Aktuelles aus z/VM, z/VSE, und Linux on IBM z Systems

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Agenda

- § z/VSE
- § Linux on z Systems
- § z/VM
- § New Statements of Direction
- § Summary

The Cat turned 50 !

z/VSE 50

50 years of innovation

z/VSE Customer Conferences 2015

- **German GSE in Berlin (Germany)**
  - **April 27-29, 2015**

- **Edge2015 in Las Vegas (Nevada)**
  - **May 11-15, 2015**

- **IBM System z Technical University in Dublin (Ireland)**
  - **May 18-22, 2015**

- **z/VM z/VSE Linux on z Systems Workshop in Binghamton (New York)**
  - **June 25-27, 2015**

- **GSE European Working Group in Böblingen (Germany)**
  - **Oct 19-21, 2015**

z/VSE continues to demonstrate IBM's Commitment

Hardware Support
More Capacity
Quality
z/OS Affinity
Interoperability
Protect Integrate Extend

z/VSE V5.1 - 4Q2011
- zEnterprise exploitation
- IEDN connection to zBX
- 64-bit virtual memory objects
- ALS to System z9
- z/VSE z/VM IP Assist (VIA)

+ SoD: CICS Explorer, LFP in LPAR

z/VSE V5.1.1 - 2Q2012
- CICS Explorer Monitoring
- Universal database connector
- Linux Fast Path in LPAR

z/VSE V5.1.2 - 2Q2013
- 64-bit I/O for applications
- Networking enhancements
- Security enhancements

+ SoD: CICS Explorer Update, DVD Install, IPv6/VSE price reduction

z/VSE V5.2 - 2Q2014
- Additional zEnterprise exploitation
- DVD install
- Networking and security enhancements

+ SoD: New version of z/VSE, ALS to System z10, support for channels & containers in CICS TS for z/VSE

Announced on April 7, 2014, jointly with Mainframe50 anniversary

z/VSE Vnext
- ALS to System z10
- CICS TS for z/VSE V2.1 incl CICS Explorer update, support for channels & containers

Coming soon, 50 years after DOS/360

z/VSE Hardware Support Status (as of April 2015)

IBM z Systems	z/VSE Vnext (planned)	z/VSE V5.2	z/VSE V5.1	z/VSE V4.3 (EoS)	z/VSE V4.2 (EoS)
IBM z13	a	a	a	a	a
IBM zEnterprise EC12 & BC12	a	a	a	a	a
IBM zEnterprise 196 & 114	a	a	a	a	a
IBM System z10 EC & z10 BC	a	a	a	a	a
IBM System z9 EC & z9 BC	r	a	a	a	a
IBM eServer zSeries 990 & 890	r	r	r	a	a
IBM eServer zSeries 900 & 800	r	r	r	a	a

z/VSE Support for IBM z13

- **Together with GA of z13 we delivered toleration PTFs for z/VSE 5.1 and 5.2**

- **z/VSE**
  - **can run in more LPARs (up to 85)**
  - **supports new Crypto Express5S in coprocessor and accelerator mode**
  - **supports more than 16 domains with the new Crypto Express5S**
  - **supports new FICON Express16S**
    - **FICON-attached devices**
    - **FCP-attached SCSI disks**
  - **supports existing OSA Express4S and 5S**
  - **supports newest version of SCRT**

z/VSE Software Support Status (as of April 2015)

VSE Version and Release	Marketed	Supported	End of Support
z/VSE V5.2 requires z9 or newer system	a	a	**tbd**
z/VSE V5.1 requires z9 or newer system	r	a	**06/30/2016**
z/VSE V4.3 requires z900 or newer system	r	r	10/31/2014
z/VSE V4.2 incl CICS/VSE V2.3, DL/I V1.11	r	r	10/31/2012
z/VSE V4.1 [2)]	r	r	04/30/2011
z/VSE V3.1 [1)]	r	r	07/31/2009
VSE/ESA V2.7	r	r	02/28/2007

[1]) z/VSE V3 is 31-bit mode only. It does not implement z/Architecture, and specifically does not implement 64-bit mode capabilities. z/VSE is designed to exploit select features of IBM System z10, System z9, and zSeries hardware.
[2]) z/VSE V4 is designed to exploit 64-bit real memory addressing, but will not support 64-bit virtual memory addressing

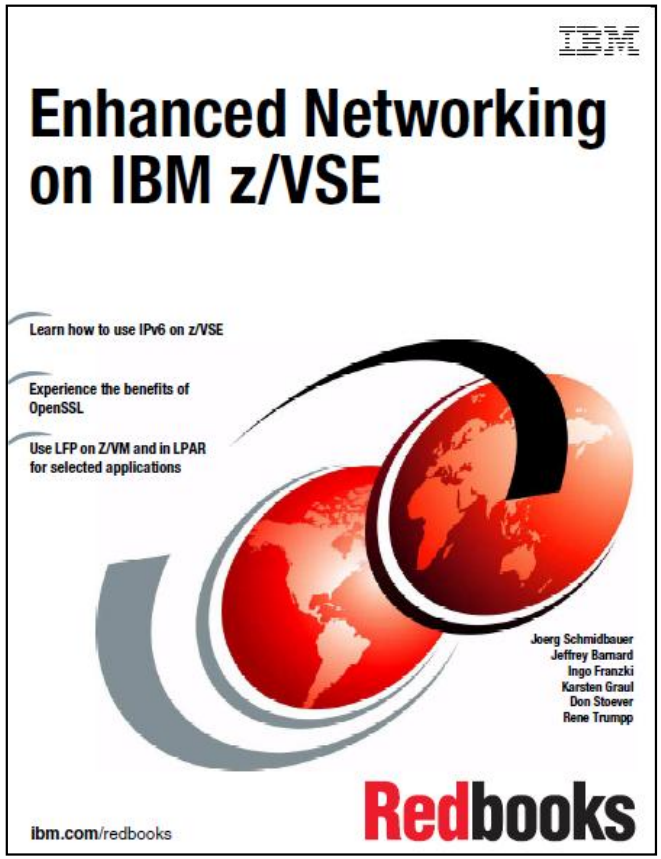
z/VSE SOA and Interoperability

Connector Functions	z/VSE V5.2	z/VSE V5.1	z/VSE V4.3 EoS	z/VSE V4.2 EoS	z/VSE V4.1 EoS
z/VSE Connectors (no additional charge)					
VSAM, POWER, Librarian, ICCF lib, console	Yes	Yes	Yes	Yes	Yes
VSAM Redirector	Yes	Yes	Yes	Yes	Yes
SOA Web Services, i.e. SOAP and XML **Updated with V5.2**	Yes	Yes	Yes	Yes	Yes
z/VSE Script and DL/1	Yes	Yes	Yes	Yes	Yes
DB2 Stored Procedures for VSAM and DL/1	Yes	Yes	Yes	Yes	Yes
VTAPE interface to IBM Tivoli Storage Manager (TSM)	Yes	Yes	Yes	Yes	Yes
LDAP client (LDAP server on another platform required) **Updated with V5.2**	Yes	Yes	Yes	Yes	
SNMP agent	Yes	Yes	Yes		
LFP from z/VSE to Linux TCP/IP in z/VM-mode LPAR	Yes	Yes	Yes		
z/VSE z/VM IP Assist (VIA)	Yes	Yes			
GDPS client	Yes	Yes			
LFP via zEnterprise HiperSockets Completion Queues	Yes	Yes			
z/VSE Database Call Level Interface (DBCLI) connector	Yes	Yes			
IPv6 support for z/VSE connectors **New with V5.2**	Yes				
z/VSE trigger monitor for WebSphere MQ client **New with V5.2**	Beta				
IBM Middleware (priced)					
CICS Transaction Gateway ECI	Yes	Yes	Yes	Yes	Yes
Host on Demand / Host Application Transformation	Yes	Yes	Yes	Yes	Yes
DB2 Connect / DB2 UDB (DB2 Server for z/VSE V7.5 Client)	Yes	Yes	Yes	Yes	Yes
WebSphere MQ (z/VSE Client no charge)	Yes	Yes	Yes	Yes	Yes

Updated Redbook: Enhanced Networking on IBM z/VSE – SG24-8091

Update available since December 31, 2014
http://www.redbooks.ibm.com/Redbooks.nsf/RedpieceAbstracts/sg248091.html

This IBM Redbooks publication helps you install, tailor, and configure new networking options for z/VSE that are available with TCP/IP for VSE/ESA, IPv6/VSE, and Fast Path to Linux on System z (Linux Fast Path). We put a strong focus on network security and describe how the new OpenSSL-based SSL runtime component can be used to enhance the security of your business.



Chapter 1. Networking options overview
Chapter 2. TCP/IP for VSE/ESA
Chapter 3. IPv6/VSE
Chapter 4. Fast Path to Linux on System z
Chapter 5. OpenSSL
Chapter 6. Comparison of stacks and protocols
Appendix A. API reference

z/VSE Live Virtual Classes (Webcasts)

- *Future topic*
  - z/VSE for beginners
- *March 10, 2015*
  - Analyzing CICS TS SOS problems in z/VSE
  - How to determine CICS wait time from CICS traces
- *February 24, 2015*
  - Mobile access to existing z/VSE applications
- *2014*
  - z/VSE SCSI support and migration options
  - z/VSE VSAM enhancements
  - z/VSE connectors update
  - Introduction to tuning VSAM file performance under CICS TS in z/VSE
  - Tapeless initial installation
  - z/VSE Version 5 update
  - TCP/IP for z/VSE update
  - Update on encryption and SSL
- *2013*
  - Exploit new z/VSE solutions with zBC12 in a virtualized environment
  - Language Environment for z/VSE
  - z/VSE CMT and SCRT update
  - How to avoid or handle CICS storage availability problems
  - z/VSE security enhancements
  - Important update on z/VSE enhancements
  - z/VSE release migration considerations - Part 1&2
- *2012*
  - System z hardware exploitation in z/VSE
  - VSE/POWER – all the news since z/VSE 4.2
  - Securing data transfers using IPv6/VSE
  - The new z/VSE Database Connector (DBCLI)
  - IPv6 in z/VSE
  - Monitoring principles and z/VSE monitoring options

Replays available!

Dates and replays @

ibm.com/systems/z/os/zvse/education/

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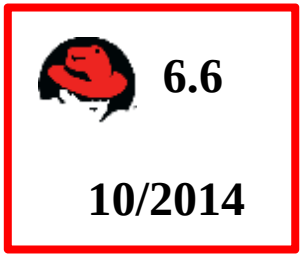
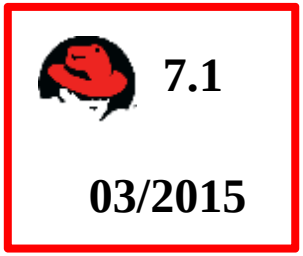
Linux Distributions (as of April 2015)

- **SLES 10 SP4: Available since 04/2011**
  - Kernel 2.6.16, GCC 4.1.0
- **SLES 11 SP3: Available since 07/2013**
  - Kernel 3.0, GCC 4.3.4
- **SLES 12: Available since 10/2014**
  - Kernel 3.12.36 (since 01/2015), GCC 4.8

- **RHEL 5.11: Available since 09/2014**
  - Kernel 2.6.18, GCC 4.1.0
- **RHEL 6.6: Available since 10/2014**
  - Kernel 2.6.32, GCC 4.4.0
- **RHEL 7.1: Available since 03/2015**
  - Kernel 3.10.0, GCC 4.8





Supported Linux on z Systems Distributions

Distribution	z13	zEnterprise - zBC12 and zEC12	zEnterprise - z114 and z196	System z10 and System z9
RHEL 7	✔ (1,3)	✔ (4)	✔ (4)	✘
RHEL 6	✔ (1,3)	✔ (5)	✔	✔
RHEL 5	✔ (1,3)	✔ (6)	✔	✔
RHEL 4 (*)	✘	✘	✔ (9)	✔
SLES 12	✔ (2,3)	✔	✔	✘
SLES 11	✔ (2,3)	✔ (7)	✔	✔
SLES 10 (*)	✘	✔ (8)	✔	✔
SLES 9 (*)	✘	✘	✔ (10)	✔

✔ Indicates that the distribution (version) has been tested by IBM on the hardware platform, will run on the system, and is an IBM supported environment. Updates or service packs applied to the distribution are also supported. Please check with your service provider which kernel-levels are currently in support.

See www.ibm.com/systems/z/os/linux/resources/testedplatforms.html for latest updates and details.

Linux Support of IBM z13 – Work in Progress

§ SIMD – Vector extension facility (kernel 3.18)

- 32 128-bit vector registers are added to the CPU
- 139 new instructions to operate on the vector registers
- User space programs can use vectors to speed up all kinds of functions, e.g. string functions, crc checksums,...

§ SMT – CPU multi threading (> kernel 3.19)

- Once enabled, the multi threading facility provides multiple CPUs for a single core
- The CPUs of a core share certain hardware resources such as execution units or caches
- Avoid idle hardware resources, e.g. while waiting for memory

§ Extended number of AP domains (kernel 3.18)

- AP crypto domains in the range 0-255 will be detected

§ Crypto Express5S cards (> kernel 3.19)

- New generation of crypto adapters with improved performance

10GbE RoCE Express Feature

7.0 12

- **Native PCIe networking card**
  - 10 Gigabit remote direct memory access (RDMA) capable network card
  - Uses Infiniband RDMA over Converged Ethernet (RoCE) specification
  - Up to 16 10GbE RoCE Express adapters per machine
  - Reduced latency and lower CPU overhead
  - Supports point-to-point connections and switch connection with an enterprise-class 10 GbE switch

- **Hardware & Software requirements**
  - IBM zEC12 (w/ appropriate updates), zBC12 (w/ appropriate updates), or z13
  - z/VM 6.3 with APAR VM65417 – Available
    - System Config option – disabled by default
    - Required millicode fixes must be applied prior to enabling in system config
  - z/OS 1.12, z/OS 1.13, z/OS 2.1 with APAR OA43256
  - Linux support is available upstream and as tech preview in SLES12 / RHEL7
  - Fulfills 2013 Statement of Direction

zEDC Express Feature

- **Native PCIe data compression / decompression card**
  - Up to 8 adapters can be installed into a single machine
  - With large blocks, it can compress data at more than 1 GB per second
  - Implements compression as defined by RFC1951 (DEFLATE)
  - Comparable to “gzip -1”

- **Hardware & Software requirements**
  - IBM zEC12 (w/ appropriate updates), zBC12 (w/ appropriate updates), or z13
  - z/VM 6.3 with APAR VM65417 – Available
    - System Config option – disabled by default.
    - Required millicode fixes must be applied prior to enabling in system config
  - z/OS 1.12, z/OS 1.13, z/OS 2.1 with APAR OA43256
  - z/OS 1.12, z/OS 1.13, z/OS 2.1 with APAR OA44482
  - Linux device driver to gain access to zEDC has been posted on LKML and has been accepted into the upstream kernel
  - The zlib open source library is a C implementation commonly used to provide compression and decompression services
  - Fulfills 2013 Statement of Direction

IBM XL C/C++ for Linux on z Systems V1.1

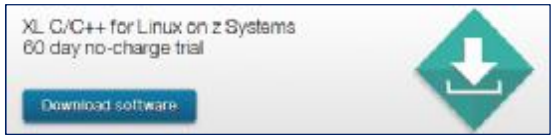
High-performance compiler now delivered

§ XL C/C++ for Linux on z Systems offers:

- **Increased return on hardware investments** for improved application performance with leading-edge optimization technology and exploitation of the latest z Systems hardware.
- **The Clang infrastructure in the front end with advanced optimization technology** in the IBM compiler back end.
- **Highly tuned math libraries**, including Mathematical Acceleration Subsystem (MASS), Basic Linear Algebraic Subprograms (BLAS), and Automatically Tuned Linear Algebra Software (ATLAS).
- **Standards compliance** with support for international C and C++ programming language standards and GNU C/C++ compatibility extensions for ease of application migration to IBM z Systems.

- **Software requirements**
  - Red Hat Enterprise Linux for IBM System z 7
  - Red Hat Enterprise Linux for IBM System z 6.3
  - SUSE Linux Enterprise Server for System z 12
  - SUSE Linux Enterprise Server for System z 11 SP3

Available since Feb 2015



More information:

- **Data sheet:**

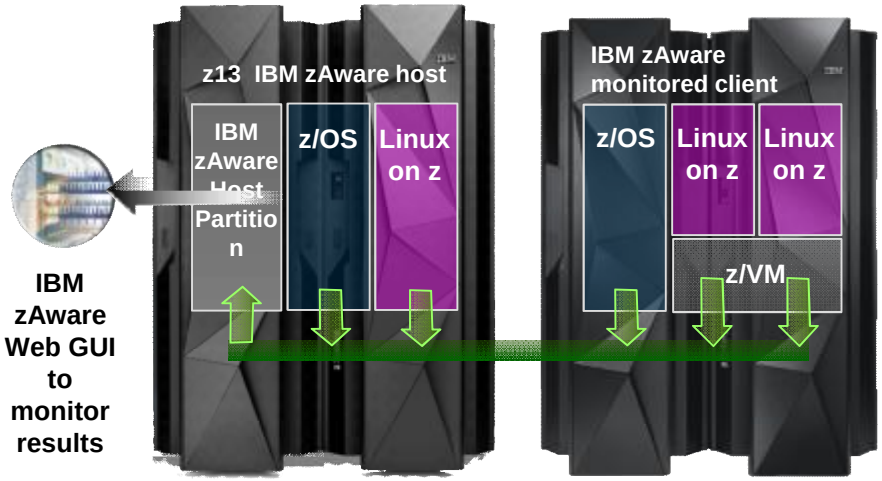
- **Café Community & Forum**

ibm.com/software/products/en/czlinux

IBM zAware V2.0 – Analyze Linux on z Systems

IBM zAware is available with z13 for Linux on z Systems to deliver a creative availability solution to help maximize service levels

- Faster insight into the health of the Linux on z images
- Identify unusual system behavior of the Linux on z images
- Support for Linux on z message log analysis



- User can group multiple systems' data into a combined model: by workload (e.g. for all web servers), by solution (e.g. one model for your cloud), or by z/VM host
- Support for native or guest Linux on z images
- IBM zAware delivered on IBM z13 builds on previous IBM zAware function

DB2 with BLU Acceleration for Linux on z Systems

Super simple. Super fast.

- **Large order of magnitude benefits**
  - **Performance**
  - **Storage savings**
  - **Time to value**
- **New technology in DB2 for analytic queries**
  - **CPU-optimized unique runtime handling**
  - **Unique encoding for speed and compression**
  - **Unique memory management**
  - **Columnar storage, vector processing**
  - **Built directly into the DB2 kernel**
- **Revolution or evolution**
  - **BLU tables coexists with traditional row tables - in same schema, storage, and memory**
  - **Query any combination of row or BLU tables**
  - **Easy conversion of tables to BLU tables**
    - **Change everything, or change incrementally**

Options

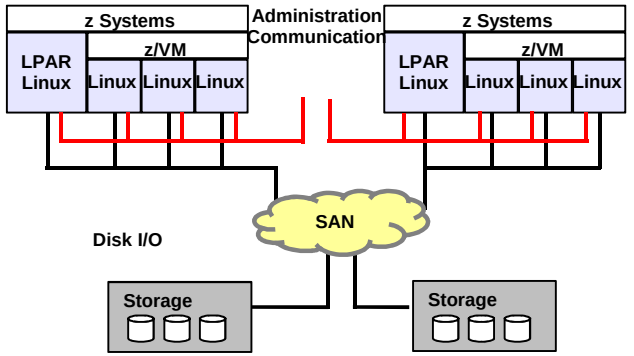
- **Upgrade of DB2 LUW for Linux on z clients**
- **Replacement of Linux on z Oracle installations**
- **Satisfy requirement for a columnar in-memory db**
- **DB2 with BLU Acceleration is the preferred solution for customers who do not have DB2 for z/OS but would like to run analytics on z Systems Linux data**
- **Enhanced opportunity for distributed consolidations onto z Systems**

IBM Spectrum Scale* for Linux on z Systems

Based on IBM GPFS technology

Robust clustered file system

- Concurrent high-speed, reliable data access from multiple nodes
- Extreme scalability and accelerated performance
- Smooth, non disruptive capacity expansion and reduction



One cluster configuration example

Linux instances in LPAR mode or on z/VM, on the same or different CECs

Up to 32 cluster nodes with same or mixed Linux distributions / releases

Support for ECKD™- based and FCP-based storage

Heterogeneous clusters w/ client nodes w/o local storage access running Linux on x86 or POWER®

Supported storage: DS8000®, IBM FlashSystem™ IBM Storwize® V7000, SVC, IBM XIV®

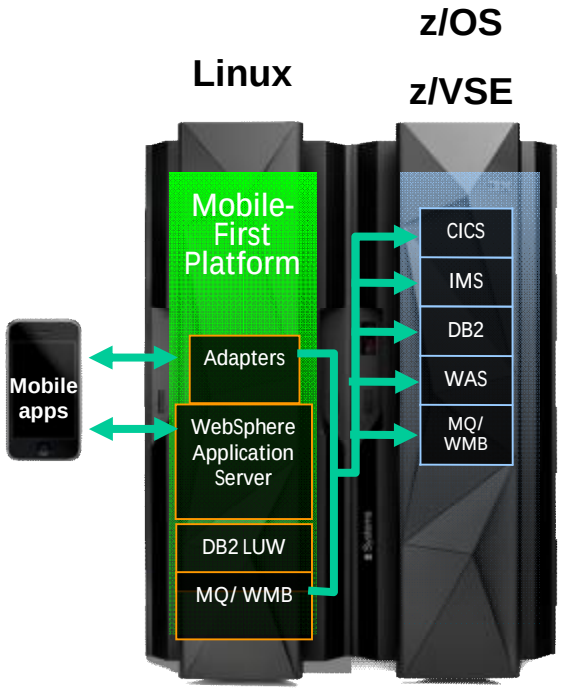
Supported workloads: WebSphere App. Server, WebSphere MQ® or similar workloads

Support statements for first version

***** New product name***

Connecting Mobile Apps to IBM z Systems

- **Server side software components and adapters for channeling z Systems to mobile devices with IBM MobileFirst Platform Foundation**
- **Mobile application support with WebSphere Application Server on z Systems**
- **Mobile protocol connectivity with core z Systems applications including CICS, IMS, TPF, MQSeries, WMB and DB2**



"IBM [MobileFirst Platform Foundation] provides us with ready-to-use adapters that easily connect to existing web services and applications. The solution integrated seamlessly with our existing environment of IBM WebSphere Application Server and IBM DB2 database software, so we could get to work on development sooner rather than later."
Dominik Weitz, Software Developer, ABK-Systeme GmbH

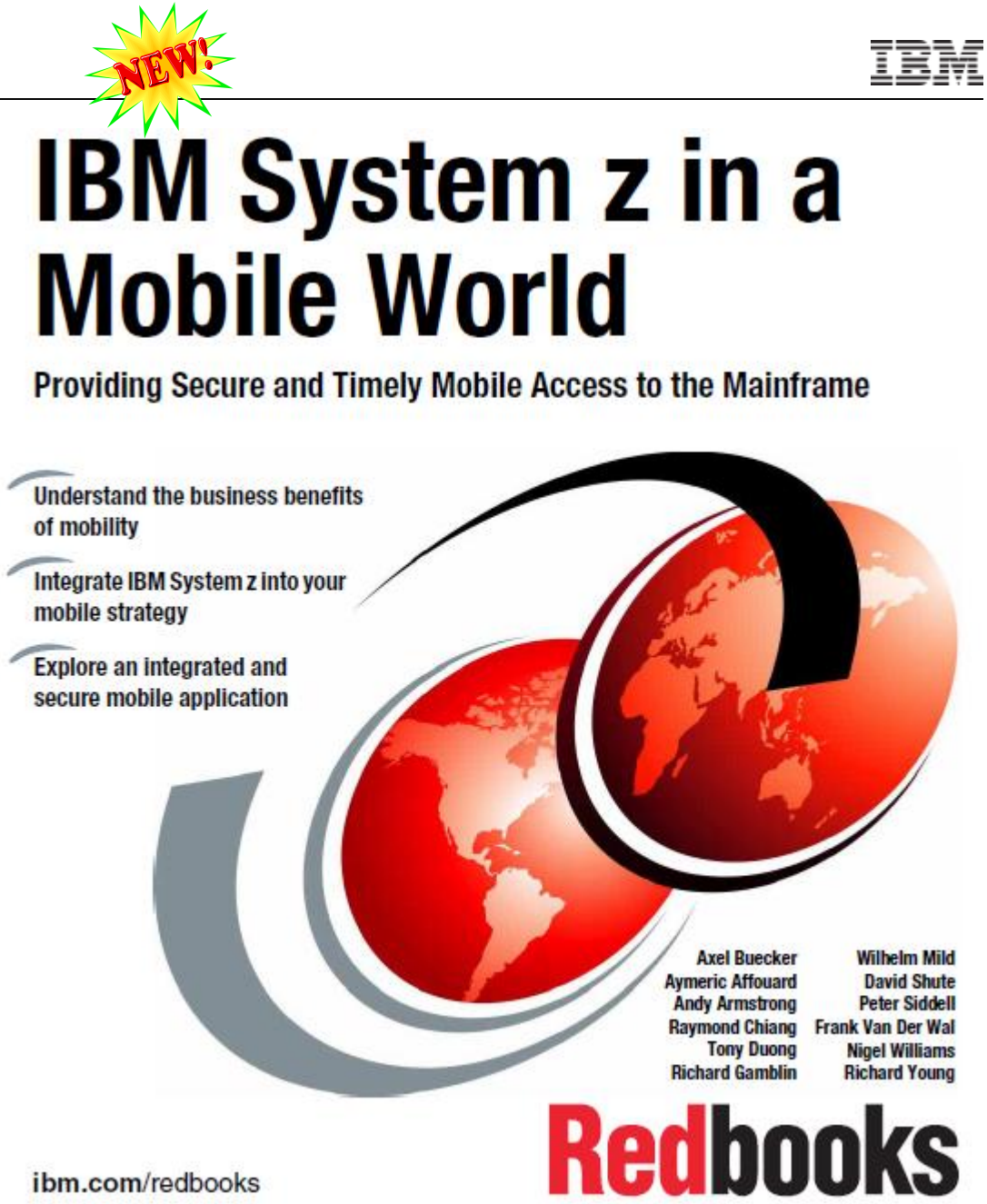
IBM MobileFirst Platform Foundation, formerly known as IBM Worklight, IBM WebSphere Application Server and IBM DB2 are running on Linux on z Systems

New Redbook

Table of Contents:

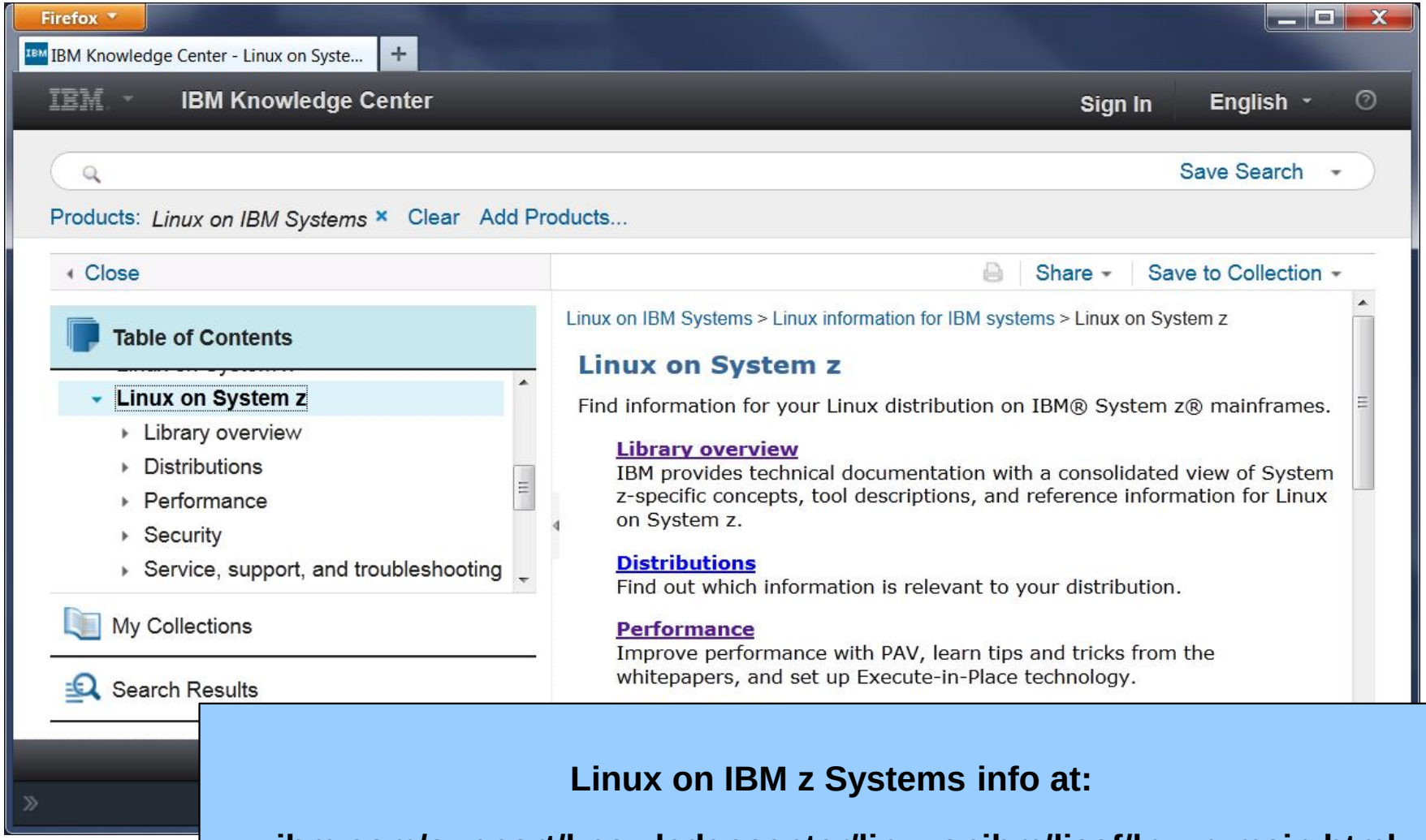
1. Understanding the business context in a mobile world
   - Business drivers
   - IBM MobileFirst
   - SoE and SoR
   - IBM Worklight
   - Industry use cases
2. Architecting and planning the solution
   - Deployment models
   - Enterprise architecture
   - Designing for resilience
   - Designing for security
3. Customer scenario
   - Overview of scenario
   - Agile approach to deliver applications
   - Deploying to a HA infrastructure
   - Enabling E2E security
   - Mobile analytics

http://www.redbooks.ibm.com/abstracts/sg248215.html



NEW!

ibm.com/support/knowledgecenter/



Linux on IBM z Systems info at:

ibm.com/support/knowledgecenter/linuxonibm/liaaf/lnz_r_main.html

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z/VM Release Status Summary (as of April 2015)

UPDATE

z/VM Level	GA	End of Service	End of Marktg.	Minimum Processor Level	Maximum Processor Level	Security Level
6.3	7/2013	12/2017[5]		IBM System z10®	-	EAL 4+[2] OSPP-LS
6.2	12/2011	12/2016[3]	7/2013	IBM System z10®	z13 [4]	-
6.1	10/2009	4/2013	12/2011	IBM System z10®	zEC12	EAL 4+ OSPP-LS
5.4	9/2008	12/2016[1]	3/2012	IBM eServer zSeries 800& 900	zEC12	-
5.3	6/2007	9/2010	9/2010	z800, z900	z196	EAL 4+ CAPP/LSPP

[1] Or later (Announced August 6, 2014)
[2] Targeted Security Level in V6.3 SOD
[3] Extended from original date (Announced February 4, 2014)
[4] Announced January 14, 2015
[5] Announced February 3, 2015

Marketed & Serviced

Serviced, but not Marketed

End of Service & Marketing

z/VM Version 6 Release 3

Making Room to Grow Your Business

July 23
Product Announcement

July 26
Product General Availability

April 30
System SSL Cryptographic Module FIPS 140-2 Certification

Feb 24
Announce additional support

July 16
z/VM support for zEDC Express and 10GbE RoCE Express features Available

June 9
CPU pooling Available

Aug 15
ILMT 9.01 support of CPU pooling Available

January 14
z13 and z/VM Enhancements Announcement

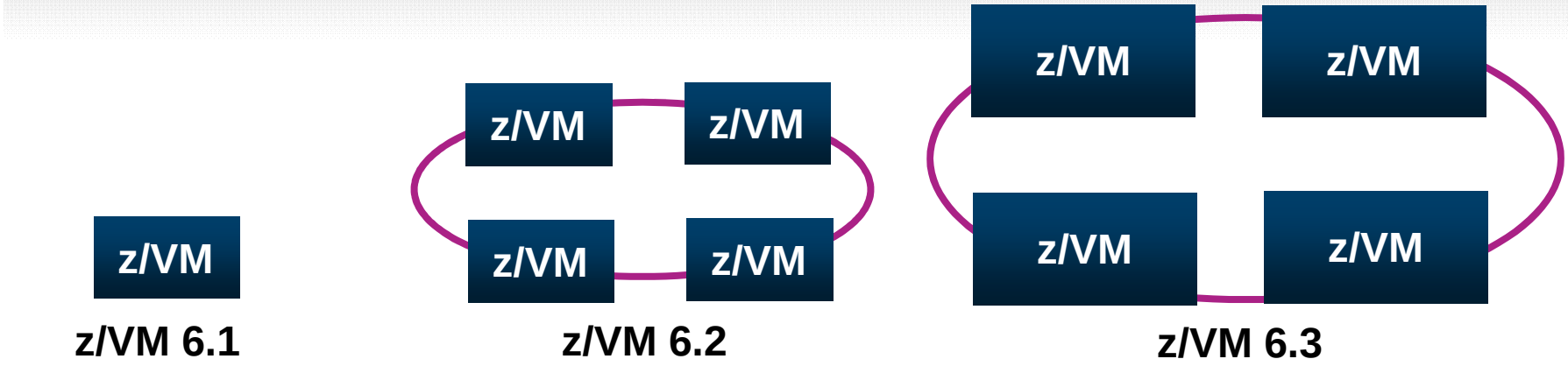
March 13
SMT and Scalability Support Available

Feb 13
Base z13 & Crypto support Available

June 26
Multi-VSwitch Link Aggregation Available

2013 2014 2015

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



Expanding the Horizon of Virtualization

§ Release for Announcement – The IBM z13™

- January 14, 2015
- Announcement Link

§ z/VM Compatibility Support

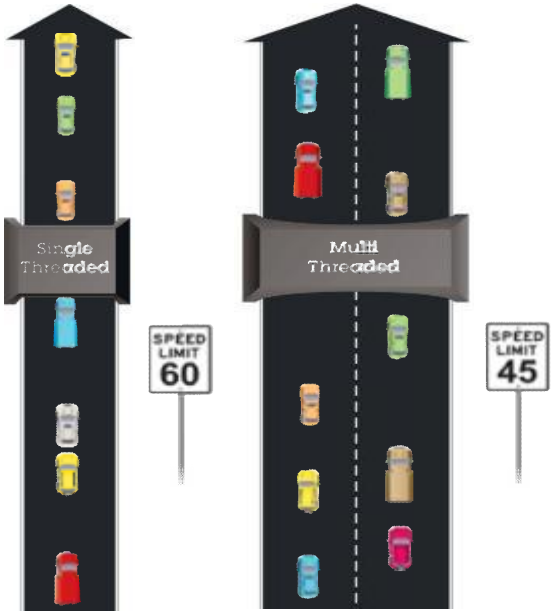
- PTFs available February 13, 2015
- Also includes Crypto enhanced domain support
- z/VM 6.2 and z/VM 6.3
- No z/VM 5.4 support
- Refer to bucket for full list

§ Enhancements and Exploitation Support only on z/VM 6.3

- IBM z13 Simultaneous Multithreading
- Increased Processor Scalability
- Multi-VSwitch Link Aggregation Support (Link Aggregation with Shared OSAs)

z/VM – Simultaneous Multithreading (SMT)

- § Objective is to improve capacity, not performance
- § Allows z/VM to dispatch work on up to two threads of a z13 IFL
- § VM65586 for z/VM 6.3 **only**
  - – PTFs available since March 13, 2015
- § Transparent to virtual machine
  - – Guest does not need to be SMT aware
  - – SMT is not virtualized to the guest
- § z13 SMT support limited to IFLs and zIIPs
  - – z/VM support is only for IFLs
- § SMT is disabled by default
  - – Requires a System Configuration setting and re-IPL
  - – When enabled, applies to the entire system
- § Potential to increase the overall capacity of the system
  - – Workload dependent



Which approach is designed for the higher volume of traffic? Which road is faster?

****Illustrative numbers only***

z/VM – Increased CPU Scalability

§ Various improvements to allow z/VM systems to be larger in terms of processors and more efficient, improving the n-way curve

§ APAR VM65586 for z/VM 6.3 **only**
- PTFs available since March 13, 2015

§ For z13
- With SMT disabled, increases logical processors supported from 32 to 64
- With SMT enabled, the limit is 32 IFLs (64 threads)

§ For processors prior to z13
- Limit remains at 32
- May still benefit from improved n-way curves

z/VM – Multi-VSwitch Link Aggregation

§ Makes it possible to do Link Aggregation with VSwitches without the requirement for dedicated OSAs

§ Allows a port group of OSA-Express features to span VSwitches within a single or multiple z/VM systems.
  – Cannot be shared with non-z/VM logical partitions or z/VM systems without support

§ APARs VM65583 and PI21053 for z/VM 6.3 **only**
  – PTFs planned to be available June 26, 2015

§ Only available on z13
  – Requires OSA enhancements introduced with the z13

§ Allows better consolidation and availability while improving TCO

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New SoD: z/VM Support for Single Instruction Multiple Data (SIMD)

Announced January 14, 2015

In a future deliverable IBM intends to deliver support to enable z/VM guests to exploit the Vector Facility for z/Architecture (SIMD).

- The Single Instruction Multiple Data (SIMD) was introduced as part of the z13, allowing use of the new Vector Facility.
- The initial z/VM support for z13 does not contain the virtualization of SIMD, which would allow guests to exploit it and gain potential performance benefits.

New SoD: Product Delivery of z/VM on DVD/Electronic Only

Announced January 14, 2015

Product Delivery of z/VM on DVD/Electronic only: z/VM V6.3 will be the last release of z/VM that will be available on tape. Subsequent releases will be available on DVD or electronically.

- No more tapes for z/VM product delivery for future z/VM releases.
- Allows testing resources to be spent else where.

New SoD: GDPS/PPRC Multiplatform Resiliency Capability

Announced January 14, 2015

In the first half of 2015, IBM intends to deliver a GDPS/Peer to Peer Remote Copy (GDPS/PPRC) multiplatform resiliency capability for customers who do not run the z/OS operating system in their environment. This solution is intended to provide IBM z Systems customers who run z/VM and their associated guests, for instance, Linux on z Systems, with similar high availability and disaster recovery benefits to those who run on z/OS. This solution will be applicable for any IBM z Systems announced after and including the zBC12 and zEC12.

- Lower the skill expense of running a GDPS environment, particularly for those customers with little, or no, z/OS background.

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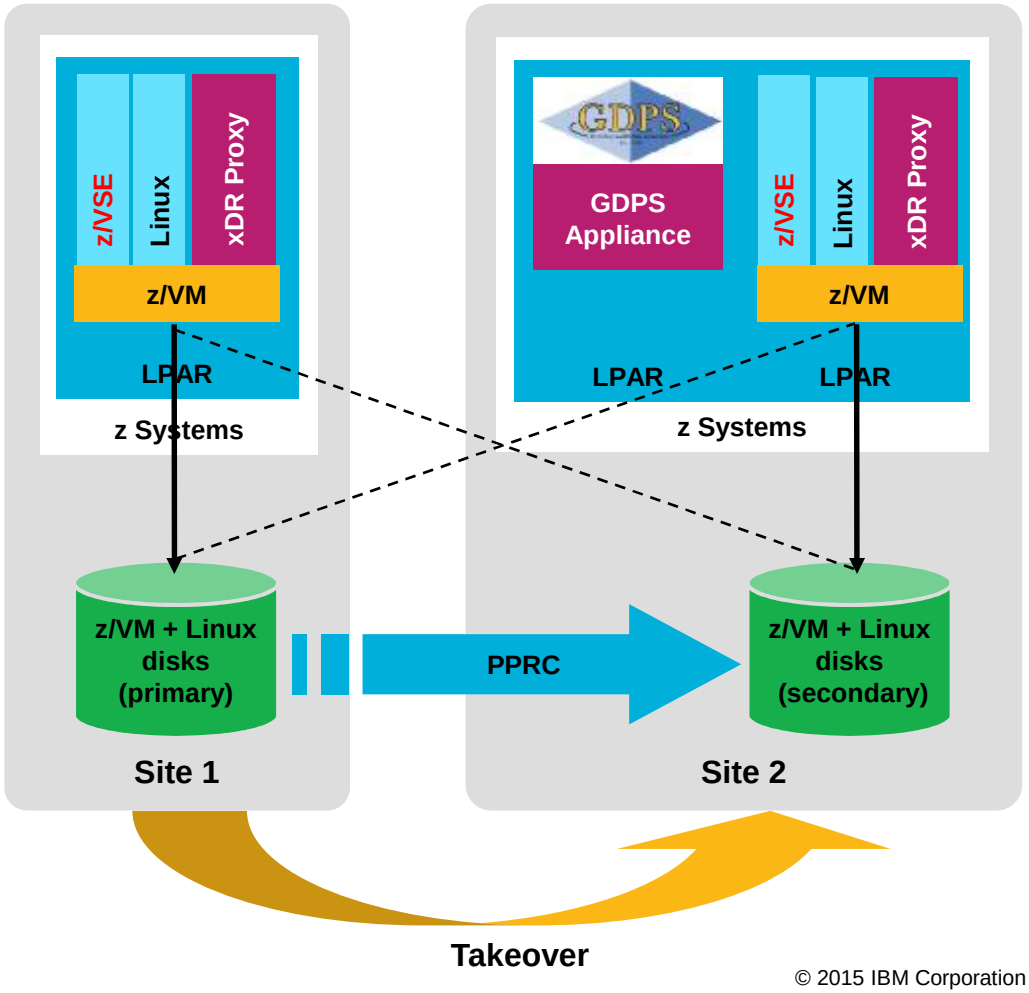
NEW!

Disaster Recovery for Linux on z Systems and z/VSE

GDPS Virtual Appliance extends GDPS capabilities into z/VM and Linux on z Systems environments that do not have z/OS.

GDPS Virtual Appliance features:

- Single point of control and automation reduces the need for highly specialized skills to handle recovery and planned site switches
- Manages remote copy environment and keeps data available and consistent for operating systems and applications.
- HyperSwap® function protects against failures to disk subsystems.
- Monitoring and automation to ensure reliable and rapid recovery via automated processes
- Virtual Appliance requires:
  - General purpose engine
  - z/VM and Linux on z Systems
  - ECKD Disk



New SoD: KVM offering for IBM z Systems

Announced January 14, 2015

In addition to the continued investment in z/VM, IBM intends to support a Kernel-based Virtual Machine (KVM) offering for z Systems that will host Linux on z Systems guest virtual machines.

The KVM offering will be software that can be installed on z Systems processors like an operating system and can co-exist with z/VM virtualization environments, z/OS, Linux on z Systems, z/VSE, and z/TPF.

The KVM offering will be optimized for z Systems architecture and will provide standard Linux and KVM interfaces for operational control of the environment, as well as providing the required technical enablement for OpenStack for virtualization management, allowing enterprises to easily integrate Linux servers into their existing infrastructure and cloud offerings.

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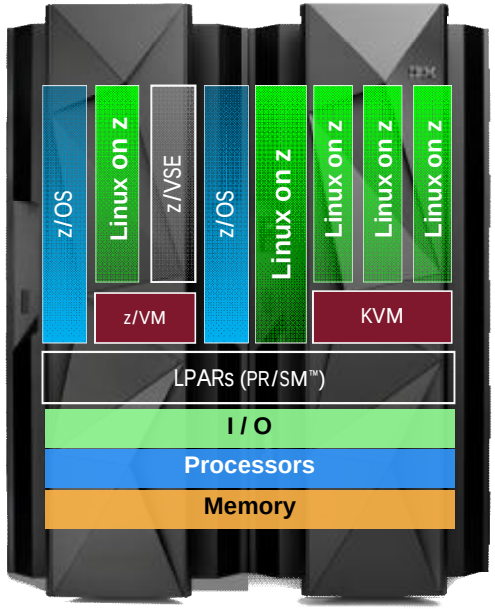
NEW!

KVM offering for IBM z Systems

What and why?

- New software distribution of KVM on z Systems
- Coexistance with z/VM‘s support of Linux on z Systems
- An additional option for virtualization on z Systems
- The IBM commitment to z/VM remains steadfast



Client Pain Points

- Complexity and time required to implement server virtualization
- Virtualization vendor lock-in
- Total cost of ownership for server virtualization solutions
- Closed Proprietary solutions
- Lack of seamless integration with new cloud technologies like OpenStack

KVM Solution

- Simplifies configuration and operation of server virtualization
- Leverage common Linux admin skills to administer virtualization
- Provides an Open Source virtualization choice
- Lower cost virtualization alternative for Linux workloads
- Flexibility and agility leveraging the Open Source community
- Easily integrate into Cloud/OpenStack environments

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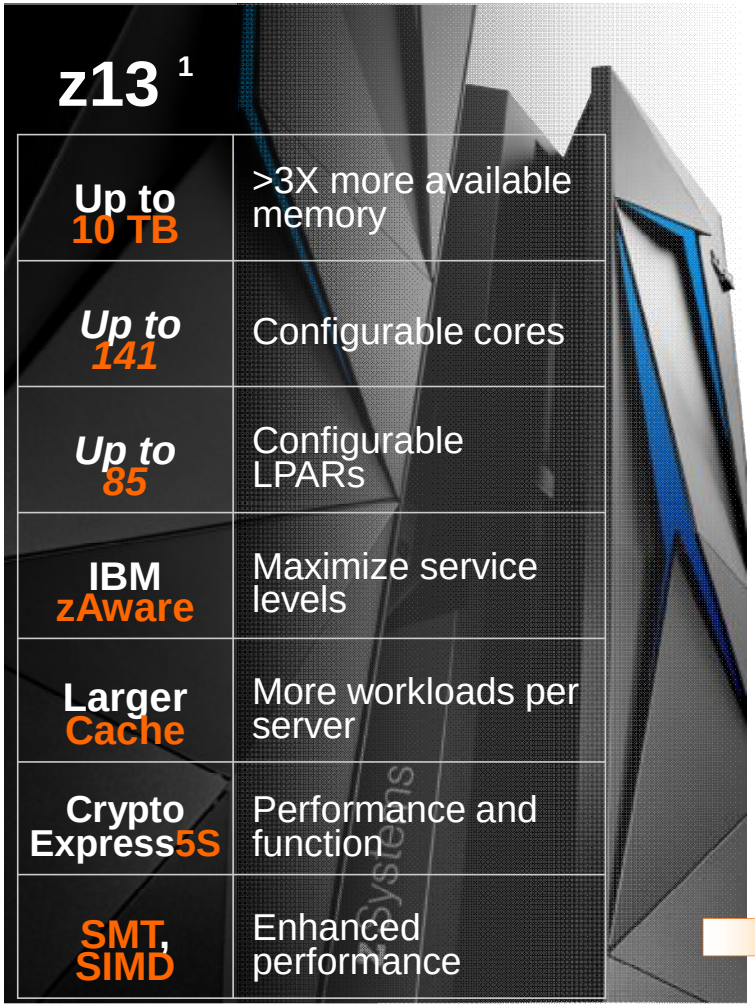
Agenda

- § z/VSE
- § Linux on z Systems
- § z/VM
- § New Statements of Direction
- § Summary

IBM z13 – The platform for Cloud, Analytics, Mobile, Security, Social



Enterprise grade solutions:	
IBM GDPS® Virtual Appliance	*Continuous availability & Disaster recovery*
IBM Spectrum Scale (IBM GPFS technology)	*Clustered file system*
SOD: KVM for z Systems	*Open source virtualization*
IBM Infrastructure Suite	*Management suite for z/VM and Linux*
IBM Wave for z/VM IBM z/VM	*Intuitive virtualization management* *Virtualization with efficiency at scale*
IBM z13	*Unmatched server technology & capacity*

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[1] Total capacity improvement over zEC12 of 40+ percent

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