Consolidation and virtualization update with Linux and z/VM on System z

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Notes:
Performance is in Internal Throughput Rate (ITR) ratio based on measurements and projections using standard IBM benchmarks in a controlled environment. The actual throughput that any user will experience will vary depending upon considerations such as the amount of multiprogramming in the user's job stream, the I/O configuration, the storage configuration, and the workload processed. Therefore, no assurance can be given that an individual user will achieve throughput improvements equivalent to the performance ratios stated here.
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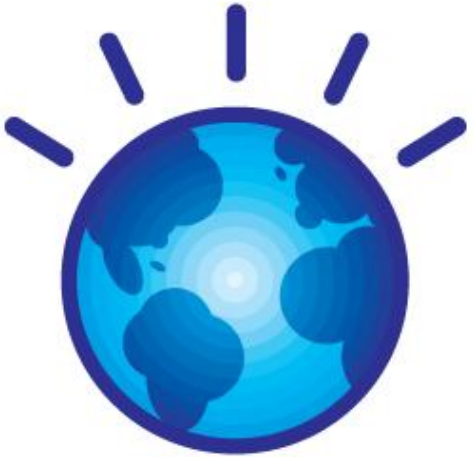
Discussion Topics

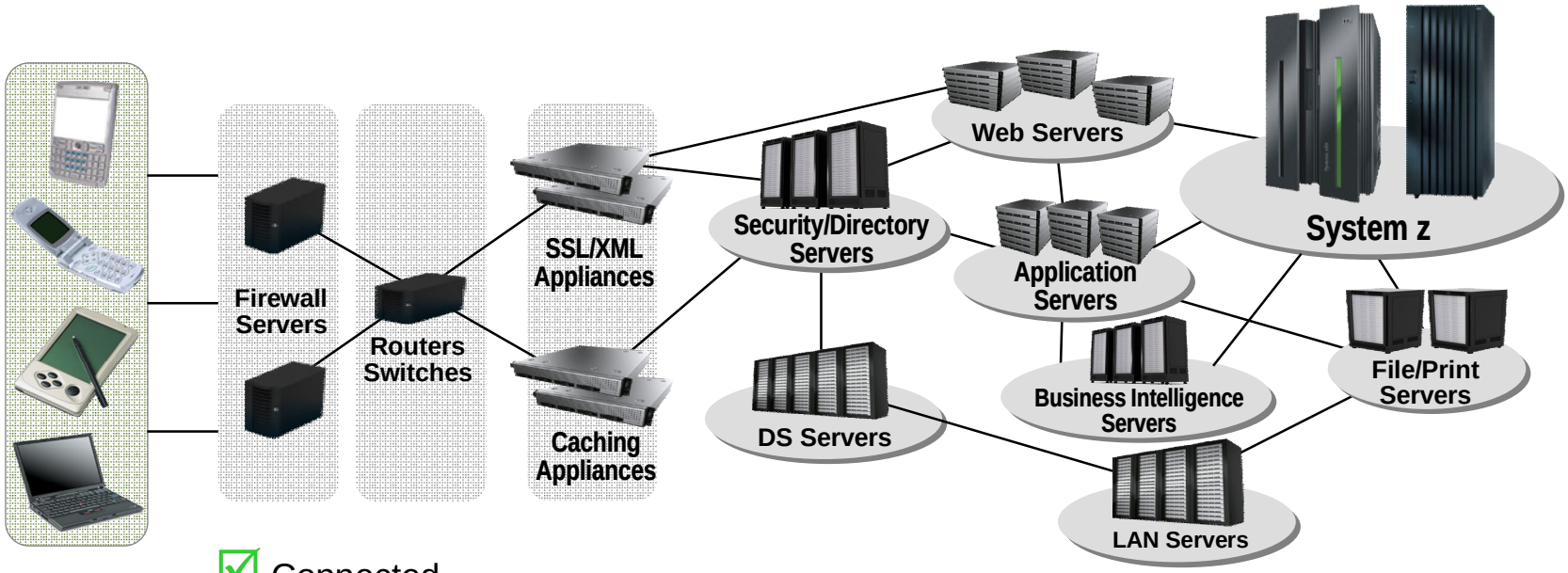
- **Business drivers for IT optimization and consolidation**
- **Linux® on IBM System z® marketplace dynamics**
- **Smarter optimization and consolidation with IBM zEnterprise™**
  - Consolidate more, spend less
  - Optimize workloads across architectures
  - Manage and govern for business success
- **Customer success stories**



A Typical IT Infrastructure Hinders Competitiveness

Businesses spend too much time and money managing their assets instead of managing their business!

- Islands of computing create organizational inefficiencies
- IT complexity constrains business responsiveness



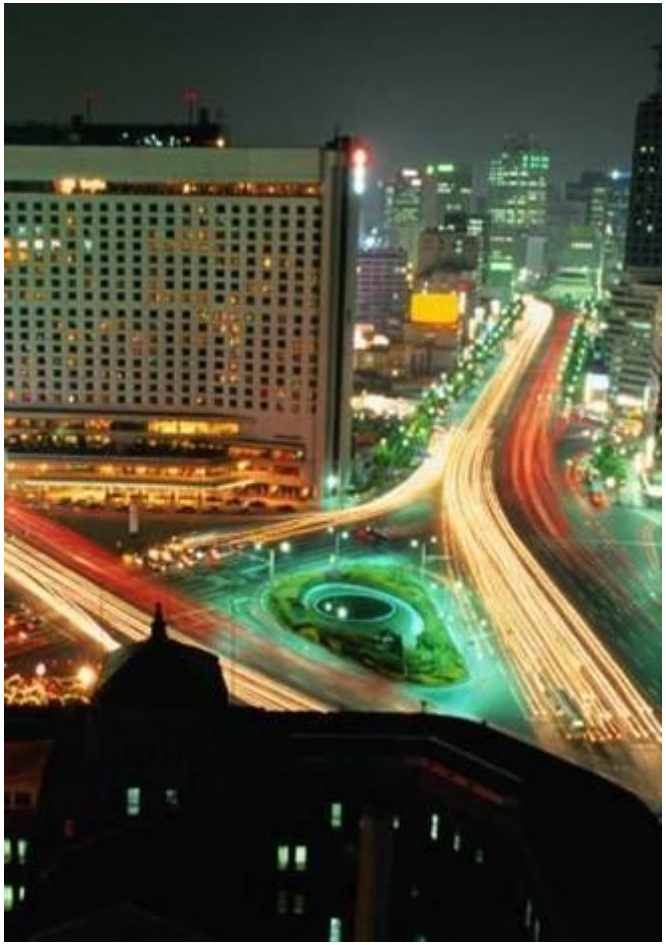
☑ Connected

☒ Integrated

☒ Flexible, Dynamic, and Responsive

☒ Aligned with Business Objectives

A Smarter IT Infrastructure Addresses Today's Challenges... *and* Tomorrow's Opportunities



REDUCE COST

Not just containing operational cost and complexity, but achieving *breakthrough* productivity gains through virtualization, optimization, energy stewardship, and flexible sourcing.

IMPROVE SERVICE

Not only ensuring high availability and quality of existing services, but also meeting customer expectations for real-time, dynamic access to innovative *new* services.

MANAGE RISK

Not only addressing today's security, resiliency, and compliance challenges, but also preparing for the new risks posed by an even more *connected* and *collaborative* world.

IBM zEnterprise System

Delivers Superior IT Optimization and Consolidation for Your Enterprise

Reduce Cost		zEnterprise delivers superior **resource sharing** and **virtualization efficiency** – helping users optimize their spending on energy, floor space, software, and staffing.
Improve Service		zEnterprise provides an extensive set of time-tested **command and control** functions that help users maintain service agreements during peak periods and satisfy business demands with incredible **speed and agility**.
Manage Risk		zEnterprise offers unrivaled **system availability** and flexible business continuance and disaster recovery options to help clients protect their business.

zEnterprise offers a clear advantage because it delivers better business value in these key areas

– ***Plus*** –

zEnterprise integrates and manages multiple server architectures for optimal application placement

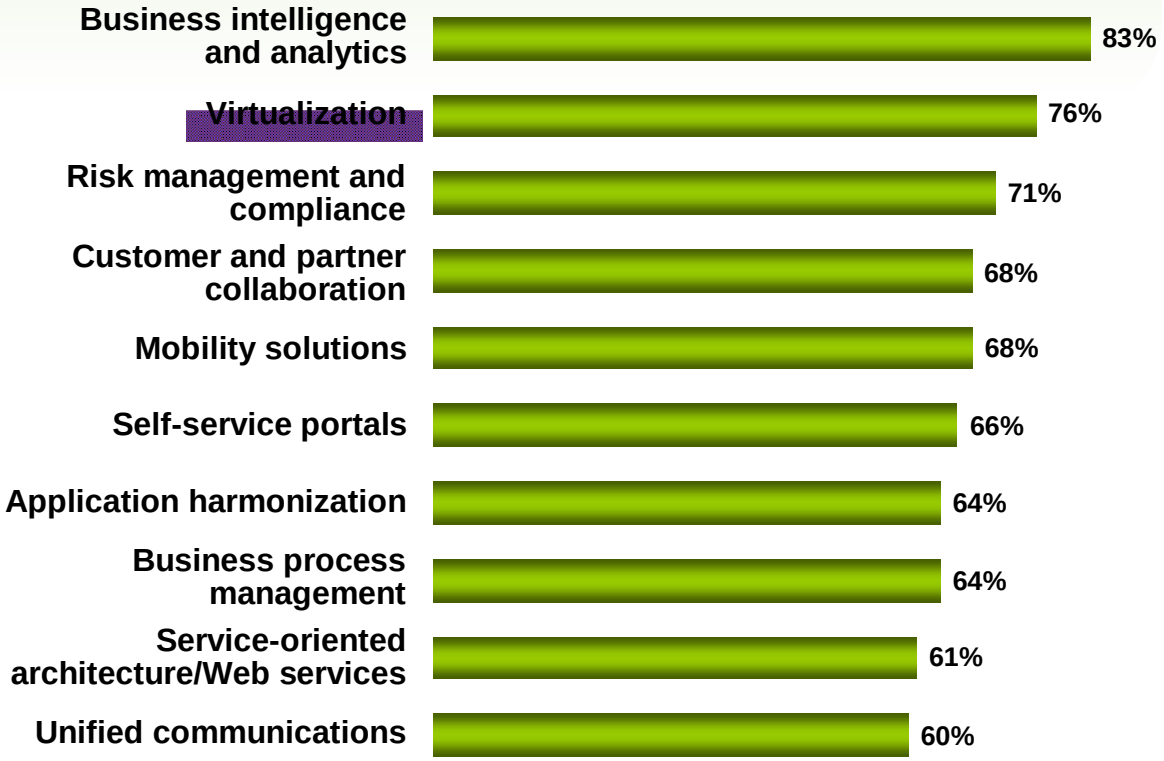
IT Optimization and Consolidation

IBM 2009 CIO survey results

CIOs select their ten most important visionary plan elements

76%

of CIOs cited *"implementing a virtualized computing environment"* as part of their visionary plans to enhance competitiveness.



Note: CIOs were asked to select all applicable answers to the question, *"What kind of visionary plans do you have for enhanced competitiveness?"*

By Liz Benison of Capgemini | 29 September 2009 | CIO UK

Mainframe computing is set for a rebirth

There are several reasons why this is so…

- **Reliability** is of course on the list, with many machines having a record of a decade or more running without interruption…
- **Availability** is another fact … often being considered as the rock-bottom starting point…
- …unmatchable **security** features, the high inbuilt redundancy and **disaster recovery**, the extensive **input-output** facilities…
- …the sheer **processing power** and MIPS rating that supports the massive throughput…
- One reason is the current interest in **cloud computing** and **virtualization** … often touted as brand-new – have been realities in the mainframe world for decades.

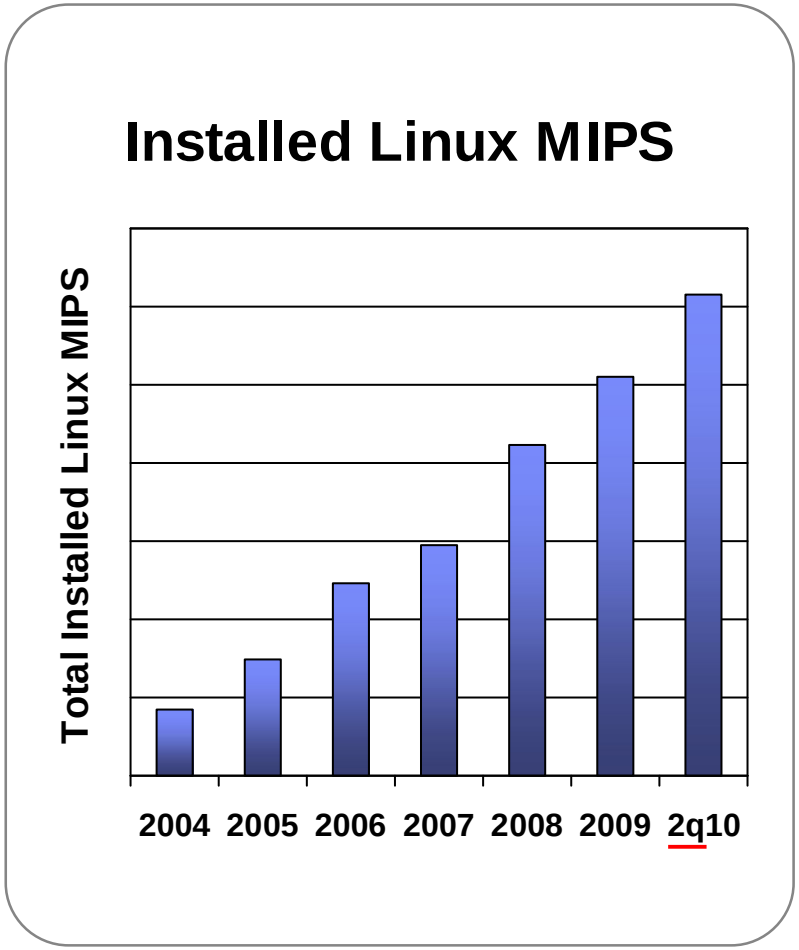
Clearly the availability of open source (…) systems and applications software such as Linux provided as a standard facility has given the mainframe a major boost, with such options proving popular across all sectors including public.

www.cio.co.uk/article/3202920/mainframe-computing-is-set-for-a-rebirth/?otc=44

Client Adoption Continues to Drive Linux Success on System z

*Installed Linux MIPS at 43% CAGR**

- **The momentum continues:**
  - Shipped IFL engine volumes increased 35% from YE07 to YE09
  - Shipped IFL MIPS increased 65% from YE07 to YE09
- **Linux is 18% of the System z customer install base (MIPS)**
- **70% of the top 100 System z clients are running Linux on the mainframe**
- **More than 3,100 applications are available for Linux on System z**



* Based on YE 2004 to YE 2009

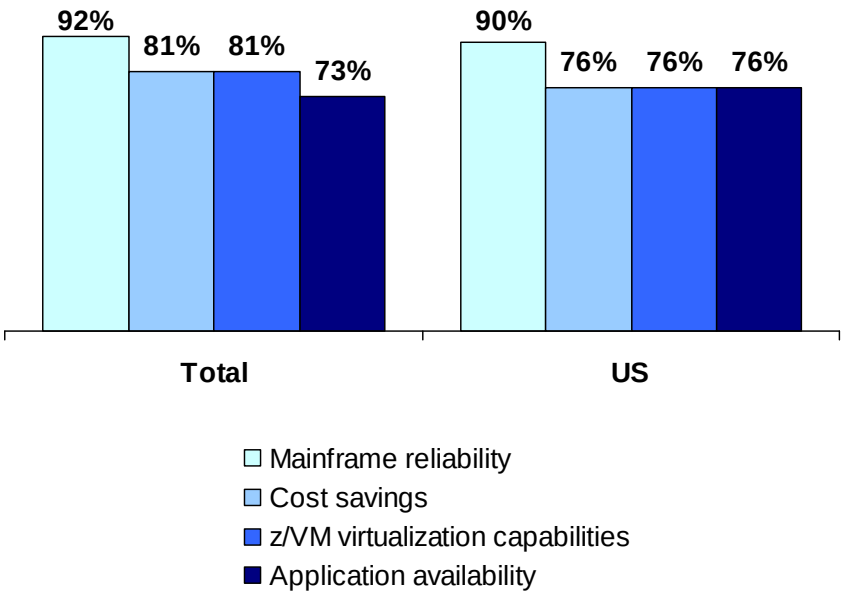
Reasons for Running Linux on the Mainframe

Mainframe reliability is the top driver for running Linux on System z, followed by: cost savings, z/VM® virtualization capabilities and application availability

The most important **z/VM capabilities** are rapid deployment of Linux virtual machines and high server consolidation ratio

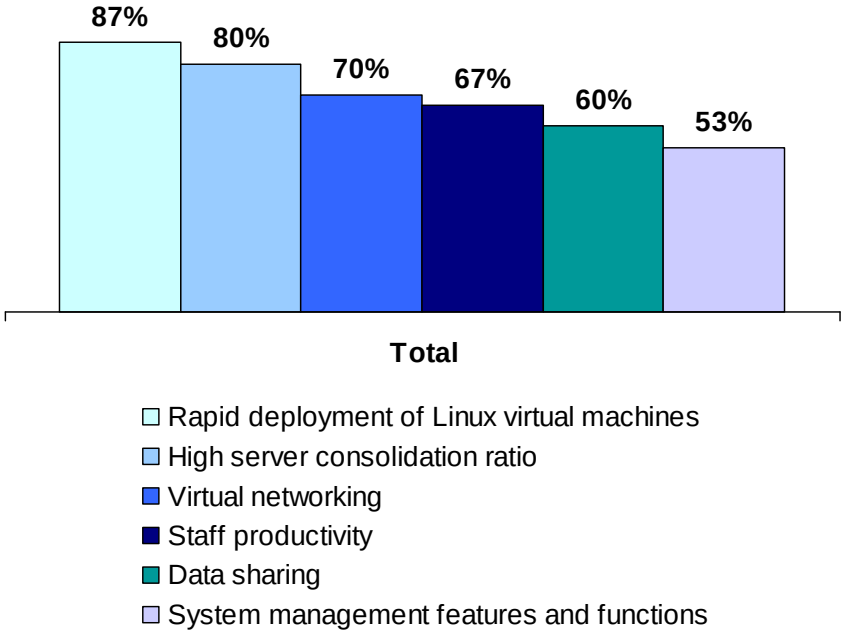
Key Factors in Running Linux on Mainframe

Base: Running Linux on mainframe



z/VM Capabilities Valuable for Running Linux on Mainframe

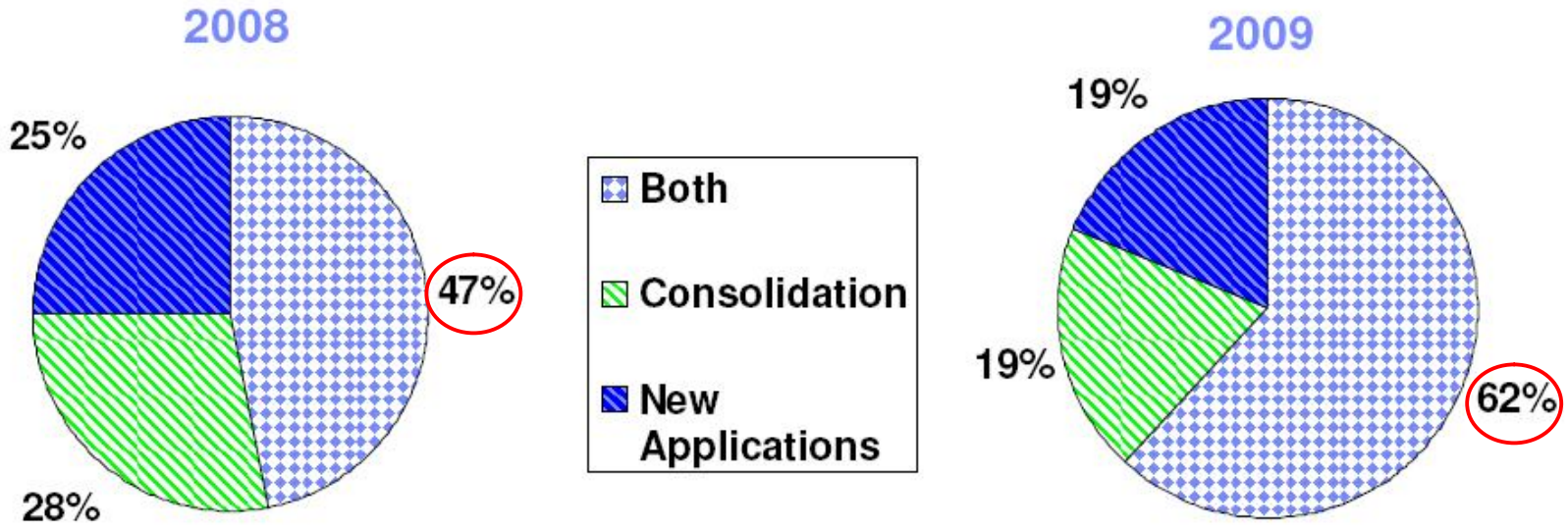
Base: Those who consider z/VM capabilities a key factor in running Linux on mainframe



Source: 2009 IBM Market Intelligence

Linux on System z: Consolidation vs. New Applications

Q: Are you using Linux on System z to consolidate workloads, host new applications or both?



Many users start with a Linux consolidation project or deploy new applications, and then expand their use of Linux on System z to do both.

Source: 2009 IBM Market Intelligence

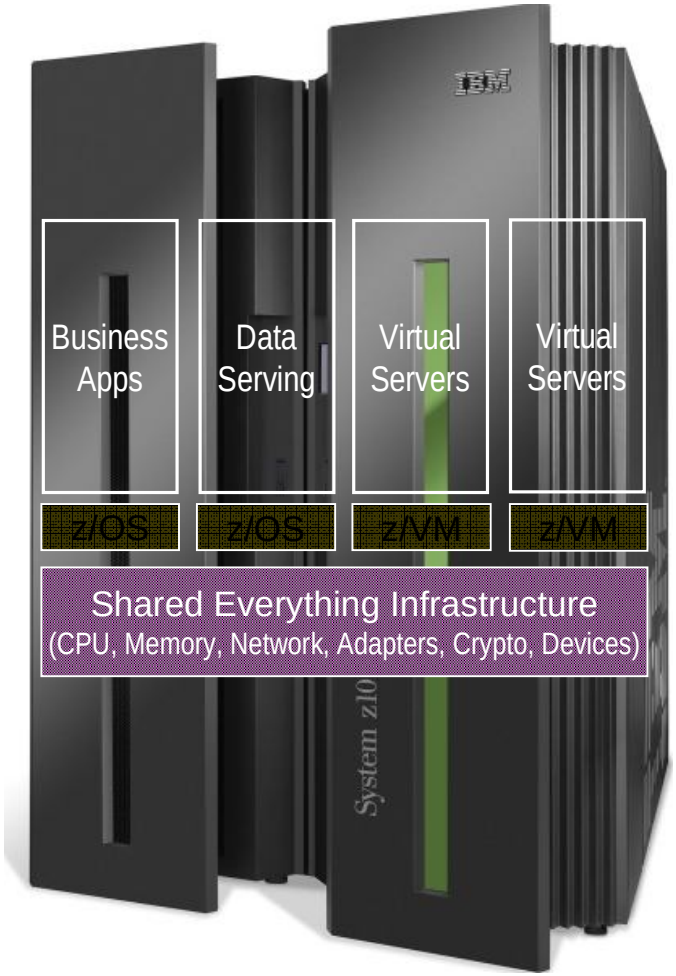
IBM System z IT Optimization and Consolidation

Helping Clients Save Money, Reduce Complexity, Improve Service

- Consolidate more servers per core than virtualized x86 offerings: spend less on software, energy, floor space and disaster recovery
- Manage more server images with fewer people
- Exploit extensive z/VM facilities for life cycle management: provisioning, automation, monitoring, workload management, capacity planning, security, charge back, patching, backup, recovery, more...
- Deploy new servers and applications faster: in seconds instead of hours or days

"From every perspective, running applications under Linux on System z makes sense for our organization. Performance, reliability, disaster recovery, server provisioning and cost efficiency have all seen dramatic improvements – helping us deliver better service and value to our members across the state."

– Ted Mansk, Dir. of Infrastructure Engineering and Databases at Blue Cross Blue Shield of Minnesota



IBM zEnterprise System – Best in Class Systems and Software Technologies

A system of systems that unifies IT for predictable service delivery

Unified management for a smarter system:
IBM zEnterprise Unified Resource Manager

- Unifies management of resources, extending IBMSystem z qualities of service end-to-end across workloads
- Provides platform, hardware and workload management

The world's fastest and most scalable system:
IBM zEnterprise™ 196 (z196)

- Ideal for large scale data and transaction serving and mission critical applications
- Most efficient platform for Large-scale Linux consolidation
- Leveraging a large portfolio of z/OS® and Linux on System z applications
- Capable of massive scale up, over 50 Billion Instructions per Second (BIPS)

Scale out to a trillion instructions per second:
IBM zEnterprise BladeCenter® Extension (zBX)

- Selected IBM POWER7® blades and IBM x86 blades[1] for tens of thousands of AIX® and Linux applications
- High performance optimizers and appliances to accelerate time to insight and reduce cost
- Dedicated high performance private network

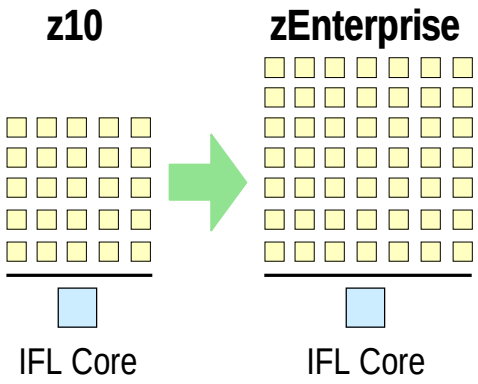
1 All statements regarding IBM future direction and intent are subject to change or withdrawal without notice, and represents goals and objectives only.

Consolidate More and Spend Less with IBM zEnterprise

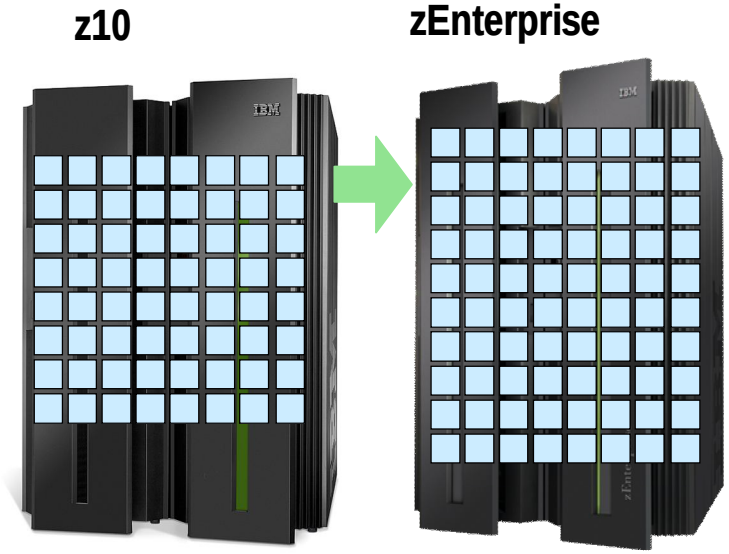
Increasing the Economic Appeal of Linux on z/VM Server Consolidation and IT Optimization

- zEnterprise delivers greater levels of server consolidation **density** and **scalability** with Linux and z/VM that sets a new standard for TCO and service management
- Solution Edition pricing for very large consolidations starts at under $1,000 per virtual server for 3 years – that's less than $1 per day! (1)

Run more virtual servers per core

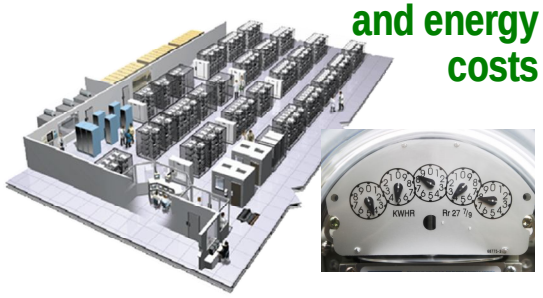


Configure more cores per System

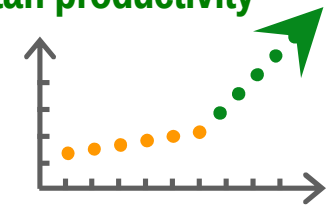


Spend even less on software

Save even more on floor space and energy costs



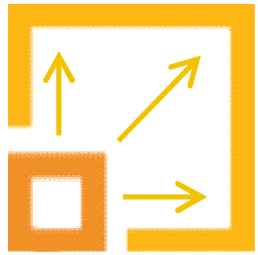
Increase staff productivity even more



(1) Calculations based on specific solution offering components using IBM and client experiences. Results can vary.

zEnterprise Delivers Impressive IFL Scalability Enhancements

Expanding the Economic Appeal of Linux-on-z/VM Server Consolidation and Workload Optimization



- 25% more processor cores – up to 80 IFLs and 96 total system cores
- 30-to-60% faster processing – larger cache memory structure for extreme virtualization; new instructions accelerate Java code
- 100% more memory – up to 3 TBs for memory-hungry virtual servers
- Consolidate more virtual servers per core, per z/VM LPAR, per zEnterprise
  - Require even fewer physical servers, fewer network devices, fewer switches, less disk space, less energy, and less floor space
  - Spend even less on software license fees with extreme levels of resource sharing and workload consolidation
  - Increase the productivity of your staff as they manage even more server images on a single zEnterprise system

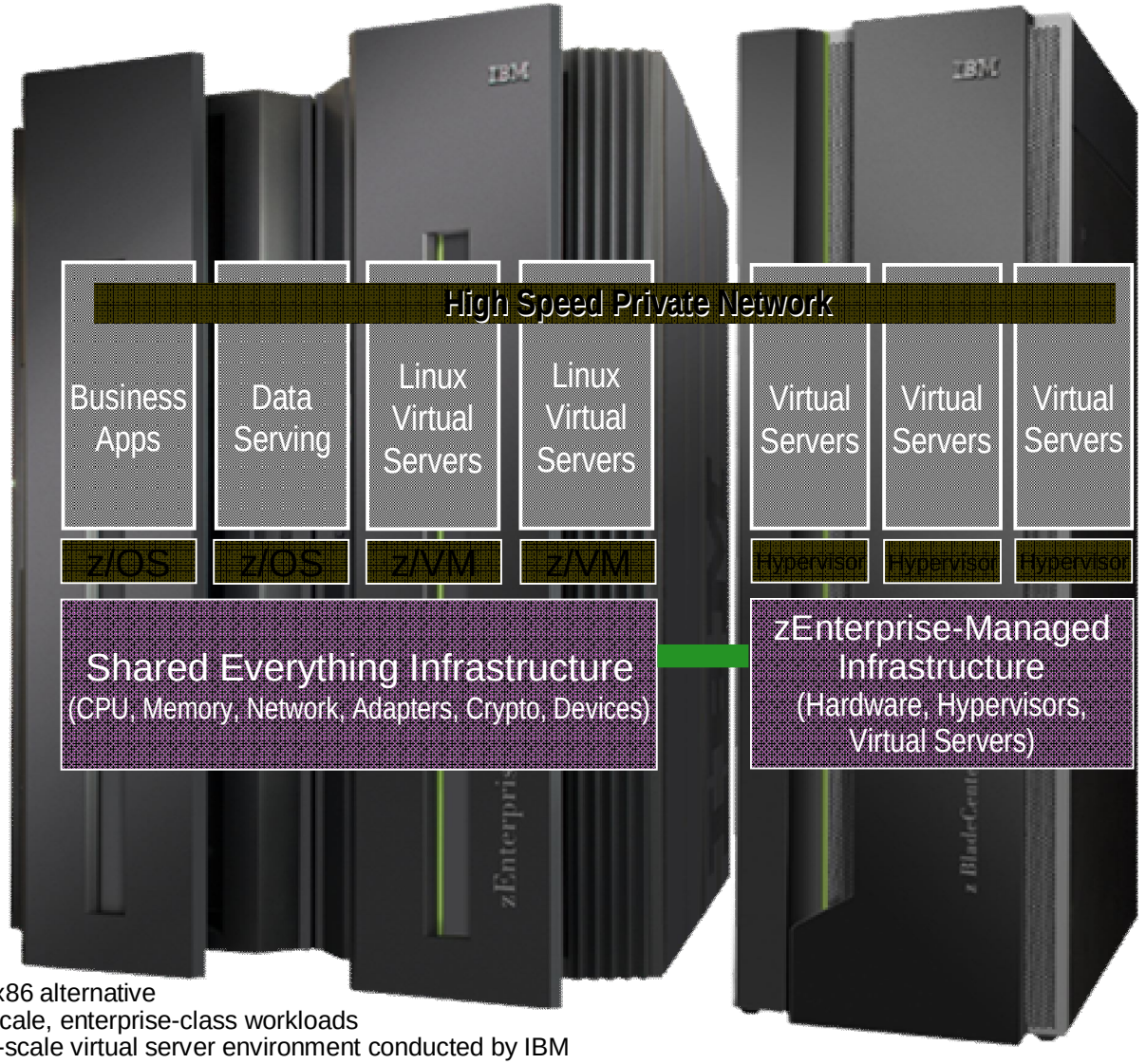
Run **50** or more virtual servers per core

Potentially host **1000s** of Linux server images using z/VM

IBM zEnterprise IT Optimization and Consolidation

Even Greater Savings, Operational Simplification, and System Reliability

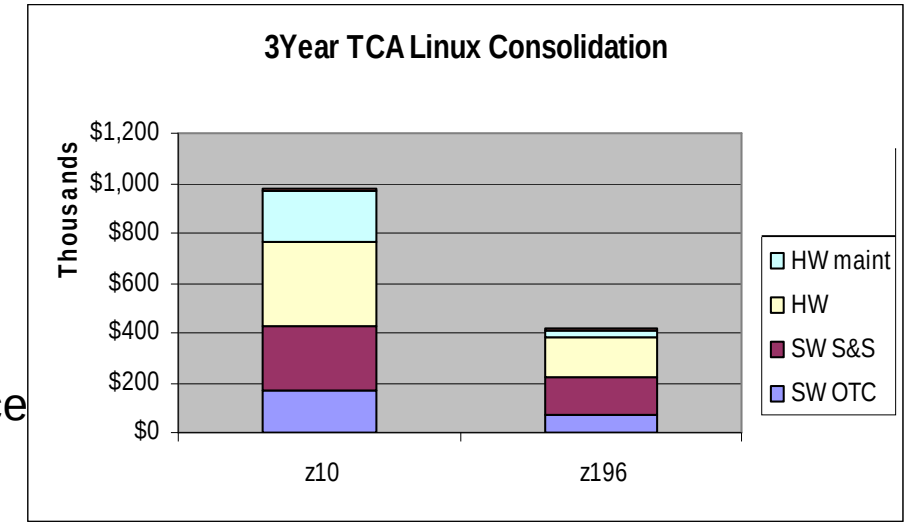
- Consolidate even more with zEnterprise IFLs: up to 60% faster at 33% lower price
- Increase energy savings as you scale, up to 75% (1)
- Spend up to 70% less on acquisition costs (2) and boost staff productivity by up to 70% (3) compared to virtualized x86 alternatives
- Incorporate IBM POWER® and System x technologies for unparalleled levels of workload optimization
- Manage and govern the integrated environment to deliver superior business results at a lower cost

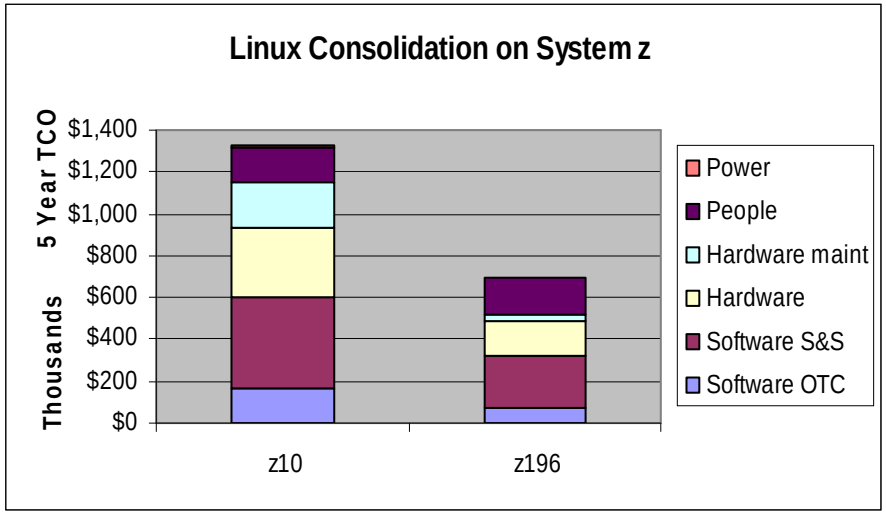


(1) Based on zEnterprise comparison to virtualized x86 alternative
(2) Based on three-year acquisition costs for large-scale, enterprise-class workloads
(3) Based on life-cycle management testing of large-scale virtual server environment conducted by IBM

Driving Down the Cost of Linux and Increasing Customer Value

- Three-year TCA for z196 is less than half of a z10 for equivalent capacity
- Superior Virtualization
- Larger z196 processors can lead to fewer IFLs which:
  - Reduces software OTC and maintenance
  - Simplifies management
  - Reduces hardware costs
    - IFL and memory over 50%
    - Maintenance over 80%
- Able to scale while adding resources non-disruptively
  - Add more engines within book package
  - Better performance per watt



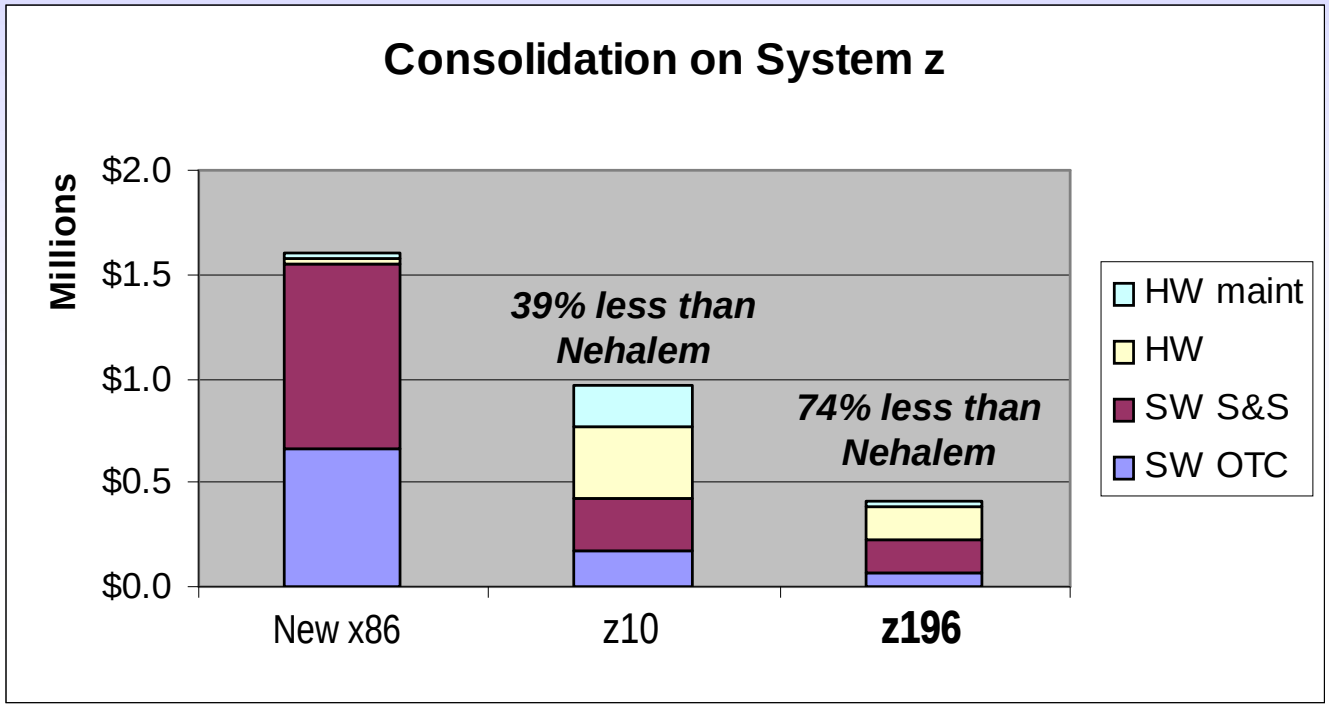


The Most Efficient Platform for Large Scale Consolidation

Linux on z196

- ***Lower acquisition costs of hardware and software vs distributed servers****
- ***Less than $1.00 per day per virtual server (TCA)****
- ***Reduce floor space by up to 90% compared to distributed servers****
- ***Reduce energy consumption by up to 80% compared to distributed servers****

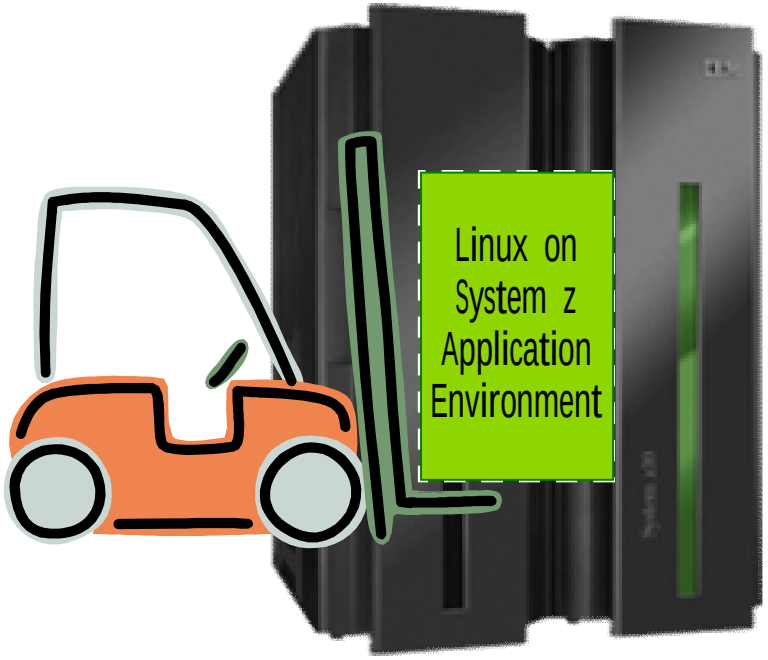
Consolidate 40 Oracle server cores onto 2 Linux cores on zEnterprise



* Distributed server comparison is based on IBM cost modeling of Linux on zEnterprise vs. alternative distributed servers. Given there are multiple factors in this analysis such as utilization rates, application type, local pricing, etc., savings may vary by user.

Linux on System z Technology Refreshes

Forklift Upgrades: Fast, Easy, Upwardly Compatible



IBM System z10

IBM zEnterprise System

"One of the key advantages we see of running Linux on System z is as new generations of hardware technology are introduced, we're able to basically do a forklift upgrade – we don't have to re-certify applications as we have had to do on other platforms in the past."

– IT Manager, Delivery Industry Company

zEnterprise Blades Complement Linux on z/VM Consolidations

Use Blade Technology to Increase Application Supply and Further Optimize Workload Placement

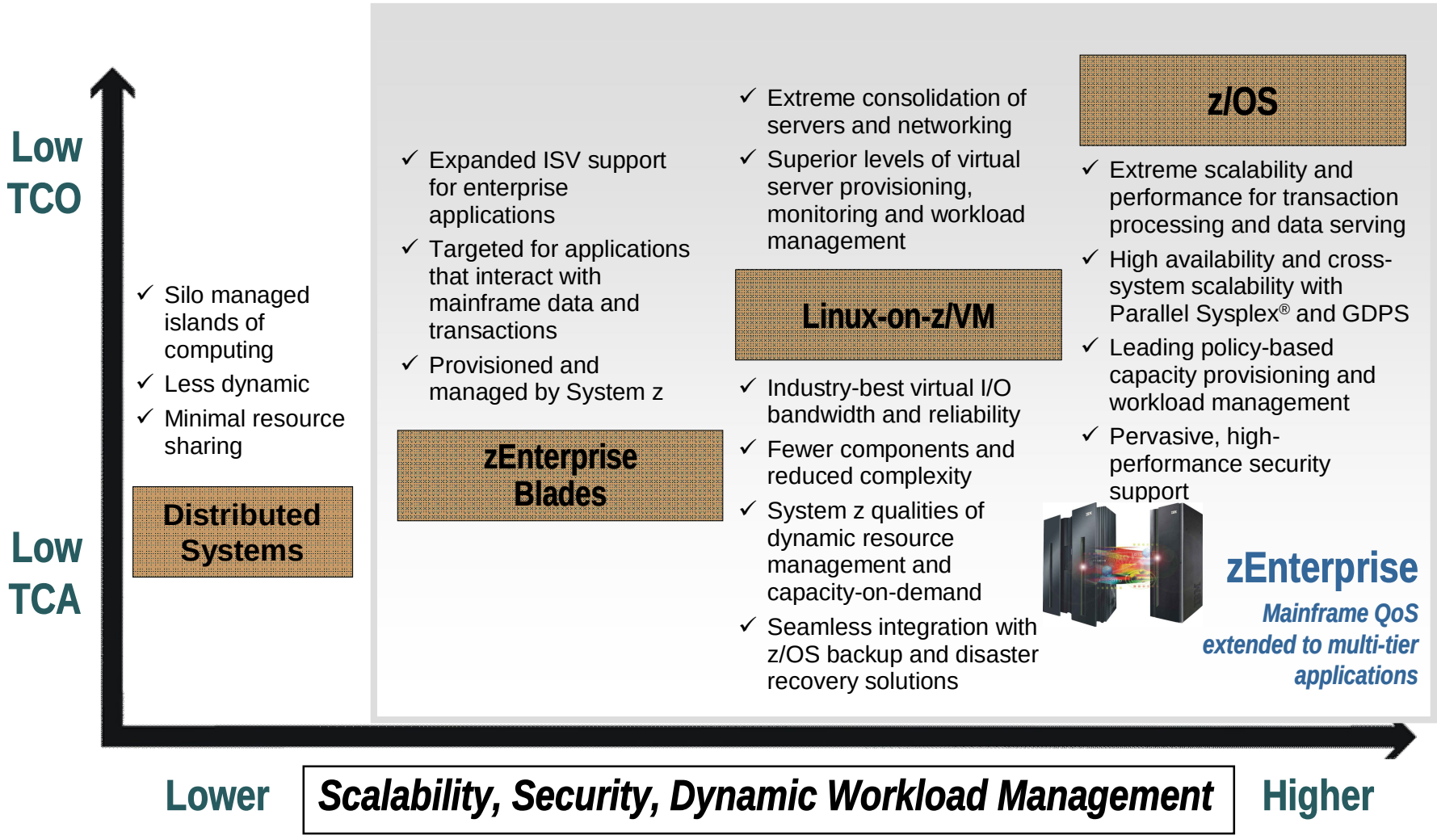
- Server and application consolidation on System z using Linux and z/VM is the industry leader in large-scale, cost-efficient virtual server hosting
- Blades in zEnterprise BladeCenter Extension (zBX) offer clients ability to increase value of server consolidation on System z IFL specialty processors:
  - Host a complete solution suite on zEnterprise by running "**companion**" apps on zEnterprise blades in conjunction with Linux applications running on z/VM
  - User Power and x86 blades for compute-intensive application logic that does not require z/VM and zEnterprise qualities of service
- Use zEnterprise Unified Resource Manager as a common interface to manage virtual servers running on z/VM and zEnterprise blades
  - This simplifies the effort to manage a "fit for purpose" solution deployment that runs applications on different architectures (e.g., IFLs, Power, x86)
  - This provides operational convenience when you want to re-host blade applications to Linux on z/VM as a result of application growth and/or a need for superior qualities of service

Smarter Virtualization with z/VM
Why Run Linux on System z Instead of Power or x86?

- **Do more with less**
  - Consolidate more servers, more networks, more applications, and more data than any other platform
  - Achieve nearly 100% utilization of system resources nearly 100% of the time
  - Enjoy the highest levels of resource sharing, I/O bandwidth, system availability, and staff productivity
- **Reduce costs on a bigger scale**
  - Consolidation density saves on power and floor space
  - Extreme over-commitment of system resources saves on software license fees *and* helps absorb workload spikes
  - Minimize hardware needed for business continuance and disaster recovery (e.g., CBU processors)
- **Manage growth and complexity**
  - Exploit extensive z/VM facilities for life cycle management: *provisioning, monitoring, workload mgmt, capacity planning, security, charge back, patching, backup, recovery, more...*
  - Add hardware resources to an already-running system without disruption – the epitome of Dynamic Infrastructure
  - Tightly integrate Linux and z/VM with z/OS for disaster recovery (e.g., GDPS®/PPRC Multiplatform Resiliency)
  - Co-residency with z/OS (leveraging HiperSockets™ for network-intensive applications)

zEnterprise: Service Levels to Match Your Business Needs

Increased flexibility for your multi-tier, multi-architecture strategy



zEnterprise Unified Resource Manager
Transforming the way resources are managed and deployed

What is it?

Unified Resource Manager provides ***workload awareness*** *to optimize the system resources in accordance with understanding the policies assigned to that particular workload. Functions are grouped into two suites of tiered functionality that enable different levels of capability – Manage suite and Automate suite.*

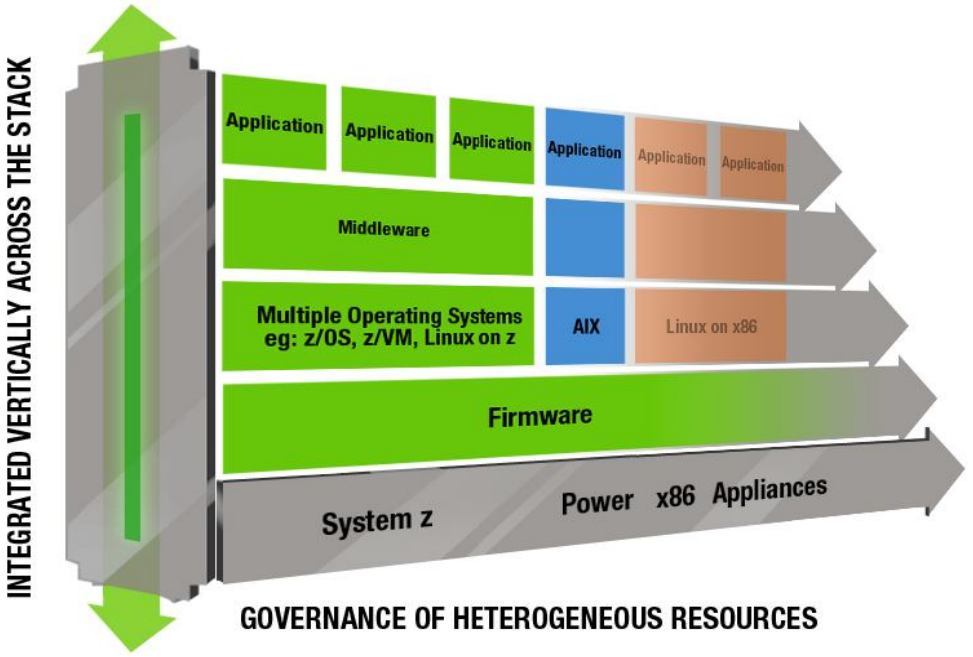
How is it different?

- **Heterogeneous management:** Total systems management across heterogeneous resources
- **Integration:** Single point of control, common skills for resources, reduced complexity of day to day operations.
- **Monitoring:** New dashboard for CPU resources and energy management.
- **Simplified installation:** Auto discovery and configuration of resources and workloads with single interface
- **Secure:** Security with lower latency, less network hops, less complexity,
- **Service and support management:** Virtual machines and blades able to perform hardware problem detection, reporting and call home

zEnterprise Unified Resource Manager

Building on Classic System z Strengths for Workload Management

- Introduces virtual server provisioning and management for Linux guests running on z/VM
  - Use the Unified Resource Manager to create z/VM virtual machines
  - Simplify the skill level needed to manage a Linux on z/VM environment
- Extends the comprehensive management of the System z technology stack to include blade resources
- Provides end-to-end governance and management that spans entire business processes
- Simplifies the effort to optimize workload placement across a mix of system architectures
- Modify your application landscape using a single user interface
  - Eliminate multiple platform management consoles
  - Improve business responsiveness



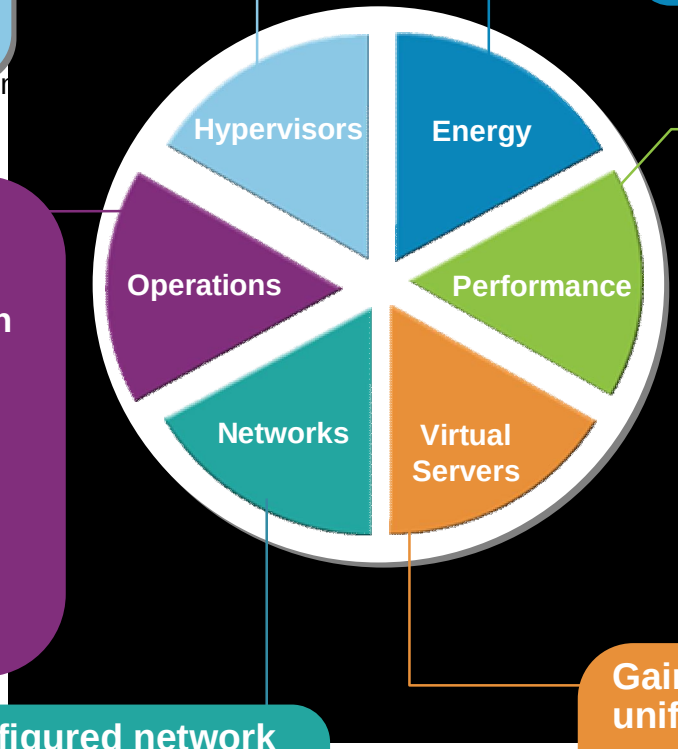
…Value Made Possible by the Unified Resource Manager

Simplified installation of hypervisors

Gain significant time to market with improved speed of deployment

Simplified energy management

Energy cost savings



Save time, cost and simplify asset management

Decrease problem determination and resolution time for cross-platform resources

Improve and simplify cross-platform availability procedures

Enable broader and more granular view of resource consumption

Allow critical workloads to receive resources and priority based on goal-oriented policies established by business requirements

Smart business adjustments based on workload insight

Provide deep insight into how IT resources are being used

Factory installed and configured network

Improved network security with lower latency, less complexity, no encryption/decryption

Gain flexibility, consistency and uniformity of virtualization

Provide the business with faster time to market

Simplified network management for applications

IBM System z Offerings for Large Scale Consolidation

The Enterprise Linux Server

A dedicated IBM zEnterprise or System z10 server for large-scale Linux workloads

System z Solution Edition for Enterprise Linux

Additional capacity on an installed IBM zEnterprise or System z10 server for large Linux workloads

- **Offerings include**
  - System z IFL specialty processors, memory, and I/O connectivity
  - Hardware maintenance for three to five years
  - z/VM virtualization software package with three to five years of subscription and support
- **Supported with promotions from Linux Development partners Novell and Red Hat**
- **Very competitive pricing**
  - Competitive TCA with scalable Linux and UNIX® alternatives
  - Total Cost of Ownership and Qualities of Service that blow away the competition
  - Price / performance improves as you grow your environment
  - Able to host thousands of servers in a single system
  - Pricing starting at under $1,000 per virtual server for 3 years for very large consolidations(1)

More Solution Editions include: SAP, Business Resiliency, Security, WebSphere®, Application Development, Chordiant, ACI, Data Warehousing, Cloud

(1) Calculations based on specific solution offering components using IBM and client experiences. Results can vary.

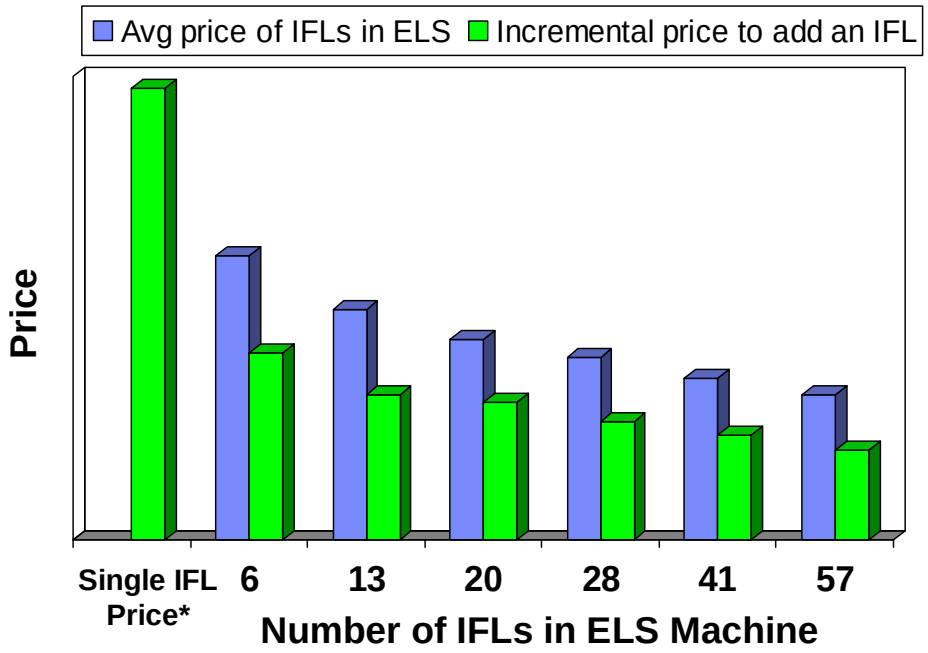
TCA: hardware, virtualization software, memory, maintenance

IBM Enterprise Linux Server

Transforming the Economics for Large Scale Consolidation

Enterprise Linux Server
Price per IFL

Includes: IFL, 16 GB memory, z/VM,
3 years maintenance and S&S



- **The new Enterprise Linux Server dramatically reduces the marginal cost of scaling for consolidations**
  - The average cost of consolidation declines significantly as the scale of consolidation increases
  - The marginal price of an incremental IFL can be as much as 80% less than the single IFL price
  - You don't have to buy big to save big

Note: participation and pricing may vary by country.

Unprecedented Economies of Scale for Consolidation on Linux on System z

* Based on July 2009 pricing for IFL ($75K) and memory ($2250/GB) with discounted software and hardware maintenance for 3 years.

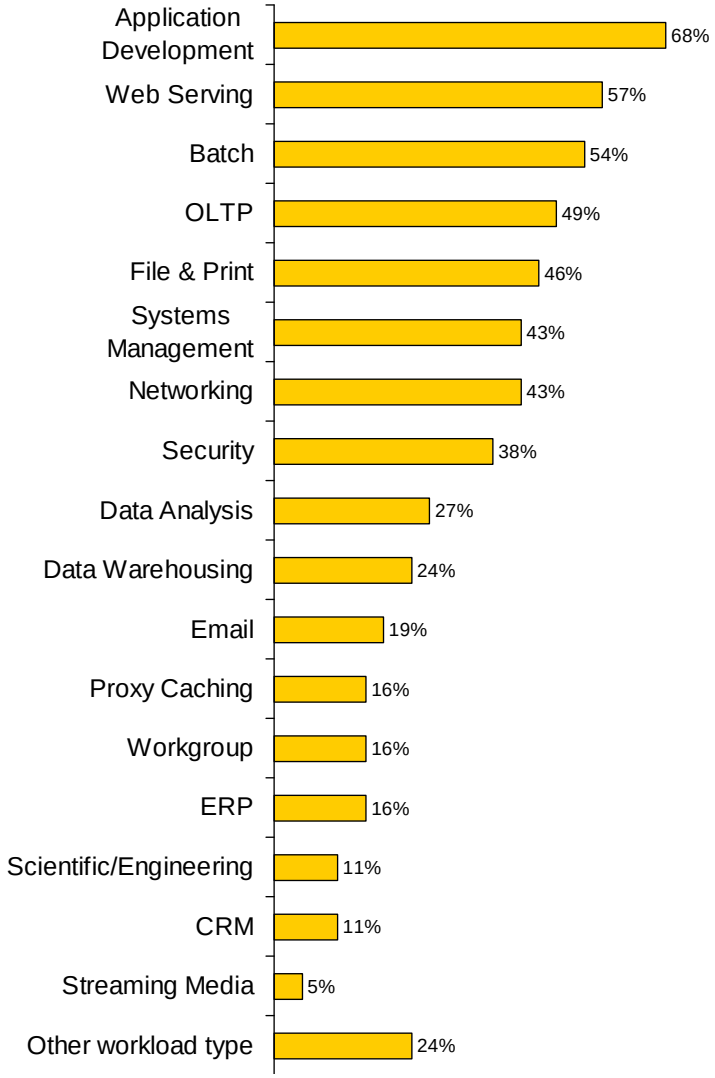
Smarter Virtualization
with the IBM Enterprise Linux Server

- **x86 virtualization solutions have some hidden and some not-so-hidden issues**
  - Physical server sprawl is needed to scale a virtualized x86 environment – typically with linear, per-machine pricing
  - x86 virtual machine sprawl can be difficult to manage, causing operational complexity
  - Ineffective capacity planning can result in failure to meet service level agreements
  - Limited core-to-core consolidation ratios and virtual machine mobility requirements can lead to costly software fees
  - x86 systems do not have a heritage of robust security support
  - Duplication of hardware and is needed for disaster recovery
- **Enterprise Linux Server provides a superior <u>scale-up</u> system architecture for scale-out x86 applications**
  - Dynamically expand your system "on demand" – add capacity when you need it, not any sooner, not any later
  - Enjoy superior operational capabilities for greater levels of command and control
  - Total Cost of Ownership economics favor server virtualization on an Enterprise Linux Server, especially when factoring in disaster recovery and server technology refreshes

Key Functional Distinctions of z/VM versus VMware ESX

Attribute	z/VM V6.1	VMware ESX 4.0	System z Value Add
Scalability and Performance			
Real CPU sharing	Architecturally limitless; more than 60 VMs per CPU (workload dependent)	Up to 20 VMs per CPU (workload dependent)	More easily add servers w/o adding HW; save on per-CPU software license fees
Architected maximum number of VMs	Thousands per copy of z/VM	320 per copy of VMware	Reduce real server sprawl...
Practical maximum number of VMs	Hundreds per copy of z/VM	Tens per copy of VMware	...and host a large # of mixed workloads
Real CPU and memory capacity on demand	Yes, non-disruptively	No	Fast, easy capacity growth
In-memory support	Minidisk cache; Virtual Disks in Storage; DCSS (shared program executables)	Shared virtual memory pages (detected via background operation)	Enhanced resource utilization: “do more with less”; greater system scalability
Virtual Machine (VM) scalability	Up to 64 CPUs, 1 TB of memory, extensive I/O bandwidth	Up to 8 CPUs, 255 GB of memory, modest I/O bandwidth	Host server images on System z that require extreme scalability
Run multiple copies of hypervisor on single server	Yes; share CPU, I/O, and networking resources with up to 60 copies of z/VM on one mainframe	No	Enables failover, workload isolation, and scalability without duplicating hardware
Flexible Operations			
Command and control, monitoring, automation infrastructure	Extensive, robust, time-tested	Modest, yet easy to use	Cost-optimized systems management support
System co-residency with z/OS	Yes; LPAR technology lets users run z/VM side-by-side z/OS inside the same machine	No	Secure, inside-the-box network access to z/OS data and transaction services
Hypervisor-on-hypervisor support	Yes; run multiple copies of z/VM as guests of z/VM (even new release levels on old releases)	No	Support dev/test, training, and release upgrades without duplicating hardware
Resource over-commitment support (memory, CPU, network, I/O)	Extensive	Modest	Absorb workload spikes; add more virtual servers to a seemingly full system
Virtual Machine mobility support	Planned future support; dynamic scalability of z/VM lessens need to relocate guest images	Yes; essential for workload mgmt across multiple copies of VMware	Non-disruptively add or remove real resources to meet user demand
Infrastructure Economics			
Cost-efficient disaster recovery	Yes; Capacity Backup on Demand CPUs offer inexpensive multi-system failover options	No; typically requires a duplication of hardware and software license fees	Reduce hardware expense; spend less on software; accelerate time-to-recovery
Cost-efficient technology refresh	Yes; mainframe upgrades offer investment protection and application compatibility	No; typically requires re-purchasing new hardware and application verification	Upgrade hundreds-to-thousands of virtual servers over the weekend

What Are Linux Users Running on System z?



Surveys indicate customers use:

- Web Serving
- Web Application Serving
- Data Services
- Systems Development

Best Fit Workloads for Linux on System z:

- **Web Application Servers:** WebSphere Application Server
- **Email and collaboration:** Domino®, Web 2.0
- **Data services**: Cognos®, DB2®, Oracle, Informix®, Information Server, Information Builders WebFOCUS
- **Business critical ISV applications**: e.g., SAP
- **Development of WebSphere and Java™ applications**
- **Virtualization and security services**
- **Business connectors**: WebSphere MQSeries®, DB2 Connect™, CICS® Transaction Gateway, IMS™ Connect for Java
- **Network Infrastructure**: FTP, NFS, DNS, etc., and Communications Server and Communications Controller for Linux, CommuniGate Pro (VoIP)
- **Applications requiring top end disaster recovery model**

Source: 2009 IBM Market Intelligence

Why Are Data Centers Consolidating to System z?

- Virtualization on IBM System z offers unique value compared to competitive scale-out solutions from Sun, HP, and others
- Superior availability and security reduces risks and improves service levels
- Extremely efficient virtualization technology lowers costs – System z achieves very high core-to-core consolidation ratios
- **Real customers, real workloads**

Customer	Distributed Cores	Ratio of Distributed to System z Cores*	Ratio of Distributed to System z cores*
Allianz	**60**	**30 to 1**	48 hour migration
Government Agency	**292**	**58 to 1**	70% cost savings
Bank of Russia	**200**	**50 to 1**	Reduces payment processing costs by 95%

* Client results will vary based on each specific customer environment including types of workloads, utilization levels, target consolidation hardware, and other implementation requirements.

TCO Comparisons – Real Customer Cases

Scenarios	Cost of Distributed vs. System z			Distributed Cost Ratio	Migration Cost
Green Field Cases					
- Banking Benchmark	$43.3M	vs.	$18.2M	2.4x	No migration
Migration Examples					
- Asian financial company	$119.0M	vs.	$53.0M	2.2x	6.0M
- Asian insurance company	$25.1M	vs.	$16.3M	1.5x	2.1M
- NA financial services	$58.9M	vs.	$34.0M	1.4x	5.0M
- European financial	$17.9M	vs.	$4.9M	3.7x	4.7M
- US County government	$8.1M	vs.	$4.7M	1.7x	2.9M
Case Studies					
- European agency	€386.0M	vs.	€204.0M	1.9x	6.3M
- Restaurant chain	$56.3M	vs.	$23.3M	2.4x	10.0M
- Asian healthcare	$15.1M	vs.	$8.9M	1.7x	4.8M
- Asian bank	$31.6M	vs.	$23.5M	1.3x	6.0M
- US utility	$13.4M	vs.	$6.2M	2.2x	1.9M
- US manufacturer	$64.0M	vs.	$43.3M	1.5x	12.2M
Data Warehouse Offload					
- NA financial company	$22.4M	vs.	$14.7M	1.5x	0.9M

IBM GTS Server Consolidation and Migration Services

A new solution approach for migration and consolidation of IT Assets based on IBM's own IT Transformation experience

Leverages product manufacturing concepts and automation techniques to achieve "Factory Like" production results

Two Engagement Phases

Phase I:
Design & Approach Services

Logical

Create:
- "As is" client environment and "To be" target architecture
- High Level Solution Description
- Business Case and High Level Transition Plan

Phase II:
Planning & Implementation Services

Physical

Create:
- Physical Design and Implementation Plan

Execute:
- Consolidated Environment
- Application Migration

New integrated methods, assets and technologies

Benefits

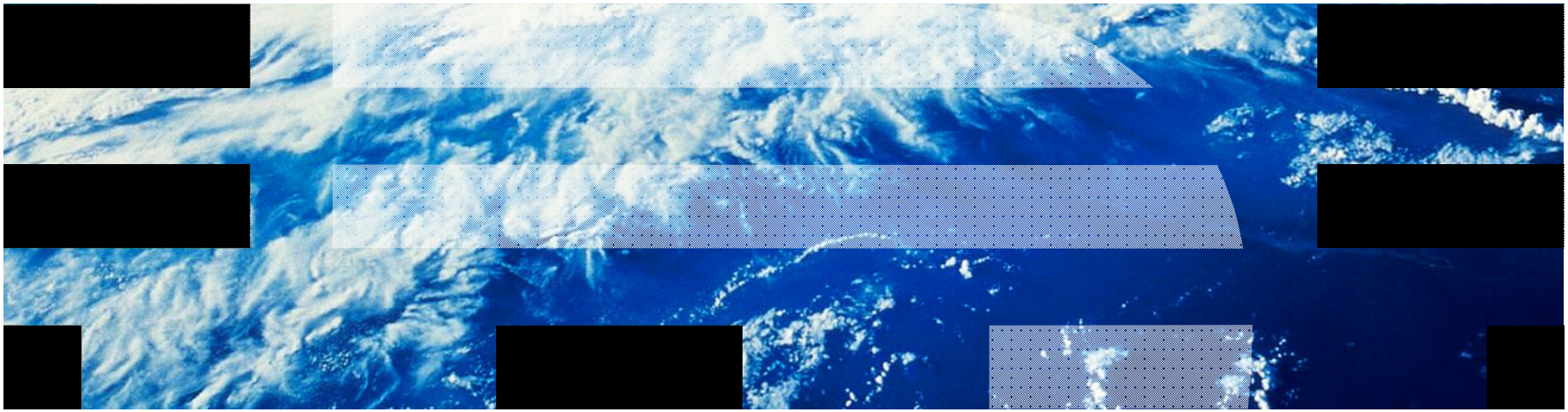
- Migration cycle time can be reduced from months to days; potential ROI in 6 to 18 months
- Economy of Scale - shared global resource pool shared across contracts
- Increased efficiency - from standardized, automated execution
- Faster time to value with reduced costs and improved quality

Learn more at: www.**ibm.com**/systems/migratetoibm/systems/z/demo.html

Summary
Why Choose zEnterprise for IT Optimization and Consolidation

Reduce Cost	✓ "Do more with less" – consolidate more servers/networks/data; save on software fees, energy, floor space ✓ Spend less on disaster recovery and business continuance ✓ The *Enterprise Linux Server* and *Solution Edition for Enterprise Linux* greatly enhance the economics of server consolidation with Linux on System z – lowest overall TCO, competitive TCA, superior QoS ✓ Take advantage of low-cost of blades to integrate UNIX / x86 applications that don't require z/Architecture® QoS ✓ Unified Resource Manager can improve staff productivity when managing multi-architecture solutions in a zEnterprise environment
Improve Service	✓ Deploy new workloads faster, with the highest levels of resource sharing and efficiency ✓ Dynamically add hardware to an already-running system to meet business demands now, not days or weeks later ✓ Enjoy unmatched levels of workload management to ensure high priority workloads get what they need and overall service level agreements are managed with the highest degree of certainty ✓ System z command and control enables superior levels of business agility and staff productivity ✓ zEnterprise accelerators, such as the IBM Smart Analytics Optimizer, can improve overall system performance and end-user responsiveness
Manage Risk	✓ System z offers unrivaled system availability and flexible business continuance and disaster recovery options to help clients protect their business ✓ CBU processors offer a cost-attractive and resource-efficient way to test your System z DR environment ✓ Performance monitoring facilities for capacity planning and overall system health checking ✓ The IBM Migration Factory simplifies the effort to migrate workloads to Linux on System z ✓ zEnterprise can monitor zBX resources and improve availability by taking preventative action when needed ✓ Data / management network connectivity between System z and zBX resources is private (secure)

Customer Success Stories



EFiS Financial Solutions

Resolves data center pain points and further optimizes the IT infrastructure using the IBM Enterprise Linux Server

Business challenge:

The driving business challenge at EFiS was the requirement to reduce cost, risk, and resources while improving efficiency and ecology at the same time. Security requirements, scalability, and the need to process huge amounts of transactions, while saving cost for software licenses, furthermore lead to the decision to move from various hardware platforms (including x86, IBM eServer™ pSeries®, SPARC/Solaris and HP) to System z running Linux.

Solution:

By migrating various servers to one IBM System z9® Linux-only BC machine, EFiS managed to optimize their data center in 2008. The fact that fewer servers had to be managed led to easier control and operation of the environment. With the update of the current production z9® system to a IBM System z10™-based Enterprise Linux Server, EFiS continues to optimize their IT-infrastructure for the constantly changing set of business requirements.

Benefits:

- The continuous optimization of the IT Infrastructure has resulted in fewer servers to manage, and eased control and operations
- Reduced cost, risk, and resources
- Recovered data center floor space
- Strengthened ability to scale with business growth

EFiS FINANCIAL SOLUTIONS

"We chose an IBM Enterprise Linux Server with a System z Business Class configuration running SUSE Linux Enterprise Server for System z from Novell for the high reliability, advanced security, extreme scalability, and high compute power this solution offers."

"Another crucial factor for the decision to move to this combined solution was the energy and power savings this offering from IBM and Novell could provide us."

"Together with our implementation partner PROFI Engineering Systems AG, we were able to integrate Green IT as an important part of our strategy."

"SUSE Linux Enterprise Server for System z on an IBM Enterprise Linux Server Business Class provides us with optimal resource utilization, while addressing our critical energy and power costs."

— Ernst Bauer, Chief Operating Officer of EFiS Financial Solutions AG

PROFI Innovative IT-Lösungen

Baldor Electric Company

Consolidation on IBM System z10 Cuts Complexity and Cost

Business challenge:

When Baldor Electric acquired its major competitor, Reliance Dodge, it also acquired hundreds of separate servers that cost money, time and effort to support and maintain. Baldor Electric aimed to reduce IT costs, which meant reducing complexity, consolidating systems and simplifying the software landscape. The company wished to integrate the two organizations as rapidly and cost-effectively as possible.

Solution:

Baldor consolidated to SAP Business Suite, hosted on 70 virtual machines running SUSE Linux Enterprise Server on the IBM System z10 Enterprise Class platform. Where previously Reliance Dodge relied on overnight batch processes to synchronize data on different servers, the SAP applications on z10™ provide an always-up-to-date picture of current business. Baldor also migrated data from separate storage systems to the IBM System Storage™ DS8100 platform.

Benefits:

- Cut IT costs by 50 percent as a proportion of sales, while maintaining ultra-high availability
- Eliminated more than 200 stand-alone servers
- Cut electricity costs by 60% and floor-space requirements by 50%

"We have freed up an area of about 3,000 sq. ft., which is now being turned into office space. This has also dramatically reduced the power and cooling requirements of our infrastructure – cutting electricity costs by 60 percent."

— Mark Shackelford, Director of IT Services at Baldor Electric

Solution components:

- IBM System z10 EC
- IBM System Storage DS8100
- IBM DB2
- IBM z/OS
- IBM z/VM
- SAP Business Suite
- SUSE Linux Enterprise Server

Clients Deploy Dedicated System z Servers
For Workload Consolidation with Linux

"It has really ticked all the boxes. It reduced the dependency on a data centre, it reduced the complexity from over 60 servers down to one box, it enabled us to put a lot more robustness around it in terms of DRP and scalability, and was environmentally friendly as well."

– Steven Coles, CIO, Allianz

Smart is: Consolidating from over 60 servers to just one!

Allianz

Reduced IT costs – paid for itself in just over a year

kVA power usage down from about 40 to 4

Minimum disruption in cutover to new server

Source: "Allianz consolidates from 60 servers to 1 mainframe in 48 hours"
Computerworld, November 4, 2009 -- http://www.computerworld.com.au/article/324815/allianz_consolidates_from_60_servers_1_mainframe_48_hours

Bank of New Zealand

A bank uses Red Hat Enterprise Linux on System z10 to reduce their carbon footprint and address datacenter cost and capacity concerns

The Bank of New Zealand ***reduces their datacenter footprint by 30%, heat output by 33%, carbon footprint by 39%, and expects a 20% ROI***

Business Challenge

- A datacenter with 200 Sun servers was at capacity
- Bank of New Zealand needed to grow, reduce emissions and costs, become more open, and seeks to become carbon neutral by 2010

Solution

- Consolidate 200 Sun servers into just one IBM System z10 mainframe running Red Hat Enterprise Linux

Benefits

- Bank of New Zealand reduced power consumption by close to 40%, heat output by 33%
- Just one administrator needed for 200 virtual servers
- New environments are deployed in minutes, not days

"Deploying IBM mainframes with Red Hat Enterprise Linux to address our carbon footprint and cost savings concerns was a very big deal, especially at the senior management level."

Lyle Johnston
Infrastructure Architect
Bank of New Zealand

http://www.ibm.com/press/us/en/pressrelease/26621.wss

Automobile Services Company Selects IBM System z, Linux and WebSphere as New Strategic Direction for Enterprise Middleware

Business challenge:

Client relied on a Microsoft .net infrastructure running on HP blades to connect its various systems. Ad-hoc functionality and non-standard interfaces created support and scalability challenges that made the company less agile in responding to business requirements and new opportunities.

Solution:

A new project offering in-car communication services prompted the company to pursue an IBM WebSphere SOA-based enterprise standard for middleware running on Linux on System z. The System z solution significantly outperformed a Microsoft® / HP alternative.

Benefits:

- IBM solution gives the client a more flexible middleware infrastructure to support innovative new solutions
- Increased responsiveness allows client to bring new offerings to the marketplace sooner rather than later
- Client is in a better position to differentiate itself from competitors

The client cited value, performance, and robustness as the primary reasons for selecting the IBM solution.

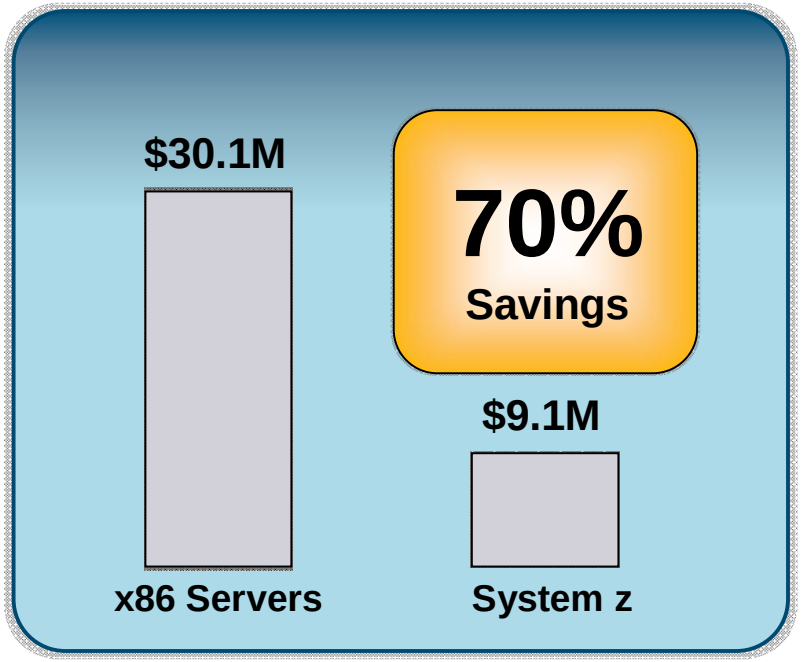
Solution components:

- IBM System z
- Linux on System z
- IBM Tivoli® Composite Application Manager
- IBM Tivoli OMEGAMON®
- IBM WebSphere Process Server
- IBM WebSphere Service Registry and Repository
- IBM WebSphere Modeler

Linux on System z Advantages
As Seen by a Large Financial Services Company

- Test servers tend to multiply (one application can require 16 or more servers)
  - Unit testing
  - QA testing
  - Enterprise testing
  - Regression testing
  - Cluster testing
  - Middleware and Operating System version testing
- Reliable common driver code for all virtual servers
- Hardware platform changes / upgrades are all possible without major disruption to Linux
- Every virtual server benefits from hardware upgrades, technology refreshes, and hardware currency – no waiting for the 3-to-4-year upgrade cycle
- No cables!
- No flaky memory cards, no NIC mismatches, no CPU failures
- Real hardware multi-pathing
- Significant power / floor space / cooling savings
- Decommissioned virtual server resources are returned to the shared pool of system resources and reused (vs. spending about $800 to dispose of an old physical server)

A Government Organization Consolidates Applications and Data to Drive Down Costs of Hardware, Software, and Management by 70%!



Top three reasons for savings

- Consolidated 292 Oracle servers to one System z
- System administration costs reduced 90%
- Subscription and support licenses reduced over 95%

Customer: A regional North American government organization

Other benefits:

Superior resiliency and security
Single administrator productivity
Infrastructure simplification
Lower energy costs

Transzap Boosts Uptime with IBM System z

Transzap, Inc.

Business challenge:

Transzap offers its customers a comprehensive suite of financial software tools. As a small business with tens of billions of dollars in client transactions flowing through their systems each year, Transzap needed an economical, reliable platform to provide clients with high availability, while enabling the capacity to accommodate growth within their software-as-a-service business model.

Solution:

Transzap decided to consolidate on an IBM System z platform to provide the stability and scalability needed to accommodate triple digit volume growth, enabling them to focus on the business of software innovation. Transzap migrated to System z and virtualized its critical applications on Linux on System z, a platform that supports Transzap's dynamic Java and Oracle environments.

Benefits:

- Helps Transzap serve more than 69,000 users across 6,800 companies
- Provides higher levels of uptime for their customers
- Offers peace of mind through 24x7 world-class hardware support

"We intend to deliver a 99.9% application uptime guarantee to our customer base, thanks to the availability characteristics of System z."

— Peter Flanagan, CEO, Transzap, Inc.

Solution components:

- IBM System z
- Linux on System z
- IBM z/VM

Computacenter Helps Clients Cut Costs with Enterprise Linux Server

Business challenge:

With many clients keen to move their business-critical systems onto Linux, Computacenter wanted to find a way to deliver world-class availability and security for Linux environments at a competitive price point.

Solution:

IBM helped Computacenter deploy an Enterprise Linux Server at its Hatfield Solution Centre, enabling the company to run proofs-of-concept that demonstrate the superiority of Linux on the System z over traditional server architectures.

Benefits:

- Enterprise Linux Server can improve energy efficiency by up to 90 percent, and support Green IT objectives
- Powerful IBM Integrated Facility for Linux (IFL) processors can reduce the cost of per-processor licenses software by up to 97 percent
- z/VM can provision new Linux environments in minutes, with no need to procure new hardware, increasing enterprise agility
- The serviceability and reliability of IBM System z with the openness and cost-efficiency of Linux

"We recognized that the new Enterprise Linux Server is a really compelling option that can offer the highest levels of availability and cost-efficiency at the same time."

— Neill Burton, Solutions Director at Computacenter

Solution components:

- IBM Enterprise Linux Server
- Linux on System z
- IBM XIV® Storage System

Casas Bahia

Building a High-Performance Online Store

Business challenge:

Casas Bahia wanted to gain competitive advantage and reach new customers across Brazil by implementing a new online store.

Solution:

Working with IBM Brazil, Casas Bahia built a highly scalable, secure and available online store, based on IBM System z10 Enterprise Class servers running z/OS and Linux on z/VM.

Benefits:

- The online store receives more than 250,000 customer visits per day, and serves as a major new revenue stream.
- The IBM solution can handle up to 12,000 concurrent connections, ensuring a smooth shopping experience.
- The System z infrastructure can dynamically adapt to changing patterns of demand, ensuring optimal performance at all times.

"The performance of the System z servers is excellent, delivering a very fast and smooth shopping experience for online customers."

— Frederico Wanderley, CIO, Casas Bahia.

Solution components:

- IBM System z10 EC
- IBM DB2 for z/OS
- IBM WebSphere Application Server for z/OS
- IBM Tivoli Access Manager for e-business
- IBM z/OS
- IBM z/VM
- SUSE Linux Enterprise Server

Choosing Linux on System z for Deploying New Applications

Colacem believes that deploying **SAP** on Linux on a System z makes excellent business sense

- Colacem is so pleased with its SAP/Linux/System z application environment that it plans to implement a second phase to add new SAP applications to its application portfolio.
- *"I can host my warehouse, my business applications, and my DB2 database all on the same machine. This gives me huge performance advantages". – Mr. Andrea Coccia, CIO, Colacem S.p.A.*

University of North Carolina enables health **informatics**

- IBM worked with UNC to create a robust, closely governed **data warehouse** solution that unifies multiple data stores, making it possible to quickly and easily access data and transform it into useful information.
- "*This is a great example of how information management and technology can actually drive important medical research." – Dr. Donald Spencer, Associate Director of Medical Informatics, UNC Health Care System*

Ball State University cut costs and improve organizational efficiency with IBM **Enterprise content management**

- ECM solution within a service oriented architecture that facilitates intelligent aggregation and delivery of content regardless of where it is stored.
- *"With IBM ECM, all of a sudden information is available – as it's needed, and where it's needed." – Charles Tuite, Lead Enterprise Content Management Architect, Ball State University*

Leveraging System z for Consolidation Savings:
IBM's Own Transformation has Delivered Results

IBM IT Transformation

Cumulative benefit of approximately $4 billion.

For every dollar invested: a $4 cumulative benefit.

	1997	Today
CIOs	128	1
Host data centers	155	7
Web hosting centers	80	5
Network	31	1
Applications	15,000	4,700

Data Center Efficiencies Achieved

Thousands of servers ➔ approximately 30 IBM System z mainframes and large Power servers.

Project Big Green

80% less energy and 85% less floor space. 2X existing capacity with no increase in consumption or impact by 2010.

Cloud-enabled on demand IT delivery solution

Self-service for 3,000 IBM researchers. Business Intelligence Cloud services.

IBM IT Delivery

Lowering Energy Costs by Optimizing Server Utilization

Business challenge:

As part of the IBM Project Big Green, IBM consolidated roughly 3,900 servers across the business to approximately 30 IBM System z mainframes. This move not only reduces management burdens for the associated systems, but also yields improved server efficiency and higher utilization levels. As part of this effort, IBM wanted to apply the latest monitoring technology to optimize performance, availability and server utilization.

Solution:

Using IBM Service Management solutions, IBM IT Delivery staff can proactively identify and respond to issues in and utilization of its System z environment and related applications. By doing so, administrators can resolve problems before they impact users and deliver a higher quality of service using fewer people. By helping improve system utilization, the solution also helps staff avoid investing in and powering unneeded hardware.

Benefits:

- Reduced operational costs through improved staff efficiency
- Increased system utilization to avoid investment in and powering unneeded hardware
- Decreased service disruptions through increased visibility

"By using IBM Service Management solutions to increase system utilization, we can avoid investing in and powering unneeded hardware. This contributes to greater energy efficiency and lower energy costs."

— Chris Young, Linux on System z Specialist, IT Delivery, IBM

Solution components:

- IBM Tivoli Enterprise Console
- IBM Tivoli Monitoring
- IBM Tivoli OMEGAMON XE on z/VM and Linux
- IBM System z

TIP14102-USEN-00

National Business Center Slashes Costs by Creating Strategic Enterprise Cloud Platform on IBM System z

Efficient Data Centers Prove to be a Competitive Advantage

Business challenge:

Despite being part of the Department of the Interior, the National Business Center (NBC) does not receive governmental funding, and relies on competitive bids to operate. It needed to be able to offer the best service while keeping a sharp eye on costs to succeed.

Solution:

Implemented IBM System z mainframes running Linux and IBM WebSphere SOA. A range of IBM Tivoli products help manage mainframe virtualization, provisioning, and balancing workload.

Benefits:

- NBC can experience greater efficiency thanks to higher utilization, better integration, and simplified management than it could realize if using a distributed computing architecture
- System z maximizes ROI by operating at 80-to-100% utilization compared to the 10-to-20% average of distributed servers
- Offers customers solid and secure service, ensuring maximum satisfaction
- Takes advantage of System z virtualization capabilities to optimize resource provisioning and workload balancing

"System z is our enterprise server of choice due to clear advantages in cost-of-acquisition and operation – these savings are vitally important to us as they ensure NBC remains competitive in bidding situations."

— Doug Bourgeois, Director, National Business Center

Solution components:

- IBM System z and z/VM, WebSphere SOA, Linux, and IBM Tivoli management products

The National Business Center
Government Shared Service Provider

Source: Clabby Analytics, August 2009

Oracle Consolidation on System z from Sun Solaris

A Large Japanese Electronics Industry Client

83% Savings on ISV Software Licensing

- Client evaluated the System z capabilities and determined that all applications could successfully migrate without rewriting the existing Java applications
- IBM understood client pain points and was able to quickly design, develop, and implement a solution

Pain Points	Solution Value
▪ Instability of distributed environment	▪ Stable nonstop core system
▪ Frequent outages and reliability	▪ Superior reliability, availability, and scalability
▪ Poor transaction performance due to complex physical network	▪ Improved transaction rate with high-speed internal network
▪ Poor scalability	▪ Highly scalable environment with System z virtualization
▪ High hardware and software cost associated with aging infrastructure	▪ Optimized hardware cost (System z + System x hybrid system)
▪ Migration concerns of existing Java application	▪ Existing Java applications run without rewrite

"IBM System z is the best system as the next generation open platform in terms of reliability, scalability, and system performance. We evaluated IBM because of its end-to-end support including installation services and maintenance services. Also, IBM demonstrated the high quality proposal, articulated the clear and concrete architecture roadmap, so that we concluded that IBM is the best and the trusted partner."

– Client Corporate Information Officer (CIO)

Reduce Cost, Manage Risk and Improve Service with System z

New mainframe customer selected System z to create an advanced IT platform to support explosive Internet growth

China Internet Network Information Center (CNNIC):

CNNIC decided to use IBM System z as the IT foundation of its *Prospective Business Research Platform* after stringent tests and simulations on various industry solutions. CNNIC chose IBM's mainframe technology for its superior integration capability as well as unmatched stability and security required for its IT infrastructure. (1)

Strong business continuity, security, and cost efficiency by deploying Linux and z/OS on IBM System z virtualization technology

Handelsbanken (Sweden):

"Customers entrust us with their hard earned savings so it's paramount that we select one of the industry's most powerful and secure servers - the IBM System z," said Roger Rydberg, technical manager at Handelsbanken. "[System z] allows us to keep up with business climate changes because we can add or eliminate capacity any time based on customer demands. We can even make changes easily without having to stop any services." (2)

Stable, predictable, easy-to-manage environment; license fee cost savings and improved server performance

Salt River Project (USA):

"We were very interested in Linux on the mainframe for the enhanced utilization, flexibility, workload consolidation, and management capabilities offered there," said Kevin Masaryk, Senior Linux/UNIX Administrator. "A key success for us is the ability to consolidate multiple workloads into one instance of Red Hat Enterprise Linux as opposed to running in our traditional environment, where each workload would have to run on a separate server; that's a huge benefit for us." (3)

(1) ibm.com/press/us/en/pressrelease/27768.wss
(2) ibm.com/press/us/en/pressrelease/27282.wss
(3) ibm.com/software/success/cssdb.nsf/cs/JRDS-7S8NEV?OpenDocument&Site=corp&ref=crdb

IT Optimization & Consolidation

System z Success

- "Do more with less" – consolidate more servers and more data, and drive down costs
- Spend less on disaster recovery and business continuance
- Meet business demands now by dynamically adding system resources
- Provide superior levels of business agility and staff productivity

CNNIC
中国互联网络信息中心
China Internet Network Information Center

- ✓ Explosive Internet growth of China supported
- ✓ Migrated distributed servers to a Linux on System z environment
- ✓ Huge performance improvement
- ✓ Environmentally efficient data center

Handelsbanken

- ✓ Lower costs through consolidation
- ✓ Improved scalability and performance
- ✓ Greener IT infrastructure
- ✓ Disaster recovery ensures cross-country operations

Handelsbanken Optimizes Banking Services with z/OS and Linux
Delivering Strong Business Continuity, Security and Cost Efficiency

One of the main reasons to standardize the environment on Linux was the ability to lower costs and use the IT personnel more effectively by leveraging the solution's integrated virtualization functionality.

To maintain business operations, the bank utilizes IBM System z Parallel Sysplex clustering technology and IBM's availability and disaster recovery solution branded as GDPS.

Parallel Sysplex and GDPS allow Handelsbanken to run its System z workload as highly powerful "clustered" servers that move new work requests to the available resources so that even planned or unplanned outages in multiple and distant data centers have little to no impact on business operations.

Known for its ability to share system resources with one of the highest degrees of efficiency among other systems, the System z mainframe can consolidate hundreds of virtual servers into a single mainframe – allowing customers like Handelsbanken to run critical customer transactions in the midst of executing other strategic IT projects.

"Customers entrust us with their hard earned savings so it's paramount that we select one of the industry's most powerful and secure servers – the IBM System z."

"It allows us to keep up with business climate changes because we can add or eliminate capacity any time based on customer demands. We can even make changes easily without having to stop any services." (1)

– Roger Rydberg, Technical Manager, Handelsbanken

(1) ibm.com/press/us/en/pressrelease/27282.wss

Thank you