

IBM System z Technology Summit



Solving the Server Sprawl Problem with effective IT Optimization

Presenter

Date



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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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Demands on IT



32.6 million servers worldwide

- **85% idle** computer capacity
- **15%** of servers run 24/7 without being actively used on a daily basis



Between 2000 and 2010

- servers **grew 6x** ('00-'10)
- storage **grew 69x** ('00-'10)
- virtual machines **grew 51% CAGR** ('04-'10)



Internet connected devices **growing 42% per year**



1.2 Zeta bytes (1.2 trillion giga bytes) exist in the “digital universe”

- **50%** YTY growth
- **25%** of data is unique; **75%** is a copy



Data centers have **doubled** their energy use in the past five years

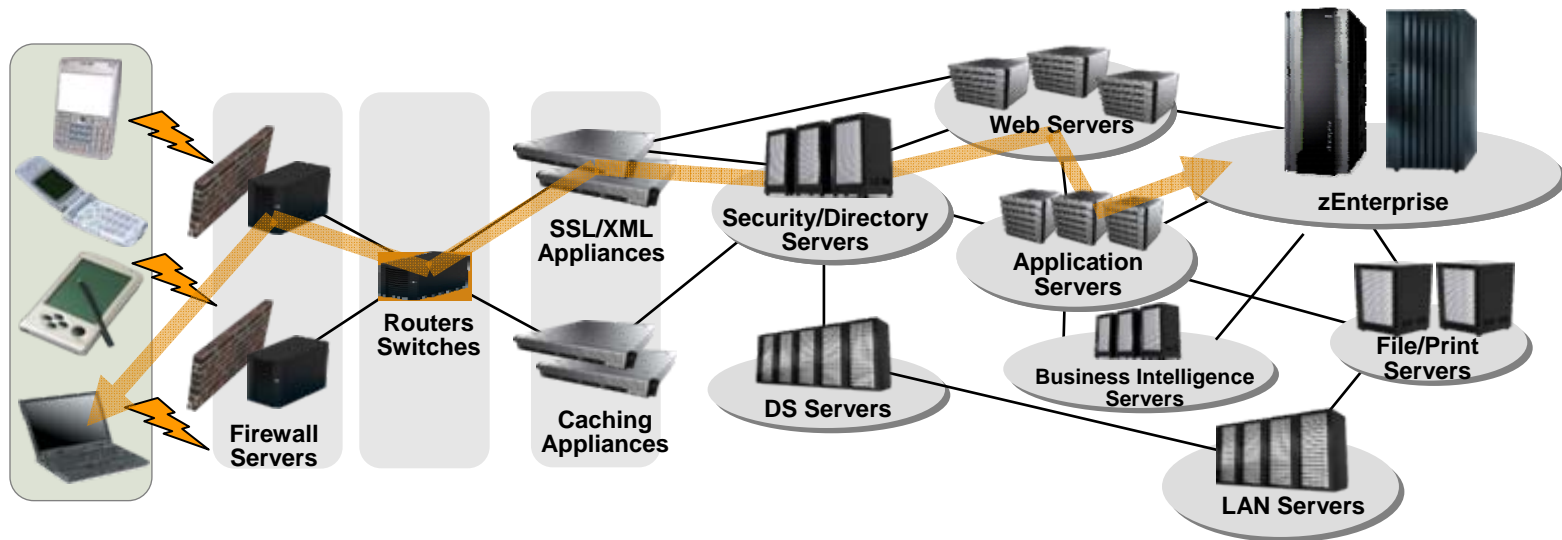
- **18% increase** in data center energy costs projected



Since 2000 security vulnerabilities grew **eightfold**

... while IT budgets are growing less than 1% per year.

Server Sprawl Limitations?



- How many x86/Unix servers are deployed every month?
- How much data center space is available, or will it become a problem?
- How big is the energy consumption growing?
- How many additional people are required to maintain the constantly growing number of servers?
- How will the software license cost grow, including the virtualization software?
- How can IT availability ensured, what happens in the case of a disaster?

Do you have to re-think your IT server strategy?

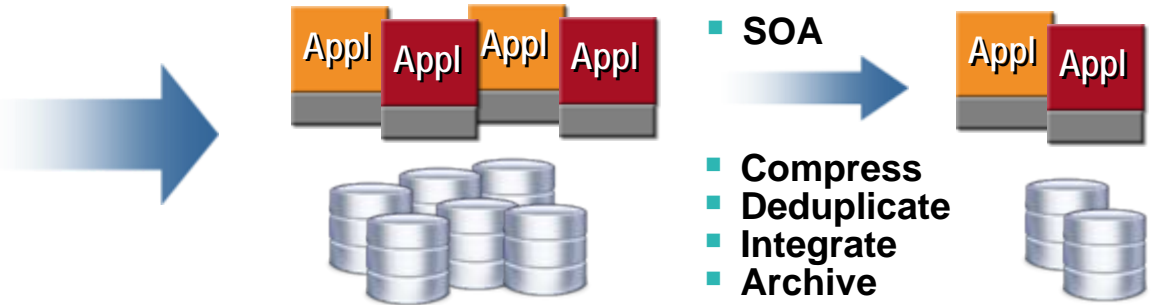
Strategies to Reduce Costs and Improve Value

Optimize the Overall IT Environment

Consolidate Hardware Infrastructure



Consolidate Redundant Software and Data



Improve Service Delivery



IBM's Optimized Systems are tuned to help address the unique needs of any workload and yield the best performance

Key Considerations for leveraging Optimized Systems

Architecture

Create a strong architectural foundation to address Business needs

- Selection of operating system, server and storage platform
- Middleware exploiting the hardware architecture
- Security, Reliability, Availability and scalability characteristics
- New workloads eg. analytics leveraging Big Data
- Consolidation and virtualization leading to private clouds

Economics

Optimize Total Cost of Ownership

- Energy costs
- Facility costs
- IT administration labor costs
- Hardware, Software licensing cost
- Networking costs

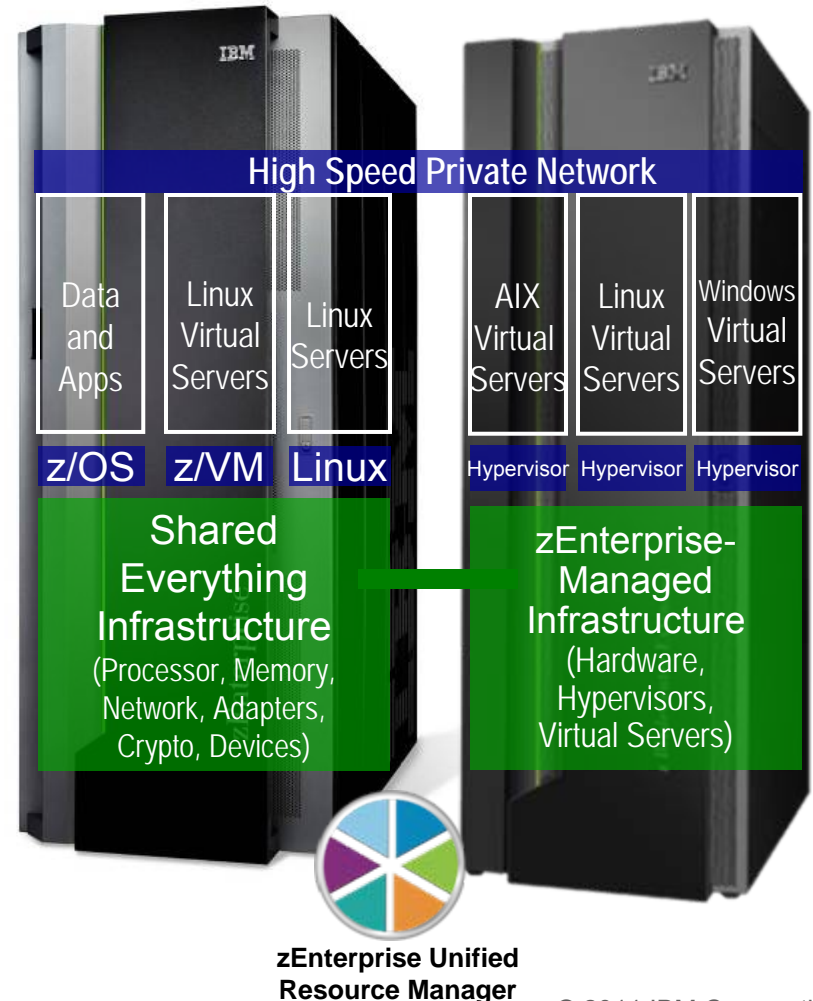
Performance

Align performance requirements with business needs

- Policy based resource allocation
- Single pane of glass management of the entire infrastructure

A highly Optimized System: zEnterprise System

- **Large-scale server consolidation to Linux on zEnterprise**
 - zEnterprise and z/VM virtualization technologies provide shared every resource infrastructure
- **zBX offers additional consolidation capabilities, extending Linux on zEnterprise**
 - Integrated hypervisor offers AIX, Linux and Windows virtual server hosting
- **zEnterprise Unified Resource Manager provides a common management interface for virtual servers running on z/VM and zBX**



Workload Consolidation on multi-workload Systems improve IT Economics

Large-scale server consolidation with Linux on zEnterprise

- Run more applications/software at less expense
- Manage more virtual servers with fewer people
- Absorb workload spikes more easily
- Consolidate more servers per core
- Spend less on disaster recovery
- Occupy less floor space
- Save on energy



A refrigerator size box versus a full room of servers.

The differences are quantum.

Large-scale Consolidation Examples

*Do more with
less*

*Consolidate more servers,
networks, applications, and data
on a single Linux and z/VM*



Run 60 virtual machines on just four IFLs - a cost-efficient approach for software licensed on a per-processor basis

*Achieve savings
on a greater
scale*

Use less power and floor space

BALDOR

Cut electricity costs by 60% and floor space requirements by 50%

*Manage Growth
and Complexity*

*Scale resources to support
different types of workloads
with Linux IFLs*



Up to 60% more capacity and up to 33% lower prices for Linux IFL hardware environments

The economics of Linux on zEnterprise 114

- Consolidate an average of **30 distributed servers** or more on a single core, or **hundreds** in a single footprint.
- Deliver a virtual Linux server for approximately **\$500 per year** or as little as a **\$1.45 per day per virtual server** (TCA)¹

TCA Analysis:

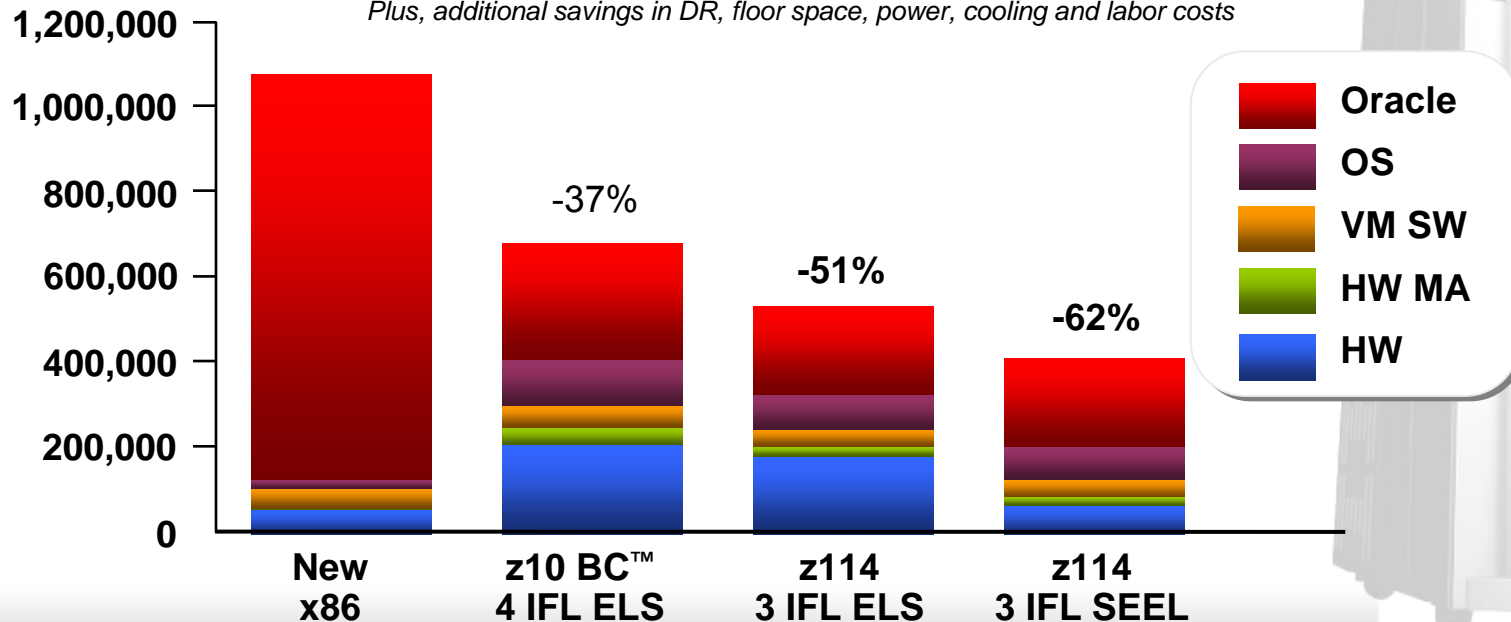
Consolidate 40 Oracle server cores onto 3 Linux cores on z114

Lower acquisition costs of hardware and software vs. distributed servers

– up to 51% less than Nehalem² in new footprint (**Enterprise Linux Server (ELS)**) –

– or up to 62% less when adding to existing footprint (**Solution Edition for Enterprise Linux (SEEL)**) –

Plus, additional savings in DR, floor space, power, cooling and labor costs

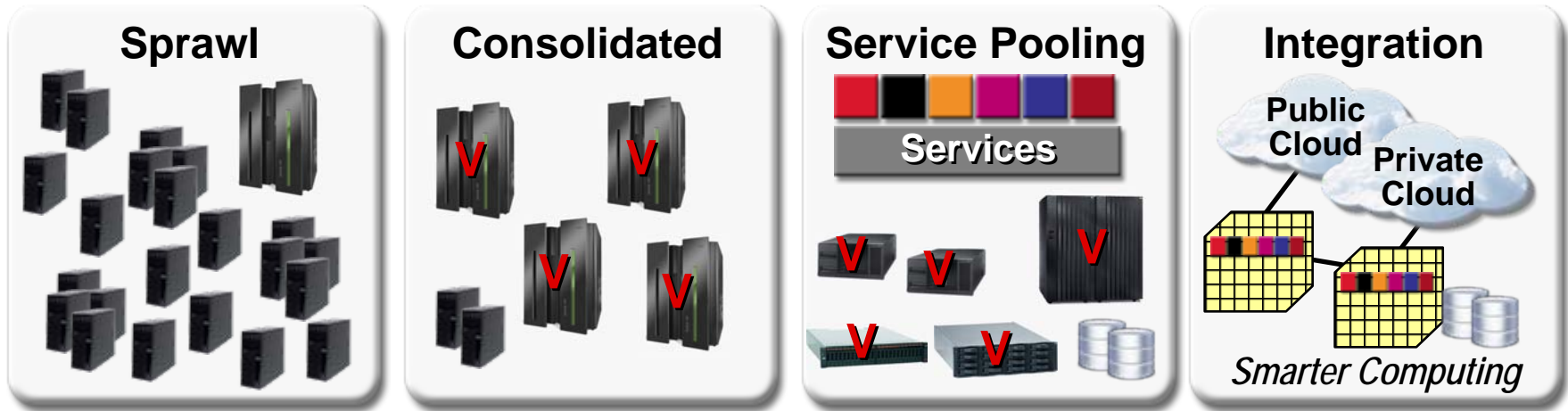


¹ Based on US Enterprise Linux Server pricing. Pricing may vary by country. Model configuration included 10 IFL cores running a mixed workload averaging 31 virtual machines per core with varying degrees of activity. Includes zEnterprise hardware and z/VM virtualization software. Does not include Linux OS or middleware software.

² 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.

IBM's Smarter Computing Transformation

IT Optimization



Key Technologies

- Comprehensive virtualization
- Ensembles and scalable servers
- Converged networks
- Service Oriented Architecture
- End-to-end service management
- Cloud computing services

IBM's Smarter Computing Transformation

***Consolidate & optimize
to dramatically reduce TCO***

**Average utilization increased
from <10% to 60%**

**Average reduction in TCO
of 70%**

**Total savings across 5700
migrations is ~\$50M**

**Total cumulative savings
project to date ~\$100M**

**Highest average TCO savings
achieved with migrations from
UNIX to Linux on z \$780 per
server per month**

***Virtualization & workload redeployment
drive further benefits***



**“Location view” of migrations
enables elimination of data
center fixed infrastructure**



**Timeframe for provisioning
resources cut from days or
weeks to hours**



**Creates space and frees up
resources for future workloads**

**Labor requirements reduced by 50%
through consolidation to System z,
freeing up resources to focus on
new services**

What is different about Linux on zEnterprise?

Virtualization with z/VM and zEnterprise

- **Do more with less**
 - Consolidate 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**
 - Exploit extensive z/VM facilities for life cycle management: *provisioning, monitoring, security, workload mgmt, capacity planning, charge back, patching, backup, recovery, ...*
 - Add hardware resources to an already-running system without disruption
 - Consolidation on a “scale up” machine like Linux on zEnterprise means fewer cables, fewer components to impede growth
- **More flexibility, minimize lead time for new projects**
 - Consolidating to a single zEnterprise server offers significant advantages in terms of flexibility
 - Rapid provisioning reduces lead time for new IT projects, helping to increase business agility

z/VM Version 6 Release 2

Accelerate the journey to smarter computing with multi-system virtualization and virtual server mobility

Features:

- Multisystem virtualization allows up to 4 z/VM instances to be clustered, serviced, and administered as a Single System Image (SSI)
- Live Guest Relocation (LGR) moves running Linux virtual servers without disruption to the business
- Provides a set of shared resources for the z/VM systems and their hosted virtual machines
- Scales up to four systems horizontally, each with up to 32 CPUs and 256 GB memory
- High server consolidation ratio with support for more virtual servers than any other platform in a single footprint

Benefits:

- Relief from the challenges associated with virtual machine sprawl on competitive systems
- Helps clients avoid planned outages for virtual servers when performing maintenance
- Provides a more manageable infrastructure for cloud computing
- Improved systems management to help manage the life cycle of the z/VM hypervisors and the virtual servers
- Enhanced workload balancing with the added ability to move work to available resource in addition to long standing capability to move system resources to work

What is different about Linux on zEnterprise?

Access to System z specific hardware

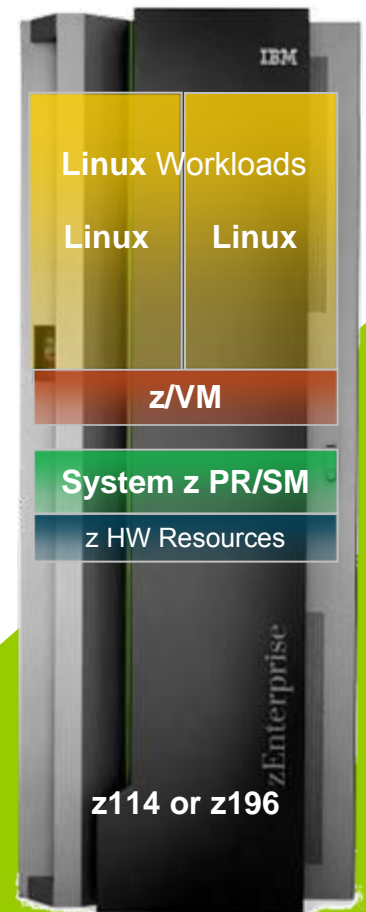
- HiperSockets for ultra-high speed communication between Linux images on the same machine
- OSA-Express3 for very high speed communication between systems
- Traditional mainframe and Open I/O subsystems
 - IBM DS8000 Enterprise Storage Systems
 - IBM XIV Storage System and Storwize V7000
 - SAN Volume Controller for other storage
- Crypto support – CPACF, CryptoExpress3

What is different about Linux on zEnterprise?

Built-in Security for Linux Workloads

- Industry's top-rated EAL5+ security classification* for hardware Logical Partitions
- 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
- Network security features to help address outside threats
- Encryption solutions to help secure data from theft or compromise

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



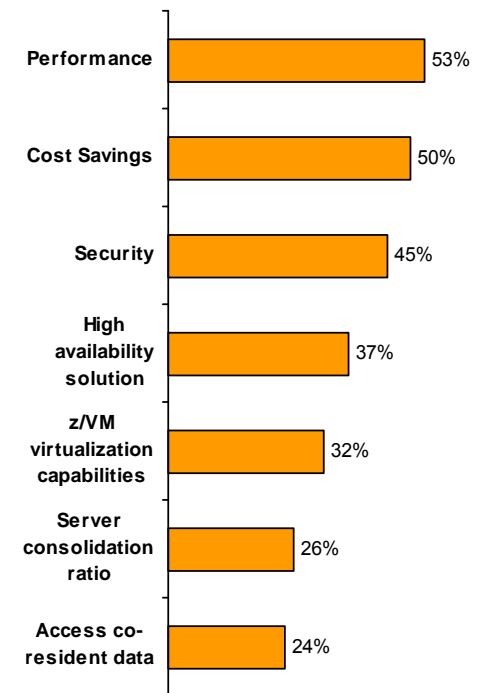
The Gold Standard for Security

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

Large-scale IT Optimization with Linux on zEnterprise

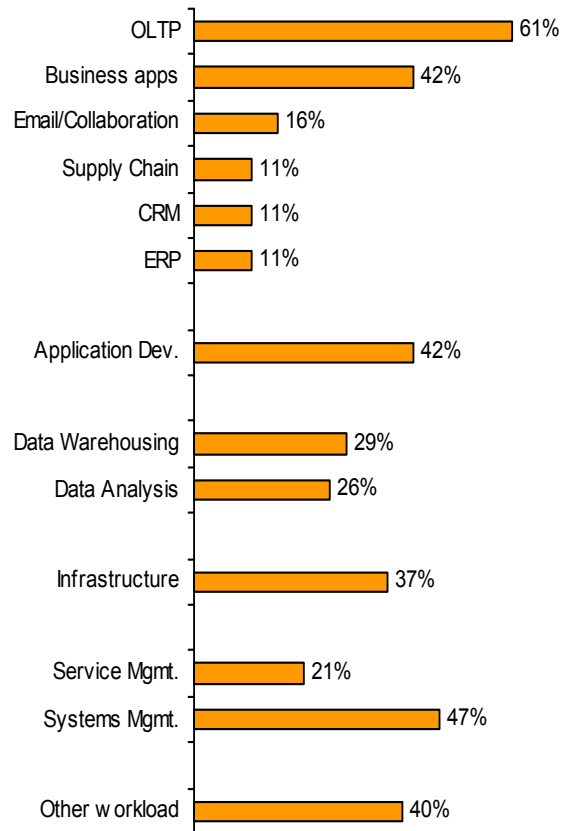
- **Economics of Linux (IFL) Specialty Engines**
- **TCO versus Total Cost of Acquisition**
- **High Availability requirements**
- **Disaster Recovery requirements**
- **Open standards and Linux**
- **Customer data on System z**
- **Increased Performance requirements**
- **'Green' value from System z**
- **Virtualize everything with up to 100% utilization rates**
- **Highest security rating or classification for any commercial server**
- **zEnterprise is the only Heterogeneous platform in the industry**

Client feedback: Reasons to run workloads on Linux on System z



Percentage of survey respondents.
Source: Oct2011 IBM Market Intelligence

Client Feedback on Best Fit Workloads



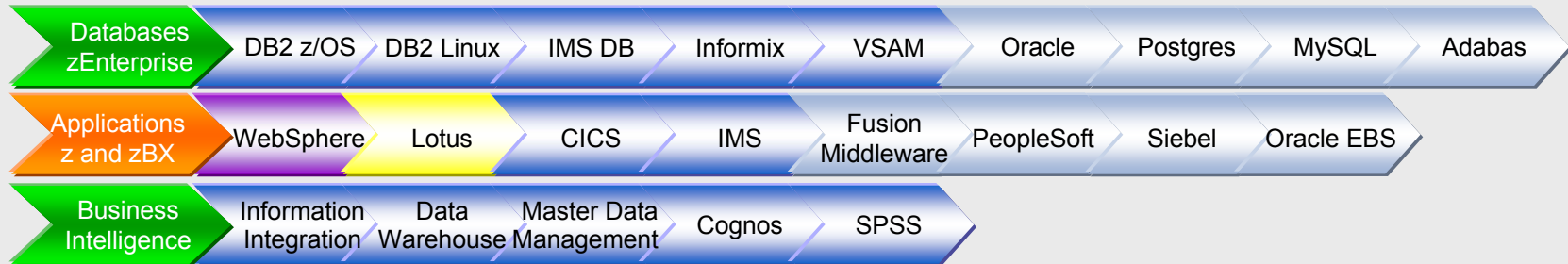
Percentage of survey respondents.
Source: Oct2011 IBM Market Intelligence

Recommended “best fit” workloads:

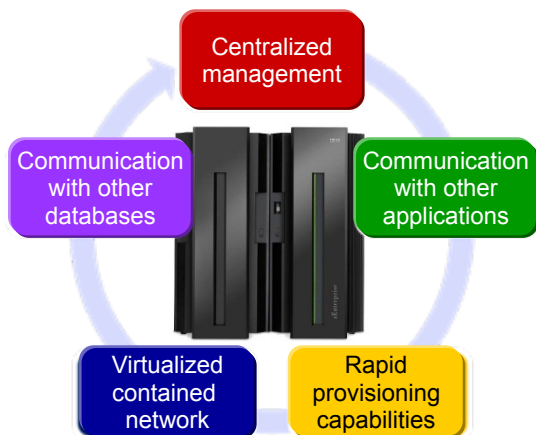
- **Data services:** Cognos, SPSS, DB2, InfoSphere, Informix[®], Oracle Database, Builders WebFOCUS, ...
- **Business applications:** WebSphere, SAP, Oracle E-Business Suite, ...
- **Development & test:** e.g. of WebSphere / Java applications, ...
- **Email & collaboration:** Lotus Domino[®], Lotus Collaboration products, Web 2.0, ...
- **Network Infrastructure:** FTP, NFS, DNS, ...;
Business connectors: WebSphere MQSeries[®], DB2 Connect[™], CICS[®] Transaction Gateway;
Security Services: Firewall, Proxy, ...
- **Cloud Management:** Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS), Business Process as a Service

Foundation for Data, Analytic and Applications

Supports and Integrates Data Like No Other Platform



- Consolidation and integration of databases
- Tight integration of data and applications
- Business Intelligence close to the data



- The only platform that can run nine commercial databases, supported at the same time
- Better align and synchronize data, for data integrity. Use the internal architecture to consolidate database communications
- Leverage internal networking between databases and applications
- Centralize management across entire enterprise

Deploy Oracle Software to the “Best Fit” Technology Tier to meet Business Requirements

- IT Optimization and server consolidation with Linux on System z provide an excellent price performance for Oracle software.

<p>Oracle Database 11g Release 2 Version 11.2.0.3</p>	<p>Oracle E-Business Suite 12.1.x native on Oracle Database 11g Release 2</p> 
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- Oracle workloads consolidated and managed end to end as single system
- Fewer resources to manage Oracle operations reducing exposure to operational errors and downtime
- Extensive automation and intelligent workload management capabilities help manage and optimize all aspects of IT services
- zBX does run all Oracle applications certified on supported operating environments

TRANSZAP

Being able to virtualize Oracle and other applications with z/VM on System z and having Linux as the operating system foundation have provided Transzap with significant advantages.

“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 of Transzap, Inc.

Application Server Consolidation

Server consolidation and virtualization with zEnterprise offers a number of advantages:

- It enables organisations to make better use of modern multi-core processors.
- It reduces the number of physical servers that need to be managed and maintained.
- It reduces the cost of managing individual workloads freeing up budget to put back into the business.
- It improves overall system reliability by reducing the amount of manual administration (a major factor in system reliability) required.
- It reduces the energy consumption and might free up sufficient space in the data center.
- It enables near memory-speed network technology for application to data communication.
- It enables high qualities of service provided by the System z.

To regain control of our SAP IT infrastructure, for example, consolidation and virtualization onto zEnterprise is an efficient way.



"We had no issues with the migration - in fact, none of our users even noticed the change-over. What they did notice, however, was an improvement in response times as the performance of the Linux operating system on System z is so good.

The superb scalability of the solution gives us the confidence that we can easily accommodate future growth."

- Aribert Starnell, Division Manager,
Production Computer Center at
Endress+Hauser InfoServe

The Industry's Only Multi-Architecture Cloud Solution

Security

Extending System z Security to a Private network across heterogeneous resources

Availability

Resiliency management and fewer points of failure

Virtualization

1000s of virtualized systems across a heterogeneous resource pool

Efficiency

1/4 network, 1/25th floor space, 1/20 energy, 1/5 administration

Scalability

A new dimension of scale infrastructure capable of a Trillion Instructions per second

Multi-architecture cloud optimization

- Optimize your cloud services with an integration of System z, Power™, and x86 applications
- Manage your heterogeneous infrastructure at a platform level from a single point of control with the System z Unified Resource Manager
- Provide visibility, control, and automation across this virtualized environment with the Tivoli® Integrated Service Management suite of products for zEnterprise



"The IBM System z Solution Edition for Cloud Computing eliminates the trouble and expense of buying and managing new infrastructure Moreover, as demand for a solution increases, the cloud can simply allocate more resources, so there is no problem with scalability."

- Professor Visaggio, full professor of Software Engineering at the University of Bari

zEnterprise Blades Complement Linux on z/VM Consolidations

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

- **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
 - Use 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

BG-Phoenics

BG-Phoenics extends the benefits of mainframe computing

With the world's first production deployment of IBM zEnterprise with the zBladeCenter Extension

Overview

The need

BG-Phoenics wanted to improve the quality of service for multi-tier applications running on multiple operating systems and hardware platforms, while preserving flexibility and cutting complexity.

The solution

Installed two IBM® zEnterprise™ 196 servers, each with a zEnterprise BladeCenter® Extension with two IBM POWER7® processor-based blade servers and two Intel Xeon processor-based blade servers.

The benefit

The IBM zEnterprise System brings multiple platforms into a unified solution, controlled using IBM zEnterprise Unified Resource Manager, reducing complexity and cost while enabling greater flexibility.

BG-Phoenics GmbH offers a comprehensive set of IT infrastructure and software services to social security institutions and professional associations in Germany. Combining years of experience in IT services with deep industry knowledge and advanced technological capabilities, BG-Phoenics provides innovative solutions ranging from complete IT outsourcing to the development of new business software. The company operates out of two data centers and 12 offices in major cities throughout Germany, serving a total of 5,800 users in more than 130 locations.

As social insurance institutions, many of the organizations that BG-Phoenics serves have statutory obligations to their members to ensure efficient, effective and secure information processing at low operational costs. To support these clients, BG-Phoenics aims for extremely high standards in the availability and performance of its IT infrastructure. It also aims to ensure maximum security for sensitive data—this is especially important for ‘multi-tenanted’ environments in which different clients are hosted on the same physical infrastructure.

To keep pace with evolving demands from customers, BG-Phoenics needed to build a new IT infrastructure that would combine high flexibility with low cost of ownership. Randolph Sigmund, Team Leader Operating Systems/Systems Management at BG-Phoenics, comments: “Our vision was to have a single platform that would combine the best features of the three architectures we were already using. We wanted the security, robustness and scalability of the mainframe, with the processing power and broad enterprise application support of the Unix world, plus the low costs and scale-out capability of x86 systems.”

As the number and scale of multi-tier applications at BG-Phoenics grew, the company was seeing a corresponding increase in complexity and management costs for its existing infrastructure. In general terms, BG-Phoenics observed that hardware acquisition costs were falling over time, that software costs were relatively static, but that personnel and other operational costs (including powering and cooling hardware) were rising steeply. The company's vision was to simplify and integrate the different elements of its infrastructure in order to reduce costs and

BG-Phoenics runs Lotus Domino servers for email and collaboration on Linux, hosted on z/VM on the z196 servers. These Lotus Domino servers are connected to IBM CommonStore for Lotus Domino Server, which runs on AIX on the PS701 blades.

Email is still highly important; using Linux makes it cost-effective to run this service on the ultra-reliable z196 hardware with the efficiencies of virtualization on z.

“We can run z/OS® and Linux on the z196 servers, IBM AIX® on Power Systems™ blade servers in the zBX, and both Linux and Microsoft Windows on Intel-architecture blades in the same zBX. All the hardware can be monitored and controlled using zEnterprise Unified Resource Manager.

Standardization brings a host of benefits: faster and more transparent processes; reduced administration and lower training costs; improved quality; easier automation; and greater consistency, translating to reduced long-term cost of ownership.” - Randolph Sigmund, Team Leader

Operating Systems/Systems Management at BG-Phoenics

The IBM zEnterprise System brings multiple platforms into a unified solution, reducing complexity and cost while enabling greater flexibility.



Eurocontrol



Eurocontrol consolidates IT environment into virtual hybrid datacenter

Challenge

Consolidation of IT environment

Solution

Virtual hybrid datacenter based on IBM System zEnterprise Server

Key benefits

Easier management, flexibility, faster applications, greater capacity, even greater availability, scalability, cost savings

At the European air traffic management organization Eurocontrol, located at Maastricht The Netherlands, it's all about managing air traffic in the safest possible way. Substantial amounts of data, such as flight data, personnel deployment and training scenarios, are continuously processed in real time into useable information. A reliable and efficient IT environment is crucial to this task. To achieve such a smart datacenter, Eurocontrol and IBM are consolidating part of the present server environment into a virtual hybrid datacenter based on an IBM System zEnterprise Server with Linux as operating system. This is to result in a better view on operations, more flexibility, faster responding applications, greater capacity, higher availability of the infrastructure and considerable cost savings on supervision, licenses, floor space and energy.

The intergovernmental organization Eurocontrol, established in 1960 to ensure the safety of the increasing level of European air traffic and currently made up of 39 Member States, aims at achieving a safe, efficient and environmentally-friendly air traffic operations.

The organization supports the European Union in delivering a Single European Sky to meet the safety, capacity and performance challenges of European aviation in the 21st century. Eurocontrol has units at Brussels (Headquarters, Central Flow Management Unit, Central Route Charges Office), Paris (R & D), Luxemburg (Educational Institute) and Maastricht.

The Maastricht Upper Area Control Centre (MUAC), the air traffic control center in Maastricht, is managed by four countries: Belgium, the Netherlands, Luxembourg and Germany. The center has been controlling the air traffic since 1972. Eurocontrol MUAC is today responsible for the safety of all air traffic above 24,500 feet (approximately 7,500 meters) in the Benelux, north-west Germany and above the North Sea.

The importance of IT

Since its establishment, Eurocontrol MUAC has been using a unique platform for its applications and tools to safely control the air traffic in its area of responsibility. Next to the extensive functionality of its applications for displaying the actual air situation picture in an unambiguous manner, a high demand exists for an IT infrastructure that is extremely reliable, not only protected for unplanned outages but also capable for

Eurocontrol are consolidating part of the present server environment into a virtual hybrid datacenter based on an IBM System zEnterprise Server with Linux as operating system.

“IBM’s virtualization technology in zEnsemble completely meets our expectations for a heterogeneous virtual environment that demands a high level of availability, flexibility, scalability and sustainable performance, as well as environmental friendliness and manageable, low costs.

The open source Linux operating system ensures that we have less dependencies on suppliers and manufacturers of hardware and software platforms.”

- Huub Meertens, Head of the SUP Engineering Section at Eurocontrol MUAC

The success of this project has been the trigger for a new IT strategy for the complete data centre to consolidate applications onto a minimum number of servers and to make Linux the standard operating system.

(The zEnterprise) environment is extremely well suited to operate Linux on System z, as well as to operate Linux on Intel blades and Power blades.



zEnterprise offers an ideal platform for solving the Server Sprawl Problem with effective IT Optimization



- Simplified IT infrastructure inside a single zEnterprise
- Tight workload integration
- Highly scalable, flexible and secure
- Business continuance that help avoid downtime
- Pay less as you run more



Backup

Why Linux on zEnterprise?

Why zEnterprise?

- Designed to run mixed workloads at very high utilization
- Highest degrees of efficiency, availability, workload management and security
- Cost efficient use of floor space, power, cooling
- Designed and implemented for zero downtime
- Mature and tested operational procedures to cope with exceptions
- Skilled and experienced staffs
- Comprehensive automation
- No single points of failure

Why z/VM virtualization?

- IBM's most mature and robust hypervisor
- Tightly integrated with zEnterprise hardware support
- Provides consolidation of many virtual Linux instances in a single hardware logical partition (LPAR)
- Enhanced management functions for virtual images
- Larger workloads with more scalability
- Grow virtual server workloads without linearly growing energy costs

Why run Linux as a z/VM Guest?

- Share CPU, memory, network and security hardware resources
- Server consolidation saves power, space and management costs
- Rapid and agile provisioning and de-provisioning of Linux servers
- Linux can transparently take advantage of zEnterprise hardware
- z/VM provides high performance communication between guest virtual machines and across LPARs
- Linux instances can automatically benefit from the disaster recovery solutions that are in place
- Potential for dramatic software cost savings - software is licensed at distributed rates

So ... what's different with zEnterprise?

Availability	Near zero downtime/continuous availability, even during maintenance of HW, OS, database and application components. Enhanced disaster recovery responsiveness.
Efficiency	Reduced infrastructure complexity through consolidation, automation and virtualization, saving on energy, labor, SW, and more. Management of the end to end applications, fast private network, fewer hops and points of failure. High resource utilization.
Scalability	Flexibility and near-linear large scalability, unmatched in the IT world, to grow with your business. Superior virtualization with z/VM. Unprecedented scale.
Integration	Capability to handle the largest volumes of data, in a day and age when data is booming. Tight integration and simpler management of data and applications on one system. Homogeneous system environment.
Security	Comprehensive protection of critical data from all IT security threats. Private server network.
Affordability	Improved price performance with Solution Editions for Enterprise Linux.



Insurance Company Consolidated 292 Servers to a z10

Before

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

Over 600 Cables

Backbone

Network

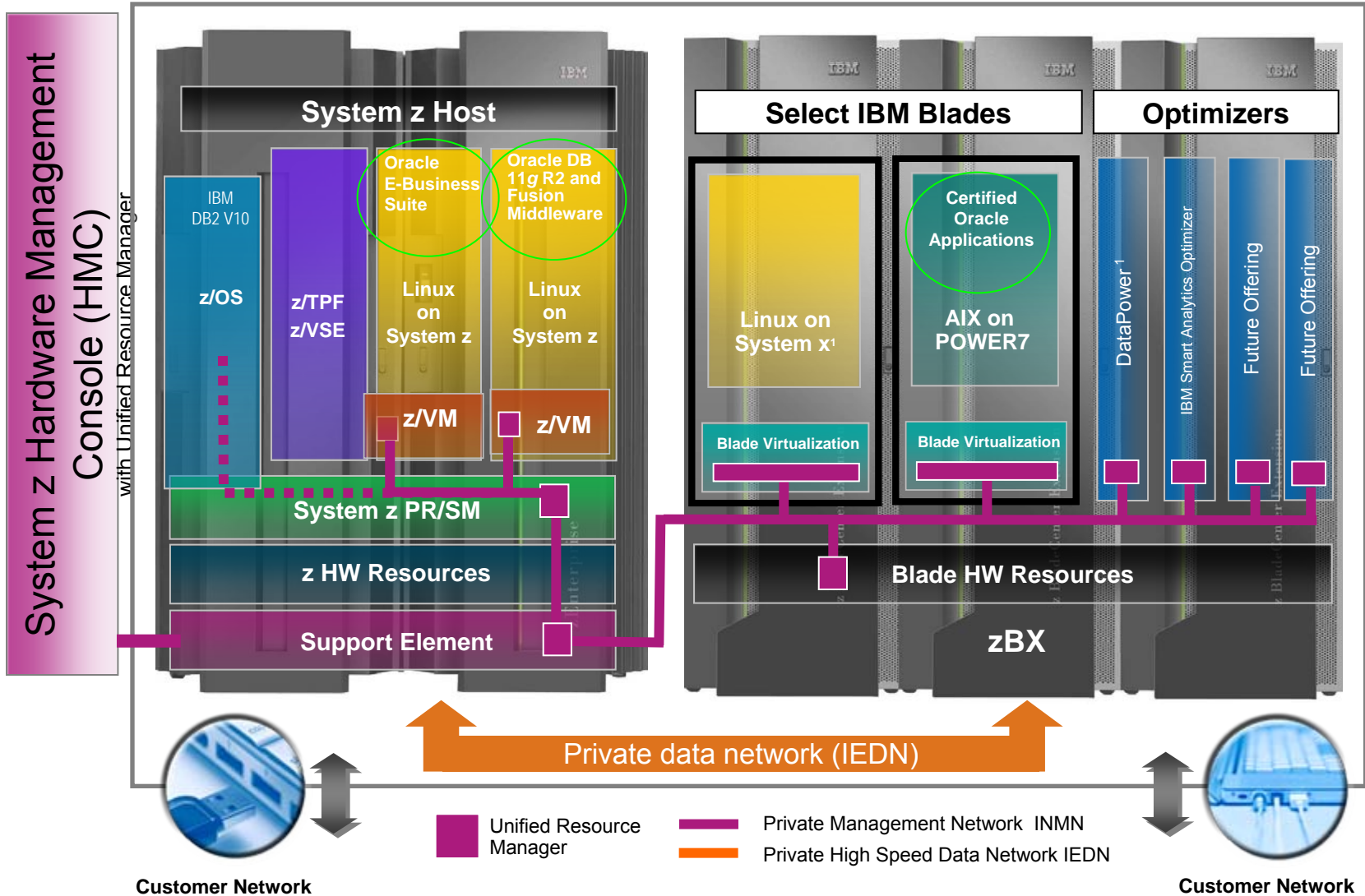
The diagram only shows **30** of **292** servers

After

Backbone

Just 10 Cables!

Examples of Oracle Solutions on zEnterprise System



Reliable and Scalable Business Collaboration

Imagine the Possibilities on zEnterprise



IBM Lotus Domino



IBM Lotus Sametime

- Post chat to an Activity
- Post chat to Community Forum
- Business Card



IBM Lotus Quickr

- Add page to Activity
- Publish to Quickr
- Community Wiki



IBM Lotus Connections

- Improved Communities & Search
- Mobil Access
- Social Networking

Lotus knows the value of people.

Lotus collaboration software on Linux on zEnterprise is enabling clients to work smarter with adaptive collaboration.

- **Empower individuals** to be ... more effective, responsive, innovative, and engaged
- **Enabling organizations** to reduce costs, deepen relationships, increase productivity, and innovate efficiently

Lotus offers solutions to deliver:

- **Exceptional web experience**
- **Social Software**
- **Collaboration**
- **Messaging**

Business Intelligence and Predictive Analytics

IBM Cognos BI and SPSS

- **Integrated technology stack creates compelling value for IT**
 - Predictive Analytics, BI, DW on, highly scalable and secure System z platform
 - Low cost, easy to manage
- **Integrated technology stack creates compelling value for the Business User**
 - Makes Predictive Analytics accessible to the Business User
 - Cognos node: Outcome of Predictive Analytics accessed through Cognos reports, KPI, Dashboards
- **Integrated technology stack maximizes performance, regulatory compliance and lowers costs**
 - No need to move data to a different platform
 - No need to manage a different platform



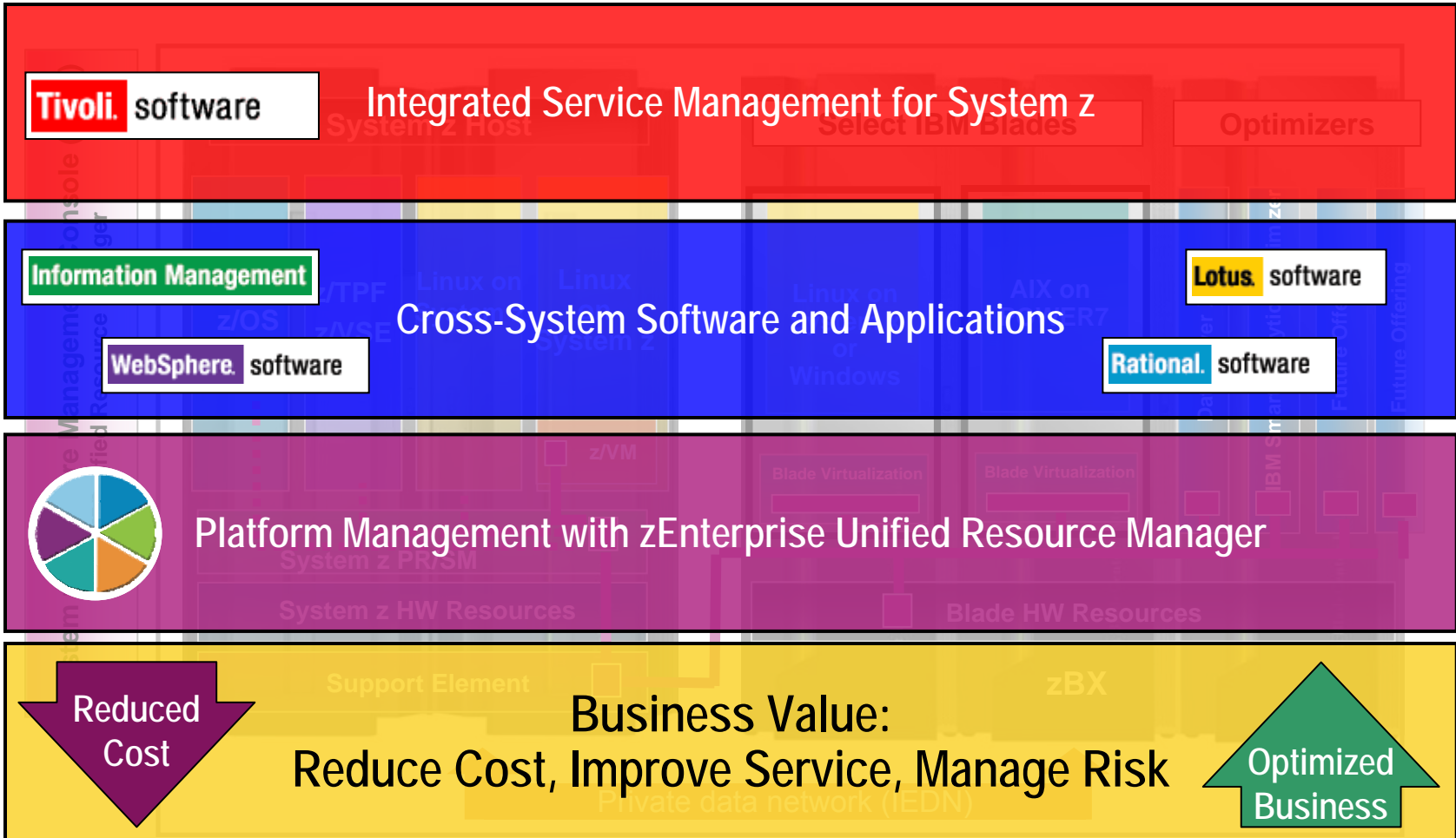
Miami-Dade County selects IBM System z platform to expand their IBM Cognos 8 BI enterprise infrastructure

Its ease of deployment and management, combined with the ability to provide simplified and faster access to data, has enabled Miami-Dade County to enhance its BI functionality and scalability, while also saving in the hardware and software costs associated with expanding their BI infrastructure.

The benefits of the Integrated Technology stack are difficult to replicate.

Workload Optimization with Operational Certainty and Efficiency

Using zEnterprise for “Best Fit” Cloud Computing



Deploy Workloads on Best-Fit-Architecture for Efficiency and Innovation

- Over 7,000 applications supported on z/OS & Linux for System z
- zBX enables a broader set of applications
 - ▶ AIX on Power Blades
 - ▶ Linux on System x Blades
 - ▶ Windows on System x Blades



Freedom of choice

Utilize the best fit architecture – System z, RISC, x/86