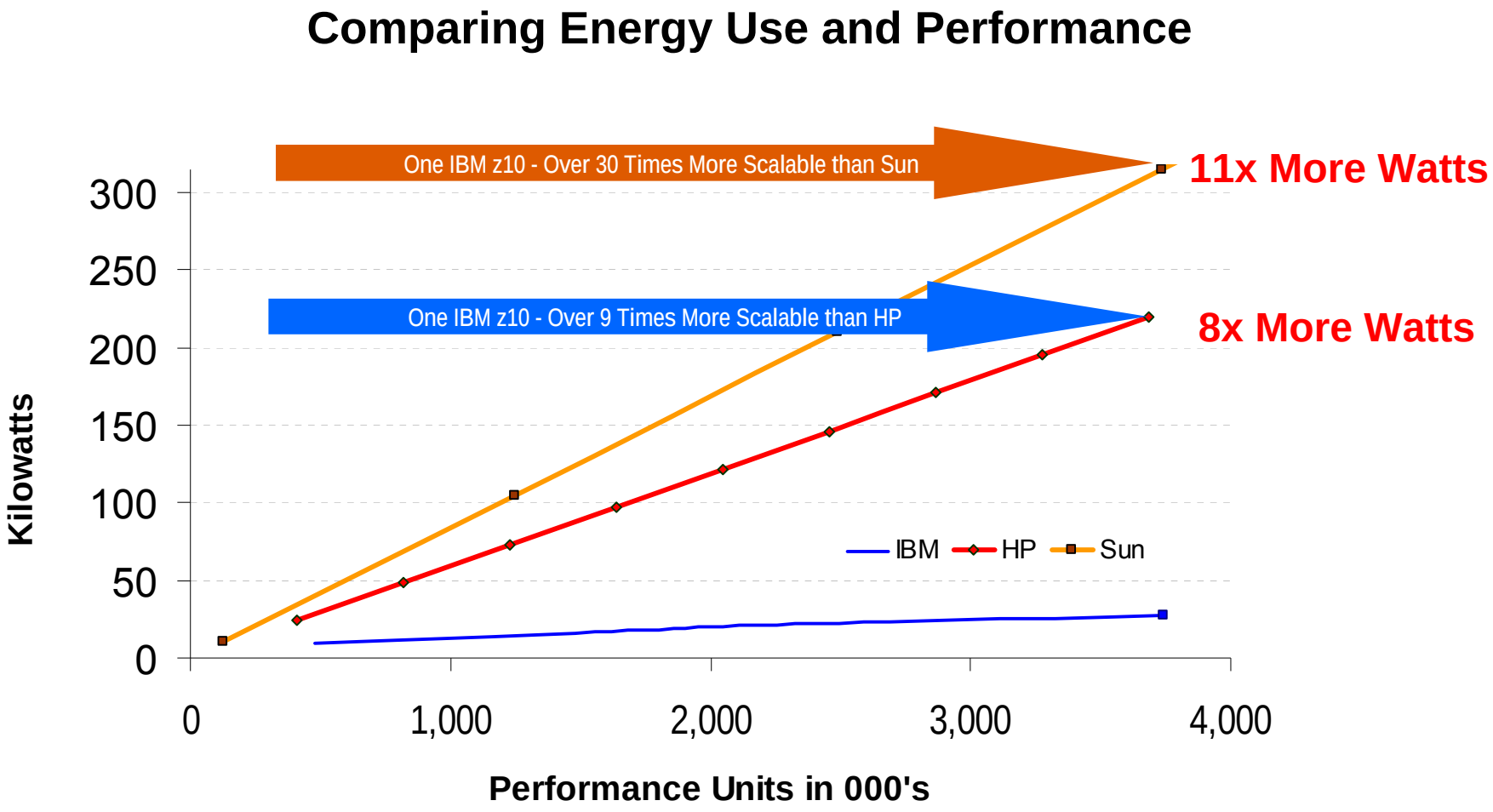


- Shutdown LPAR on z9 for maintenance
- Upgrade OS and middleware on LPAR
- IPL LPAR on System z9
- Shutdown LPAR on System z10 for maintenance
- Upgrade middleware on LPAR
- IPL LPAR on System z10

What is Needed?

- **Automatic Sysplex Failover**
- **Different versions of Operating System and middleware can coexist in a Sysplex**

Consumes Less Power Than HP And Sun For The Same Work



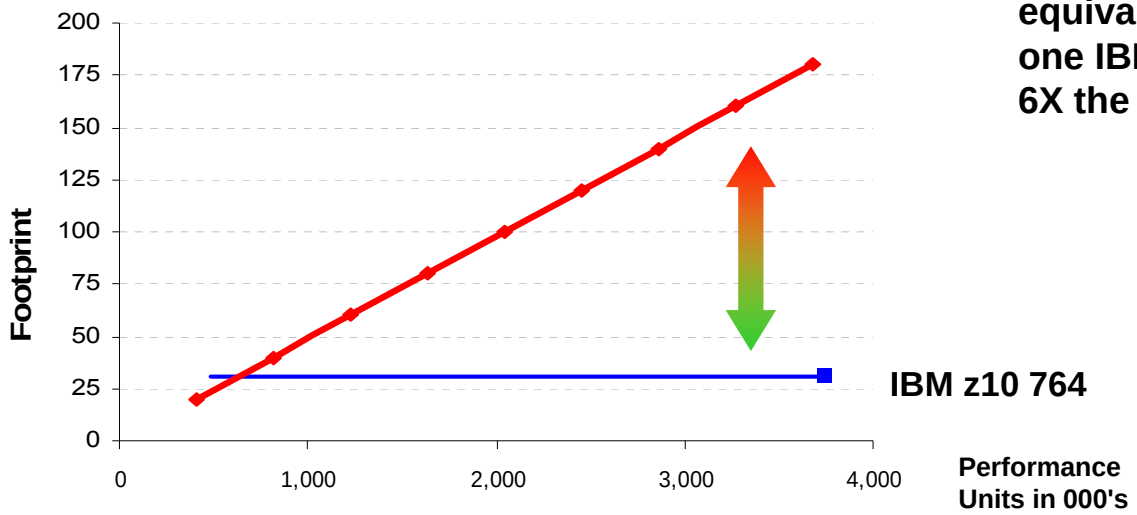
*HP Integrity Superdome Itanium 2 9050 64/128

**Sparc Enterprise M8000 16/64

The Mainframe Also Delivers More Compute Power Per Unit Of Floor Space

Computing Density of Mainframe Helps Avoid Costly Facilities Upgrades

HP Superdome*
9050 64 Chips/128 Cores



9 HP Superdomes equivalent performance to one IBM System z10 EC at 6X the floor space

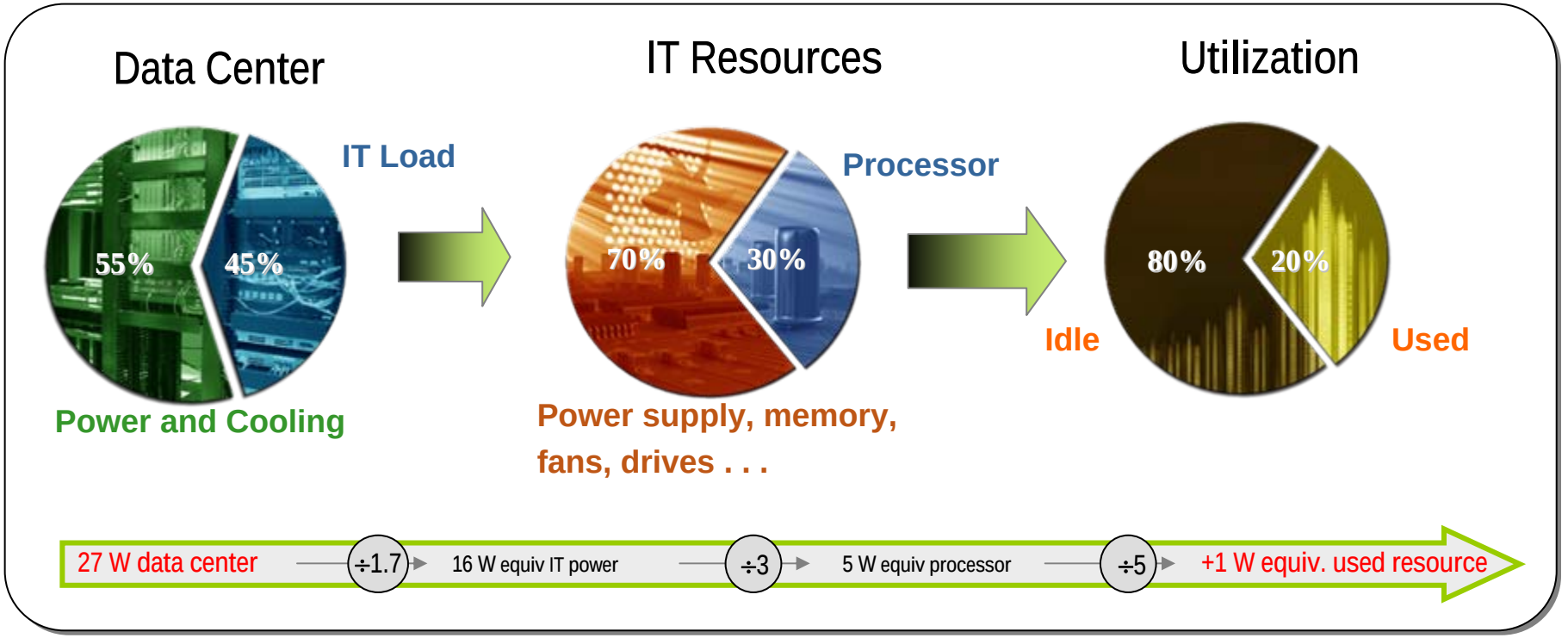
One IBM z10 – 6 times less floor space than equivalent HP's

HP — IBM —

*HP Integrity Superdome Itanium 2 9050

Source for HP, Sun Server calculations Ideas International; source IBM : IBM customers

Energy Considerations Also Favor The Mainframe:
One Watt Of Computing Requires 27 Watts Of Power



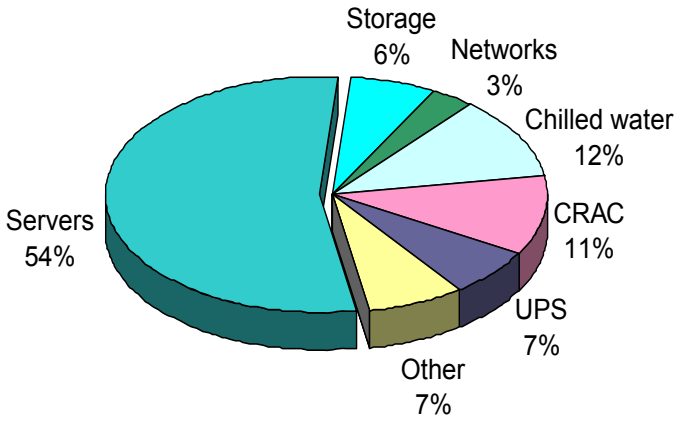
- **Insufficient cooling and insufficient power are pressing datacenters causing expensive expansion**
- **Energy costs currently consume 10-15% of most IT budgets and is rising**
- **The Mainframe offers compelling energy economics**

*Source: Springboard research

Mainframe Power Efficiency

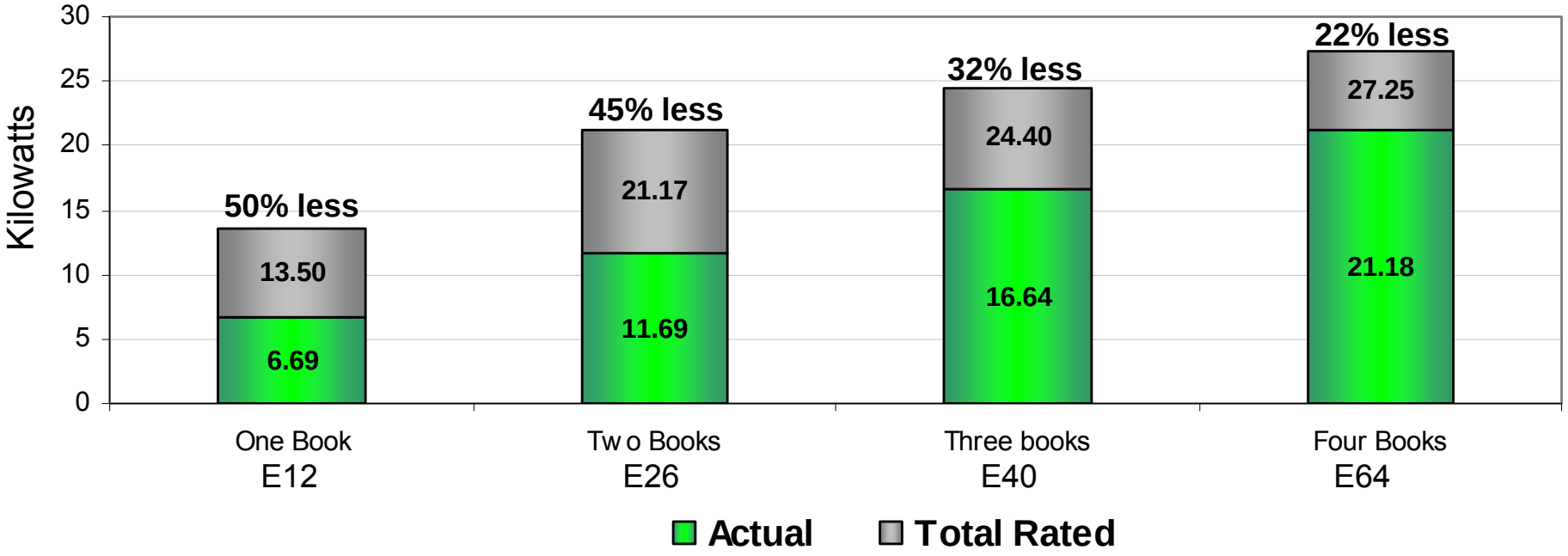
- Representative Energy Efficiency Usage in Mainframe and Distributed Environments demonstrate that mainframes waste less energy
- In Mainframe environments a smaller percentage of facility power is wasted; the power drawn is more effectively used computational work
- Depicted by PUE or **P**ower **U**sage **E**fficiency = Total Power/ IT Power
  - The lower the better (1.0 is ideal)
  - Most efficient mainframe data centers have PUE = 1.6
  - Many distributed data centers run at 2.0
- Our studies show that out of every kW drawn, 432 Watts is used by the Mainframe for productive work
  - vs. 108 Watts for distributed servers
  - Let's check IBM's Poughkeepsie data center now… http://fss2.pok.ibm.com/pue/

Power Utilization Efficiency (PUE)



Actual System z10 Energy Consumption Is Often Better

Actual energy consumption experienced by 243 customers compared to rated value



The Combination Of Hardware And Software Is The Smartest Platform For A Smarter Planet