Linux on System z
better and more secure

The Game Changer
for Consolidation, Cloud, Analytics and Mobile

*Transforming your IT Infrastructure
to become Efficient and Economic*

Trademarks

The following are trademarks of the International Business Machines Corporation in the United States and/or other countries.

AIX*	DB2*	FlashCopy*	InfoSphere	Performance Toolkit for VM	Smarter Cities*	WebSphere*
BladeCenter*	DB2 Connect	HiperSockets	Lotus*	POWER7*	SPSS*	XIV*
BuildForge*	Domino*	IBM*	Maximo*	PR/SM	Storwize*	zEnterprise*
ClearCase*	Easy Tier	IBM (logo)*	MicroLatency	Quickr*	System Storage*	z/OS*
Cognos*	FICON*	IMS	MQSeries*	Rational*	System z*	z/VM*
DataStage*	FileNet*	Informix*	OMEGAMON*	Smarter Analytics	Tivoli*	

* Registered trademarks of IBM Corporation

The following are trademarks or registered trademarks of other companies.

Adobe, the Adobe logo, PostScript, and the PostScript logo are either registered trademarks or trademarks of Adobe Systems Incorporated in the United States, and/or other countries.

Cell Broadband Engine is a trademark of Sony Computer Entertainment, Inc. in the United States, other countries, or both and is used under license therefrom.

Intel, Intel logo, Intel Inside, Intel Inside logo, Intel Centrino, Intel Centrino logo, Celeron, Intel Xeon, Intel SpeedStep, Itanium, and Pentium are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

IT Infrastructure Library is a registered trademark of the Central Computer and Telecommunications Agency which is now part of the Office of Government Commerce.

ITIL is a registered trademark, and a registered community trademark of the Office of Government Commerce, and is registered in the U.S. Patent and Trademark Office.

Java and all Java based trademarks and logos are trademarks or registered trademarks of Oracle and/or its affiliates.

Linear Tape-Open, LTO, the LTO Logo, Ultrium, and the Ultrium logo are trademarks of HP, IBM Corp. and Quantum in the U.S. and

Linux is a registered trademark of Linus Torvalds in the United States, other countries, or both.

Microsoft, Windows, Windows NT, and the Windows logo are trademarks of Microsoft Corporation in the United States, other countries, or both.

OpenStack is a trademark of OpenStack LLC. The OpenStack trademark policy is available on the OpenStack website.

TEALEAF is a registered trademark of Tealeaf, an IBM Company.

Windows Server and the Windows logo are trademarks of the Microsoft group of countries.

Worklight is a trademark or registered trademark of Worklight, an IBM Company.

UNIX is a registered trademark of The Open Group in the United States and other countries.

* Other product and service names might be trademarks of IBM or other companies.

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.

IBM hardware products are manufactured from new parts, or new and serviceable used parts. Regardless, our warranty terms apply.

All customer examples cited or described in this presentation are presented as illustrations of the manner in which some customers have used IBM products and the results they may have achieved. Actual environmental costs and performance characteristics will vary depending on individual customer configurations and conditions.

This publication was produced in the United States. IBM may not offer the products, services or features discussed in this document in other countries, and the information may be subject to change without notice. Consult your local IBM business contact for information on the product or services available in your area.

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

Information about non-IBM products is obtained from the manufacturers of those products or their published announcements. IBM has not tested those products and cannot confirm the performance, compatibility, or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

Prices subject to change without notice. Contact your IBM representative or Business Partner for the most current pricing in your geography.

This information provides only general descriptions of the types and portions of workloads that are eligible for execution on Specialty Engines (e.g, zIIPs, zAAPs, and IFLs) ("SEs"). IBM authorizes customers to use IBM SE only to execute the processing of Eligible Workloads of specific Programs expressly authorized by IBM as specified in the "Authorized Use Table for IBM Machines" provided at www.ibm.com/systems/support/machine_warranties/machine_code/aut.html ("AUT"). No other workload processing is authorized for execution on an SE. IBM offers SE at a lower price than General Processors/Central Processors because customers are authorized to use SEs only to process certain types and/or amounts of workloads as specified by IBM in the AUT.

Success of Linux on IBM System z in 4Q2013
## *Installed Linux MIPS at 49% CAGR**

- **78 of the top 100 System z Customers are running Linux on the mainframe as of 4Q13 ****

- **58% of new FIE/FIC System z Accounts run Linux (FY10-3Q13)**

- **26.7% of Total installed MIPS run Linux as of 4Q13**

- **Installed IFL MIPS increased 31% from 4Q12 to 4Q13**

- **38% of System z Customers have IFL's installed as of 4Q13**

- **34% of all System z servers have IFLs**

Installed Capacity Over Time

Installed IFL Capacity

YE04 YE05 YE06 YE07 YE08 YE09 YE10 YE11 YE12 YE13
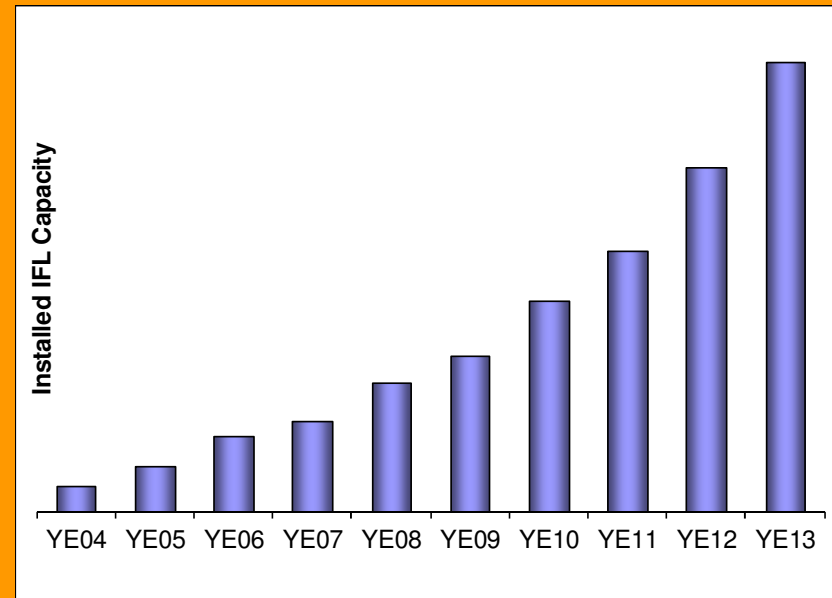
* Based on YE 2003 to YE 2013
   Compound Annual Growth Rate (CAGR)
**Top 100 is based on total installed MIPS

Linux on z Installations by Industry
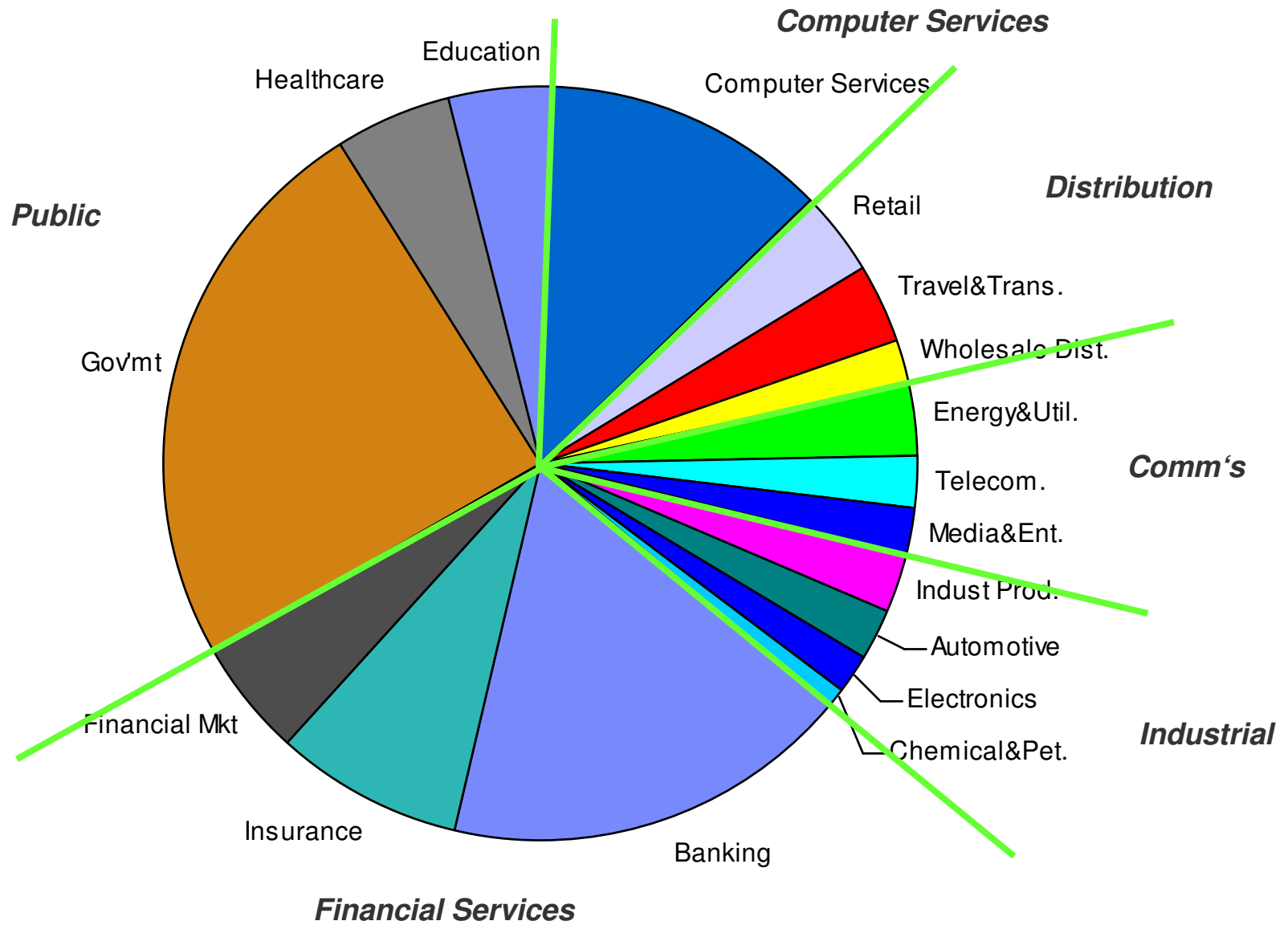
IT Optimization with the IBM Enterprise Linux Server
Improved Effectiveness and Efficiency
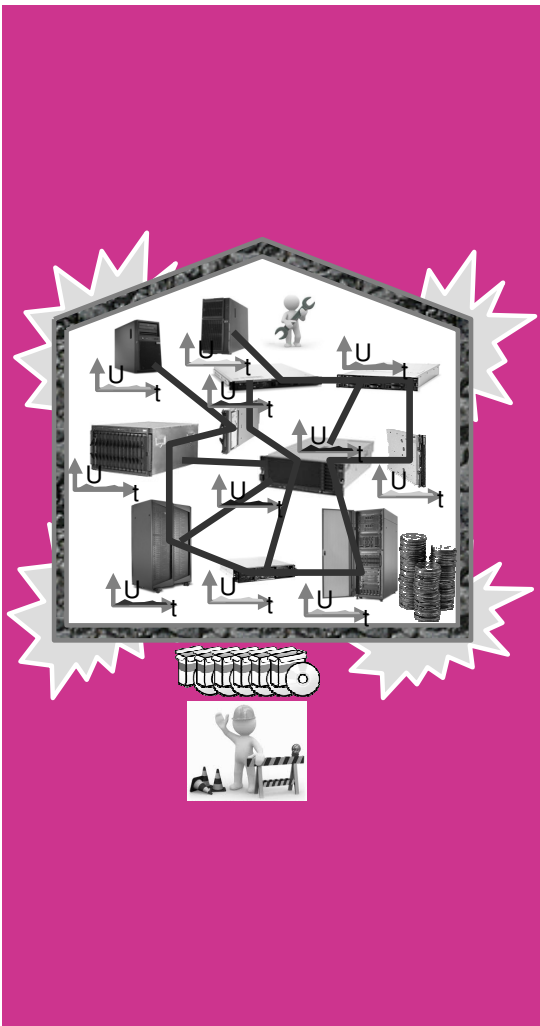
✓ **Operations and maintenance reduction**

✓ **Software acquisition and licensing cost reduction**

✓ **Maximizing utilization**

✓ **Network reduction**

✓ **Collocation of data and applications**

✓ **Floor-space and energy reduction**

✓ **Growth inside a server**

✓ **Improving security**

✓ **Disaster recovery cost reduction**

IBM, ISV and open source Solutions

Linux Linux Linux Linux

Virtu-alization

Hardware virtualization

Why consider an Enterprise Linux Server?

An Enterprise Linux Server provides

- **Single server simplicity**
  - Fewer components lead to a simpler and less complex IT environment which requires less administration efforts

- **Efficiency at scale - high flexibility, scalability and resource utilization**
  - All system resources can be shared and directed dynamically between applications, virtually, whenever and wherever they are needed

- **High server capacity with up to 13 / 101 cores running at 4.2 / 5.3 GHz[1]**
  - Host up to hundreds of virtual Linux® servers in a single footprint

- **Non-disruptive growth within one physical server**
  - Computing capacity can be added on demand, on the fly[2]

- **Ultimate security**
  - EAL5 certification and high-speed cryptography integrated as part of the chip

- **Economics**
  - Saving opportunities in software, maintenance, energy & floor space, disaster recovery

[1] ELS based on zBC12 server, ELS based on zEC12 server provides 101 cores running at 5.3 GHz

[2] Processors, memory, I/O connectivity can be added without disruption.

What is Different about an Enterprise Linux Server (ELS)

- **Do more with less**
  - Deploy more servers, more networks, more applications, and more data
  - Achieve nearly 100% utilization of system resources nearly 100% of the time
  - Enjoy the highest levels of resource sharing, I/O bandwidth, and system availability

- **Reduce costs on a bigger scale**
  - Save on software license fees
  - Consume less power and floor space
  - Minimize hardware needed for business continuance and disaster recovery

- **Manage growth and complexity – leverage highest security**
  - Exploit extensive facilities for life cycle management: provisioning, monitoring, security, workload management, capacity planning, charge back, patching, backup, recovery, etc.
  - Add hardware resources to an already-running system without disruption
  - Workload deployment on a "scale up" machine means fewer cables, fewer components to impede growth

- **More flexibility, minimize lead time for new projects**
  - Workload deployment to a single ELS offers significant advantages in terms of flexibility
  - Rapid provisioning reduces lead time for new IT projects, helping to increase business agility

Built-in Security for Linux Workloads

- Industry's top-rated EAL5+ security classification* for hardware Logical Partitions (LPARs)

- EAL4+ security classification on z/VM offering unmatched levels of secure virtualization and consolidation

- Security-rich holistic design to help protect system from malware, viruses, and insider threats

- Granular access controls integrated across the platform

- Centralized audit collection available for an enterprise view

- Network security features to help address outside threats

- Encryption solutions to help secure data from theft or compromise while in flight or at rest

The IBM advantage …only ELS hardware can boast the combination of EAL5+, an EAL4+ certified hypervisor, FIPS 140-2 Level 4 and related security certifications

Linux Workloads

Linux   **Linux**

z/VM

Hardware virtualization

HW Resources

z Enterprise
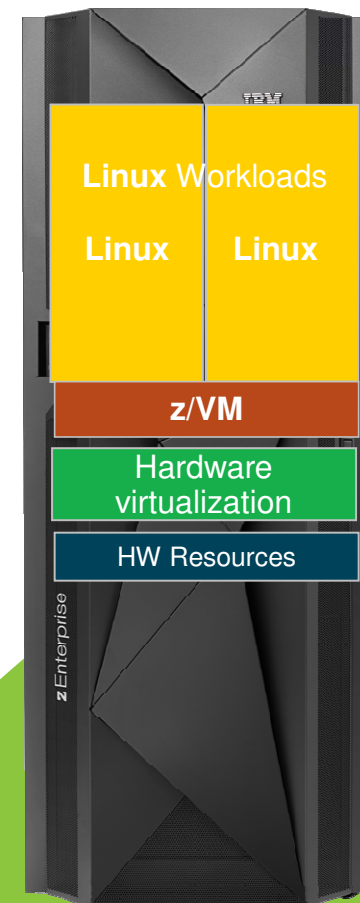
The Gold Standard for Security

* https://www.bsi.bund.de/ContentBSI/EN/Topics/Certification/newcertificates.html

Network Optimization through Virtualization:
Insurance Company Consolidated 292 Servers to a System z

3560E-24TD	8
3560E-24TD	17
3560E-12D	6
50 Ft UTP Cable	584
10GB Eth Fiber Cable	60

Before

Over 600 Cables

Backbone

Network

The diagram only shows **30** of **292** servers

After

Backbone

Just 10 Cables!

Data is based on real client opportunity and on internal standardized costing tools and methodologies.
Client results will vary by types of workloads, technology level of consolidated servers, utilization factor, and other implementation requirements. Savings will vary by client.

Huge savings and more stable, secure and controlled network

Corporation

SmarterComputing

IBM
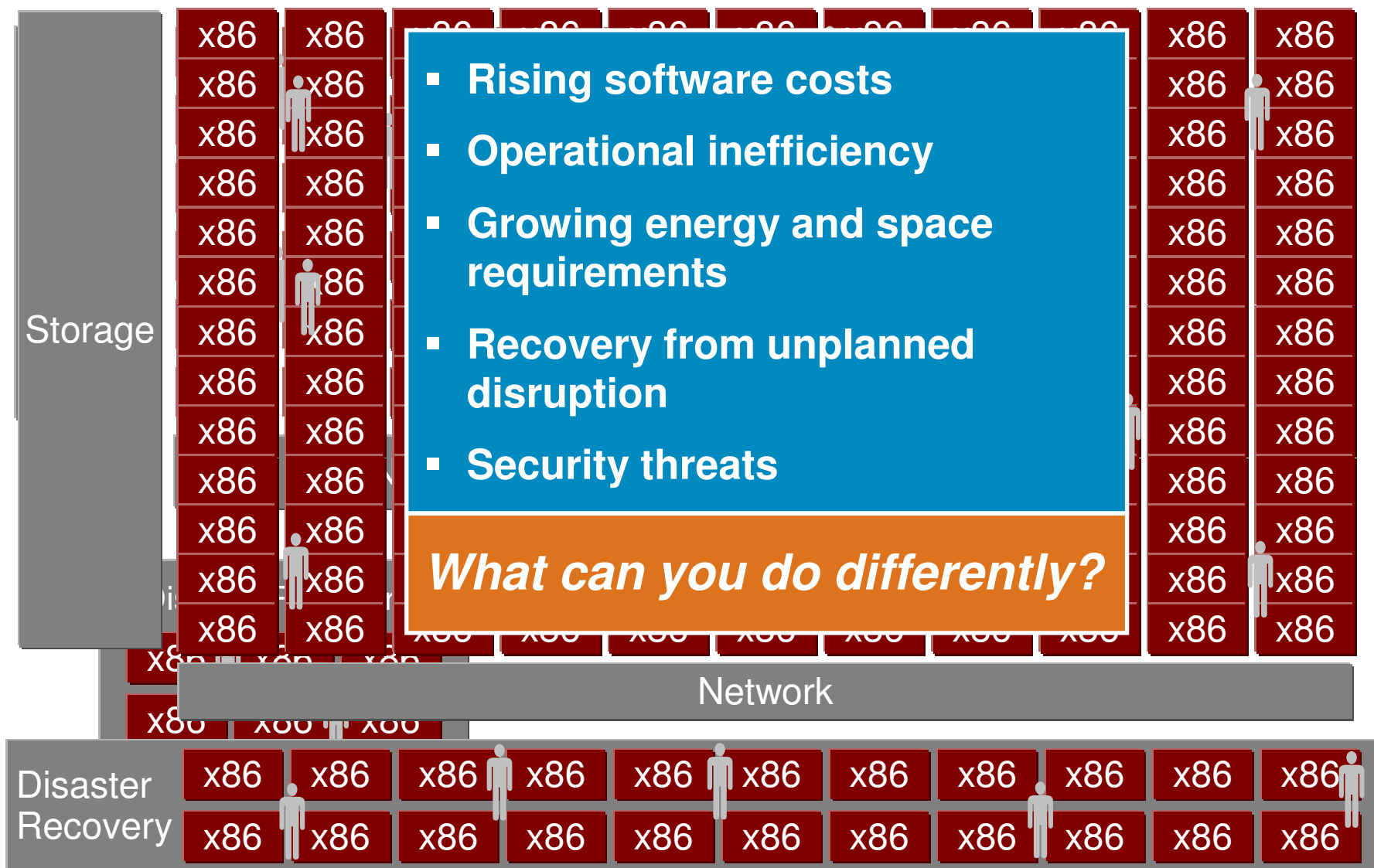
EFiS EDI Finance Service AG boosts business flexibility and efficiency

EFiS replaced ~200 x86 servers, including a number of Sun systems, that were not fully meeting performance or scalability requirements.
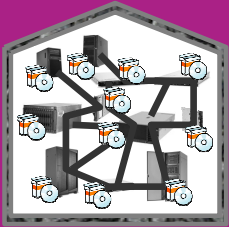
"We are able to fulfill our clients' expectations and our vision of quality of service,"

- Armin Gerhardt, CEO at EFiS EDI Finance Service AG

- **Doubled processing speeds by replacing obsolete and underperforming hardware with a new ELS infrastructure.**

- **Delivered more than 30% savings in energy consumption through hardware consolidation and improved resource utilization.**

- **Improved processor utilization levels and reduced investment in costly software license fees, delivering instant cost savings.**

Allianz Australia

Support growth with green savings

Consolidated

60
Wintel
servers

1
System z

Energy use

40kVA

to

**4kVA
(-90%)**

**$1m
Savings**
in
facilities,
hardware
and
software
costs

Linux

**Production
cutover
48 hrs**
**Zero impact
to customers**

Investment paid back in just over a year

BENEFITS to Clients
Comparison to Distributed

"Our data centre was running out of power and we couldn't add any more servers to the infrastructure,"
Peter Rowe,
Allianz Australia infrastructure and operations head

Allianz Australia Limited offers a wide range of insurance and risk management products and services.

White Cube benefits of moving from an x86 based environment to an Enterprise Linux Server[1]

IT needs have changed and grew dramatically. As they expanded internationally, they need to support a truly 24x7 global business.

"Creating a superior customer experience requires excellence in all aspects of our business, including IT."

- James Meara, IT Executive
at White Cube

- **Following a detailed research and analysis of various server platforms, they made the decision to buy their first Enterprise Linux Server.**

- **Dramatically simplified IT environment.**

- **Linux is easily recognizeable to anyone familiar to it elsewhere.**

- **Enterprise Linux Server has expanded capabilities, providing an efficient, secure and available foundation – unmatched on distributed platforms.**

[1] Video: www.youtube.com/watch?v=Yuz4LSH__Pk

IBM Enterprise Linux Server is open for all solutions

Capitalize from transformative technologies

- Data services
- Business applications
- Mobile applications
- Security & Infrastructure services
- Email & collaboration services
- Business Process Management
- Enterprise Content Management
- Development & test
- Industry Solutions
- All managed in a Cloud

Cloud ready   Data ready   Mobile ready   Security ready

IBM Enterprise Linux Server

Enterprise Linux Server – the efficient and economic infrastruture for consolidation and new Linux workload deplyoments

BEST FIT Workloads to run on the Enterprise Linux Server

✓ **Data services**: DB2®, Cognos® ,SPSS®, InfoSphere™, Informix® Oracle Database

✓ **Business applications**: WebSphere® Application Server, WebSphere Process Server, WebSphere Commerce, SAP apps, Oracle apps, Java™

✓ **Mobile application hosting**: WebSphere Portal, IBM Worklight®

✓ **Security & Infrastructure services**: WebSphere MQSeries®, WebSphere Message Broker, WebSphere Enterprise Service Bus, DB2 Connect™

✓ **Email & collaboration**: Lotus® Domino®, Lotus Collaboration (Sametime, Connections, Quickr™, Forms)

✓ **Business Process Management**: Business Process Manager, WebSphere Business Monitor, FileNet® Business Process Manager, WebSphere Operational Decision Management

✓ **Enterprise Content Management**: FileNet Content Manager, Content Manager, Content Manager On Demand

✓ **Development & test**: e.g. of WebSphere/Java applications – Rational® Asset Manager, Build Forge®, ClearCase®, Quality Manager

✓ **Industry Solutions**: Intelligent Operations Center for Smarter Cities®, Smarter Infrastructure for Social Services - Curam on zEnterprise, Enterprise Asset Management (Maximo®) for Government, Smarter Analytics™ Anti-Fraud Infrastructure for zEnterprise, zEnterprise Smarter Analytics for Retail

➔ **All workloads managed in a Cloud**: Tivoli® Provisioning Manager (TPM), Tivoli System Automation Manager (TSAM), SmartCloud Provisioning (SCP), CSL-Wave, xCat, …

Category	Percentage
Add. Bus.Apps	84%
Security	84%
Infrastructure	84%
Web Serving	81%
ERP/CRM/SCM	76%
Analytics & DW	68%
Batch	53%
App. Develop.	50%
Systems Mgmt	50%
Collaboration	50%
Mobile	13%

*Source: IBM Market Intelligence 1Q2013
Percentage of survey respondents*
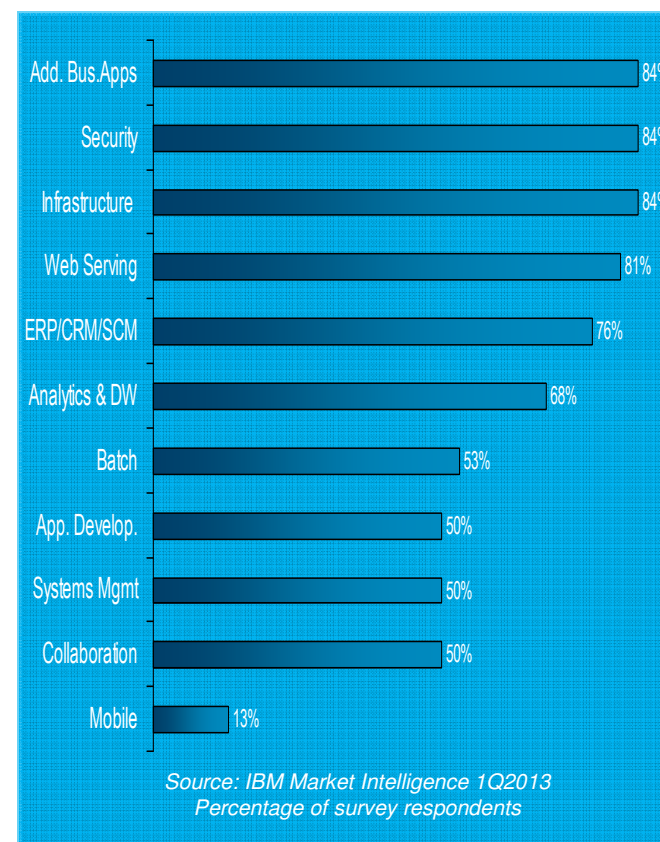
Summary Best Fit scenarios for IT Optimization with IBM System z

- **Virtualization and server management**

- **Security and integration services for entire enterprise**

- **Database and warehouse services**

- **Cloud and cloud management**

- **Mobile Application Run-time, development and test**
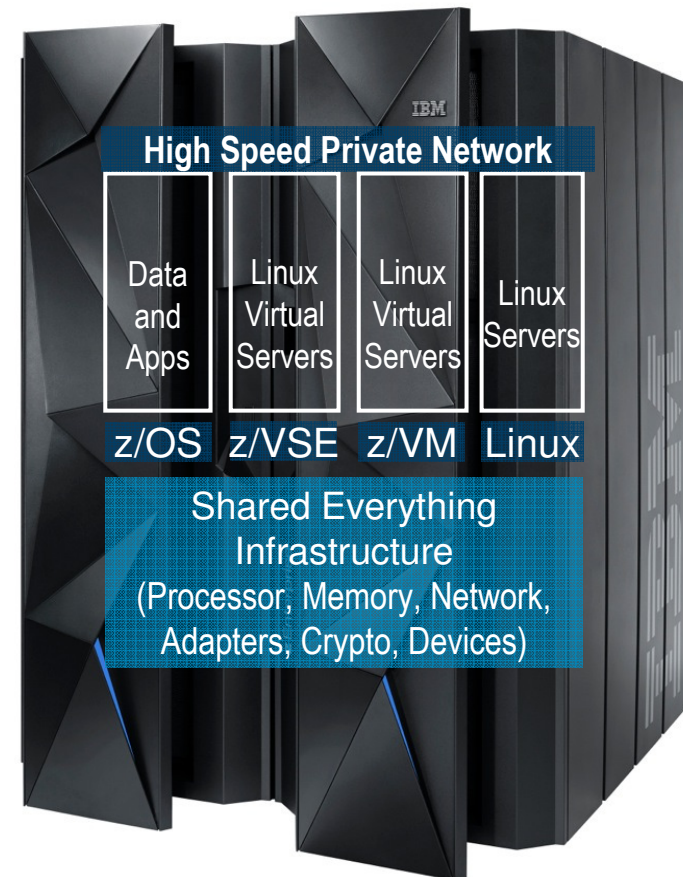
EVRY – *Enabling scalability of financial services clients to meet growing demand for credit and debit card transactions*

Business need:

"We are seeing a trend using the mainframe as a data warehouse for their in-house analytics applications. With the popularity of analytics and online banking both increasing rapidly, we estimated that our existing solution would only be able to accommodate the growth in MIPS requirements without upgrading."

Solution:

EVRY deployed two IBM zEnterprise EC12 servers configured with Linux, z/OS®, IBM DB2 for z/OS, IBM CICS® and IBM IMS™ for its clients' production landscapes, and a third as a disaster recovery environment. Enabling a broad range of cost-effective support for Linux, DB2 and Java™ workloads.

"

Today, we are using our zEnterprise EC12 environment to run some of our largest workloads ever.

Typically, we now process around 100 million transactions each day, but during this year's Easter holiday, online shopping events pushed our daily transactions to a peak of 128 million—an increase of more than 10 percent.

The EC12 handled this peak in transaction volumes without breaking a "*sweat.*

- Jan Brandvold, VP Nordic Operations, Sales, Communication and Mainframe, EVRY

Optimize and Consolidate for Lower Cost

Linux on System z enables a total cost of acquisition of less than

$1 per day per virtual server[1]

Consolidate up to 40 distributed cores or more on a single System z core, or hundreds on a single footprint[1].

System z servers often run consistently at **90%+ utilization[1]**

zBC12: **36% boost per core** *further* **reduces the cost** of **deployment of new and existing workloads** *and* **large scale consolidation[3]**

TCO Example[2]

- Software Support
- DR
- Facilities
- Hardware Maint.
- New Hardware

HP Proliant BL460c   **zBC12 w/ IFLs**

zEnterprise BC12 can deliver up to 36% lower TCO running Oracle on IFLs[2]

Software Cost Calculation Example

	Example 1: From 48[1] cores to 4	Example 2: From 272[1] cores to 20
Before: **SW license** **Support per year**	$48 * 0,5^{1} * \$40K = \$960K$ **$48 * 0,5^{1} * \$10K = \$240K$**	$136 * 0,5^{1} * \$40K = \$5.440K$ **$136 * 0,5^{1} * \$10K = \$1.360K$**
After: **SW license** **Support per year**	$4 * \$40K = \$160K$ **$4 * \$10K = \$40K$**	$20 * \$40K = \$800K$ **$20 * \$10K = \$200K$**
1. Year	$ 40 K savings	$ 360 K savings
2. Year	$ 200 K savings	$ 1.160 K savings
3. Year	$ 200 K savings	$ 1.160 K savings
Total for 3 Years	**$ 440 K savings**	**$ 2.680 K savings**

[1] Software cost for these server cores is 50% of full price.

NOTE: IBM does not provide any ISV software prices, the prices in this example do not reflect any real prices.

Confronto spesa triennale
Oracle Enterprise Edition

ORACLE

Su x86:
1°   Anno: € 814.656,65
2°   Anno: € 146.904,60
3°   Anno: € 146.904,60

Totale Triennale
€ 1.108.465,85

ORACLE

Su System Z114 IFL:
1°   Anno: € 135.776,10
2°   Anno: €   24.484,10
3°   Anno: €   24.484,10

Totale Triennale
€ 184.744,3

Risparmio **ORACLE** su System Z114
- € 923.721,55

Deploy Oracle Software to the "Best Fit" Technology

Oracle DB & Fusion Middleware

Linux

z/VM

Hardware Virtualization

Hardware Resources
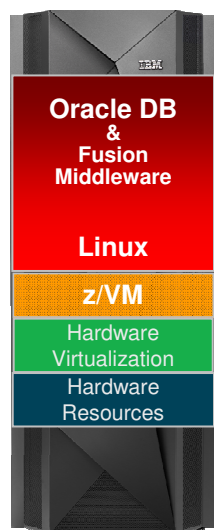
Oracle software deployments (incl. consolidations) with the Enterprise Linux Server provides an excellent price performance.

- From an Oracle licensing perspective 1 IFL = 1core

- Less operational efforts

- High levels of security and availability

Business Connexion – South Africa	**Sparda Datenverarbeitung eG** – Germany
▪ ICT services to the financial sector, government, … and more	▪ IT provider for approximately 4.2 million customers
▪ Approximately 50 virtual Linux servers; flexible environment for hosted services; high performance for Oracle databases	▪ Runs a number of very large Oracle databases, where the virtual Linux server requires 30 GB memory and ~350 GB storage
▪ Enabled competitive pricing for client services	▪ Experienced >99% availability, which proves the Linux reputation

IBM®

The Met Office forecasts a bright outlook for Linux on zEnterprise
Saving software licensing and hardware lifecycle costs by consolidating applications and systems

The need
The Met Office uses post-processing systems to tailor its weather forecasts for specific clients' needs. Running these systems on a distributed Linux infrastructure was becoming complex and expensive.

The solution
Following a comprehensive evaluation and benchmarking process, the Met Office decided to migrate suitable candidates from its distributed Linux landscape onto a pair of IBM zEnterprise 196 servers.

- **Oracle licensing costs cut by a factor of 12**

- I/O-intensive workloads perform considerably better on zEnterprise than on commodity servers

- Fewer physical servers means a more manageable Linux landscape and lower hardware lifecycle costs

> "*By consolidating distributed commodity servers you can save a great deal of money. When we looked at all of the parameters, it just made sense to move the workload to the mainframe.*"
>
> — Martyn Catlow, portfolio lead for centralised IT infrastructure, the Met Office

Linux on System z as Central Web Access Point

Web enable, improve interface, simplify, extend existing applications

Linux on System z

WS Portal

HATS

WAS

SOA

Connection via HiperSockets

System z Environment

+ CICS
+ TCP/IP
+ COBOL

Linux DB2 ORACLE

Windows/ DB2 MS SQL

z/VM	LPAR or z/VM
IFL Engine (s)	Standard CP Engine (s)

IBM System z
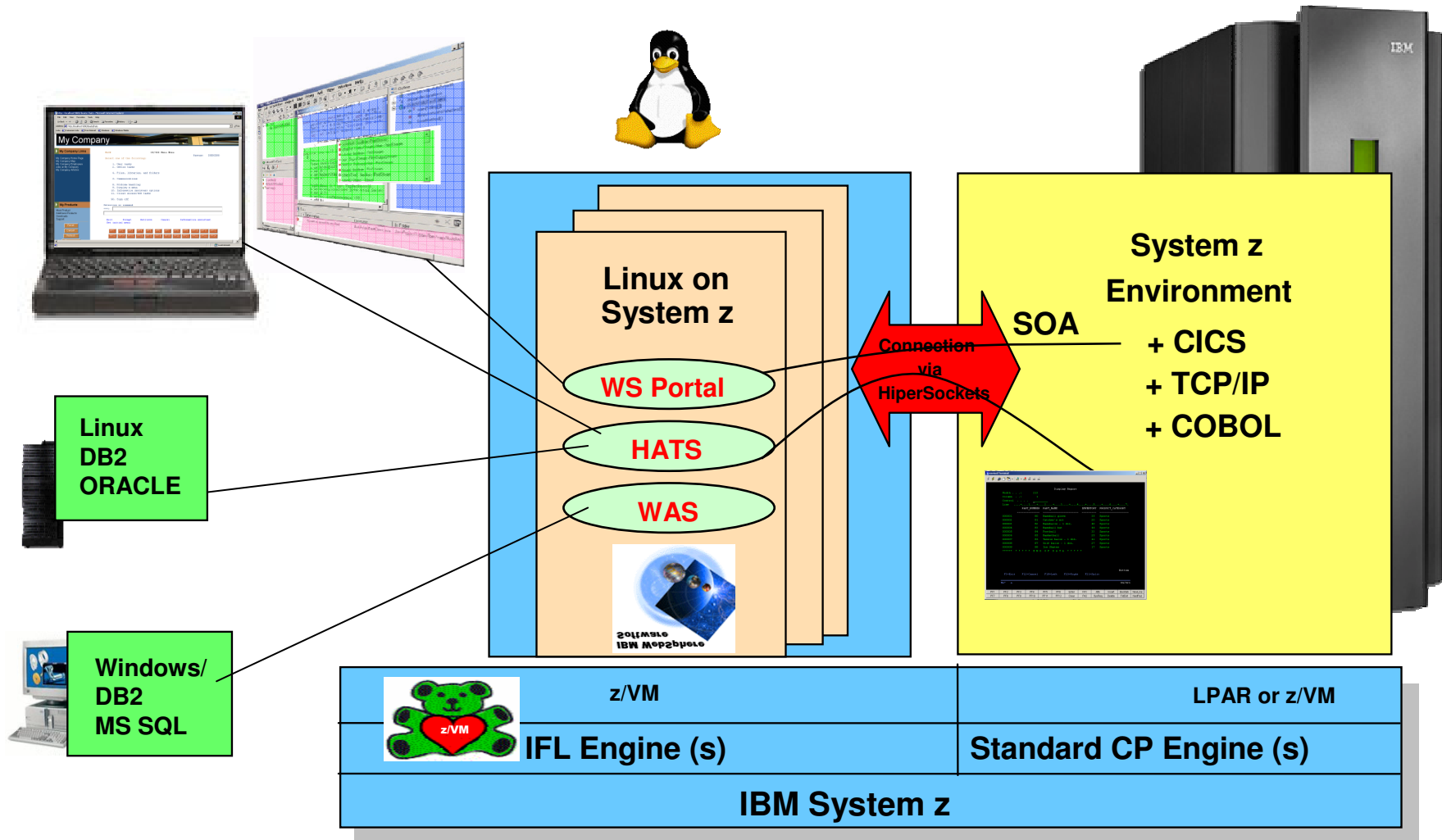
Benefits of Webhosting on Enterprise Linux Server
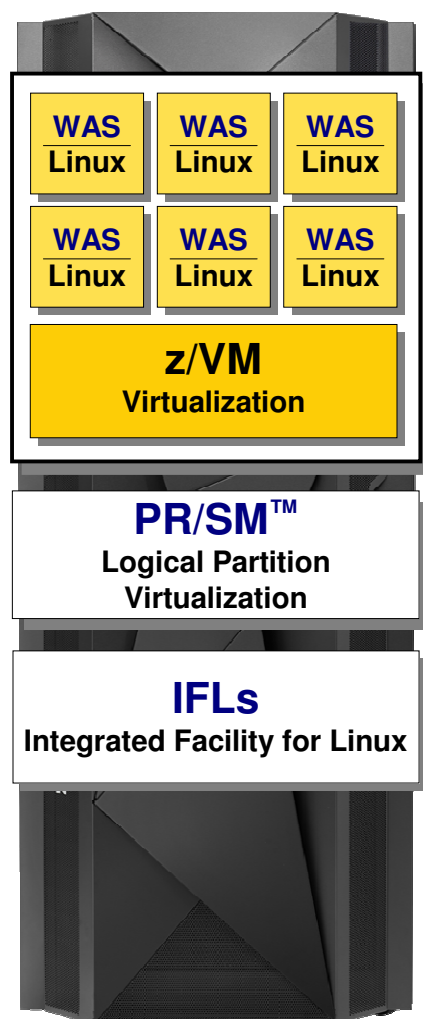
WAS Linux	WAS Linux	WAS Linux
WAS Linux	WAS Linux	WAS Linux

z/VM
Virtualization

PR/SM™
Logical Partition
Virtualization

IFLs
Integrated Facility for Linux

- Ability to consolidate many Linux and WebSphere Application Server (WAS) instances to a single server footprint
  - Savings: floor space, electrical, cooling, potential for software license savings

- Better disaster recovery (DR) capabilities since all artifacts grouped by System z
  - Ability to shared WAS product binaries across multiple Linux instances hosted by z/VM
  - WAS maintenance updates quickly apply to all

- Ability to create new instances of Linux and WAS very quickly
  - Using z/VM and Cloud functions

- Ability to access applications and data across HiperSockets
  - TCP/IP network mapped to real memory backplane

Nationwide®
On Your Side℠

Key Benefits (Value Proposition)

- Expected to save $16M over the next 3 years (2007)

- Initial phase consolidated 250+ Production,
            Development & Test servers to 6 IFLs

- Nationwide.com runs on WebSphere on Linux for System z

- Superbowl commercial -- anticipate 22X increase in traffic.

- Rent 1 IFL for 2 weeks.

- Test to anticipated load before superbowl.

- Handle superbowl load for a few weeks.

- After superbowl, returned the IFL.

- Zero downtime during this process. Zero time spent acquiring/provisioning new servers. Zero time spent changing server configurations.

"Nationwide's Linux on System z project currently (2013):

- Jim Tussing, CTO, is pleased about the large scale IT consolidation, optimization and cloud delivery. The journey to a very successful cloud-based solution
    - that reduced power, cooling and floor space requirements by 80% s
    - saved the company an estimated $46 million to date

- http://www.youtube.com/watch?v=ku9HELtbxvA

- Offers fast and simple provisioning of new virtual servers, helping Nationwide bring new services to market faster.

Web Application Hosting and SOA Infrastructure
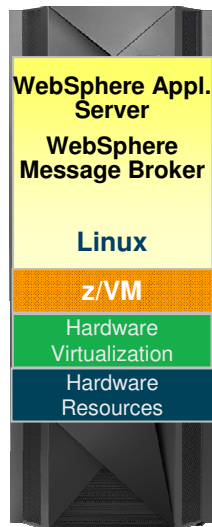
WebSphere Appl. Server

WebSphere Message Broker

Linux

z/VM

Hardware Virtualization

Hardware Resources

- Ability to consolidate many Linux and WebSphere Application Server (WAS) instances to a single server footprint

- Better disaster recovery capabilities since all artifacts grouped

- Ability to shared WAS binaries across multiple Linux instances hosted by z/VM virtualization

- Ability to create new instances of WAS very quickly

- Ability to communicate and access data across HiperSockets

- Integrate different services into a SOA solution with MQ

Traxpay - Germany	**Bank of Tokyo-Mitsubishi UFJ (BTMU)** - Japan
▪ Traxpay looked to redesign the B2B payment process to offer an innovative financial transactions platform, enabled 24/7	▪ BTMU developed a Service Oriented Architecture (SOA) platform to realize this "cloud-banking" concept
▪ Banking connections are implemented in Java using WebSphere Application Server. Highly secure point-to-point communication links are established with IBM WebSphere MQ	▪ It does „*not only enables service linkage on Linux and other systems, but also scalability*"
▪ ELS and WebSphere allows to deliver the utmost in online performance, reliability, and security for our customers	▪ SOA platform, leveraging WebSphere Message Broker, has accelerated the ability to build services in response to business issues
	▪ 18% increase of re-utilization rate of services*
	* as of March 2012

Service Oriented Architecture (SOA) – the way to new solutions

- Applications look the same for all users
- Existing core applications can become a Web service
  (independent of their language, COBOL, ASM, PL/I, Java, C#)
- New business logic is built

Increased success for the Enterprise

appl-x

DB

Product Catalog:
- pictures
- description
- specifications
- testimonials

Linux on System z

New Logic

Web Services
IIB (WMQ)

DB2
LUW

WAS

IBM WebSphere Software

Traditional System z

MQ

debit check

shipping

restock

VSAM

DB2

IMS

LPAR or z/VM

System z

LPAR or z/VM
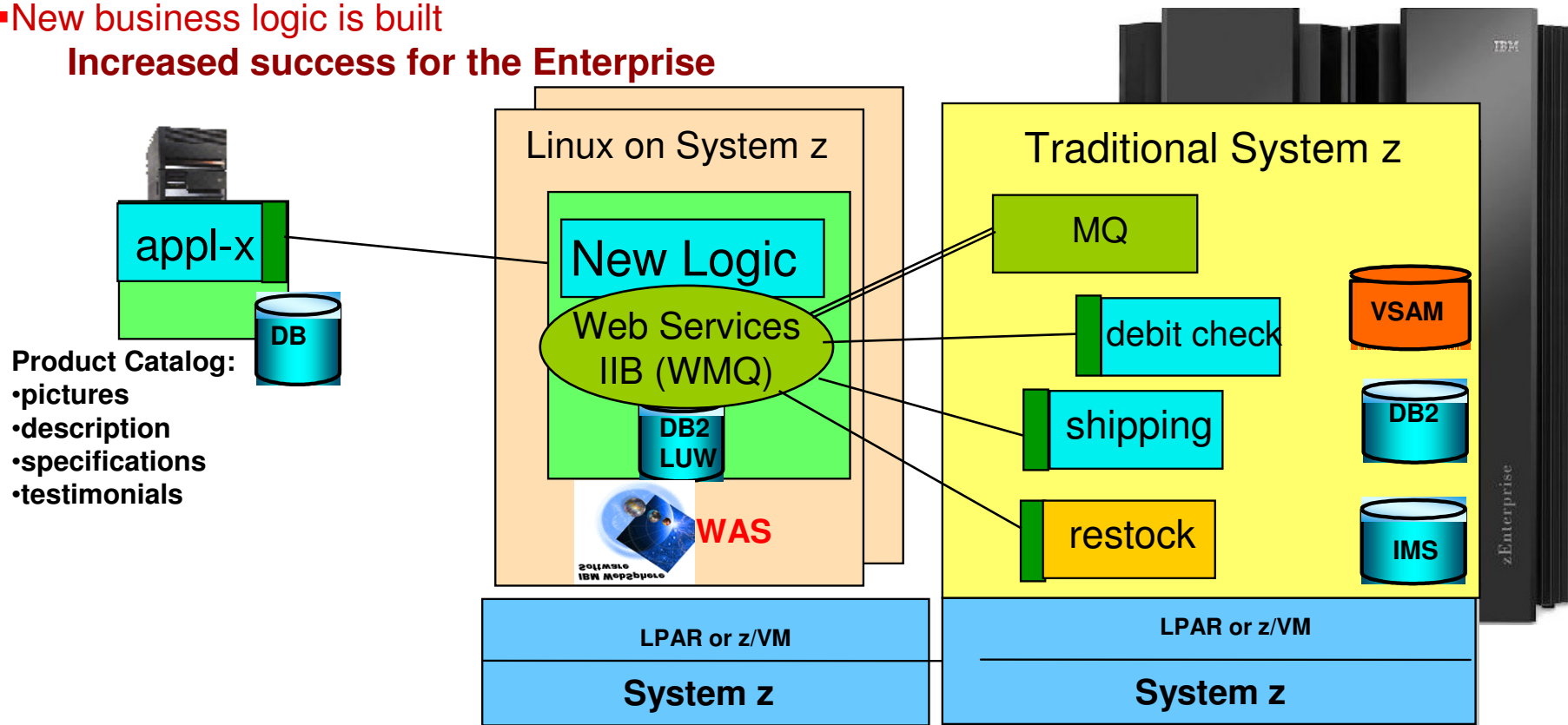
System z

Integration of Processes

NYS Dept Of Taxation And Finance – Case Study
Modernizing applications to enable real-time insight with System z

What's Smart:

- **Deployed an SOA solution that leveraged existing assets**

- Delivers faster execution

- Easily adaptable and fast to implement

- Open to new technologies

Business Value:

- A single view of constituent data

- Cross-agency integration

- High Quality of Service

- New revenue generating opportunities

The new SOA infrastructure provides the needed structure to meet public sector demands of servicing the constituent needs along with the needs of the business.

Bankia gains innovative insights to boost competitiveness
Staying ahead of the competition with a Smarter Computing framework from IBM

The need:

Bankia wants to become one of the most competitive and trusted financial groups in Spain. Bankia's strategy is to win the information war to improve business operational decisions and provide superior customer service.

The solution:

To analyze huge quantities of business, market and customer data in near-real time, Bankia chose to implement IBM InfoSphere software to collect and integrate data from multiple sources, running on a highly scalable IBM System z platform. The ability to host multiple virtual Linux servers on the System z server has helped Bankia to maximize resource utilization and reduce data center complexity.

The Benefit:

- **Enables the real-time integration of data seamlessly and securely to provide trusted information for crucial analysis on ever-increasing and rapidly changing data.**

- **Facilitates monitoring and mitigates risk.**

- **Boosts productivity by an estimated 400 percent.**

> *"Deploying Linux on virtualized System z servers represents an enormous advantage for us: in fact, it allowed us to carry out an extremely rapid deployment, saving us a considerable amount of money, time and resources"*
>
> —*Maria José Álvarez Tapias, Director of the Quality Management Systems Department, Bankia*

Solution components:
- IBM zEnterprise 196 (z196)
- IBM z/VM
- Linux
- IBM InfoSphere DataStage

Business Intelligence and Predictive Analytics

IBM DB2, IBM InfoSphere, IBM Cognos BI and SPSS

Integrated solution stack creates compelling value

– Predictive Analytics, Business Intelligence, Data Warehousing on highly scalable, secure and available server

– Low cost, easy to manage

– Simplified and faster access to the transactional data

– Simplified integration of Hadoop, streaming and transactional dats

SPSS

Cognos

InfoSphere Warehouse

DB2 LUW

Linux

Virtualization Management

Hardware resources

zEnterprise

Siccob

▪Created a virtualized Linux landscape running more than 300 production environments, and deployed DB2, InfoSphere DataStage and Cognos

▪Enabled growth in mobile, internet and branch transactions; avoiding $1.5 million in electricity costs annually

IBM Business Analytics

▪Offers services for data warehousing and analytics; all data is analyzed using Cognos, which generates reports for distribution

▪Delivers services to ~200,000 end-users

Lowering the costs of trusted analytics
IBM DB2 Analytics Accelerator V3.1

z/OS

InfoSphere Warehouse

DB2 z/OS

Cognos BI

DB2
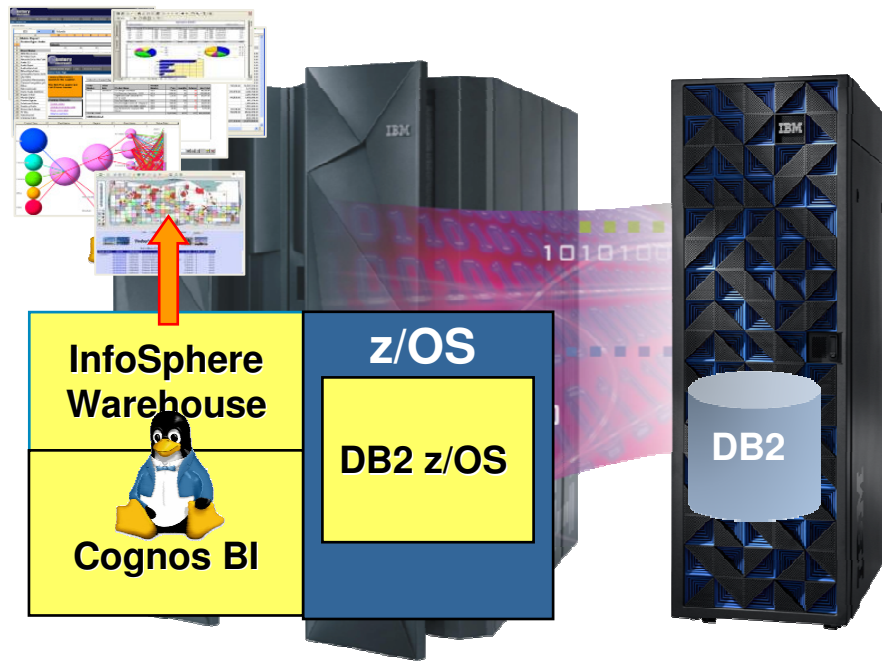
Blending System z and Netezza technologies to deliver unparalleled, mixed workload performance for complex analytic business needs.

More insight from your data

- Unprecedented response times for "right-time"analysis

- Complex queries in seconds rather than hours

- Transparent to the application

- Inherits all System z DB2 attributes

- No need to create or maintain indices

- Eliminate query tuning

- Fast deployment and time-to-value

A city in China uses analysis and predictive modeling to help reduce traffic congestion and optimize public transit routes

Aggregates
traffic and transit data providing citywide views of traffic conditions

Analyzes
bus data against KPIs, uncovering scheduling and routing shortfalls

Reveals
areas prone to congestion, facilitating future transit planning

Solution Components

- IBM Intelligent Operations Center
- IBM SPSS® Modeler
- IBM InfoSphere DataStage
- IBM DB2
- IBM WebSphere Application Server
- IBM System z
- IBM China Research Lab
- IBM Business Partner Jiangsu Posts and Telecommunications Planning and Designing Institute Co. Ltd.
- IBM Business Partner Esri
- Government: Intelligent Transportation Systems

Business Challenge: In this large city where buses and taxis are the predominant modes of travel, traffic congestion was becoming a serious problem. Lacking insight into road conditions or the tools to analyze and model traffic patterns, officials struggled to identify areas prone to congestion, optimize bus routes and effectively manage the urban transport system.

The Smarter Solution: The city built an **intelligent traffic system** that collects, aggregates and analyzes static and near-real-time traffic and transit data, providing a city-wide view of conditions that helps planners predict traffic jams and optimize public transit routes and assets. In addition, transit origin-destination estimation algorithms and traffic key performance indicator (KPI) analysis provide insight into popular travel patterns and passenger bus loads, helping authorities adjust the number of buses in service according to commuter demand.

With the rollout of its intelligent traffic system, the city takes a giant step toward achieving its goal of becoming one of the world's smartest cities.

Porto Alegre: A smarter city that keeps its citizens moving
Accelerating essential road maintenance response time by 50 percent with help from IBM and Procempa

The need

Porto Alegre wanted to improve quality of life for citizens by keeping its growing population moving. To reduce road closures, the city needed to increase the efficiency of its maintenance processes.

The solution

The city implemented an asset management solution based on IBM Maximo® software on Linux for System z. Data on maintenance activities is displayed in near-real time on a digital map of the city.

- Accelerates essential maintenance work, reducing road closures

- Projected to achieve a 50 percent reduction in response times, and a 30 percent reduction in backlogs

- Estimated to deliver a 60 percent reduction in TCO

By consolidating our distributed asset management systems into a private cloud, we benefit from reduced IT operational costs as well as increased security—which is especially important for our mobile Maximo applications. — *Walfrido Goulart, Data center manager, Procempa*

TRANSZAP

Guaranteed application uptime to SaaS customers

BENEFITS to Clients
Comparison to Distributed

Linux

10 Intel Servers

Triple digit growth

69,000 users

6800 Companies

Transaction volume

SaaS customers

"Our business and reputation rest on promising a fast, reliable and secure service to our clients," said Peter Flanagan, CEO of Transzap. "We're a small company but our transaction data volumes are growing upwards of 100 percent, annually. We couldn't trust our business to any competitive product other than the IBM System z."

oildex

Superior Scalability and Availability

Transzap offers its customers a suite of financial tools delivered via Software-as-a-Service model. It operates Oildex, an ePayable system and digital data exchange.
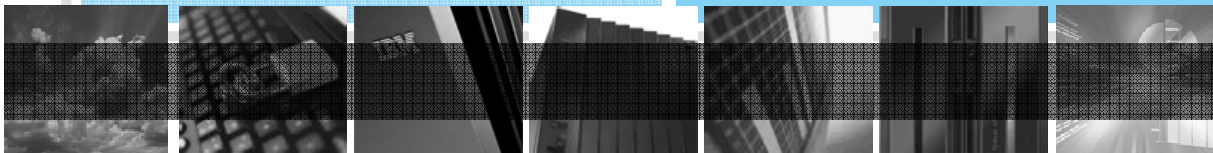
Banco do Estado do Rio Grande do Sul S.A. (Banrisul)
Supporting more efficient banking services

The need:

As Banrisul's business expanded, scalability became an increasing challenge for its Intel processor-based servers. The bank was concerned that inflexible systems were limiting its ability to support increasing numbers of clients and transactions, and hampering its ability to quickly deliver new banking products and services.

The solution:

Banrisul decided to take advantage of Integrated Facility for Linux (IFL) engines on its existing IBM System z servers to run its Oracle databases in a virtualized environment. This would allow it to considerably reduce the time, effort and expense associated with expanding its hardware infrastructure.

The Benefit:

- Enhanced scalability through advanced virtualization capabilities, making it much easier and quicker to meet increased capacity demands.

- Improved resource utilization that optimized the price-performance of the solution, reducing the number of CPUs per database by more than 50 percent.

- IBM zEnterprise consumes much less energy than the old Intel-based servers, allowing Banrisul to improve its control of energy usage.

"We have been able to cut the number of CPUs required to support our credit database by more than 50 percent, and we are still seeing the same level of performance.

Activating each additional IFL has proven to be very simple and given Banrisul more capacity to host new workloads."

—*Ronaldo Rapacki, IT Development Manager at Banrisul*

Solution components:

- IBM zEnterprise 196
- IBM System z10® Enterprise Class (z10 EC™)
- IBM z/VM
- Red Hat Enterprise Linux

eThekwini Municipality

Business need:

Aiming to modernize its user interfaces, the Municipality wanted an open platform backed by enterprise-class support, and offering very high availability and performance.

Solution:

Five IFLs running SUSE Linux Enterprise Server (SLES) for System z on an IBM zEnterprise 114 (z114) server, with one further processor for z/OS®.

Both operating systems run as virtualized instances on the z/VM hypervisor, in four logical partitions (LPARs).

The Municipality uses IBM DB2 databases and IBM WebSphere Application Server on SLES for System z.

"Equally, if we put the SUSE Linux Enterprise Server workload on Windows instead, we would need at least 30 production servers and 30 servers for Disaster Recovery, each with OS and software licenses.

Instead, we need to license just five IFLs for SUSE Linux Enterprise Server for System z.

Naturally, there are also significant energy savings in consolidating to our z114 rather than running a distributed Windows landscape."

- Roney Moodley, Deputy Head, Service Delivery at eThekwini Municipality

https://www.suse.com/success/stories/ethekwini-municipality.html

© 2014 IBM Corporation

Much more workloads that benefit from ELS

Reliable and Scalable Business Collaboration	IBM Enterprise Content Management (ECM) Solutions	IBM Maximo Asset Management
Lotus Domino + TREND MICRO **Lotus Sametime** **Lotus Quickr** **Lotus Connections**	IBM ECM portfolio includes approximately forty different software products such as **FileNet** and **IBM Content Manager**	**Maximo Asset Management** unifies comprehensive asset life cycle and maintenance management on a single platform.
Gruppo API – Italy	**Large Healthcare Insurer** – USA	**City and Country of Honolulu** – USA
The migration of Lotus Domino, the corporate email system, worked extremely well. Over a two week period, 1,200 user email boxes were moved to ELS without interruption of service to users.	FileNet and Content Manager On Demand are used with DB2, InfoSphere and Cognos to support the business processes for the Integrated Health Management. The solution enables to analyze a large collection of data while also achieving real-time claims adjudication and offering a robust member portal.	Maximo software is used as a single point of management for every aspect of a wide range of public services. Using the solution, the city can also improve the perception of the city by performing more preventive and corrective maintenance.

Mobile Environment on zEnterprise connecting to Core Systems

Linux on z

z/OS

WebSphere Application Server

Adapters

Worklight

Server

DB2 LUW

MQ/ WMB

CICS®

IMS™

DB2®

WAS

MQ/ WMB

Mobile apps

zEnterprise

SOA

Siebel, PeopleSoft

SAP

IBM zEnterprise®
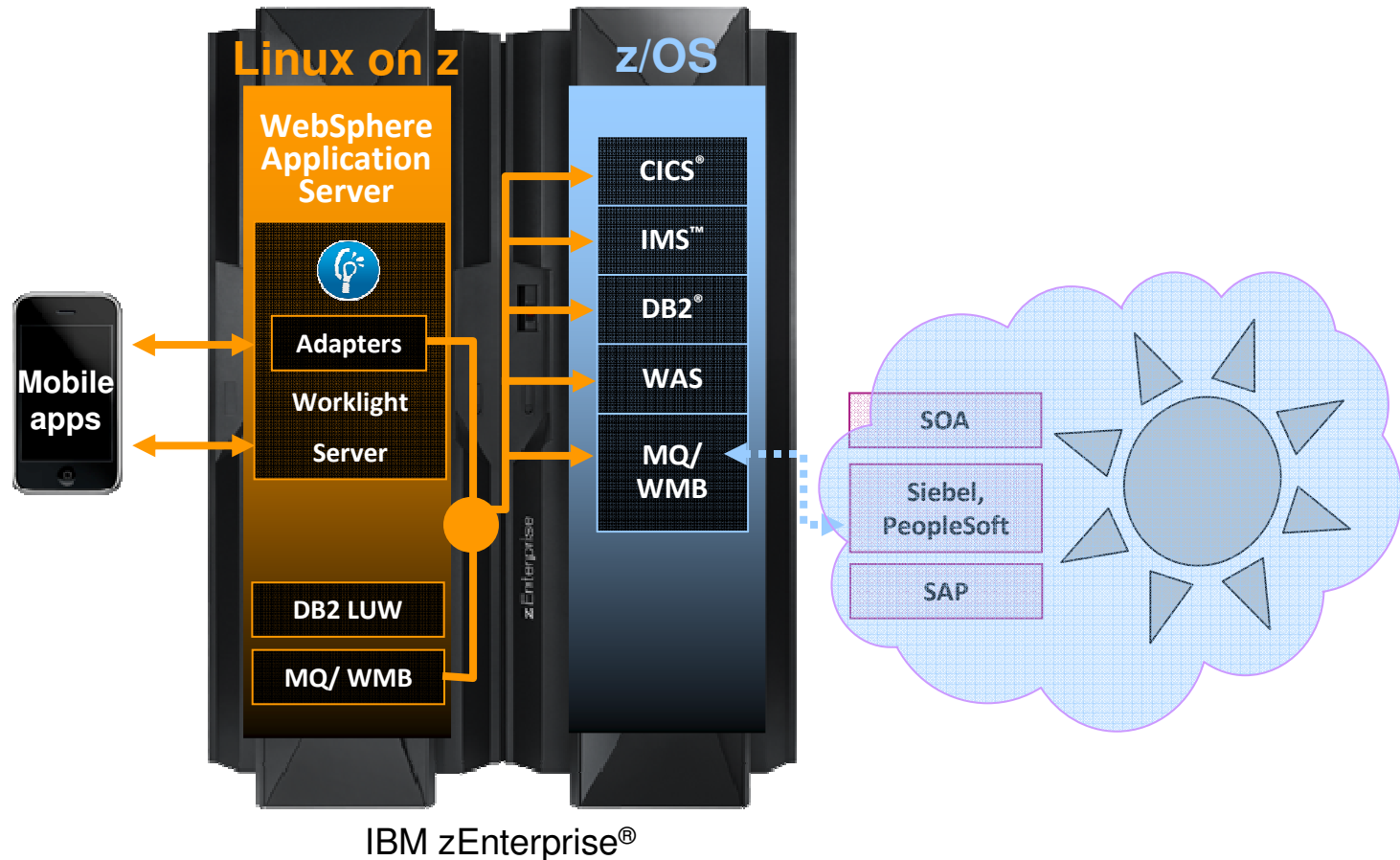
- **Server side software components and adapters for channeling System z to mobile devices** with IBM Worklight Server

- **Mobile application support** with WebSphere Application Server on System z

- **Mobile protocol connectivity with core System z applications** including CICS, IMS, TPF, MQ, WMB and DB2

Enterprise Linux Server and Storage Synergy
Designing, developing, and testing together is key to unlocking true value

	ELS
New IBM System Storage® DS8870	✓
XIV® Storage Systems	✓
Storwize® V7000	✓
SVC	
TS1140	✓
TS3500	✓
TS7700 Virtualization Engine	✓
IBM FlashSystem 820 with SVC	✓

IBM FlashSystem Solution
Combining IBM SVC & IBM FlashSystem

Considerations when using an Enterprise Linux Server

The extreme performance of IBM FlashSystem with IBM MicroLatency™ provides:

– I/O per sec 430k - Mixed 70/30% read/write (Model 820)

– Low entry price (4 TB on the Model 810)

– Very attractive match of incredible performance and price options - Model 820 12 TB

  • Include the San Volume Controller (SVC) at competitive pricing

– Delivers outstanding performance per gigabyte, can quickly uncover business insights using traditional data analytics as well as new big-data technologies.

– Enterprise Class services with SVC

  • Business Continuity with Copy services, FlashCopy® Back-up, Drive Storage Efficiency with Easy Tier™.. driving optimal Workload Availability

– When compared to equivalent disk systems, IBM flash storage solutions deliver 6.7 times more capacity in a single rack, 19 times more cost efficiency in dollars/per IOPS, and are 115 times more energy efficient.[1]

Connect via Fiber Channel with enterprise services using SVC

1   Flash Outperforms disk in IBM Almaden Research Lab Demonstration

Effective Virtualization Test

- Test environment
  - Running a mix of server types as Linux guests on z/VM:
    LPAR with 28GB central storage + 2 GB expanded storage

Guest workload	Guest Memory
WebSphere Application Server	13.5 GB (Java heaps 8GB)
Database DB2	12.0 GB (memory pools about 2 GB)
Tivoli Directory Server (ITDS)	1.5 GB
Idling guest	1.0 GB

- **Test scenarios**
  - Leave the guest size fix
  - Decrease the LPAR size in predefined steps to scale the level on memory overcommitment
  - Measure the execution time of a predefined workload (TPM)

Test Results
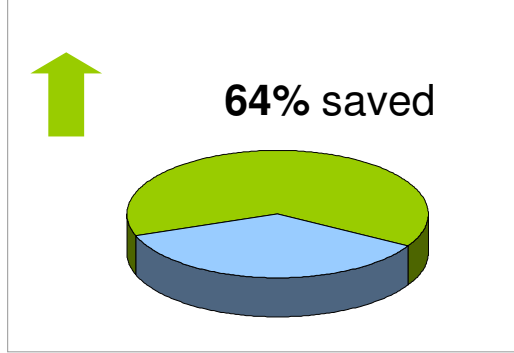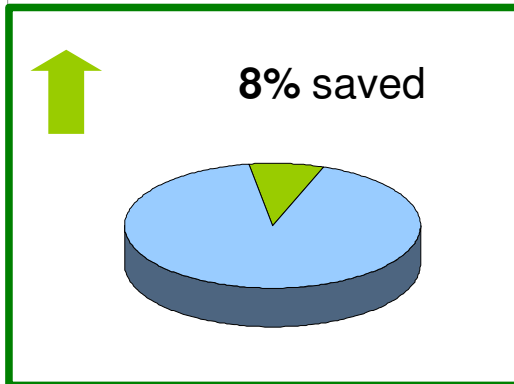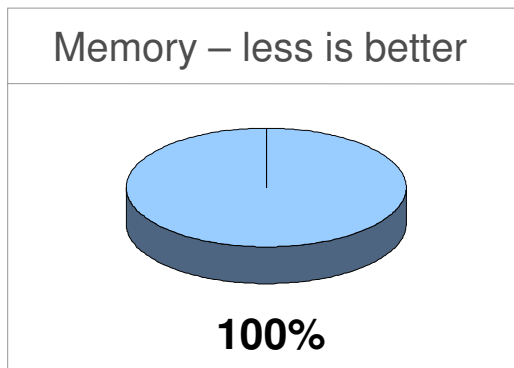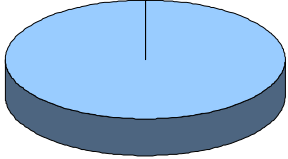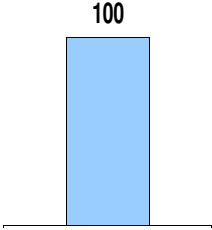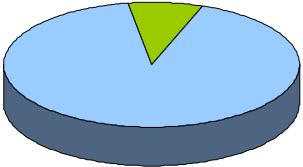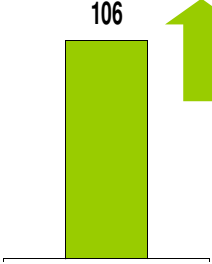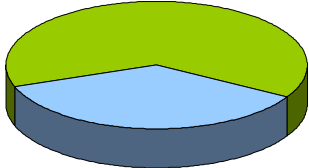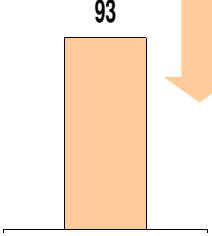
Memory – less is better

100%

8% saved

64% saved

BASE settings = 100%

- Sum of guest size definition
- Base performance

Performance – more is better

100

?

?
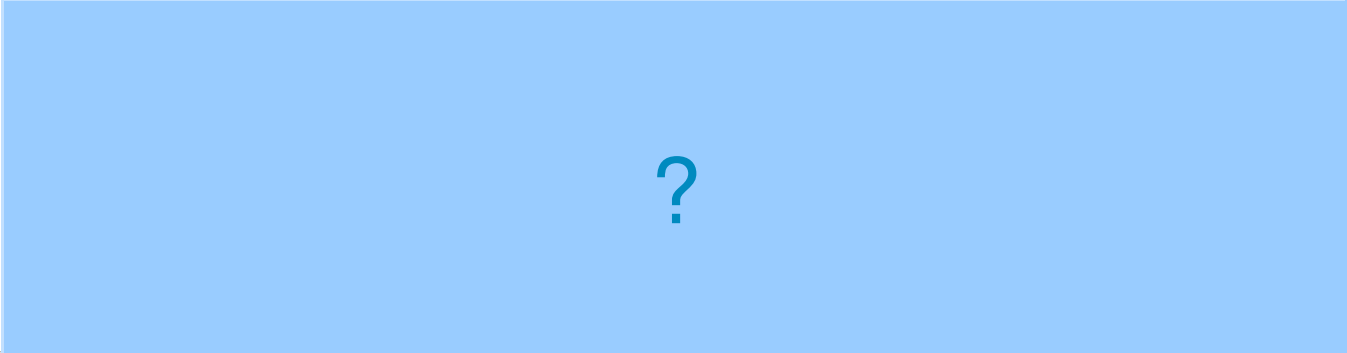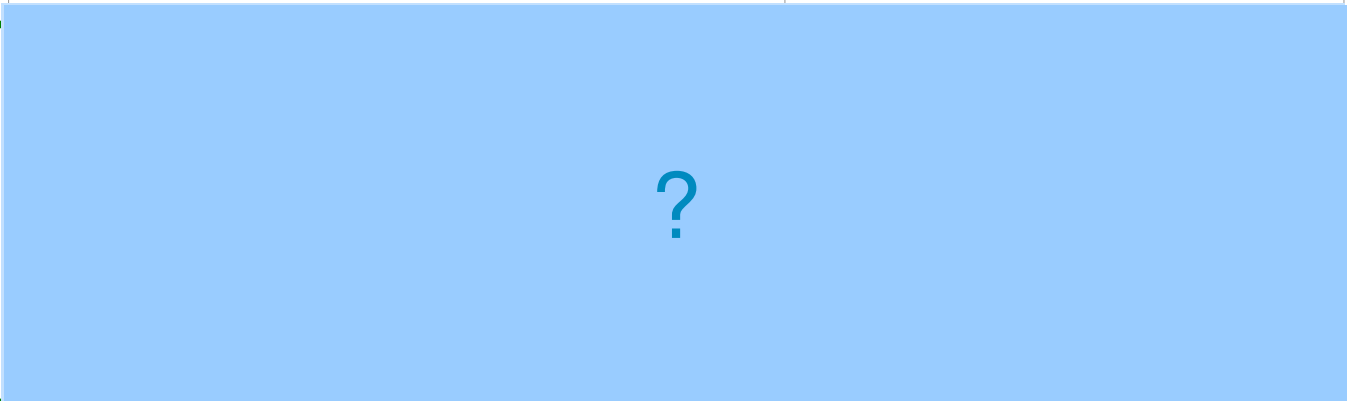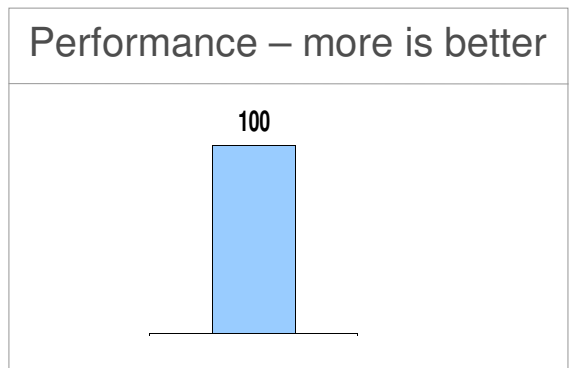
Test Results

Memory – less is better		Performance – more is better

BASE settings = 100%
- Sum of guest size definition
- Base performance

100%

100

8% saved

OPTIMAL settings
+ Reduce memory by 8%
+ Improved performance by 6%

106 + 6%

64% saved

CHEAPEST settings
+ Reduce memory by 64%
− Decreased performance by 7%

93 - 7%

Effective Virtualization with Linux on z and z/VM shared memory
Linux Shared Memory Exploitation for many Virtual machines
z/VM Discontiguous Saved Segments (DCSS)

- **DCSS support is Data-in-Memory technology**

  - Share a single, real memory location among multiple virtual machines

  - Can reduce real memory utilization

- **Use Cases:**

  - **As fast Swap device**

  - **For sharing read only data**

  - **For sharing code (e.g. program executables/libraries)**

- **The large DCSS allows the installation of a full middleware stack in the DCSS (e.g. WebSphere, Databases, etc)**

- **The DCSS becomes a consistent unit of one software level**

- **NSS – Named Saved System – for a bootable Linux image**

http://public.dhe.ibm.com/software/dw/linux390/perf/ZSW03186USEN.PDF

© 2014 IBM Corporation
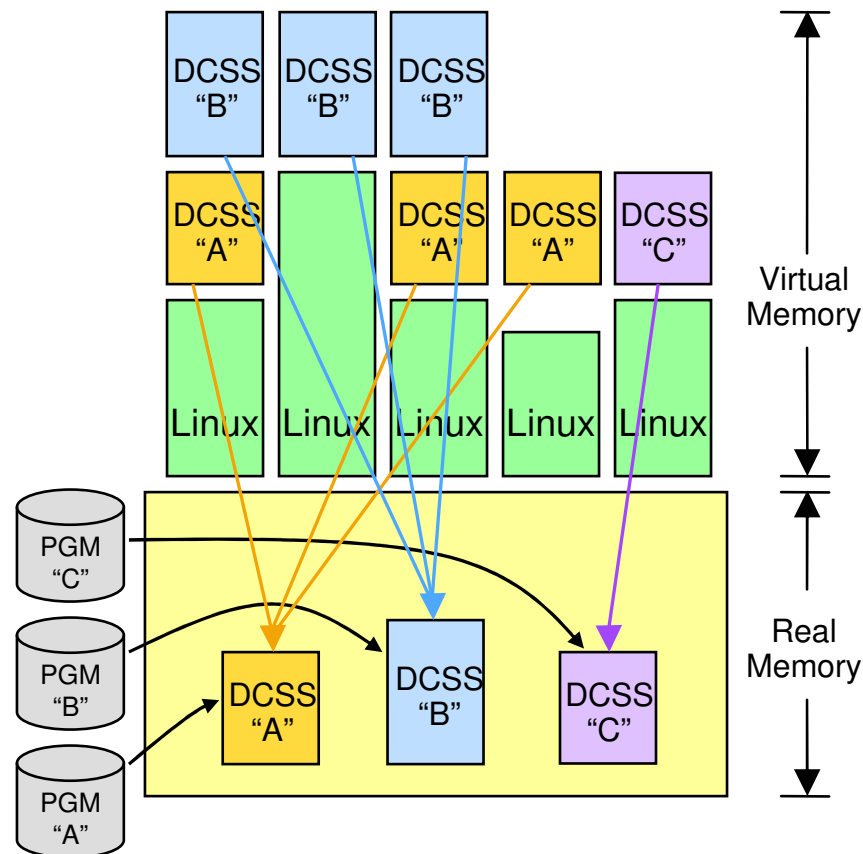
Managing an Enterprise Linux Server (ELS)
E.g.: Visualization and management of virtual and physical resources

IBM-WAVE **provides the graphical interface that simplifies and helps to automate the management of virtual Linux servers.**

- **Monitors and manages virtual servers and resources** from a single graphical interface

- **Simplifies and Automates** tasks

- **Provisions virtual resources** (Guests, Network, Storage)

- **Supports advanced z/VM® capabilities** such as Single System Image and Live Guest Relocation

- **Allows delegation of administrative capabilities** to the appropriate teams
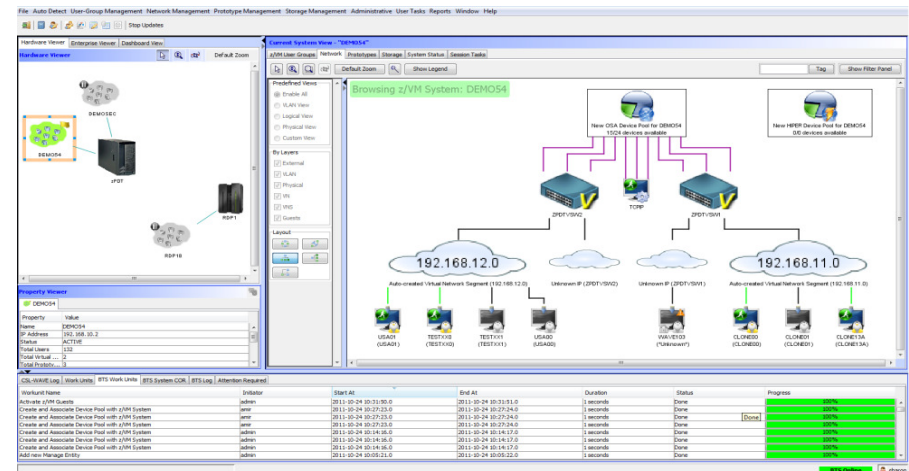
A simple, intuitive graphical tool providing management, provisioning, and automation for a z/VM environment, supporting Linux virtual servers.

© 2014 IBM Corporation

Implement TSM on Linux on System z as central Backup Hub

Linux DB2 ORACLE

Windows DB2 MS SQL

Linux on System z

Linux on System z

System z Production Environment

+ TCP/IP
+ VTAM
+ CICS TS
+ VSAM
+ COBOL
+ DB2

TSM Server (Tivoli Storage Manager)

Tivoli

DB2 LUW Data Warehouse

DB2 LUW

Connection via HiperSockets

Storage Pools

DASD

Tapes / VTS

z/VM or LPAR

z/VM or LPAR

IFL Engine(s)

CP Engine(s)

IBM System z

z/VM
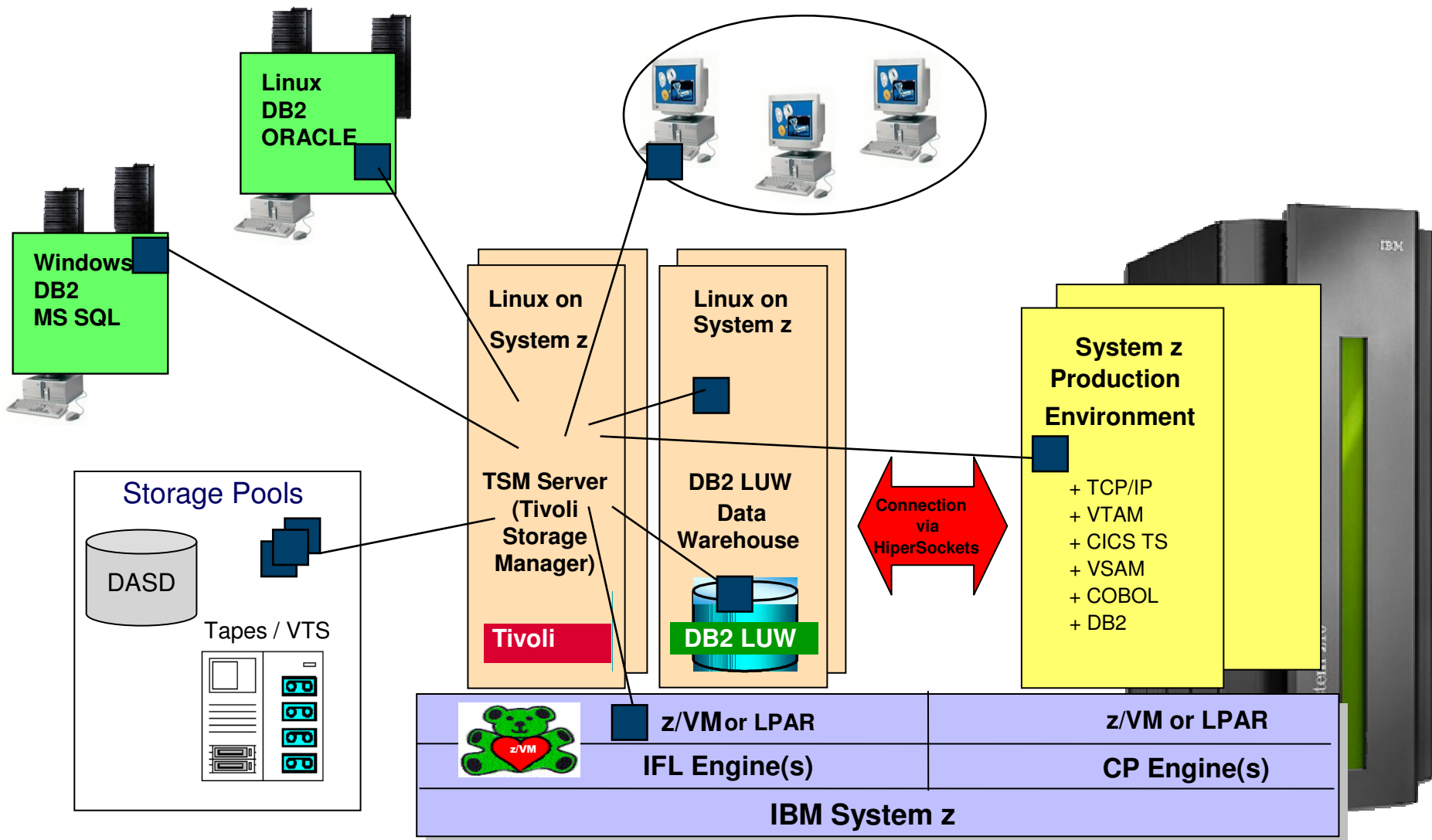
The Game Changer for Enterprise Linux
Enterprise Linux Server – based on IBM zEnterprise BC12 (zBC12)

Facts	Linux Server Solution	Values
Deploy up to **40** virtual servers per core		As low as **$1.[00]/day** per virtual server[1]
Up to **520** virtual servers in a single ELS footprint	**Linux Server Solution** including hardware, hypervisor and maintenance	Save up to **55%** on TCO over 5 years[2]
Secure isolation of logical partitions with highest level of security certification		More than **3,000** Linux ISVs apps supported
Support for **Red Hat**, **SUSE** and **OpenStack® Cloud**		Still starting as low as **$75K USD**[3]

[1] IBM calculations of zEnterprise limits across maximum zBC12 configuration. Results may vary. 3-Year cost for hardware, hardware maintenance, and z/VM.
[2] Based on preliminary measurements and projections comparing Oracle DB on x86 2 chip 8 core 2.13GHz blades vs. zBC12 and ELS solution edition pricing. Subject to change and results may vary based on numerous factors.
[3] Based on US market and will vary by country.

What is Different about an Enterprise Linux Server (ELS)

E.g.: Software Costs and Disaster Recovery

Less SW acquisition & licensing

Fast & secure disaster recovery

Linux software is often priced by the number of cores.

One ELS core is equivalent to one x86 core !

Coordinated near-continuous availability and disaster recovery solution
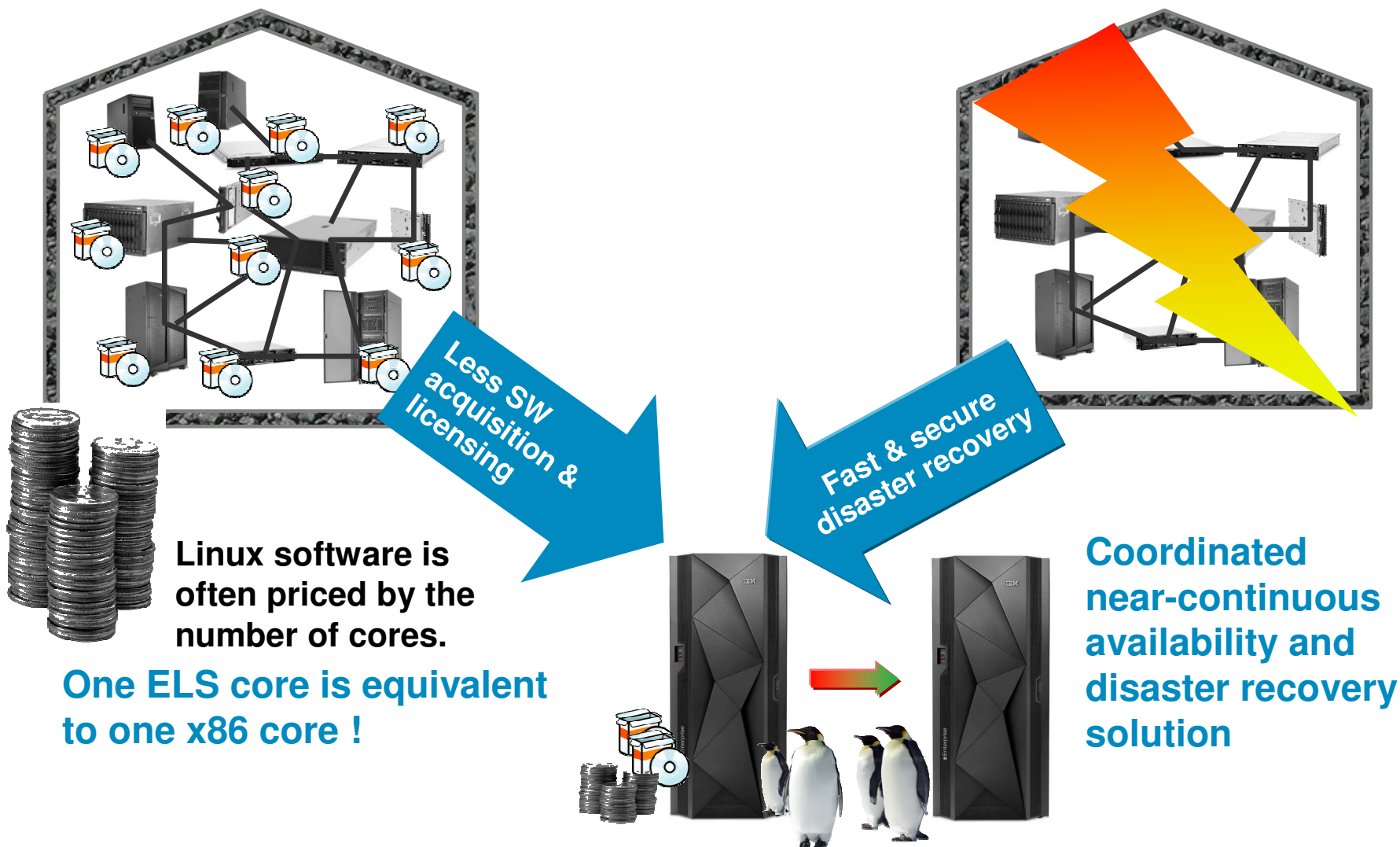
What is Different about an Enterprise Linux Server (ELS)

E.g.: Operational Efficiency & Security and Growth Inside the Server

Improved Security and **Operational Efficiency**

Grow Inside Horizontal & vertical scalability

Less servers, cables, switches result in less operational effort and less intrusion points.

ELS virtualization capabilities provide mature and sophisticated technologies.

System z Momentum is great !
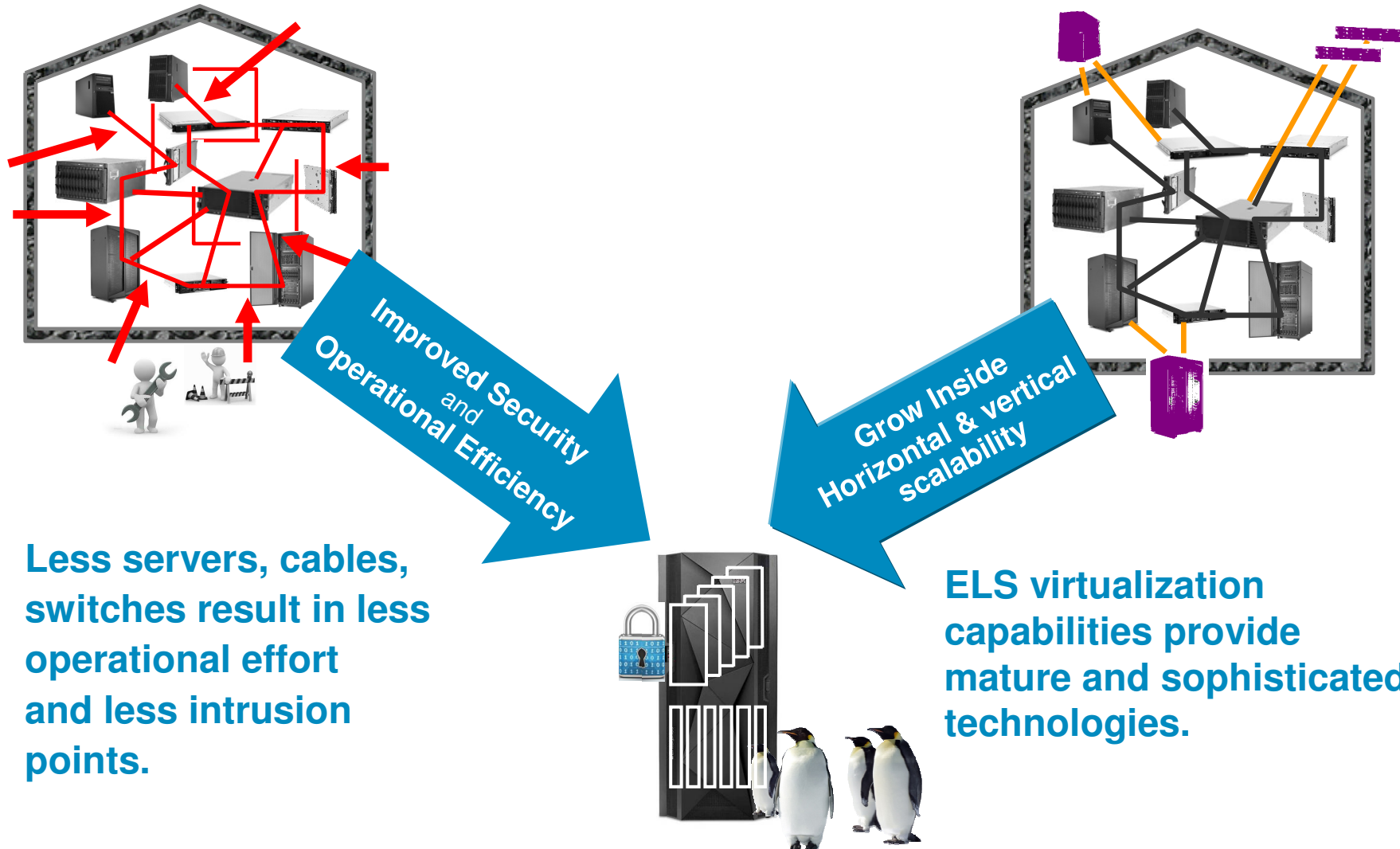
250+ Companies around the World have migrated Workloads (incl. Oracle Workloads) to System z over the past 18 Months

BANKS	OTHER FINANCIAL INST.	RETAILERS	HEALTHCARE	UTILITIES / ENERGY

BANKS
- *Banco Itau*
- *Bank of NZ*
- *Bank of Montreal*
- BCP [Peru]
- *Bank of China*
- *Central Bank of Russia*
- FNB Namibia
- *Industrial Bank of Korea*
- PSBank *Philippines Savings Bank*
- Postbank [Germany]
- VietinBank [Vietnam]

OTHER FINANCIAL INST.
- DTCC — The Depository Trust & Clearing Corporation
- Allianz

GOVERNMENTS
- CAIXA [Brazil]
- Ministry of Finance of the Republic of Kazakhstan [Kazakhstan]
- NBC — The National Business Center [USA]

RETAILERS
- Home Depot
- HeiTech

TRANSPORTATION
- Con-way Freight
- БЕЛОРУССКАЯ ЖЕЛЕЗНАЯ ДОРОГА [Belarusian Railways]
- Delta

HEALTHCARE
- Aurora Health Care
- BlueCross BlueShield Association
- UNC HEALTH CARE

HOSTING PROVIDERS
- BRZ Deutschland Bauinformationstechnologie
- finanz informatik
- EFiS FINANCIAL SOLUTIONS
- TRANSZAP
- Atos Origin

UTILITIES / ENERGY
- nationalgrid
- PETROL [Slovenia]

OTHERS
- HOPLON infotainment [Gaming] [Brazil]
- Federal Service for Hydrometeorology and Environmental Monitoring [Russian Hydrometeorological Research Institute]
- BALDOR [Manufacturer/USA]

Users of Linux on System z

IBM focus: Linux on all IBM Systems

Linux on System z
- Applications close to the data
- Applications need "Mainframe" criteria
- Vertical and horizontal scaling (hundreds of virtual servers at the same time)
- Great workload-management
- excellent virtualization
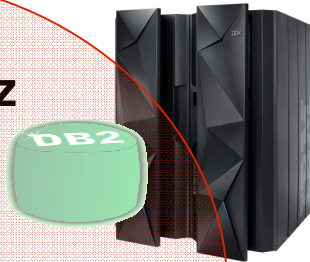
Linux on System x
- Low-priced entry
- Simultaneous operation of Windows and Linux via virtualization
- High reliability and simple manageability by Enterprise X-Architektur
- Very good price / performance ratio via Clustering
- Big performance density by BladeCenter
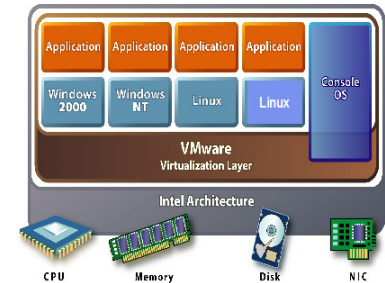
Linux everywhere

Linux on System p
- Applications demanding high performance
- Consolidation of multiple servers / applications via LPARs
- Native Linux or AIX

Linux on special devices
- Applications demanding highest performance
- special purpose

Linux on System i
- If an integrated solution is required (hardware / software / network)
- Simple administration and operation
- If midrange system is required
- Consolidation of applications via LPARs (up to 31)
- High degree of security
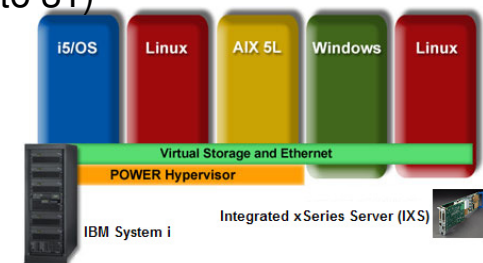
Why Linux on System z is an option

- **System z the largest scalable server**

- **Reliability and availability of System z**

- **High Availability of System z and zEnterprise - out of the box**

- **Linux is Linux - but inherits System z - characteristics**

http://www-03.ibm.com/systems/z/os/linux/about/index.html

Thanks

Wilhelm Mild

IBM Executive IT Architect

THE *Open* GROUP
Master
Certified IT Architect

IBM Deutschland Research
& Development GmbH
Schönaicher Strasse 220
71032 Böblingen, Germany

Office: +49 (0)7031-16-3796
wilhelm.mild@de.ibm.com