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What's new for z/VSE, z/VM and Linux on System z

IBM/GSE Spring Conference, Würzburg, April 2010

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DS6000	IBM eServer	System z10	zSeries*
DS8000	IBM logo*	System z10 Business Class	z9
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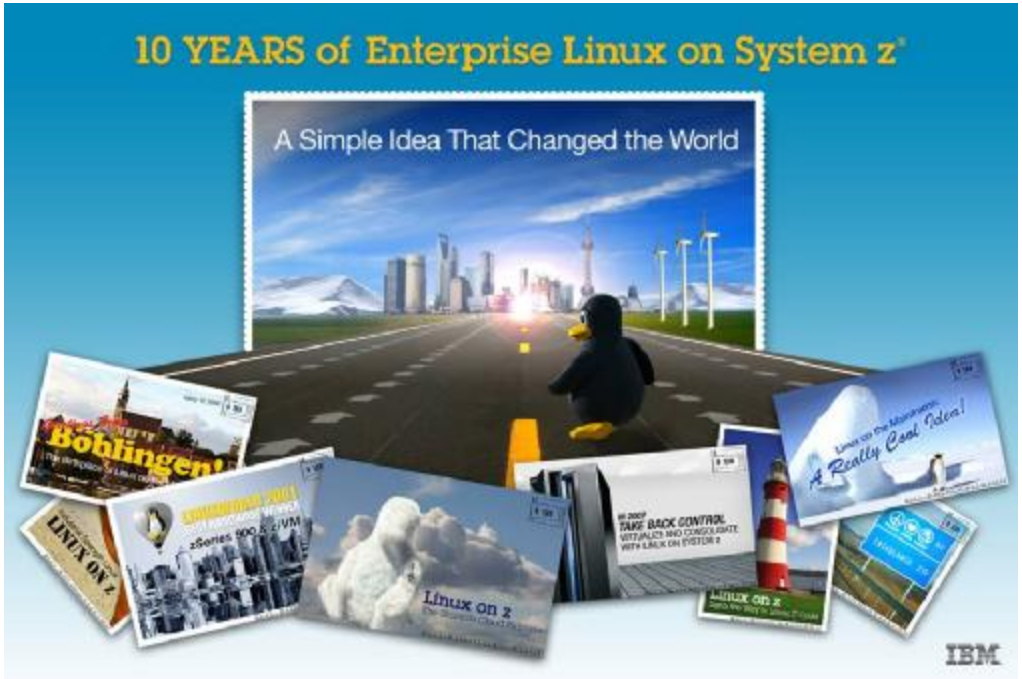
Happy Birthday !

10th anniversary:
Linux on System z

45th anniversary:
z/VSE



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Agenda

- **z/VSE**
- **Michael Daubman**
  - **z/VM**
  - **Linux on System z**
- **Summary**

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z/VSE Evolution

z/VSE V4.3 GA planned for 4Q2010

IPv6/VSE May 28, 2010

z/VSE V4.3 Preview Oct 20, 2009
- Virtual storage (24-bit) constraint relief
- 4-digit device addresses
- Security/crypto/networking enhancements

z/VSE V4.2 Oct 17, 2008
- **More tasks, PAV, LDAP Client, SVC**
- **SoD** for CICS/VSE, EGL, WMQ**

z/VSE V4.1 March 16, 2007
- z/Architecture only / 64-bit real addr
- MWLC full & sub-cap pricing

z/VSE V3.1 March 4, 2005
- selected zSeries features, FCP/SCSI
- 31-bit mode only

Protect
Integrate
Extend

Capacity
Quality
z/OS Affinity
Interoperability

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z/VSE Support Status

VSE Version and Release	*Marketed*	*Supported*	*End of Support*
z/VSE V4.2[2]	**Yes**	**Yes**	**tbd**
z/VSE V4.1[2]	No	**Yes**	**04/30/2011**
z/VSE V3.1[1]	No	No	07/31/2009
VSE/ESA V2.7	No	No	02/28/2007

[1]) z/VSE v3. 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

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z/VSE V4.3 Preview
Announced Oct-20-2009, GA planned for 4Q 2010

§ Virtual storage constraint relief
- Move selected system programs and buffers from 24-bit into 31-bit storage

§ Ease of use through four-digit device addresses
- Transparent for system, vendor, and user applications that rely on 3-digit CUUs

§ IBM System z10 technology exploitation
- Dynamic add of logical CPs to LPAR without Re-IPL
- Large page (1 megabyte page) support for data spaces
- FICON Express8 support

§ Enhanced storage options
- Parallel Access Volume (PAV) feature of IBM Systems Storage DS8000 and DS6000
- DS8000 Remote Mirror and Copy (RMC) feature support through ICKDSF
- IBM System Storage TS7700 Virtualization Engine Release 1.5

§ Network, security, and auditability enhancements
- SNMP agent to retrieve z/VSE specific system and performance data

§ DOS/VS RPG II support for CICS Transaction Server (CICS TS)
- Allows RPG programs implemented for CICS/VSE V2.3 to run with CICS TS

§ IPv6 SoD

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z/VSE Support for IBM Mainframe Servers

IBM Servers	z/VSE V4.3 Plan	z/VSE V4.2	z/VSE V4.1
IBM System z10 Business Class (z10 BC)	**Yes**	**Yes**	Yes
IBM System z10 Enterprise Class (z10 EC)	**Yes**	**Yes**	Yes
IBM System z9 EC & z9 BC	**Yes**	**Yes**	Yes
IBM eServer zSeries 990 & 890	Yes	Yes	Yes
IBM eServer zSeries 900 & 800	Yes	Yes	Yes

Reminder:

- **z/VM V6 requires System z10 technology**
- **Novell SLES 11 requires System z9 or z10 technology**

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IBM System z10 Exploitation (1 of 2)

Functions	**z/VSE V4.3 Plan**	**z/VSE V4.2**	z/VSE V4.1
z/Architecture mode (with 64-bit *real* addressing)	Yes	Yes	Yes
64-bit *virtual* addressing	No	No	No
ESA/390 processor support	No	No	No
Processor storage (i.e. real memory) … *up to*	32 GB	32 GB	8 GB
Large page (1 megabyte page) support for data spaces	New	No	No
Dynamic add of logical CPs	New	No	No
CP Assist for Cryptographic Function (i.e. DES, TDES, etc.) § CPACF z9 extensions (i.e. AES 128-bit, etc.) § CPACF z10 extensions (i.e. AES 256-bit, etc.)	Yes Yes Yes	Yes Yes Yes	Yes Yes Yes
up to 60 LPARs and 4 LCSSs	Yes	Yes	Yes
HiperSockets™ (including spanned HiperSockets)	Yes	Yes	Yes

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IBM System z10 Exploitation (2 of 2)

Functions	**z/VSE V4.3 Plan**	**z/VSE V4.2**	z/VSE V4.1
FICON Express8, Express4, FICON Express2 ('FICON' & 'FCP')	Yes	Yes	Yes
Fibre Channel Protocol (FCP) for SCSI Disks	Yes	Yes	Yes
OSA-Express3, OSA-Express2, OSA-Express features	Yes	Yes	Yes
§ z10 OSA-Express3 - 4-port exploitation	Yes	Yes	Yes
OSA Integrated Console Controller (OSA-ICC)	Yes	Yes	Yes
Crypto Express3 – 2P & 1P	Yes	Yes	No
Crypto Express2 – 2P & 1P	Yes	Yes	Yes
§ SSL clear key encryption assist	Yes	Yes	Yes
§ Configurable Crypto Express3	Yes	Yes	No
§ Configurable Crypto Express2	Yes	Yes	Yes
§ 2048-bit RSA keys	Yes	Yes	Yes
§ z10 Dynamic Add/Remove Cryptographic Processors	Yes	Yes	No

Note: selected FICON or OSA Express cards may not be supported on System z10 processors

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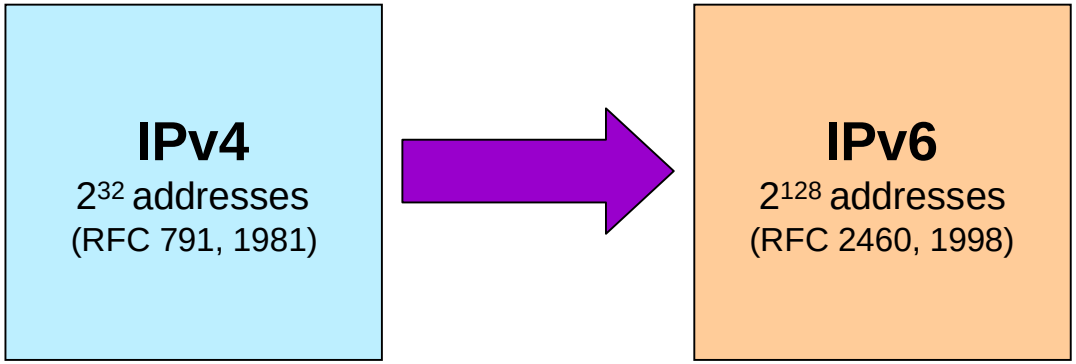
Internet Protocol Version 6 (IPv6)

- IPv6 is the “next generation” protocol designed by the Internet Engineering Task Force (IETF) to replace the current version Internet protocol, IP Version 4 (IPv4).
- IPv6 removes the IP addressing limitation of IPv4
- IPv6 is expected to gradually replace IPv4, both coexisting for a number of years
- Availability of IPv6 support addresses long term requirements of the commercial community and government agencies
  - *IPv6 is a strategic direction and a requirement of US Government projects*
  - *US DoD, GSA, and NASA require IPv6 compliant products in all new IT acquisitions*
  - *European Commission (EU) will specify IPv6 capabilities as a core requirement*



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ARIN
American Registry for Internet Numbers

www.arin.net

April 15, 2009

CEO/Executive Name
Organization Name
Postal Address Block

SUBJECT: Notice of Internet Protocol version 4 (IPv4) Address Depletion

Dear [Addressee],

This letter concerns the fact that Internet Protocol version 4(IPv4) addresses are running out and calls your attention to what we are doing about it. You are receiving this letter as your organization currently utilizes IPv4 number resources. [1]

IP addresses are the numbers behind domain names and are essential to the Internet. In May 2007, the American Registry for Internet Numbers (ARIN) advised the Internet community on IP address depletion in what is called Internet Protocol version 4 (IPv4) [2]. At the current rate of consumption, IPv4 will be depleted within the next two years [3]. After that, organizations that need additional IP addresses will need to adopt IPv6, a newer version of the Internet Protocol that provides a much larger pool of address space.

Please note the following two important items:

1. You should begin planning for IPv6 adoption if you are not doing so already. One of the most important steps is to make your organization's publicly accessible resources (e.g. external web servers and e-mail servers) available via IPv6 as soon as possible. This will maintain your Internet connectivity during this transition. For more information on IPv6, please refer to ARIN's online IPv6 Information Center [4].

2. ARIN is taking additional steps to ensure the legitimacy of all IPv4 address space requests. Beginning on or after 18 May 2009, ARIN will require applications for IPv4 address space to include an attestation of accuracy from an organizational officer. This ensures that organizations submitting legitimate requests based on documented need will have ongoing access to IPv4 address space to the maximum extent possible.

Please feel free to contact ARIN if you have any questions regarding this notice. Send e-mail to hostmaster@arin.net or call the registration services helpdesk at 703-227-0660.

Sincerely,

John Curran
Chairman, Board of Trustees
American Registry for Internet Numbers

Why is IPv6 needed ?

- **Requirement from government and governmental firms & agencies**
  - Worldwide
- **IPv4 addresses running out**
  - Completely allocated by 2H 2011
  - Already difficult to obtain IPv4 address blocks
- **Address notation(s)**
  - IPv4:
    192.168.1.1
  - IPv6 uses 16-byte addresses (several choices, all are equivalent):
    1020:0000:0000:0000:0020:0200:300A:0213
    1020:0:0:0:20:200:300A:213
    1020::20:200:300A:213
- **Begin planning for IPv6 now!**
- **No Drop Dead Date**
  - It's not like Year 2000
- **IPv6 can co-exist with IPv4**
  - IPv6 is NOT backward compatible

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IBM IPv6/VSE® Version 1 Release 1

Allow z/VSE users to participate in an IPv6 network

- **New product:** 5686-BS1
- **Announcement:** April 06, 2010
- **Planned availability:** May 28, 2010
- **Minimum requirement:** z/VSE V4.2 (DY47077)
- **Pricing:** Enabled for sub-capacity pricing

- **IPv6/VSE is designed to provide**
  - TCP/IP stack
  - IPv6-enabled applications
  - IPv6 APIs (IBM's EZA socket APIs)

- **IPv6/VSE only supports the IPv6 protocol**
  - TCP/IP for VSE/ESA V1.5 only supports the IPv4 protocol
  - Both stacks can be run concurrently within one z/VSE system
  - Existing IPv4 applications continue to run unchanged

Note: IPv6/VSE is a registered trademark of Barnard Software, Inc.

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IPv6/VSE Functionality

§ IPv6 TCP/IP stack

– Runs in a separate partition using its own stack ID

§ IPv6/VSE dual stack support

– Allows IPv6-enabled applications to access the IPv4 and IPv6 networks simultaneously in either batch or CICS environment

§ IPv6-enabled utility applications

– Running external to the IPv6/VSE stack partition for greater stability & performance

so-called IP-Tools

- FTP server (POWER queues, VSAM catalogs, SAM file, z/VSE libraries, etc.)
- Batch FTP client (access to remote host FTP servers)
- TN3270E server (TN3270/TN3270E terminal and TN3270E printer sessions)
- NTP server (Network Time Protocol server)
- NTP client (sync TOD clock with external server)
- System logger client (log selected console messages to a Linux syslog-ng daemon)
- Batch email client (send email to a SMTP server)
- Batch LPR (Line Printer Requestor)
- Batch remote execution client (job in z/VSE can trigger a script to run on a remote host)
- Batch PING (ping a remote host)
- GZIP data compression (simple GZIP data compression)
- REXX automation (uses z/VSE REXX EXECs for automation)

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Why did we choose BSI over CSI ?

TCP/IP licensed from CSI

V2 ← IPv6 goes here?

.

.

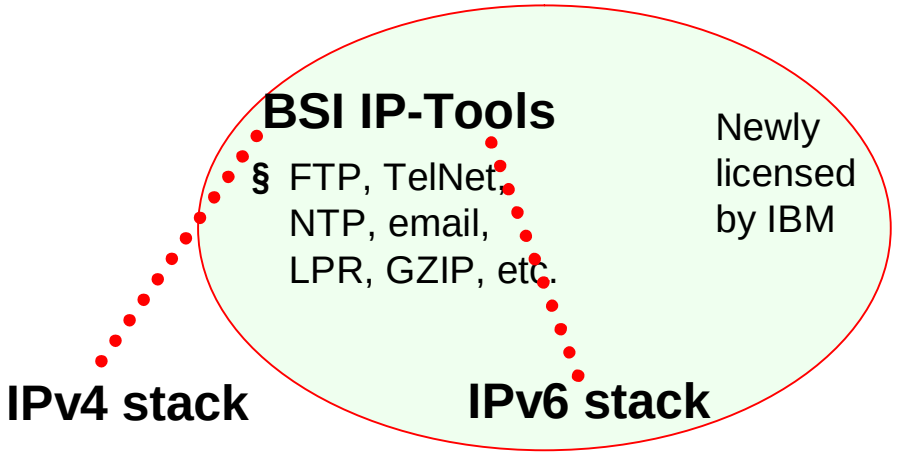
V1.5G ← IPv6 goes here?

V1.5F

V1.5E

- CSI announced in 10/2009 that IPv6 is under development.
  - When will it ship?
  - How will it be packaged?
  - Will it be priced/unpriced?
- IBM is concerned about product quality.
  - New function is constantly being implemented as part of service stream.

IPv6/VSE licensed from BSI



- BSI shipped a brand-new IPv6 product.
  - Announced at WAVV in 5/2009
- All BSI IP-Tools are enabled to run with both stacks, IPv4 and IPv6.
  - Common application (tools) code
- IBM‘s testing has proven excellent quality.
- z/VSE needed a solution NOW !

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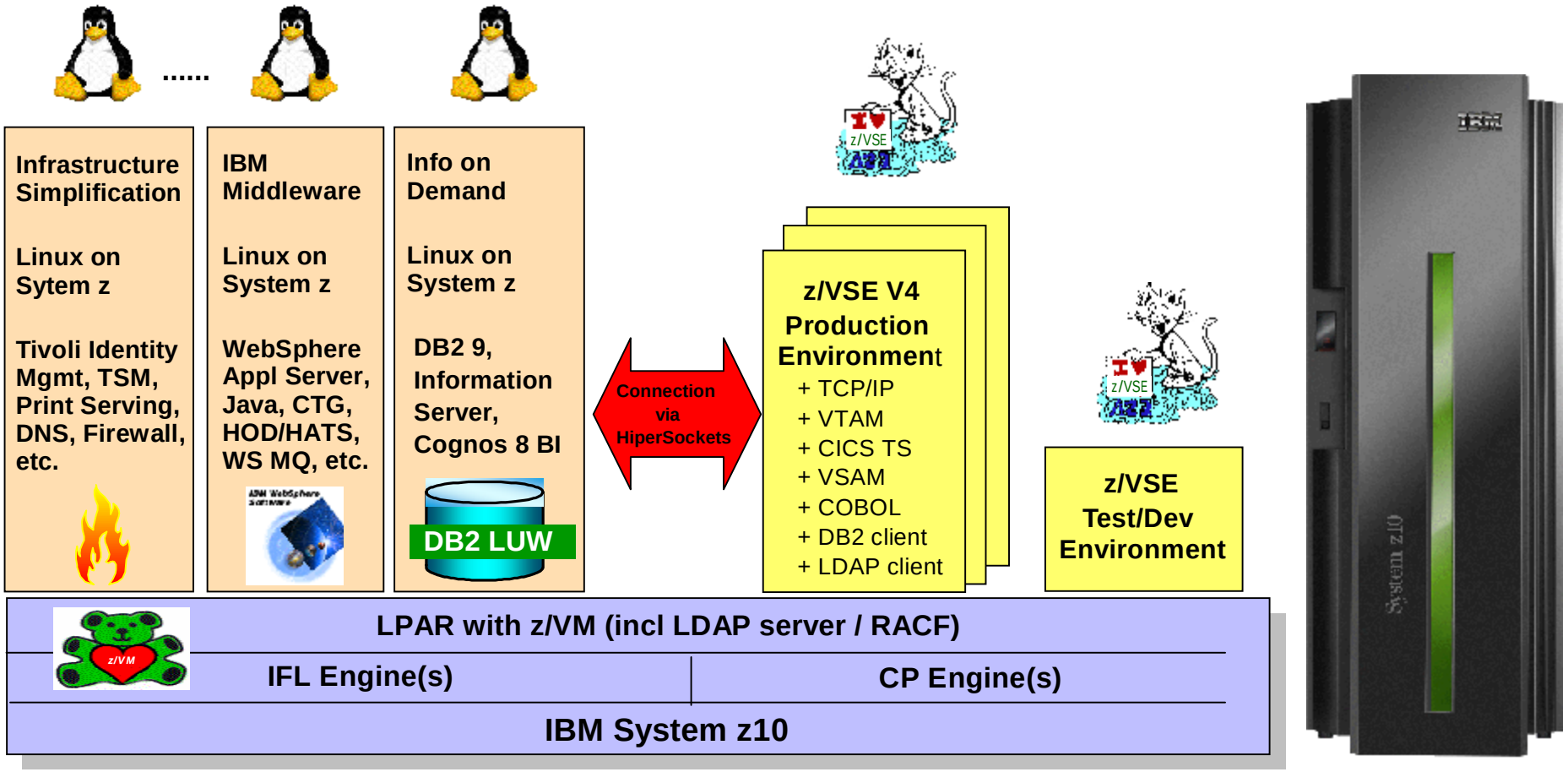
z/VSE Strategy:
Hybrid Environment leveraging z/VSE, z/VM, and Linux on System z

Protect existing VSE investments

Integrate using middleware and VSE connectors

Extend with Linux on IBM System z technology & solutions



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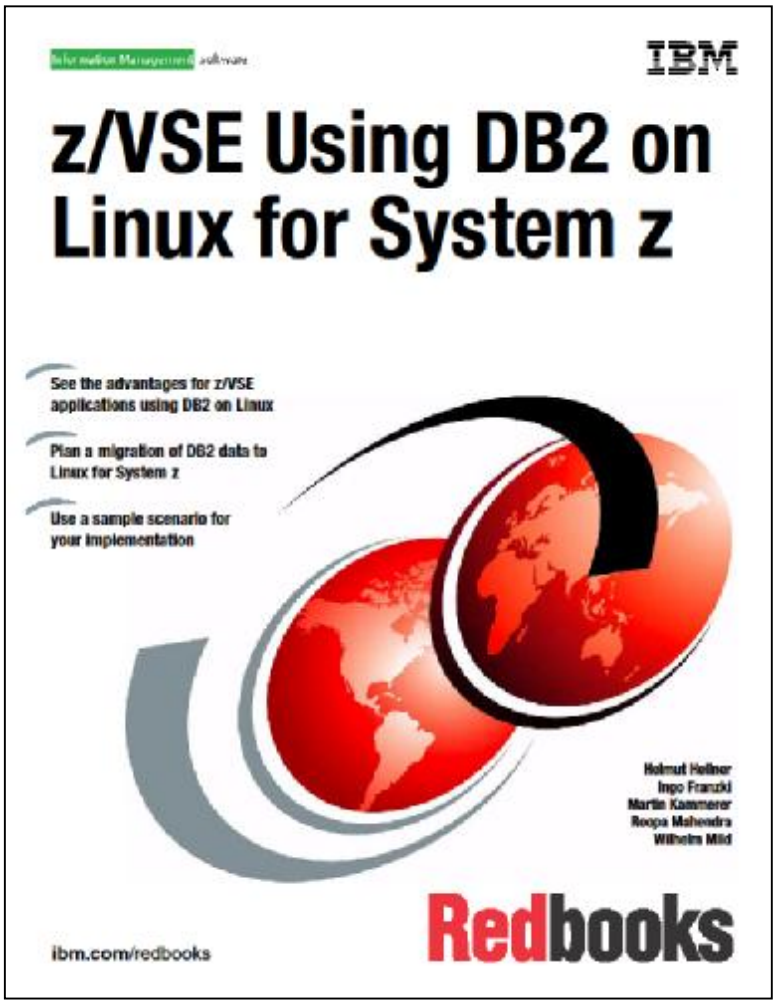
New Red Book

Contents:

- Chapter 1. Overview of a future oriented DB2 environment
- Chapter 2. Planning DB2
- Chapter 3. Environment setup and customization
- Chapter 4. DB2 data migration and application dependencies
- Chapter 5. Monitoring and tuning
- Appendix A. Configuration members
- Appendix B. Database manipulation



http://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/sg247690.html?Open

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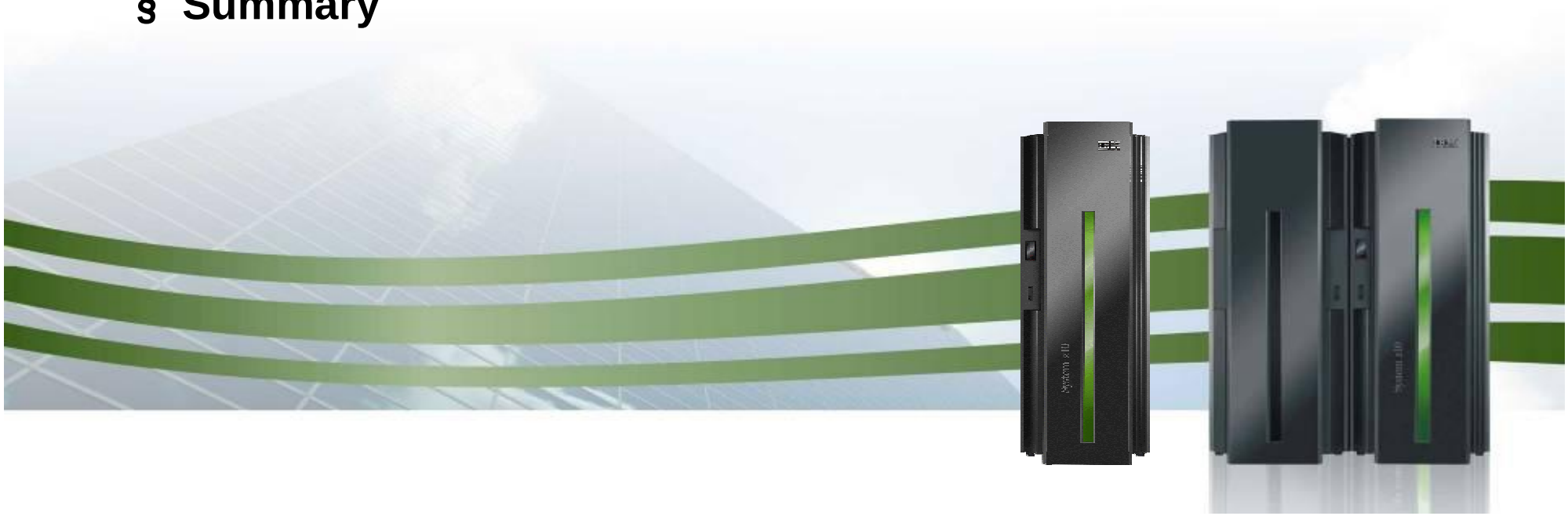
Agenda

- **z/VSE**
- **Michael Daubman**
  - **z/VM**
  - **Linux on System z**
- **Summary**



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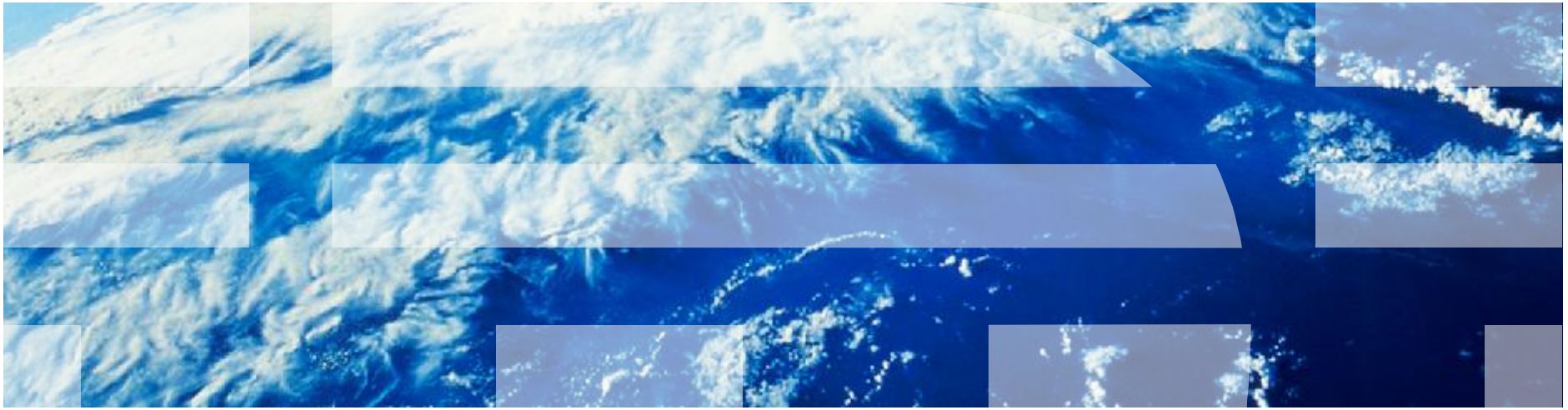
z/VM and System z Virtualization Futures

Michael Daubman
IBM Systems &Technology Group, System z Platform
Linux and Virtualization on IBM System z PDT Leader
mdaubma@us.ibm.com



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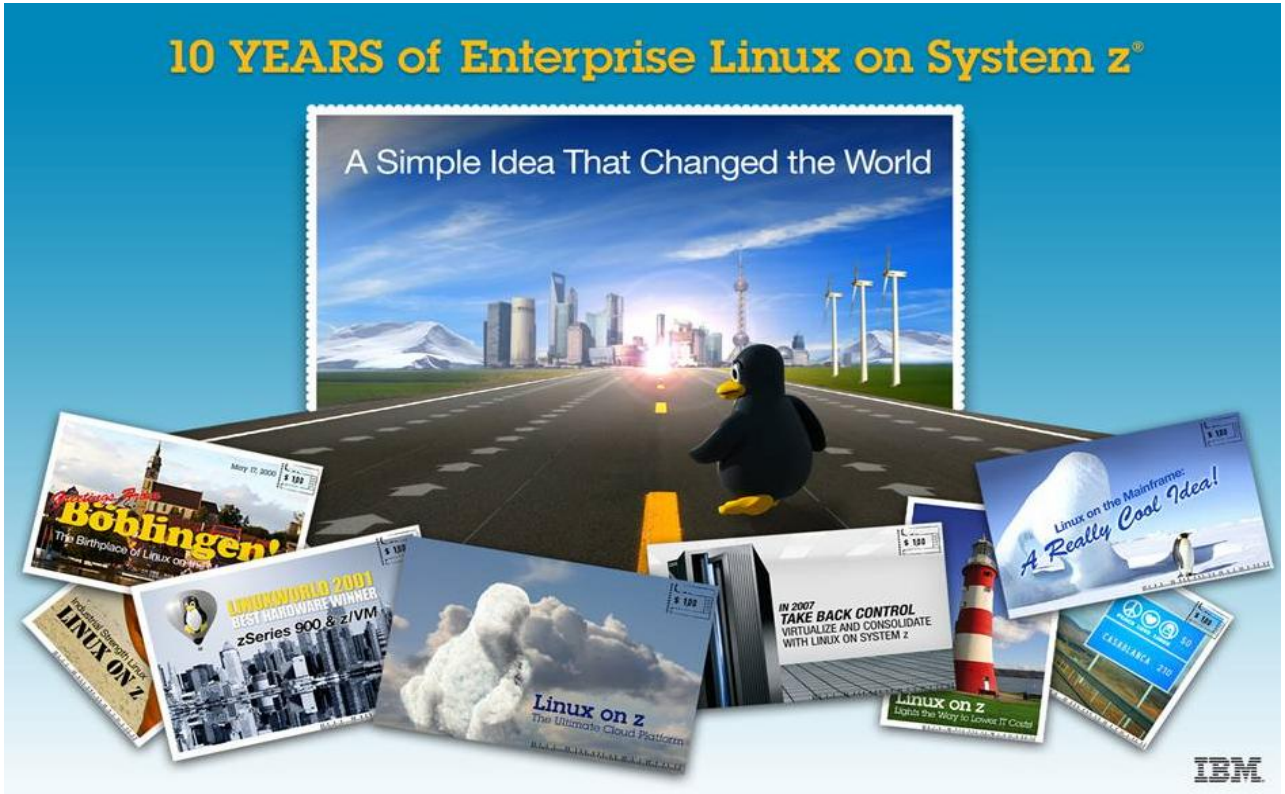
Topics

§ Virtualization marketplace dynamics

§ z/VM futures outlook

§ Linux on System z development themes (and outlook)



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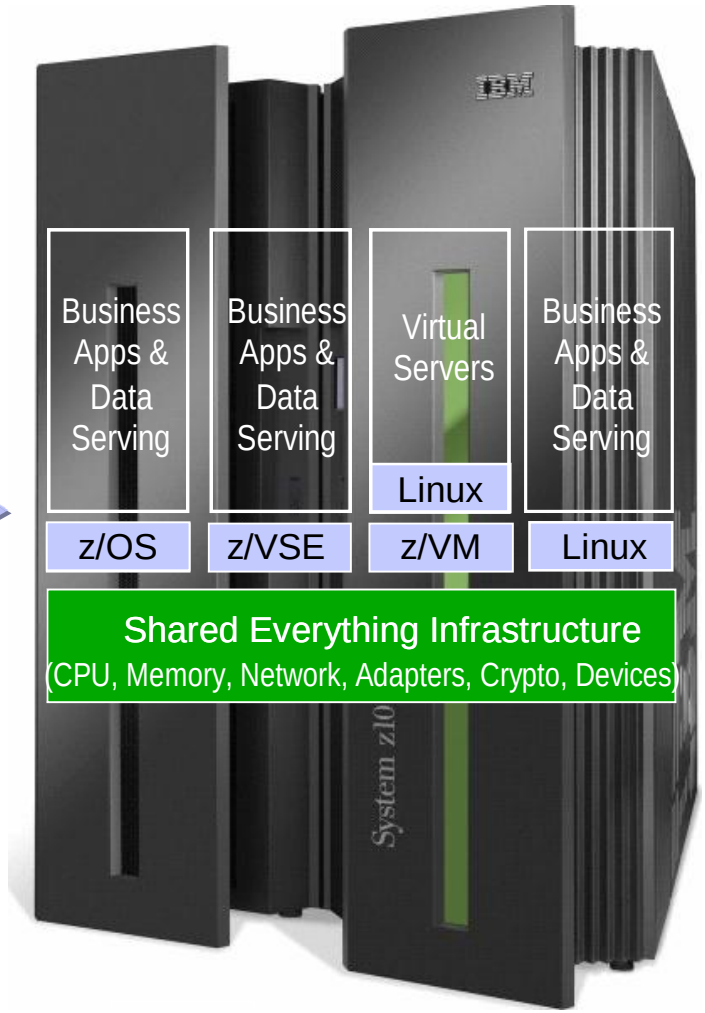
System z IT Optimization and Consolidation

Saving Money and Reducing Complexity
Helping You "Do More with Less"

- Consolidate more servers per core and spend less on software, more than 70% less in some cases
- Manage more server images with fewer people, up to 50% improvement in staff productivity
- Save up to 80% on energy and floor space
- Deploy new servers and applications faster
- Absorb workload spikes and maintain service level agreements with less complexity
- Spend less on disaster recovery



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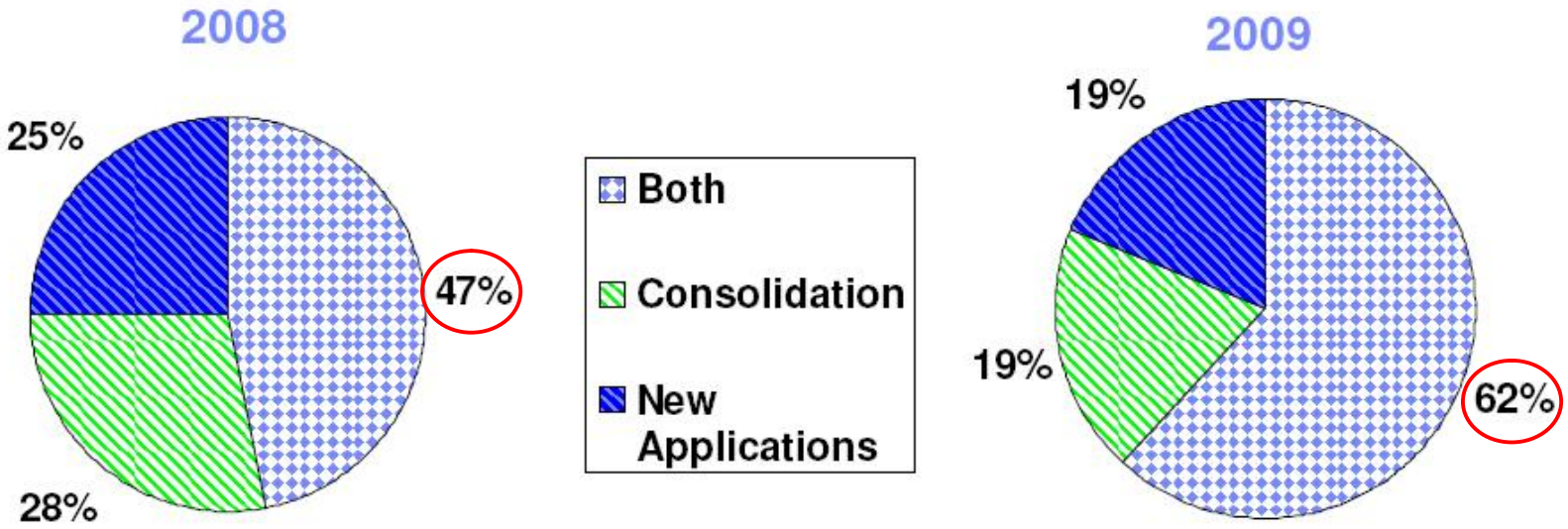
Linux on System z: Consolidation vs. New Applications

Q: Are you using Linux on System z to consolidate workloads, host new applications, or both?



Source: 2009 IBM Market Intelligence

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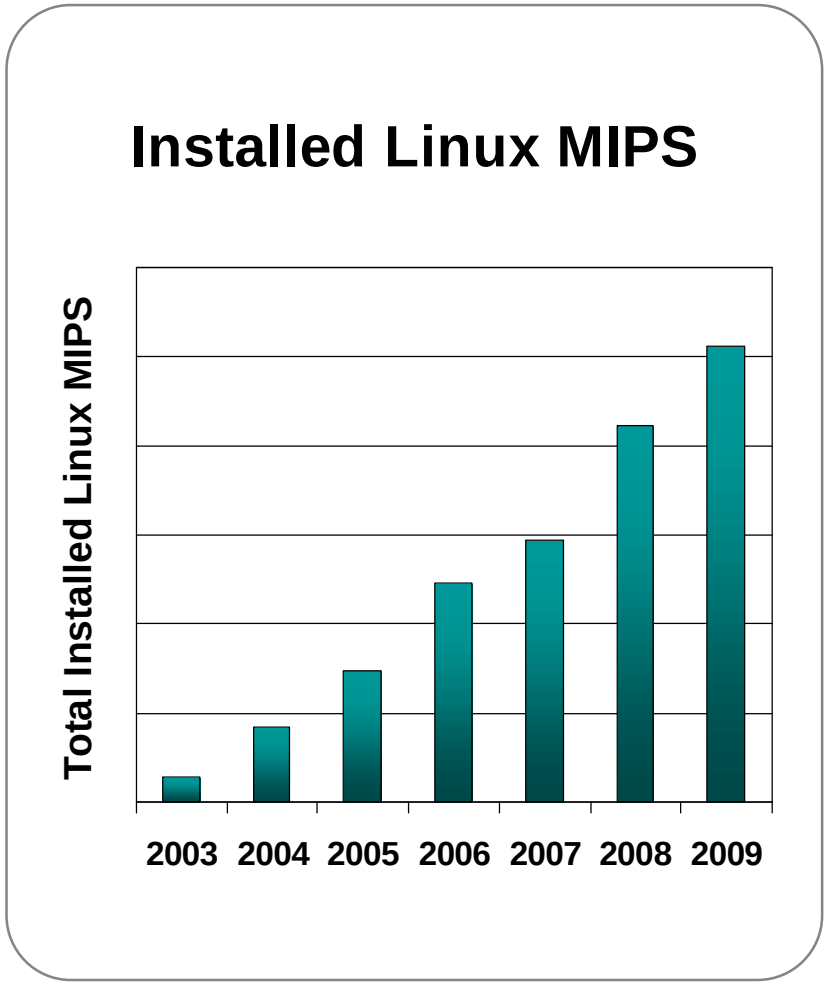
Client Adoption Continues to Drive Linux Success

*Installed Linux MIPS at 43% CAGR**

- **The momentum continues:**
  - Shipped IFL engine volumes increased 35% from YE07 to YE09
  - Shipped IFL MIPS increased 65% from YE07 to YE09
- **Linux is 16% of the System z customer install base (MIPS)**
- **70% of the top 100 System z clients are running Linux on the mainframe**
- **More than 3,100 applications are available for Linux on System z**



* Based on YE 2004 to YE 2009

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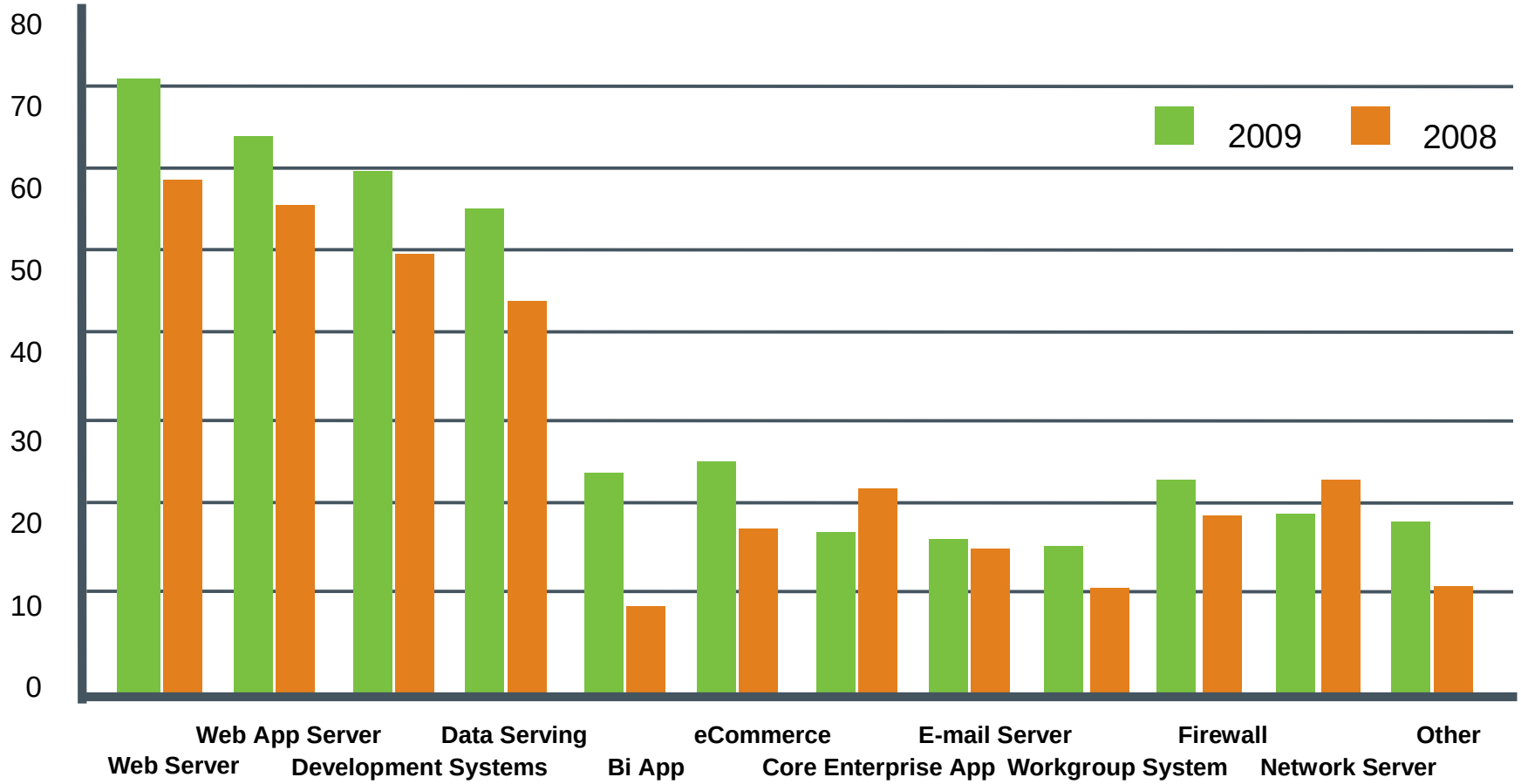
What Workloads are Clients consolidating to IFLs?

More than 3,100 commercial ISV applications are available for Linux on System z, on top of over 500 IBM Linux Offerings



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High Core-to-Core Ratios for Consolidations
From Distributed IT-Environments to IFLs

Real customer examples with real workloads!

Industry	Distributed Cores	IBM Enterprise Linux Server ™ Cores	Core-to-Core Ratio*
Public	292	5	58 to 1
Banking	111	4	27 to 1
Finance	442	16	27 to 1
Banking	131	5	26 to 1
Insurance	350	15	23 to 1
Insurance	500+	22	22 to 1
Banking	63	3	21 to 1
Finance	854	53	16 to 1
Health care	144	14	10 to 1
Transportation	84	9	9 to 1
Insurance	7	1	7 to 1

* Client results will vary based on each specific customer environment including types of workloads, utilization levels, target consolidation hardware, and other implementation requirements.

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The IBM Enterprise Linux Server
The IBM System z Solution Edition for Enterprise Linux

- **The IBM Enterprise Linux Server is a System z10 machine configured to run Linux-only workloads – it includes the following hardware and software components:**
  - IFL specialty processors (2-10 for z10 BC machine; 6-64 for z10 EC machine*)
  - 16 GB of memory per IFL (if system configuration permits)
  - Hardware maintenance for 3-5 years
  - z/VM® software (base product and all features) with 3-5 years of subscription & support
  - Minimum of three 4-Port FICON® cards and two 4-Port OSA cards
  - Clients can optionally add more memory and I/O connectivity

- **The Solution Edition for Enterprise Linux delivers a similar solution stack that users can add to an existing System z10 machine:**
  - Integrated Facility for Linux (IFL) specialty processors
  - 16 GB of memory per IFL (if system configuration permits)
  - Hardware maintenance for 3-5 years
  - z/VM software (base product and features) with 3-5 years of subscription & support
  - Clients can optionally add more memory or I/O connectivity (OSA and FICON cards)

- **Acquisition pricing for Solution Edition for Enterprise Linux is marginally more expensive than UNIX-system alternatives**
  - But with superior qualities of service and a lower total cost of ownership

•Entry configuration for EC machine may vary by country.

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Clients Deploy Dedicated ELS Servers

For Workload Consolidation with Linux

"It has really ticked all the boxes. It reduced the dependency on a data centre, it reduced the complexity from over 60 servers down to one box, it enabled us to put a lot more robustness around it in terms of DRP and scalability, and was environmentally friendly as well."

– Steven Coles, CIO, Allianz

Smart is: Consolidating from over 60 servers to just one!

Allianz

Reduced IT costs – paid for itself in just over a year

kVA power usage down from about 40 to 4

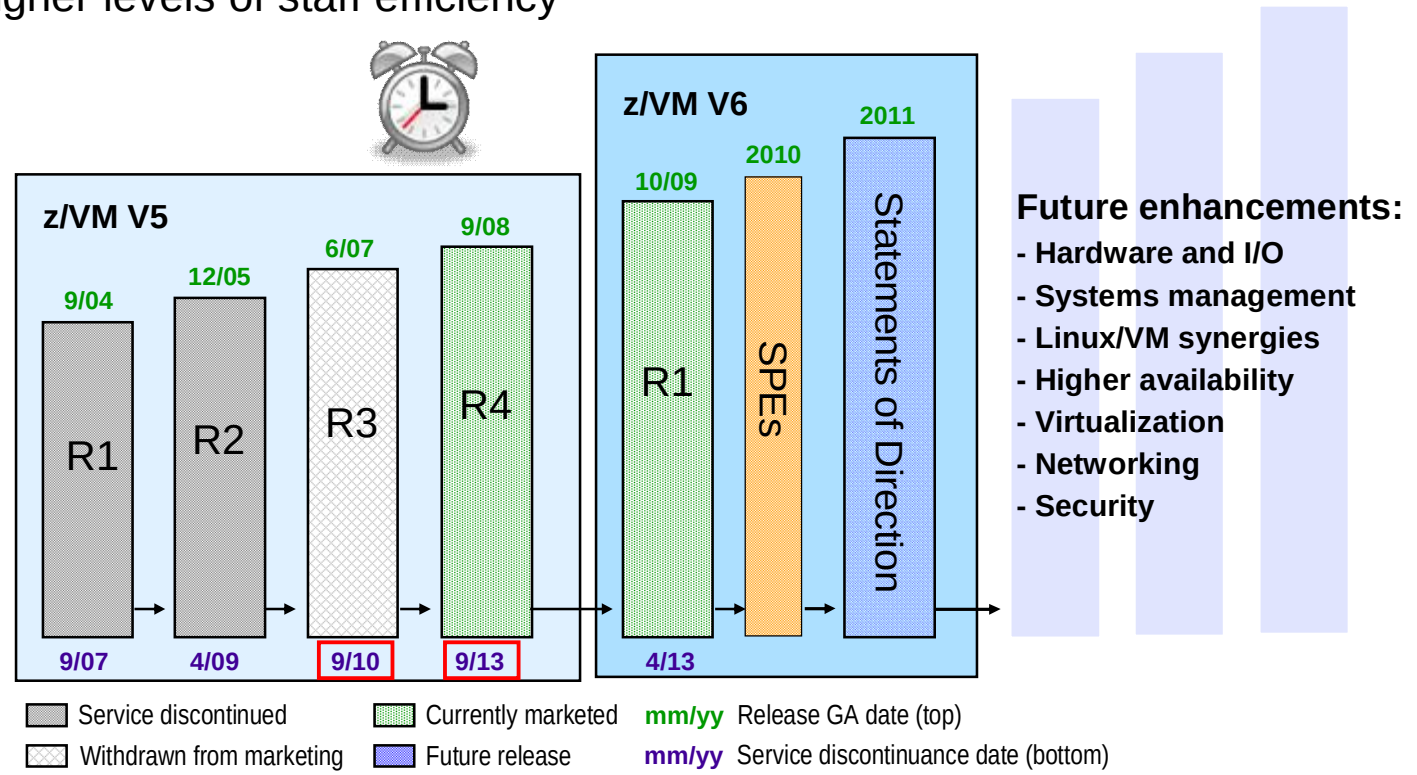
Minimum disruption in cutover to new server

Source: "Allianz consolidates from 60 servers to 1 mainframe in 48 hours"
Computerworld, November 4, 2009 -- http://www.computerworld.com.au/article/324815/allianz_consolidates_from_60_servers_1_mainframe_48_hours

z/VM Release History

z/VM helps clients "do more with less"

- Higher core-to-core consolidation ratios
- Higher levels of resource sharing and utilization
- Higher levels of staff efficiency



IBM has received certification of z/VM V5.3 from the German Federal Office of Information Security (Bundesamt für Sicherheit in der Informationstechnik) for conformance to the Controlled Access and Labeled Security protection profiles (CAPP and LSPP) of the Common Criteria standard for IT security, ISO/IEC 15408, at Evaluation Assurance Level 4+ (EAL 4+).
While z/VM V5.4 and V6.1 have not been officially evaluated for conformance, they are designed to meet the same standards.

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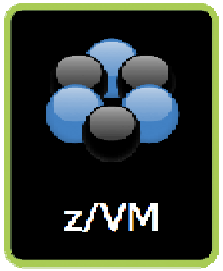
z/VM V6.1

The Foundation for System z Virtualization Growth

Announced October 20, 2009; available since October 23, 2009



- **Establishes a new z/VM technology base for IBM System z10 and future systems**
  - z/VM V6.1 only operates on System z10 EC, z10 BC, and future generation servers
  - Acknowledges the ***highly attractive economics*** of workload consolidation on System z10 servers
  - Allows optimization of z/VM function for greater business value on newer hardware
- **New function and packaging for z/VM V6.1**
  - Exploitation of the System z10 server cache management instructions to help improve the performance of z/VM virtual networking for guest-to-guest streaming workloads
  - Better integration with IBM Systems Director by providing the z/VM Manageability Access Point (zMAP) agent (including the Platform Agent for Linux) with z/VM V6.1 for easier agent installation
  - Support for FICON Express8 – designed to provide faster access to data (link data rate of 8 Gbps)
  - Support for Crypto Express3 – the next generation cryptographic feature for System z (z/VM support is planned to be available in 11/2009)
  - Support for IBM System Storage DS8000 Extended Address Volumes (planned availability 12/2009)
  - Inclusion of several functional enhancements previously delivered in the z/VM V5.4 service stream
- **Product announcement includes statements of direction for future z/VM support**
  - z/VM hypervisor clustering support: "Single System Image" (SSI)
  - Linux virtual machine mobility support: "Live Guest Relocation" (LGR)

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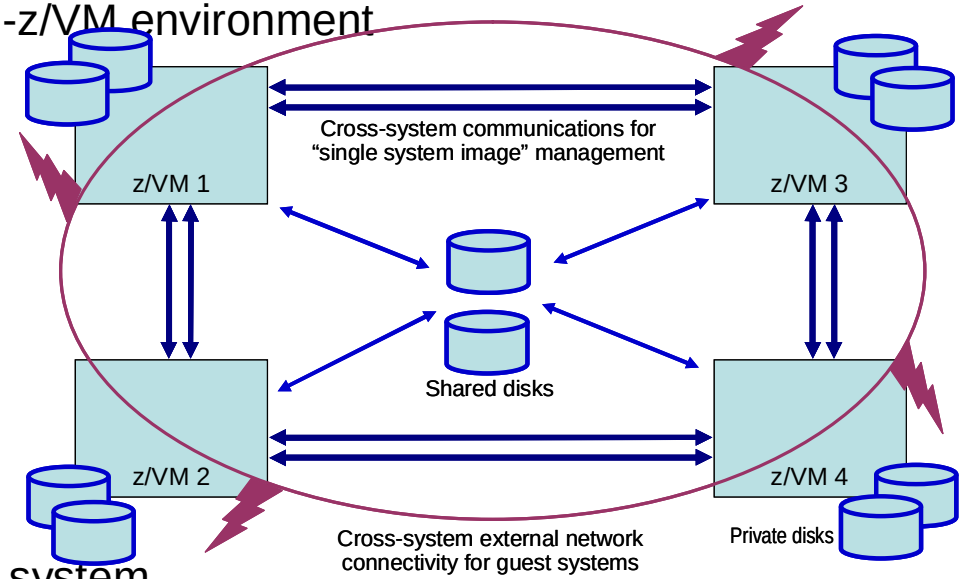
z/VM V6 Statements of Direction
Clustered Hypervisor Support and Guest Mobility

- Clients can cluster up to four z/VM systems in a **Single System Image** (SSI)
- Provides a set of shared resources that can be used by both z/VM and hosted virtual machines, with full awareness of sharing by the clustered z/VM systems – be they on the same and/or different System z10 servers
  - Directory, minidisks, spool files, Virtual Switch MAC addresses
- Helps simplify systems management for a multi-z/VM environment
  - Single user directory
  - Cluster management from any system
    - Apply maintenance to all systems in the cluster from one location
    - Issue commands from one system to operate on another
  - Built-in cross-system capabilities
  - Service consolidation: run one copy of service virtual machines for the cluster
  - Resource coordination and protection: network and disks



- Dynamically move Linux guests from one z/VM system to another in the cluster via **Live Guest Relocation** (LGR)
  - Helps reduce planned outages; enhances workload management
  - With z/VM: dynamically move work to available resources **and** dynamically move resources to work

Note: All statements regarding IBM's plans, directions, and intent are subject to change or withdrawal without notice, and represent goals and objectives only.

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Available Linux on System z Distributions
Kernel 2.6 based

- **Novell SUSE Linux Enterprise Server 9 (GA 08/2004)**
  - Kernel 2.6.5, GCC 3.3.3, Service Pack 4 (GA 12/2007)
- **Novell SUSE Linux Enterprise Server 10 (GA 07/2006)**
  - Kernel 2.6.16, GCC 4.1.2, Service Pack 3 (GA 10/2009)
- **Novell SUSE Linux Enterprise Server 11 (GA 03/2009)**
  - Kernel 2.6.27, GCC 4.3.2 + z10 support
- **Red Hat Enterprise Linux AS 4 (GA 02/2005)**
  - Kernel 2.6.9, GCC 3.4.6, Update 8 (GA 05/2009)
- **Red Hat Enterprise Linux AS 5 (GA 03/2007)**
  - Kernel 2.6.18, GCC 4.1.2, Update 5 (GA 03/2010)

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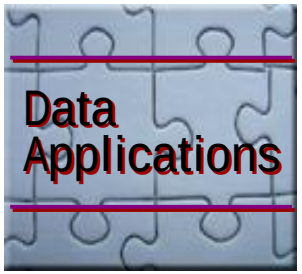
Linux on System z Development Focus

Integration



Application Serving

•z/OS integration

Data Hub

•Database Consolidation

Virtualization

Virtualization &

Virtualization Management

•Ease of Use

•Serviceability

•Hosting capacity

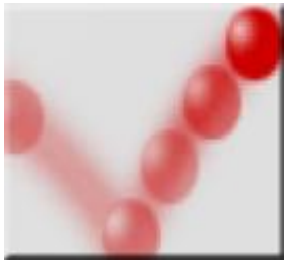
Security

Security

•Certifications

•Data security & privacy

Business Continuity



Continuous Availability

& Data Replication

•RAS

•Differentiation for mission critical workloads

Base Tasks

Customer Requirements

•Address customer observed deficiencies

Competitiveness

•Close competitive gaps

•Differentiation / innovation that matters

Hardware Support

•Exploitation of new System z HW

•Storage exploitation

Linux

•Maintainership & code currency

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Recent Linux on System z Development Activity (Examples)

§ System z10 support

- Decimal Floating Point (DFP)
- New CPU crypto algorithms like SHA-512/384 and AES192/256
- Large Page Support
- HiperSockets Layer 2 support

§ Storage

- HyperPAV for simple and efficient multipathing
- FCP performance improvements

§ Improve serviceability

- Activation/deactivation of standby CPU and memory
- Suspend/resume to hibernate to disk
- HiperSockets Network Traffic Analyzer for sniffing in HiperSockets LANs

§ Improve z/VM synergy

- Terminal server for convenient ssh access to z/VM guest consoles
- Read and write z/VM monitor stream data
- Adaptive CPU and memory management controls CPU activation/deactivation and memory ballooning based on user defined policies

Note: this list comprises selected items only

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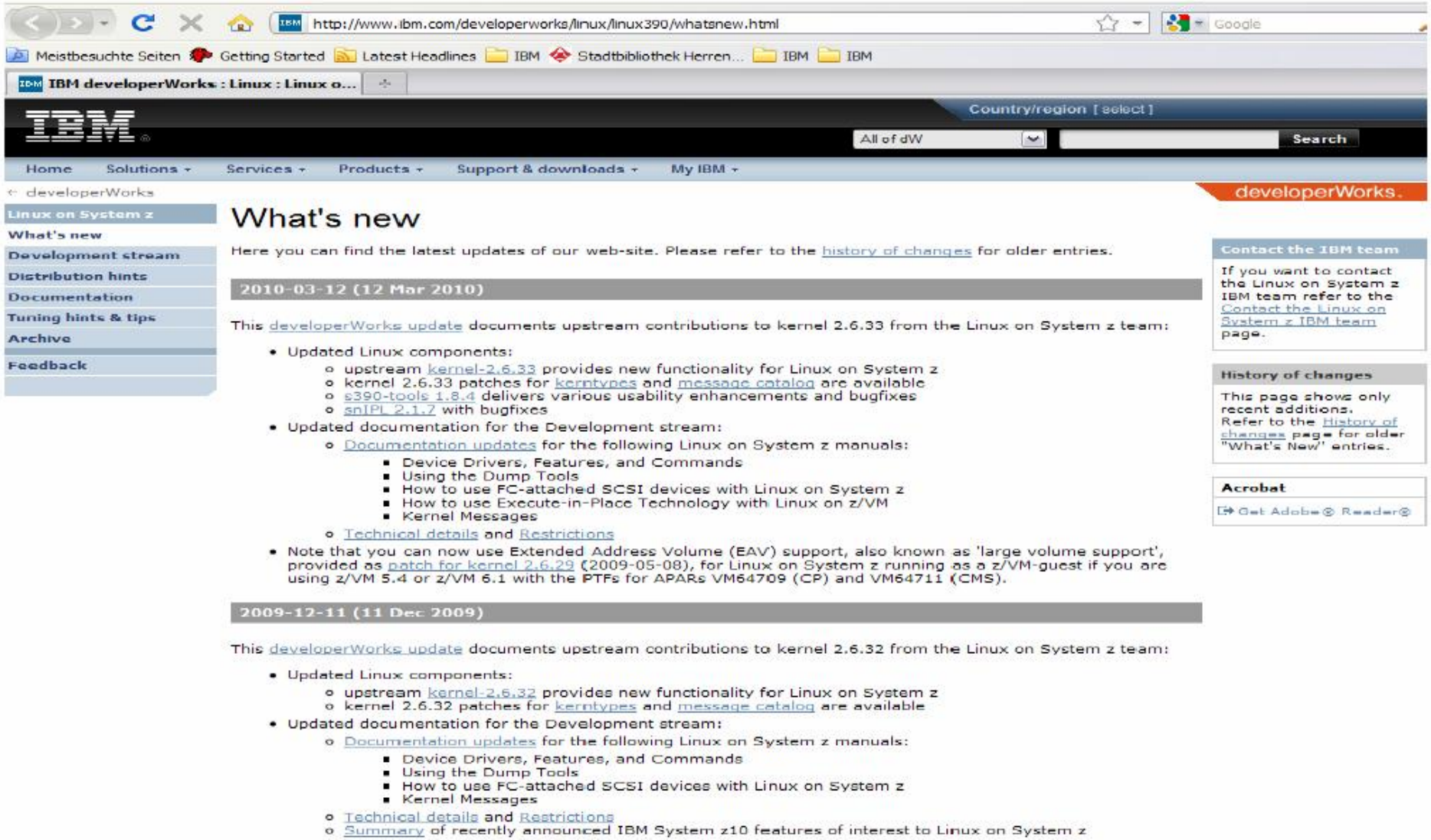
developerWorks Update for Kernel 2.6.33



www.ibm.com/developerworks/linux/linux390/whatsnew.html

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Outlook: Current Linux on System z Development Themes

§ Support future System z hardware

- Leverage new hardware capabilities and deliver functional improvements and extensions
- Main areas include: CPU features, I/O and I/O infrastructure, scheduling performance, new Crypto algorithm support

§ Improve Resiliency and RAS

- Allow for less complex software setups through leveraging platform RAS in Linux
- Main areas include: enhanced handling of I/O and environmental exceptions; FCP integrity and improved usability

§ Support ISVs and future workload

- Prepare for future workload and strive for additional solution availability
- Main areas include: exploitation of new hardware features, new and improved debugging and performance tools for application development

§ Performance work in toolchain and kernel (incl. I/O)

Note: this list comprises selected items only

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CeBit 2010: Linux Kernel Programmers won Linux New Media Award

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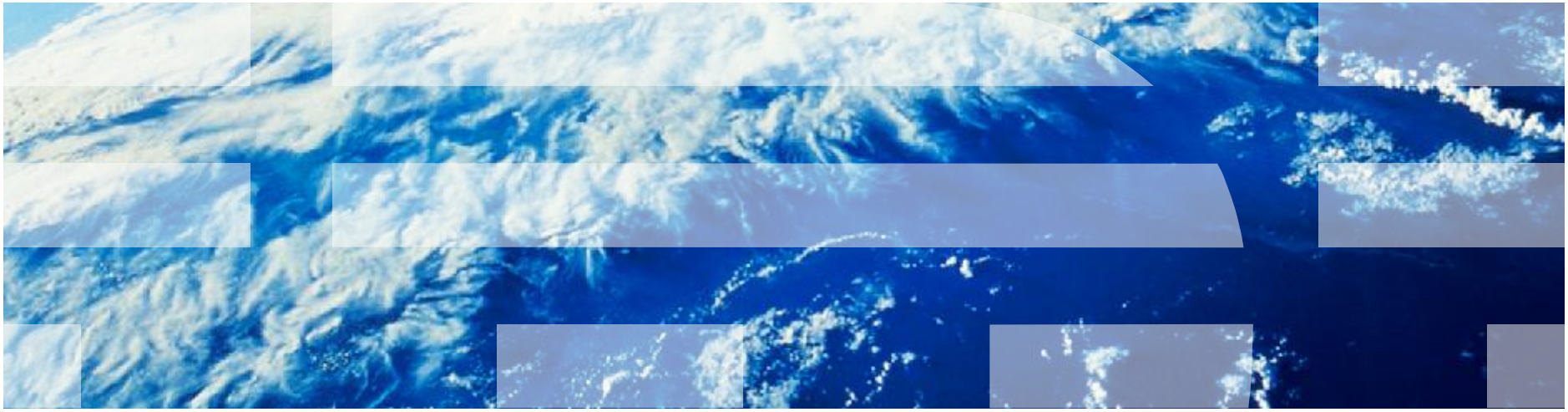
Thank you



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