IBM

10 Years Linux on System z: The past, the present & the future

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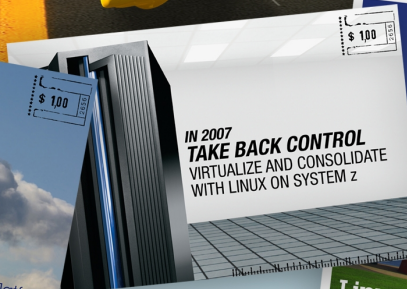
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10 YEARS of Enterprise Linux® on System z®

A Simple Idea That Changed the World

MAY 17, 2000

Greetings From Böblingen!
The Birthplace of Linux on the Mainframe

Industrial Strength Linux
LINUX ON Z

LINUXWORLD 2001
BEST HARDWARE WINNER
zSeries 900 & z/VM

Linux on z
The Ultimate Cloud Platform

IN 2007
TAKE BACK CONTROL
VIRTUALIZE AND CONSOLIDATE
WITH LINUX ON SYSTEM z

Linux on z
Lights the Way to Lower IT Costs!

Linux on the Mainframe:
A Really Cool Idea!

PEACE LOVE LINUX
CASABLANCA 210

IBM®

The Past

1998 – 2000: The Dot Com Bubble

The NASDAQ (or Dot Com) Bubble of the late 1990s http://www.housingmarketnews.net/asset-bubbles/dot-com-bubble.php

1998 – 2000: Microsoft Windows 2000

1998 – 2000: Linux Kernel 2.2 Released

The number of people running Linux is estimated at **over 10 million**, making it not only an important operating system in the Unix world, but an increasingly important one in the PC world.

IBM

1998 – 2000: The Melissa Worm Attacks the Internet

Mikko Hypponer 13:17 27.3.1999   1   Re: W97M.Malissa
Mikko Hypponer 13:23 27.3.1999   1   Re: Melissa
Mikko Hypponer 13:34 27.3.1999   1   Re: Melissa virus?
Mikko Hypponer 13:36 27.3.1999   1   RE: More on ProMail
Mikko Hypponer 13:44 27.3.1999   1   Re: alt.sex virus in list.zip (Melissa)

te e-mail systems

To: <orvis@llnl.gov>
From: Mikko Hypponen <Mikko.Hypponen@DataFellows.com>
Subject: Re: W97M.Malissa

-----BEGIN PGP SIGNED MESSAGE-----

>The FIRST community (Forum of Incident Response and Security Teams,
>http://www.first.org) is planning an emergency teleconference for
>Tuesday morning (3/30/99) at 9AM PST. We wre planning to talk about
>the W97M.Melissa virus and how we are going to respond to it. We would
>like you or someone else from Datafellows to participate. If you or
>someone in your organization can do this, let us know.

That's 11PM Tuesday evening our time. Sure, I'd be happy to join.

Files] description for
pread within hours of

Mikko Hypponer 16:37 27.3.1999   4   Virustapaus
Mikko Hypponer 16:42 27.3.1999   4   Melissa virus
Mikko Hypponer 17:19 27.3.1999   5   Re: melissa

1998-2000: IBM e-business

The IBM e-business campaign established IBM's unique role in the Internet arena by introducing anew buzzword: "e-business." This term defined IBM's vision for doing business in the Internet age and provided IBM with an instant association with the web.

IBM

Innovation, Vision and Strategic Direction

"Linux will do for applications, what the Internet did for networks"

Irving Wladawsky-Berger

In the beginning … Bigfoot

- The original i370 project was started in August 1998 by Linas Vepstas, at the instigation of Daniel Lepore

- Later, Neale Ferguson, Peter Schulte-Stracke, and Rob van der Heij joined in to provide code and shoot bugs

- Rick Troth helped with boot-loader issues

- The result of this effort was a compiler, an assembler, a port of glibc, and a kernel that would usually boot but was missing important features, such as disk drivers and network drivers, never mind a variety of infrastructure

Timeline – 1999

- **January**
  - A splinter group begins work on a Linux on S/390 project in Böblingen, Germany, just for the "coolness factor." Their work is neither sanctioned nor budgeted and most likely cannot be found on any official charts.
- **October**
  - Embracing Linux at IBM became Sam Palmisano's bet while he was a senior vice president. "*The Internet has taught us all the importance of moving early, the advantage of being a first-mover*," Palmisano said in an interview. "*We want to be riding that Linux momentum at the front, not trailing it*."
  - First public discussion of IBM's Linux for S/390 port at WAVV by Dr. Strassemeyer in his keynote address with a "secret" preview running on an IBM MP3000
- **December**
  - IBM publishes a collection of patches and additions to the Linux 2.2.13 kernel for System/390 to start a market evaluation, and creates excitement in the developer community.

The IBM project team

- The sponsors
  - Karl-Heinz Strassemeyer
  - Boas Betzler
- The early development team
  - Ingo Adlung*
  - Eberhard Pasch*
  - Hartmut Penner*
  - Martin Schwidefsky*
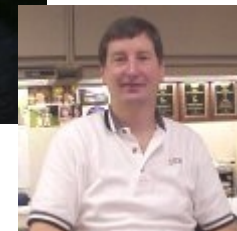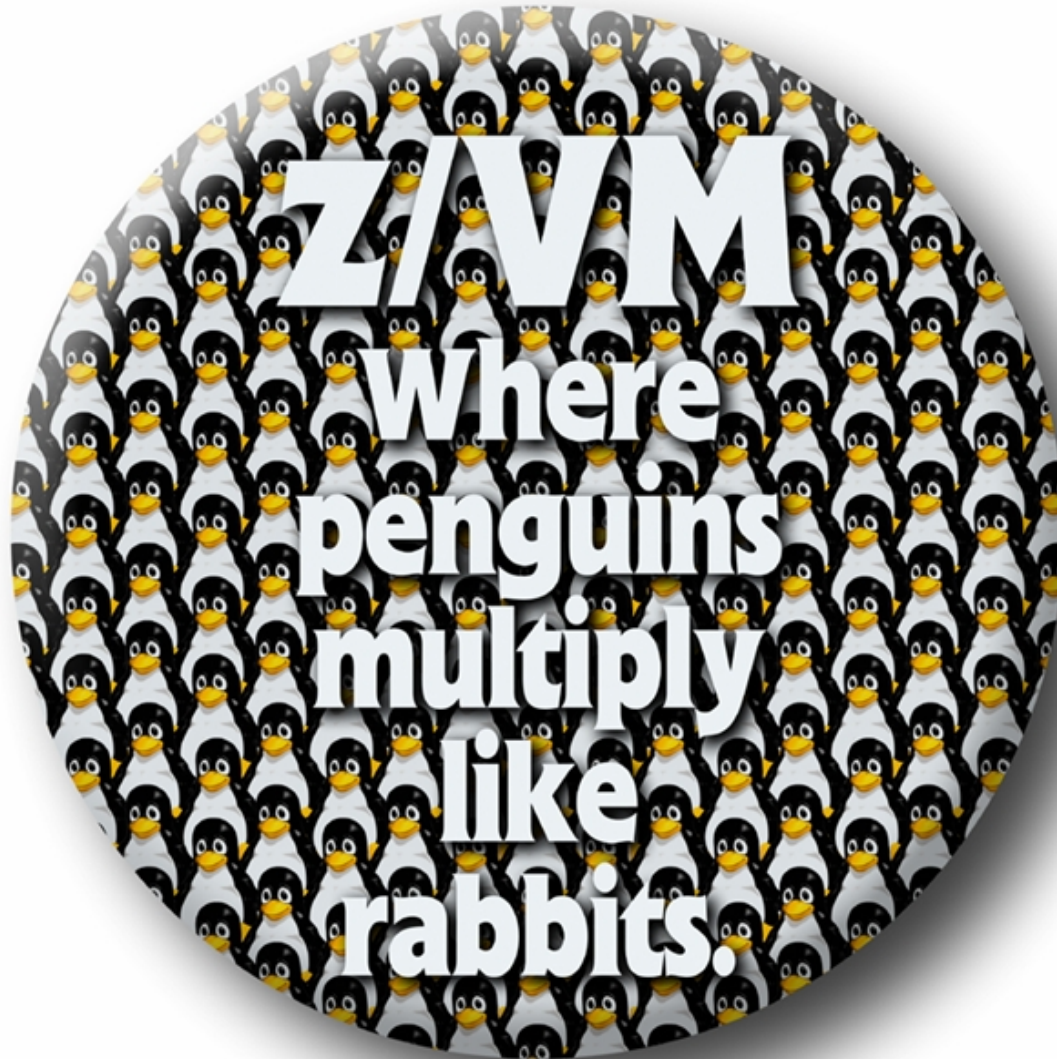 - Holger Smolinski
  - Ulrich Weigand*
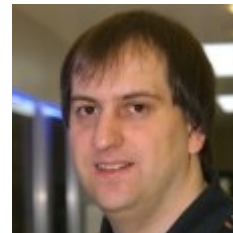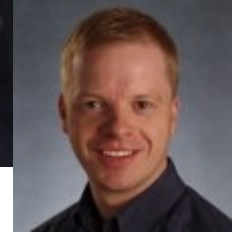
* IBM Corporate Award for Linux on S/390

The IBM project team

- Some of the "sales team"
    - Jim Elliott
    - Erich Amrehn
    - Jim Savoie
    - Bill Reeder
    - Len Diegel
    - Tom Murphy

Timeline – 2000

- ## January

  - Linux for S/390 becomes available for technology demonstration from the Marist College Server, which allows clients to test it. Clients respond with over 4,000 downloads.

- ## February 2000

  - Mentioned at LinuxWorld Expo in NYC in keynote address by Linus Torvalds
  - Public showing at the Expo on an IBM MP3000 by Boas Betzler and Ed Gauthier
  - "*S/390: The Linux Dream Machine*" article by Scott Courtney http://www.linuxplanet.com/linuxplanet/reports/1532/1/

- ## March 2000

  - Romney White presents Linux on S/390 at SHARE 94 in Anaheim (Session 9309) to a standing room only crowd

2000: Linux on z Big Application Focus

Timeline – 2000

- **May 17, 2000**
  - Formal announcement of Linux for S/390 by IBM at Vista (IBM's mainframe customer executive event) by Bill Zeitler (GM S/390) with a demo by Jim Elliott
  - IBM takes out a full page advertisement for Linux for S/390 in the Wall Street Journal

- **May 2000**
  - David Boyes described "Test Plan Charlie" where it was demonstrated that >41,400 separate instances of Linux could run simultaneously on one LPAR of a single S/390 server under VM. The S/390 was pushed until it had no more resources to allocate, but the system never crashed.

- **August 2000**
  - At the Atlanta Linux Fest, Linux for S/390 won "Best of Show" award

Timeline – 2001

- ## February 2001
  - IBM announces plans to spend $1B on Linux development at LinuxWorld Expo in NYC
  - IBM wins "Best Hardware" at the Expo with an eServer zSeries 900 running Linux
  - Linux Community Development System launched

- ## 2001
  - HiperSockets becomes available.
  - SUSE Enterprise Linux Server 7 becomes available.

Timeline – 2002 and 2003

- **2002**
  - Major ISV announcements include: mySAP.com, Oracle9i Database Server, System Management Solutions from BMC, CA and Tivoli.
  - Open FCP (Fibre Channel Protocol) support and Storage Area Network (SAN) enablement are developed.
  - SUSE Linux Enterprise Server 8 becomes available.
- **2003**
  - Over 250 apps are now available, including Lotus Notes and Tivoli System Automation for Linux.
  - Virtualization improvements such as the Discontiguous Saved Segments (DCSS) technology and Parallel Access Volume (PAV) support for improved I/O performance are developed.
  - Red Hat Enterprise Linux 3 becomes available.

Timeline – 2004 and 2005

- **2004**
  - Increasing numbers of businesses think that Linux on zSeries delivers true business value – great security and resiliency, simple infrastructure, great utilization of resources, and application flexibility to respond to changing market demand.
  - SUSE Linux Enterprise Server 9 becomes available.
- **2005**
  - The biggest Linux on zSeries client now runs more than 290 IFLs.
  - New reliability and virtualization enhancements through developed HyperSwap and N-Port-ID Virtualization (NPIV) support are unveiled, allowing for continuous operations and high utilization.
  - Red Hat Enterprise Linux 4 becomes available.

Timeline – 2006 and 2007

- **2006**
  - The number of available applications approaches 1,000, with over 300 ISVs developing.
  - SUSE Linux Enterprise Server 10 becomes available.
- **2007**
  - IBM announces project "Big Green," which shrinks 3,900 servers to about 30 System z servers running Linux, in order to reduce power consumption by 80% in five years. Project Big Green spurs a global shift to Linux on System z.
  - z/VM 5.3 supercharges System z virtualization – over 1,000 virtual images can run on a single copy of z/VM, which helps reduce energy consumption and data-center costs.
  - Red Hat Enterprise Linux 5 becomes available.

The Present

Timeline – 2008, 2009 and 2010

- **2008**
  - IFLs include authorization to run OpenSolaris Operating System.
- **2009**
  - IBM introduces Enterprise Linux Server and Solution Edition for Enterprise Linux for large-scale consolidation and savings; both are quickly embraced by clients worldwide.
  - z/VM V6.1 – A foundation for future virtualization growth becomes available
  - SUSE Linux Enterprise Server 11 becomes available.
- **2010**
  - Now over 3,150 Linux applications are available.
  - Cloud Computing, Business Intelligence and Collaboration are only a few workloads that are best fit to Enterprise Linux on System z.
  - Large-scale server consolidations on System z starting at $2,000 per virtual server instance.

A Simple Idea that Changed the World

Today

2010

Linux on IBM System z® is providing a scalable and flexible virtual infrastructure inside a single IBM System z server.

It is customized for **server virtualization and consolidation**, **business relevant workloads** such as business intelligence and collaboration, and **new business models** such as cloud computing.

The Linux on System z infrastructure provides significant IT cost savings opportunities:

- **People Cost** – increase the productivity of the IT staff

- **Software Costs** – reduce software license fees by consolidating a large number of virtual machines per System z core

- **Energy Costs** – dramatic reduction in power usage

- **Facilities Costs** – reduce floor space with dense server consolidation on System z

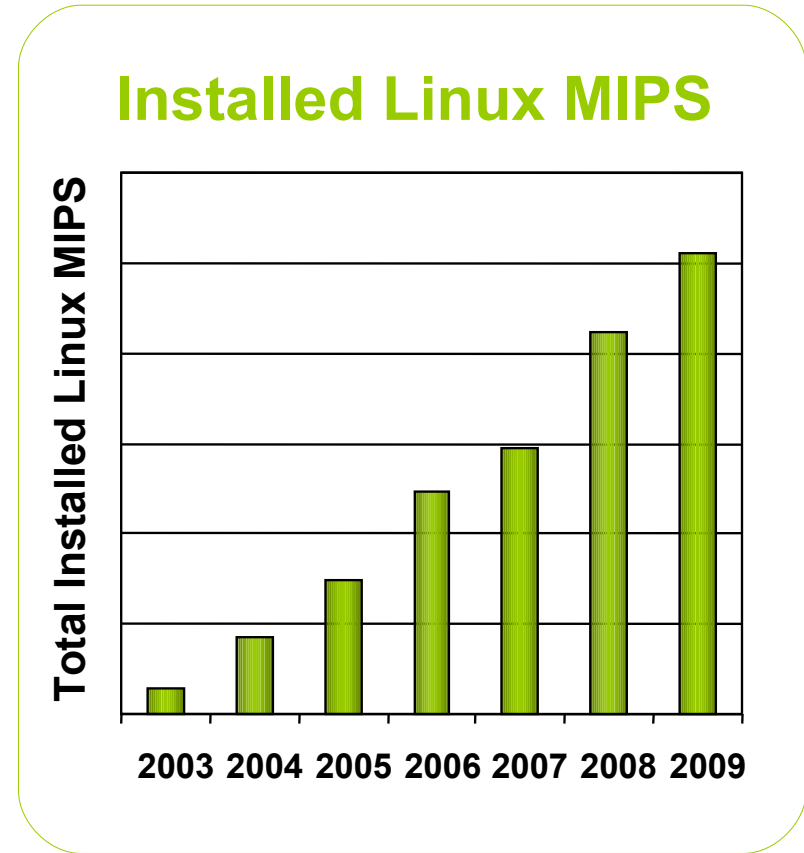- **Networking Costs** – consolidate networks inside the box too

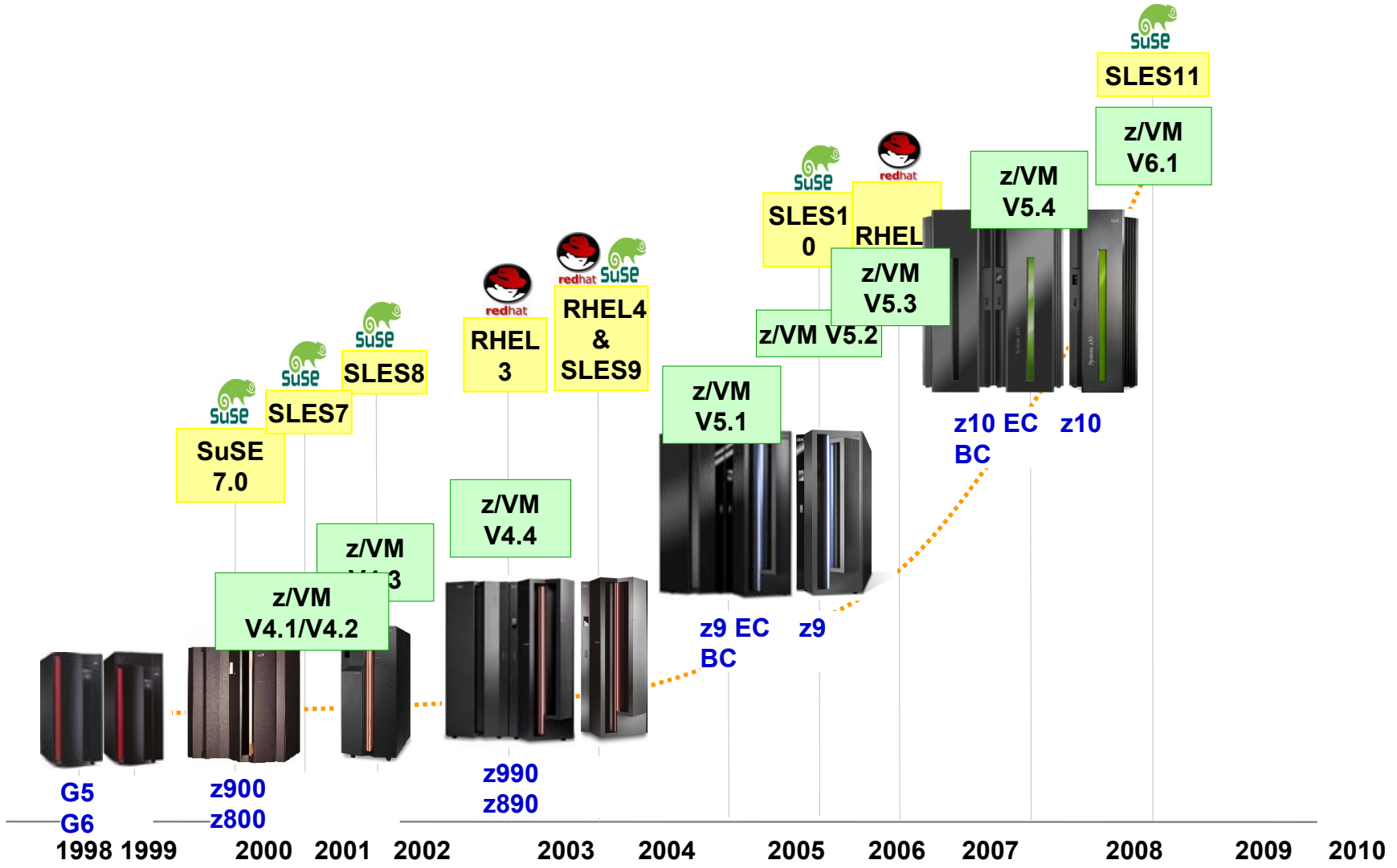# Client Adoption Continues to Drive Linux Success
*Installed Linux MIPS at 43% CAGR**

- **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

Total Installed Linux MIPS

2003 2004 2005 2006 2007 2008 2009

* Based on YE 2004 to YE 2009

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

SLES11

z/VM V6.1

SLES10

RHEL

z/VM V5.4

z/VM V5.3

z/VM V5.2

RHEL4 & SLES9

RHEL 3

SLES8

SLES7

SuSE 7.0

z/VM V5.1

z/VM V4.4

z/VM V4.3

z/VM V4.1/V4.2

z10 EC BC   z10

z9 EC BC   z9

G5 G6

z900 z800

z990 z890

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

27   …

IBM

The growth and expansion of Linux as a mature, cost-effective alternative for business-critical workloads

Linux continues to enable new ways of doing business

Edge and Web Infrastructure

- Community Driven
- Internet Enabled
- Worldwide Volunteers

Application and Data Serving

- Open Industry Driven
- Open elements of IT industry join existing community
- Linux adoption in the enterprise accelerates

Business-Critical Enterprise Workloads

- Competition Driven
- Accepted as mature, open, lower-cost alternative for hosting DB, BI, ERP, CRM in business-critical environments
- Linux is a permanent presence in the datacenter

Typical Applications

- E-mail Servers   · DHCP
- Apache   · HPC
- Lightweight database

- e-Business Applications
- Application Servers
- Mission critical database
- Dynamic Business Models

- Next-generation workloads
- Virtualization / consolidation
- Cloud and dynamic infrastructure
- New business models

1991 – 2004   **2005 – 2006**   **2007 – 2010**

The road ahead for Linux on System z is brighter than ever!

Questions?

Hans-Joachim Picht

Linux on System z Initiatives

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