

z Systems platform's Unique Strengths

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Beijing 北京, China – May 19th, 2015



z Systems platform's Unique Strengths

Once you have completed this module, you should be able to:

- Identify the main challenge facing z Systems sellers
- Articulate the simple definition that has driven the requirements for mainframe development
- Articulate the eight design points that have driven 50 years of technological innovation for the mainframe
- Identify the reasons why z Systems is compared to Fort Knox, where the US gold reserves are stored



The Challenge

Customer experience is the new battleground



Exploiting Mobile, Analytics and cloud is essential in creating competitive advantage in digital business...

How Mobile and Social Technologies are Changing How We Engage, Work, and Do Business

Users expect response to social inquiry
in less than 5 minutes.¹

1 trillion connected objects
and devices by 2015.²



Big Data and Analytics are Enabling Smarter, Faster, Right-time Decisions



2.5 billion gigabytes of data are generated every day³

7.6% annual increase in customer lifetime value for firms that use engagement analytics⁴



Enterprises are looking to exploit cloud efficiency for mission critical services

Cloud deployment has **grown 92%** since 2012⁵

Approximately 70% of enterprises will pursue hybrid cloud by 2015⁶



Security is paramount to ensure trust and confidence in the digital era

70% of security executives have **cloud and mobile concerns**⁷

614% of enterprises experienced mobile malware growth in just one year⁸




Clients are influenced by many **factors** and **biases** that make each system selection decision unique



There are no “one size fits all” answers.

Systems selection



How do I offer the best value to my client to meet their needs?

Why does IBM care about addressing these challenges?

- Competition moves in quickly if you take too long to arrive at the right system recommendation.
- Competition says, “IBM’s too complex for you. Consider our simpler solution.”
- Help Sales Reps play a more consultative role with clients.

Sales Reps are challenged with:

- Understanding the benefits and best fit for each IBM system
- Identifying and considering the local client factors that influence system choice
- Determining which IBM system should ultimately be recommended to the client
- Confirming that the system the Rep recommends will deliver the most value for the client

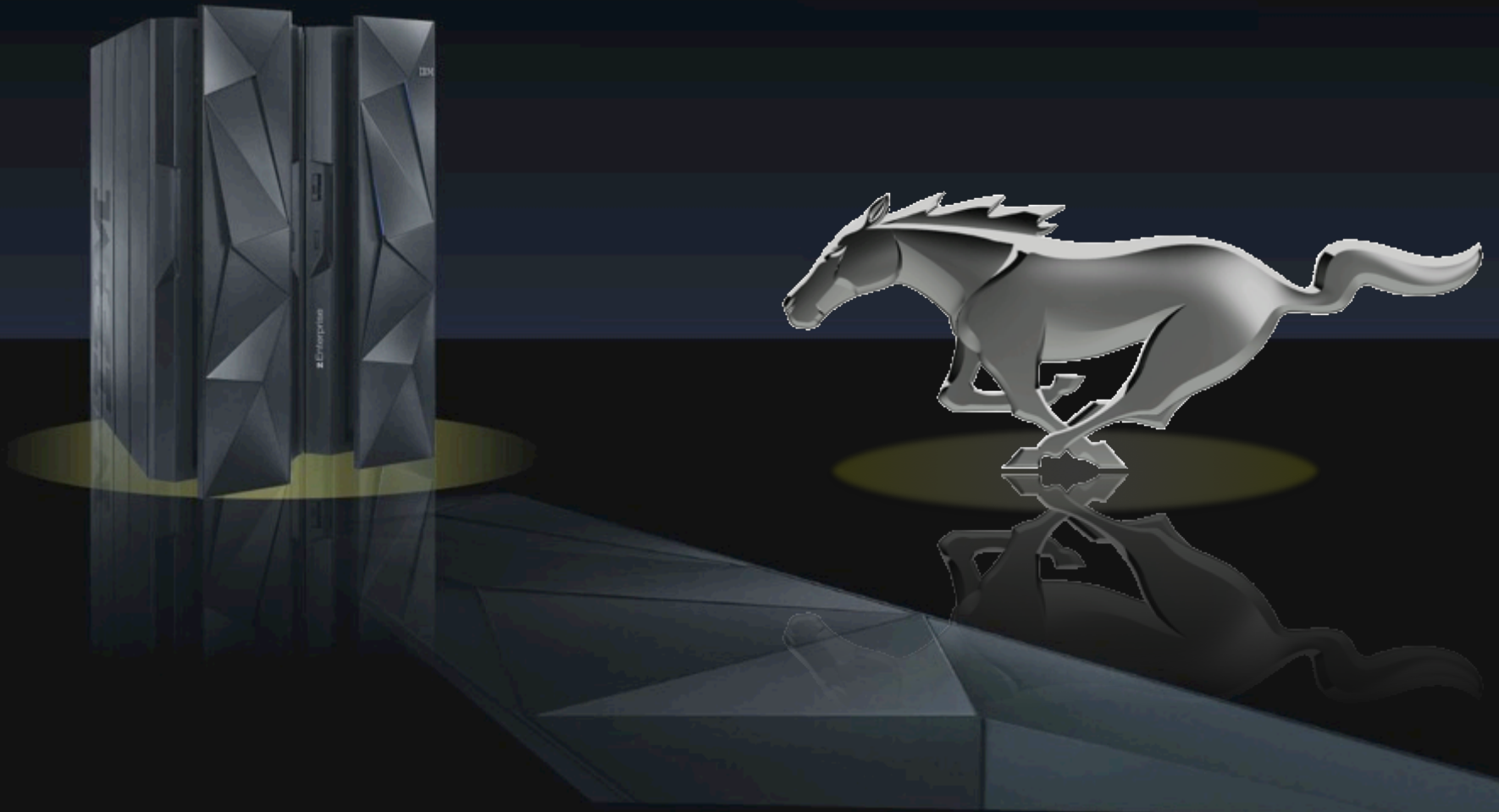


Discussion question



How can you
be sure that
you are offering
a solution that is the
best fit for your
clients' needs?

MAINFRAME STRENGTHS



Advanced Top Gun: Winning with z Systems™



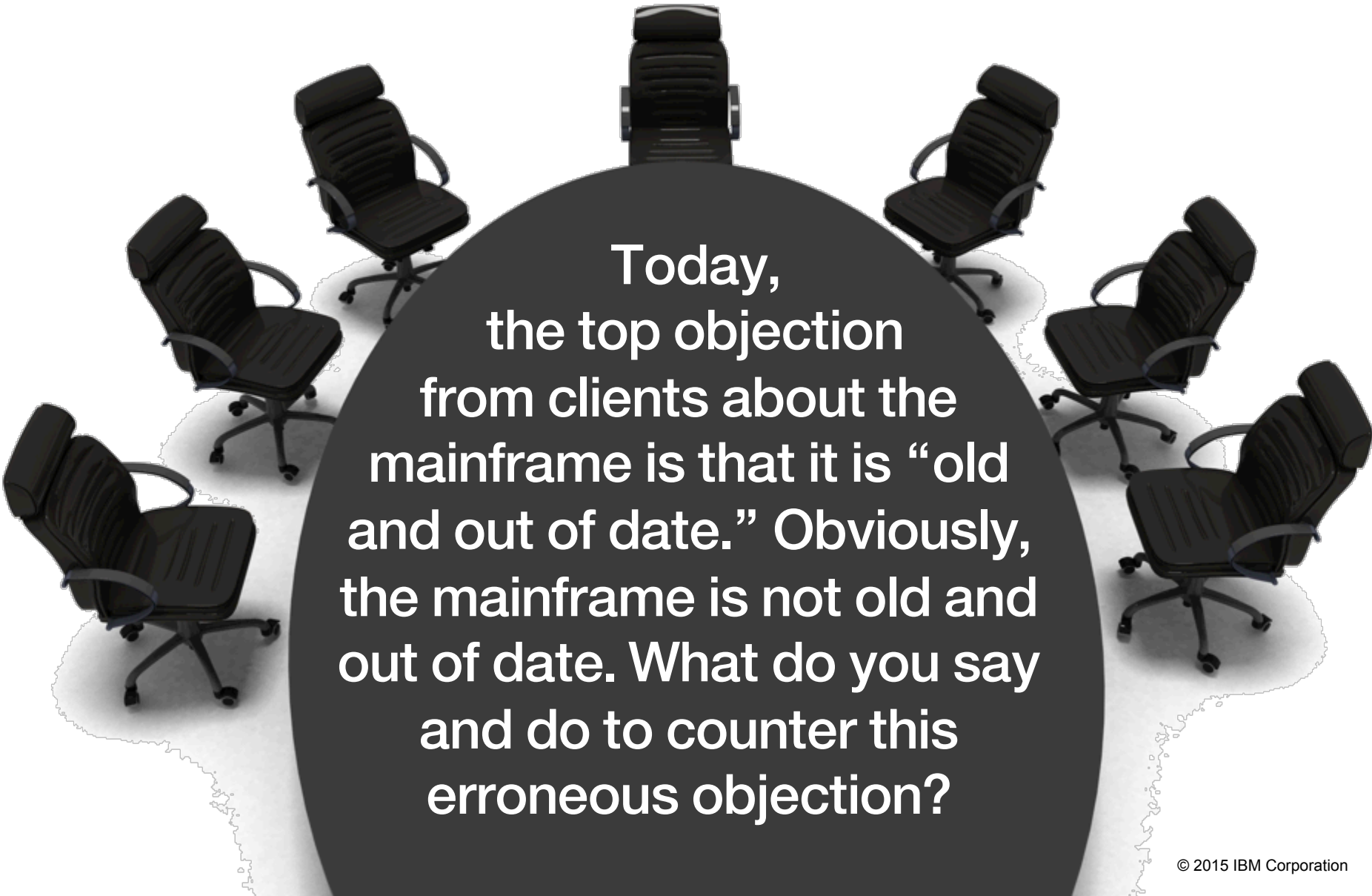
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celebrating
50
YEARS



SYSTEM 300

Discussion question



Today,
the top objection
from clients about the
mainframe is that it is “old
and out of date.” Obviously,
the mainframe is not old and
out of date. What do you say
and do to counter this
erroneous objection?

On the left side of the slide, there is a partial view of a grey IBM mainframe computer with a blue light strip and a small IBM logo. Next to it is a vertical bar composed of several colored segments: yellow, orange, pink, blue, yellow, orange, pink, and blue.

Mainframe

A computer system designed to continuously run very large, mixed workloads at high levels of utilization meeting user-defined service level objectives.

A vertical stack of IBM server racks, with the top rack featuring a blue light strip and an IBM logo. The racks are set against a dark background with a subtle pattern of overlapping circles.

History & Compatibility

Technology & Design

Virtualization

Workload Management

I/O Subsystem

Security

Hybrid Computing

Manufacturing

**Your existing
IBM 1401 computer programs
will run without change
on IBM SYSTEM/360.**

We wanted to prove how easy it is to move from an existing 1401 computer to a new SYSTEM/360. We wanted to prove that our Emulators—special hardware devices we have developed—enable SYSTEM/360 to use your existing computer programs without costly reprogramming. We invited customers to bring their 1401 programs to us and test them on a SYSTEM/360. And they came—more than 125 of them—from as far away as Sweden. They came with card programs and tape programs...with payroll programs and inventory programs...with COBOL and FORTRAN programs...with scientific and mathematical problems. They came with programs they had written, programs they had been using successfully on 1401 systems. We ran all these programs on SYSTEM/360 without changing any of them. And they ran faster—sometimes

Look at these remarkable test results!

Application	1401 Time	SYSTEM/360 Time	How much faster?
Freight reconciliation	9.4 minutes	4.5 minutes	2.0 times faster
Matrix inversion	9.5 minutes	3.2 minutes	2.9 times faster
COBOL compile	22.0 minutes	5.1 minutes	4.3 times faster
FORTRAN compile & go	28.0 minutes	6.5 minutes	4.3 times faster
Cash distribution	20.0 minutes	7.9 minutes	2.5 times faster
Manufacturing production program	42.0 minutes	18.0 minutes	2.3 times faster
Inventory analysis	45.0 minutes	15.3 minutes	2.9 times faster
Tax reporting	1.8 minutes	0.8 minutes	2.2 times faster
Inventory update	37.0 minutes	16.1 minutes	2.3 times faster

three times faster...sometimes four times faster...sometimes only 20% faster—but, on the average, about twice as fast. Programs that are written for IBM 1620, 1410, 1460, 1440 and all 7000 series computers also will work on SYSTEM/360 as long as you choose to use them. Eventually, you will want to reprogram to take full advantage of SYSTEM/360 speed and versatility.

But you don't have to do it right away. You can convert a program at a time, any time you choose. SYSTEM/360 is ready to start working for you the day it moves in. It's ready to go like 60 right now—1965—with your 1960 programs. Imagine what great things it will do when you reprogram!

IBM

SYSTEM/360—The Computer with a Future.

IBM has a holistic approach to **mainframe design** that includes **hardware, software and procedures**, as well as many factors, like **compatibility** and **investment protection**.



z/Architecture® simultaneously supports 24-bit, 31-bit, and 64-bit addressing modes. This provides **backwards compatibility** and **investment protection**.

Can you think of any other IT platform that could offer this?

How about non-IT?



History & Compatibility

Digital Business Redefined



Patented
coupling
system

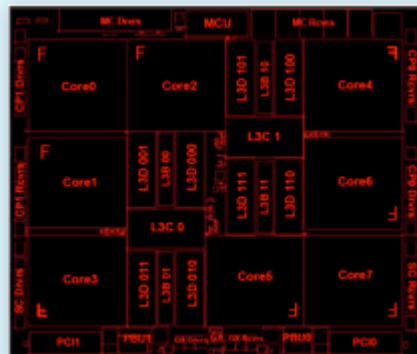
Lego pieces of all varieties constitute a universal system. Despite variation in the design and purpose of individual pieces over the years, each remains **compatible** in some way with existing pieces. Lego bricks from 1958 still interlock with those made in the current time, and Lego sets for young children are **compatible** with those made for teenagers.

Since 1949

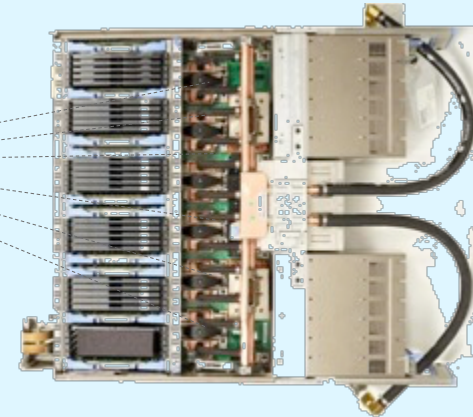
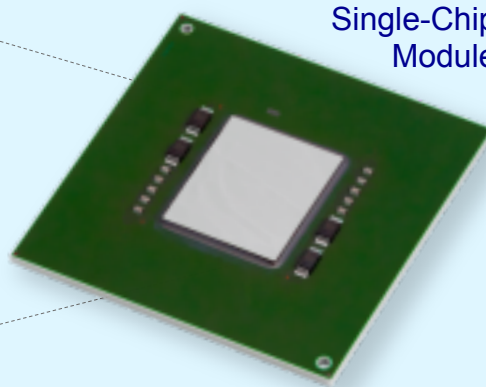


History & Compatibility

Digital Business Redefined



Single-Chip
Module



The z13 comes with a **5.0 GHz eight-core** processor chip, which allows us to deliver the world's **most scalable** and **largest single system image platform** in the market.

The z13 offers up to 168 processor cores that can be configured with over 110,000 MIPS in a **single footprint** and up to 10TB of RAIM memory.

- ✓ **Dense Packaging:** improves performance; shorter distances lowers latency
- ✓ **Enhanced IBM z/Architecture®:** dynamic simultaneous multithreading (SMT), single-instruction multiple-data (SIMD), superscalar pipeline design

Technology & Design

Digital Business Redefined

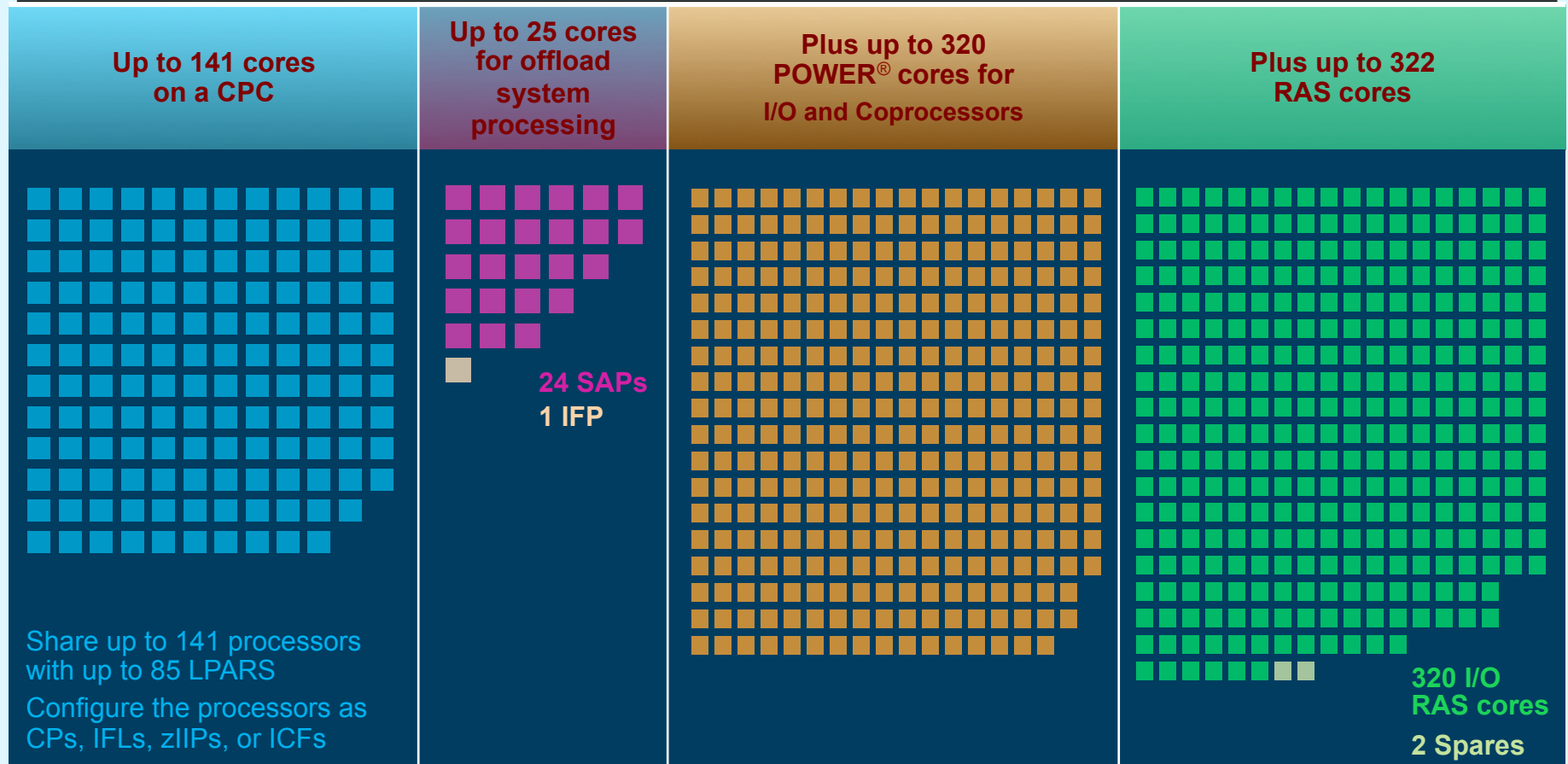
- ✓ **Cache:** core-cache design (L1 and L2), processors chip-cache design (L3) and node-cache design (L4) optimized by HiperDispatch: avoid untimely swaps
 - >Total **L1** per core is 40% larger
 - >Total **L2** per core is 100% larger
 - >Total on-chip shared **L3** is 33% larger
 - >Total shared **L4** is 266% larger
 - >Unique private **L2** cache design reduces **L1** miss latency
- ✓ **Hardware Transactional Memory:** increases parallelism
- ✓ **On chip cryptography & data compression:** boosts SW performance
- ✓ **IBM zAware & zManager:** provides intelligent, proactive hybrid monitoring
- ✓ **Specialty Engines:** enables a true hybrid platform fine tuned for mixed workloads
- ✓ **Transparent sparing for all CPU types:** z13 has 2 spare CPUs per server



Technology & Design

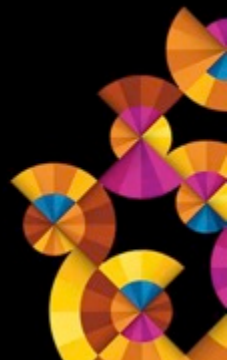
Digital Business Redefined

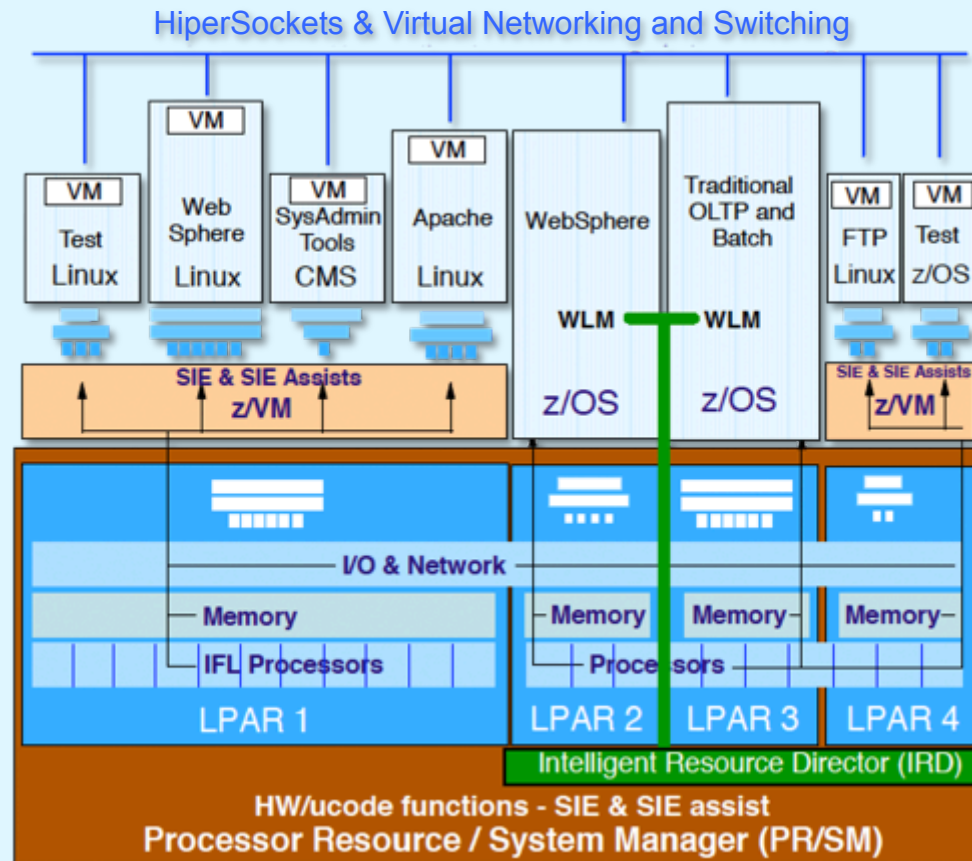




Technology & Design

Digital Business Redefined

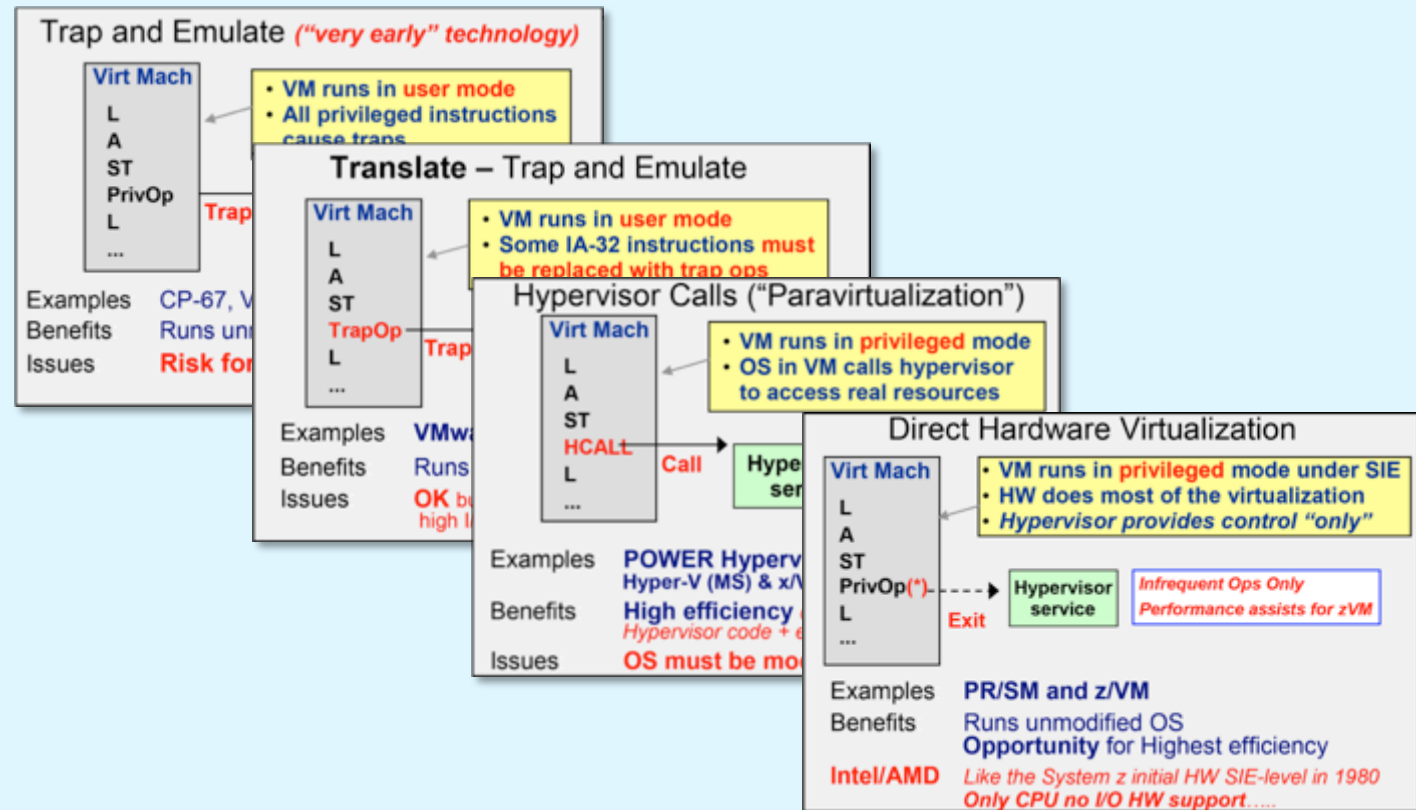




- ✓ Sophisticated hypervisor
- ✓ SIE instruction: virtualization is built-in, not added-on
- ✓ 10% of the integrated circuits used for virtualization (SIE)
- ✓ Time and Event-driven dispatching
- ✓ Shared-all architecture
- ✓ Any virtual CPU can access any physical CPU to operate
- ✓ LPAR zoning
- ✓ Guaranteed LPAR capacity

Virtualization

Digital Business Redefined

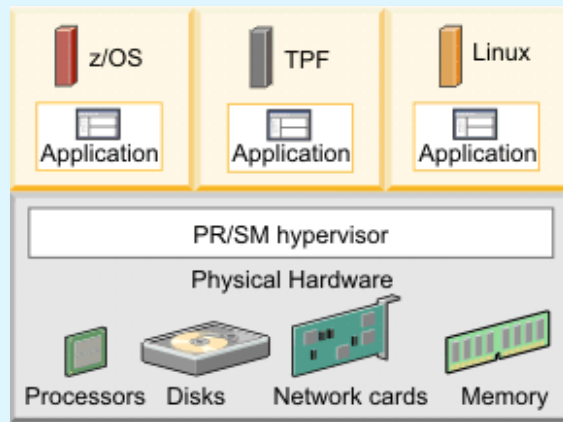


Virtualization

Digital Business Redefined



z Systems PR/SM®



- Type 1 Hypervisor, integrated in HW
- PR/SM enables each logical partition to have dedicated or shared processors and I/O, and dedicated memory (which you can dynamically reconfigure as needed).
- Up to 85 LPARs on a single system

Multiple Image Facility (MIF) and **multiple-channel subsystem (MCSS)** are the root technologies that enable I/O resource sharing at the hardware level. These technologies enable I/O channel paths, and subsets of I/O devices attached to those channel paths, to be shared among logical partitions.

Virtualization

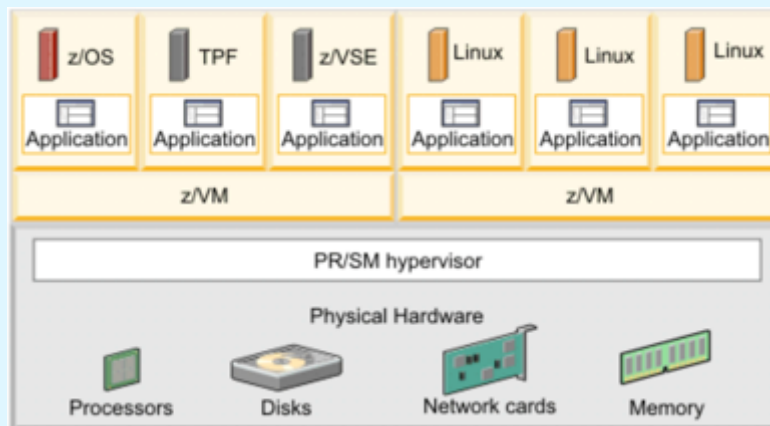
Digital Business Redefined



z Systems PR/SM



z/VM®



- z/VM can create virtual devices that do not physically exist.
- z/VM has sophisticated scheduling algorithms to optimize the overall system throughput and response.
- The number of virtual machines you can create is limited only by the amount of resource available.
- z/VM can run as a guest of itself to multiple levels.

Virtualization

Digital Business Redefined



z Systems PR/SM



z/VM



z Systems Virtual Networking

These virtual networking technologies leverage the Queued Direct I/O (QDIO) Hardware Facility and QDIO Control Program (CP) that are integrated with all System z models.

- ✓ **HiperSockets:** TCP/IP virtual LANs, simulating QDIO network adapters
- ✓ **z/VM guest LANs:** virtual TCP/IP LANs within a z/VM environment that facilitate internal virtual machine communication between guest operating systems
- ✓ **z/VM virtual switches:** special type of guest LAN that bridges physical OSA-Express adapters and OSA-Express guest LANs, providing external LAN connectivity to the guest LAN environment



Virtualization

Digital Business Redefined





z Systems PR/SM



z/VM



z Systems Virtual Networking



z Systems virtual I/O

Virtual I/O consists of I/O channels, devices, and adapters that appear to be exclusively owned by a virtual system.

To create virtual I/O, systems come equipped with **Multiple Image Facility**, and **z/OS® Intelligent Resource Director** provides **Dynamic Channel Path Management**.

Enable I/O resource sharing at the hardware level

Dynamically adjust the channel configuration in response to shifting workload patterns



Virtualization

Digital Business Redefined





z Systems PR/SM



z/VM



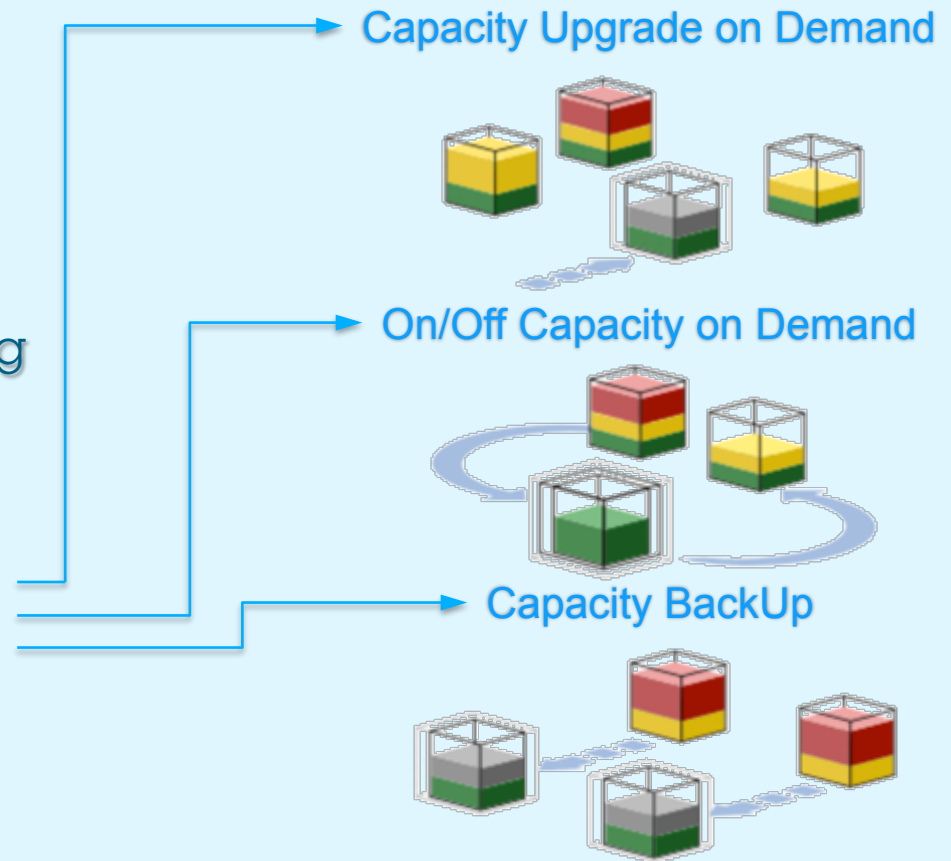
z Systems Virtual Networking



z Systems virtual I/O



Capacity on Demand for
z Systems



Virtualization

Digital Business Redefined



z Systems PR/SM



z/VM



z Systems Virtual Networking



z Systems virtual I/O



Capacity on Demand for
z Systems



z Systems z/OS and Parallel
Sysplex® clustering



Clustering driven by specialty engines
(Coupling Facility)
Presents a single system image
of a z/OS workload
Potentially 2.5M MIPS per 32-way cluster
Enables rolling updates
Supports continuous access to business services
and data – from anywhere, at anytime
Designed for 99.999% availability



Virtualization

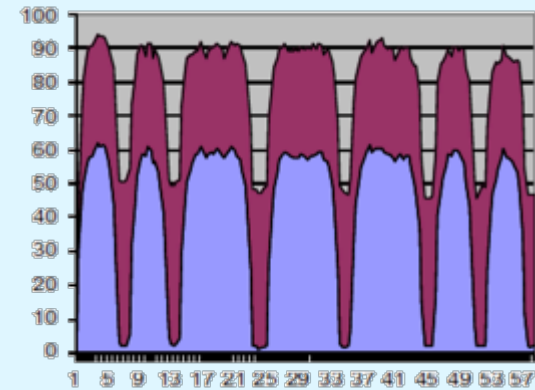
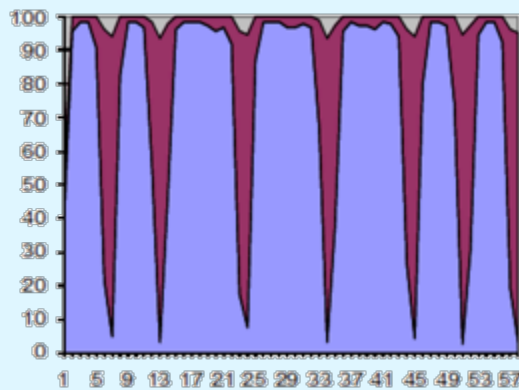
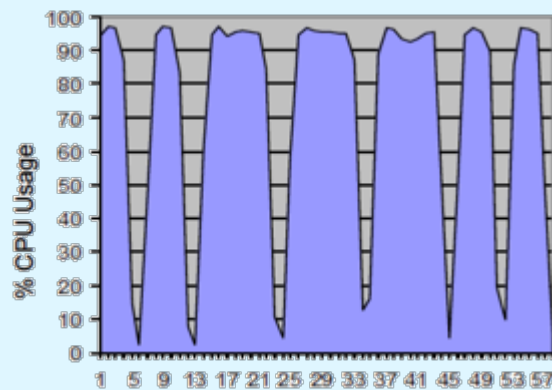
Digital Business Redefined



z Systems Have Perfect Workload Management: Priority transactional workload on z/OS does not degrade when low priority donor workload is added

Designed to support diverse mixed workloads – not just more of the same

- Intelligent and autonomic management of diverse workloads and system resources based on business policies and workload performance objectives
- Allows deployment while maintaining one virtual server per application
- Complete workload isolation
- High speed inter-server connectivity
- Handles peak workload utilization of 100% without service level degradation
- Utilization often (usually) exceeds 90%



Workload Management

Digital Business Redefined

System z I/O Subsystem Offloads Work

System Assist Processor

- Manages path selection
- Filter intermediate interrupts
- I/O Priority
- Dynamic path reconnect

Hardware System Area

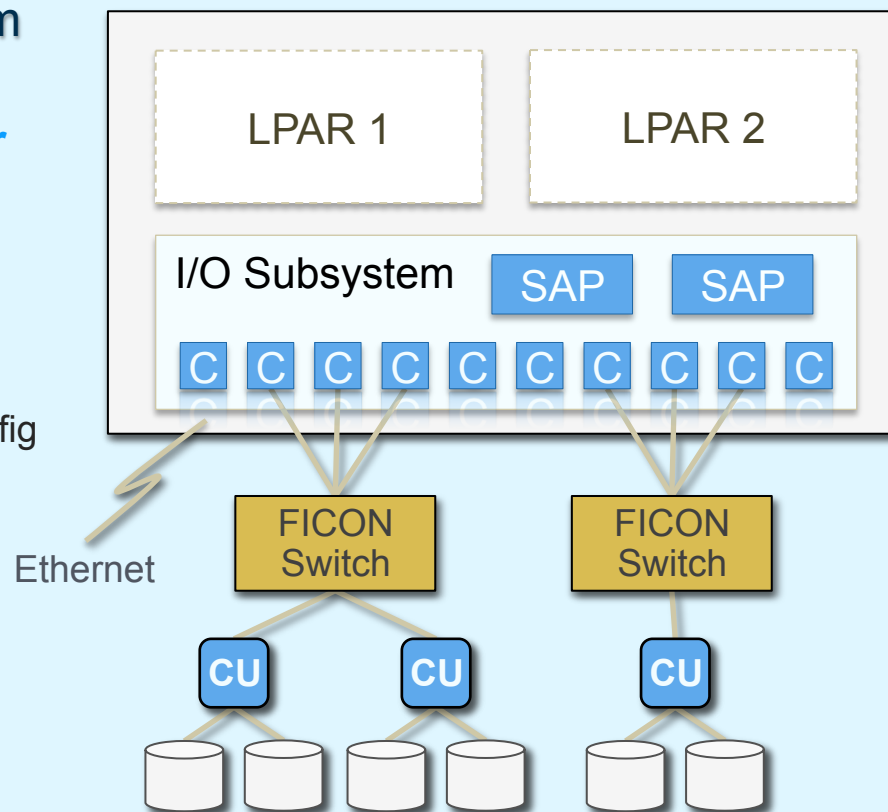
- 96GB of memory for I/O config

Channels

- Manages physical links
- Direct memory transfer

Control Units

- Manages interfaces
- Cache
- Abstracts devices
- Dynamic path reconnect



AND
THE
BENEFITS?

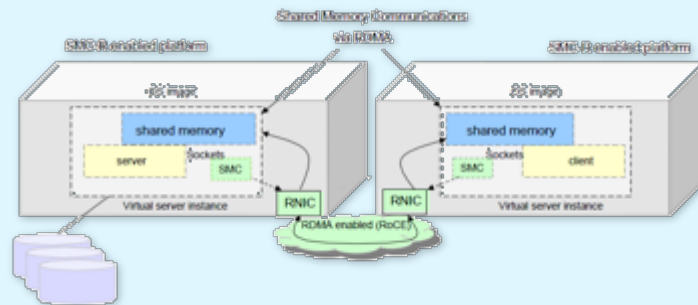
- I/O prioritization
- Off-load I/O cycles
- Lowers SW costs
- Increase sharing
- Simplify DR

I/O Subsystem

Digital Business Redefined

Many applications today use TCP/IP to communicate server to server: using traditional Ethernet technology, **network latency** and **processor resource consumption** can be high.

IBM continues to **innovate** with new PCIe features



Shared Memory Communications via Remote Direct Memory Access (SMC-R) is a feature of z/OS v2.1 and exploits a new **10GbE RoCE Express** feature of z13.



The combination is designed to **reduce latency** and **improve wall clock time**

Transaction without SMC-R



Transaction with SMC-R



Can be **server-to-server** communication in a multi-server environment or **LPAR-to-LPAR** communication on a single system




I/O Subsystem

Digital Business Redefined

The diagram illustrates the architecture of zEnterprise LPARs and HiperSockets. It is divided into three main sections labeled "Logical Partition" at the top.

- Left Logical Partition:** Contains a box for **z/OS 1.12** with **EAL 4+** below it.
- Middle Logical Partition:** Contains a box for **z/OS 1.13** with **RACF 1.13** and **EAL 5+** below it.
- Right Logical Partition:** Contains a large box for **z/VM 6.1 EAL4+**. Inside this box are two smaller boxes for **Linux Guest VM**. The left guest VM contains **Linux SLES 11SP2** with **EAL 4+** below it. The right guest VM contains **Linux RHEL 5** with **EAL 4+** below it.

Below the partitions, a horizontal line represents the hardware layer. A double-headed vertical arrow indicates connectivity between the partitions. A box labeled **HiperSockets** is positioned on this line. At the bottom, a large box labeled **zEnterprise LPARs** with **EAL 5+** below it spans the width of the diagram, with arrows pointing up to the partitions.



Industries & solutionsServicesProductsSupport & downloadsMy IBM

IBM Systems > Mainframe servers > Operating systems > z/OS > Features and Functions >

z/OS Statement of Integrity

Overview

What's New

z/VM

Resources

First issued in 1973, IBM's MVS™ System Integrity Statement, and subsequent statements for OS/390® and z/OS, has stood for over three decades as a symbol of IBM's confidence in and commitment to the z/OS operating system. IBM reaffirms its [commitment to z/OS System Integrity \(PDF, 1.1MB\)](#).

IBM's commitment includes design and development practices intended to prevent unauthorized application programs, subsystems, and users from bypassing z/OS security—that is, to prevent them from gaining access, circumventing, disabling, altering, or obtaining control of key z/OS system processes and resources unless allowed by the installation. Specifically, z/OS "System Integrity" is defined as the inability of any program not authorized by a mechanism under the installation's control to circumvent or disable store or fetch protection, access a resource protected by the z/OS Security Server (RACF®), or obtain control in an authorized state; that is, in supervisor state, with a protection key less than eight (8), or Authorized Program Facility (APF) authorized. In the event that an IBM System Integrity problem is reported, IBM will always take action to resolve it.

IBM's long-term commitment to System Integrity is **unique in the industry**, and forms the basis of z/OS' industry leadership in system security. z/OS is designed to help you protect your system, data, transactions, and applications from accidental or malicious modification. This is one of the many reasons IBM System z™ remains the industry's premier data server for mission-critical workloads.

Security

Digital Business Redefined

IBM's Fort Knox: z Systems

Workload Isolation



- Isolation of users in a separate address space
- Processing integrity with LPAR separation (PR/SM)
- HiperSockets - In memory communication between LPARs
- System programs separated from user programs
- Authorized Program Facility (APF)

Architectural Principles



- Strict division between privileged and non-privileged instructions
- Strict division between configuration hardware (SE) and runtime hardware
- No access to privileged state unless authorized
- z Systems Firmware

Crypto Card



- High speed cryptography integrated on the new Crypto Express4S chip
- Enhanced digital signature capability with new Enterprise PKCS #11
- New credit transaction verification support for smart payment cards
- Enterprise Key Management Foundation

Small attack surface



- Viruses cannot be readily introduced



Security

Digital Business Redefined



IBM DB2
Analytics
Accelerator



z BladeCenter®
Extension



IBM WebSphere
DataPower® Integration
Appliance XI52 Virtual
Edition on System x

zManager



IBM WebSphere
DataPower®
Integration
Appliance
XI50



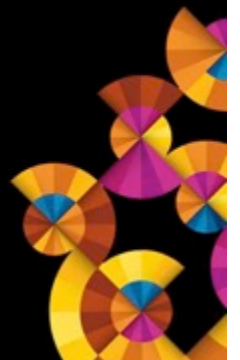
Hybrid Computing

Digital Business Redefined

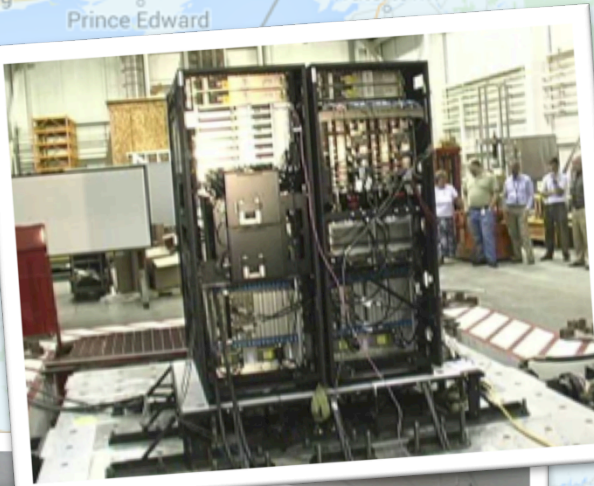
**Test:
8.0 Richter Scale**

Manufacturing

Digital Business Redefined



Advanced Top Gun: Winning with z Systems™



Manufacturing

Digital Business Redefined



A vertical stack of IBM server racks, with the top rack featuring a blue light strip and an IBM logo. The racks are set against a dark background with a subtle pattern of overlapping circles.

History & Compatibility

Technology & Design

Virtualization

Workload Management

I/O Subsystem

Security

Hybrid Computing

Manufacturing

Platform Core Capabilities

Transaction Processing

Data Serving

Mixed Workloads

Operational Efficiency

Trusted and Secure Computing

Reliable, Available, Resilient

Virtually Limitless Scale

- *The world's premier transaction and data engine now enabled for the mobile generation*
- *The integrated transaction and analytics system for right-time insights at the point of impact*
- *The world's most efficient and trusted cloud system that transforms the economics of IT*

IBM z13: The New Possible



Mobile

Deliver **up to 36%** better response time, **up to 61%** better throughput, and **up to 17%** lower cost per mobile transaction



Analytics

Deliver insights **up to 17x** faster and with **13x** better price performance than closest competitor



Cloud

Enable superior Cloud services at **up to 40%** lower cost than x86 Cloud and **up to 65%** less than Public Cloud over three years



Security

Accelerate speed of encryption **up to 2x** over the zEC12 to help protect the privacy of data throughout its life cycle



Impact of the MainFrame on French Economy

A Platform for the Future – IDC Study

Partners say Mainframe is appropriate for next projects on



Cloud **52%**



Mobile **50%**



Big Data **70%**



of French GDP is operated by Mainframes

20% of Mainframe Customers develop Open Source solutions on Mainframe

15% of Mainframe Workloads are based on Open Source applications

40% of the ecosystem partners consider Data & Application Security as a key driver to invest on Mainframe

2,8 %
Of French Total IT spent



65% of mission critical applications run on mainframe

30,000 associated Jobs



40% of companies plan new hiring in 2014



300 Partners
in the ecosystem

Source: IDC France Study Mainframe December 2013
For Internal Use Only

The importance of technology choice

Technology Economics: across sectors, organizations with higher mainframe use demonstrate...

- ✓ An average of 31% lower IT Cost of Goods
- ✓ Computational growth that is roughly 3x more economically efficient

... over distributed server-heavy organizations.

28%  less IT spend per barrel of oil

68%  lower IT cost per loan approval

67%  less cost per teller transaction

48%  lower IT cost per credit card transaction

27%  lower IT cost per retail store

31%  less IT spend per vehicle for automotive companies

30%  less IT spend per airline passenger mile

27%  less IT cost per hospital bed

“... in the long run the marketplace rewards those that make the optimum use of the right computing resources in the right way as evidenced by business performance.”

Dr. Howard Rubin, Chief Executive Officer and Founder, Rubin Worldwide
Technology Economics: The Impact of Your Computing Strategy in Real Business Terms; 2012 Rubin Worldwide.

Discussion question



In platform
selection, when is
a public cloud the
wrong choice?

Price per VM is a good reason, but
Amazon's Jim Bezos has threatened
to cut prices dramatically. Is it just
about price?

Key learning points

- Customer experience is the new battleground
- The challenge facing z Systems sellers is how to offer the best value to meet their clients' needs.
- Today's mainframe reflects 50 years of technological innovation based on a simple definition and eight design points that include:
 - History and compatibility
 - Technology and design
 - Virtualization
 - Workload management
 - I/O subsystem
 - Security
 - Hybrid computing
 - Manufacturing
- z/Architecture simultaneously supports 24-bit, 31-bit, and 64-bit addressing modes. This provides backwards compatibility and investment protection.
- The z13 comes with a 5.0 Ghz (8-core) processor chip which allows IBM to deliver the world's most scalable and largest single system image platform in the market.
- Under z/VM, the number of virtual machines that can be created is limited only by the amount of resources available.

Key learning points

- PR/SM, a type 1 hypervisor, enables each logical partition to have dedicated or shared processors and I/O, and dedicated memory, which can dynamically reconfigure as needed and can enable up to 85 LPARS on a single system.
- The QDIO Hardware Facility and the QDIO CP enable virtual networking on the system. The *QDIO Hardware Facility* is a type of internal I/O (integrated into the system) that facilitates internal logical partition communication.
- Capacity Upgrade on Demand (CUoD) allows for the non-disruptive addition of central processor capacity.
- z Systems has perfect workload management, allowing for 100% workload utilization.
- z Systems I/O subsystem offloads work from the general processor prioritizing the workload.
- New PCIe features and shared memory communications reduce latency and improve wall clock time.
- z Systems availability is the highest in the industry.
- Studies have proven that increased mainframe usage delivers better business results.
- z Systems have a strong heritage of being the most secure system on the market today. It has been compared to Fort Knox.

Advanced Top Gun: Winning with z Systems™



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