

IT Optimization with Linux on z Systems

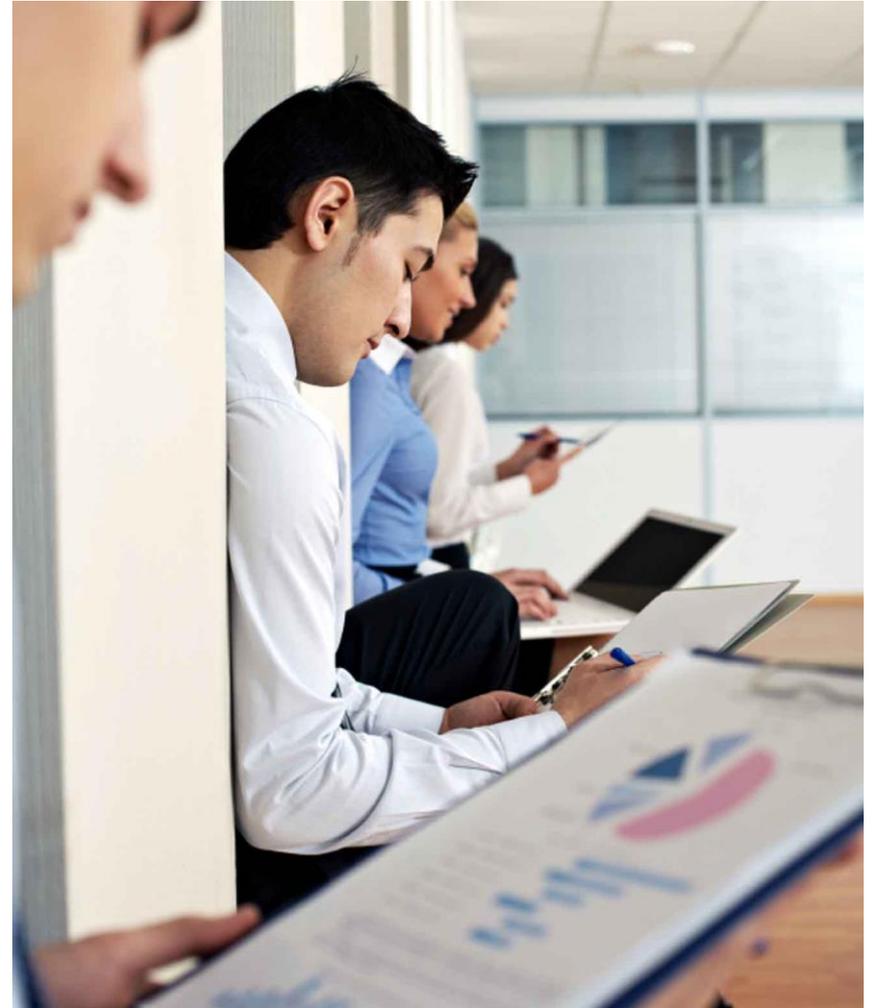


VMworkshop.org



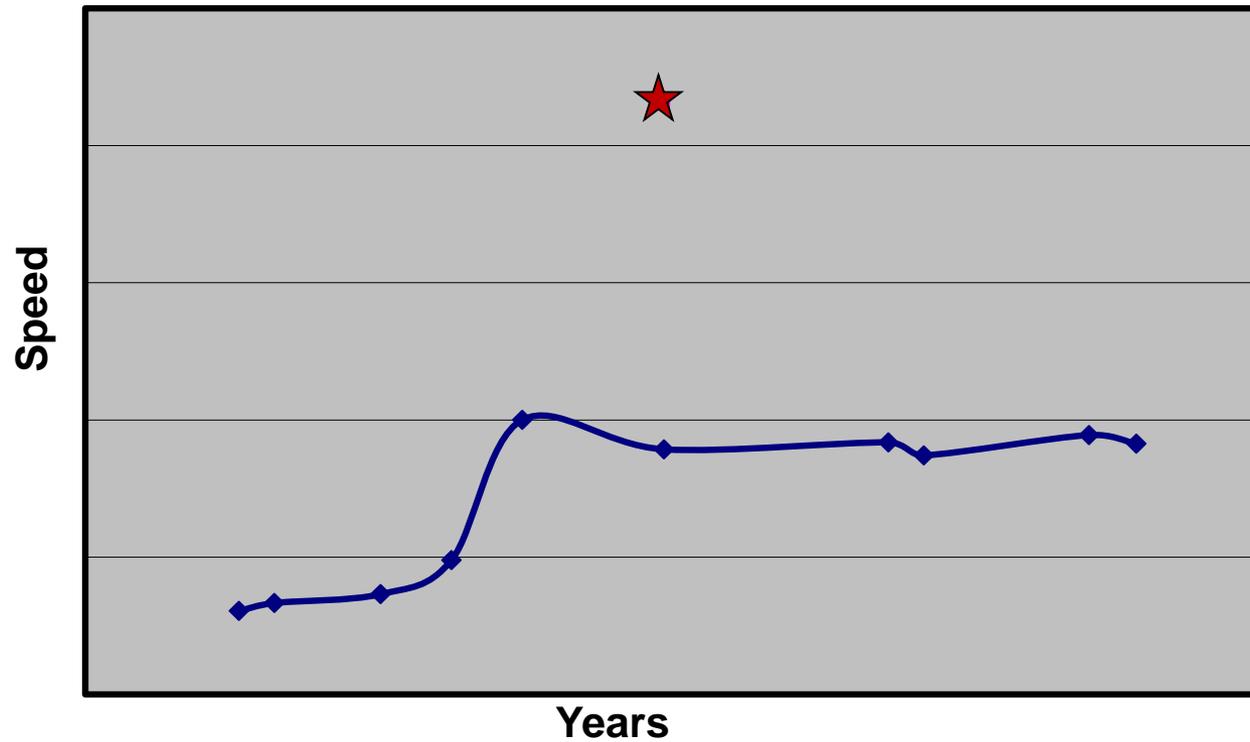
Agenda

- **Infrastructure optimization**
 - *Cost and business value*
- **Linux on z Systems is Linux**
 - *What makes it different*
- **Application examples**
 - *Typical workloads*



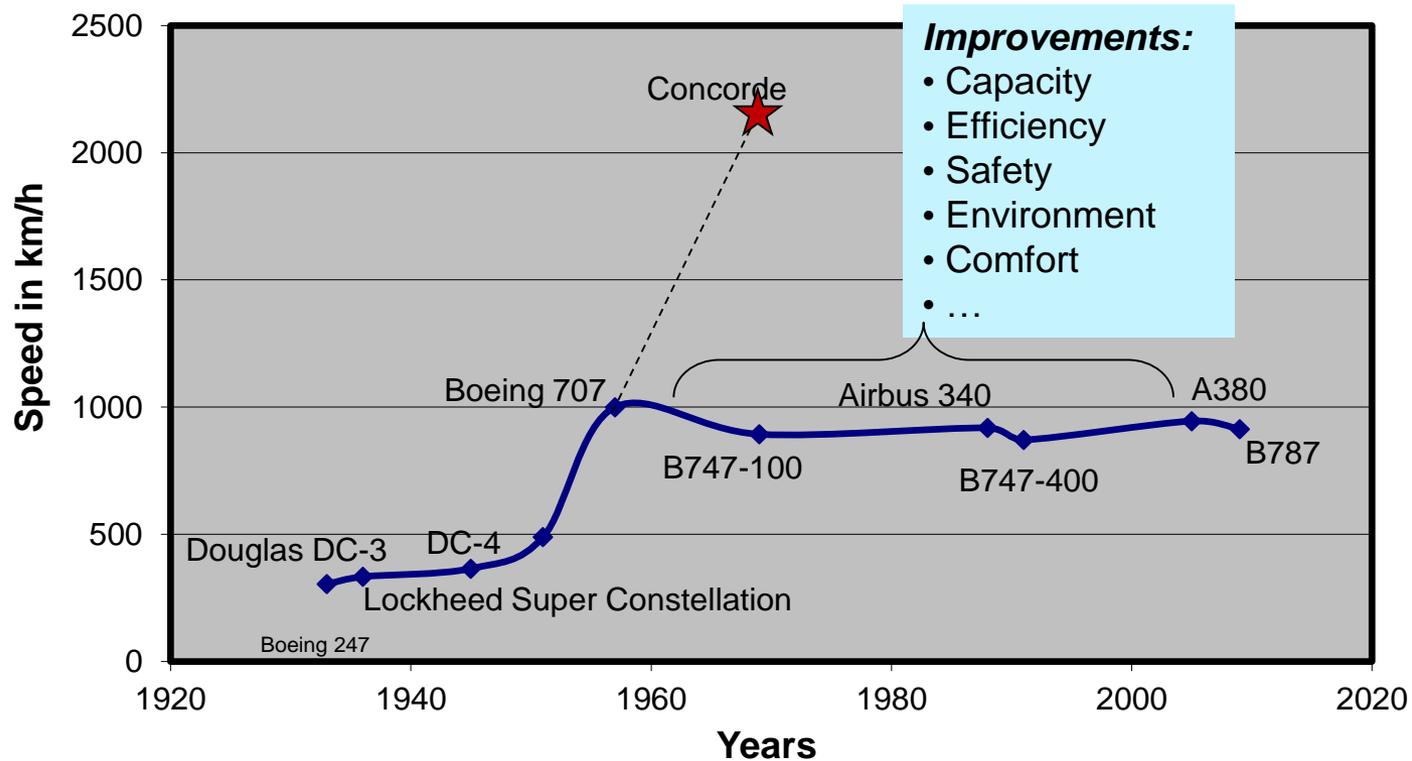
Industry trend

– which industry product trend is depicted here?



Industry trend: commercial aircraft industry

Commercial Aircraft Cruise Speed



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?

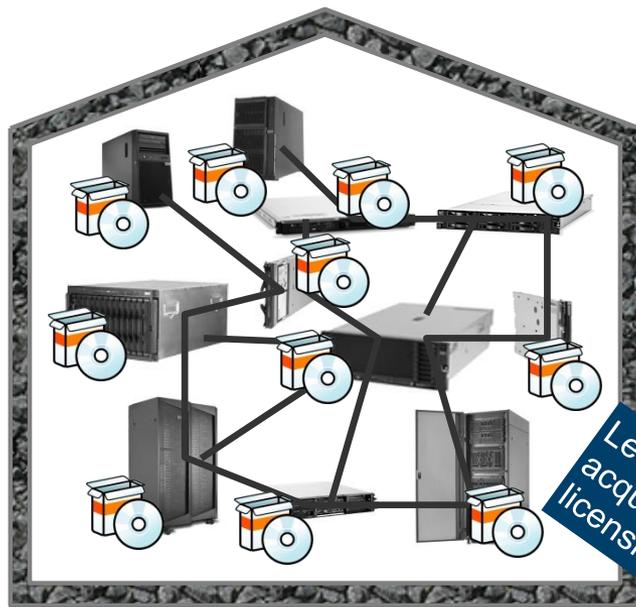
Fifty people? Five hundred people?

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

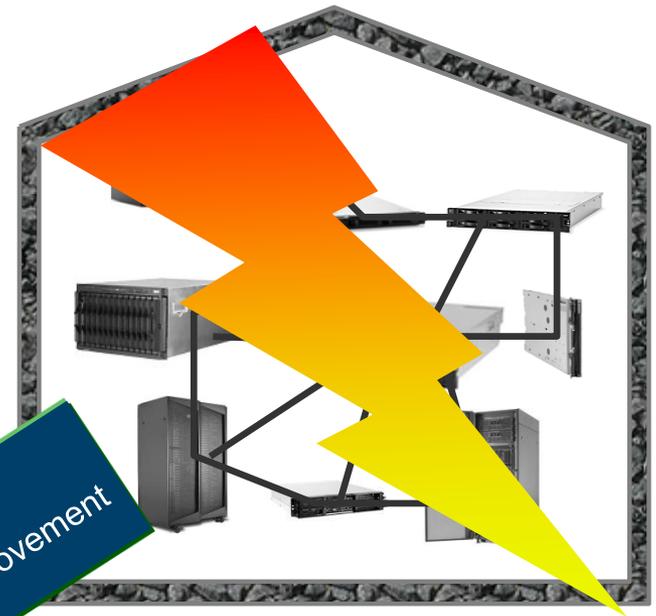


The Difference of Deployment on System z

Examples: Software Costs and Disaster Recovery



Less SW acquisition & licensing



DR improvement



Distributed software is often priced by the number of processor cores.

On System z, one IFL is equivalent to one core!



Coordinated near-continuous availability and DR solution for critical data on Linux

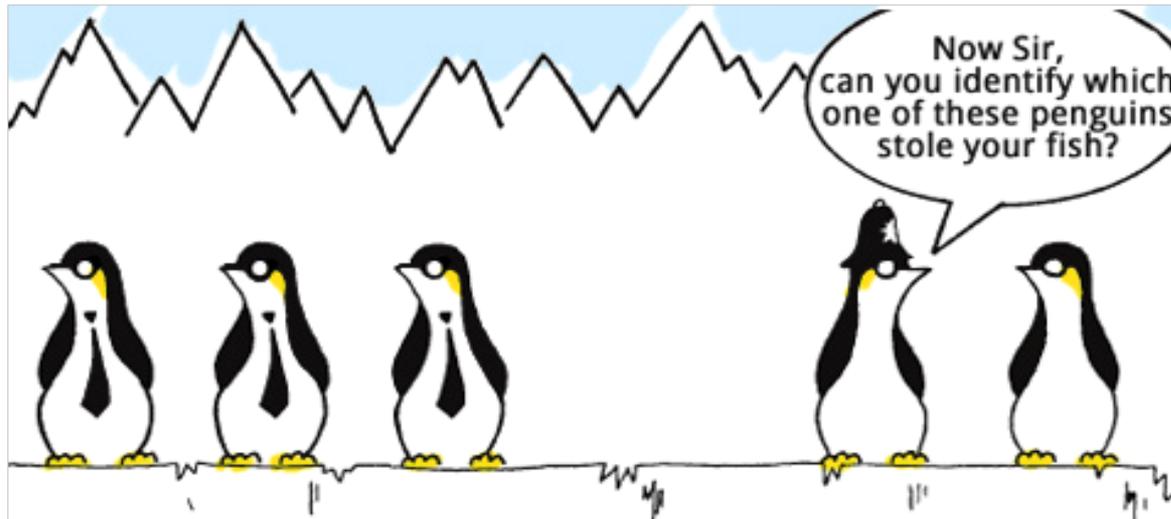
Complete Range of IT Cost Factors

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

Full Range of IT Cost Factors			
Availability <ul style="list-style-type: none"> High availability Hours of operation 	Additional development and implementation <ul style="list-style-type: none"> Investment for one platform – reproduction for others 	Security <ul style="list-style-type: none"> Authentication and authorization User administration Data security Server and OS security RACF versus other solutions 	Controlling and accounting <ul style="list-style-type: none"> System analysis Cost
Backup/restore/site recovery <ul style="list-style-type: none"> Backup Disaster scenario Restore Effort for complete site recovery Storage area network (SAN) effort 	Operations <ul style="list-style-type: none"> Monitoring and operating Problem determination Server management tools Enterprise-wide integrated server management 	Operating concept <ul style="list-style-type: none"> Development of an operating procedure Feasibility of the developed operating procedure Automation 	Integration <ul style="list-style-type: none"> Integrated functionality versus functionality to be implemented (possibly with third-party tools) Balanced system Integration of and into standards
Infrastructure <ul style="list-style-type: none"> Space Power Network infrastructure Storage infrastructure Initial hardware costs Software costs Maintenance costs 	Resource utilization and performance <ul style="list-style-type: none"> 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 <ul style="list-style-type: none"> Personnel education Availability of resources 	Deployment and support <ul style="list-style-type: none"> System programming <ul style="list-style-type: none"> Consistent OS and software levels Database effort Middleware <ul style="list-style-type: none"> Software maintenance Software distribution across firewalls Application <ul style="list-style-type: none"> Technology upgrade System release change without interrupts 	Further availability aspects <ul style="list-style-type: none"> 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

Linux is Linux,

but are all Linux infrastructure solutions identical?



No

, while Linux is Linux, the underlying infrastructure (hardware and infrastructure software) directly affects the Linux workloads.

Why Linux on z Systems

- **Higher utilization**

- ✓ Up to 100% (typically 80%+) → lower software license cost

- **Scalability**

- ✓ Resources can be added transparently → incremental growth as needed

- **Faster processor**

- ✓ Lower number of cores (IFLs) → lower software license cost

- **Capacity on Demand (CoD) and Capacity Backup (CBU)**

- ✓ Flexibility to react to peaks or disaster → being prepared at lower cost

- **Highest reliability**

- ✓ Better availability → higher quality of service

- **Integration and virtualization**

- ✓ Two levels of virtualization (LPAR and z/VM) → security, flexibility, consolidation of conflicting workloads on single physical server

- ✓ DR advantages → lower complexity and integration with z/OS or z/VSE systems

- ✓ Easier systems management → lower management cost

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.*

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.**



Nationwide[®]
Insurance

“Our goal was server optimization and our approach was virtualization.”

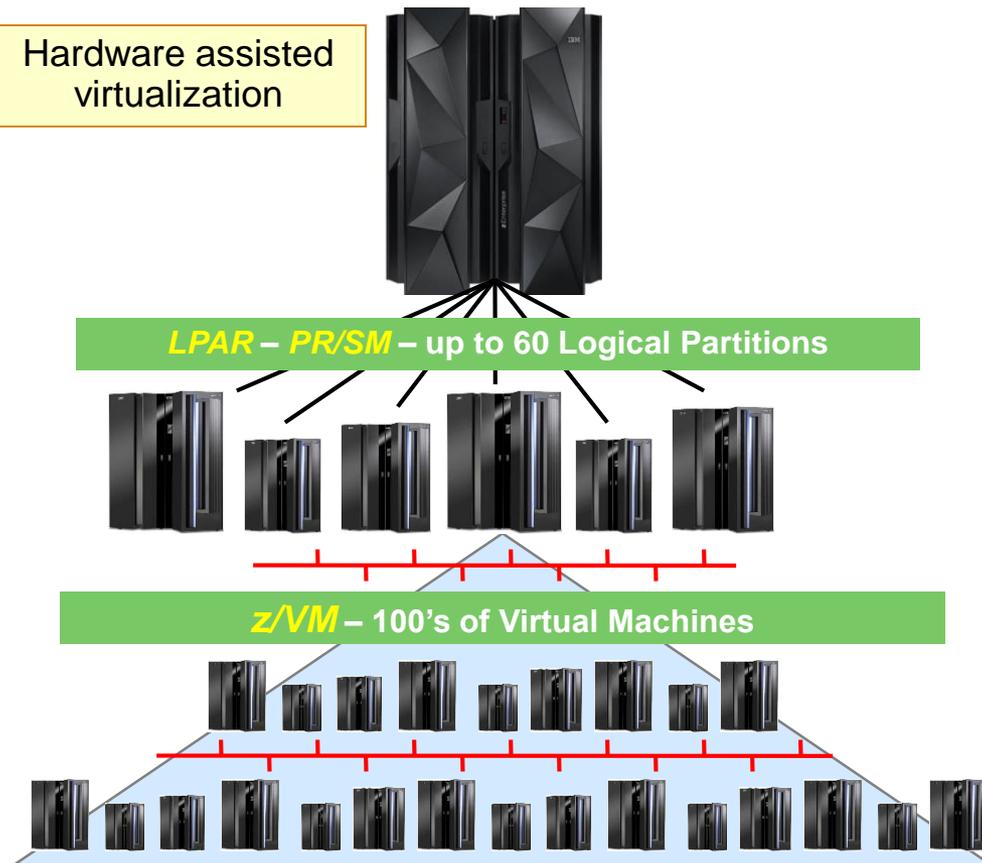
— Guru Vasudeva, Nationwide vice president and CTO

enterprisesystemsmedia.com/article/optimized-computing-nationwides-linux-on-system-z-virtualization-reduces-tc

z Systems – Extreme Virtualisation

Build-in and Shared Everything Architecture

Hardware assisted virtualization



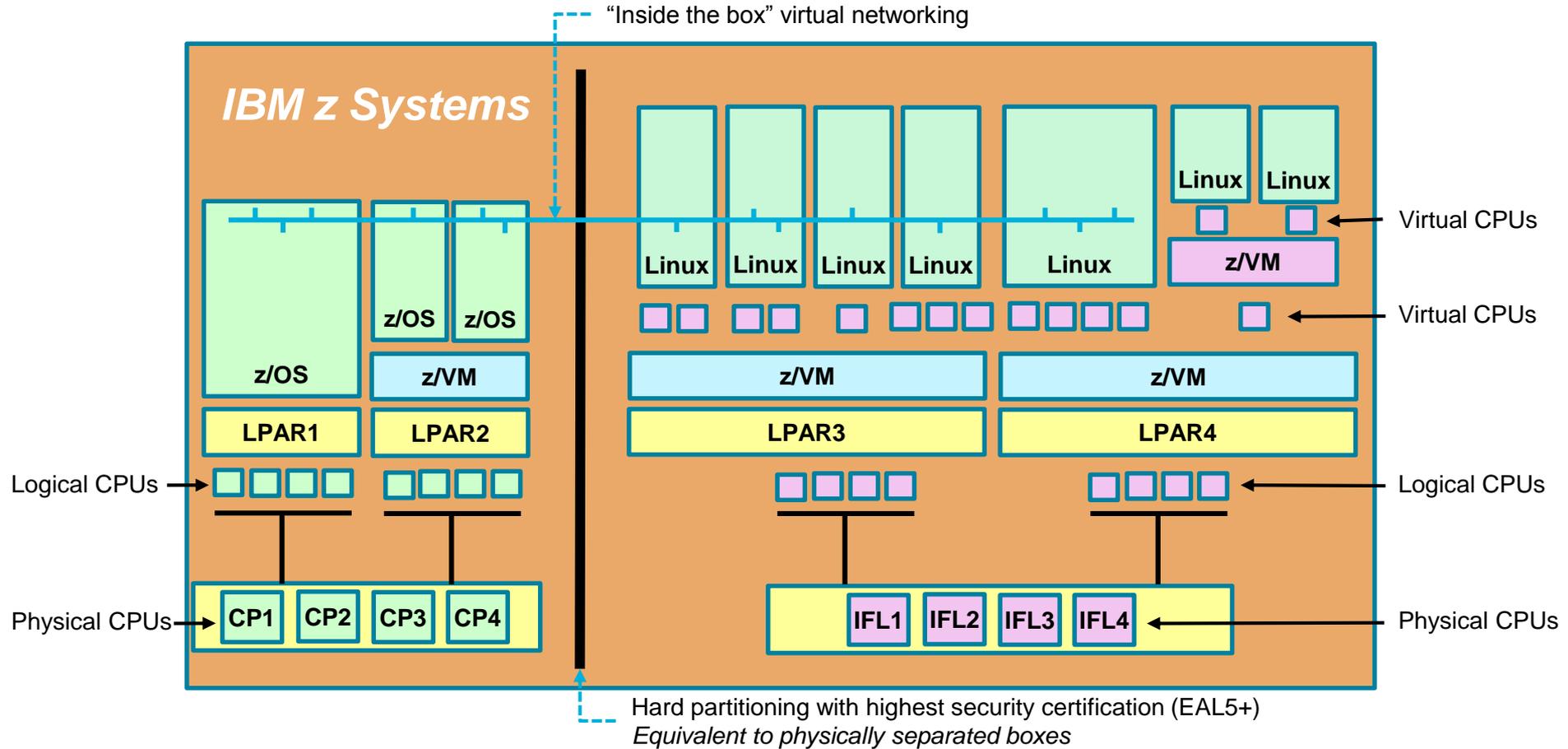
z Systems

- 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)

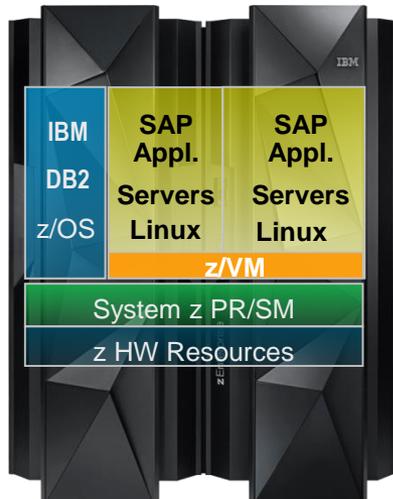
Distributed platforms

- Limited virtual server scalability per core
- Scaling requires additional physical servers
- Operational complexity increases with growth of virtual server images
- Single level of virtualization (no VM on VM)

IBM z Systems Virtualization Options



SAP Application Server Deployment and Consolidation on System z



Business Continuity

- DB on z/OS
- Data Sharing in Parallel Sysplex®
- HA with Tivoli System Automation

Server Consolidation

- Internal near memory-speed communication
- Scale-up and scale-out capabilities
- Fabulous performance throughout

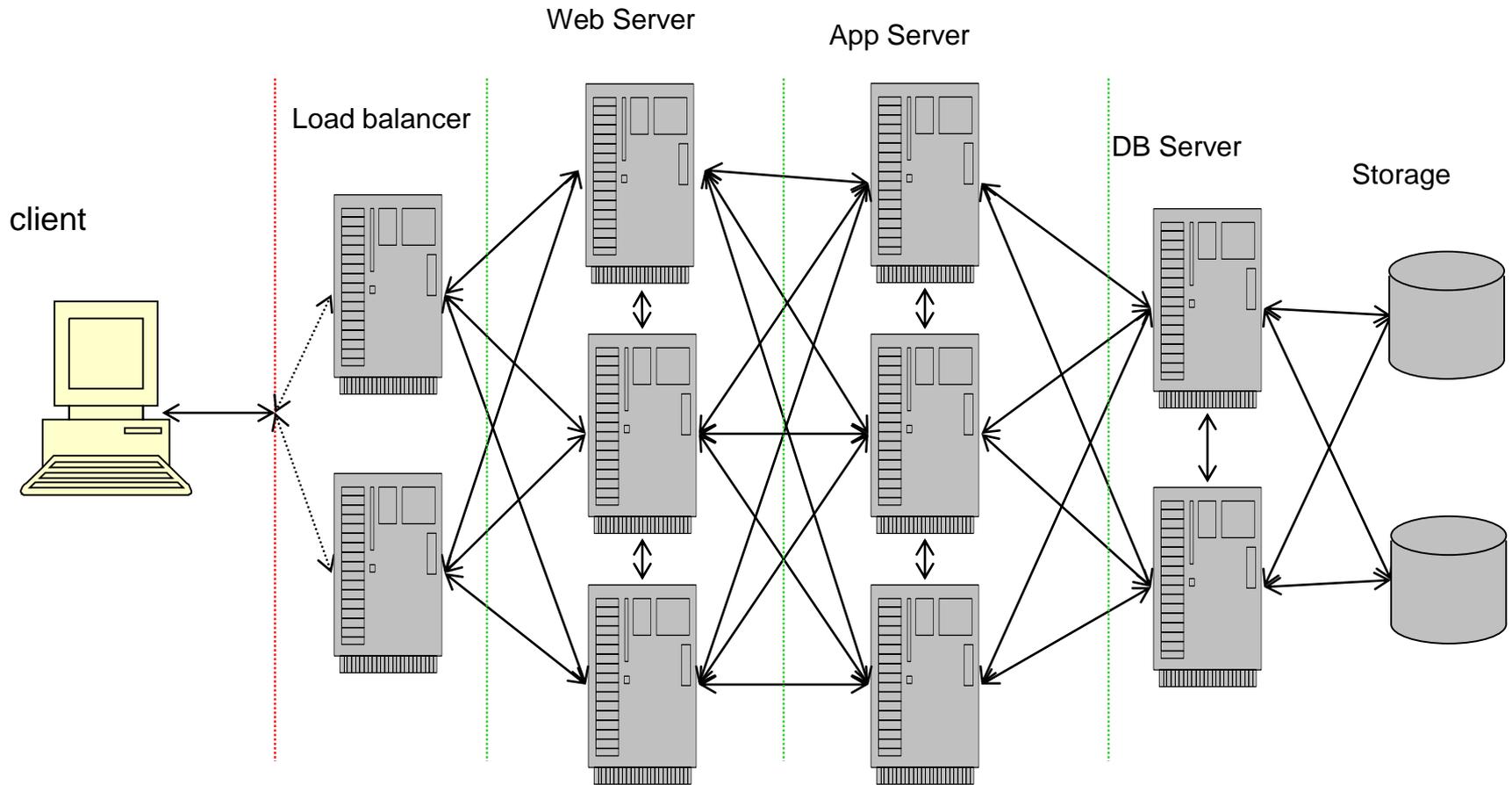
Embasa - Brazil

- **Manages one of the largest water treatment services**
- **Needed a high-performance, cost-effective way to introduce SAP software while continuing with the tried and trusted database solution**
- **Commercially attractive “Solution Edition” gave confidence to go ahead**

Endress+Hauser – Germany

- **Specialist in measurement technology; 89 companies across 42 countries**
- **Detailed cost-benefit analysis compared Linux on System z to Power/x86 servers. z/OS, z/VM and a total of 80 IFLs**
- **Simple and intuitive user management tools make it possible for just 1.5 FTEs to administer the entire Linux landscape**

HA with Independent Tiered Execution Streams



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

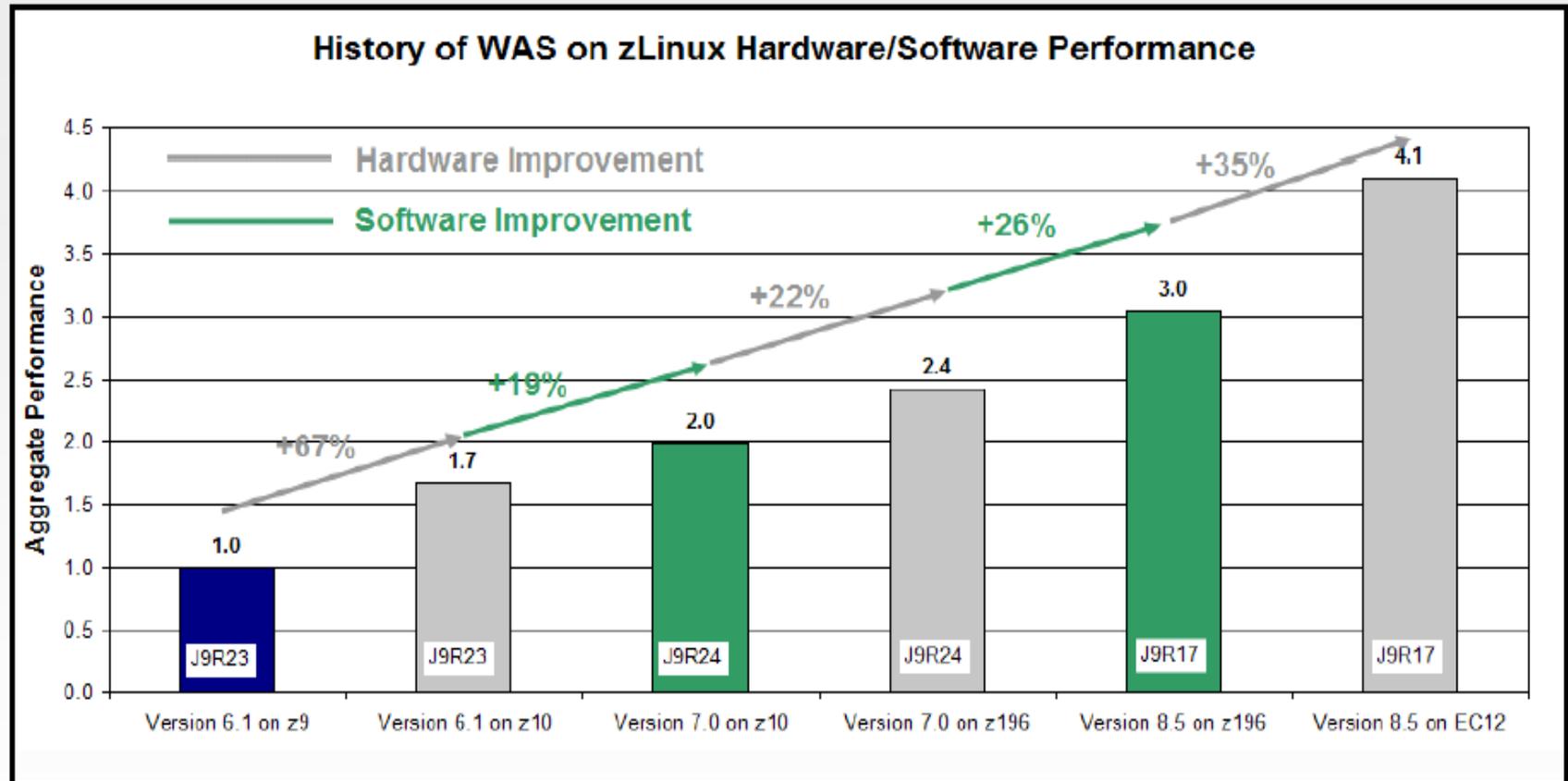
Backbone

Just 10 Cables!

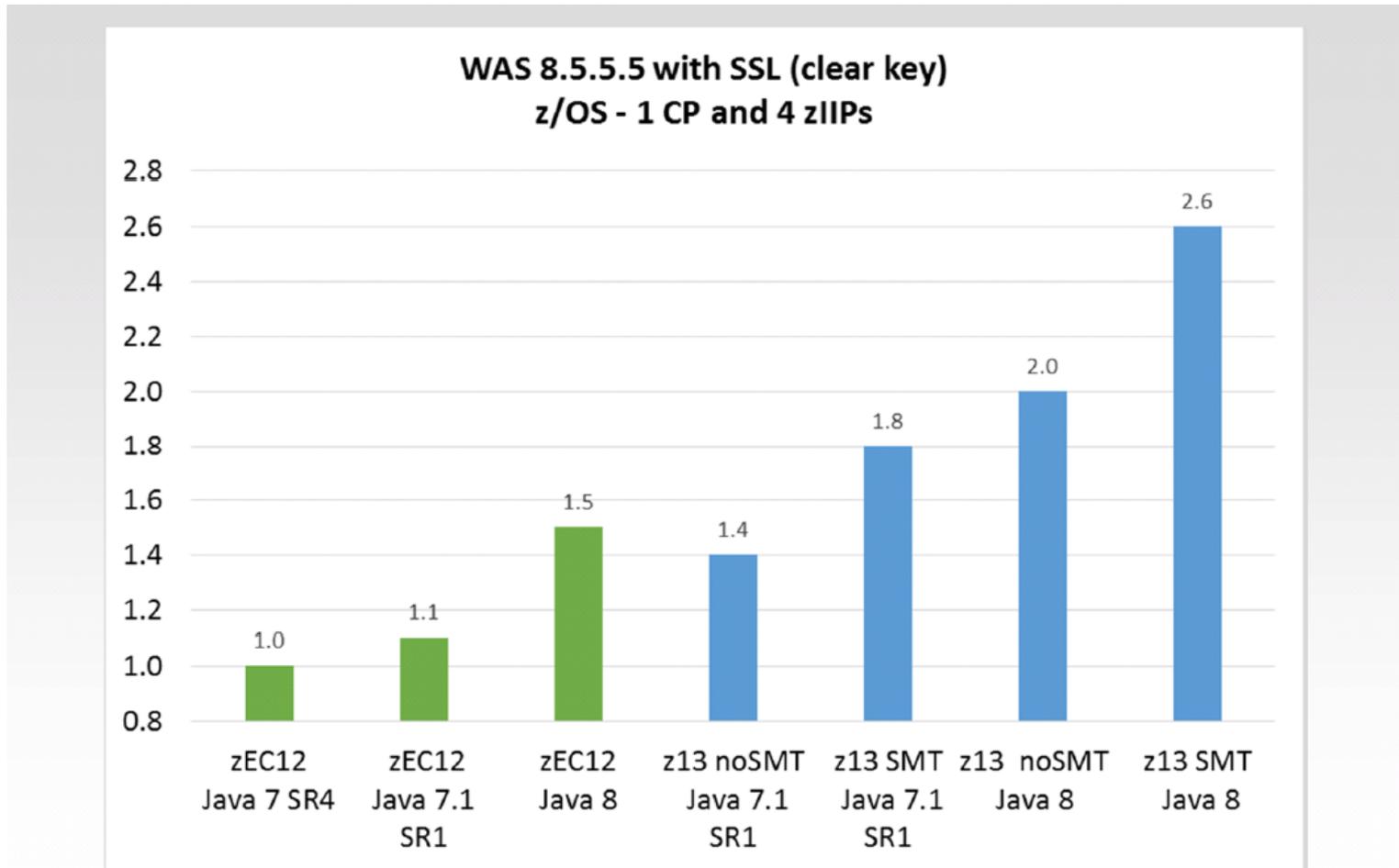
WebSphere Application Server (WAS) on Linux on z Systems

4x aggregate HW, SDK and WAS improvement:

WAS 6.1 (Java 5) on z9 to WAS 8.5 (Java 7) on zEC12



z/OS WAS 8.5.5.5 – SSL-Enabled DayTrader 3.0



2.6x improvement in throughput with IBM Java 8 and IBM z13

(Controlled measurement environment, results may vary)

Sicoob

Supporting rapid business growth

The need:

To meet its strategic objective of being the primary provider of financial services to its members, Brazilian credit union system Sicoob needs to ensure that it can meet members' **needs for 24/7 service and mobile access to information**. The existing distributed infrastructure could not scale to provide the necessary performance and availability, or to enable the data consolidation required for analytics.

The solution:

Virtualized its distributed servers on SUSE Linux Enterprise Server for IBM® System z®—making this its strategic platform for all new servers. Initially, the bank ran **more than 300 virtual servers on two IBM zEnterprise® 196 servers**. The solution includes IBM DB2® software supporting 50 major databases, IBM InfoSphere® DataStage® software for data transformation, and IBM Cognos® software for business analytics.

The benefits:

- Enabled 600 percent growth in mobile solutions and 200 percent growth in internet banking
- Supported 60 percent increase in in-branch transactions, while avoiding R\$ 3 million [USD 1.5 million] a year in electricity costs
- Transformed the speed, reliability and efficiency of service delivery to members, with rapid deployment of new resources

“Compared with databases on our previous distributed landscape, DB2 running on Linux on the IBM System z platform offers more reliability and performance, and better integration with our backup, monitoring and ETL tools.”

—Paulo Nassar, IT Processing and Storage Infrastructure Manager, Sicoob

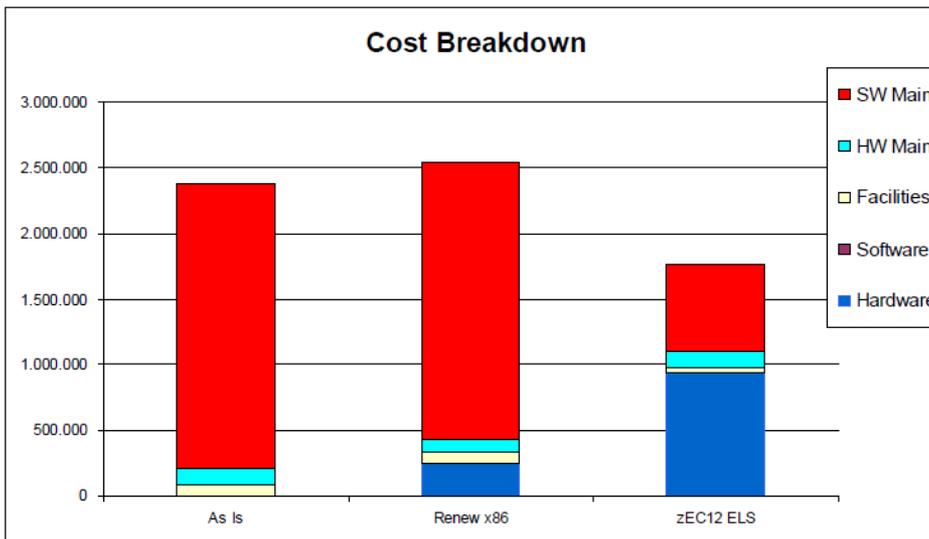
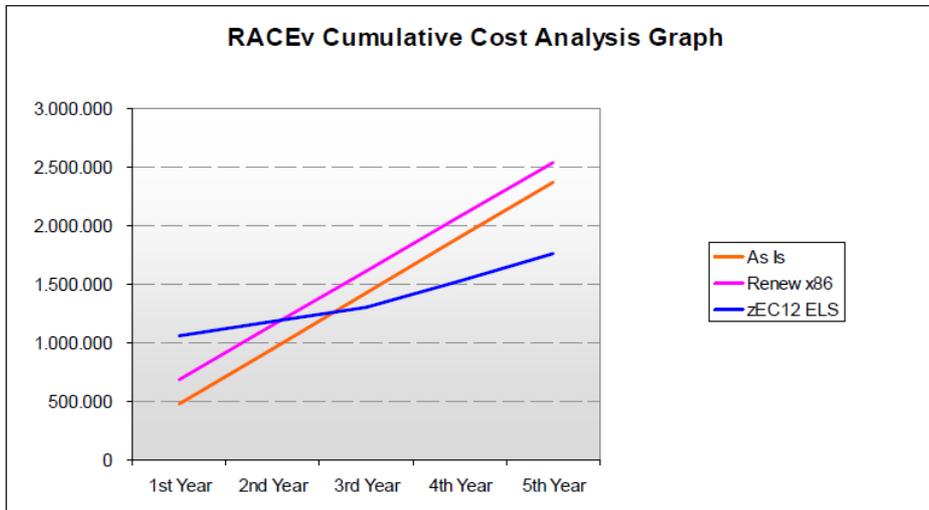
Solution components:

- IBM® DB2® for Linux on System z®
- IBM Cognos® for Linux on System z



ZSP03735-USEN-00

Database consolidation example



- ProLiant BL260c G5 Xeon E5430**
 Quad Core 2.66GHz (1ch/4co)
- 50 physical Linux servers
 - 10 servers @ 25% utilization
 - 20 servers @ 15% utilization
 - 20 servers @ 10% utilization
 - Oracle DB Standard Edition



Renewal: ProLiant BL280c G6 Xeon X5672 Quad Core 3.2GHz (1ch/4co)

The Met Office forecasts a bright outlook for Linux on z Systems

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

IBM FlashSystem & Linux on z Systems

Highest Reliability, Maximum Performance

Now you can leverage the “Economies of Scale” of Flash

- Accelerate Application Performance
- Gain Greater System Utilization
- Lower Software & Hardware Cost
- Save Power / Cooling / Floor Space
- Drive Value Out of Big Data



IBM FlashSystem is certified ([see SSIC](#)) to attach to Linux on z to meet your business objectives

Performance of Linux on z with FlashSystem

I/O bound relational databases, like Oracle, can benefit from IBM FlashSystem over spinning disks.

- **21x** reduction in response times*
- **9x** improvement in IO wait times*
- **2x** improvement in CPU utilization*

New FlashSystem 900 and z Systems FiconExpress16s I/O cards can provide an even higher throughput

Why IBM FlashSystem for Linux on System z?

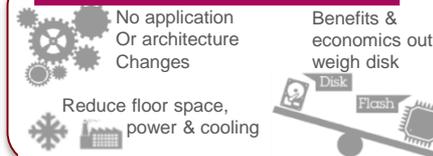
Extreme Performance



Enterprise Reliability



Macro Efficiency



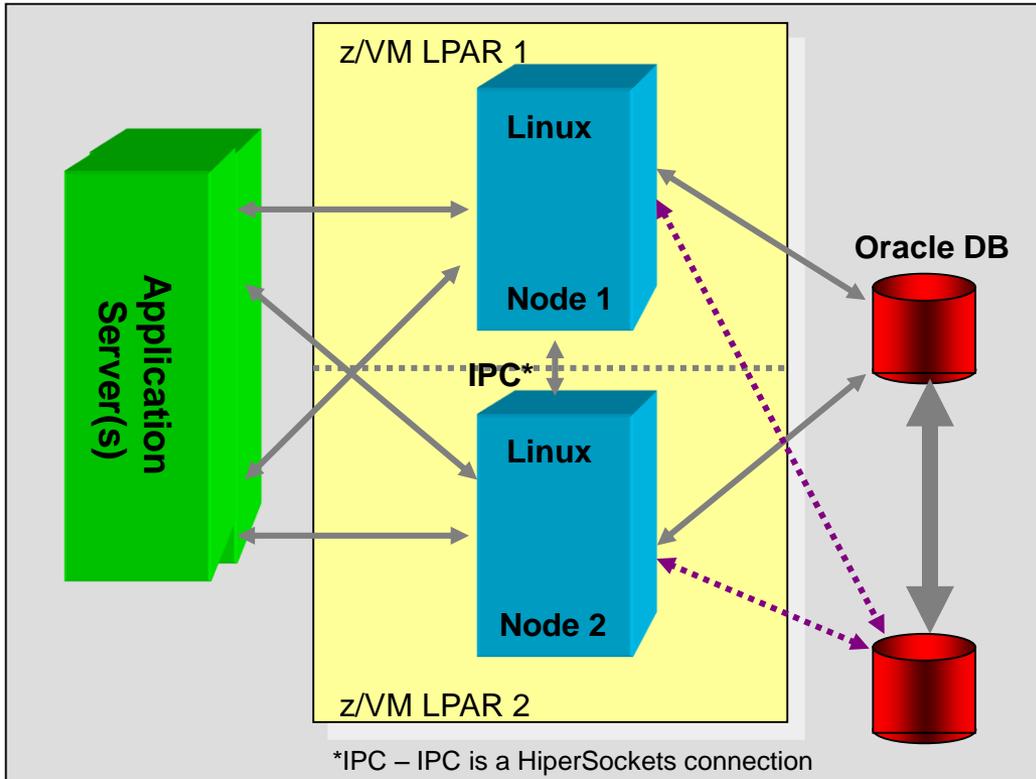
IBM MicroLatency™



* IBM internal test results with IBM FlashSystem 820 and FiconExpress4s

Oracle HA with System z

Oracle RAC



- Guards against Linux failure, LPAR failure, z/VM failure, Oracle instance failure, LPAR maintenance
- Can be: Active/active, active/passive
- Not limited to two nodes

Server provided HA

Oracle

- RAC
- Data Guard
- Flashback
- CRS
- Grid Control

Operating system HA

Linux

- Linux Clustering

z/VM

- Mature Hypervisor
- Hardware assist
- z/VM SSI/LGR

Hardware provided HA

System z

- Spare CPUs
- N+1 power supplies
- Chip sparring in memory
- Concurrent maintenance
- 50 years MTBF (system fail.)

Virtualization and Cloud Portfolio for Linux on z Systems and z/VM

Virtualization

Infrastructure &
Virtualization Management

IBM z/VM 6.3

- Support more virtual servers than any other platform in a single footprint
- Integrated OpenStack support



IBM Wave for z/VM

- A graphical interface tool that simplifies the management and administration of z/VM and Linux environments

Differentiation

Entry Level Cloud

Standardization & Automation



IBM Cloud Manager with OpenStack

- A simple, entry level cloud management stack
- Based on OpenStack
- Supports System z environments
- Formerly known as SmartCloud Entry

Standardization

Advanced Cloud

Orchestration & Optimization



IBM Cloud Orchestrator

- Builds on functionality of **IBM Cloud Manager with OpenStack** and adds runbook automation and middleware pattern support for workload deployment
- Based on OpenStack
- System z support as “managed-to”
- Formerly known as SmartCloud Orchestrator

*Service Lifecycle
Management*

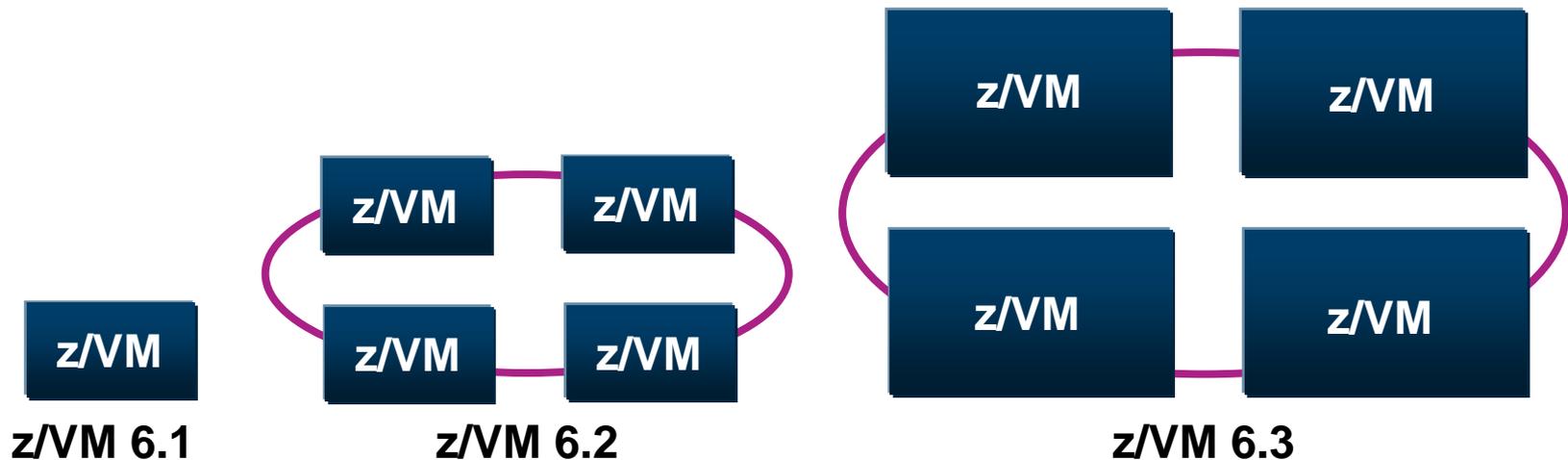
z/VM Version 6 Release 3

Making Room to Grow Your Business

Continued Evolution

- Improved TCO
- Scaling and efficiency improvements
- Ease of usability

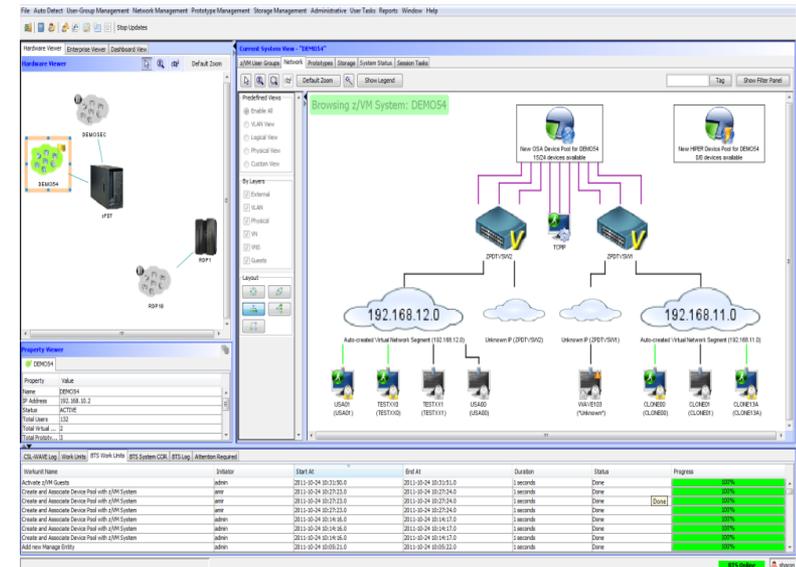
See <http://www.vm.ibm.com/zvm630/>



IBM Wave for z/VM (IBM Wave)

IBM Wave simplifies and helps automate management and administration of z/VM and Linux virtual servers, jumpstarting the steps needed to get to cloud. With its content rich interface IBM Wave extends the reach of your staff and lets you manage z/VM and Linux intuitively and cost effectively, reducing reliance on deep expert skills.

- Monitors and manages virtual servers and resources from a single interface
- Simplifies and automates administration and management 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 management, provisioning, and automation tool to help you fully leverage the power of System z virtualization on z/VM.

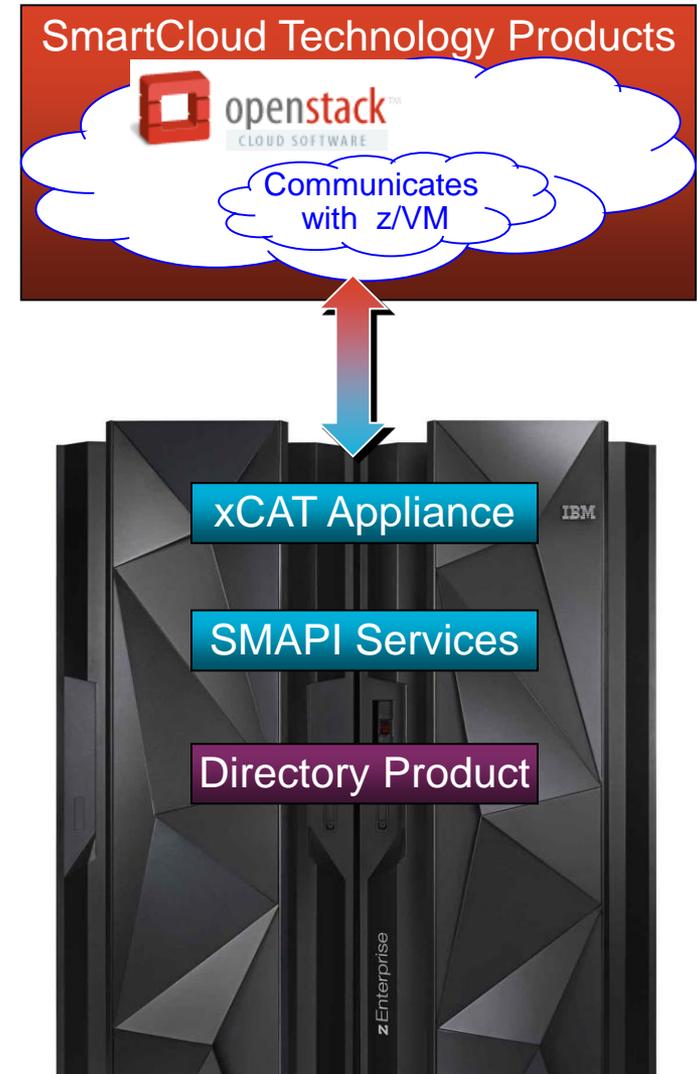
IBM Cloud Manager with OpenStack

Benefits:

- Full access to OpenStack APIs, backed with IBM support
- Cloud management solution that is easy to use
- Self service portal for workload provisioning and virtualized image management
- Heterogeneous support for IBM PowerVM®, z/VM, IBM PowerKVM and x86, and more
- Deploy, resize and capture
- Linux server backup and restore

Requires z/VM 6.3 with appropriate service

- *The xCAT Appliance utilizes new and existing Systems Management APIs (SMAPI) to interact with the z/VM system*



IBM Enterprise Cloud System

Trusted Cloud. Simply Delivered.



Open Linux Environment

- Red Hat/SUSE
- 3000+ Applications



Fully Automated Cloud Orchestration & Monitoring



Hypervisor and Virtualization Management



Utility Pricing and MSP Flexible Financing



Trusted, 24/7 IBM Support



Award Winning Hardware Design



- Integrated
- Delivered in 30-45 Days
- Production Ready in Hours

- 99.99%+ Availability
- EAL4 Server Security
- Available June 20, 2014

Open Source Priorities in 2015

Databases-Messaging



GEMFIRE®



Cluster Computing



Dev Languages-Environments



Cloud Infrastructure

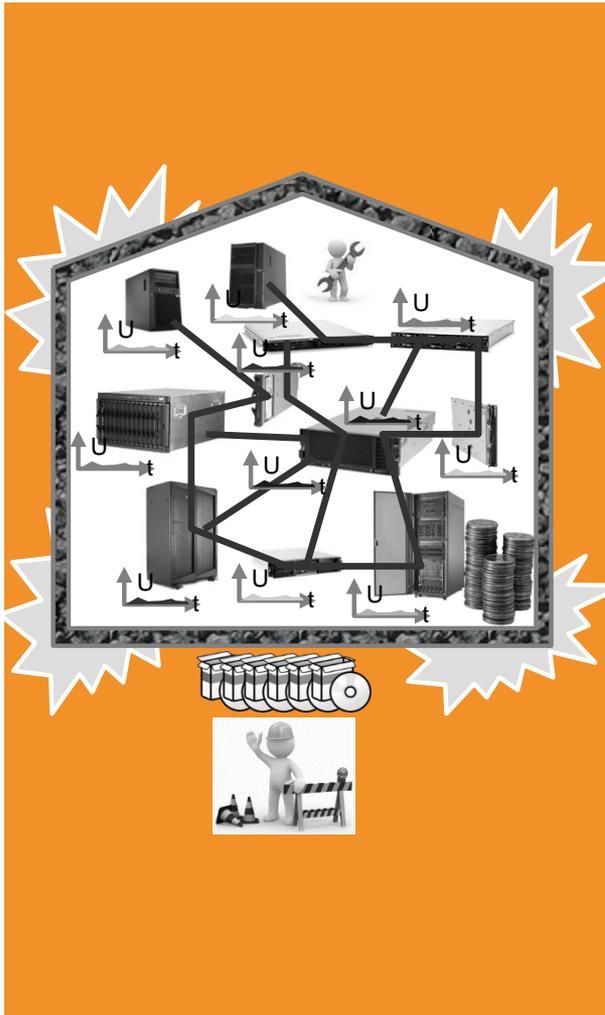


Green port/test done
open source versions

Looking at various sources of input: e.g. BlueMix, Githubstats, feedback from: IBM client reps, direct client input e.g. zBLC, on going research

IT Optimization with z Systems

Improved Effectiveness and Efficiency



- ✓ Operational and management 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



Linux on IBM z Systems

The real alternative to x86 server sprawl



A full room of servers **versus** One footprint with the size of a refrigerator

Unmatched Linux capacity

It's easy and cost-effective.

- Dundee City Council

Great degree of flexibility and scalability.

- Halkbank

Quickly and cost-effectively deploy innovative services.

- Banca Carige

Maintenance and support effort reduced by at least 65%.

- Algar Telecom

Operates even when resources are at 100% utilization.

- Bank of Tokyo-Mitsubishi UFJ

Differentiates in level of service and quality of service.

- L3C LLP

Questions



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