IBM Update

WAVV 2010
Covington KY – April 9 to 13, 2010

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DFSMS	IBM*	System z9	z/VSE
DS6000	IBM eServer	System z10	zSeries*
DS8000	IBM logo*	System z10 Business Class	z9
Enterprise Storage Server*	IMS	Tivoli	z10
ESCON*	MQSeries*	TotalStorage*	z10 BC
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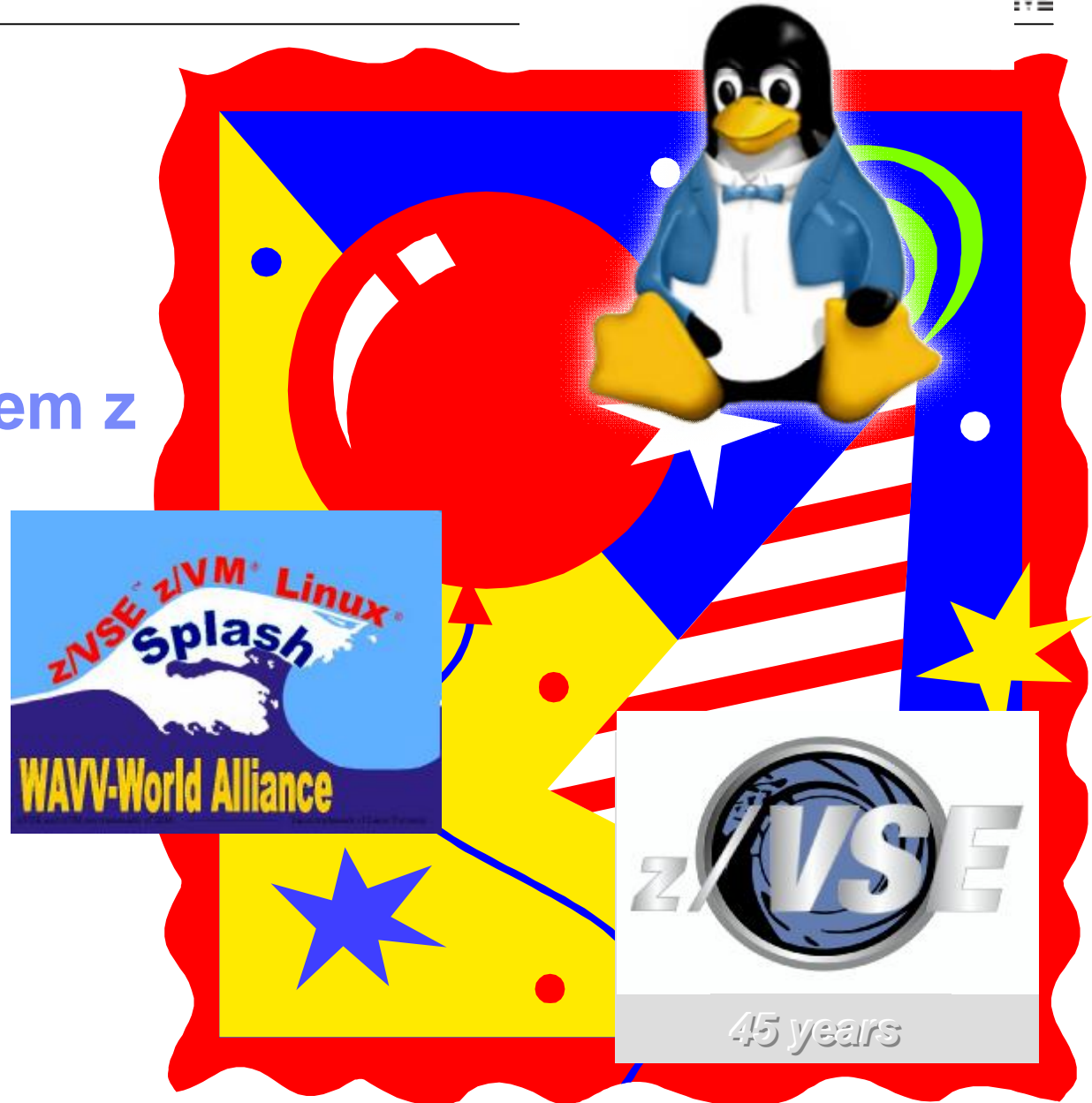
Celebrating...

10th anniversary
- **Linux on System z**

15th anniversary
- **WAVV**

45th anniversary
- **z/VSE**

How it began

10 YEARS of Enterprise Linux® on System z®
A Simple Idea That Changed The World

"Our Linux initiative and our relationship with the Linux community have had a major impact on the IBM culture... I am convinced that this kind of collaborative culture is required for businesses that want to be innovation leaders in the 21st century."

- Irving Wladawsky-Berger

1999   2000   2001   2002   2003   2004   2005   200

Never trust a computer you can lift :-)
http://linux390.marist.edu
Linux for S/390

SLES 8   **RHEL 3**

October 2001 ── Red Hat 7.2 available (implemented on Linux 2.4 kernel)

November 2000 ── SuSE Linux 7.0 available

August 2000 ── "S/390 Install Fest" with SuSE pre-release

July 2000 ── IBM announced Integrated Facility for Linux (IFL)

May 17, 2000 ── **IBM announced Linux for the enterprise user**

December 18, 1999 ── Kernel patches (version 2.2.13) available on Marist College web site

Spring 1999 ── Linux running under VM/ESA
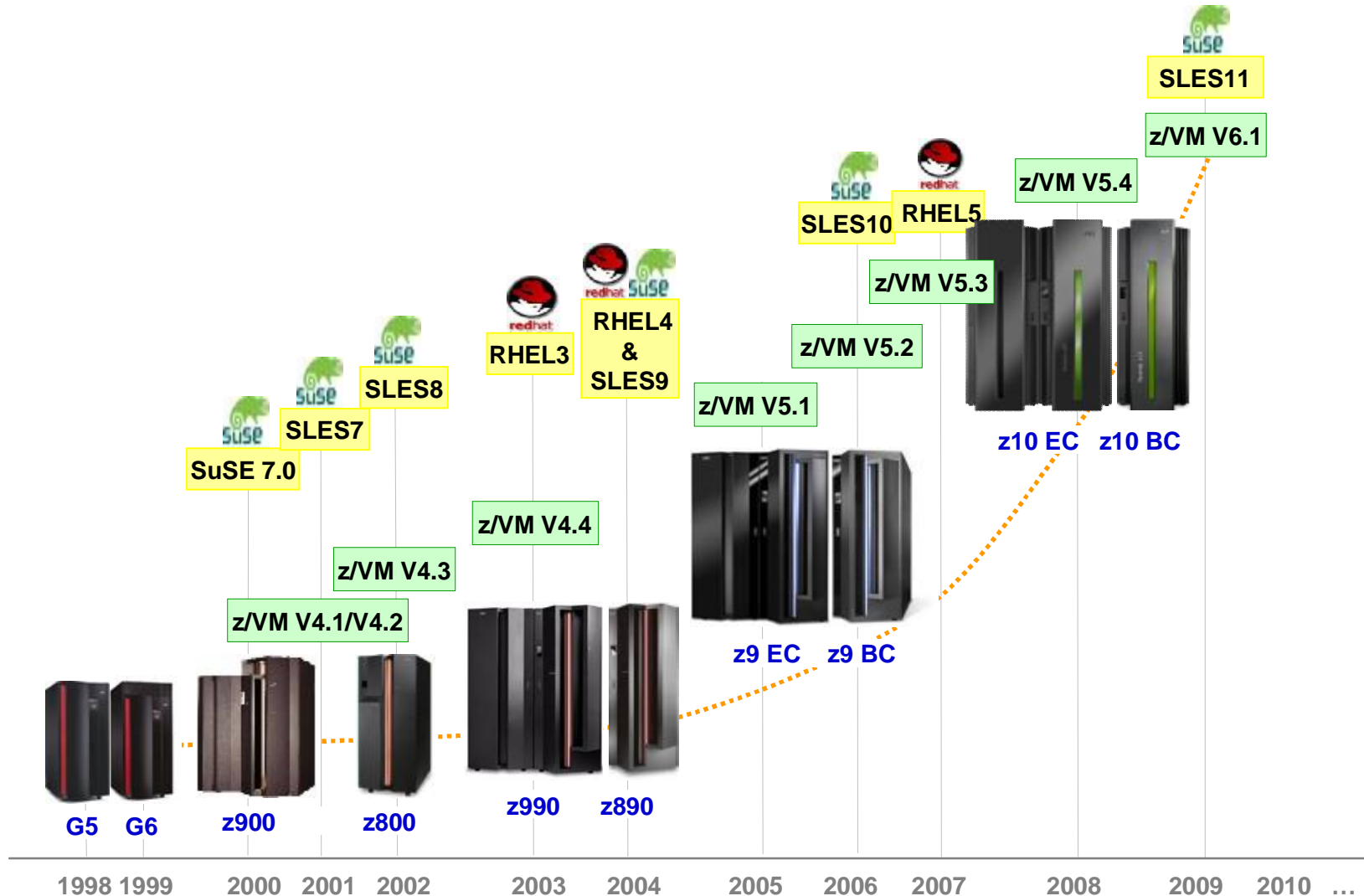
A Simple Idea

10 years ago

2000

§ **Increased solutions** through Linux application portfolio

§ Large number of **highly skilled programmers** familiar with Linux

§ **Integrated business solutions**

   – Data richness from IBM eServer™ zSeries®

   – Web capability of Linux applications

§ **Industrial strength environment**

   – Flexibility and openness of Linux

   – Qualities of service of zSeries and S/390®

§ **Unique ability to easily consolidate large number of servers**

LINUX FOR S/390...

...IT'S COOL.

Linux on System z – Unique Advantages based on IBM System z and z/VM Technology Innovation

SLES11

z/VM V6.1

z/VM V5.4

SLES10 RHEL5

z/VM V5.3

z/VM V5.2

RHEL4 & SLES9

z/VM V5.1

RHEL3

SLES8

z/VM V4.4

SLES7

z/VM V4.3

SuSE 7.0

z/VM V4.1/V4.2

z10 EC   z10 BC

z9 EC   z9 BC

z990   z890

G5   G6   z900   z800

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

7

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**

Installed Linux MIPS
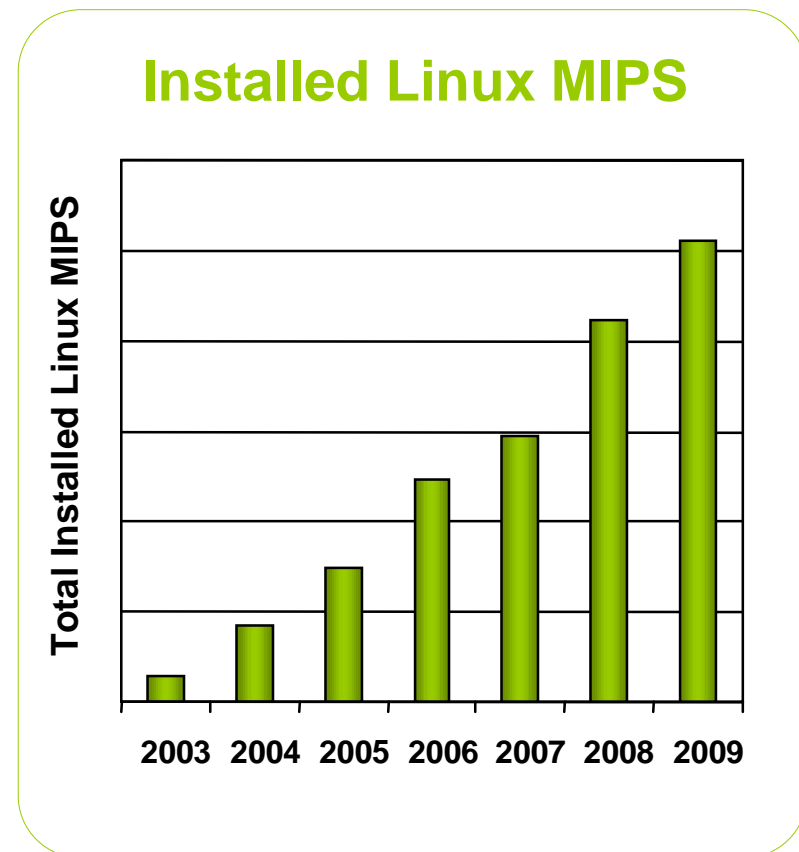
MIPS: million instructions per second – relative performance indicator widely used for mainframes.

8   * Based on YE 2004 to YE 2009

IBM

45th Anniversary

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Evolution of VSE – the 60's and 70's

S/360

§ 1965: Disk Operating System/360

- Releases 1 to 27
- designed to run in 16 KB systems
- disk used for program libraries, transient supervisor functions, etc.
- 1 partition, up to 3 beginning in Release 3, batch multiprogramming in R16
- BTAM for telecommunications added in Release 3
- User programming in Macro Assembler, COBOL, Fortran, PL/1, and RPG

§ 1972: DOS/VS

- Releases 28 to 34
- up to 16 MB virtual storage
- 5 partitions (up to 7 in R34)
- Linkage Editor, Relocating Loader
- VSAM - balanced sequential/random
- POWER (first a Type III in 1968)
     short for **"P**riority **O**utput **W**riters, **E**xception Processors, and Input **R**eaders"
- 'DBDC' => CICS and DL/I

Evolution of VSE – the 80's

IBM 4300

§ **1979: DOS/VSE**

- 7 partitions, up to 12 in Release 2
- Fixed Block Architecture (FBA)
- Misc. enhancements: ASI procedures, channel switching, DASD sharing, add statements, missing interrupt handler, etc.
- MSHP, ICCF, ACF/VTAM
- Priced Components

IBM 9370

§ **1987: VSE/SP V3**

- 12 partitions
- Virtual Address Extensions (VAE), up to 9 address spaces
- New Librarian
- Interactive User Interface (IUI)
- Conditional JCL
- Packaging: base and optional products; base was designed, developed, tested, shipped, and serviced as if it were a single integrated system
- Capacity-based Pricing
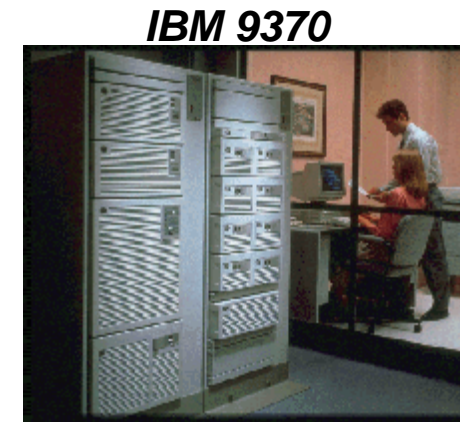
Evolution of VSE – the 90's

§ 1990: VSE/ESA V1.3

- 31-bit real and virtual addressing
- Dynamic partitions, number limited only by tasks, 1 partition per address space
- Access Registers
- Data Spaces
- Virtual Disk
- Virtual Storage Constraint Relief
- Dynamic (XA) Channel Subsystem
- ESCON Channels

IBM 9221

§ 1998: VSE/ESA V2.3

- Year 2000 ready
- optional Turbo dispatcher, support for n-way processors
- VSAM KSDS > 4GB
- TCP/IP for VSE/ESA (native), offered under agreement with CSI
- ACF/VTAM V4.2
- LE and LE-based languages: COBOL, PL/1, C for VSE/ESA

Multiprise 2000

12

Happy Birthday z/VSE

45 years

z/VSE Update

IBM

z/VSE Evolution

Protect
Integrate
Extend

Capacity
Quality
z/OS Affinity
Interoperability
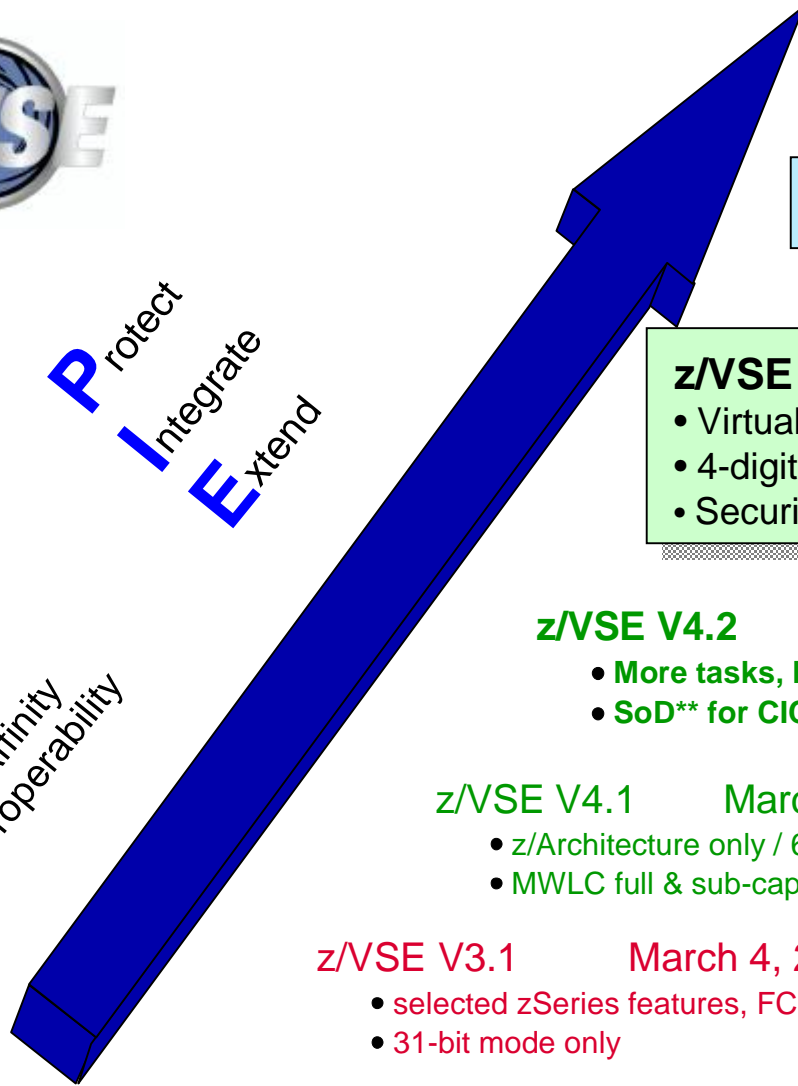
z/VSE V4.3   GA 4Q2010

IPv6/VSE   Ann. 4/06/2010; GA 5/28/2010

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
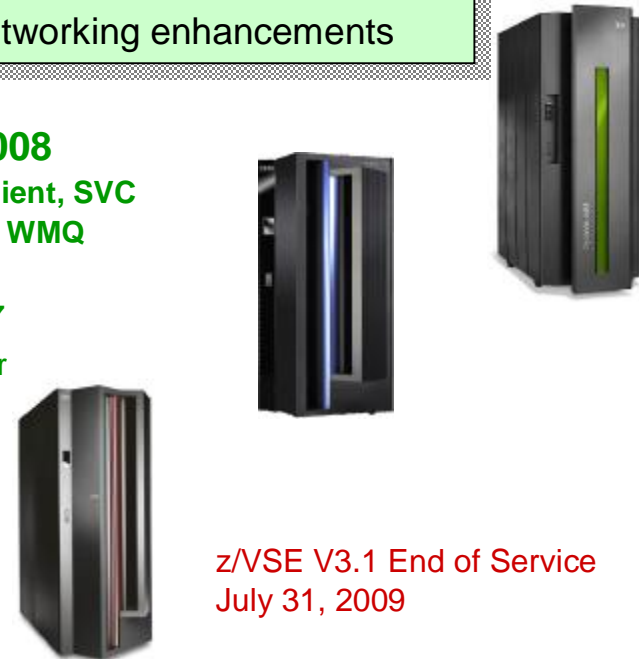
z/VSE V3.1 End of Service
July 31, 2009

Changes in 2009 and 2010

- § *02/26/2008 - IBM System z10 Enterprise Class*
- § 09/12/2008 - z/VM V5.4 available
- § 10/17/2008 - z/VSE V4.2 available
- § *10/21/2008 - IBM System z10 Business Class*
- § 04/28/2009 - z/VSE V4.2.1 announced
- § 05/28/2009 – Support for PAV available
- § 07/07/2009 - Preview: IBM z/VM V6.1
- § **07/17/2009 - z/VSE V4.2.1 available**
- § 07/17/2009 – Encryption Facility for z/VSE V1.2 available
- § 07/31/2009 - End-of-Service for z/VSE V3.1
- § **10/20/2009 - z/VSE V4.3 Preview announcement**
- § 10/20/2009 - z/VM V6.1 announced
- § 10/23/2009 - z/VM V6.1 available
- § 10/20/2009 - 2nd edition of Redbook 'Security on IBM z/VSE' (SG24-7691)
- § 02/02/2010 - z/VSE V4.1 end-of-service extended from 04/30/2010 to 04/30/2011
- § 02/03/2010 - New Redbook: 'z/VSE Using DB2 on Linux for System z' (SG24-7690)
- § **04/06/2010 – IPv6/VSE announced**

z/VSE V4.3 preview (announced October 2009)

§ 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

§ IBM System z10 technology exploitation:

– Dynamic add of logical CPs

– 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

§ DOS/VS RPG II support for CICS Transaction Server for VSE/ESA (CICS TS)

– Allows RPG programs implemented for CICS/VSE V2.3 to run with CICS TS

§ IPv6 SOD

IPv6/VSE® Version 1 Release 1

Allow z/VSE users to participate in an IPv6 network

§ Announcement: April 06, 2010

§ Planned availability: May 28, 2010

§ IPv6/VSE is designed to provide

– TCP/IP stack

– IPv6 APIs

– IPv6 enabled applications

§ IPv6/VSE <u>only</u> supports the IPv6 protocol

– TCP/IP for VSE/ESA V1.5 <u>only</u> supports the IPv4 protocol

– Both stacks can be run concurrently within one z/VSE system

– Existing IPv4 applications continue to run unchanged

§ IPv6/VSE dual stack support allows applications to access the IPv4 and IPv6 networks simultaneously in either batch or CICS environment

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

Special Guests

… please welcome

Michael Poil
  CICS L3 Service Specialist

Robert J. Sodan
  CICS Level 2 Support

Alan Altmark
z/VM Strategy, Design, and Development

z/VM Update

IBM
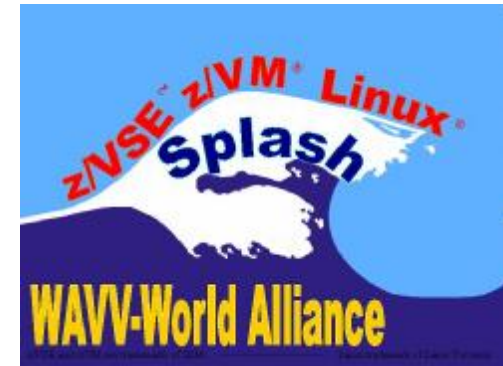
z/VM: helping clients "do more with less"

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

z/VM V6

z/VM V5

		6/07	9/08
9/04	12/05		

10/09

R1

R2

R3

R4

R1

Statements of Direction

Future enhancements:
- **Hardware and I/O**
- **Systems management**
- **z/VM Clusters**
- **Live Guest Relocation**

9/07   4/09   9/10   9/13   4/13

	Service discontinued		Currently marketed	**mm/yy**	Release GA date (top)
	Withdrawn from marketing		Future release	**mm/yy**	Service discontinuance date (bottom)
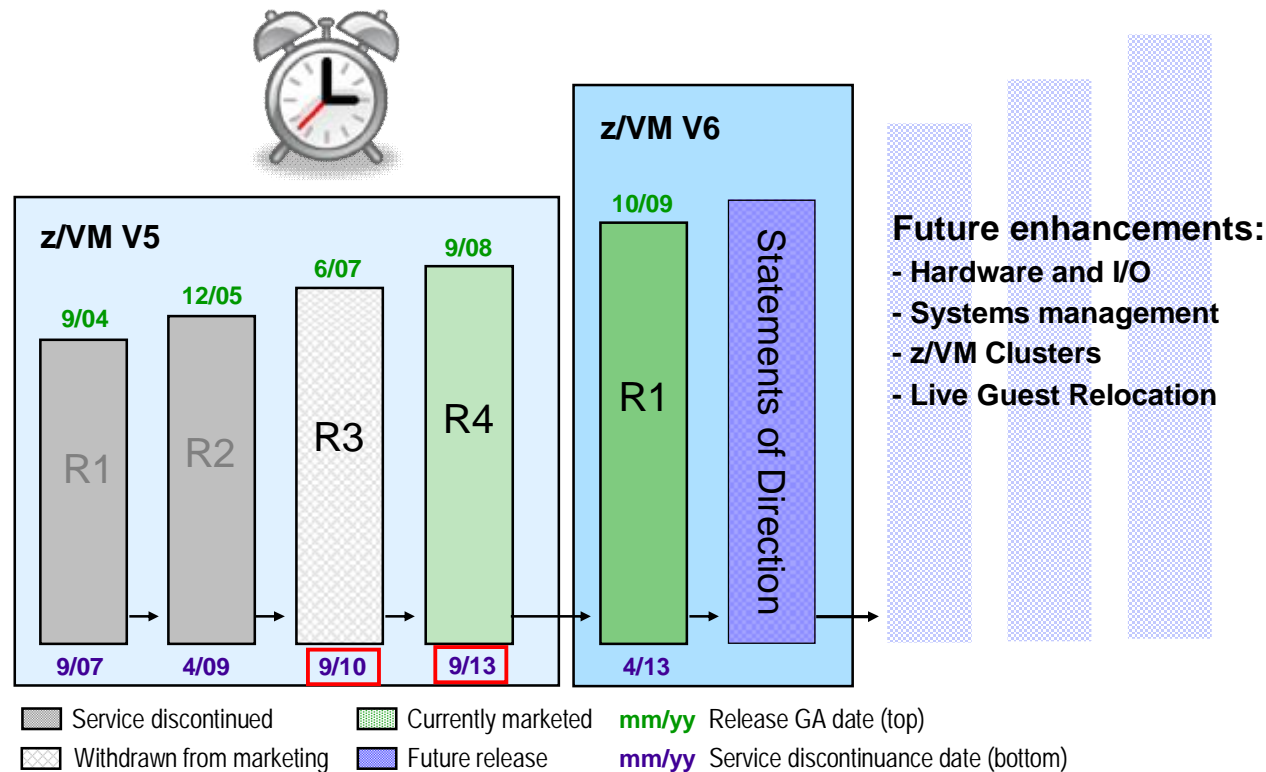
z/VM Version 6.1

§ **Establishes a new z/VM technology base for IBM System z10 and future systems**
  – z/VM V6.1 only operates on z10 EC, z10 BC, and future generation servers

§ **Allows optimization of z/VM function for greater business value on newer hardware**
  – New facilities
  – New instructions

§ **z/VM Version 5.4 is still available for System z9 and earlier**
  – Will remain in service until 2013
  – Will not get the same functional upgrades as z/VM V6

z/VM Single System Image Cluster – The WAVV of the Future

Private disks

Member 1

Up to **16** CTCs for ISFC-based
SSI communications

Member 2

Shared disks

Member 3

Member 4
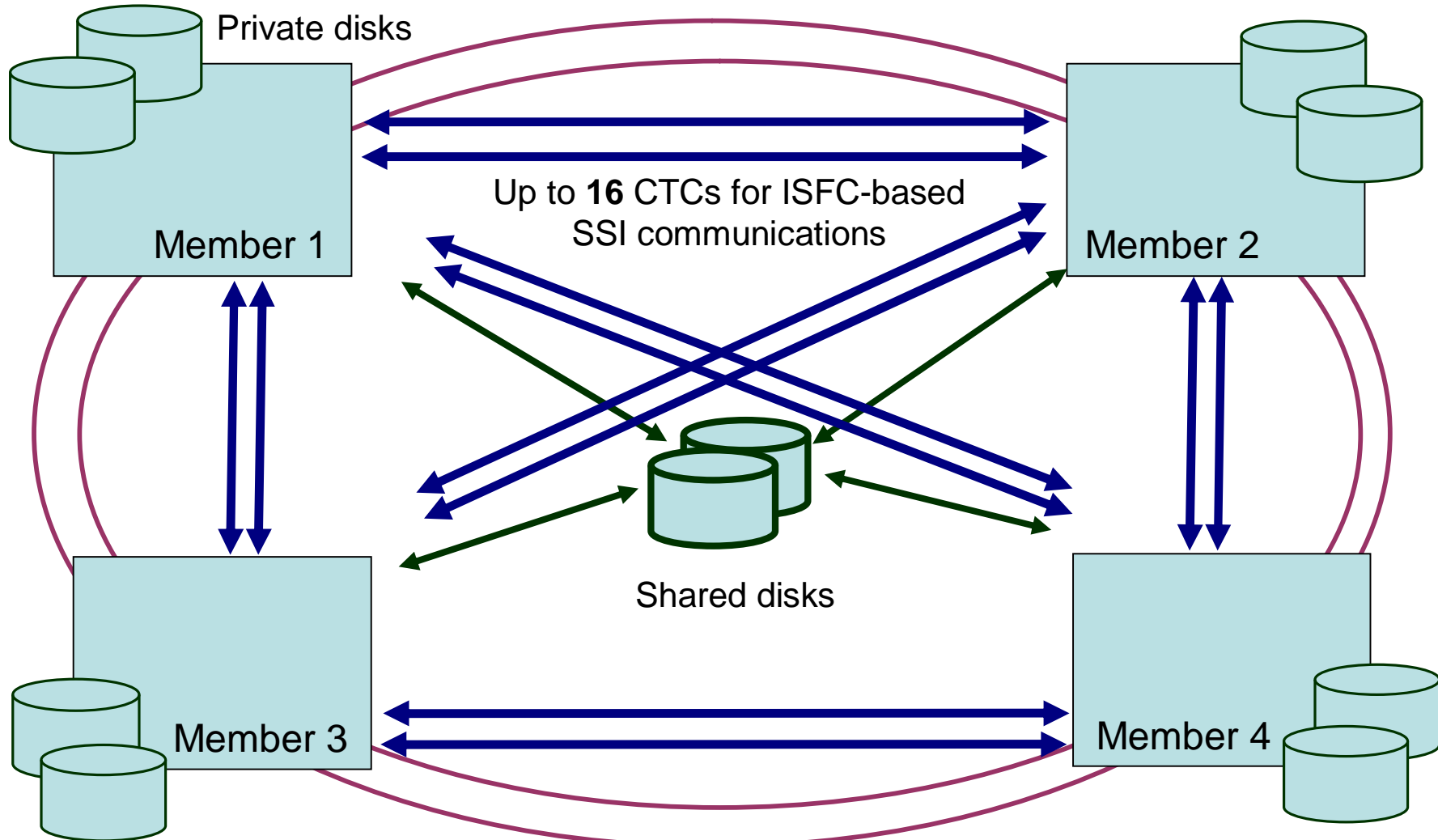
1. Common LANs for guest IP communications
2. Common SANs for guest FCP connections

Sessions of note

§ z/VM Platform Update   Today   11:45

§ z/VM Performance Primer   Today   1:45

§ Securing z/VM: The Road to EAL 4   Today   4:15   New!

§ Cloud Computing Security   Sunday   10:30   New!

§ Advanced Configuration and Auditing   Sunday   4:15   New!
   with RACF

Klaus Goebel
z/VSE Systems Manager

Linux on System z Update

IBM

Yahoo! Finance:
Survey Predicts Continued Strong Growth of Linux Use on Mainframes* June 15, 2009

2010

"The study surveyed 100 IT executives and managers at companies with at least $2 billion in annual revenue about their use of the Linux operating system on IBM mainframes. 93% of respondents projected that their use of IBM's IFL (Integrated Facility for Linux) specialty mainframe processor would increase or at least remain steady over the course of the next two years. *42% projected that their use of the IFL would grow between 21% and 40%,* and 10% projected that it would grow more than 76%."

"The two main reasons cited by respondents for this increased use of Linux on the mainframe were: 1) the desire to take advantage of computing capacity available on their mainframe's central processors and/or IFLs, and 2) *their assessment that using Linux on the mainframe would be more cost-effective than other platforms*. Respondents also said they were using Linux on the mainframe to support "green" computing initiatives and infrastructure consolidation strategies."

* http://finance.yahoo.com/news/Survey-Predicts-Continued-prnews-15547427.html?.v=1

IBM

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

2010

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.

What Workloads are Clients consolidating to IFLs?

2010

More than 3,100 commercial ISV applications are available for Linux on System z, on top of over 500 IBM Linux Offerings
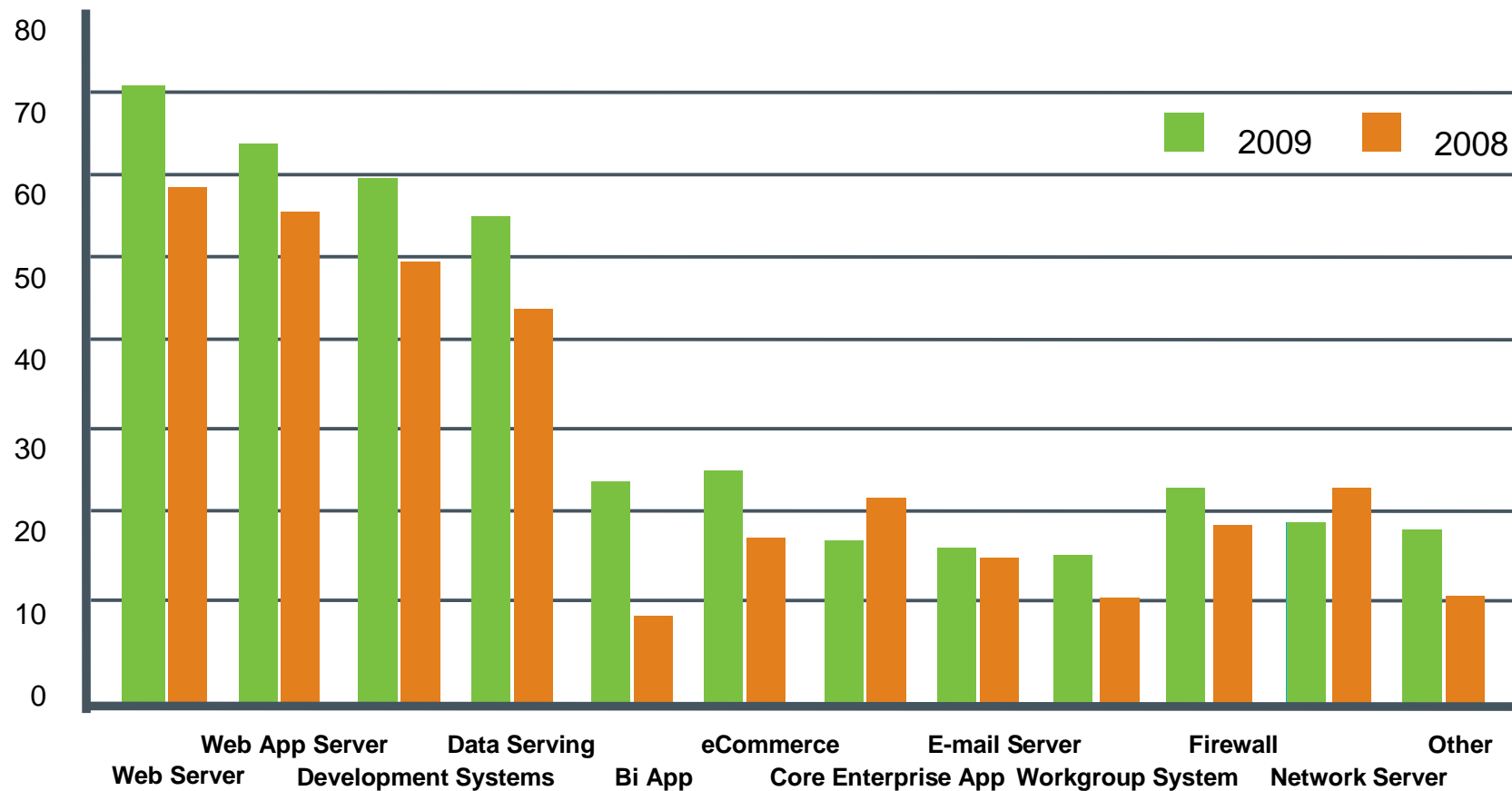
The IBM Enterprise Linux Server and the System z Solution Edition for Enterprise Linux

2010

- § **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.

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

......

Infrastructure Simplification	IBM Middleware	Info on Demand
Linux on Sytem z	Linux on System z	Linux on System z
Tivoli Identity Mgmt, TSM, Print Serving, DNS, Firewall, etc.	WebSphere Appl Server, Java, CTG, HOD/HATS, WS MQ, etc.	DB2 9, Information Server, Cognos 8 BI

DB2 LUW

Connection via HiperSockets

z/VSE V4 Production Environment
+ TCP/IP
+ VTAM
+ CICS TS
+ VSAM
+ COBOL
+ DB2 client
+ LDAP client

z/VSE Test/Dev Environment

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

IFL Engine(s)	CP Engine(s)

IBM System z10

Supreme Court of Virginia

Legacy LPAR — TCPIP

z/VSE 4.1

TCPIP

VTAM

CICS

Z V M 5.3

DB 2 | D L I | V S A M

VSE Connectors/VSAM Redirector

TCPIP — **LINUX LPAR**

OSA Ports

VSWITCH1 & VSWITCH2

Z V M 5.3

DB2 / WAS — *PROD*

DB2 / WAS — *QA*

DB2 / WAS — *TEST*

SLES 10

DB2 8.1 / WAS 6.1 — PROD

DB2 8.1 / WAS 6.1 — Demo/Training (QA)

DB2 8.1 / WAS 6.1 — Testing
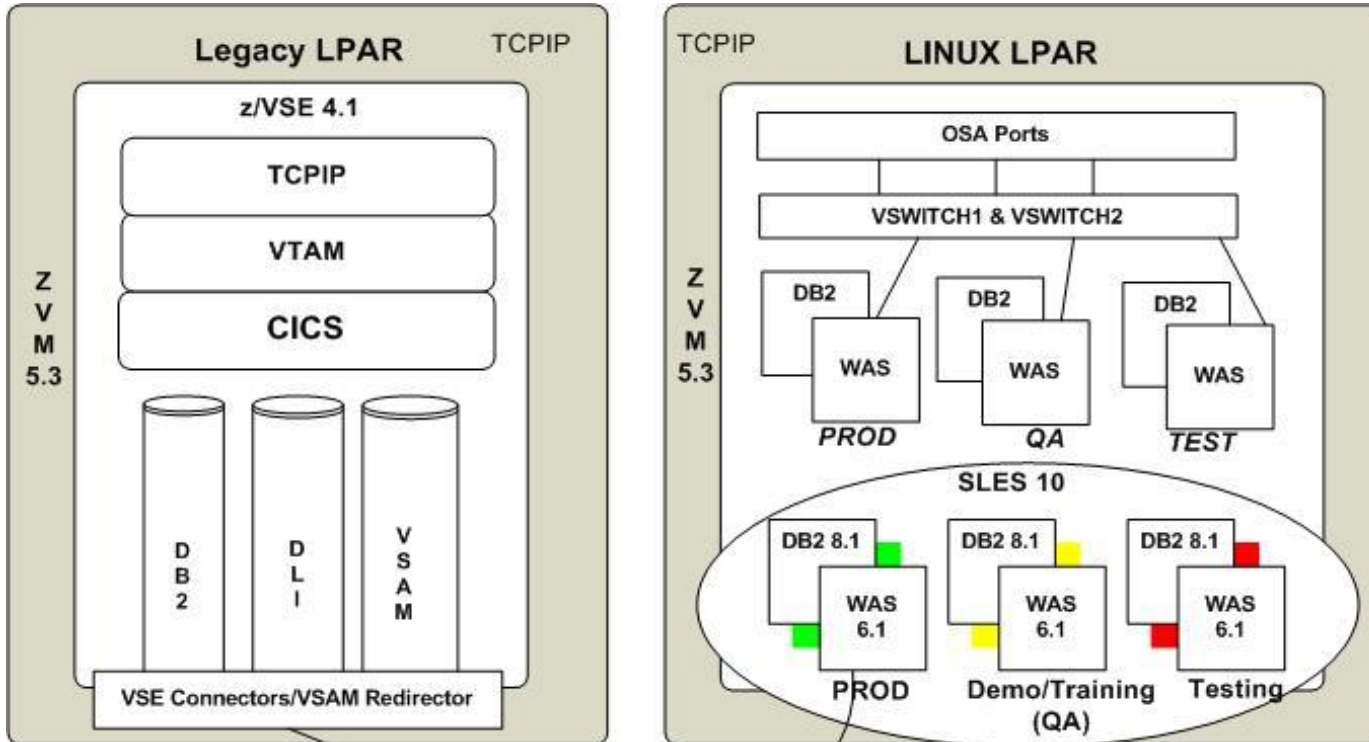
Production + Disaster Recovery System:

- 1 + 1 z10 BC
- 2 + 2 CPs
- 5 + 5 IFLs
- 48 + 32 GB memory
- 2 + 2 z/VM V5 LPARs
- 7 + 4 z/VSE V4 guests
- 41 + 14 SLES 10 guests

§ **z10 BC for Court System (internal)**
- Serves 325 courts, 5.000+ users, 4 million cases (2007)
- Integrating z/VSE, DB2/UDB and WebSphere applications
- eMagistrate* system serves 125 locations, 2.800 trans per day
  2007 ComputerWorld Honors Program Laureate

§ **z10 BC for Internet**
- eCommerce application integrating z/VSE and WebSphere appls
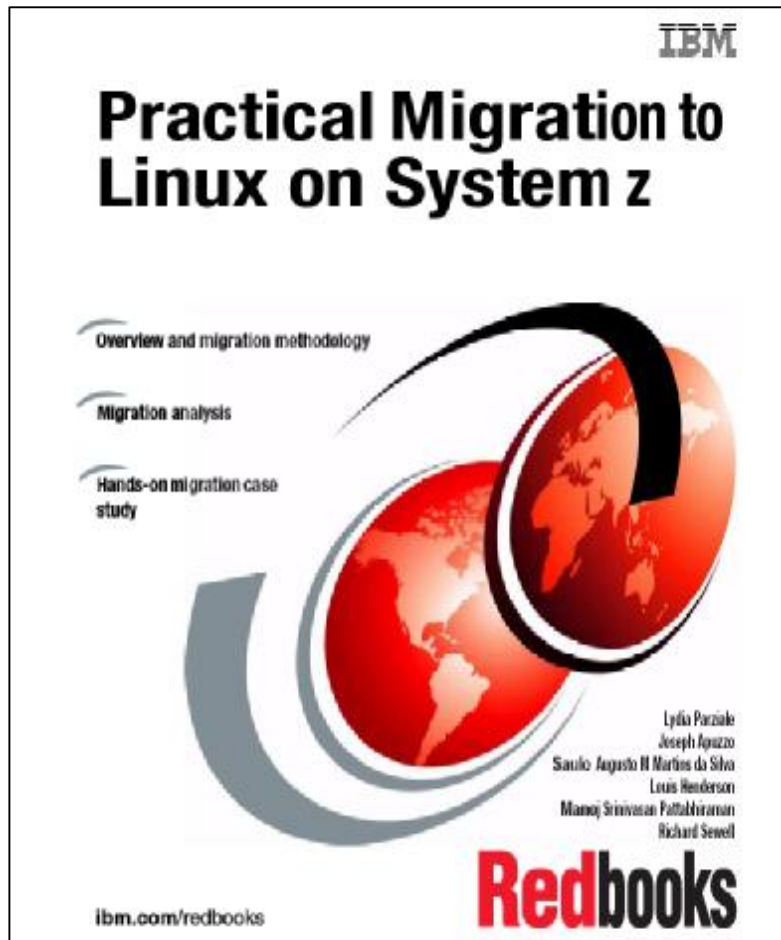
New Red Books

www.redbooks.ibm.com/redbooks/pdfs/sg247727.pdf
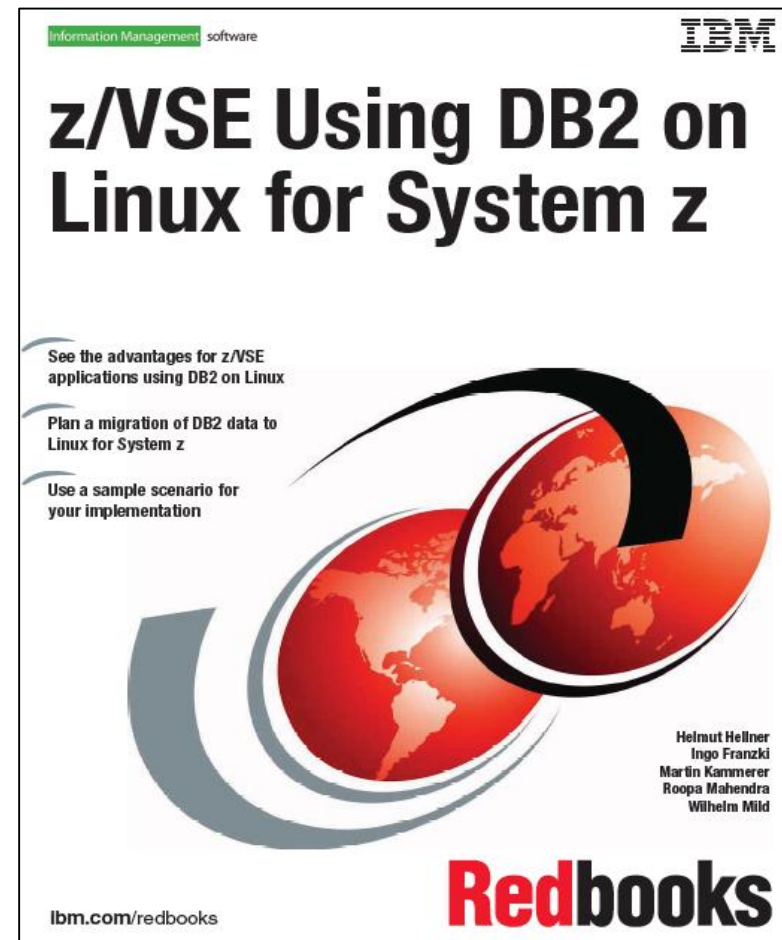
www.redbooks.ibm.com/redbooks/pdfs/sg247690.pdf

Available Linux on System z Distributions
Kernel 2.6 based

2010

§ **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)

Linux on System z Development Focus

Integration	*Virtualization*	*Security*	*Business Continuity*
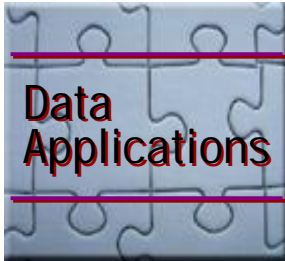
Application Serving

•z/OS integration

Data Hub

•Database Consolidation

**Virtualization &
Virtualization Management**

•Ease of Use

•Serviceability

•Hosting capacity

Security

•Certifications

•Data security & privacy
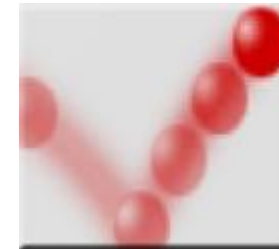
**Continuous Availability
& Data Replication**

•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

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
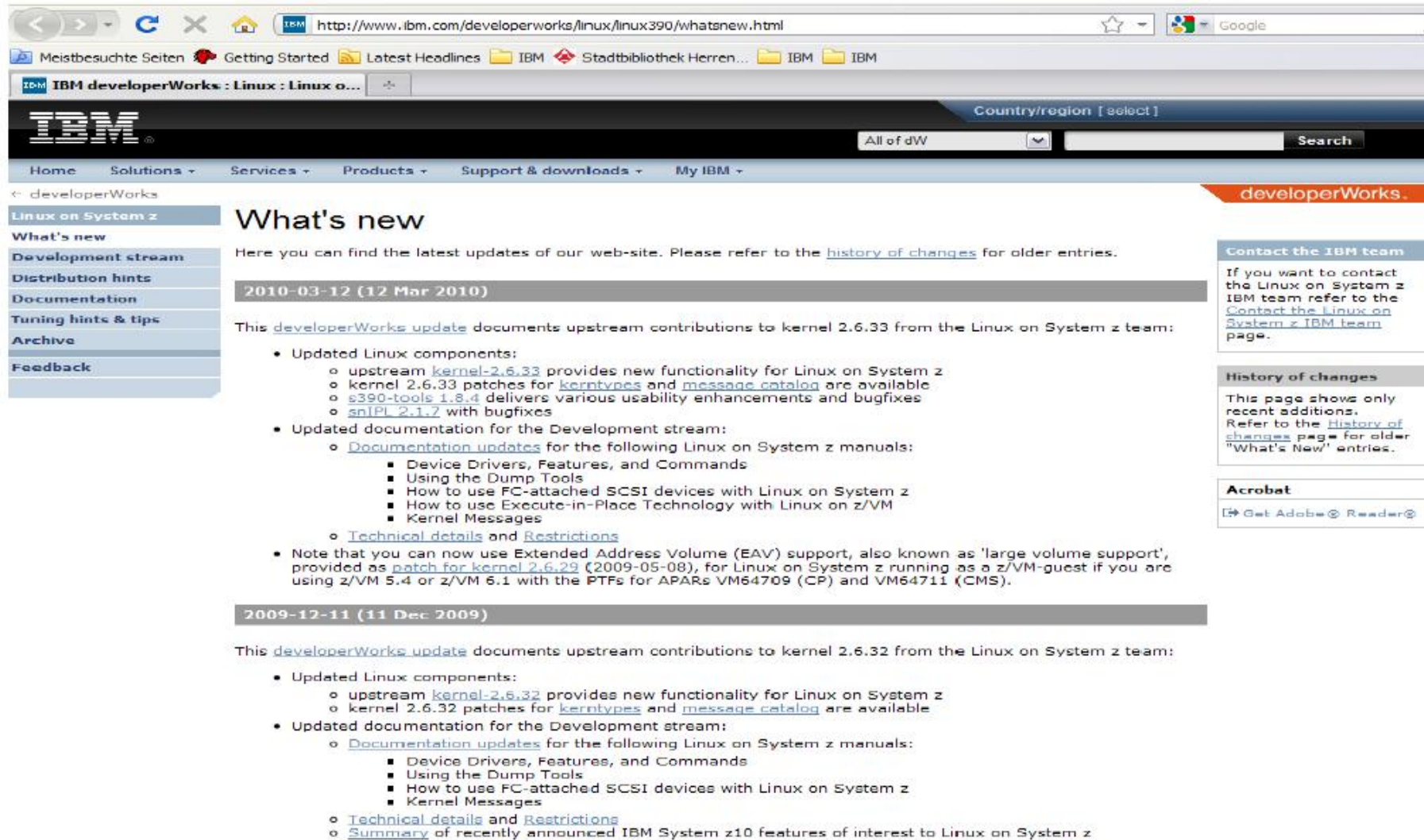
§ Improve serviceability

– 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

developerWorks Update for Kernel 2.6.33

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

Questions