



Linux @ IBM

Linux on zSeries: What, Why, Where

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IBM @server Strategic Initiatives



Session 9330, Share 100
Dallas, TX February 24, 2003



Linux on zSeries: What, Why, Where

Abstract

- IBM believes Linux to be game changing technology; as the Internet was to networking, IBM believes Linux will be to application programming. The speaker will cover the Why, What and Where of Linux on zSeries:
 - ▶ Why IBM is so committed to Linux in general, and on zSeries specifically
 - ▶ What IBM means by Linux for zSeries (and Linux for S/390) and the zSeries virtualization technology provided by z/VM
 - ▶ Where Linux on zSeries has come from, where it is now and where IBM sees it going in the future
 - ▶ IBM and ISV applications available for Linux on zSeries
- This session qualifies for the Linux for S/390 certificate track.



BusinessWeek - The Linux Uprising - March 3, 2003

www.businessweek.com/magazine/toc/03_09/B382203linux.htm

- No one could have seen this one coming, not even Linus Torvalds, the young Finnish programmer who wrote Linux as a cut-down version of Unix for the PC in 1991. Torvalds figured it would be a free plaything for computer hobbyists who weren't satisfied by what big tech companies like Microsoft and IBM produced. "If someone had told me 12 years ago what would happen, I'd have been flabbergasted," says Torvalds.
- Frustrations, though, run high. One Microsoft executive, chief strategist Craig Mundie, even calls Linux unhealthy for the technology industry. "It ultimately is a question about whether societies are going to value intellectual property or not," he says.
- The Linux phenomenon spreads like water--finding its way into all sorts of surprising nooks and crannies.



BusinessWeek - The Linux Uprising - March 3, 2003

www.businessweek.com/magazine/toc/03_09/B382203linux.htm

- Today, Linux and IBM are as inseparable as Las Vegas animal tamers Siegfried and Roy. Big Blue has more than 4,600 Linux customers.
- During a ride down the escalator on the way out of the building, three Gen Y guys dressed in black and sporting multiple facial piercings seemed to represent a passing era. One of them, talking on a cell phone to a friend, called the gathering "boring." Down-escalator, a young woman dressed in a camouflage shirt and pants and a pink babushka heartily agreed. "It's all Big Business now. Linux has been taken over by the suits," she sneered. Her name was oh-so avant-garde: Scirocco Six. Yet it turned out she was working for none other than Microsoft.



BusinessWeek - The Linux Uprising - March 3, 2003

www.businessweek.com/magazine/toc/03_09/B382203linux.htm

LINUX EVERYWHERE *The operating system is finding its way into a wide variety of devices and uses*

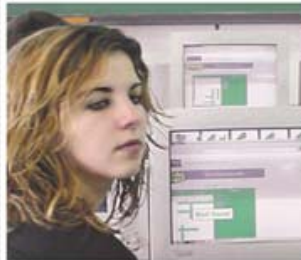


CORPORATE COMPUTING

Linux is gaining ground in corporate data centers, where buyers use it for running everything from Web sites to stock-trading systems. It held a 13.7% market share in servers last year.

DESKTOP COMPUTING

Linux has 2% of the market, but it's making converts. Wal-Mart sells \$200 Linux-based PCs. In Spain, the region of Extremadura is giving away 10,000-plus Linux-based PCs to residents.



SIMULATION

DaimlerChrysler is using Linux machines to simulate car crashes. With Linux, it can do the simulations 20% faster and 40% cheaper than on more traditional computing systems.

DIGITAL ANIMATION

Pixar Animation Studios, creator of hit films *Monsters Inc.* and *Toy Story*, is switching from Sun servers to Linux for the painstaking rendering of digital characters.



NUMBER-CRUNCHING

Oil explorer Amerada Hess is using a Linux-based supercomputer to help it find pockets of oil and gas.

CONSUMER ELECTRONICS

Linux is the digital brains inside TiVo television-recording devices. Consumer-electronics companies are using Linux to build everything from game consoles to TVs with Internet connections.



REBUILDING IRAQ: THE PLAN, THE PROBLEMS

The McGraw-Hill Companies

BusinessWeek

MARCH 3, 2003
www.businessweek.com

MCDONALD'S
WILL IT ESCAPE HAMBURGER HELL?

CEOs
TIME TO GET OVER THE FUNK

WAL-MART
DOES IT DISCRIMINATE AGAINST WOMEN?

CELL PHONES
A GUIDE TO THE NEXT GENERATION

AOL Keyword: BW

THE LINUX UPRISING

How a ragtag band of software geeks is threatening Microsoft and Sun—and turning the computer world upside down

PAGE 76

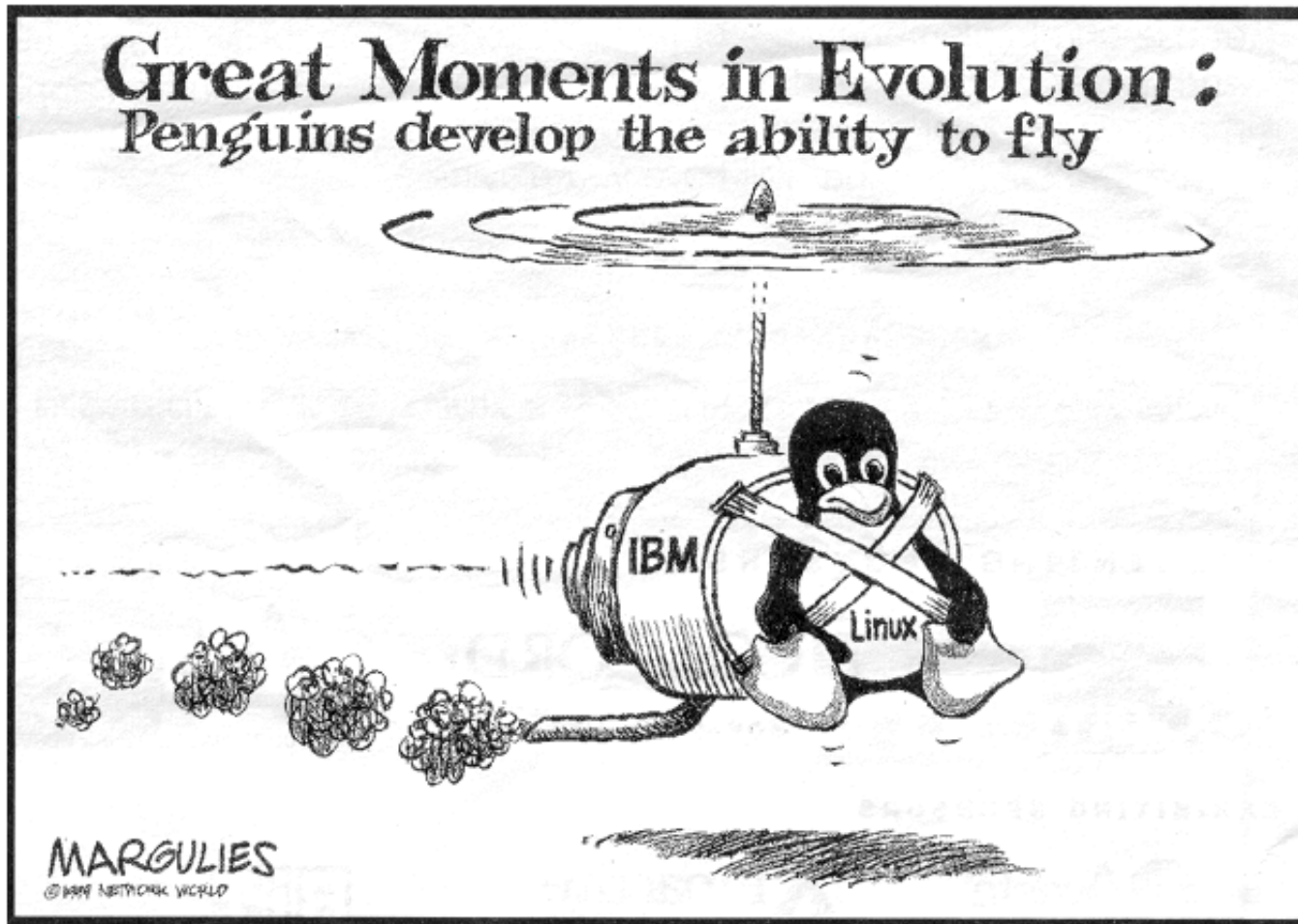


Linux is not just an operating system kernel!





And we can have fun with Linux



© The Bergen Record





Linux @ IBM

Linux on zSeries





What is Linux on zSeries?

- A native zSeries operating environment
 - ▶ Pure Linux, an ASCII environment
 - ▶ Exploits IBM zSeries hardware
 - ▶ Linux for S/390 - 32-bit
 - ▶ Linux for zSeries - 64-bit
- Not a unique version of Linux or other operating system
- Not a replacement for other IBM zSeries operating systems





Why Linux on zSeries?

1. Increased solutions through Linux application portfolio
2. Large number of highly skilled programmers familiar with Linux
3. Integrated business solutions
 - ▶ Data richness from zSeries
 - ▶ Wide range of Linux applications
4. Industrial strength environment
 - ▶ Flexibility and openness of Linux
 - ▶ Qualities of service of zSeries
5. Unique ability to easily consolidate large number of servers





zSeries Application Sourcing Strategy

- The IBM commitment to z/OS and VSE/ESA is not affected by this Linux strategy
- zSeries customers are offered additional opportunities to leverage their investments through Linux
- New doors are opening for zSeries customers to bring Linux-centric workloads to the platform
- Application sources
 - ▶ z/OS and VSE/ESA - traditional
 - ▶ z/OS - UNIX System Services
 - ▶ Linux on zSeries
 - ▶ WebSphere - Java, Enterprise Java Beans, CORBA



What zSeries Brings to Linux

- The most reliable hardware platform available
 - ▶ Redundant processors and memory
 - ▶ Error detection and correction
 - ▶ Remote Support Facility (RSF)
- Centralized Linux systems are easier to manage
- Scale to 16 application processors and up to 3 dedicated I/O processors
- Hundreds of Linux virtual servers
- Designed to support mixed work loads
 - ▶ Allows consolidation while maintaining one server per application
 - ▶ Complete work load isolation
 - ▶ High speed inter-server connectivity



Value of Linux on zSeries

- Reduced Total Cost of Ownership (TCO)
 - ▶ Environmental savings - single footprint vs. hundreds of servers
 - ▶ Consolidation savings - less storage, less servers, less software licenses, less server management/support
- Improved service level
 - ▶ Systems management (single point of control)
 - ▶ Reliability, availability, security of zSeries hardware and z/VM software
 - ▶ High performance integration with z/OS and VSE/ESA
- Speed to market
 - ▶ Capacity-on-demand capability on zSeries
 - ▶ Dynamic allocation of on-line users, less than 60 seconds to add a new Linux server image using z/VM



Discrete vs. Consolidated

Driving workload consolidation

Discrete servers	Consolidated solution
Larger support staffs are required to maintain servers and network gear	Smaller support staffs are required to maintain 1 or 2 servers
Disaster recovery very difficult for large / complex server farms	Disaster recovery very easy for virtual server farms
Lower hardware reliability	Higher hardware reliability
Software resource must be duplicated for each server	Software resource shared among virtual servers
Higher software application cost due to more hardware processors	Lower software application cost due to fewer hardware processors
Failover is provided by additional server hardware in "hot standby mode"	Failover is provided by virtual server in "hot standby mode"
Discrete servers may require significant amounts of power and floor space	Server and disk storage subsystem require minimal power and floor space



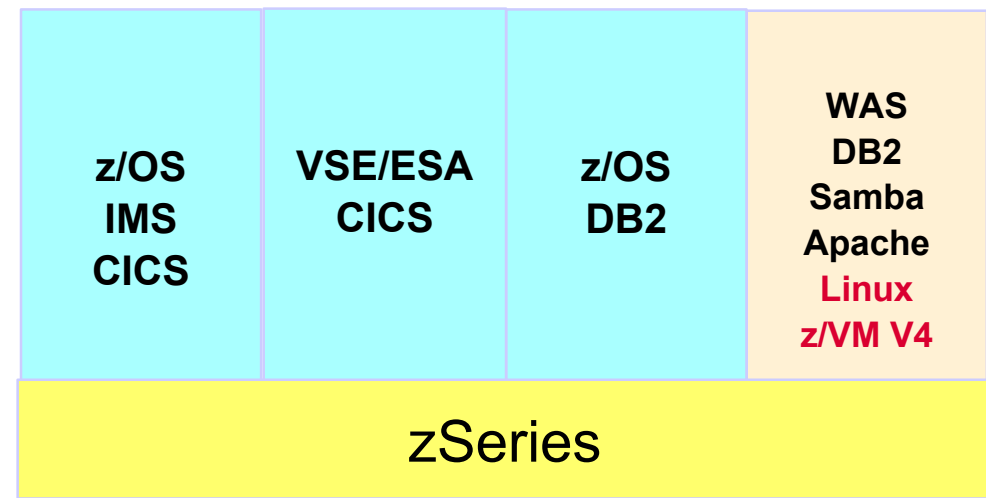
Operating Environments

- Basic mode
 - ▶ An entire processor complex devoted to Linux
- Logical Partitions (LPAR)
 - ▶ Hardware partitioning enabling up to 15 "logical partitions" each of which runs a separate operating system, traditional operating system and Linux
- Virtual Partitions (z/VM)
 - ▶ zSeries virtualization technology
 - ▶ Support for large numbers of Linux images with rich system management capabilities
 - ▶ Very flexible, great for server consolidation
 - ▶ Best RAS characteristics



zSeries Integrated Facility for Linux

- Additional engines dedicated to Linux workloads
 - ▶ Supports z/VM V4, Linux for S/390 and Linux for zSeries
 - ▶ Available on 9672 G5/G6, Multiprise 3000 and zSeries
 - ▶ IFLs on "sub-uni" systems run at full speed!
- Traditional zSeries software charges unaffected
 - ▶ IBM zSeries and S/390 software
 - ▶ Independent Software Vendor products
- Software on Linux and z/VM charged **only** against the IFLs





z/VM Version 4

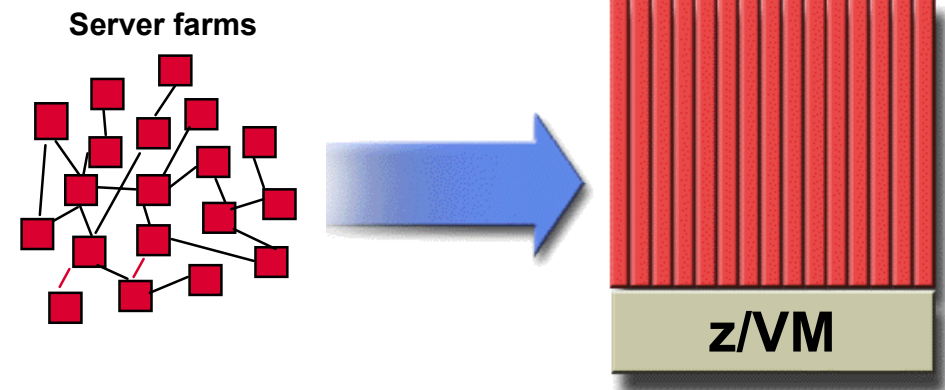
IBM zSeries Virtualization Technology

- Combination of hardware, firmware and software
 - ▶ Over 30 years of development experience
- Supports ten to hundreds of images, depending on workload
- Supports Linux for S/390 guests on 9672 G5/G6 and Multiprise 3000
- Supports Linux for S/390 and Linux for zSeries guests concurrently on zSeries
- z/Architecture exploitation
- Extensive systems management software from IBM and ISVs



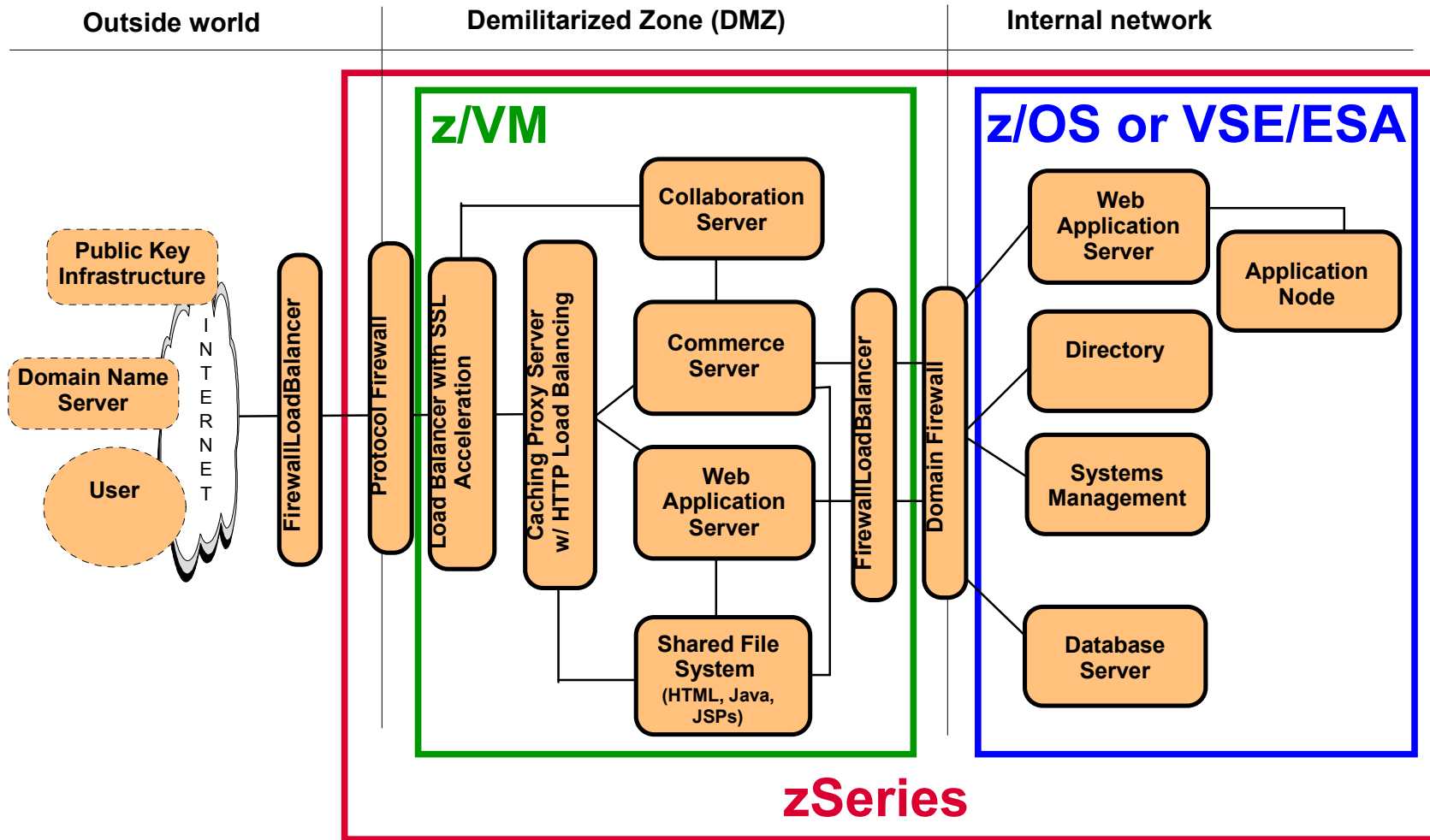
The Value of z/VM for Linux

- Enhanced performance, growth and scalability
 - ▶ Server consolidation enables horizontal growth
 - ▶ N-tier architecture on two tiers of hardware
 - ▶ Extensive support for sharing resources
 - ▶ Virtual networking
 - ▶ Effective isolation of Linux images, if required
- Increased productivity
 - ▶ Development and testing
 - ▶ Production support
- Improved operations
 - ▶ Backup and recovery
 - ▶ Command and control





Application Serving with Linux





Linux for Developers

- developerWorks
 - ▶ Dedicated "Linux Zone"
 - ▶ ibm.com/developerworks/linux
- Linux Application Tools
 - ▶ ibm.com/zseries/os/linux/ldt/
- zSeries Linux Community Development System
 - ▶ ibm.com/zseries/os/linux/lcds
- Speed-start your Linux application
 - ▶ Linux Software Evaluation Kit
 - ▶ Full function, market-available products
 - ▶ ibm.com/developerworks/offers/linux-speed-start

Speed-start your Linux app 2003 



IBM eServer Integrated Platform for e-business on zSeries

ibm.com/eserver/zseries/announce/integrated.html

- An open, integrated solution that is designed to enable you to quickly and easily deploy e-business solutions for Linux on the zSeries mainframe
- Choose from tested hardware and software packages that will provide all the components you need for a Linux- and mainframe-based e-business, including:
 - ▶ SuSE Linux Enterprise Server 7 for S/390 and zSeries
 - ▶ z/VM v4.3
 - ▶ WebSphere Application Server AE v4.0.4.
 - ▶ IBM Directory Server (LDAP) v4.1
 - ▶ One year of software support and IBM Global Services Linux line support
- You can also add hardware and software, including the IFL for the IBM eServer z800 or an IBM eServer z900, DB2 Connect v7.2 and optional installation and customization support from IBM Global Services and IBM Global Financing



IBM Services for Linux

ibm.com/linux/services

■ Clusters

- ▶ SupportLine
- ▶ Cluster 1350 installations
- ▶ OEM procurement
- ▶ Hardware set-up
- ▶ Software installation

■ Managed operations

■ Middleware enablement

- ▶ DB2
- ▶ WebSphere AS
- ▶ WebSphere MQ
- ▶ ISVs
- ▶ QuickStarts

■ Workload consolidation

- ▶ File/print, Web serving, e-mail
- ▶ Linux solutions for e-business
- ▶ Application porting
- ▶ Solaris to Linux migration



■ Training

- ▶ 5 languages
- ▶ 20 countries
- ▶ All servers
- ▶ Web-based and classroom
- ▶ Cluster workshops

■ Web hosting

- ▶ xSeries
- ▶ zSeries Linux
- ▶ Linux virtual services

■ Technical support

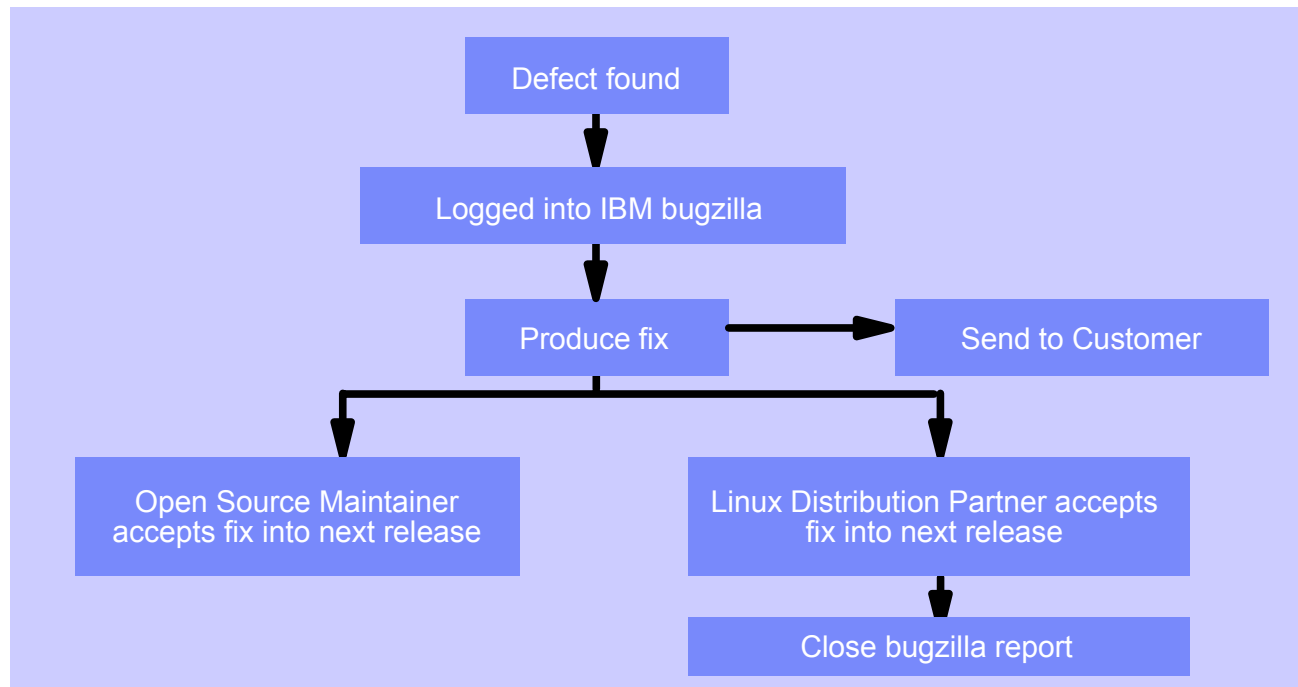
- ▶ SupportLine
- ▶ Account advocate
- ▶ Advanced support
- ▶ All servers including clusters
- ▶ 24/7



IBM Level 1-2-3 Linux Support

Open Source involvement benefits our customers

- LTC and IGS teams have experts in every key Linux subsystem and can respond to any problem
- IBM works directly with the code owners to integrate fixes into the base quickly and efficiently

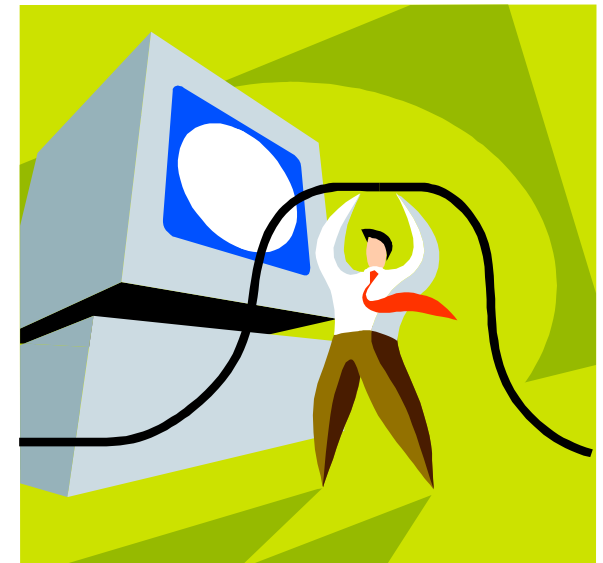




Linux Virtual Services

IBM Managed Hosting

- IBM provides a managed hosting solution ... in a virtual instead of a physical environment
- You get equivalent function to that in a physical environment ... but with the unique e-business on demand benefits
- Equivalent hosting cage functionality
 - ▶ Floor space and power
 - ▶ Server capacity
 - ▶ Storage
 - ▶ Bandwidth
 - ▶ Managed services
 - ▶ Backup and recovery
 - ▶ Monitoring and security services
- e-business on demand benefits
 - ▶ Fast provisioning
 - ▶ Pay only for capacity needed





Linux @ IBM

Software for Linux on zSeries



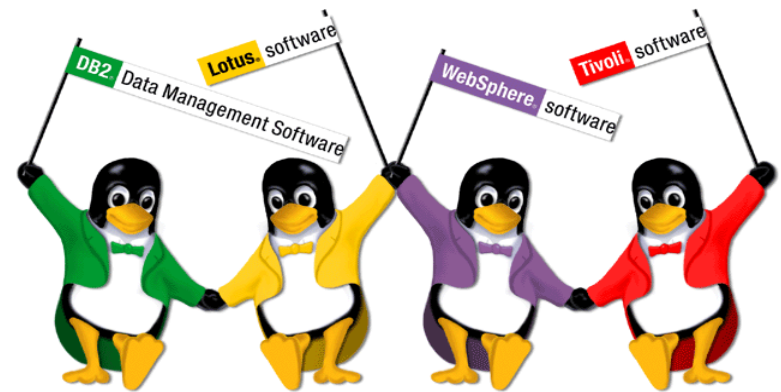


IBM Software for Linux

ibm.com/software/linux

- Solutions available across all product lines
 - ▶ Transaction integration
 - ▶ Leverage information
 - ▶ Leverage collaboration
 - ▶ Systems management
 - ▶ Application development
- IBM software products for Linux are scalable, modular, flexible, standards based and reliable
- Products in *italics* on the following charts are new or have a new version/release since SHARE 99

WebSphere
DB2
Lotus
Tivoli
Rational





WebSphere for Linux

IBM Software for Linux for S/390

- *WebSphere Application Server*
- *WebSphere Application Server for Developers*
- *WebSphere Application Server Enterprise*
- *WebSphere Application Server Enterprise for Developers*
- *WebSphere Application Server Network Deployment*
- *WebSphere Commerce Business Edition*
- *WebSphere Host on Demand*
- *WebSphere MQ Everyplace*
- *WebSphere MQ*
- *WebSphere Personalization Server*
- *WebSphere Portal Server*



Data Management Software

IBM Software for Linux for S/390

- **DB2 Connect Application Server Edition**
- *DB2 Connect Enterprise Edition*
- *DB2 Connect Unlimited Edition*
- *DB2 Intelligent Miner Modeling*
- *DB2 Intelligent Miner Scoring*
- *DB2 Intelligent Miner Visualization*
- *DB2 Net Search Extender*
- *DB2 Net.Data*
- *DB2 Personal Developer's Edition*
- *DB2 Runtime Client*
- *DB2 Spatial Extender*
- *DB2 Universal Developer's Edition*
- *DB2 Universal Database Enterprise Server Edition*
- Informix C-ISAM
- **Informix Dynamic Server**
 - ▶ **IDS (database)**
 - ▶ **4GL (Development tools)**
 - ▶ **SDK (Client access libraries)**
 - ▶ **ISA (Management tool)**
- U2 Unidata



DB2 Connect

IBM Software for Linux for S/390

- DB2 Connect Enterprise Edition
 - ▶ Priced per server PLUS per user (not Web applications)
- DB2 Connect Unlimited Edition
 - ▶ Priced per DB2 host sysplex PLUS per MSU
- DB2 Connect Application Server Edition
 - ▶ DB2 Connect Application Server Edition license charges are based on the number of processors available to web or application servers that use DB2 Connect
 - ▶ The license charges are not based on the number of processors available to DB2 Connect itself
- DB2 Connect includes
 - ▶ DB2 Application Development Client
 - ▶ DB2 Administration Client
 - ▶ DB2 Run-Time Client
 - ▶ WebSphere Studio Site Developer Edition
 - ▶ WebSphere MQSeries



Lotus Domino for Linux for S/390

IBM Software for Linux for S/390

- Linux on zSeries is a growing and strategically important platform within the IBM customer base
- Lotus recognizes the increasing interest in utilizing Linux on zSeries as a platform for consolidating and managing Domino server infrastructure
 - ▶ Beta in 2Q2003, GA in 4Q2003
 - ▶ Will require new Asynchronous I/O support from Linux 2.5 kernel which has been pulled into the 2.4 service stream



Tivoli for Linux

IBM Software for Linux for S/390

- *Tivoli Access Manager for e-business*
- *Tivoli Access Manager for Operating Systems*
- *Tivoli Configuration Manager*
- *Tivoli Decision Support*
- *Tivoli Enterprise Console*
- *Tivoli Identity Manager*
- *Tivoli Monitoring for Transaction Performance*
- *Tivoli Monitoring*
- *Tivoli Remote Control*
- *Tivoli Risk Manager*
- *Tivoli Software Distribution*
- *Tivoli Storage Manager*
 - ▶ Client available now
 - ▶ **Server available in 2Q2003**
- *Tivoli Switch Analyzer*
- *Tivoli System Automation for Linux*
- *Tivoli Workload Scheduler*



Other IBM Software for Linux

IBM Software for Linux for S/390

- ***IBM Application Workload Modeler***
- IBM CICS Transaction Gateway
- IBM Java Developer Kit
- *IBM Directory Integrator*
- *IBM Directory Server*
- IBM HTTP Server
- IBM Object REXX
- *IBM Screen Customizer*
- IBM Secureway Directory
- *IBM VisualAge Generator Server*
- IMS Connect



IBM Application Workload Modeler

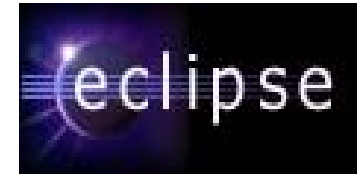
ibm.com/software/network/awm

- Provides the ability to model, measure, and analyze the performance of networks and applications in a client/server, multiprotocol, multiplatform environment
- You can more accurately plan for the roll-out of additional software or function, and determine where upgrades may be required in your network and system
- Application Workload Modeler can be used in two modes:
 - ▶ Client/Server mode benchmarks allow you to evaluate the performance of your TCP/IP communications stack and your network by modeling the behavior of an application and generating the associated network traffic
 - ▶ Application Client mode benchmarks allow you to measure the overall end-to-end performance of a well-known TCP/IP application server: HTTP, HTTPS (OpenSSL and GSKit), SAP ICLI, SMTP, DNS, FTP, DHCP, CICS sockets, TN3270 or TN3270E (non-SSL, OpenSSL, and GSKit SSL)



Eclipse

eclipse.org



- Integrated development to create applications
 - ▶ Web sites
 - ▶ Embedded Java programs
 - ▶ C++ programs
 - ▶ Enterprise Java Beans
- The Eclipse Project
 - ▶ Open Source software development project dedicated to providing a robust, full-featured, commercial-quality, industry platform for the development of highly integrated tools
- The Eclipse Tools Project
 - ▶ Focal point for diverse tool builders to ensure the creation of best of breed tools for the Eclipse Platform
- The Eclipse Technology Project
 - ▶ Provides new channels for open source developers, researchers, academics and educators to participate in the on-going evolution of Eclipse



ISVs for Linux on zSeries

- End of 2001 - 59 ISVs with 114 applications
- End of 2002 - 133 ISVs with 252 applications
- An increase of over 220% in ISVs and applications in 2002!
- Currently 139 ISVs with 262 applications
- Resources for ISVs
 - ▶ Portal for Linux at ibm.com/servers/enable/linux
 - ▶ IBM Solution Partnership Centers at www.developer.ibm.com/spc
 - ▶ Linux on zSeries Developer Relations at www.developer.ibm.com/welcome/s390/eslinux.html

Data current as of February 12, 2003



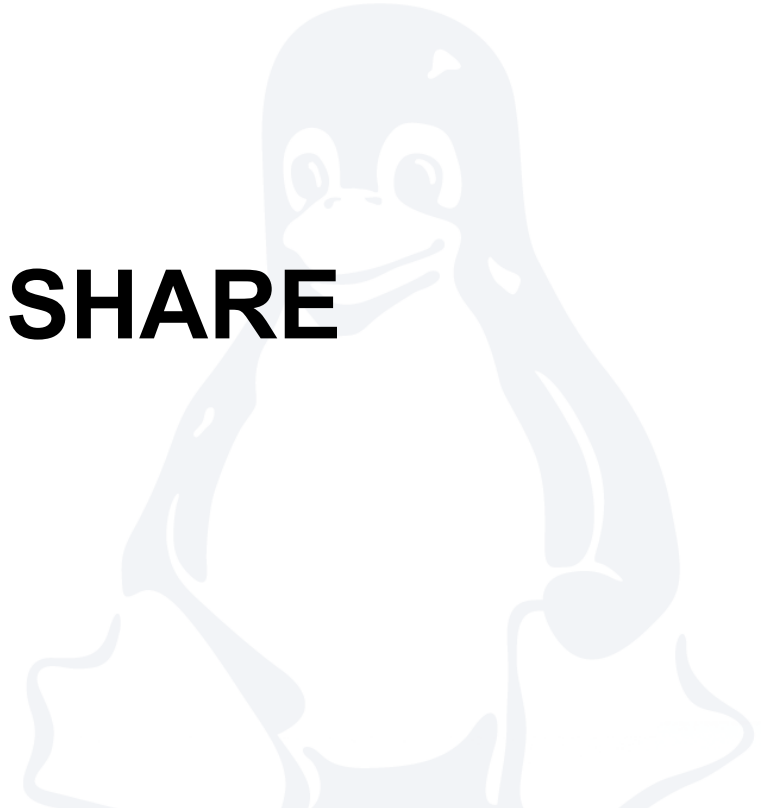
Linux Distribution Partners for Linux on zSeries

- Red Hat
 - ▶ Red Hat Linux 7.2 for S/390
 - www.redhat.com/software/linux/s390
 - ▶ Red Hat Linux 7.1 for zSeries
 - www.redhat.com/software/linux/ibmseries/z.html
- SuSE
 - ▶ SuSE Linux Enterprise Server 7 for S/390 and zSeries
 - www.suse.com/us/business/products/sles/sles7/sles_s390
 - ▶ SuSE Linux Enterprise Server 7 for IBM zSeries
 - www.suse.com/us/business/products/sles/sles7/sles_zseries



Linux @ IBM

Selected Sessions at this SHARE





Selected Sessions at this Share

- DB2
 - ▶ 1316 Extending DB2 with New Tools for UNIX and Windows from IBM
 - Joel Farber at Mon, 4:30pm - 1st Floor in Dallas A1
 - ▶ 1360 Understanding DB2 UDB and DB2 Connect for Linux/390
 - Sean Lee at Thu, 8:00am - 1st Floor in Dallas A2
- WebSphere
 - ▶ 1340 DB2 Application Development using WebSphere Studio Application Developer (WSAD)
 - Peggy Rader at Thu, 8:00am - 2nd Floor in Lone Star C2
 - ▶ 2567 WebSphere 4.0.1 Performance on z/OS and Linux for zSeries
 - Carl Parris at Mon, 4:30pm - 2nd Floor in Austin 3



Selected Sessions at this Share

- Oracle for Linux on zSeries 
- ▶ 0960 Installing and Cloning Oracle9i on Linux for zSeries
 - Bruce Frank at Mon, 4:30pm - 2nd Floor in Seminar Theater
- ▶ 0961 Performance Management and Tuning Oracle9i on Linux for zSeries
 - Tom Russell at Tue, 8:00am - 2nd Floor in Lone Star A2
- ▶ 9326 Customer Experiences: Oracle9i Database on Linux for IBM's zSeries
 - Barry Perkins at Wed, 9:30am - 4th Floor in City View 3
- ▶ 9327 Experiences Using and Migrating Workloads to Oracle9i for Linux on zSeries
 - Denny Dutcavich at Wed, 1:30pm - 4th Floor in City View 7



Selected Sessions at this Share

- Management
 - ▶ 1626 How Linux on the Mainframe Expands Your Management Options
 - Laura Knapp at Tue, 3:00pm - 2nd Floor in Austin 2
 - ▶ 2532 Management of Linux on the Mainframe: Truth or Dare?
 - Bob Johnson at Tue, 1:30pm - 2nd Floor in Lone Star A1
 - ▶ 9314 Linux Security Basics for S/390 People
 - Laura Knapp at Thu, 11:00am - 4th Floor in City View 7
 - ▶ 9334 Managing Multiple Linux Instances on VM
 - Alex deVries at Tue, 9:30am - 4th Floor in City View 7
 - ▶ 9337 Securing Linux for S/390 - User Experiences
 - Rob Amos at Tue, 8:00am - 4th Floor in Remington
 - ▶ 9344 Best Practices for Deploying Linux on VM
 - Alex deVries at Fri, 8:00am - 4th Floor in City View 3
 - ▶ 9348 Why My Penguin is Different Than Yours
 - Marcus Kraft at Thu, 11:00am - 4th Floor in Remington



Selected Sessions at this Share

- Performance
 - ▶ 2536 Performance Aspects of a Penguin Colony
 - Klaus Bergmann at Mon, 9:30am - 1st Floor in Dallas A3
 - ▶ 2559 Linux for zSeries Performance Overview
 - Klaus Bergmann at Mon, 3:00pm - 2nd Floor in Lone Star A1
 - ▶ 2581 I/O Performance and Tuning Under Linux/VM
 - Thomas Beretvas at Wed, 1:30pm - 2nd Floor in Lone Star A1
 - ▶ 9360 Monitoring & Understanding Performance for Linux on S/390 & zSeries
 - Oliver Benke at Wed, 11:00am - 4th Floor in City View 3
 - ▶ 9361 Linux for zSeries Performance Update
 - Ulrich Weigand at Mon, 9:30am - 4th Floor in Remington
 - ▶ 9216 Performance Choices for Linux and Other VM Guests
 - Bill Bitner at Thu, 3:00pm - 4th Floor in City View 7



Selected Sessions at this Share

- User experiences
 - ▶ ~~9317 Linux for S/390 in production : A Technical Experience~~
 - ~~– Boris Bötzel at Thu, 3:00pm - 4th Floor in City View 3~~
 - ▶ 9320 Linux@Marist.Edu
 - Harry Williams at Wed, 11:00am - 4th Floor in Remington
 - ▶ 9333 SCSI Devices on Linux for zSeries - Early Experiences
 - Neale Ferguson at Wed, 8:00am - 4th Floor in City View 7
 - ▶ 9345 Linux for S/390 in production : A User's Experience
 - Boris Bötzel at Fri, 9:30am - 4th Floor in City View 7



Linux and IBM zSeries

- Mainframe reliability
- Linux dependability
- Mainframe capacity
- Linux versatility
- Mainframe manageability
- Linux popularity



When they get together, they are even better!





Contact Information

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ibm.com/vm/devpages/jelliott/





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