Siegfried Langer
Business Development Manager z/VSE & Linux on System z

Optimizing IT through Workload Consolidation

WAVV Conference
Covington, Kentucky
April 7-10, 2013

Discussion Topics

§ **Business drivers for IT optimization and consolidation**
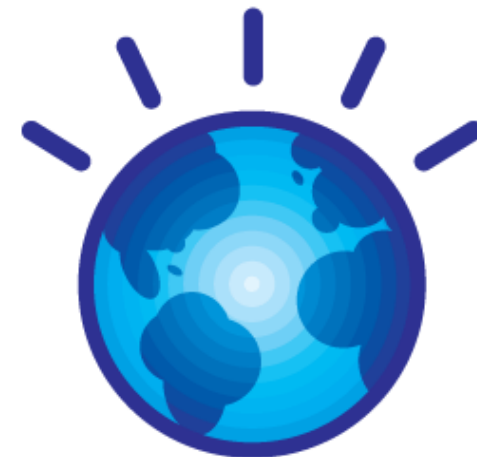
§ **Extreme virtualization**

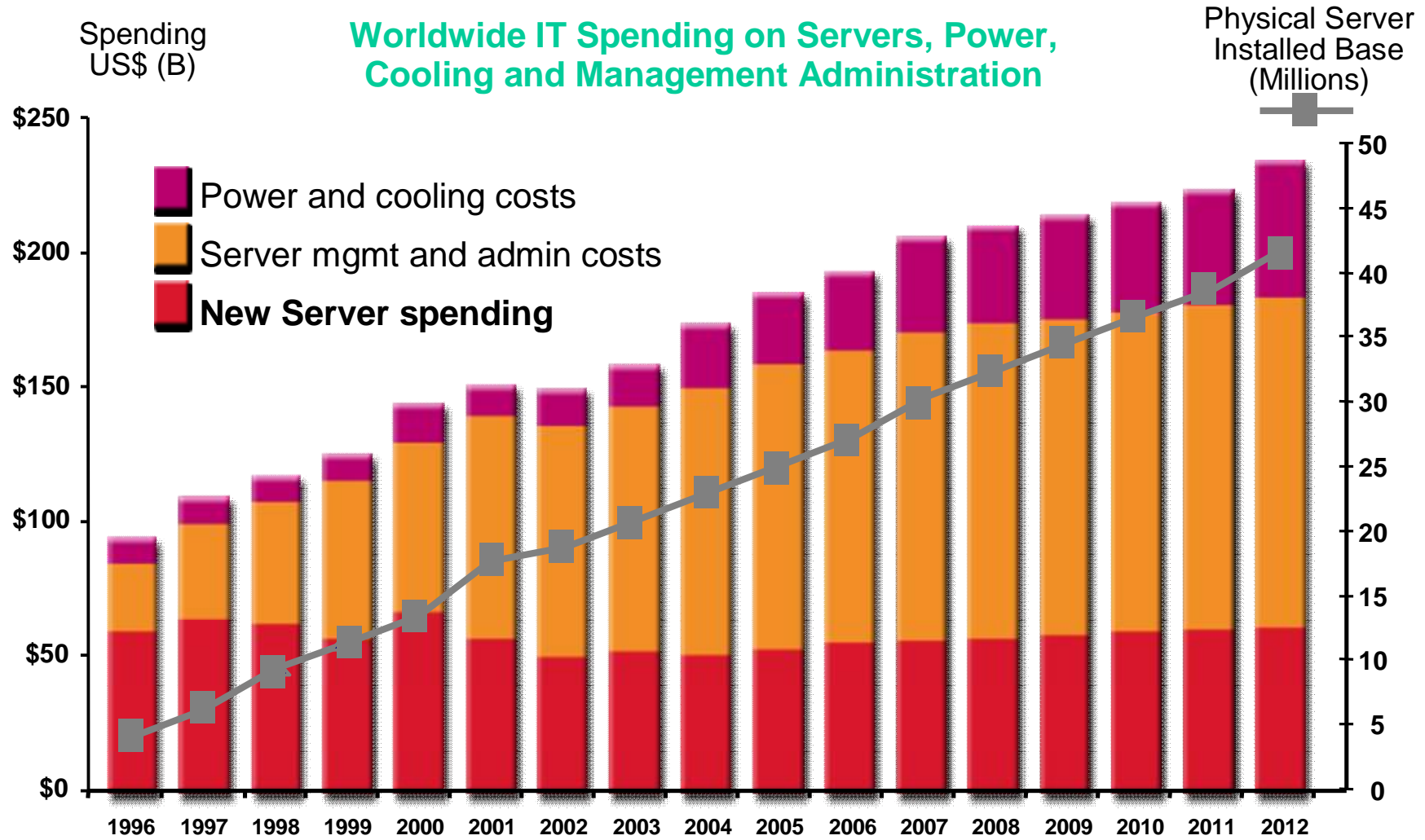§ **Performance aspects**

§ **Benefits and savings**

§ **Platform selection**

§ **Hybrid computing with IBM zEnterprise**™

§ **Cloud Computing**

IBM

IT Operating Costs Are Out of Control

Spending
US$ (B)

Worldwide IT Spending on Servers, Power, Cooling and Management Administration

Physical Server
Installed Base
(Millions)

Legend:
- Power and cooling costs
- Server mgmt and admin costs
- **New Server spending**

Source: IDC
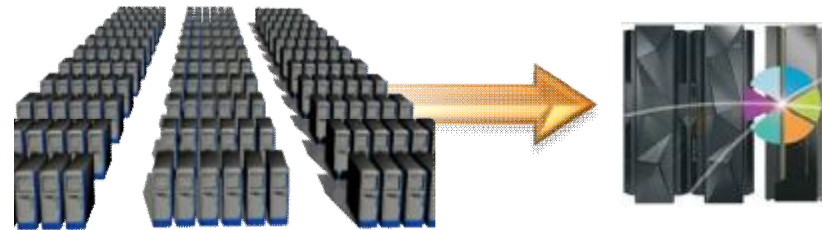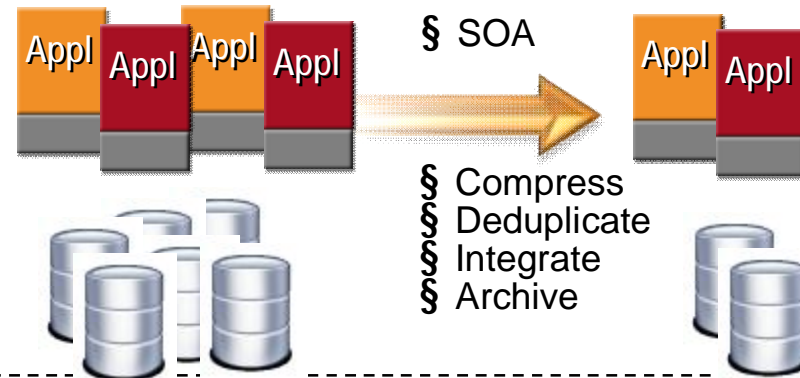
3

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Strategies to Reduce Costs and Improve Value

Optimize the Overall IT Environment

Consolidate Hardware Infrastructure

Eliminate Redundant Software and Data

Appl Appl Appl Appl

§ SOA

Appl Appl

§ Compress
§ Deduplicate
§ Integrate
§ Archive

Integrated Service Management

Improve Service Delivery

Visibility   Control   Automation   Cloud Computing

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Utilization of Distributed Servers

Provision for expected growth

Provision capacity for peak workload

Idle Resource

Idle Resource

Idle Resource

Average utilization

Workload

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
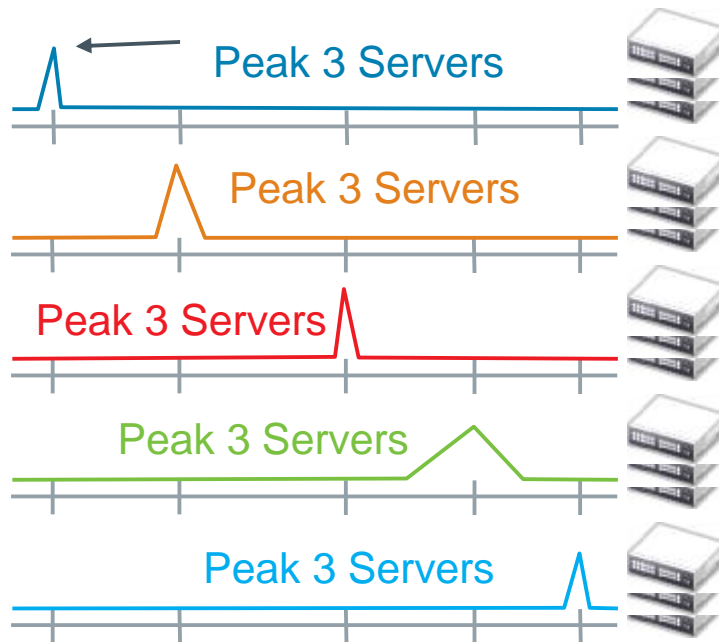
Server dedicated to one application
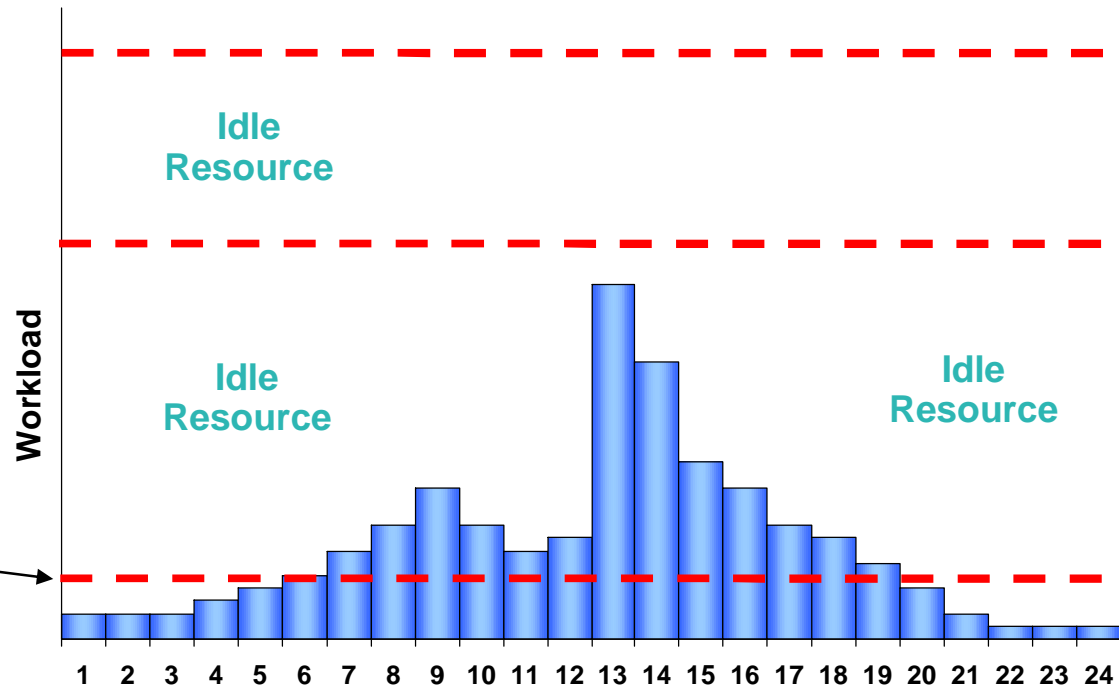
▶**Typical utilization of Windows Servers 5 – 10%**

▶**Typical utilization of UNIX Servers 10 – 20%**

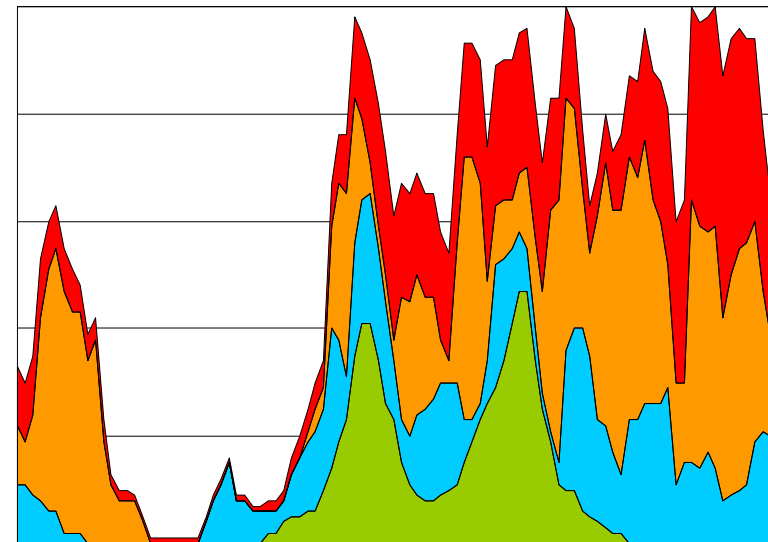▶**Typical utilization of System z Servers 85 – 100%**

Why High-End Servers?

Utilization on x86 systems

Peak 3 Servers

Peak 3 Servers

Peak 3 Servers

Peak 3 Servers

Peak 3 Servers

According to a study by Gartner, data centers that do not use virtualization have an average server CPU utilization rate of only 15%.

Mixed Utilization on IBM High End Servers

IBM High End Server: Up to 100% utilization

– Highly virtualized and shared resources

– Fewer servers, less power, cooling & admin

– Optimized use of SW assets

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IBM

Optimized Computing: Nationwide's Linux on System z Virtualization Reduces TCO and Time to Deploy

Nationwide was already experiencing serious technology pain points from the continuous growth of its business. Among these were:

- *Too many distributed physical servers with low utilization*
- *A lengthy provisioning process that delayed the implementation of new applications for headquarters and agencies, and for new customers for Nationwide's human resources outsourcing business*
- *Limitations in data center power and floor space*
- *High Total Cost of Ownership (TCO)*
- *Difficulty allocating processing power for a dynamic environment.*

Nationwide
Insurance

> *"Our goal was server optimization and our approach was virtualization."*
>
> — Guru Vasudeva, Nationwide vice president and CTO

TCO results that Nationwide has experienced:

- Monthly Web hosting fees have gone down by 50 percent.

- Hardware and operating system support needs have decremented by 50 percent.

- CPU utilization is up an average of 70 percent, with the elimination of many physical servers with below average utilization.

- Middleware licensing costs for WebSphere, Oracle, and UDB have dramatically fallen.

- There has been an 80 percent reduction in data center floor space needs, and power consumption is down.

- The net of the effort is a $15 million savings for Nationwide IT over the past three years.

www.mainframezone.com/it-management/optimized-computing-nationwides-linux-on-system-z-virtualization-reduces-tco-and-time-to-deploy

Discussion Topics

§ Business drivers for IT optimization and consolidation

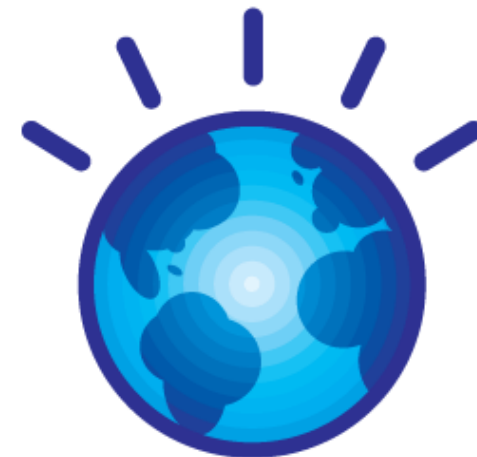§ **Extreme virtualization**

§ Performance aspects

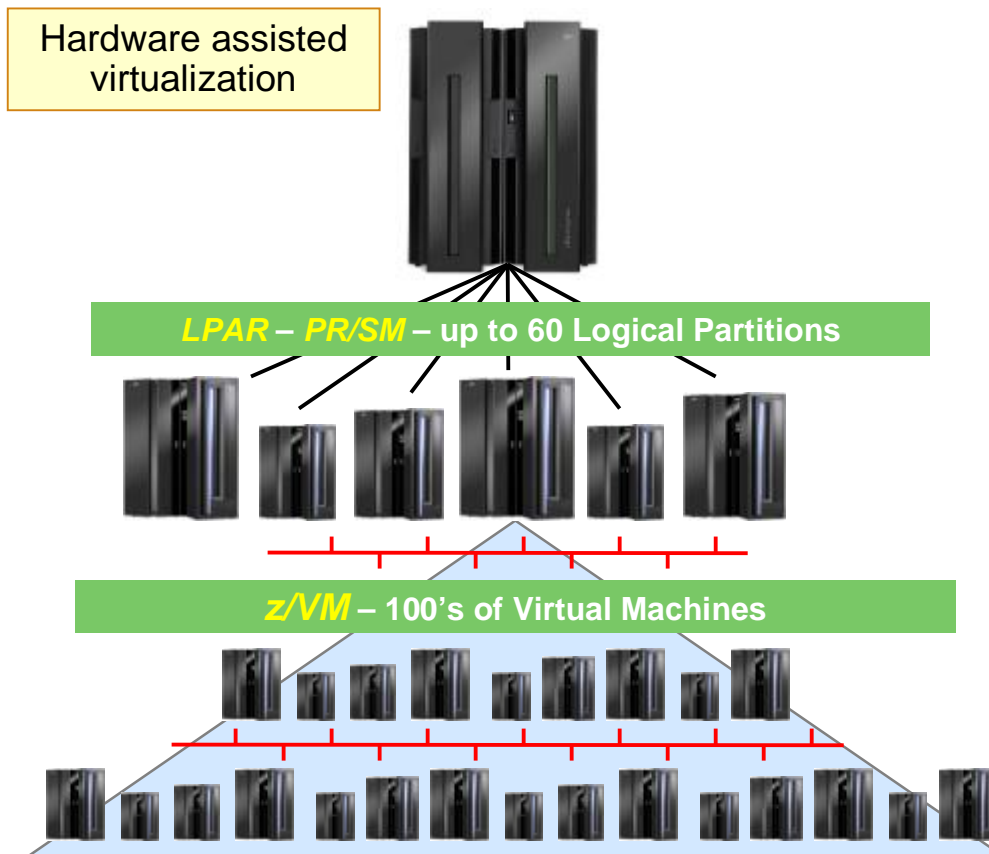§ Benefits and savings

§ Platform selection

§ Hybrid computing with IBM zEnterprise™

§ Cloud Computing

System z – Extreme **Virtualisation**
Build-in and Shared Everything Architecture

Hardware assisted virtualization

LPAR – PR/SM – up to 60 Logical Partitions
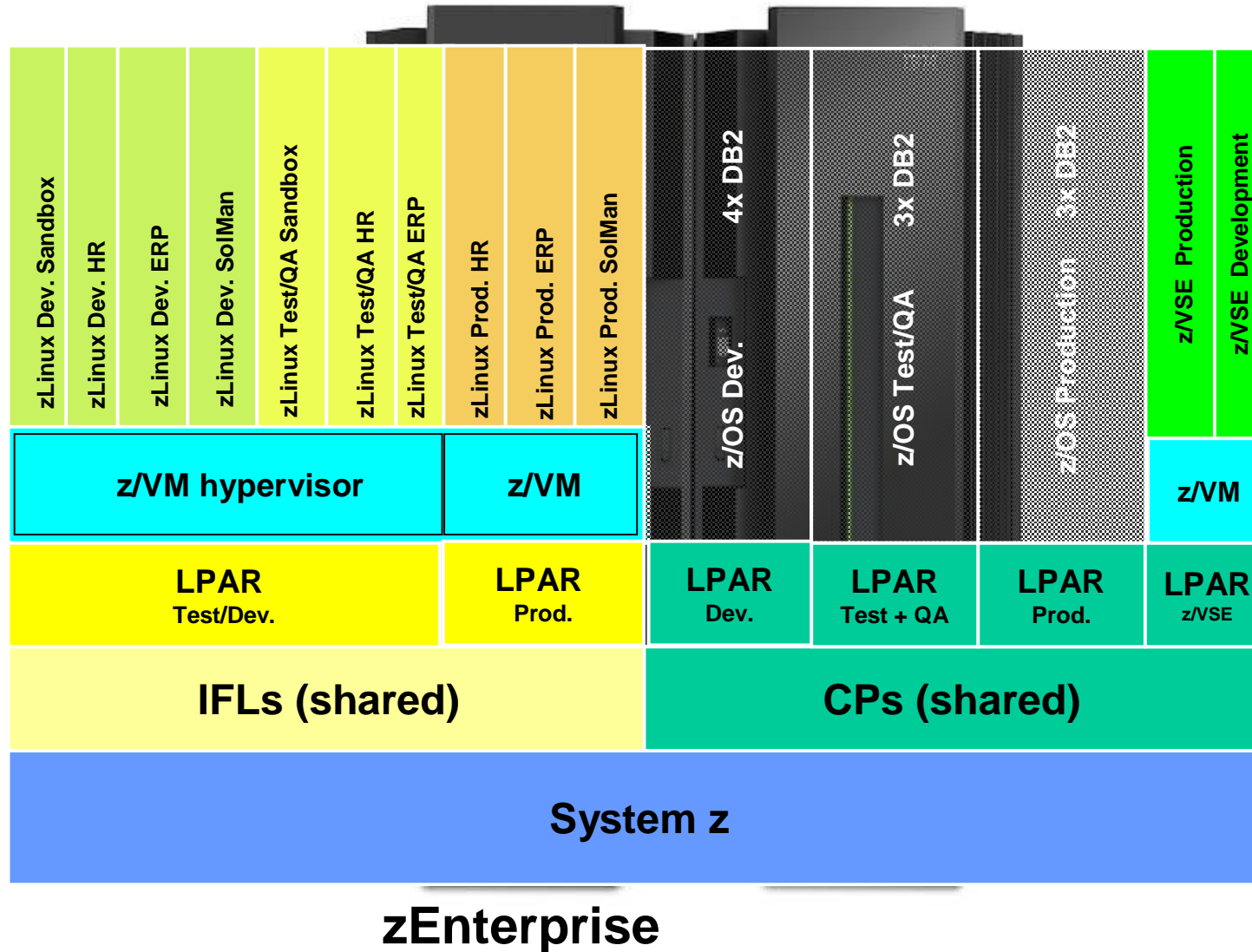
z/VM – 100's of Virtual Machines

System z

- Provisioning of virtual servers in seconds
- High granularity of resource sharing (<1%)
- Upgrade of physical resources without taking the system down
- Scalability of up to 1000's of virtual servers
- More with less: more virtual servers per core, sharing of physical resources
- Extensive life-cycle management
- HW-supported isolation, highly secure (EAL5 or EAL4+ certified)
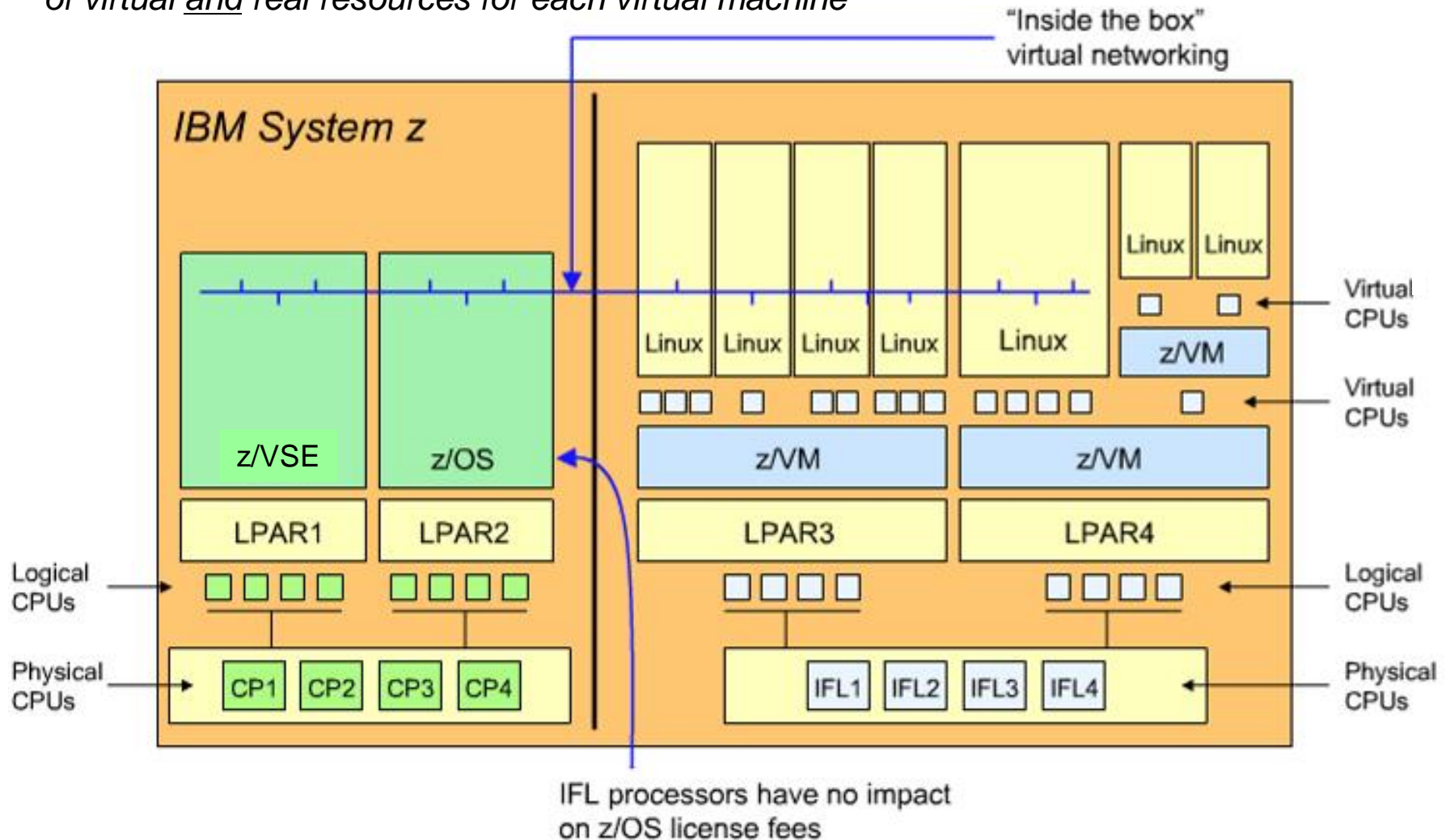
Distributed platforms

- Limited virtual server scalability per core
- Scaling requires additional physical servers
- Operational complexity increases with growth of virtual server images
- VMware, Xen, Hyper-V focus on x86, no HW management across multiple platforms

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Virtualization example – SAP

Extreme Virtualization with z/VM

z/VM can massively scale a virtual server environment with a mix of virtual and real resources for each virtual machine

"Inside the box" virtual networking

IBM System z

| Linux | Linux |

Virtual CPUs

z/VM

Virtual CPUs

| Linux | Linux | Linux | Linux | Linux |

z/VSE | z/OS

z/VM | z/VM

LPAR1 | LPAR2 | LPAR3 | LPAR4

Logical CPUs

Logical CPUs

Physical CPUs

| CP1 | CP2 | CP3 | CP4 |

| IFL1 | IFL2 | IFL3 | IFL4 |

Physical CPUs

IFL processors have no impact on z/OS license fees

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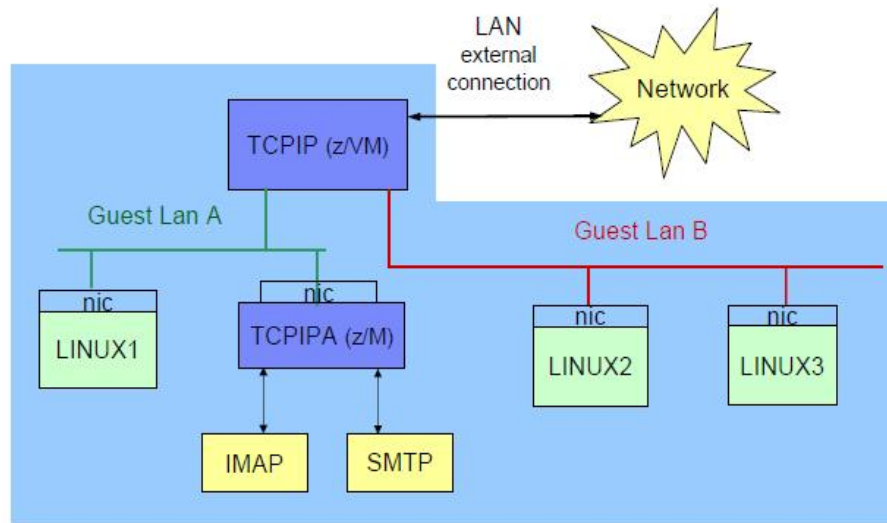# Network Virtualization

§ HiperSockets between LPARs

§ z/VM virtualizes network connectivity
  – VLAN
  – VSWITCH
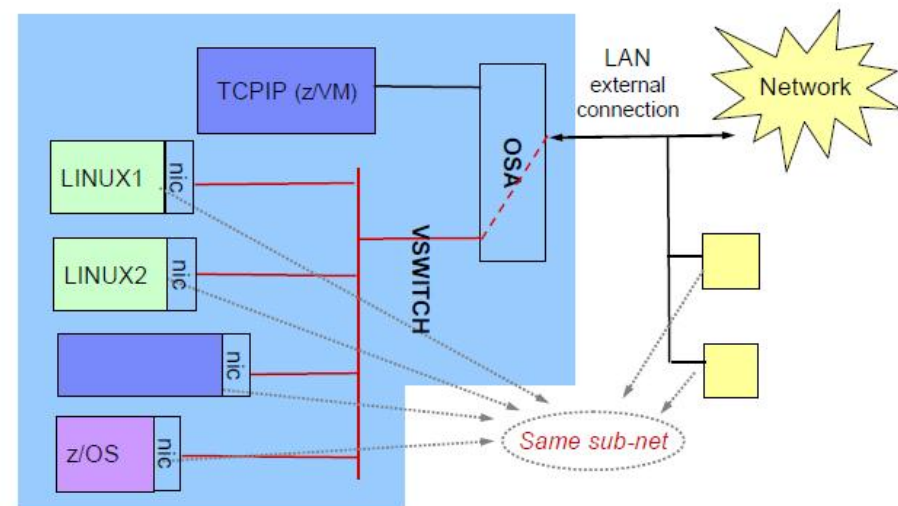
§ Virtual connectivity uses memory to memory connections
  – Very high bandwidth
  – Low latency
  – Internal – no physical devices

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Multi-system Virtualization for increased Scalability and improved Manageability - *z/VM v6.2*

§ Multi-system virtualization allows up to four z/VM instances on other LPARs or other mainframes to be clustered as a **Single System Image (SSI)** and provides increased horizontal scalability and improved manageability

  ► Provides a set of shared resources for the z/VM systems and their hosted virtual machines

Multiple CTCs for ISFC-based SSI communications

Member 1

Member 2

Member 3

Member 4

Shared volumes

Non-shared volumes
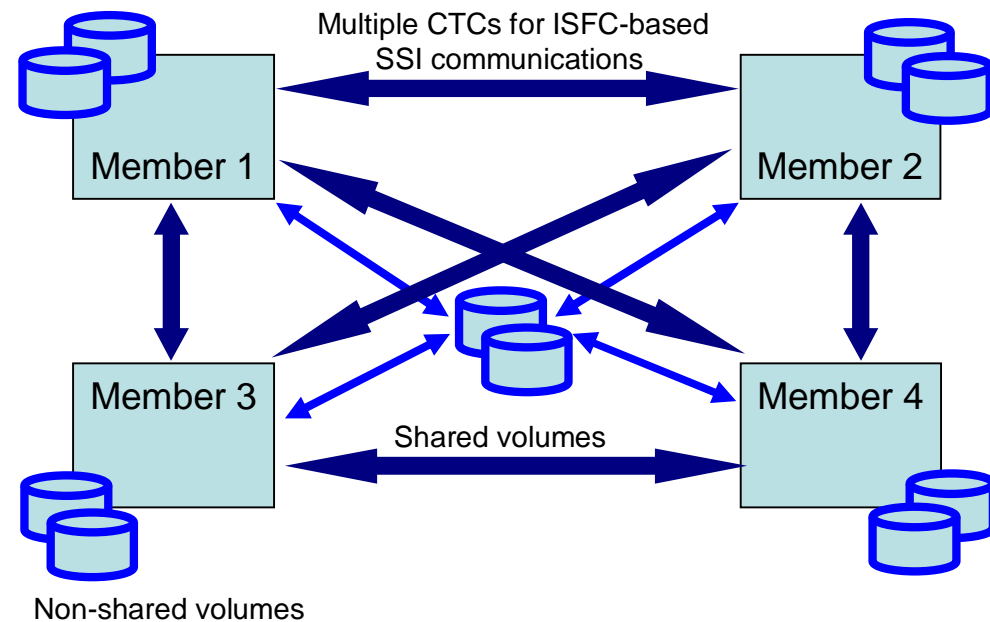
§ Live Guest Relocation (LGR) **moves virtual servers non-disruptively to another LPAR on the same or another mainframe server in the single system image**

  – Non-disruptively move work to available system resources, in addition to long-standing capability to non-disruptively move system resources to work

Discussion Topics

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§ **Extreme virtualization**

§ **Performance aspects**

§ **Benefits and savings**

§ **Platform selection**

§ **Hybrid computing with IBM zEnterprise™**

§ **Cloud Computing**
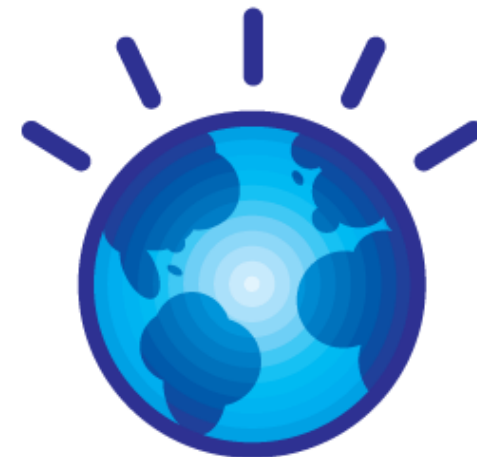
Linux on System z – Unique Advantages based on IBM System z and z/VM Technology Innovation

z/VM V6.2

RHEL6

SLES11

z/VM V6.1

zEC12

z/VM V5.4

z196   z114

SLES10   RHEL5

z/VM V5.3

z/VM V5.2

RHEL3

RHEL4 & SLES9

z10 EC   z10 BC

SLES8

z/VM V5.1

SLES7

SuSE 7.0

z/VM V4.4

z9 EC   z9 BC

z/VM V4.3

z/VM V4.1/V4.2

z990   z890

G5   G6   z900   z800

| 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 … |

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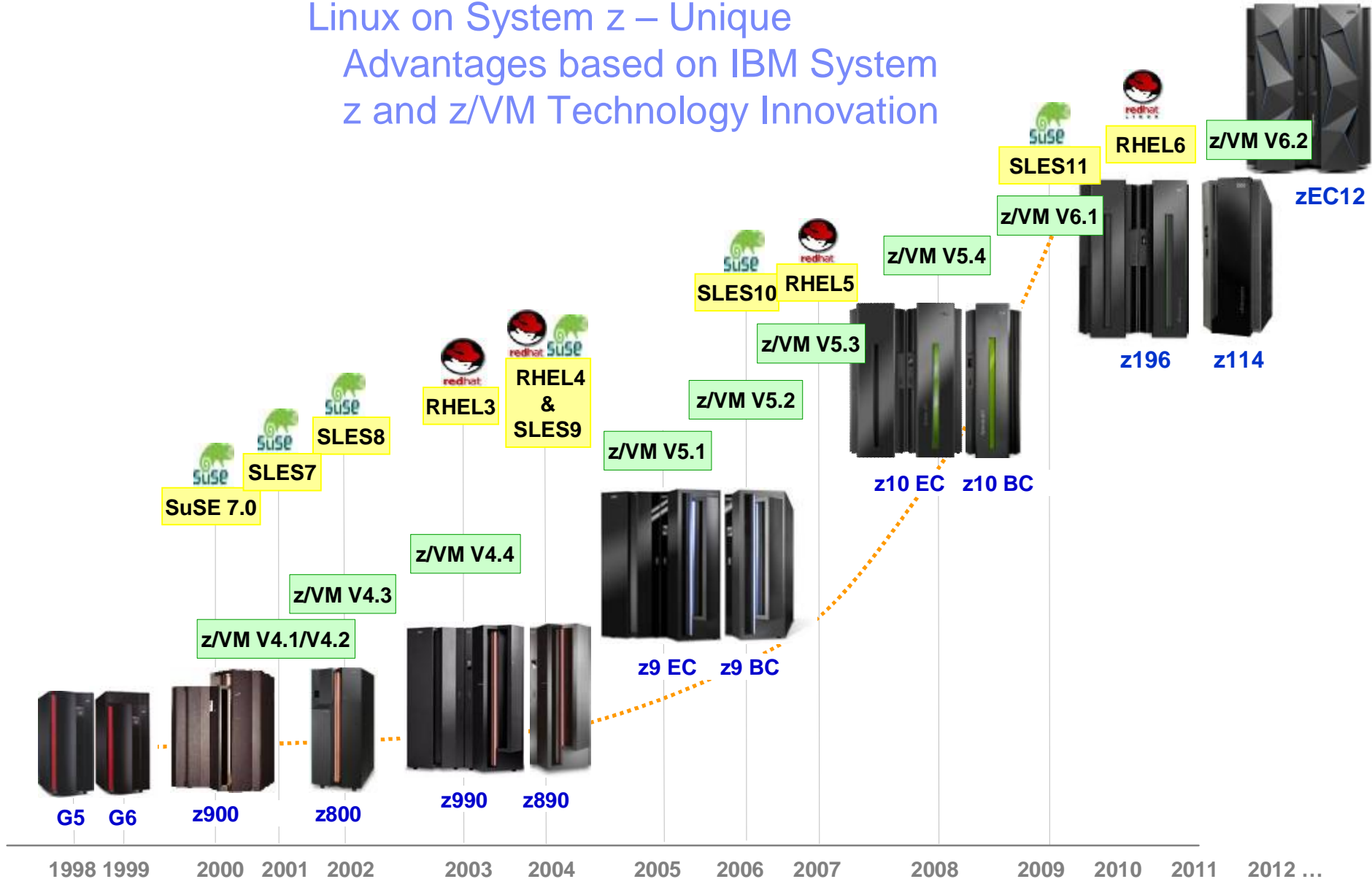
System Design Affects Virtualization Capabilities

Compare to typical UNIX
system design...

Up to 128-way SMP configuration

**Application
Code**

**I/O Device
Drivers**

Cryptography
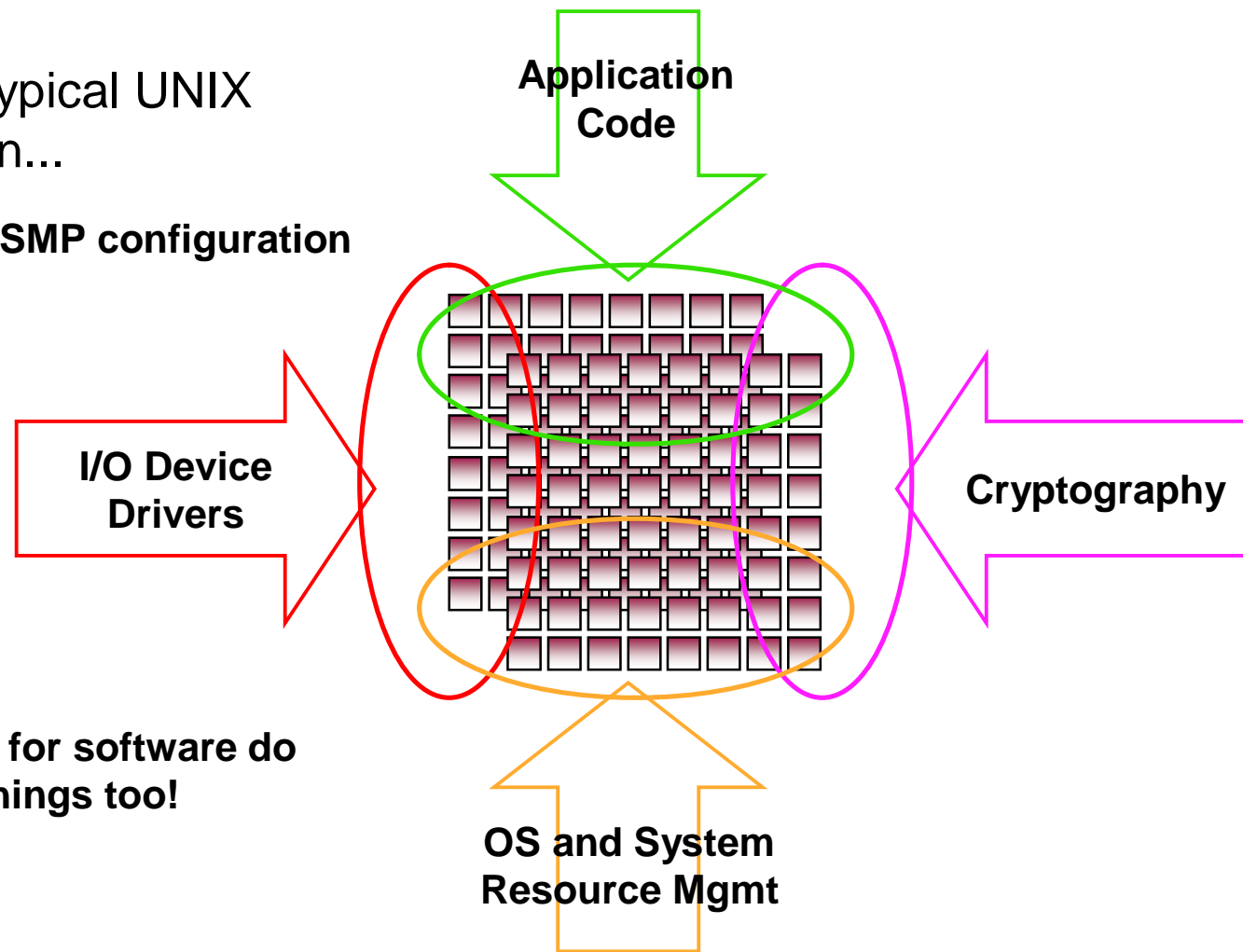
**CPUs licensed for software do
a lot of other things too!**

**OS and System
Resource Mgmt**

System Design Affects Virtualization Capabilities

More than 336 I/O Processors

System z packs a lot of compute power into a single box

No additional charge for these processors

Up to 80-way SMP on z196
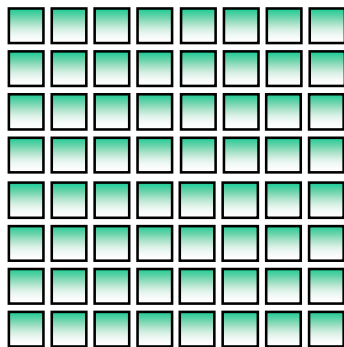
Share up to 64 processors with up to 60 LPARs

Configure these processors as CPs, IFLs, zAAPs*, zIIPs*, or ICFs*

* No software license fees

2 Standard Spare PUs

Up to 16 System Assist Processors

Offload system processing to dedicated CPUs (no impact to software license fees)
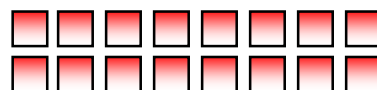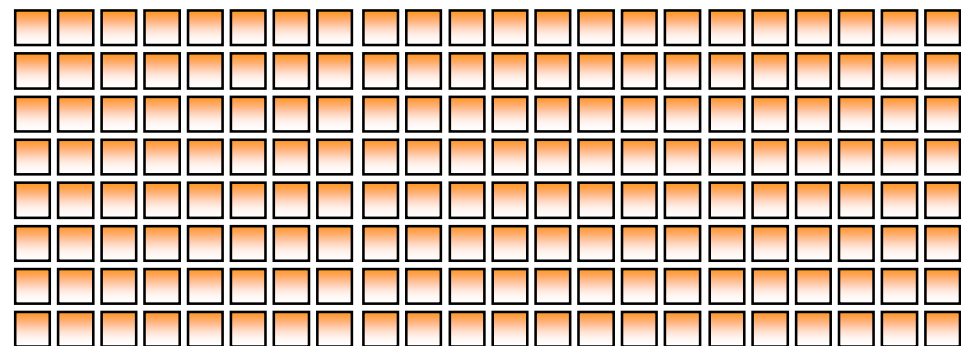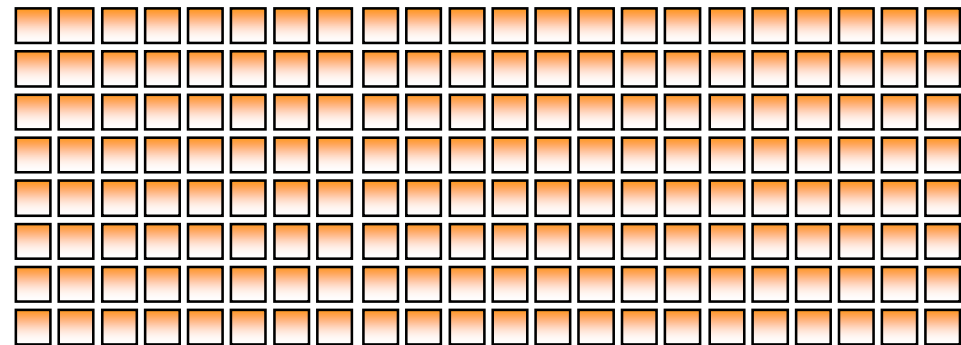
Up to 16 Crypto Express3 CPUs
High scale performance for SSL transactions

I/O Degrades Intel Performance

Intel CPU As IO Load Increases
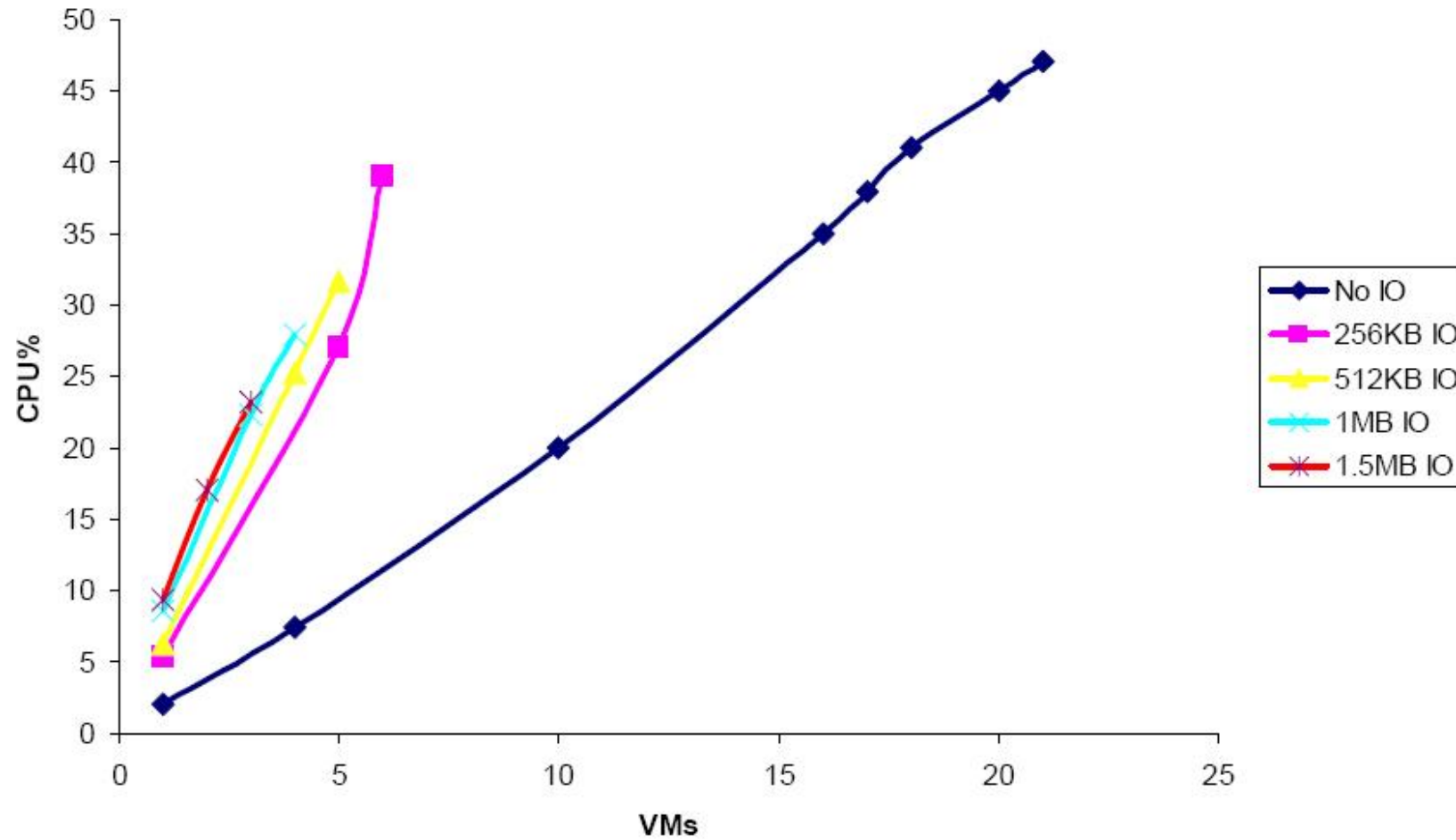
IBM research study - the System z virtualization environment provides far lower TCA than its Intel alternative

§ Most IT centers recognize that virtualization improves
  – hardware utilization
  – administrative efficiency
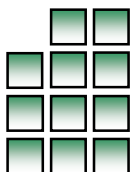 – lowers overall costs

§ Guests must run well enough to meet their service-level-agreements (SLA).
  – Business-critical or priority guests must be allocated the resources they need when they need them

§ Virtualization platforms must efficiently differentiate between high-priority and low-priority workloads running together
  – An incapability to do this may require using separate platforms for high- and low-priority workloads
  – Increasing cost and complexity

IBM Systems Magazine March/April 2013:

http://www.ibmsystemsmagmainframedigital.com/nxtbooks/ibmsystemsmag/mainframe_20130304/index.php#/36

Mixed workload - performance example (z/VM)
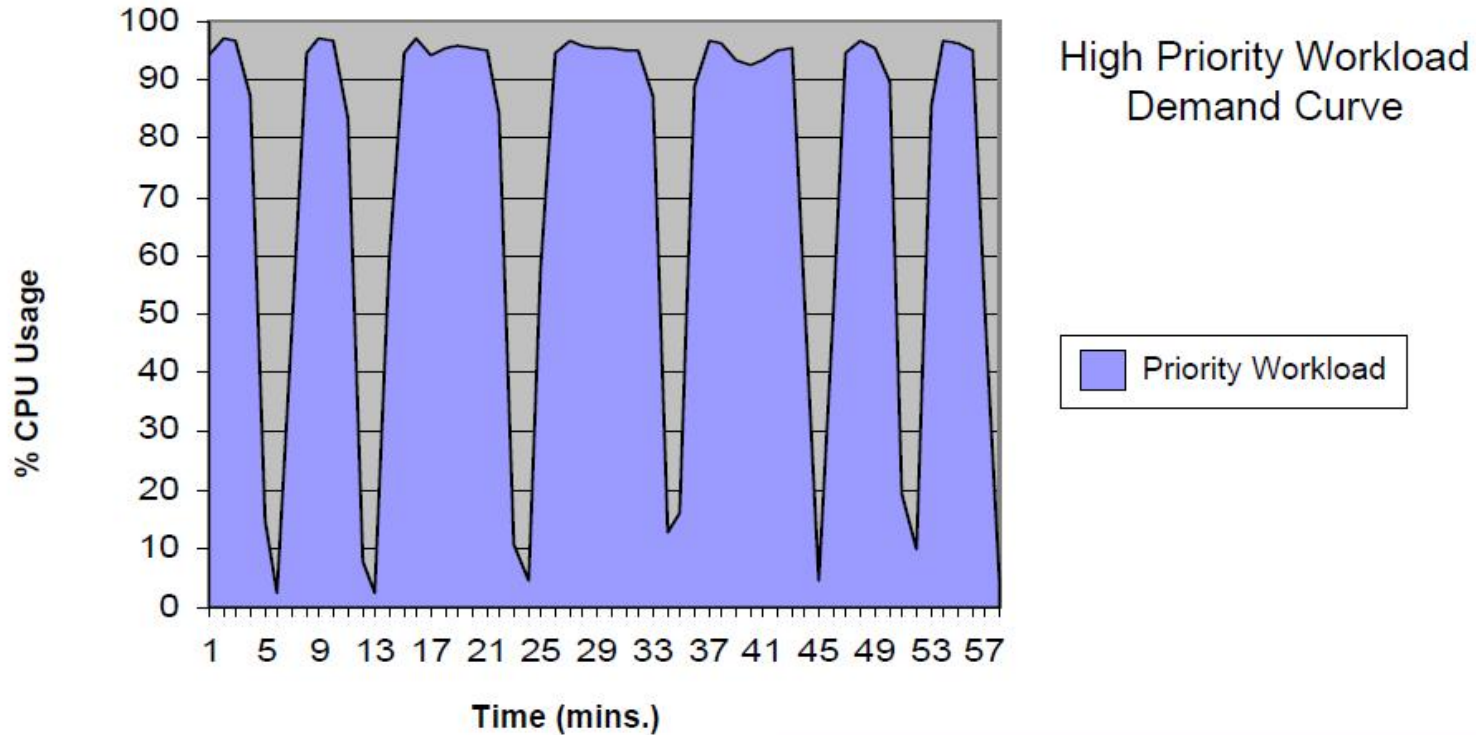
Capacity Used
High Priority - 72.2% CPU Minutes
Unused (wasted) - 27.8% CPU Minutes

Priority Workload Metrics
Total Throughput: 9.125M
Average Response Time: 140ms

§ High-priority web workload with varying demand running standalone on System z

§ Capability to run mixed workloads while assuring SLAs at peak loads

…Mixed workload - performance example (z/VM)…

Run High Priority
And Low Priority
Workloads Together

- Donor Workload
- Priority Workload

NO
throughput leakage
NO
*response time
increase*
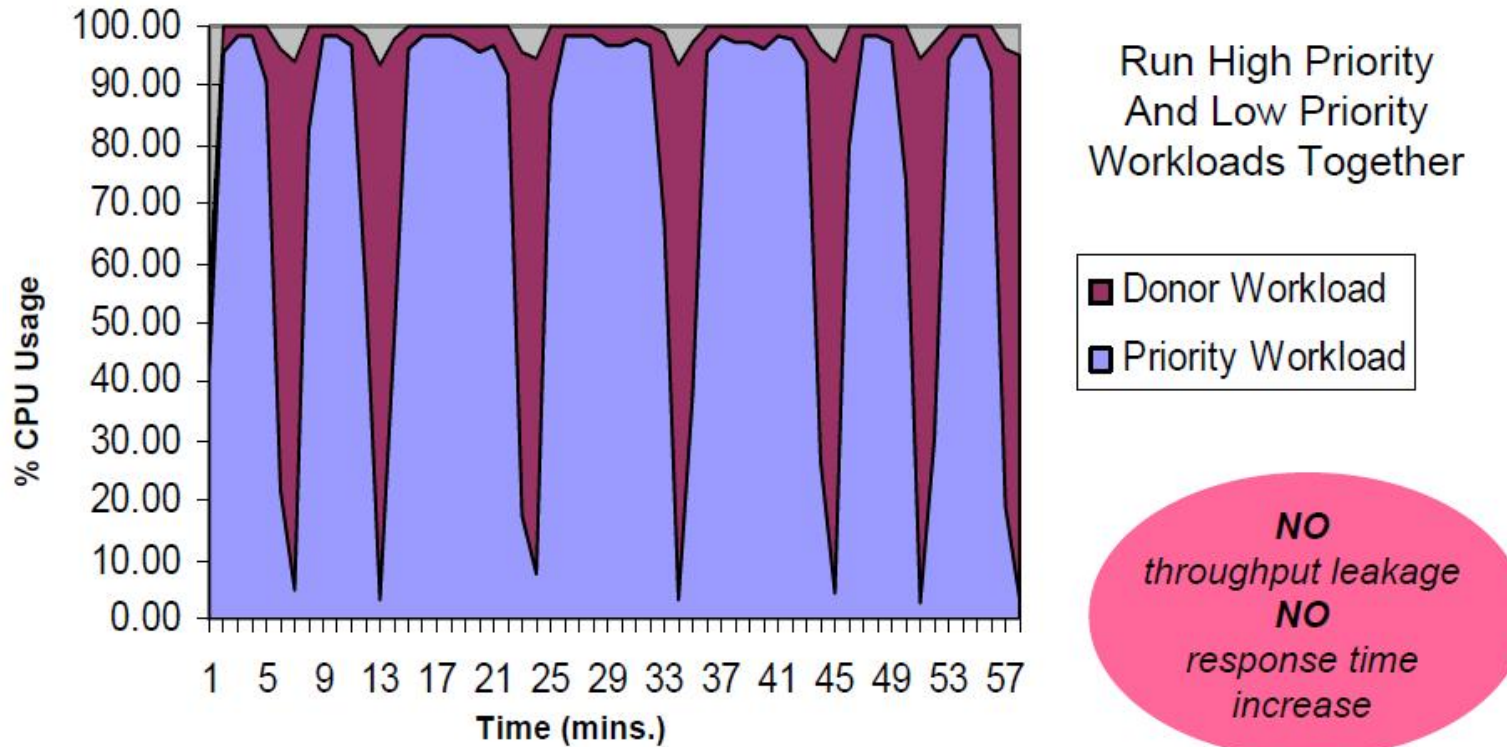
Capacity Used
High Priority - 74.2% CPU Minutes
Low Priority - 23.9% CPU Minutes
Wasted – 1.9% CPU Minutes

Priority Workload Metrics
Total Throughput: 9.125M
Average Response Time: 140ms

§ Run high-priority and low-priority workloads together – System z

§ High-priority workload on System z does not degrade when low-priority workload is added

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Mixed workload - performance example (x86 hypervisor)

Capacity Used
High Priority - 57.5% CPU Minutes
Unused (wasted) – 42.5% CPU Minutes

Priority Workload Metrics
Total Throughput: 6.47M
Average Response Time: 153ms

§ High-priority web workload with varying demand running standalone on leading x86 hypervisor

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…Mixed workload - performance example (x86 Hypervisor)

Run High Priority
And Low Priority
Workloads Together

■ Donor Workload
□ Priority Workload

30.7%
throughput leakage
45.1%
response time increase
21.9%
wasted CPU minutes
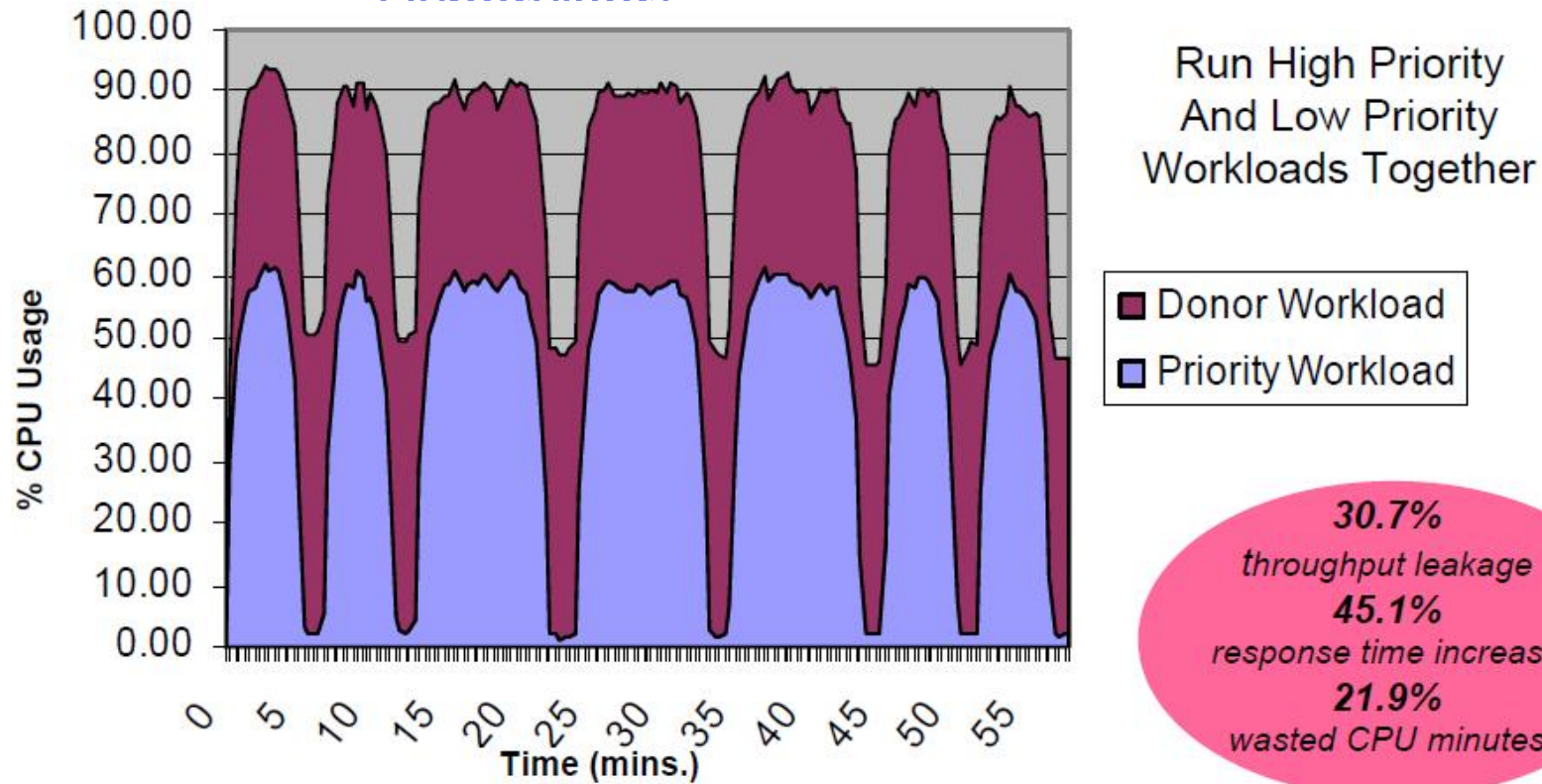
Capacity Used
High Priority - 42.3% CPU Minutes
Low Priority – 35.8% CPU Minutes
Wasted – 21.9% CPU Minutes

Priority Workload Metrics
Total Throughput: 4.48M
Average Response Time: 220ms

§ High-priority workload on leading x86 hypervisor degrades severely when low-priority workload is added

Mixed workload - performance example (z/VM vs. x86 hypervisor)

System z

Leading Intel Hypervisor

Too much resource given to Low Priority workload

High Priority workload gets less resource than needed
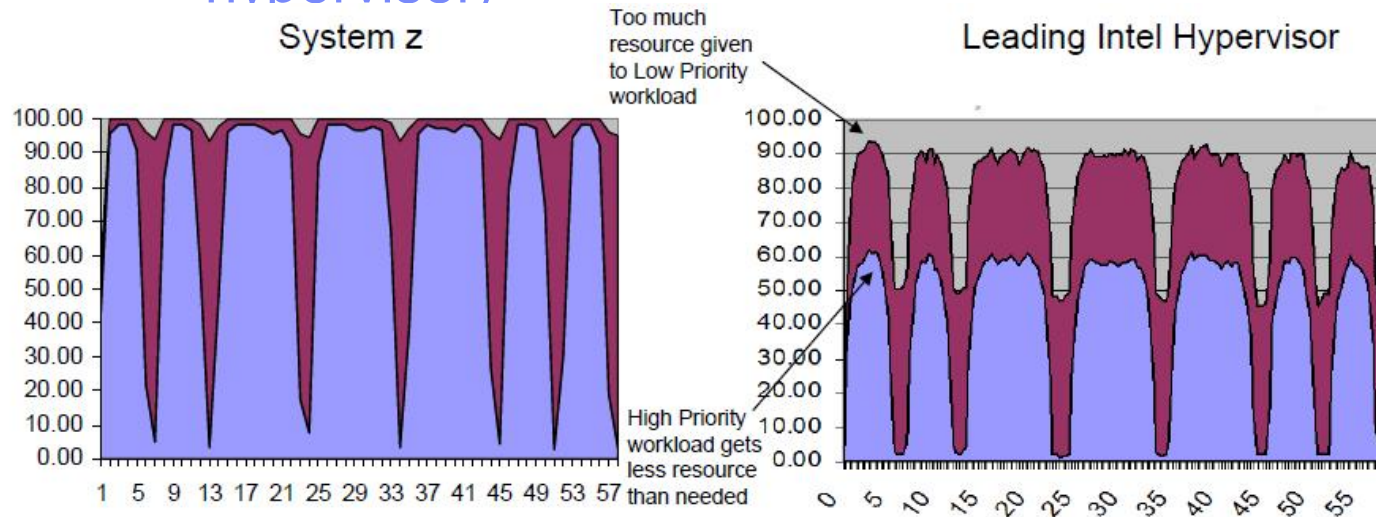
- **Priority Workload**
  - ▸ No throughput reduction
  - ▸ No response time increase
- **Low Priority Workload**
  - ▸ Soaks up remaining CPU minutes
- **Unused CPU minutes 1.9%**

- **Priority Workload**
  - ▸ 31% throughput reduction
  - ▸ 45% response time increase
- **Low Priority Workload**
  - ▸ Soaks up more CPU minutes
- **Unused CPU minutes 21.9%**

§ System z virtualization enables mixing of high- and low-priority workloads without penalty

Mixed workload example – cost comparison

Servers required to achieve the same level of performance for high and low priority workloads

| VMs | VMs |

Virtualized on 3 Intel 40 core servers

$13.7M (3 yr. TCA)

| VMs |

| High priority workloads | Low priority workloads |

IBM WebSphere 8.5 ND
IBM DB2 10 AESE
Monitoring software

High priority online banking workloads driving a total of **11.9M** transactions per hour and low priority discretionary workloads

| VMs | VMs |

| z/VM LPAR | z/VM LPAR |

z/VM on zEC12
32 IFLs

$5.77M (3 yr. TCA)

58% lower cost!

§ Deliver high- and low-priority workloads together while maintaining response-time SLA

Consolidation ratios derived from IBM internal studies. zEC12 numbers derived from measurements on z196.
Results may vary based on customer workload profiles/characteristics. Prices will vary by country.

Discussion Topics

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§ **Extreme virtualization**

§ **Performance aspects**

§ **Benefits and savings**

§ **Platform selection**

§ **Hybrid computing with IBM zEnterprise™**

§ **Cloud Computing**
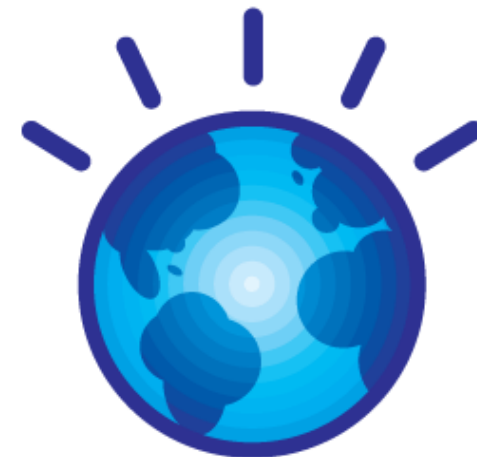
A Government Organization Consolidates Applications and Data to Drive Down Costs of Hardware, Software, and Management by 70%!
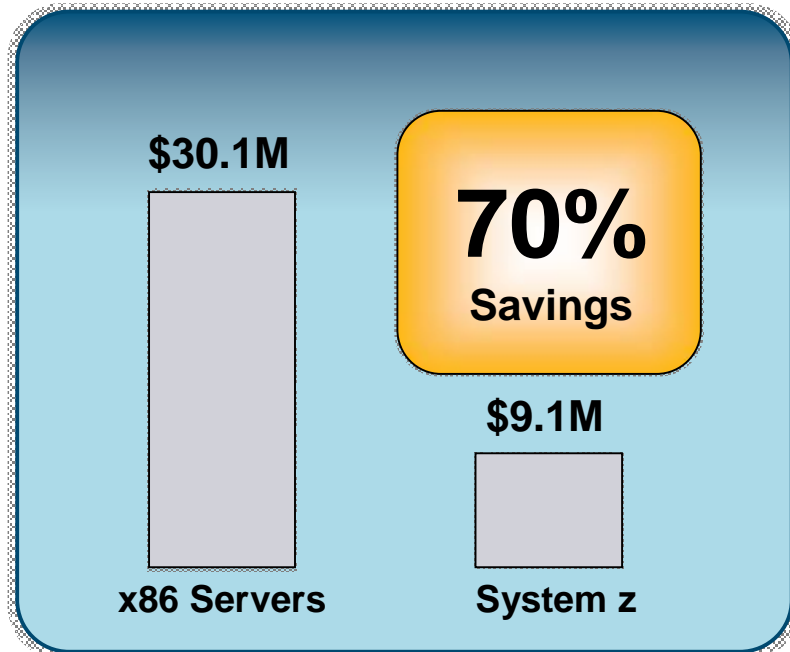
Top three reasons for savings

$30.1M

70%
Savings

$9.1M

x86 Servers

System z

Customer: A regional North American government organization

Consolidated 292 Oracle servers to one System z

System administration costs reduced 90%

Subscription and support licenses reduced over 95%

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

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The Home Depot - SAP on System z

Second largest retailer in the United States with over 1800 stores, 300,000 employees and around 1.2 billion customer transactions a year. Revenue 90 Billion.

Customer Objectives:
§ Very high SLA – for managing the stores
§ TCO equivalent to Unix/Windows systems
§ Disaster Recovery
§ Automated Management, Provisioning, Administration & Support
§ Growth without adding staff
§ Replace and Centralize store systems

Solution:
§ Migrated SAP R/3 to DB2 on z/OS
§ Near continuous operations
§ Moving application servers to Linux on z for easy provisioning and fast disaster recovery
§ Flexible use of resources allows them to add capacity without disruption, and dynamically change priorities based on time of day, or application

Benefits:

§ Scalability to support over 1 Billion transactions/year
§ Ability to support SAP and Business warehouse, enables access to P&L, and daily sales targets
§ Low TCO
§ Low unit cost /work
§ Low staffing costs
§ Faster time to market for new offerings in stores

"Continuous availability and manageability are the design principles of our IT architecture. We're proud of our ability to fail-over without data loss in a very short period of time. The improved availability and disaster recovery capabilities delivered by running the SAP applications on Linux for System z provide an extra layer of insurance against potentially damaging and expensive outages."

Clifford W. Gum; SAP Technical Architect, The Home Depot

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Transzap, Inc.

Boosts Uptime with IBM System z

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

TRANSZAP

Discussion Topics

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§ **Extreme virtualization**

§ **Performance aspects**

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§ **Platform selection**

§ **Hybrid computing with IBM zEnterprise**™
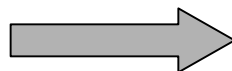
§ **Cloud Computing**

Fit for Purpose

All of these "tools" can very quickly move a person from one place to another.

But, which one is the right tool to move one person?

Fifty people? Five hundred people?

Platform Selection Is All about Using the Right Tool for the Right Job

Workload optimized systems

Complete Range of IT Cost Factors

Cost factors highlighted in yellow are the only ones that organizations routinely assess.

Full Range of IT Cost Factors			
Availability • High availability • Hours of operation	**Additional development and implementation** • Investment for one platform – reproduction for others	**Security** • Authentication and authorization • User administration • Data security • Server and OS security • RACF versus other solutions	**Controlling and accounting** • System analysis • Cost
Backup/restore/site recovery • Backup • Disaster scenario • Restore • Effort for complete site recovery • Storage area network (SAN) effort	**Operations** • Monitoring and operating • Problem determination • Server management tools • Enterprise-wide integrated server management	**Operating concept** • Development of an operating procedure • Feasibility of the developed operating procedure • Automation	**Integration** • Integrated functionality versus functionality to be implemented (possibly with third-party tools) • Balanced system • Integration of and into standards

Infrastructure
• Space
• Power
• Network infrastructure
• Storage infrastructure
• Initial hardware costs
• Software costs
• Maintenance costs
	Resource utilization and performance
	• Mixed workload/batch
	• Resource sharing: shared nothing versus shared everything
	• Parallel Sysplex versus other concepts
	• Response time
	• Performance management
	• Peak handling and scalability
	Skills and resources
	• Personnel education
	• Availability of resources
		Deployment and support
		• System programming
		  o Consistent OS and software levels
		  o Database effort
		• Middleware
		  o Software maintenance
		  o Software distribution across firewalls
		• Application
		  o Technology upgrade
		  o System release change without interrupts
			Further availability aspects
			• Planned outages
			• Unplanned outages
			• Automated takeover
			• Uninterrupted takeover (especially for databases)
			• Workload management across physical borders
			• Business continuity
			• Availability effects for other applications or projects
			• End user service
			• End user productivity
			• Virtualization

Information Technology Today

Information technology today is limited by the technology and architecture configurations available.
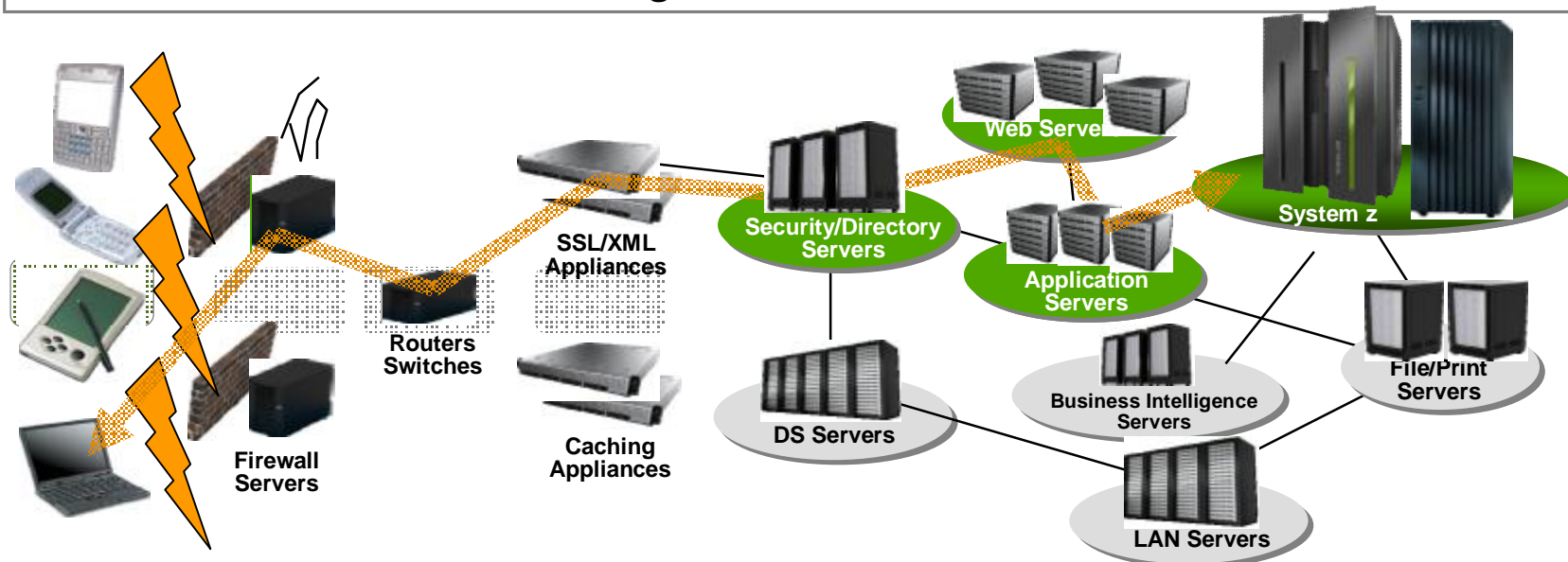
- Business processes and the applications that support them are becoming more service oriented, modular in their construction, and integrated.

- The components of these services are implemented on a variety of architectures and hosted on heterogeneous IT infrastructures.

- Approaches to managing these infrastructures along the lines of platform architecture boundaries cannot optimize: alignment of IT with business objectives; responsiveness to change; resource utilization; business resiliency; or overall cost of ownership.

- **Customers need better approach: The ability to manage the IT infrastructure and Business Application as an integrated whole.**

Workload Optimized Platform Selection

§ **Fitness for functionality – Does the code support this and/or that platform**

§ **Fitness for non functional requirements – How well does it run on each platform**

- ► Security / Availability / Disaster Recovery
- ► Scalability / Performance
- ► Maintainability / Serviceability
- ► Future growth

§ **Fitness to meet local needs – How well does this or that meet MY needs**

- ► Will this platform run my solution?
- ► What will it cost me?
- ► How well will it run?
- ► Can I operate and manage it well enough?
- ► Is this platform effective for the application scope?
- ► Is this solution shared or dedicated to a single business process?

§ Beware the hidden cost of sub-optimization.

§ Be aware of cost dynamics.

§ Large, reliable servers are best for virtualization.

§ Don't trust benchmark results that scale "nearly linearly".

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z/VSE Strategy: *Leveraging z/VSE, z/VM, and Linux on System z*

Protect existing VSE investments

Integrate using middleware and VSE connectors

Extend with Linux on IBM System z technology & solutions

......

Infrastructure Simplification

Linux on Sytem z

Tivoli Identity Mgmt, TSM, Print Serving, DNS, Firewall, etc.

IBM Middleware

Linux on System z

WebSphere Appl Server, Java, CTG, HOD/HATS, WS MQ, etc.

Info on Demand

Linux on System z

DB2 LUW, Information Server, Cognos 8 BI

DB2 LUW

Connection via HiperSockets

z/VSE Production Environment

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

z/VSE Test/Dev Environment

z/VM-mode LPAR with z/VM (incl LDAP server / RACF)

IFL Engine(s)   **CP Engine(s)**

IBM System z

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Bank of New Zealand

Architecture Benefits

- Reliability, Redundant HW components
- Ability to provide separate security zones (RED, Yellow, Green)
- Scalable solution with little interruption of service
- Assignable resource boundaries (CPU -> Licences)
- Simple , Consistent and Reliable DR. Human cost to manage and execute greatly reduced
- Consolidate and Centralise solutions
- Effective Communication (Hyper-Sockets, internal Comms)

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Planed DR Invocation Process

- Shutdown Prod
- Shutdown and deactivate PPTE and STRESS lpars running on DR z10
- Update Network switches so VLANS now active at secondary site
- Storage ownership is switched to DR site
- Add CBU's **(Capacity Backup Upgrade)**
- Activate and Start-up Production DR Lpars
- IPL Guests keeping their existing IP addresses
- Checks and balances
- Open systems to customer (DR site now becomes Prod site)
- Establish copies to now DR site

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Bank of New Zealand

Storage Replication Setup for DR
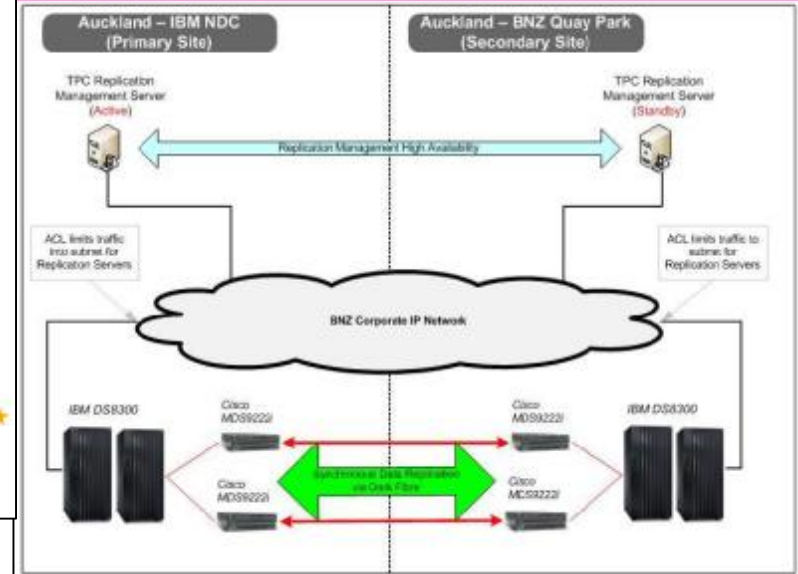
Selected charts from BNZ presentation at zTU Las Vegas 2012

How System z is optimized

| Semiconductor Technology | Microprocessor Design | Systems Design | Virtualization & Operating Systems | Compilers & Java Virtual Machine | Optimized Middleware | Solutions |
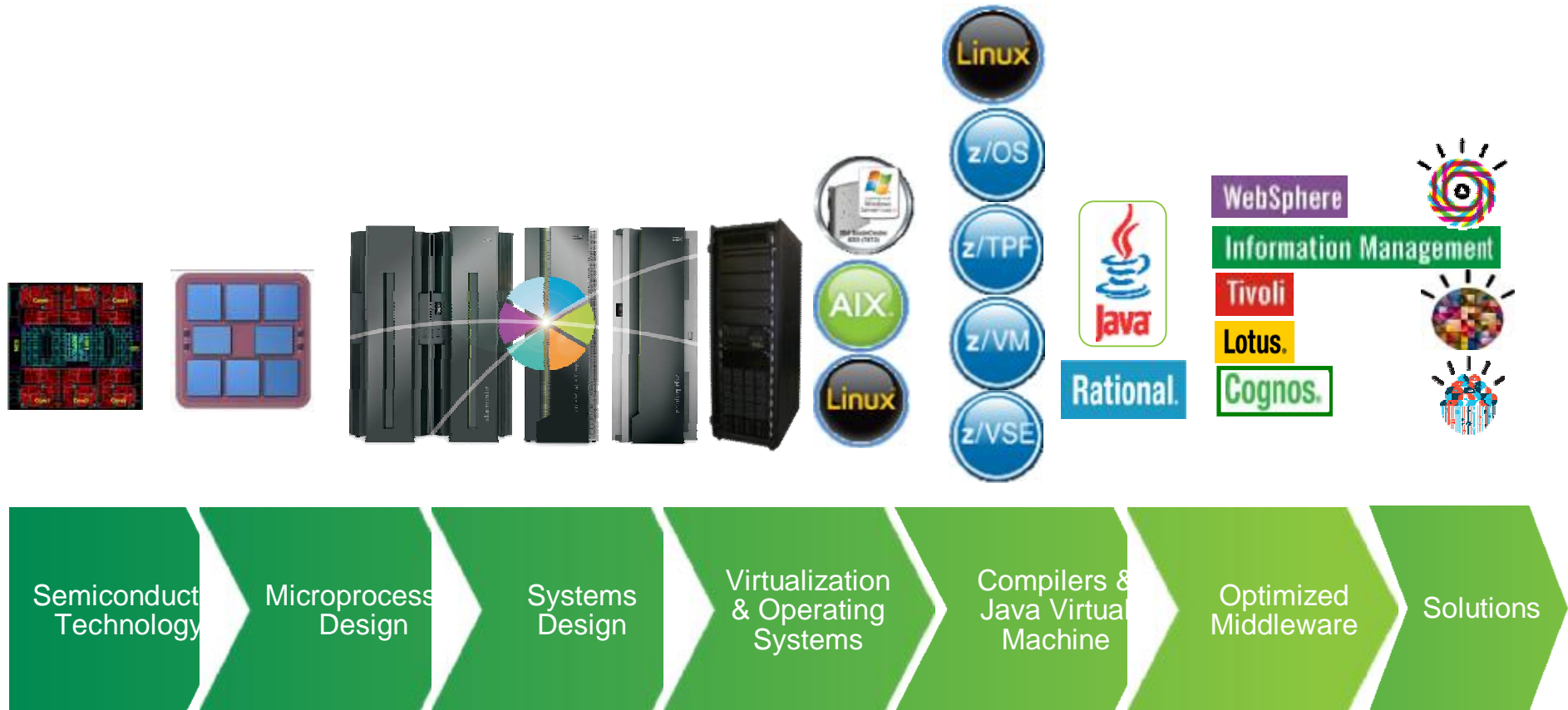
IBM zEnterprise: Designed to Host your Critical Workloads

z/OS

The Gold Standard for mission critical enterprise applications and secure, scalable data serving

Linux on System z
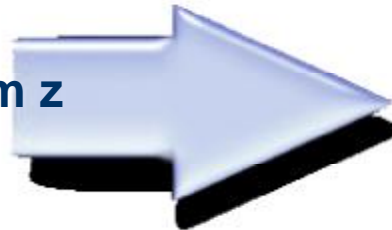
The most efficient platform for large scale application consolidation

AIX, Windows and Linux on Blades

For new and existing Blade workloads with affinity to data and applications hosted on z/OS

Dedicated Workload optimizers and appliances

Single function processors operating in conjunction with workloads on DB2 on z/OS

Value of hybrid computing

– **Business Application**

**zBX with Power
and x86 Blades**

– **IT Consolidation**

**Linux on z
ELS, SEEL, IFL & z/VM**

– **Analytics & BI**

**IBM 9700, 9710
and IDAA**

– **Application Innovation**

**zBX with DataPower
XI50z**

§ Systems Centers will support customer requests for benchmarks and proof-of-concepts

§ Customer success stories

Discussion Topics

§ **Business drivers for IT optimization and consolidation**

§ **Extreme virtualization**

§ **Performance aspects**

§ **Benefits and savings**

§ **Platform selection**

§ **Hybrid computing with IBM zEnterprise™**

§ **Cloud Computing**
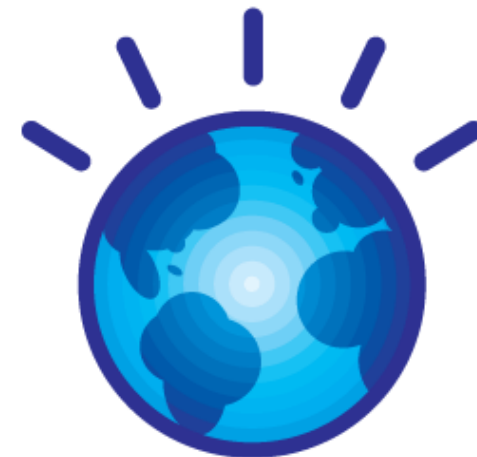
zEnterprise:
Integrated IT Infrastructure for Optimized Service Delivery

zEnterprise Unified Resource Manager - zManager

§ Integrated, dynamic, intelligent resource management

§ Workload-Aware Resource Optimization

§ Enabled for Infrastructure as a Service

IBM zEnterprise™ EC12 (zEC12)

§ Optimized to host large scale database, transaction, and mission critical applications

§ The most efficient platform for Large-scale Linux consolidation

§ Capable of massive scale up

zEnterprise BladeCenter Extension (zBX)

§ Selected IBM POWER7™ blades and IBM System x® Blades* for AIX® , Linux, and Windows applications

§ High performance optimizers and appliances to accelerate time to insight and reduce cost

§ Integrated high performance private network

Heterogeneous Virtual Infrastructure Management

Service Management

Platform Management

Hardware Management

APP APP APP APP APP APP

MIDDLEWARE

MULTIPLE OPERATING SYSTEMS
e.g., z/OS, z/TPF, z/VSE, z/VM,
Linux on System z

AIX

Linux on System x [1]

VIRTUALIZATION – PR/SM, zVM, PowerVM, System x Hypervisor

FIRMWARE

System z   Power   System x[1]   IBM Optimizer

Unified Resource Manager aka zManager

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

zEnterprise with zBX

System z Hardware Management Console with zManager

System z Host

z/OS TPF z/VSE

Linux

Linux

z/VM

System z PR/SM

z HW Resources

Support Element

Blades

Linux/ Windows on x86

AIX on Power 7

x86 Blade Virtualization

PowerVM Blade Virtualization

Optimizers

Data Power XML

Future Optimizers

Data Power XML Processing

Future Optimizers

Blade HW Resources

zBX

Private Secure Data Network

zManager

Private Management Network

Private High Speed Data Network

Customer Network

Customer Network

Example: BI - optimizing to the workload
Marrying the best of each environment

Total solution remains centrally managed by System z…

| Linux on System z

Cognos BI

WebSphere Application Server Utilities/Tools | DB2 for z/OS

DB2 Optimizer decision for acceleration | Offload DW query workload to high performance query accelerator | Smart Analytic Optimizer
Netezza Technology inside

DW query execution | *Integrates DB2 for z/OS - with high-performance Data Warehouse query technology* |

System z — **Workload Optimized**

Seamlessly plugs into the existing stack of software and hardware

…without any change to your applications.

IBM Field Management Systems (FMS)

IBM Cognos® 8 BI for Linux on System z: 30,000 users in production in just four months

Business need:

Provide the organization's sales force with secure, centralized, efficient Web-based access to critical sales information. The premise of IBM's Business Intelligence Competency Center is to deliver BI as a service better, faster and cheaper than an individual unit or function would be able to deliver to their end-users on their own.

Solution:

The IBM Cognos® 8 BI for Linux solution on System z enables a streamlined approach for the IBM sales force of 30,000+ to access critical business information from a single Web portal, when and where they need it.
Cognos is IBM's strategic Business Intelligence engine and the platform, after much due diligence, that was selected was Linux on System z.

Benefits:

- A simplified user experience with enhanced capability, enabling greater productivity
- Greater value to the business and to the IT group
- A foundation platform for the standardization of Business Intelligence across IBM
- Perceived savings of about $20 million over a five year period

"Linux offers us capabilities that we don't have on other platforms. One of those capabilities is virtualization.

So, the ability to scale up and scale across when we need to, the ability to partition out components of the machine, if we had used case scenarios which mandated different configurations but still leveraging the same common infrastructure."

- Marc Benson, IBM

Solution components:
§ IBM System z
§ z/VM
§ Linux
§ Information Management: IBM Cognos 8 BI

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More Choice with Linux on System z and zBX

Linux on System z

§ Highly virtualized with z/VM hypervisor
  – Highest flexibility
  – Supports large number of virtual servers (no architecture limitation)

§ Excellent dynamic management of resources

§ High level of integration with other System z environments (e.g. z/OS, z/VSE)
  – HiperSockets (data transfer in memory), optionally same disk environment (integration of backup, DR) and more

zEnterprise BladeCenter Extension (zBX)

§ Integration of Linux on System x and AIX on POWER Blades
  – Unified management with zEnterprise Unified Resource Manager
  – Supports integration of heterogeneous application environments

§ High-performance optimizers and appliances for fast analysis and reduced cost

zEnterprise – the integrated hybrid system

zEnterprise Client Optimized Systems	PureSystems Integrated Expert Systems

§ Multi-Architecture System for z/OS, AIX, Linux and Windows

§ Centrally managed through the Unified Resource Manager

§ Best fit when data or applications exist on System z and clients desire z governance

§ Multi-Architecture system for AIX, i/OS, Linux and Windows

§ Centrally managed through Flex System Manager (FSM)

§ Best fit when data and applications run on a combination of POWER and System x architecture

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Today: Clients can also attach IBM zEnterprise and IBM PureSystems (via Ethernet) to gain benefits of simplified management and lower IT infrastructure costs for all workloads.

IBM's Tivoli service management platform allows for integration for improving delivery of business services.

In future: Tighter integration of these two systems. Today's investment in either will gain value over time.

IBM systems overview

zEnterprise™

Power HE

Power 770

Power 4S Power 2S

Power Blades

x Blades

eX5 High End

x Volume Rack

x Volume Tower

PureApplication System
§ WebSphere and DB2

PureFlex System
§ Power 4s and 2s
§ x86 4s and 2s
§ Storage
§ Networking

§ **System z** remains the enterprise consolidation system with best economics for clients, delivering the best availability, security, scale and management required for enterprise critical work. zEnterprise with zBX is a proof point for hybrid universal management capabilities of IBM.

§ **Enterprise Power (High End and 770)** continues to be the leading system for UNIX consolidation with 60% unit share; delivers leadership virtualization, performance, security and resiliency needed by most enterprise clients.

§ **Power Express** (4s and 2s) provides highly customizable systems for traditional UNIX and IBM i applications in Midmarket or distributed enterprise clients.

§ **Power Blades** will transition to PureFlex System Power Compute Nodes.

§ **System x Blades** should be prioritized if the customer focuses on existing investment protection.

§ **eX5 High End** should be prioritized for scale-up and maximum x86 memory requirements.

§ **PureFlex System** provides unified management with enterprise storage and choice of compute nodes (Power and x86). PureFlex System can be connected to IBM general purpose systems and the environments managed through the Tivoli® suite.

§ **PureApplication System** provides a pre-integrated, pre-optimized hardware and software stack with a single point of management . It should be the first choice to compete with Oracle Exalogic offering.

System z strategy

1. *Innovate to address the IT infrastructure challenges of today and the future*

§ Further simplify, consolidate and reduce the costs of an IT infrastructure

§ Integrate, virtualize and coherently manage the multiple and varied elements of business applications

§ Scale up and leverage System z strengths in data serving

2. *Extend strengths of System z*

§ Invest for continued leadership in System z: performance, virtualization, enterprise security, enterprise business continuity

§ Extend System z best of breed capabilities to a broader set of workloads

§ Deploy optimized technologies for specific applications or components

3. *Expand the ecosystem and support core applications that our clients want*

§ Recruit new solutions and solution providers and integrators

§ Expand skills and capabilities across the globe

Discussion Topics

§ **Business drivers for IT optimization and consolidation**

§ **Extreme virtualization**

§ **Performance aspects**

§ **Benefits and savings**

§ **Platform selection**

§ **Hybrid computing with IBM zEnterprise™**
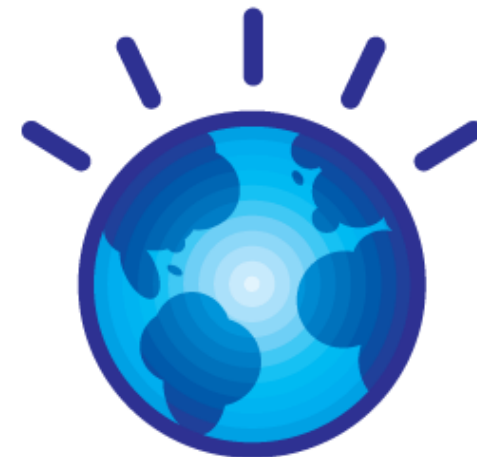
§ **Cloud Computing**

Cloud Computing – Deployment, Service, Characteristics

…based on standards

NIST National Institute of Standards and Technology
Information Technology Laboratory

SEARCH CSRC:

Computer Security Division CSD
Computer Security Resource Center

ABOUT MISSION CO

4 Deployment Models	3 Service Models	5 Characteristics
§ Private cloud § Community cloud § Public cloud § Hybrid cloud	§ Software as a Service (SaaS) § Platform as a Service (PaaS) § Infrastructure as a Service (IaaS)	§ Rapid elasticity § Broad network access § Resource pooling § Measured service § On-demand self-service

| SP 800-146 | May 2012 | Cloud Computing Synopsis and Recommendations
📄 **sp800-146.pdf** |
| SP 800-145 | Sept. 2011 | The NIST Definition of Cloud Computing
📄 **SP800-145.pdf** |

http://csrc.nist.gov/publications/nistpubs/800-145/SP800-145.pdf

Source: National Institute of Standards and Technology (NIST)

Cloud Computing – Based On Virtualization and Standardization

SELF SERVICE

AUTOMATION

STANDARDIZATION

VIRTUALIZATION
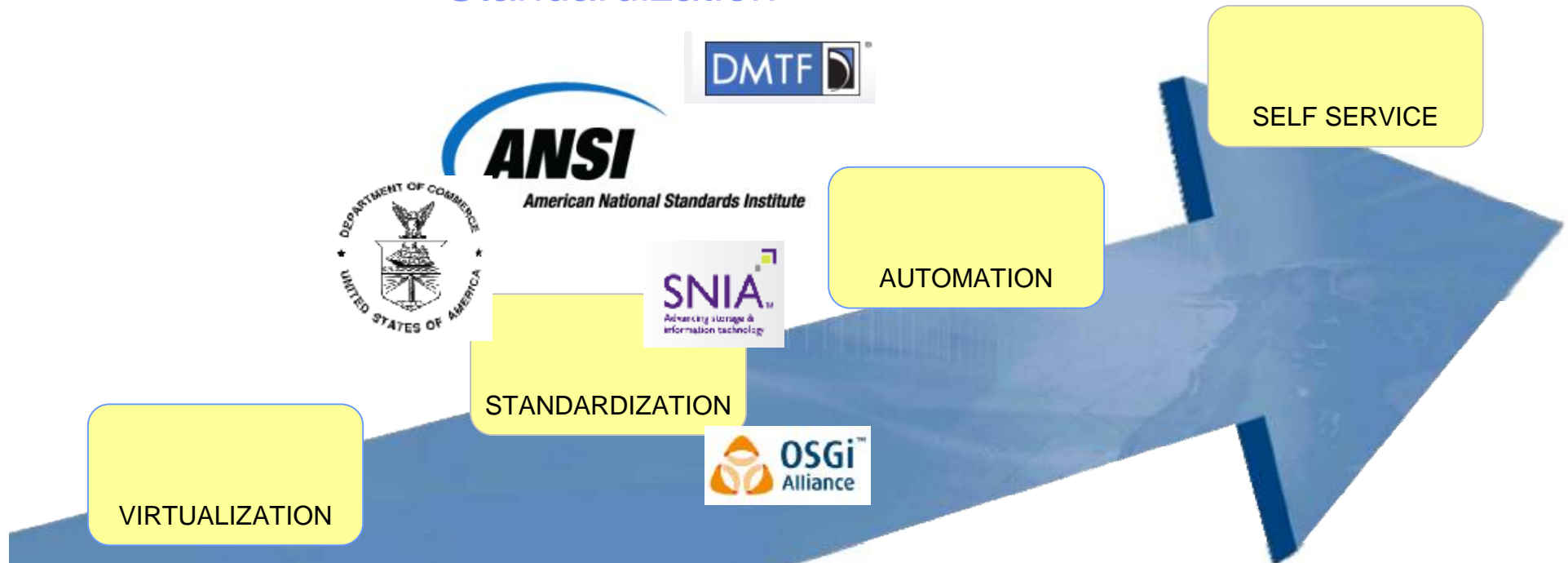
Rapid elasticity

§ **z/VM, VMware, KVM, Xen, p-Hypervisor, Hyper-V…**

§ **SAN Volume Controller (SVC), HP, DataCore, ...**

§ **HiperSockets, VLAN, VSWITCH, IBM Virtual Fabric, Cisco, ...**

System z Cloud Blueprint - Linux on System z

Integrate	**Automate**	**Orchestrate**
"Take out cost" *Consolidate and Virtualize*	*"Simplify"* *Automate and Manage Better*	*"Orchestrate"* *Service Lifecycle Management*
Differentiation	*Standardization*	*Service Management*

§ Rapid deployment of Linux virtual servers for less than $1 a day

§ Industry leading "gold standard" security for tenant isolation

§ Elastic scaling achieved by dynamically adjustable capacity at sustained performance

§ Multisystem virtualization simplifies management by clustering shared resources

§ Automated provisioning and de-provisioning

§ Pool standardized virtualized building blocks

§ Plug-and-play capacity across hardware generations

§ Capture and catalog virtual images in the data center

§ Automated methods for faster delivery of services with higher levels of control

§ Integrated virtualization management with IT service delivery processes

§ Self-service provisioning

§ Automated service lifecycle management including dynamic instantiation of cloud services

§ Pay for use

§ Optimize IT resources to reinvent business processes

- **z/VM**
- **Linux on System z**

- **Tivoli Provisioning Manager**
- **SmartCloud Provisioning**

- **Tivoli Service Automation Manager**

Extending System z Qualities of Service to Make Clouds Ready for Business

Security

industry leading security at the core of an integrated infrastructure

Identifies potential fraud in Real Time

Virtualization

Centralize Management of virtual servers across a heterogeneous pool

Enable thousands of virtual servers within a single integrated system

Availability

Resiliency management and fewer points of failure

Centralized workload management aligned to business priorities

Efficiency

Economies of scale for Labor, software and environmental costs

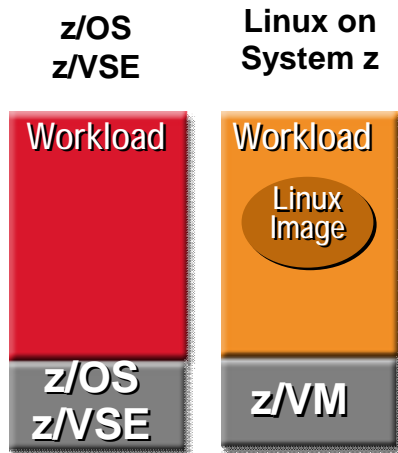*Reduce labor, energy, and development costs*

Scalability
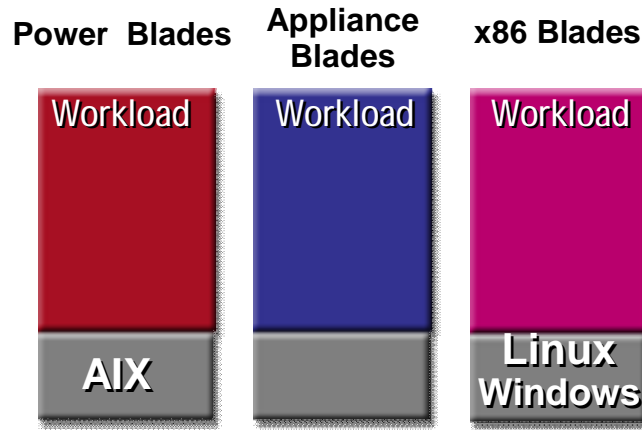
Ability to meet massive demands from users and data

Unmatched scalability with the highest transaction processing capacity

zEnterprise

Broadest Architectural Support

for Cloud Computing

z/OS z/VSE	Linux on System z
Workload	Workload
	Linux Image
z/OS z/VSE	**z/VM**

zEnterprise
zEC12, z196 or z114

Power Blades	Appliance Blades	x86 Blades
Workload	Workload	Workload
AIX		**Linux** Windows

zEnterprise BladeCenter
Extension (zBX)

Fit-for- Purpose Strategy

§ Assign workloads to the environment that best satisfies requirements

Integrated Service Management

§ Visibility
§ Control
§ Automation

Achieves overall lowest cost per workload

Questions?

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