



# L11

## Linux and Open Source: The View From IBM

Jim Elliott



September 19 - 23, 2005

San Francisco, CA



| Linux @ IBM

# Linux and Open Source: The View From IBM



Jim Elliott

Advocate – Infrastructure Solutions

Manager – System z9 and zSeries Operating Systems

IBM Canada Ltd.

[ibm.com/vm/devpages/jelliott](http://ibm.com/vm/devpages/jelliott)



# Linux and Open Source: The View from IBM

- **Open Computing**
  - Open Standards
- **Open Source**
- **Linux**
  - Overview, Value and Marketplace
- **Linux and Open Source Usage**
- **Linux and Open Source @ IBM**

References in this presentation to non-IBM web site do not represent an endorsement of their content.



| Linux @ IBM



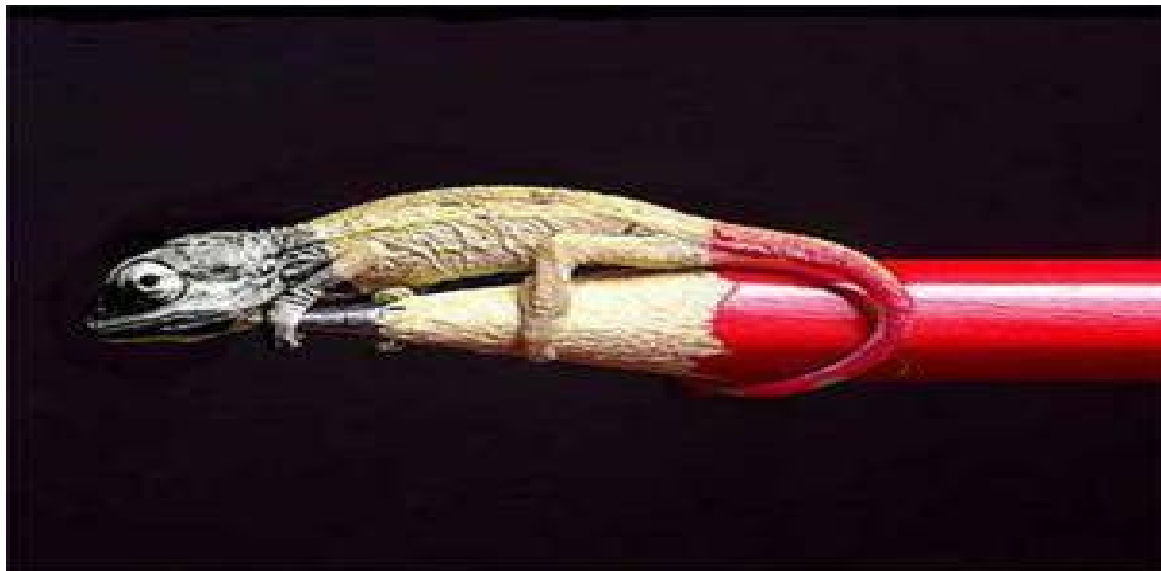
# Open Computing





## Adaptability is vital

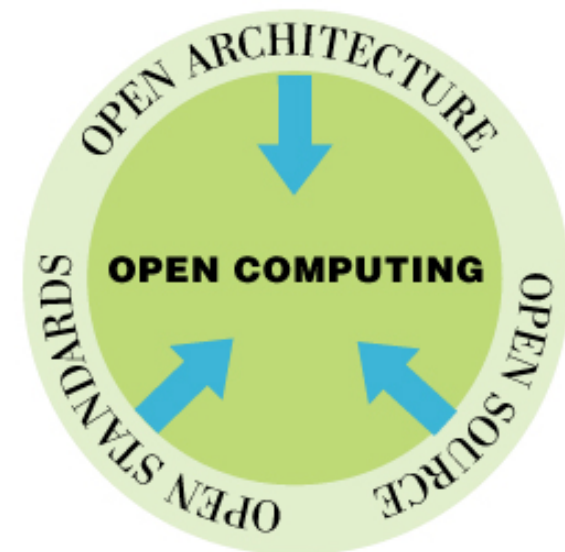
- **“It is not the strongest of the species that survives, nor the most intelligent; it is the one that is most adaptable to change.”**
  - Charles Robert Darwin (1809-82)





# The Principles of Open Computing

- **Open standards:**
  - Promoting interoperability by using open published specifications for APIs, protocols and data and file formats
  - The specifications must be published without restrictions that limit implementations, or require royalties or payments\*
- **Open architecture:**
  - Building loosely coupled, flexible, reconfigurable solutions
- **Open source software:**
  - Promotes standards
  - Leverages community development and collaborative innovation



\* other than reasonable royalties for essential patents

## Open Computing Goals

- **Ensure flexibility**
- **Ensure interoperability**
- **Avoid vendor lock-in**
- **Drive cost effectiveness**
- **Ensure future access to information**
- **Ensure a level playing field for competition**
- **Maximize freedom of action**







## Why Standardization?

- **Standardization of the rail network enabled industrialized America and Europe**
  - The connecting platform fueled growth, creating new business opportunities
  - This increased factory efficiencies by driving better connection with resources
  - This enabled new distribution models and fundamentally changed the marketplace and how it operated
- **Other technologies had similar effects:**
  - The electricity grid
  - The national highway systems
  - The Internet
  - Web services and industry-specific standards?







## Open Standards

- Published without restriction\*
- Freely available for adoption by the industry
- Control by an open industry organization
- Implemented by offerings available in the market

## Standards evolution

➔ Initiator ➔ Core group ➔ Standards body

\* other than reasonable royalties for essential patents



# An Important Trend in Maximizing the Value of IT

		Technology	
		Closed	→ Open
Control	Public	Standards are owned and controlled by the public sector but are not freely available Example: Cryptography	Details of standards are available to all: no single firm has control over how they evolve Examples: TCP/IP, HTML, XML
		Technology may be standard, but details are not made available beyond the firm Example: Landmark Graphics	Standard interfaces are made available, but owner has control over how the standard evolves and may charge for use Examples: Java, .Net
	Private		



# Open Computing Policy Roadmap

1. Insist on open standards as a matter of policy... be pragmatic about it
2. Focus on interoperable IT systems
3. Avoid procurement of proprietary, non-open standards based solutions
4. Evaluate Open Source solutions on equal footing with commercial solutions
5. Reject mandates or preferences based on development model
6. Insist on open File formats
7. Adopt open computing as an underlying philosophy

***Insist on openness, but make pragmatic business oriented decisions based on features, training cost, availability of skill, interoperability and value for money***



| Linux @ IBM



# Open Source



# Open Source Software

[www.opensource.org](http://www.opensource.org)

- **Software whose source code is published and made available to the public**
  - Community develops, debugs, maintains
  - “Survival of the fittest” – peer review
  - Generally high quality, high performance software
  - Superior security – on par with other UNIXes
- **Often built by community**
- **Redistribution rights**
- **May be a reference implementation of an open specification**



- **Examples of Open Source Software:**

- Apache – web server
- Eclipse – application development
- Gnome – desktop environment
- Mozilla – browser/mail/calendar
- OpenOffice – productivity suite
- Perl – language
- Samba – file/print
- SendMail – mail server
- Tomcat – application server



## Five principles of Open Source Software

- 1. Licensees are free to use Open Source software for any purpose whatsoever**
- 2. Licensees are free to make copies of Open Source software and to distribute them without payment of royalties to a licensor**
- 3. Licensees are free to create derivative works of Open Source software and to distribute them without payment of royalties to a licensor**
- 4. Licensees are free to access and use the source code of Open Source software**
- 5. Licensees are free to combine Open Source and other software**

Source: Larry Rosen – Open Source, Open Standards Conference – September 15, 2004





## Can OSS co-exist with Commercial Software?

- **Most OSS licenses allow combination and distribution of OSS and Commercial source code under a commercial license**
- **Some commonly encountered OSS Licenses (BSD, MIT, X11, Apache) don't require modifications to original OSS to be published upon redistribution**
- **GPL allows commercial applications to be built on top of Linux to remain commercial**
  - Application can be licensed under commercial license of choice
  - No need to disclose source code of such applications
- **LGPL Libraries can be dynamically linked to arbitrary commercial code**
  - No requirement to release commercial code under LGPL
- **Decision to use OSS is just another business decision**
- **License terms need to be understood before beginning to work with OSS**



## Why does IBM consider Open Source important?

- **Can be a major source of innovation**
  - Innovation can happen anywhere – any time
  - Development through “open communities” leads to potentially broad ideas and creativity
- **Community Approach**
  - Internet has changed how enterprises address technical innovation
  - Shapes IBM technical leaders thinking and approach to broad collaboration
- **Good approach to developing emerging standards**
  - Popular Open Source projects can become de facto / open standards
  - Wide distribution/deployment
- **Enterprise customers are asking for it**
  - Increase choice and flexibility – adoption/use of Open Source can reduce time to market

# Apache has Become *the* Standard Web Server

*news.netcraft.com*

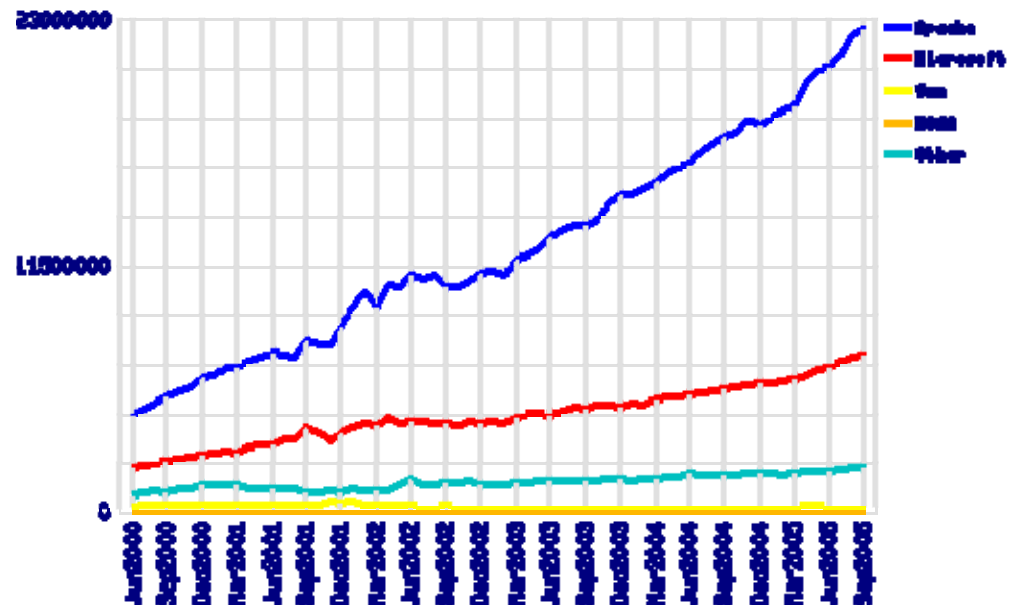
- Totals for active servers across all domains
- As of September 1, 2005

- Apache

- Sites: 22,518,078
- Share: 69.91%

- Microsoft IIS

- Sites: 7,315,449
- Share: 22.71%



The **Apache Software Foundation**

<http://www.apache.org/>



## In summary – it is about Freedom of Choice

- ***“Free software is a matter of liberty, not price. To understand the concept, you should think of free as in free speech, not as in free beer.”***
  - Richard Stallman, Free Software Foundation
- ***“It is not about Free. It's about Freedom. The freedom to collaborate. The freedom to innovate.”***
  - Nick Donofrio, IBM
- ***“Free software is only free if your time is worth nothing”***
  - Chris Pratt, IBM Canada

# Open Source



| Linux @ IBM

# Linux Overview, Value, and Marketplace



## What is Linux?

- A “UNIX-like” Operating System that is community developed with the source code being readily available
  - Robust functionality and scalability
  - Solid stability and security
  - Lightweight and modular
- Operates on virtually any platform
  - server or client
- Generally acquired on a support subscription basis from Linux Distribution Partner (LDP): Novell or Red Hat

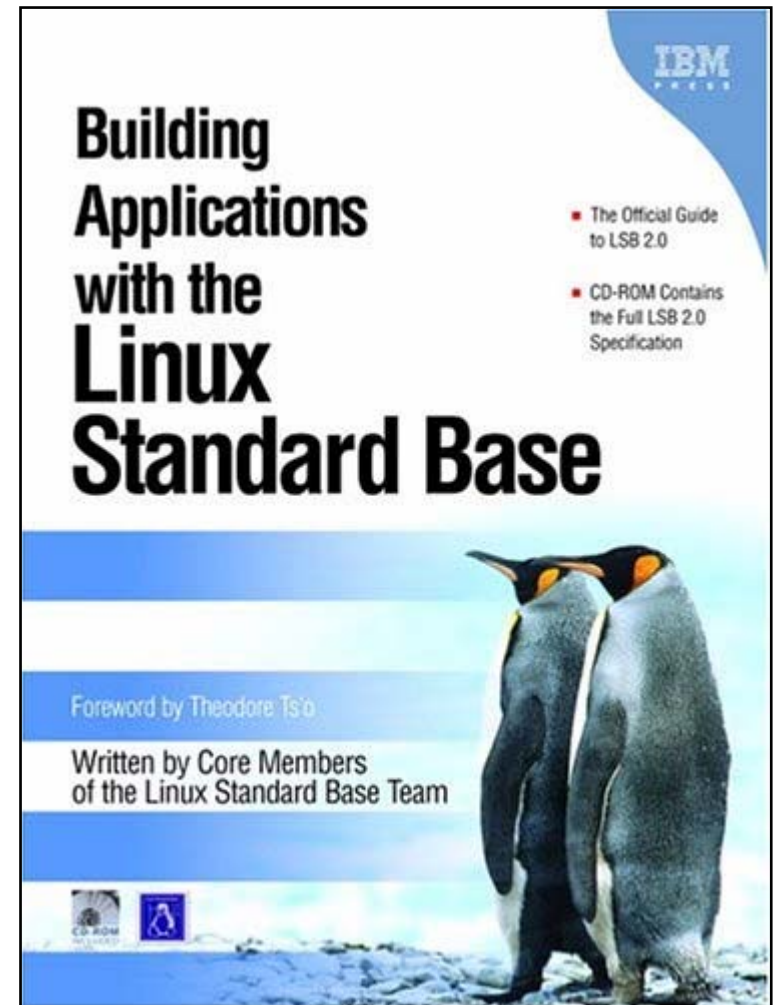




## Linux Standard Base

[www.freestandards.org](http://www.freestandards.org)

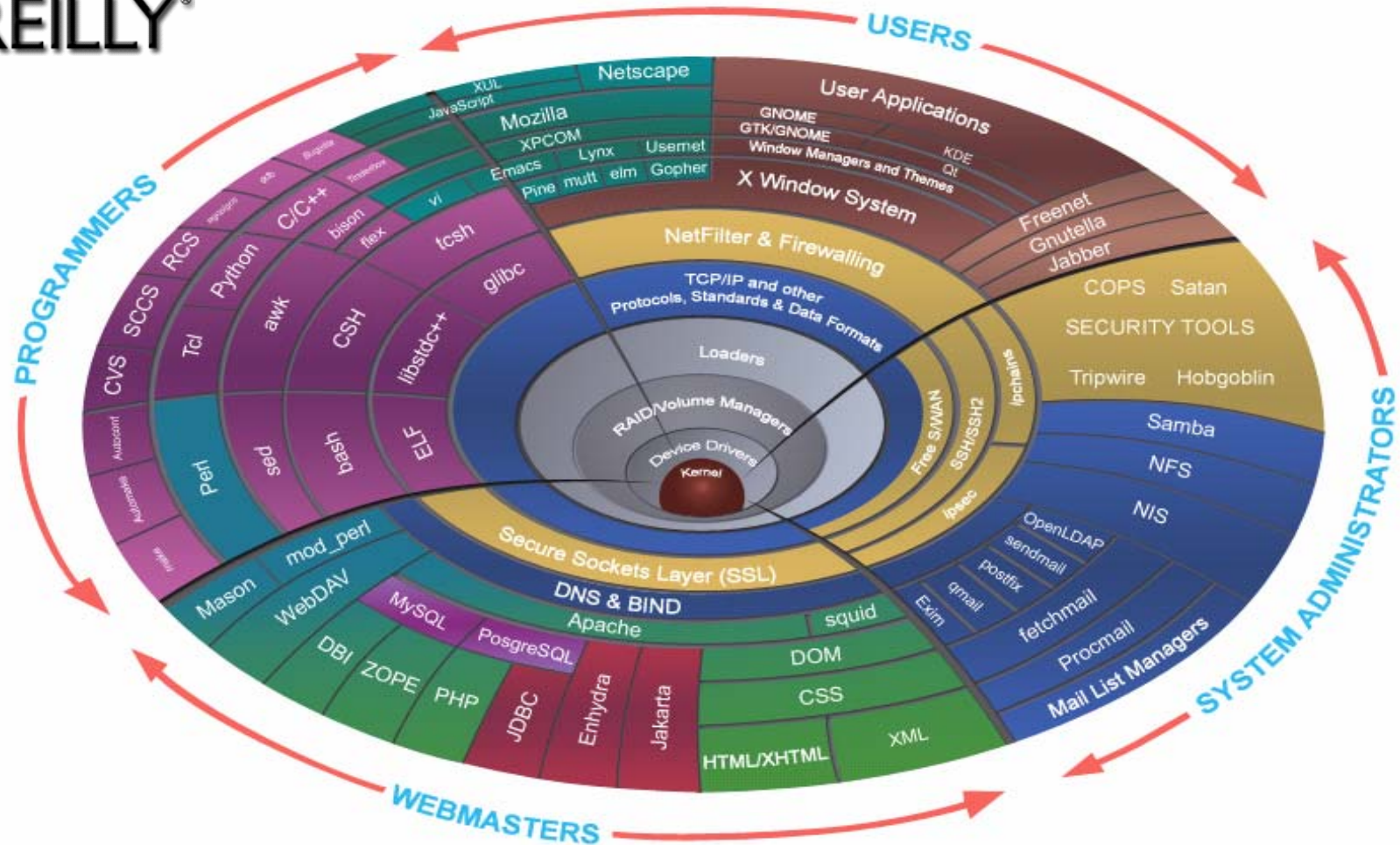
- LSB supporters include AMD, Dell, HP, IBM, Intel, Novell's SUSE LINUX, and Red Hat
- This groundswell of support is significant as it promises to keep Linux from forking and going the way of proprietary systems in the past
- Because of the reduced costs for software vendors writing to the Linux, adoption of the LSB will also result in an increase in the number of applications written to the operating system



[www.phptr.com/ibmpress](http://www.phptr.com/ibmpress)

# What is a Linux Distribution?

O'REILLY®



# Linux is an industry-wide initiative

[www.osdl.org](http://www.osdl.org)



Computer Associates™



invent



- |                                   |   |                                 |                                  |
|-----------------------------------|---|---------------------------------|----------------------------------|
| ▪ 10art-ni                        | ▪ ETRI                                      | ▪ NEC                           | ▪ Stanford University            |
| ▪ ActiveGrid                      | ▪ Fujitsu                                   | ▪ Network Appliance             | ▪ Stratus Technologies           |
| ▪ Aduva                           | ▪ Good-day                                  | ▪ Nokia                         | ▪ Sun Microsystems               |
| ▪ Alcatel                         | ▪ Google                                    | ▪ Novell                        | ▪ Timesys                        |
| ▪ AMD                             | ▪ Haansoft                                  | ▪ NTT Corporation               | ▪ Tokyo University of Technology |
| ▪ BakBone                         | ▪ Hitachi                                   | ▪ NTT Data Intellilink          | ▪ Toshiba Solutions              |
| ▪ Beijing Software Testing Center | ▪ HP  | ▪ Open Country                  | ▪ Transmeta                      |
| ▪ Berry OS Japan                  | ▪ IBM                                       | ▪ Open Source Japan             | ▪ Trolltech                      |
| ▪ Black Duck Software             | ▪ Intel                                     | ▪ Open Technologies Corporation | ▪ TurboLinux                     |
| ▪ BT Global Services              | ▪ IP Telecom                                | ▪ Oregon State University       | ▪ Unilever                       |
| ▪ Bull                            | ▪ Kobe Institute of Computing               | ▪ Pacific Crest Securities      | ▪ Unisys                         |
| ▪ Cassatt                         | ▪ Korea IT Industry Promotion Agency        | ▪ Pixelworks                    | ▪ University of Helsinki         |
| ▪ CCIA                            | ▪ Levanta                                   | ▪ Portland State University     | ▪ Virtual Iron Software          |
| ▪ Cisco                           | ▪ Lynuxworks                                | ▪ Radisys                       | ▪ Voyager Capital                |
| ▪ Co-Create                       | ▪ Marist College                            | ▪ Red Flag Software             | ▪ Waseda University              |
| ▪ Computer Associates             | ▪ Microcost                                 | ▪ Red Hat                       | ▪ Wind River                     |
| ▪ Comverse                        | ▪ Miracle Linux                             | ▪ Scalix Corporation            | ▪ Wyse                           |
| ▪ Cyclades Corporation            | ▪ Mitsubishi Electric                       | ▪ Search Cacher                 |                                  |
| ▪ EMC                             | ▪ MontaVista Software                       | ▪ SpikeSource                   |                                  |
| ▪ Ericsson                        | ▪ National University of Defense Technology |                                 |                                  |





# Linux Adoption and Acceptance

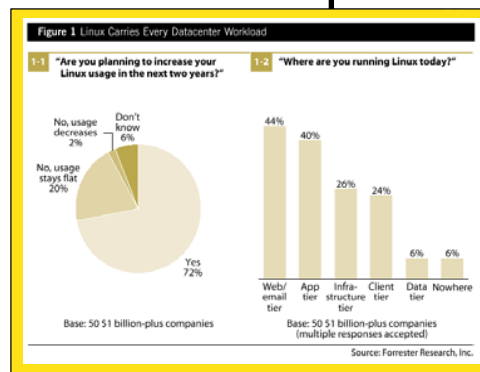
## ■ Reports from :

- Gartner
- Deutsche Bank
- Forrester
- IDC
- DH Brown
- Goldman Sachs
- Bloor Research
- Wall Street
- IBM
- Many others ...

## ■ Articles in :

- Business Week
- Financial Times
- Many others ...

## ■ All very positive ...



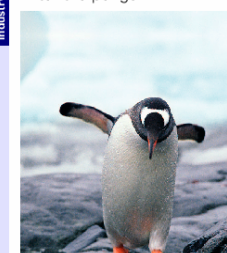
### Technology: Infrastructure Software United States

Linux handbook

**Penguin.** Linux-on-Intel appears likely to emerge as the platform in corporate data centers. This paradigm shift has significant implications for a broad range of IT vendors. Our handbook highlights key themes and related forecasts.

Linux

Enter the penguin



**WholeView™ TechStrategy™ RESEARCH**

**Linux: Questions And Answers For Execs**

By Ted Schuler  
With David Huxley

Linux will go mainstream in the datacenter in 2003. Why? Because the open source OS delivers Unix reliability at Intel prices and has strong support from vendors like HP, IBM, Oracle, and SAP. But execs still wonder about the right Linux strategy.

### Emerging Themes

#### Helping Linux?

For IBM or HP, will abandon Linux, and it's only a matter of time before they do. The only material risk is that they will not.

#### We made strategic bets on Linux?

Large companies that are moving to Linux, but many are still working out. A few have abandoned their Linux work, but most are Web apps and email on Linux. Oracle plans to move to Linux in 2003, and Deutsche Bank has moved a risk engine to Linux.

**Bloor Research – North America**  
Independent Technology Research & Analysis

**Research Brief**

IBM Corporation  
Route 100  
Somers, NY 10589  
<http://www.ibm.com>

**Linux Is Ready: IBM's Strategy**

**Preface**

In 1999, Bloor Research took a very close look at the "enterprise readiness" of Linux. We found Linux side-by-side with Windows NT — comparing the two operating environments as the database, application, and groupware servers. And we concluded that:

As a file and print server, Linux comes out on top, particularly for large operations with varying workloads where vendor management is an important option. The same goes for Web and mail servers. As a database server, Linux is a close second to Windows NT, but it's not yet ready for the job. As a groupware server, Linux is a close second to Windows NT, but it's not yet ready for the job. As a file and print server, Linux comes out on top, particularly for large operations with varying workloads where vendor management is an important option. The same goes for Web and mail servers. As a database server, Linux is a close second to Windows NT, but it's not yet ready for the job. As a groupware server, Linux is a close second to Windows NT, but it's not yet ready for the job.

Now, almost three years later, we've been asked by IBM to re-examine our Linux position. We provide our thoughts on Linux "enterprise readiness" for mission-critical computing. What we want to know is:

1. Is Linux enterprise ready (how is Linux faring from reliability, availability, scalability, flexibility, security, manageability, and server consolidation perspective toward being enterprise ready?), and;
2. How is IBM doing from a strategic/product/services/applications perspective with Linux products and services?

This Research Brief represents the result of our analysis.

**WholeView™ TechStrategy™ RESEARCH**

**FORRESTER**

**March 2003**

**The Linux Tipping Point**

Helping Business Thrive On Technology Change

**waters**

NOVEMBER 2002

**Understanding the Linux Charge**

Lynch, Morgan Stanley and Lehman Brothers, Linux is to risk applications, equity options calculators and mainframe.

By Robert Daly

Still Linux is one of the few Linux actively displaying Linux on the mainframe. The IBM efforts mainframe development is part of an effort to create a virtual server environment, and over the past year virtual server provisioning and Linux has led Merrill Lynch to expand server performance and customer savings.

"The goal here is to come up with the same using as a storage area network, for our server," says McKinley. "We're putting a layer of abstraction between the application and the server it's running on." This allows the system to move applications to different processors depending on the current workload for real-time.

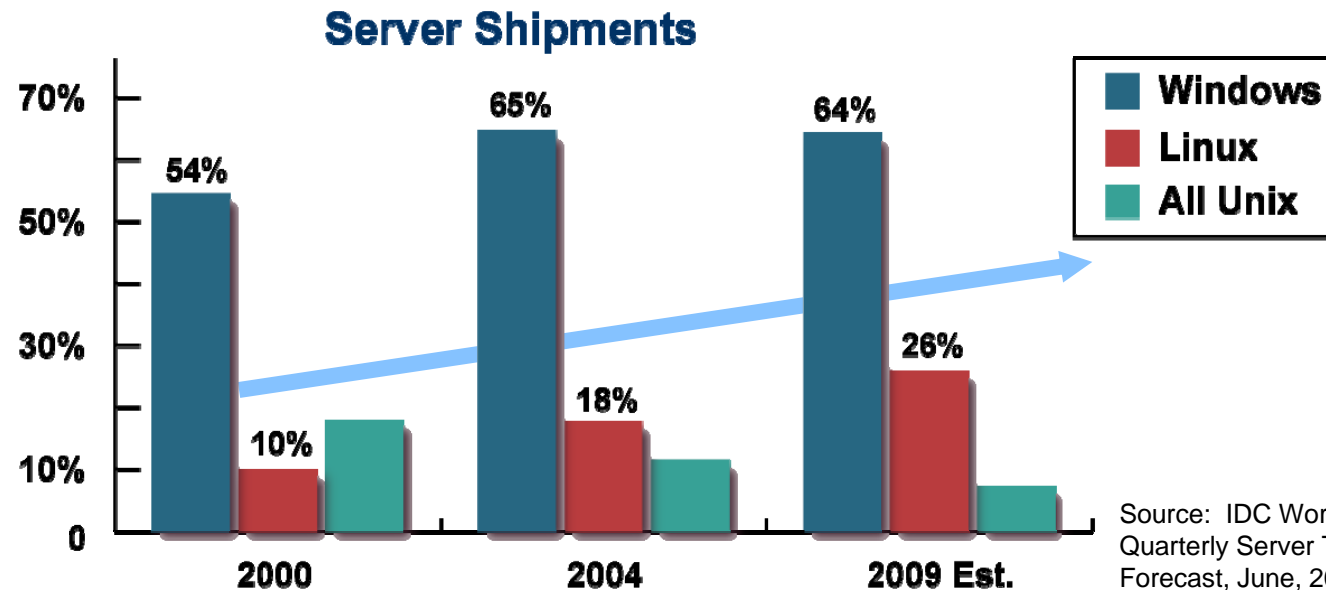
Currently, Merrill Lynch deployed virtual servers using two different methods: running various versions of Linux on the mainframe and using VMware distributed computing software to bring together various servers within the data center. Linux-based applications now can run on any available processor without concern for server architecture.

Methods of server virtualization is an uncharted environment," says McKinley. "We're in Chapter One of the data center's using both approaches and learning on the fly. Both require understanding the server spec for a given set of customers that through these techniques, Merrill Lynch has seen a 40 percent to 50 percent cost savings. "We are able to virtualize on a mainframe and on a 400MHz processor for the same purpose," says McKinley. "We're seeing the speed of provisioning, enabling more efficient use of required equipment and allowing more flexibility in the data center."

See: All Rights Reserved, Used by Permission. waters | November 2002

# Linux Server Market Continues to Grow

- **11th consecutive quarter (1Q05) of year-to-year double-digit growth**
  - Linux server revenue exceeded \$1.2B in quarterly revenue, 10.3% of overall quarterly server revenue – an all-time high
  - Year-to-year revenue growth of 35.2% and unit shipments up 31.1%

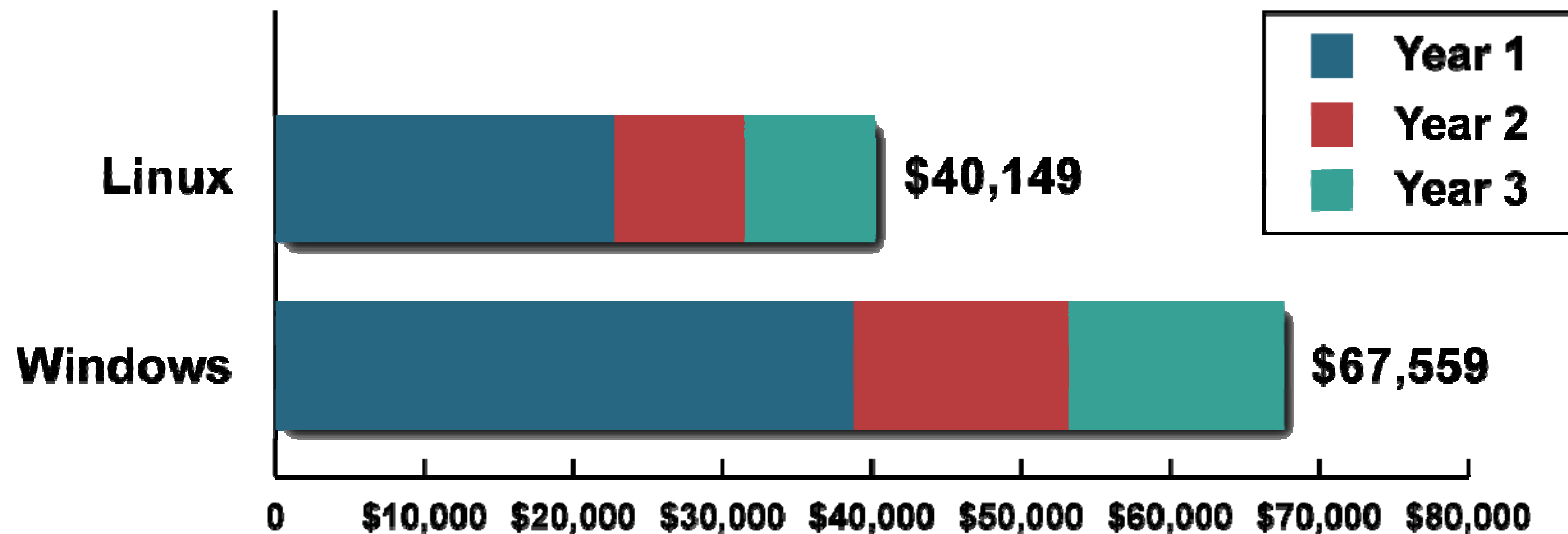


## Linux Continues to Deliver Cost Benefits

- **Linux is 40% less expensive than a comparable x86 based Windows solution**
  - Based on a 3-year period of ownership for a system supporting 100,000 operations per second on the SPECjbb benchmark



### Operating System TCO for Enterprise J2EE



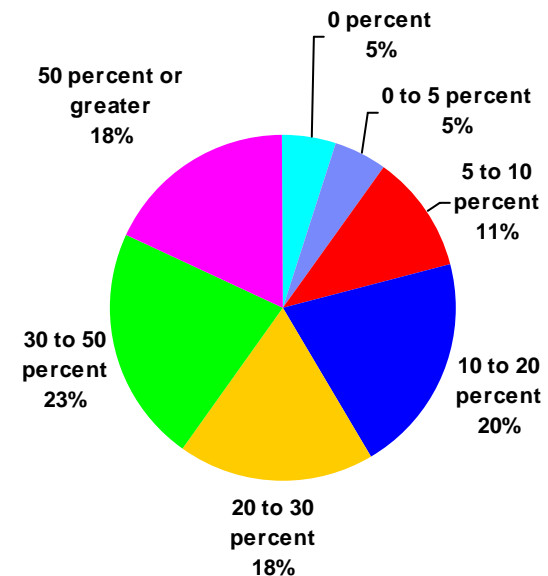
Source: Robert Frances Group: TCO for Application Servers Study, August, 2005



# Can Linux and Windows Coexist Peacefully?

- **Linux is here, Windows is not going away, and heterogeneity is the order of the day**
  - Corporate users must address interoperability and integration issues *before* deployment
  - Microsoft, LDPs, and ISVs must deliver interoperability to ensure peaceful coexistence
  - Linux now accounts for 20% of the worldwide installed base of server operating systems (15% in North America)<sup>1</sup>
  - The majority of corporate networks are heterogeneous environments with multiple operating systems
  - Windows and Linux constitute the bulk of those server installations

**Linux is Complementary to Windows**  
Estimate Linux's share in your environment as a complementary server alongside Windows



**YANKEE GROUP**

Source: Yankee Group, *Heterogeneous Linux, Windows Networks Heighten Integration Challenges*, May 19, 2005

Source: <sup>1</sup> Yankee Group 2005 North American Linux TCO Survey

# Linux capabilities and value have evolved and expanded

## Linux is free

- Better TCO than Unix
- Better TCO than Windows
- Migrate to commodity hardware
- Use as a bargaining chip
- Pluck the low hanging fruit



## Linux is mature

- Drives innovation
- Provides choices
- Enables consolidation
- Facilitates simplification
- Reduces IT costs
- Results in business advantage

1998 1999 2000 2001 2002 2003 2004 2005 2006 2007

## Linux runs on x86

- Works but not enterprise ready
- Used in non-critical areas
- Good infrastructure solution



## Linux runs on multiple architectures

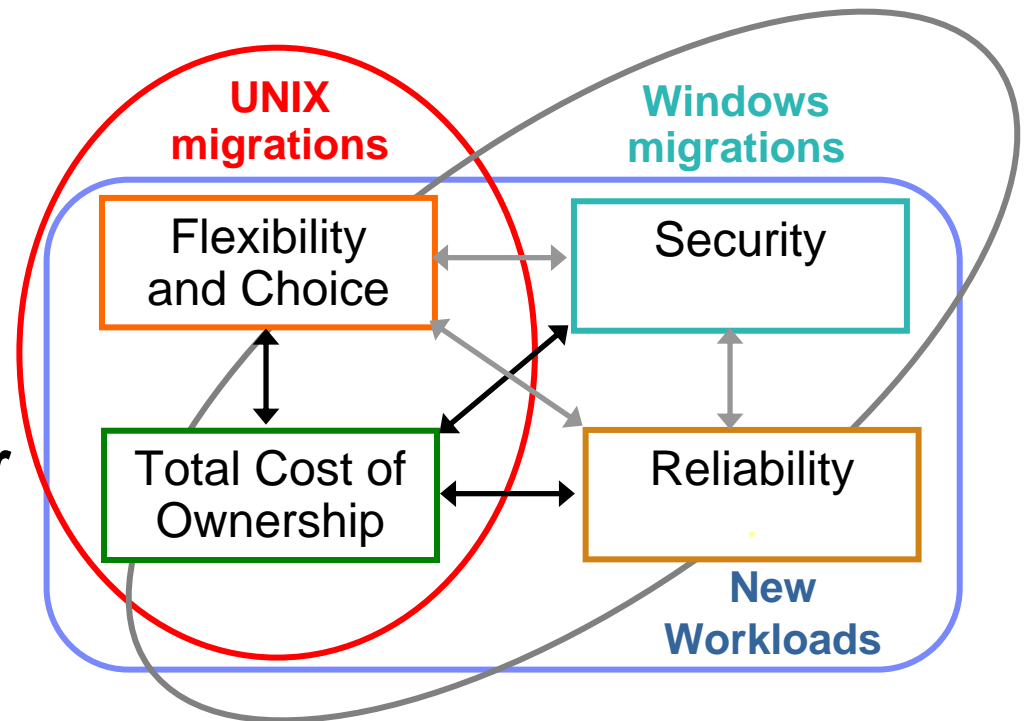
- Up to 16 way SMP support
- Unix-like features and enhancements
- Proven reliability, availability and stability
- Used for mission critical applications
- Runs ERP applications and databases

**Fact: Linux is not implemented because it is cool nor as a religious experience**

**Fact: Linux is a facilitator of Business Solutions and / or IT initiatives**

## How are Customers Adopting Linux

- Much of the early Linux adoption is replacing proprietary UNIX as Linux offers UNIX-like features and platform independence with lower cost of ownership
- Linux is replacing Microsoft servers due to choice, attractive cost of ownership, and enhanced security
- New workloads are being added to gain the full benefits of platform and vendor flexibility, low cost of ownership, solid security, and solid reliability





## Legal Issues?

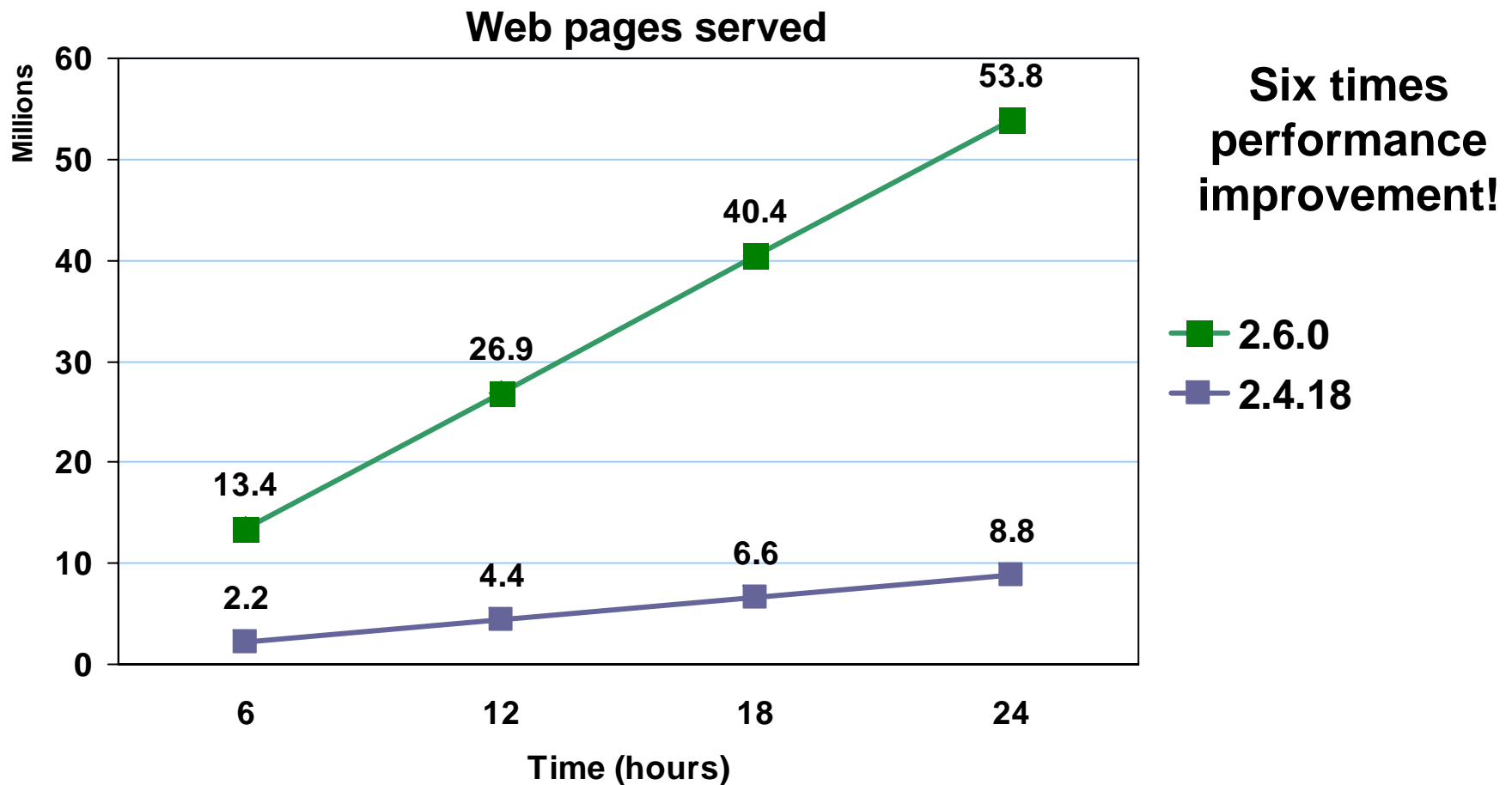
- **50 million civil law suits were filed in US state and federal courts in 2003**
- **Novell/SUSE and Red Hat provide coverage**
  - Novell/SUSE: <http://www.novell.com/licensing/indemnity/>
  - Red Hat: <http://www.redhat.com/software/rhel/assurance/>
- **Discussion and analysis of the “legal” issues around Linux**
  - <http://www.groklaw.net>

***“Since day one, the IBM strategy in the SCO Group lawsuit has been to defend against the SCO Group's unfounded claims vigorously in court. Our belief is that the best way to deal with the SCO Group campaign is where it can truly be resolved – in court.”***

**– Bob Samson – Vice President, System Sales, IBM**

# Performance improvements

## Web serving on 2.4 and 2.6



IBM xSeries Netfinity 8500R 8681-7RY with 8 Pentium III-700MHz



| Linux @ IBM

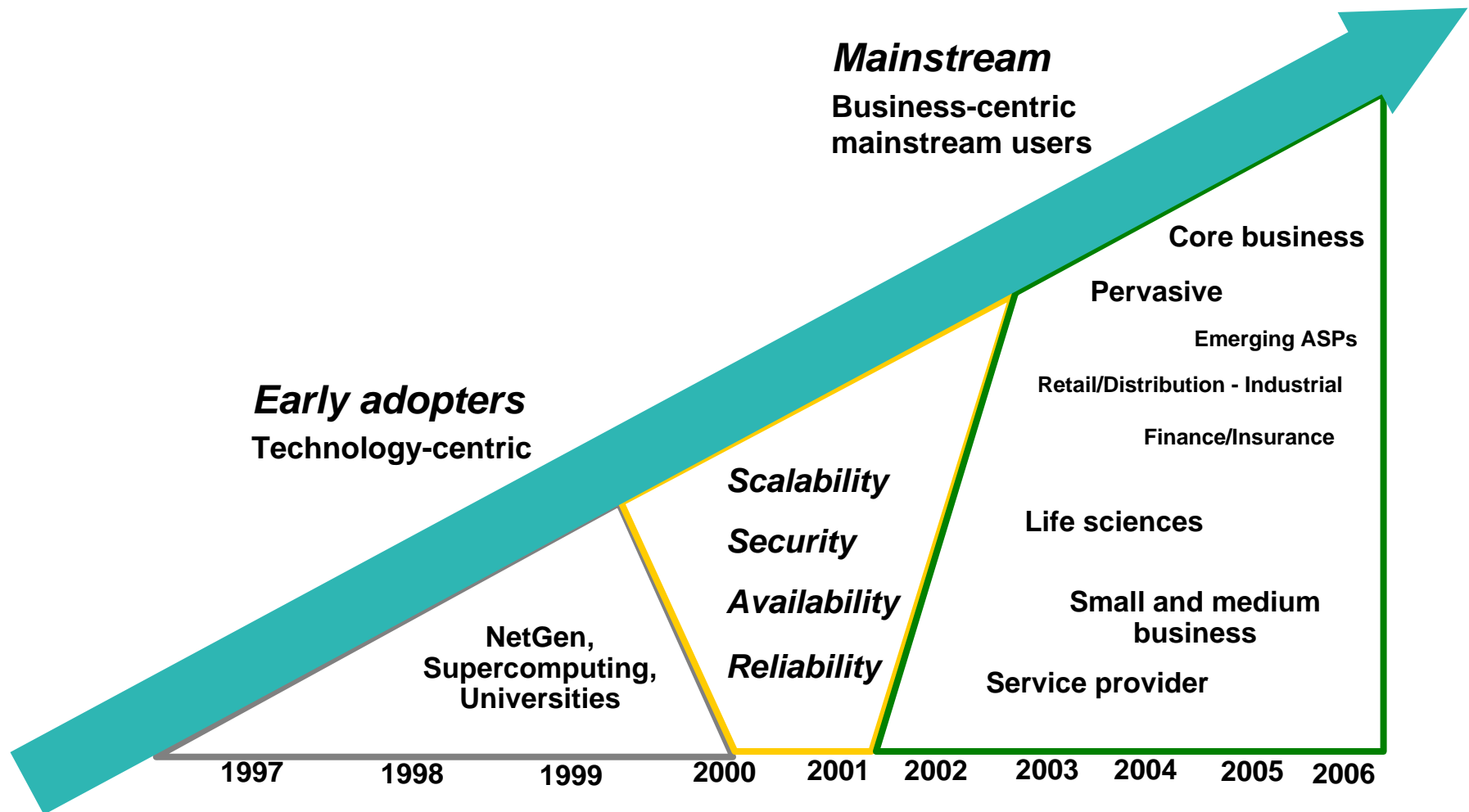


# Linux and Open Source Usage

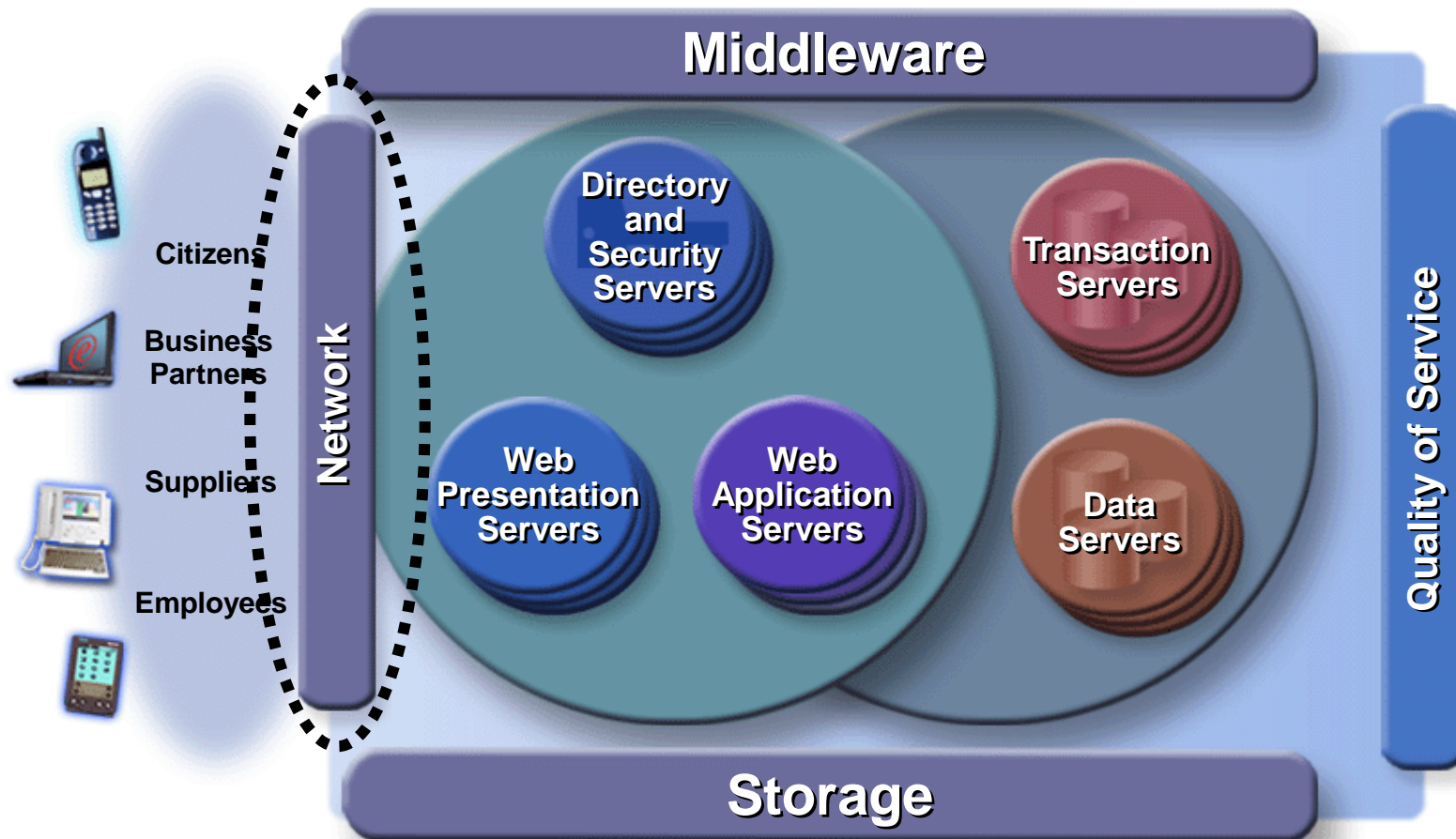




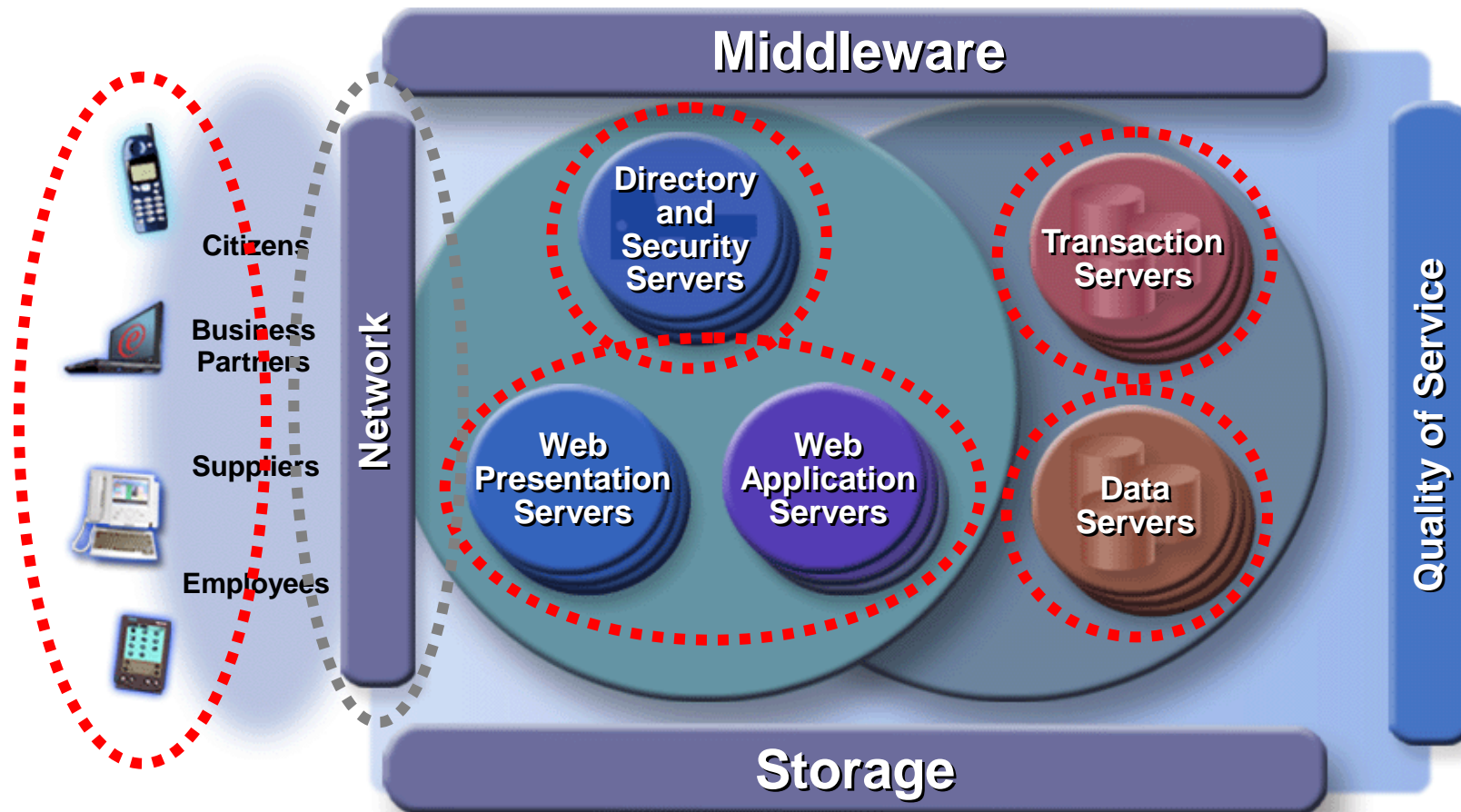
# Taking Open Source Mainstream



# “Traditional” view of Open Source fit is outdated



# Open Source fits everywhere!



# Linux Evolution to Mainstream

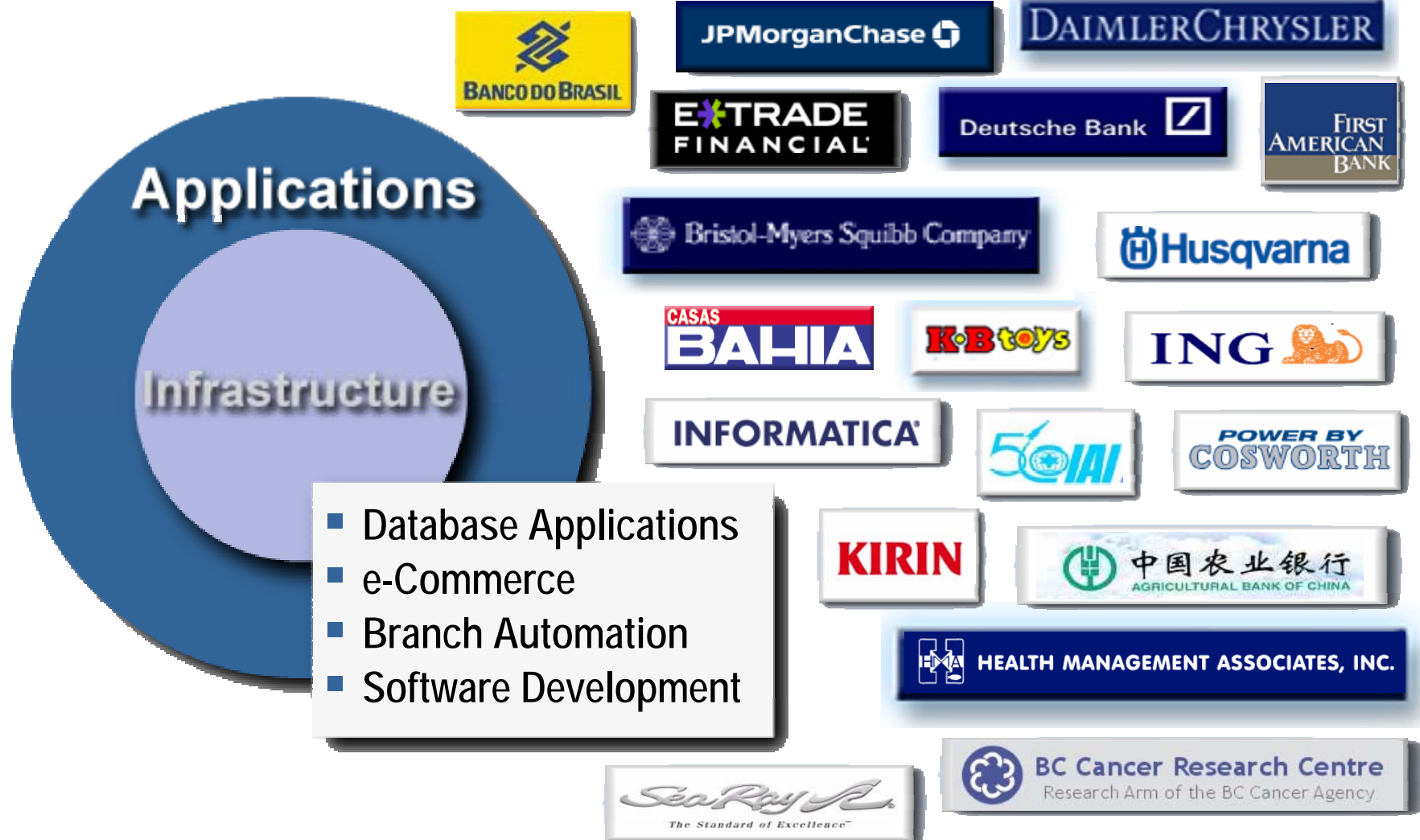
## *Companies Started with Infrastructure Implementations*





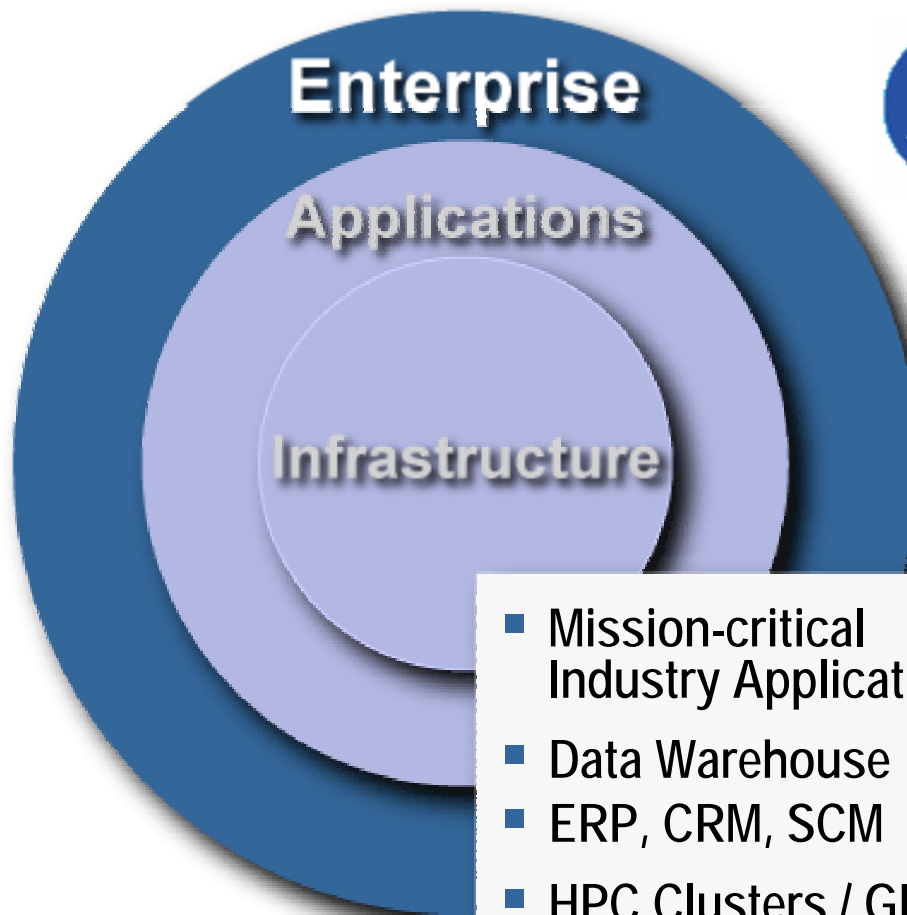
# Linux Evolution to Mainstream

## *Database and Compute Intensive Applications Were Next*



# Linux Evolution to Mainstream

## *Building on Success, Enterprise Applications Followed*



- Mission-critical Industry Applications
- Data Warehouse
- ERP, CRM, SCM
- HPC Clusters / GRID



# Open Source in the Public Sector World-Wide

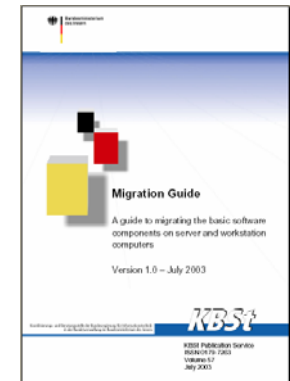
- **European Commission**

- The IDA Open Source Observatory  
<http://europa.eu.int/idabc/en/chapter/452>



- **German Federal Ministry of the Interior**

- Migration Guide  
[http://www.kbst.bund.de/Anlage303807/pdf\\_datei.pdf](http://www.kbst.bund.de/Anlage303807/pdf_datei.pdf)



- **Denmark Board of Technology**

- Open-source software in e-government  
[http://www.tekno.dk/pdf/projekter/p03\\_opensource\\_paper\\_english.pdf](http://www.tekno.dk/pdf/projekter/p03_opensource_paper_english.pdf)

- **Canada Open Source Study**

- Open Source Business Opportunities for Canada's ICT Sector  
<http://www.e-cology.ca/canfloss/report/>

- **Defense R&D Canada**

- Free and Open Source Software  
<http://cradpdf.drdc.gc.ca/PDFS/unc35/p522804.pdf>







| Linux @ IBM



# Linux and Open Source @ IBM



# IBM Linux Investments



## Linux Partners

EAL2 **2003**  
EAL3 **2004**  
EAL4 **2005**



## Patents

**2005**



## Open Source Contributions

**1998 to 2004**  
**2005**



## Chippopper

**2005**

## Linux Technology Center

**1999**

## Linux White Papers and RedBooks



## Software

DB2 **1999**  
WebSphere **2000**  
Tivoli **2001**  
Lotus **2001**  
Rational **2003**



## Servers

xSeries **1998**  
zSeries **1999**  
Cluster and Power **2001**  
BladeCenter **2002**  
OpenPower and BlueGene **2004**



## Business Partners



## Linux Services

**1999**



[ibm.com/linux](http://ibm.com/linux)



## Open Source Development Lab

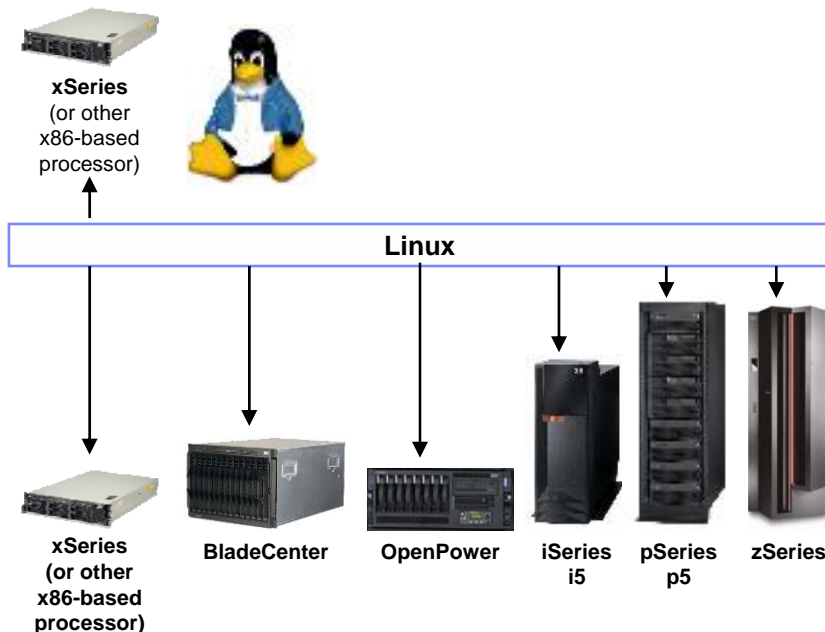
**2000**



# IBM eServer Application Advantage for Linux

*Chiphopper – IBM porting/rehosting, testing and assurance offering for ISVs*

- ISVs achieve portability via standards
- Rigorous testing apps then porting assistance
- Attain **IBM Ready for eServer with Linux** mark
- ISV support is backed by IBM for porting-related customer problems on target platforms
- First of a kind offering



- Provides assurance that IBM stands behind your choice of ISV application on IBM eServer platforms
- Helps grow the number of Linux applications on your platform of preference
- Encourages application conformance to standards, important in emerging Linux landscape
- Helps accelerate the maturation of Linux by facilitating more cost-effective choices for mission-critical, high-end environments

# IBM Linux Technology Center

[ibm.com/linux/ltc](http://ibm.com/linux/ltc)

- **IBM well accepted by the Linux community**
  - 600+ developers world-wide
- **IBM engineers leading enterprise Linux focus**
  - Deeply involved in Linux kernel development
    - Linux on POWER and zSeries
  - Motivated community to focus on addressing scalability and threading issues
  - Defect support for a set of core Linux packages
  - Key participant and contributor to the OSDL

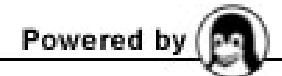




# Linux: Transforming IBM's IT infrastructure

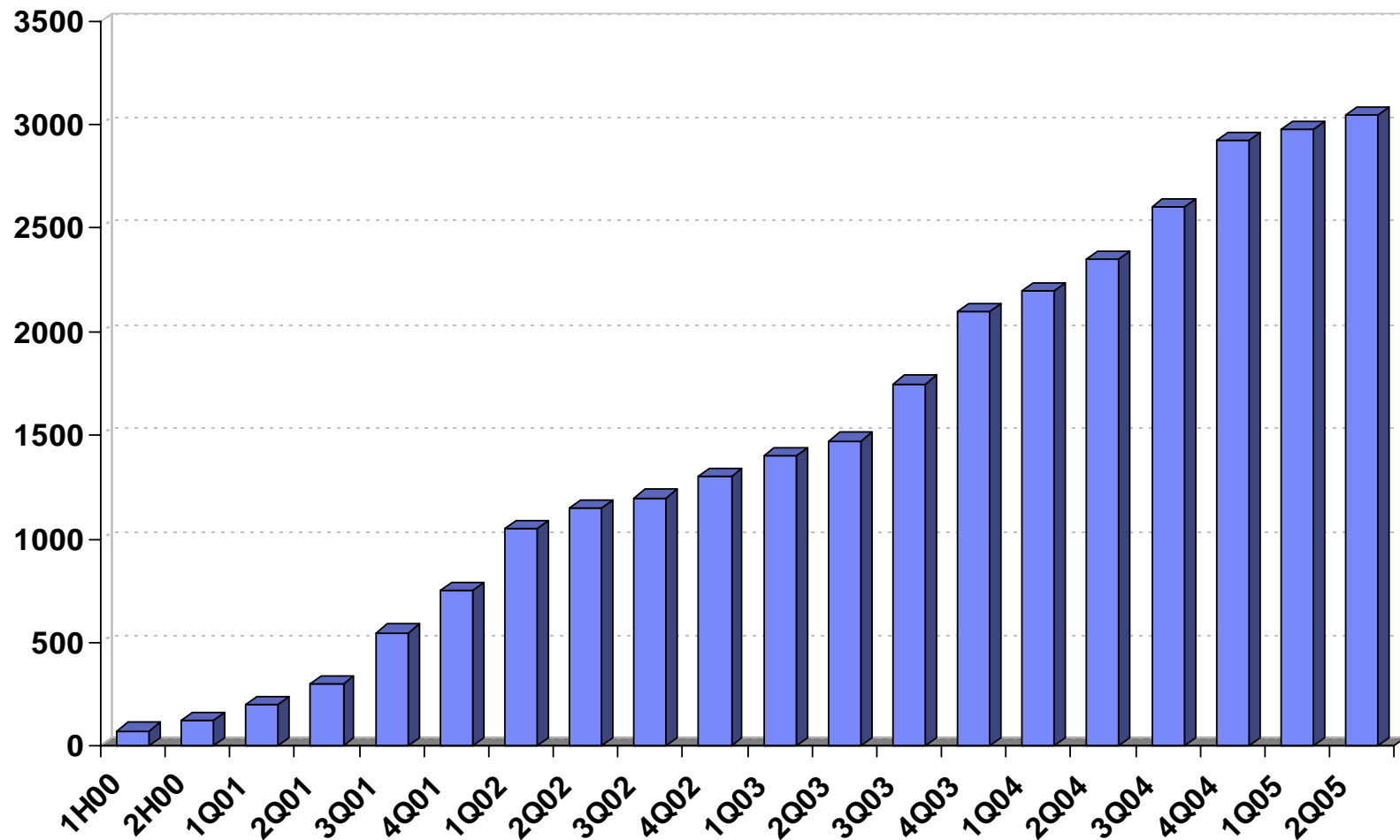
## *Providing Key Business Solutions*

- **3,000+ Production Servers Worldwide**
  - 25,000 Clients
- **ibm.com/linux and w3.ibm.com/linux**
  - Supports 320,000+ employees worldwide
- **IBM's Application Hosting Environment's HTTP workload**
  - Blade servers running in North America and EMEA
- **IBM's Special Events Infrastructure – Wimbledon, The Ryder Cup, The US Open**
  - Linux clusters in Raleigh, Boulder, and St. Louis.
- **IGS Internet Vulnerability Security Scanning**
  - Scanning 30k IP addresses/ week
- **Web Fountain Data Mining Service**
  - A development environment of over 300 Linux servers
  - A production environment of over 500 Linux servers
- **IBM Global e-Mail Anti-virus Management**
  - Scans incoming/outgoing mail for viruses
- **300mm Wafer Manufacturing Automation and Equipment Control**
  - Increased reliability over Windows 2000
  - 200+ production Linux servers



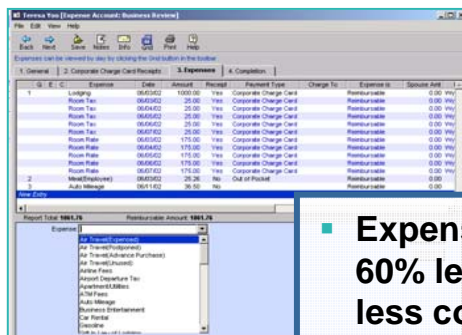
# 3044 Linux Servers in Production at IBM

*At start of 2Q2005*





# Intranet – “On Demand Workplace” at IBM

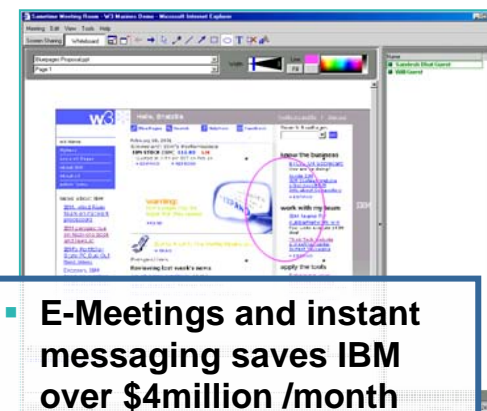


Expense	Date	Amount	Revised	Payment Type	Charge To	Expense Amt	Setback Amt
Lodging	06/05/02	100.00	Yes	Corporate Charge Card	Personnel	0.00	0.00
Room Tax	06/05/02	25.00	Yes	Corporate Charge Card	Personnel	0.00	0.00
Room Tax	06/05/02	25.00	Yes	Corporate Charge Card	Personnel	0.00	0.00
Room Tax	06/05/02	25.00	Yes	Corporate Charge Card	Personnel	0.00	0.00
Room Tax	06/05/02	25.00	Yes	Corporate Charge Card	Personnel	0.00	0.00
Room Rate	06/05/02	175.00	Yes	Corporate Charge Card	Personnel	0.00	0.00
Room Rate	06/05/02	175.00	Yes	Corporate Charge Card	Personnel	0.00	0.00
Room Rate	06/05/02	175.00	Yes	Corporate Charge Card	Personnel	0.00	0.00
Headphones	06/05/02	20.26	No	Out of Pocket	Personnel	0.00	0.00
Auto Mileage	06/05/02	30.50	No		Personnel	0.00	0.00

- Expense reports take 60% less time, 80% less cost



- Consolidating news sources saved in excess of \$2 million

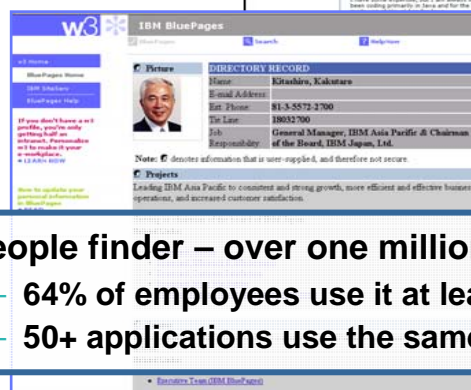


- E-Meetings and instant messaging saves IBM over \$4million /month



- Worldjams, jukeboxes, personalized news, discussion forums

Workplace application development runs on Linux on zSeries

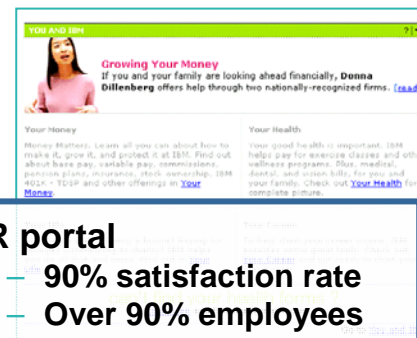


- People finder – over one million hits a day
  - 64% of employees use it at least once a week
  - 50+ applications use the same directory



w3 search engines run on Linux on xSeries

- IBM realized over \$400 million in cost avoidance in 2002 with over 40% of classes moved online



- HR portal
  - 90% satisfaction rate
  - Over 90% employees registered health benefits here last year, saving IBM over \$1 million

IBM forums run on Linux on zSeries



## IBM champions open standards around the world

- **We listen to you to understand your business needs**
  - We meet your requirements by developing standards and products
- **Every major initiative propelled by IBM and other industry leaders**
  - SOAP, WSDL, UDDI, reliable messaging, security, transactions, business process, addressing, policy, notification
- **Open standards commitment @ W3C, OASIS, WS-I**
  - 22 WG/TC chairs, 15 editorships, active participants in over 50 WG/TC
- **Significant contributions to open source**
  - Linux, XML parsing, XSL transformation, Apache SOAP, Axis, Eclipse framework, IBM Cloudscape
- **Rapid inclusion in GA products**
  - First production application platform (WebSphere Application Server)
- **Advanced technology exploration for Web services**
  - AlphaWorks Emerging Technology Toolkit refreshed every 2 months

# IBM Open Standards Leadership



1998 / 1999	2000	2001	2002	2003	2004
<ul style="list-style-type: none"> <li>Java, XML and ebXML</li> <li>Co-founder and lead architect for RosettaNet</li> <li>Author of XML4J</li> <li>Chair OMG XML Metadata Interch. Format</li> <li>Co-author W3C Document Object Model</li> <li>FounderXML.org</li> <li>Elected to Board of Directors in OASIS</li> </ul>	<ul style="list-style-type: none"> <li>Web Services and UDDI</li> <li>Co-author of SOAP 1.1 and submission to W3C</li> <li>Cofounder of UDDI.org and author of original UDDI specification</li> <li>Co-author of WSDL</li> <li>IBM contributes SOAP4J to Apache</li> </ul>	<ul style="list-style-type: none"> <li>Web Services and Tools</li> <li>Led submission of WSDL to the W3C</li> <li>Co-chaired W3 Web Services Workshop</li> <li>Founder of Eclipse.org</li> <li>Co-author of W3C XML Schema standard</li> <li>Chair of Web Services Interactive Applications TC</li> </ul>	<ul style="list-style-type: none"> <li>Web Services and Security</li> <li>Founder and chair, WS-I Organization</li> <li>Co-author of web services bus process specification (BPEL, WS-TX, WS-TC)</li> <li>Co-author for Web Services Security roadmap and specification</li> </ul>	<ul style="list-style-type: none"> <li>Web Services Interoperability</li> <li>Submission of BPEL to OASIS and co-chair WSBPELTC</li> <li>Submission of Common Base Events and WS-Manageability to OASIS</li> <li>Co-chair WSDM TC in OASIS</li> <li>Led workgroup responsible for finalization of SOAP 1.2</li> </ul>	<ul style="list-style-type: none"> <li>Web Services Management</li> <li>Chair of workgroup responsible for WS-I Basic Profile 1.1</li> <li>Co-chair of working group responsible for OASIS WS-Security 1.0</li> <li>Co-chair of OASIS WS-Notification TC</li> <li>Eclipse becomes independent organization</li> <li>More than 1,000 developers devoted to XML and more than 1,500 focused on Linux.</li> </ul>

**Over 160 business integration technology patents**

**First Web Services Gateway**

**First integrated private UDDI directory**



# IBM Open Source Leadership



1999 - 2001	2002	2003	2004	2005
<ul style="list-style-type: none"> <li>IBM forms Linux Technology Center – contributions to serviceability, performance</li> <li>Leads Apache XML projects Xalan, Xerces, SOAP</li> <li>Forms Open Source Steering Committee</li> <li>Creates OSI-approved IBM &amp; Common Public Licenses</li> <li>Participation in Mozilla</li> <li>Founder of Eclipse</li> </ul>	<ul style="list-style-type: none"> <li>Linux contributions to scalability (8-way+), reliability (stress testing, defect mgmt, doc)</li> <li>Leads Apache Web Services projects WSIF and WSIL</li> <li>Leads Eclipse projects GEF (editing), EMF (modeling), XSD (XML Schema)</li> <li>IBM contributes eServer support for Globus Toolkit 2x</li> </ul>	<ul style="list-style-type: none"> <li>IBM and SUSE achieve EAL2+ Common Criteria security cert</li> <li>Leads Apache projects Pluto (Portlet API) and WSRP4J (Remote Portal)</li> <li>Leads Eclipse projects Hyades (testing), Visual Editor, AspectJ, Equinox rich client</li> <li>Globus Toolkit 3 contributions for OGSA, OGSi</li> </ul>	<ul style="list-style-type: none"> <li>IBM and Novell/SUSE achieve EAL3+ and Common Operating Environment compliance</li> <li>Linux additional RAS</li> <li>Incubates Apache project Derby (Cloudscape Java database)</li> <li>Dialog components to Apache Jakarta taglibs</li> <li>Eclipse becomes independent org – IBM contributes UML2, Web Tools, Voice Tools</li> <li>Globus Toolkit 4 to be WS-I compliant</li> <li>IBM contributes voice recognition technology to Apache and Eclipse</li> </ul>	<ul style="list-style-type: none"> <li>Contributions to Xen hypervisor, Linux accessibility</li> <li>Contributions to Apache WSDL4J 2.0 (Woden), Web Services Security</li> <li>Database extensions to PHP</li> <li>Redeploy 30+ developerWorks projects on SourceForge.net</li> <li>IBM pledges 500 patents to OSS</li> </ul>

**More than 1000 developers involved in OSS projects**

**IBM leads 80+ OSS projects**

**IBM contributes to 150+ OSS projects**



## IBM's Open Platform Approach

**Open Grid / On  
Demand Computing**

**On Demand  
Computing  
Environment**

IBM defined "On Demand"  
computing and leads in grid  
technology

**Open Development  
Integration Platform**

**Eclipse**

IBM donated initial technology;  
base technology for IBM AD  
tools

**Open Application  
Integration**

**Web Services**

IBM led or co-led the creation  
of SOAP, WSDL, UDDI, WS-  
Security, BPEL4WS ...

**Open Application  
Server**

**Apache / Geronimo**

IBM contributed significant  
technology to J2EE and the  
Apache Software Foundation

**Open Operating  
System**


**Choice Includes  
Linux**

IBM is the #1 commercial  
supporter



# IBM Linux portal

*ibm.com/linux*

United States [change] Terms of use

Home Products Services & solutions Support & downloads My account

Linux at IBM

Linux at IBM

About Linux

Library

Industry

Solutions

The Linux at IBM competitive advantage

PartnerWorld Lens for Linux

Developers

Centers of Competency

Sports

Geography

Education

Events

News


Linux links

## Linux at IBM

### Industries and solutions

#### Industries

IBM offers solutions to help improve overall performance and flexibility to increase sales and enhance customer satisfaction. Regardless of your industry, implementing solutions quickly can help you stay on track:

**IBM Telecommunications Industry:**  
Realizing the promise of next generation services revenue

Select your industry:

#### Featured Solution

→ **The largest media company in eastern Switzerland** needed to set up a powerful, cost-effective operating environment for SAP systems in order to achieve high availability for applications and servers.

By using SAP, SuSE Linux, SteelEye LifeKeeper for Linux and IBM eServer xSeries 455, the media giant was able to create a modern economic platform providing much faster data preparation, faster online processes and room for growth.

→ [More solutions](#)

→ [View our business partner solutions](#)

Library


**Customer testimonial**

→ **GDK**


Migration

Migration to Linux can save thousands in lower

### We're here to help


**Ask the experts**  
[Get expert advice on Linux solutions](#)

### Migration Factory



→ **No Charge to Qualifying Customers** for Solaris to Linux Migration Assessments.

### Linux magazine




**download the latest issue** (15.7 Mb)

→ [Download the full pdf](#)

51

zSeries Expo 2005 Session L11

2005-09-19

 **ON DEMAND BUSINESS™**



# IBM developerWorks for Open Source

*ibm.com/developerworks/opensource*

Country/region [select] | Terms of use

All of dW [dropdown] [Search]

Home | Products | Services & solutions | Support & downloads | My account

developerWorks >

## Open source

Resources for open source development and implementation

Updated 09 Aug 2005

**Top story**

### Understand Geronimo's deployment architecture

The Geronimo deployment model has emerged as a single homogeneous framework, successfully integrating dozens of technologies. Tour it with Srinath Perera. [More >](#)

**Advanced PHP V5 objects:** Get introduced to more advanced and design-oriented features, including object types, which allow for the decoupling of system components, creating reusable, extensible, scalable code. (Articles)

**Building and filling out templates with Python and Cheetah:** Cheetah templates are easy to understand and maintain. Learn how to generate any kind of text-based content with Python scripts and Cheetah templates. (Articles)

**Profiling and optimizing Ruby code:** Discover how to profile and optimize Ruby code with RubyInline and ZenOptimize, two tools that make this process easier. (Education)

**Integrate third-party components into Geronimo:** Learn how Geronimo's unique GBeans feature lets you integrate third-party open source applications into its infrastructure. (Articles)

**Discover Python, Part 3 : Explore the Python type hierarchy:** Python does not include a special data type to handle a single character. Learn about

**My developerWorks**

Welcome **guest**

→ [Sign in](#)

→ [Register](#)

**Top project resources**

- [Apache Derby](#)
- [Apache Geronimo](#)
- [Eclipse](#)
- [PHP](#)

→ [More projects](#)

**Spotlight**

- [New Apache Geronimo support offering](#)
- [Developing on open standards databases](#)
- [Webcast: Using PHP with XML and Web Services for rapid Web development](#)

**developerWorks**

developerWorks

DB2

eServer

Lotus

Rational

Tivoli

WebSphere

Autonomic computing

Grid computing

Java™ technology

Linux

**Open source**

- [New to Open source](#)
- [Projects](#)
- [Project news](#)
- [Technical library](#)
- [Training](#)
- [Events](#)

**Power Architecture™**

**SOA and Web services**

**Web architecture**

# IBM developerWorks for Linux

*ibm.com/developerworks/linux*



Country/region [select] | Terms of use

All of dW

Home | Products | Services & solutions | Support & downloads | My account

developerWorks >

Linux

Updated 08 Aug 2005

**Top story**



**LPI exam 101 prep: Hardware and architecture**  
These study guides will let you take the exams with confidence. Start with hardware and architecture now, and we'll continue to guide you through the required material in upcoming tutorials. [More >](#)

**Hacking the Linux 2.6 kernel, Part 2: Making your first hack:** Add a feature, fix a flaw, or just have fun tinkering with operating system source code. This tutorial gets you on your way with kernel organization, system calls, kernel modules, and crafting patches. (Education)

**Hacking the Linux 2.6 kernel, Part 1: Getting ready:** Learn the best ways to acquire kernel source, how to configure and boot your new kernel, and how to use the printk function to print messages during bootup. Hack and be free. (Articles)

**Assess system security using a Linux LiveCD:** The four LiveCDs in this roundup -- Auditor, Whoppix, Knoppix-STD, and PHLAK -- pop into your CD drive, boot up, let you scan for problems, and then they're gone without a trace. (Articles)

**Build a wireless ISP on Linux:** Taking the next step beyond a wireless router doesn't have to be nightmare. Shell scripts, Linux, and easy-to-buy equipment help keep it simple. (Articles)

**Get started with Zend Core for IBM on Linux:** Connecting to a

**My developerWorks**

Welcome **guest**

[→ Sign in](#)

[→ Register](#)

**Spotlight**

- Learn Linux at IBM LinuxFest, a no-charge workshop offered in Australia and New Zealand, Fall 2005
- OpenPower project: Open access to Linux on Power servers
- New book on tuning Linux server performance

**Editor's picks**

- Linux on board: Blowing TiVo's lid
- Manage C data using GLib

**developerWorks**

DB2

eServer

Lotus

Rational

Tivoli

WebSphere

Autonomic computing

Grid computing

Java™ technology

**Linux**

- New to Linux
- Downloads & products
- Open source
- Technical library
- Training
- Forums
- Events


**Open source**

**Power Architecture™**

**SOA and Web services**

# IBM alphaWorks

*ibm.com/alphaworks*


United States change | Terms of use

[Home](#) | [Products](#) | [Services & solutions](#) | [Support & downloads](#) | [My account](#)

alphaWorks

alphaWorks

Autonomic computing

Collaboration

Data management

Eclipse technology

Grid computing

Java™ technology

Privacy and security

SOA and Web services

Systems management

Wireless technology

XML

Research topics


Feedback

## alphaWorks

Emerging technologies

Featured technologies

Updated 9 Aug 2005



### BPEL Tracking for Tivoli Monitoring for Transaction Performance

This is an add-on to Tivoli Monitoring for Transaction Performance (TMTP) to support correlating business workflows with IT end-to-end transaction flows. [More.](#)

RSS Feeds **XML**

**BPEL Tracking for Tivoli Monitoring for Transaction Performance:** An add-on to Tivoli Monitoring for Transaction Performance (TMTP) to support correlating business workflows with IT end-to-end transaction flows

**Service Management Connectors for WebSphere Studio Application Monitor:** An add-on to WebSphere Studio Application Monitor (WSAM) that supports Information Technology Infrastructure Library (ITIL) change management and capacity management processes.

**Faces for Laszlo:** A technology that makes use of multiple emerging technologies for rich Internet applications, resulting in a rich user experience on the browser. (This is an ETTK technology.)

**IBM iSeries Navigator System Management Plug-in for SAP:** An iSeries Navigator plug-in that provides simple management tools for a SAP system.

All downloads

Emerging Technologies Toolkit

RSS feeds

Forums and blogs

Academic resources

Licensing program

Top downloads

→ NotesBuddy

→ Integrated Development Environment for Laszlo

→ Sametime Plug-in for Trillian

→ HeapAnalyzer

→ HeapRoots


Related links

- developerWorks
- IBM Research
- Academic program
- ISV resources

# IBM Redbooks

[ibm.com/redbooks/portals/linux](http://ibm.com/redbooks/portals/linux)



United States change Terms of use

Redbooks

Home Products Services & solutions Support & downloads My account

Redbooks Home

Drafts

Redbooks


Redpapers

Technotes

Redbook Domains

- Application Development
- BladeCenter
- DB2 Info Mgmt
- IBM TotalStorage
- iSeries
- Linux
- Lotus
- Networking
- On Demand/Grid
- pSeries
- Solutions
- Tivoli
- WebSphere
- Windows
- xSeries
- zSeries

IBM Redbooks

 **Redbooks** Domain

Linux at IBM

Linux Redbooks Domain

**Latest Drafts ... show all**

- IBM Dynamic Infrastructure for mySAP Business Suite on IBM zSeries
- Experiences with Oracle 10g Database on Linux for zSeries

**New Technotes ... show all**

- Capacity Test of IFL vs. CP
- The CP SET LOADDEV command
- Configure Grid Security in the IBM Grid Toolbox using the Globus Certificate Service

**Skills Development**

- Residencies
- Workshops

**New Redbooks/Redpapers ... show all**

- Enable the On Demand Store with IBM Store Integration Framework
- Messaging Solutions in a Linux Environment
- Tuning Red Hat Enterprise Linux on IBM eServer xSeries Servers

**Most popular ... show Top 15**

- IBM eServer i5 and iSeries System Handbook: IBM i5/OS Version 5 Release 3 October 2004
- Linux Client Migration Cookbook A Practical Planning and Implementation Guide for Migrating to Desktop Linux
- Lotus Domino 6 for Linux


**More info ...**

- **XML** RSS feed with newest Linux related publications... More about RSS
- Solaris to Linux Migration
- IBM Retail Env. for SUSE LINUX

55

zSeries Expo 2005 Session L11

2005-09-19

 ON DEMAND BUSINESS™

# The IBM Migration Station

*[ibm.com/developerworks/ondemand/migrate/linux.html](http://ibm.com/developerworks/ondemand/migrate/linux.html)*

Country/region [select] | Terms of use

All of dW [dropdown] [Search]

Home | Products | Services & solutions | Support & downloads | My account

developerWorks > **developerWorks.**

**developerWorks**

- DB2
- eServer
- Lotus
- Rational
- Tivoli
- WebSphere
- Autonomic computing
- Grid computing
- Java™ technology
- Linux**
- Open source projects
- Power Architecture™
- SOA and Web services
- Web architecture
- Wireless technology
- XML
- Feedback

Related links

## Migration station

Overview | Database | App server | Java | **Linux** | Lotus

- ↓ Migrate from x86 Linux to multi-platform Linux
- ↓ Migrate from Solaris to Linux
- ↓ Migrate from Windows to Linux
- ↓ Migrate from Windows/.NET to Java
- ↓ Migrate from OS/2 to Linux
- ↓ Migrate to IBM middleware on Linux
- ↓ IBM migration resources for partners and ISVs

The resources on this page will help you port your applications from Windows™, Solaris, and OS/2® to run natively on Linux® on x86-based, POWER™-based, and zSeries® systems. The information here also covers porting from Windows to Java™ and porting and migrating x86-based Linux apps to Linux on multiple other hardware platforms, including IBM® eServer™ pSeries®, iSeries™, and zSeries systems. Those looking to transition their networking and application infrastructures to Linux from other operating systems will find migration resources to assist with the process.

### Migrate from x86 Linux to multi-platform Linux

#### Porting to Linux on pSeries, iSeries, and zSeries

Do your Linux apps need more power? Learn how to port and optimize your x86 Linux applications to run on IBM eServer pSeries, iSeries, and zSeries systems.

#### Document options

- Print this page
- ☒ E-mail this page

#### More resources

- Product documentation
- Migrating and developing new applications for Linux
- Developer resources for an on demand world
- Building better software faster with the IBM Software Development Platform
- Globalizing your e-business

#### Build applications

- With DB2
- With Linux





# IBM Servers and Linux

*[ibm.com/eserver/linux](http://ibm.com/eserver/linux)*

- **IBM System z9 and zSeries**
  - Hundreds of Linux servers
  - Integration using z/VM with z/OS, z/VSE, and z/TPF
- **IBM eServer iSeries / i5**
  - Up to 254 Linux partitions
  - Integration with i5/OS
- **IBM eServer pSeries / p5**
  - Up to 254 Linux partitions
  - Linux affinity in AIX 5L
- **IBM eServer OpenPower**
  - Up to 40 Linux partitions
  - Linux-only server
- **IBM eServer xSeries**
  - Freedom of choice in operating systems
- **IBM eServer 326 (AMD)**
  - High performance computing
- **IBM eServer Clusters**
  - Component integration
  - Speed to market
- **IBM eServer Blades**
  - High density servers
  - Integrated components
  - Even more freedom of choice





# IBM Software and Linux

*[ibm.com/software/linux](http://ibm.com/software/linux)*

- **Solutions available across all product lines**
  - WebSphere – middleware, application server, e-business, and infrastructure software
  - DB2 – database software
  - Lotus – collaboration and messaging software
  - Tivoli – system and storage management software
  - Rational – software development tools
- **Over 500 IBM software products available today on Linux**
- **Linux editions of software products are available the same day as all other platforms**
- **Primary software solutions to be available on Linux**

# IBM software product availability matrix

*ibm.com/linux/matrix*

## IBM @server® xSeries

DB2

Data Management Software

Version -  
Release

Hardware

## IBM @server® zSeries

DB2 Administration Client

8.2

xSeries

Tivoli software

Version -  
Release

Hardware

Kernel/Distribution

Sources

## IBM @server® pSeries

WebSphere software

Version -  
Release

Hardware

Kernel/Distribution

Sources

**NEW!**  
WebSphere  
Application Server

6.0

pSeries

Red Hat Enterprise  
Linux 3 Update 2,  
Update 3  
SUSE Linux  
Enterprise Server 8  
SP3  
SUSE Linux  
Enterprise Server 9

**Available  
December  
10, 2004**  
Software  
Announcement  
204-289  
November 30,  
2004  
Supported  
Platforms

WebSphere  
Application Server

5.1.1

pSeries

Red Hat Enterprise  
Linux 3 Update 1  
SUSE Linux  
Enterprise Server 8  
SUSE Linux  
Enterprise Server 8  
SP3  
SUSE Linux  
Enterprise Server 9

Supported  
Platforms

t Enterprise  
Linux Enterprise  
8  
Linux 1.0  
ortal Manager:  
t Enterprise  
Linux Enterprise  
8  
Linux 1.0  
AL:  
t Enterprise  
Linux Enterprise  
8  
Linux 1.0

Software  
Announcement  
203-315

# IBM Global Services and Linux

[\*ibm.com/linux/services\*](http://ibm.com/linux/services)

- **High performance cluster integration services**
- **Enhance your e-business with Linux solutions**
- **SupportLine for Linux - unmatched 24x7 remote support**
  - Fast and accurate problem resolution
  - Helpful, skilled IBM services specialists to supplement your internal staff
  - Electronic support and problem submission that saves you time and allows you to track open support issues
- **Middleware enablement services for Linux**
- **IBM e-business Hosting**
- **IBM Technical Training**



Get trained for the hot jobs.  
Linux training from IBM.

## IBM alliances with Linux distribution partners

### ■ Novell

- SUSE Linux Enterprise Server  
[www.novell.com/products/linuxenterpriseserver/](http://www.novell.com/products/linuxenterpriseserver/)
- Certified at Common Criteria EAL4+ and COE



### ■ Red Hat

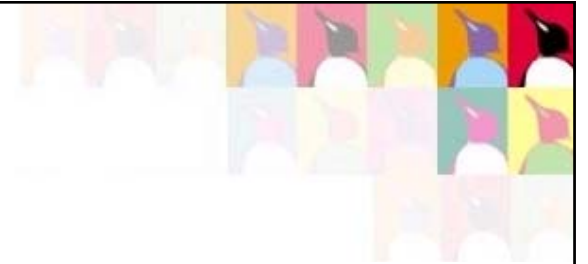
- Red Hat Enterprise Linux  
[www.redhat.com/software/rhel/](http://www.redhat.com/software/rhel/)
- Certified at Common Criteria EAL3+ and COE
  - In evaluation for EAL4 certification in 2005



- **Support for all IBM server products**
- **Service available from IBM or distributors**



| Linux @ IBM



# Summary





# *Take flight with Linux!*

- Familiarize yourself with Linux
- View Linux as a valid alternative for IT systems
- Incorporate open source software development into IT strategies

## **Jim Elliott**

Advocate – Infrastructure Solutions  
Manager – IBM System z9 and  
zSeries Operating Systems  
IBM Canada Ltd.  
[jim\\_elliott@ca.ibm.com](mailto:jim_elliott@ca.ibm.com)  
[ibm.com/vm/devpages/jelliott](http://ibm.com/vm/devpages/jelliott)





# Notices

© Copyright IBM Corporation 2000, 2005. All rights reserved.

This document contains words and/or phrases that are trademarks or registered trademarks of the International Business Machines Corporation in the United States and/or other countries. For information on IBM trademarks go to <http://www.ibm.com/legal/copytrade.shtml>.

**The following are trademarks or registered trademarks of other companies.**

Java and all Java-related trademarks and logos are trademarks of Sun Microsystems, Inc., in the United States and other countries.

UNIX is a registered trademark of The Open Group in the United States and other countries.

Microsoft, Windows and Windows NT are registered trademarks of Microsoft Corporation.

Red Hat, the Red Hat "Shadow Man" logo, and all Red Hat-based trademarks and logos are trademarks or registered trademarks of Red Hat, Inc., in the United States and other countries.

Linux is a trademark of Linus Torvalds in the United States, other countries, or both.

**All other products may be trademarks or registered trademarks of their respective companies.**

**Notes:**

This publication was produced in Canada. IBM may not offer the products, services or features discussed in this document in other countries, and the information may be subject to change without notice. Consult your local IBM business contact for information on the product or services available in your area.

All statements regarding IBM's future direction and intent are subject to change or withdrawal without notice, and represent goals and objectives only.

Information about non-IBM products is obtained from the manufacturers of those products or their published announcements. IBM has not tested those products and cannot confirm the performance, compatibility, or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

Prices subject to change without notice. Contact your IBM representative or Business Partner for the most current pricing in your geography.