Linux and Open Source: The View From IBM

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Manager – System z9 and zSeries Operating Systems
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Linux and Open Source: The View from IBM
Session 9200

- **Linux and Open Source are game-changing technologies. Jim will provide a review of Linux and Open Source from IBM's point of view covering:**
  - Overview, Value and Marketplace: A brief update on Linux and Open Source and the value to customers
  - Usage: How Linux and Open Source are being used by customers today and our view of the future
  - IBM and Open Source: How IBM is using Open Source software internally and IBM involvement in the Open Source community

Open Computing

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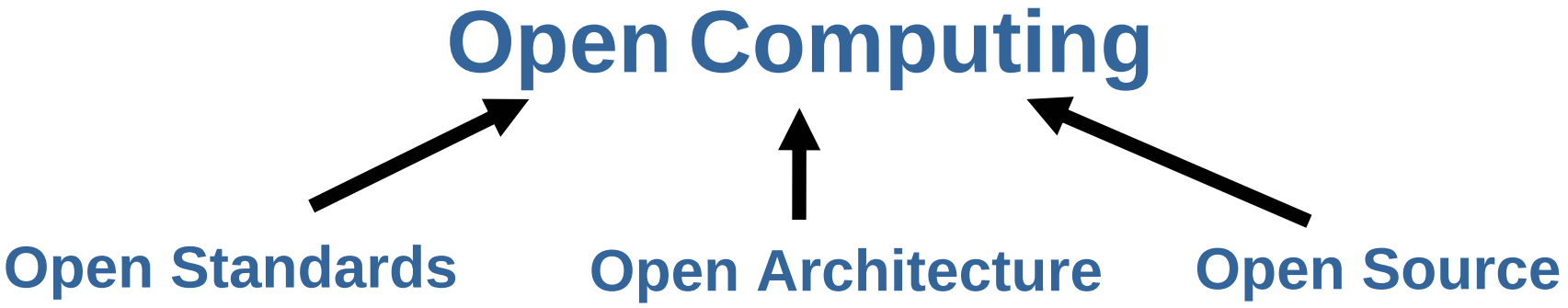
The Principles of Open Computing

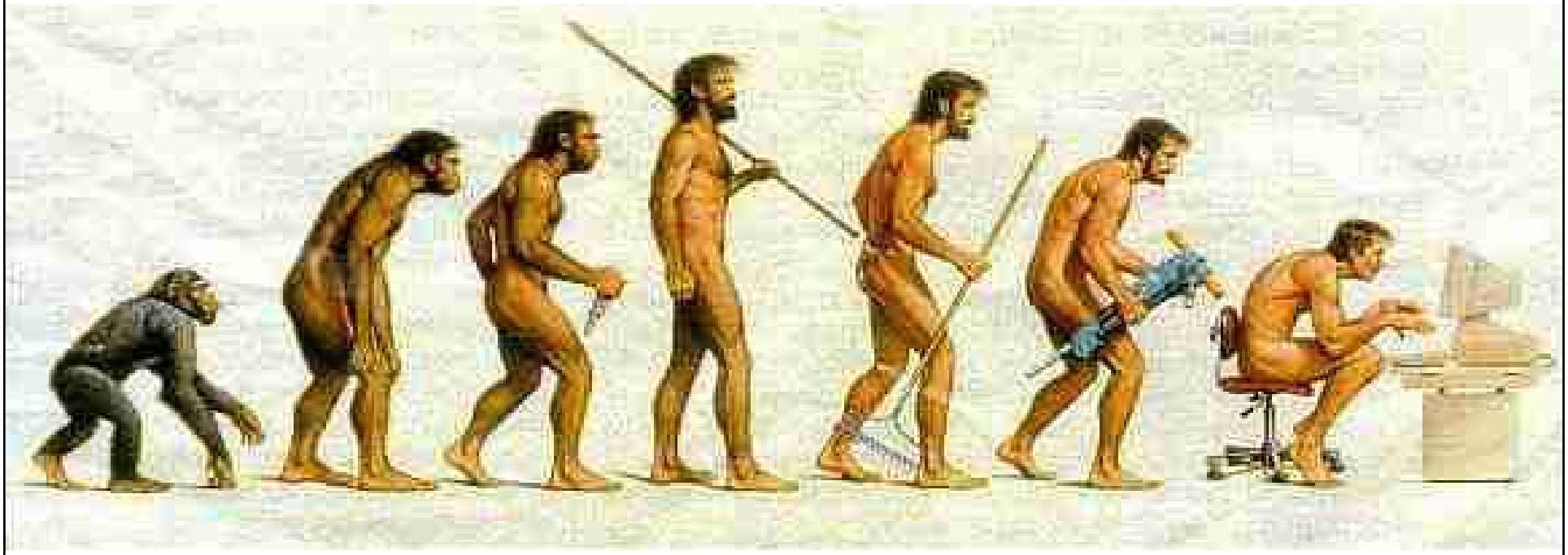
- **Permit interoperability by using published specifications for APIs, protocols, and data and file formats**
- **The specifications must be published without restrictions that limit implementations, or require royalties or payments***



* other than reasonable royalties for essential patents

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)



Open Computing Policy Roadmap

1. Insist on open standards as a matter of policy... be pragmatic about it
2. Focus on interoperable ICT 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

Open Source

Open Source Software
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?

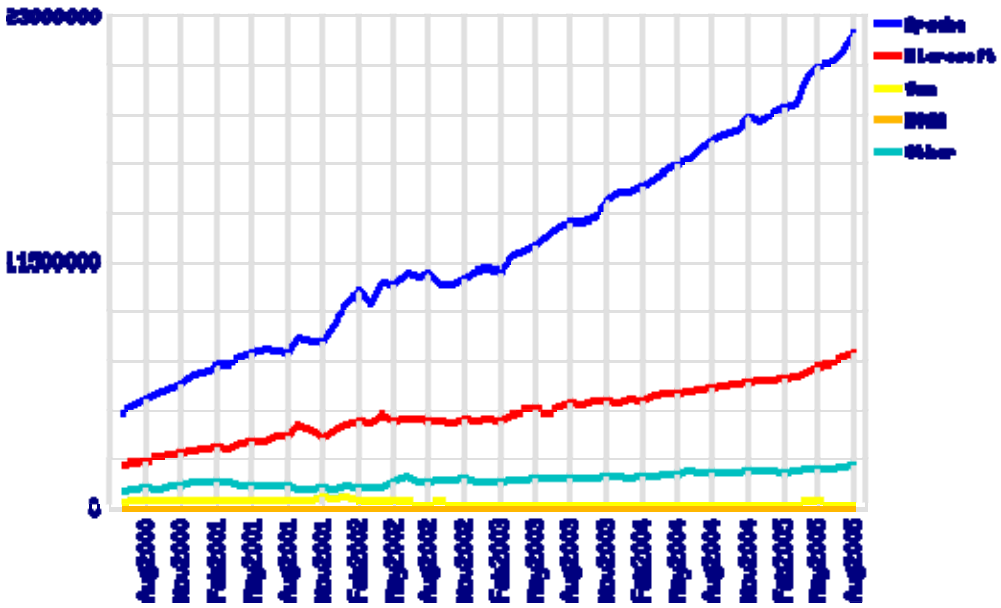
- **Most OSS licenses allow combination and distribution of OSS and Commercial source code under a commercial license**
- **Some commonly encountered OSS Licenses (BSD, MIT, X11, Apache) don't require modifications to original OSS to be published upon redistribution**
- **GPL allows commercial applications 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
  - Example – want Linux to be part of an overall, vendor-supplied and supported total solution

Apache has Become *the* Standard Web Server
news.netcraft.com

- **Totals for active servers across all domains**
- **As of August 1, 2005**
  - Apache
    - Sites: 22,195,711
    - Share: 69.97%
  - Microsoft IIS
    - Sites: 7,171,595
    - Share: 22.61%



The Apache Software Foundation
http://www.apache.org/

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 Overview, Value, and Marketplace

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What is Linux?

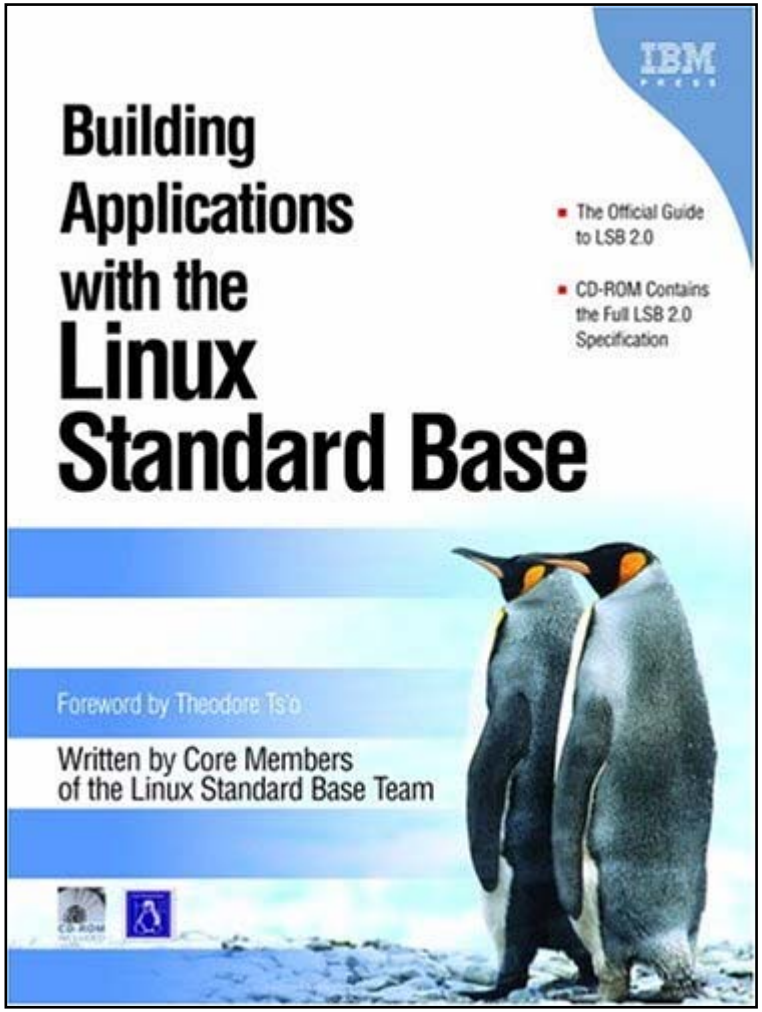
- **A "UNIX-like" Operating System that is community developed with the source code being readily available**
  - Robust functionality and scalability
  - Solid stability and security
  - Lightweight and modular
- **Operates on virtually any platform – server or client**
- **Generally acquired on a support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

redhat

suse Novell.

Linux Standard Base
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**



What is a Linux Distribution?

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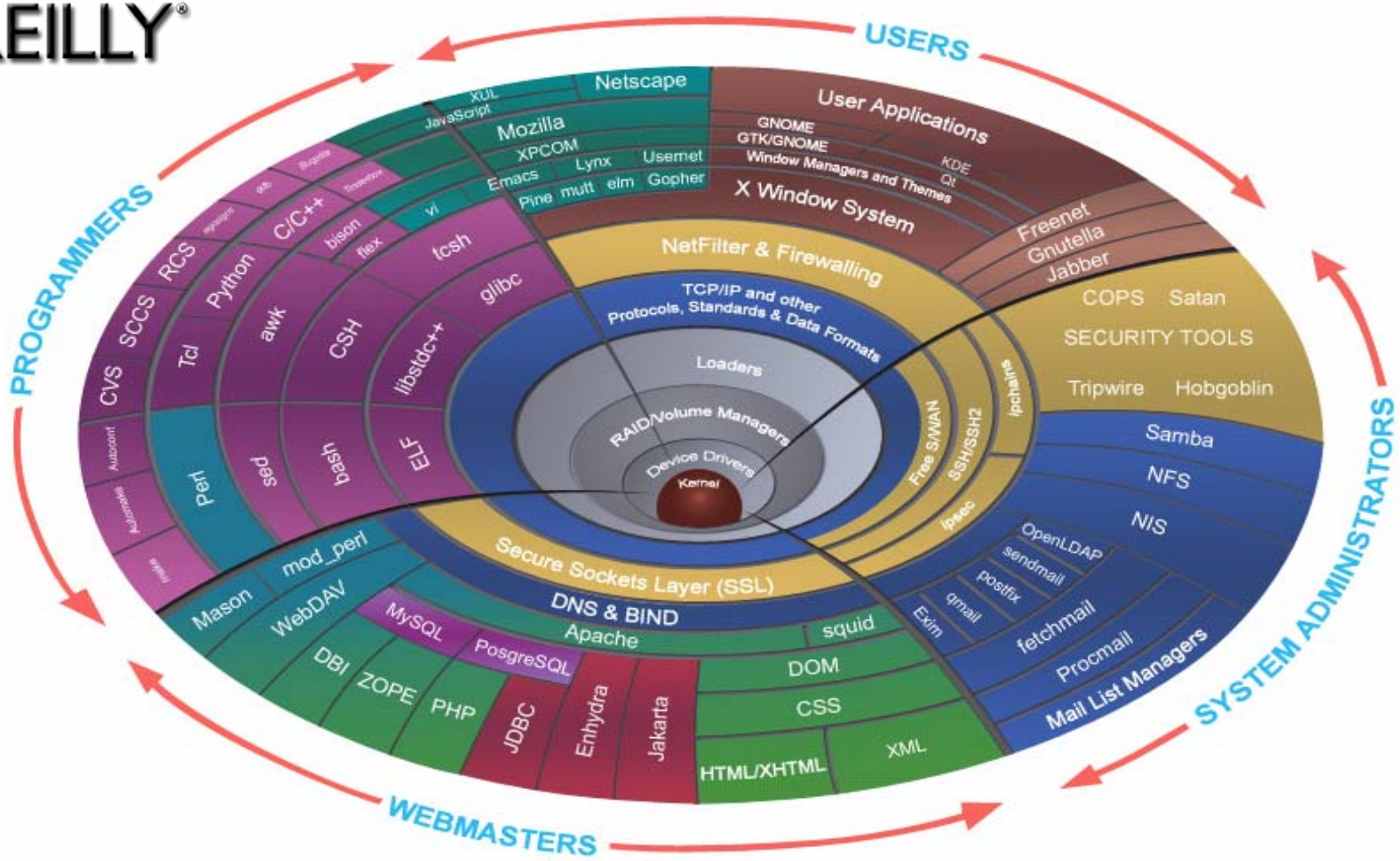


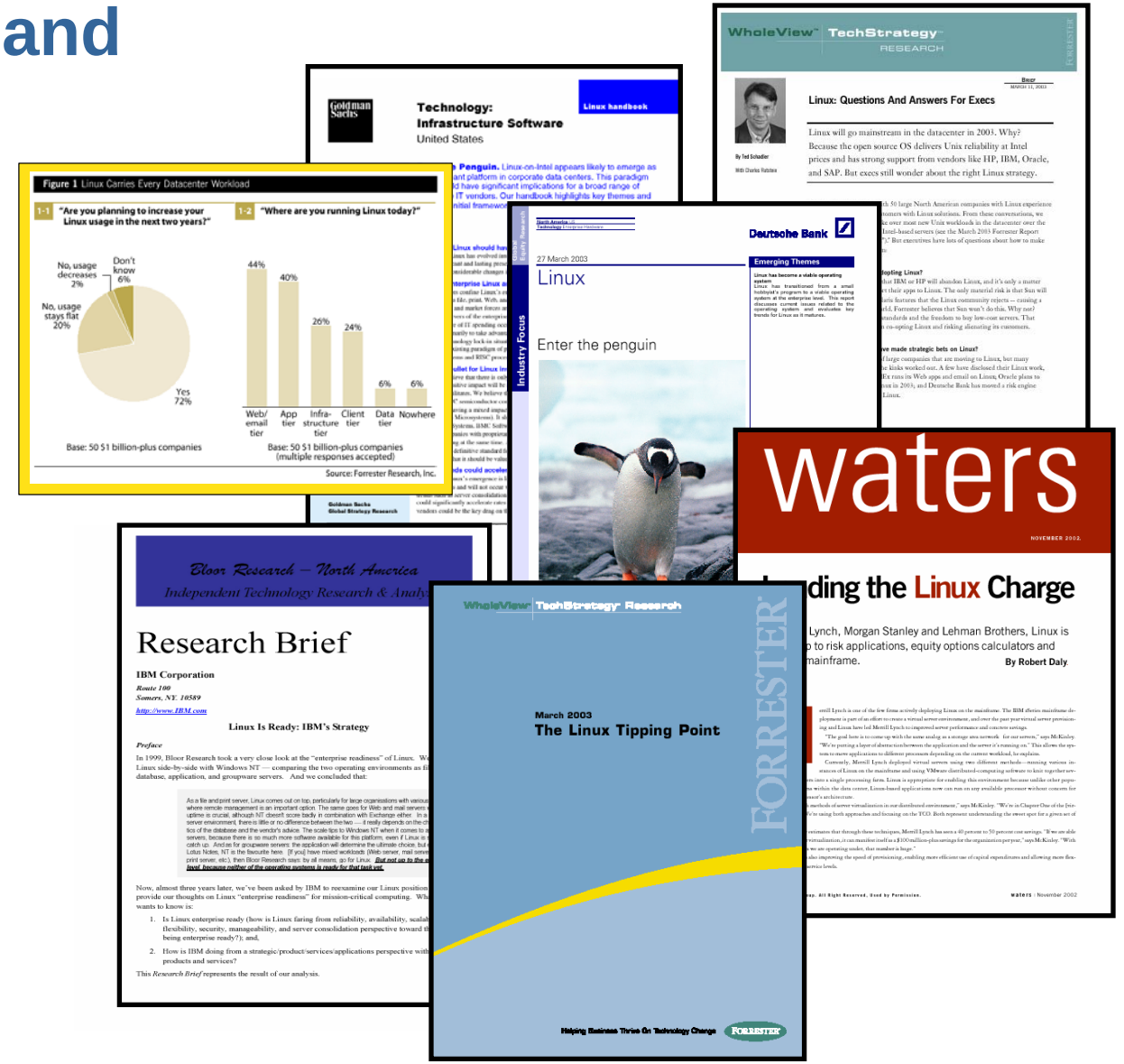
Linux is an industry-wide initiative

www.osdl.org

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

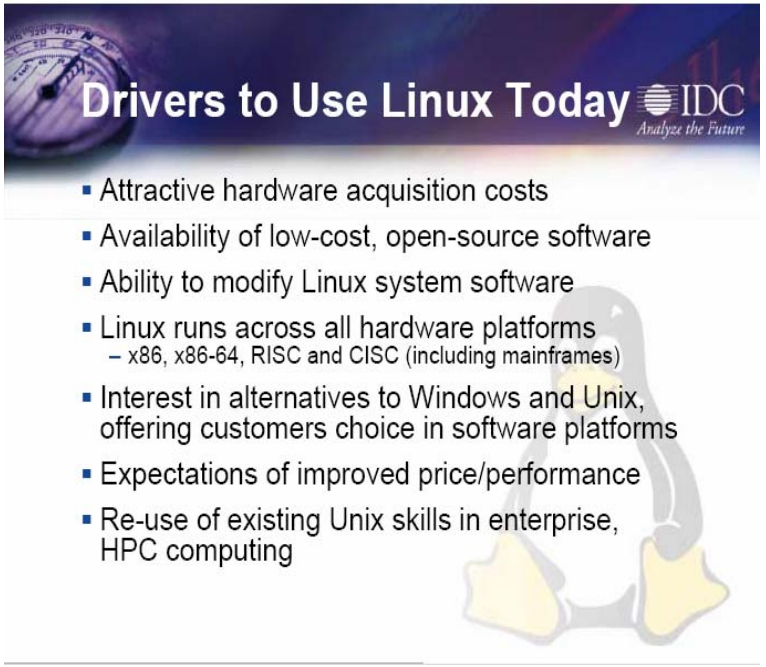
Linux Adoption and Acceptance

- **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 ...**



Why Linux is Important to Customers

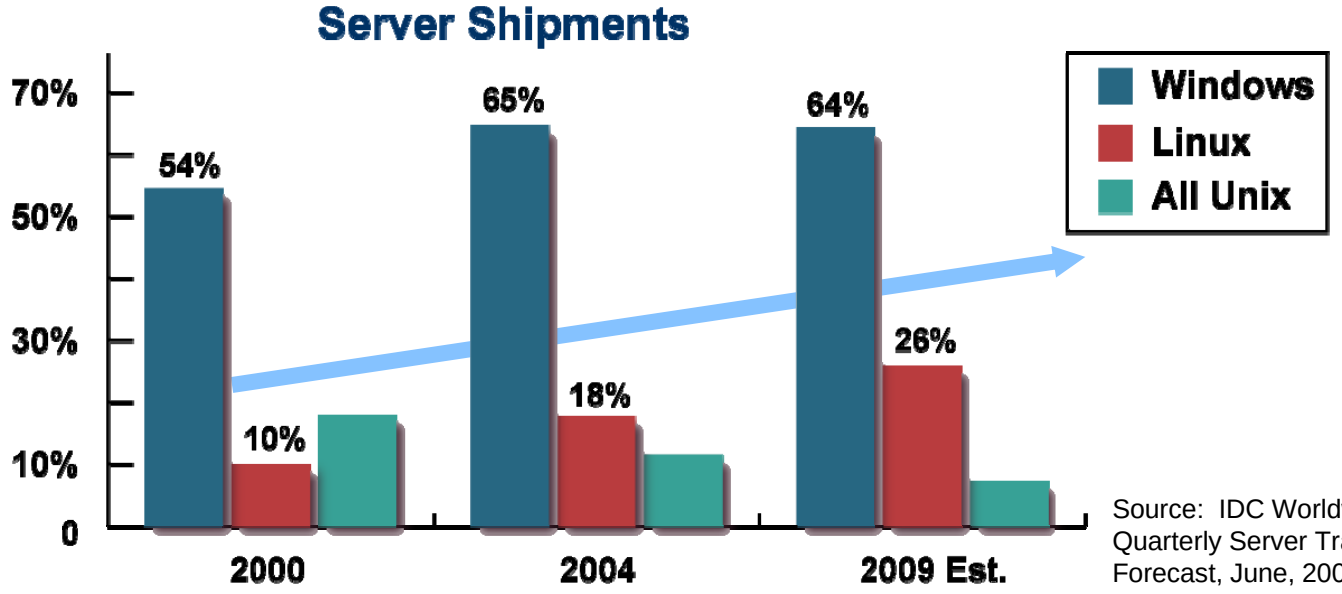
- **Linux is about choice and flexibility**
- **Linux is secure**
- **Linux is reliable**
- **Linux drives business goals**
  - Reduce costs
  - Simplification
  - Improve application service levels
  - Promotes innovation
  - Internally change business process and drive contribution to business
  - Generate revenue



Source: IDC Directions 2005

Linux Server Market Continues to Grow

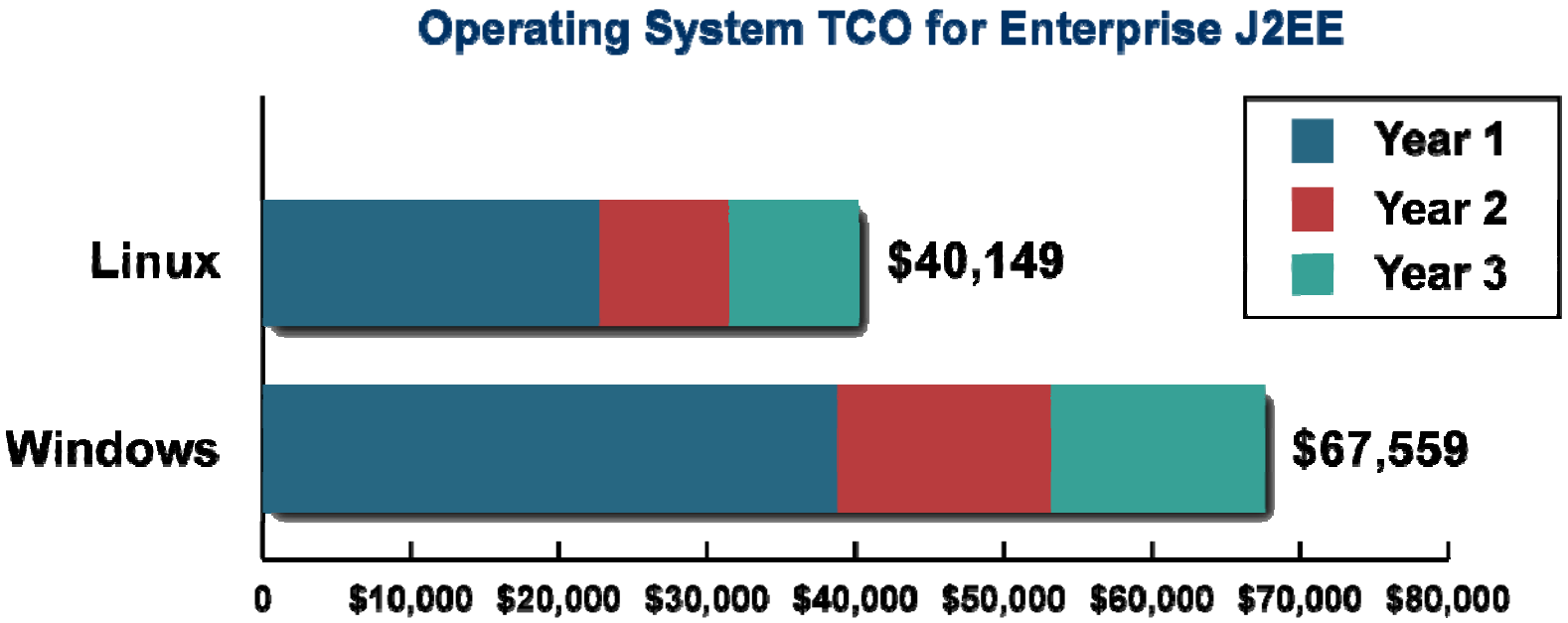
- **11th consecutive quarter (1Q05) of year-to-year double-digit growth**
  - Linux server revenue exceeded $1.2B in quarterly revenue, 10.3% of overall quarterly server revenue – an all-time high
  - Year-to-year revenue growth of 35.2% and unit shipments up 31.1%



Source: IDC Worldwide Quarterly Server Tracker and Forecast, June, 2005

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



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

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

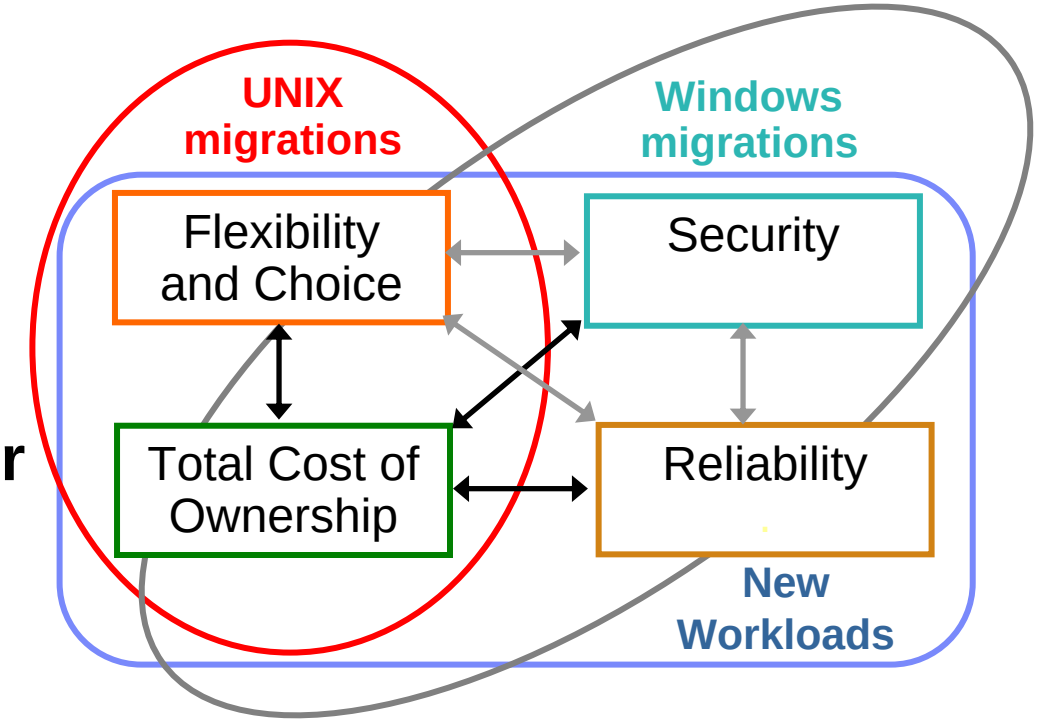
Linux runs on x86
- Works but not enterprise ready
- Used in non-critical areas
- Good infrastructure solution

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

Linux 2.6 Kernel

Major kernel internal overhauls for robustness, performance, scalability

- VM, Scheduler, NUMA topology,
- Filesystem and block IO
- HT, SMT support
- 64 GB memory support
- Max users/Groups 64K – 4 billion
- PIDs/processes 32K to 1 billion
- 16 TB filesystems, 1 million devices

Scale UP: Large SMP & NUMA

- 16 CPU xSeries
- 16-32 CPU pSeries/iSeries
- 16 CPU zSeries

Common Hot Plug infrastructure for

- PCI
- Devices
- CPUs
- USB and Firewire

Security

- Policy based security architecture
- New security policies – SELinux, etc.

Scalable APIs

- Futexes
- epoll
- Direct IO and Async IO
- Large Page APIs
- NPTL
- NUMA APIs & Topology

Distributed Filesystem Support

IRQ & Scheduling Affinity

Enhanced file system support

- NFSv4, hardened JFSs

Native Architecture Support

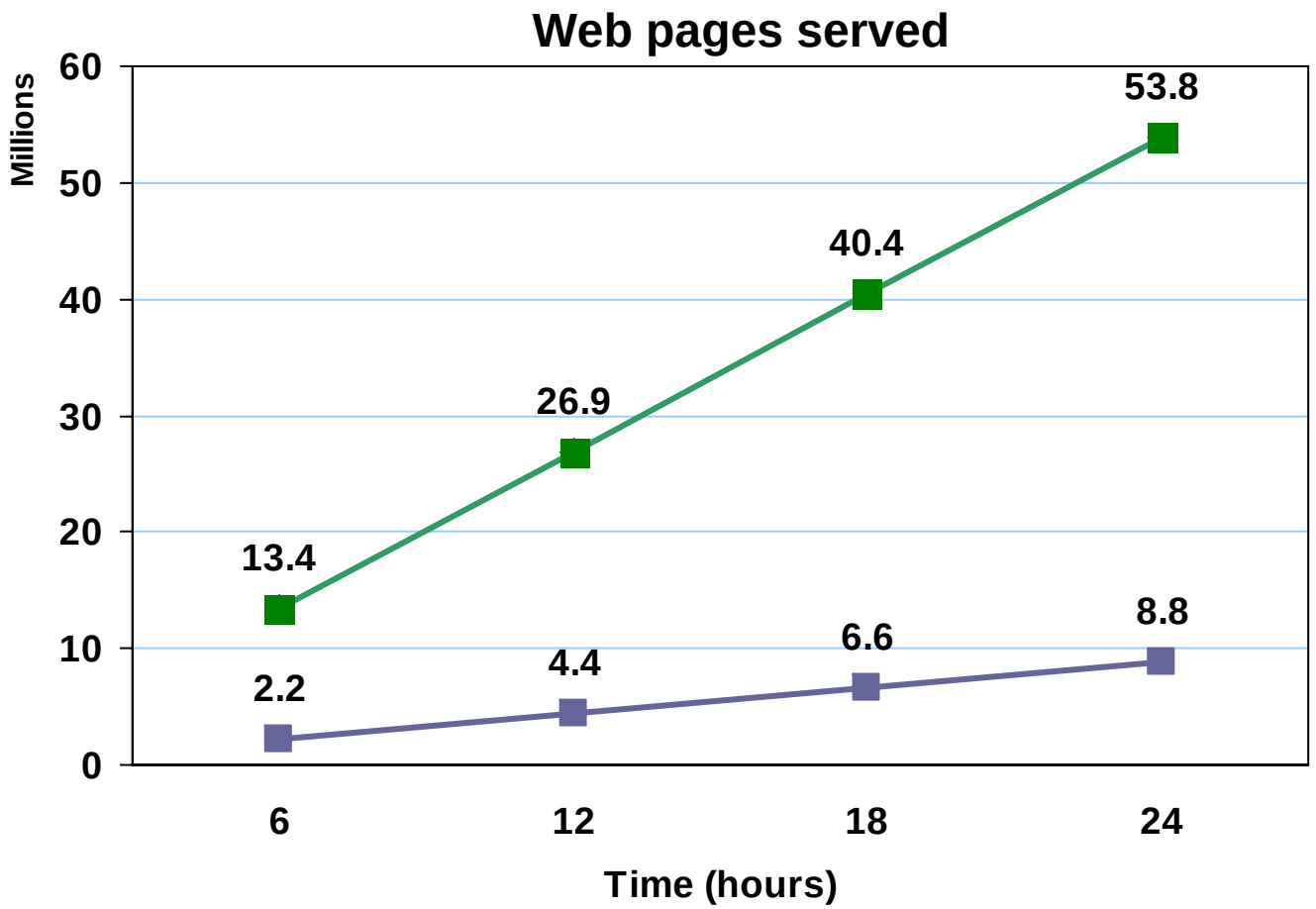
- IBM Power
- IBM zSeries
- AMD x86-64
- Intel EM64T
- Intel IA64
- And all 2.4 based architectures

New networking protocols

- SCTP, IPv6, Mobile IPv6, DHCPv6

Performance improvements

Web serving on 2.4 and 2.6



Six times performance improvement!

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

IBM alliances with Linux distribution partners

- **Novell**
  - SUSE Linux Enterprise Server
    www.novell.com/products/linuxenterpriseserver/
  - Certified at Common Criteria EAL4+ and COE
- **Red Hat**
  - Red Hat Enterprise Linux
    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 Usage

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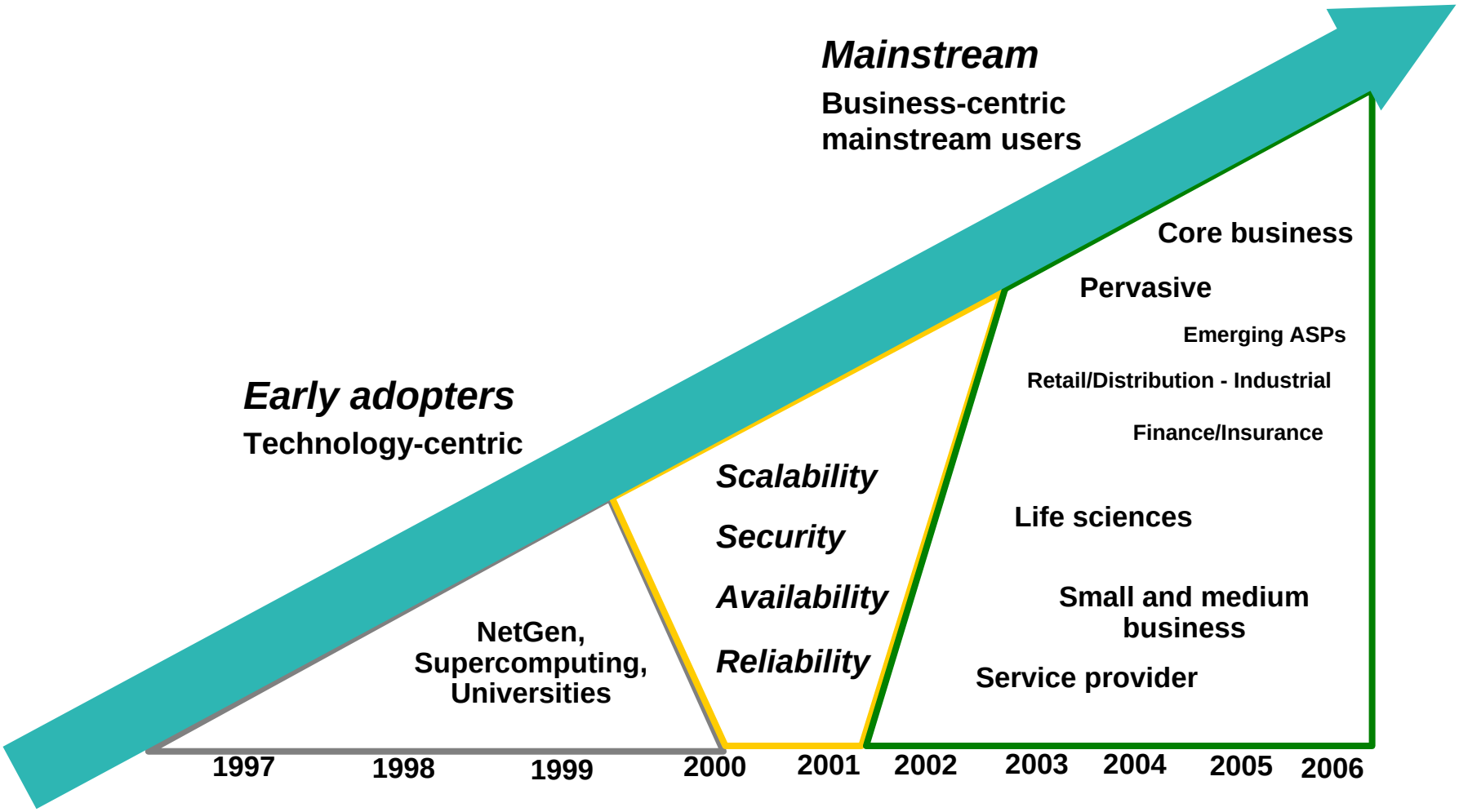
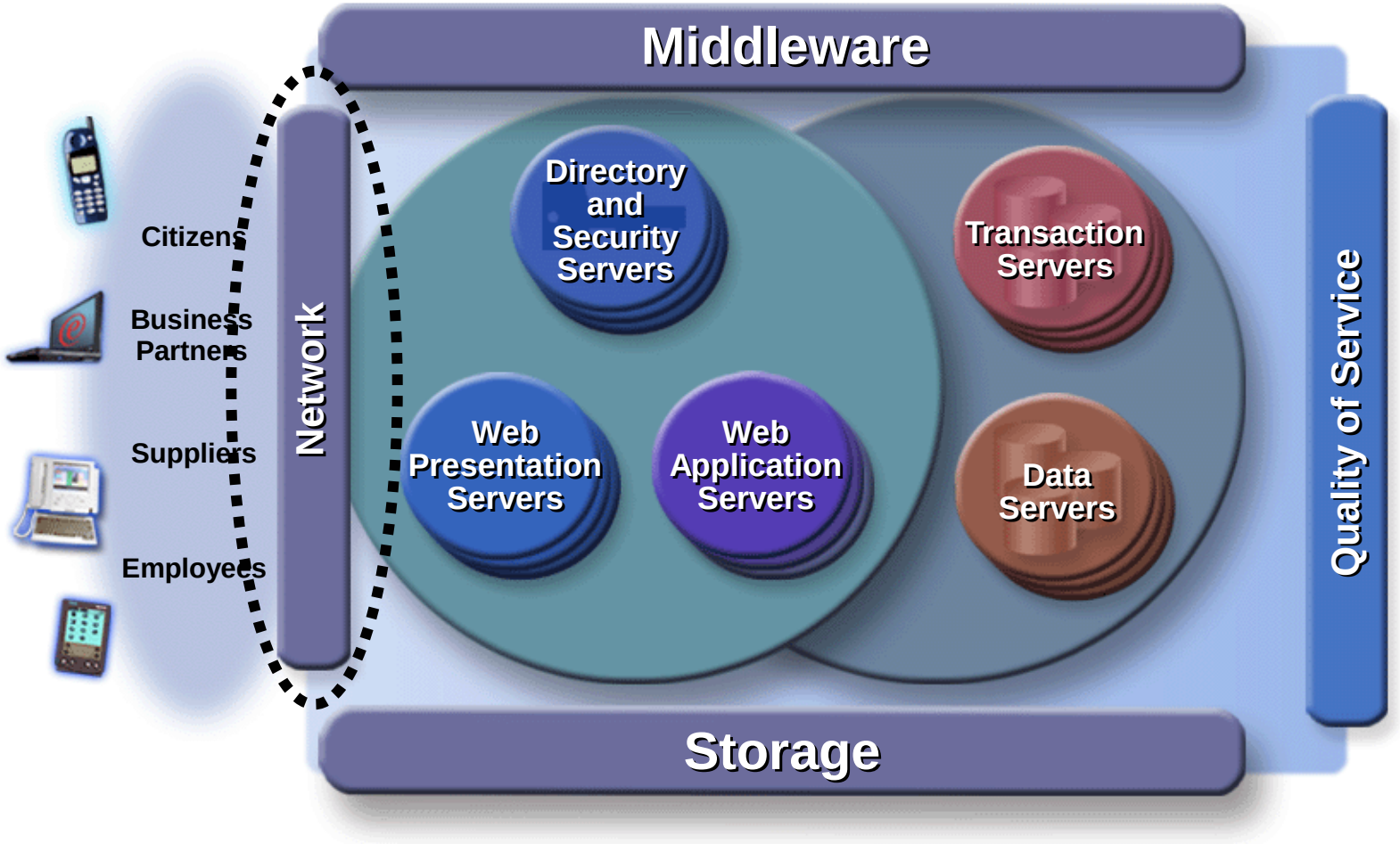
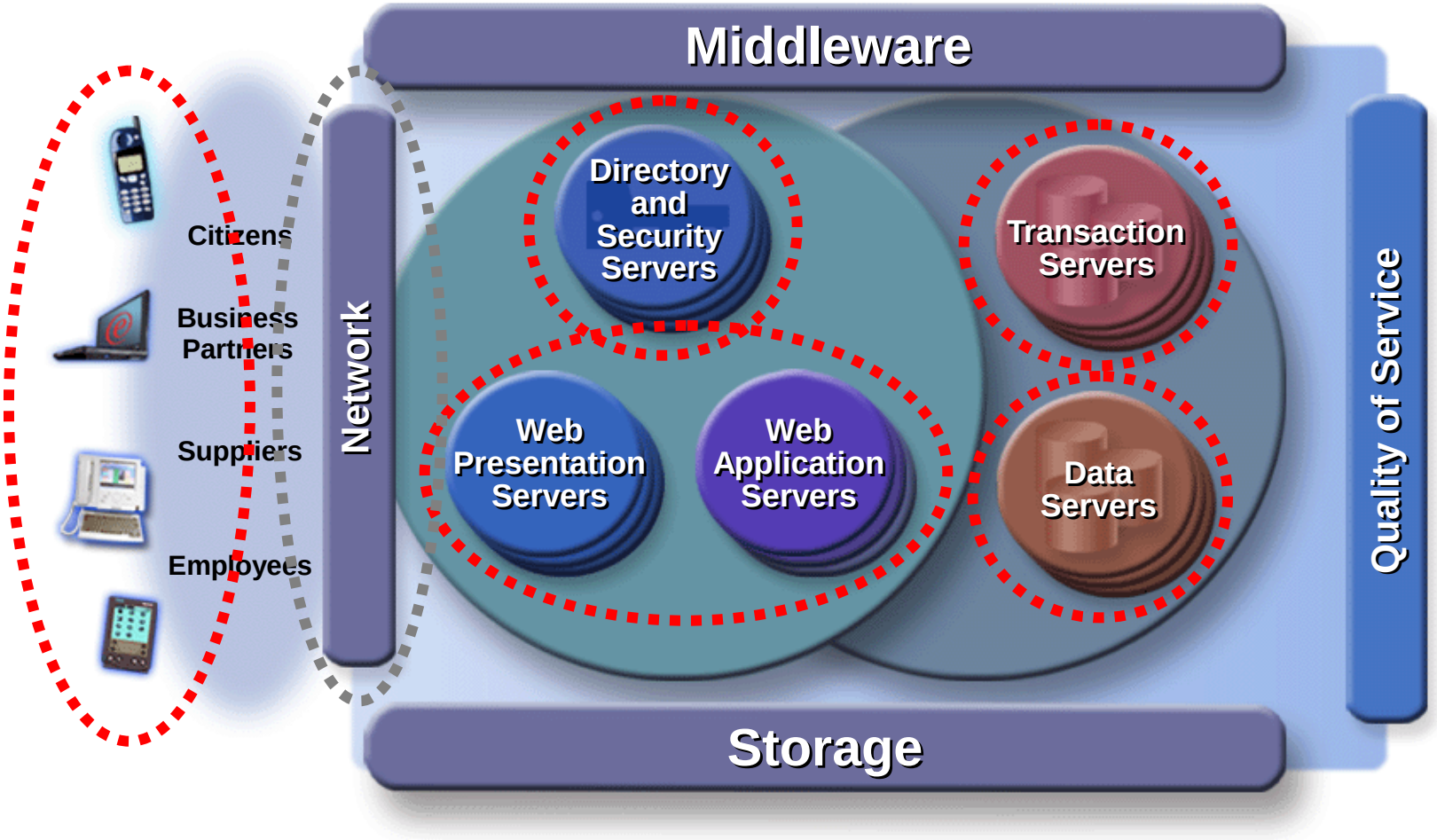
Taking Linux Mainstream



“Traditional” view of Linux fit is outdated

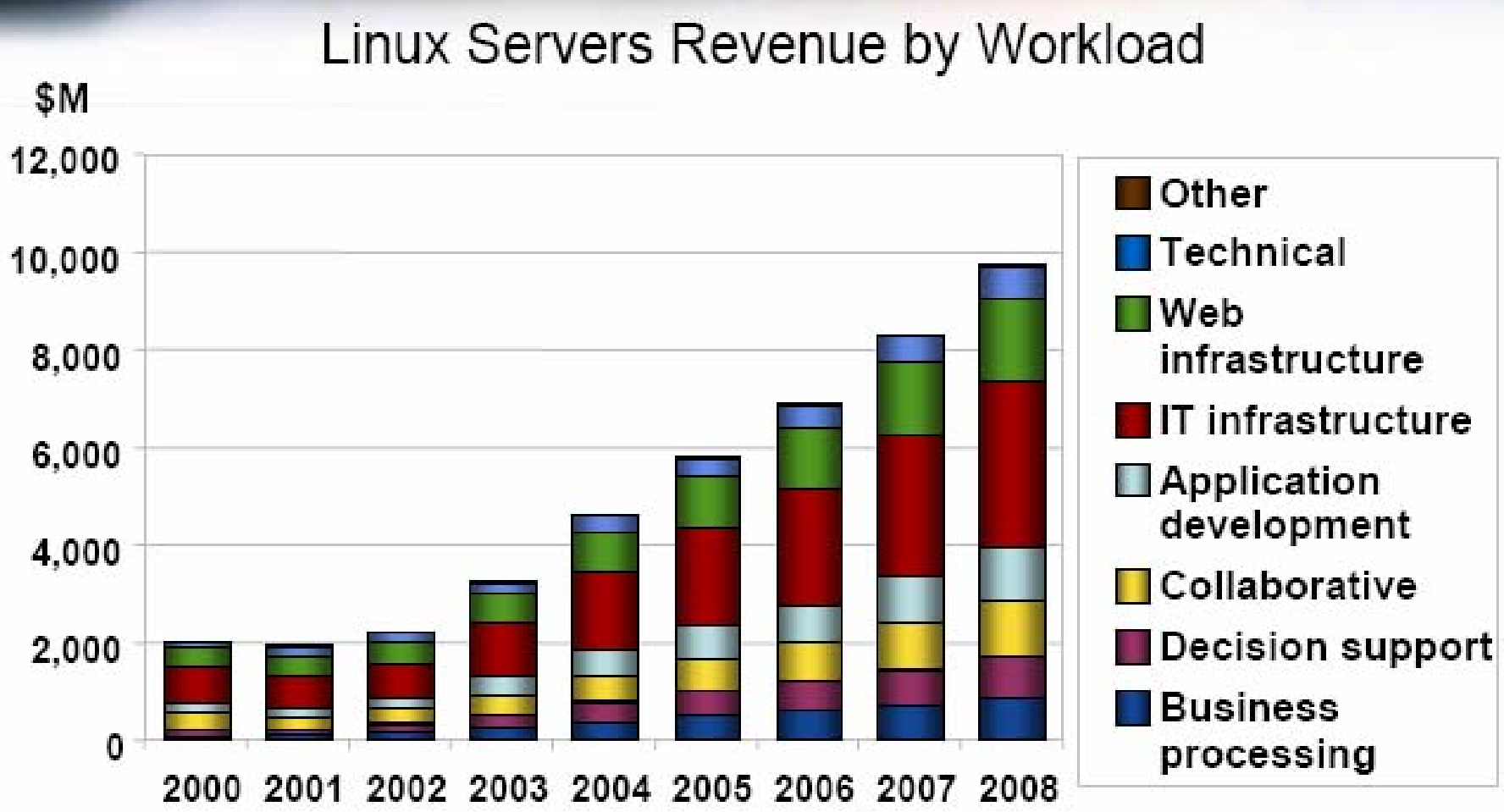


Linux fits everywhere!



Linux Servers Will Shift Their Workload Mix

IDC
Analyze the Future



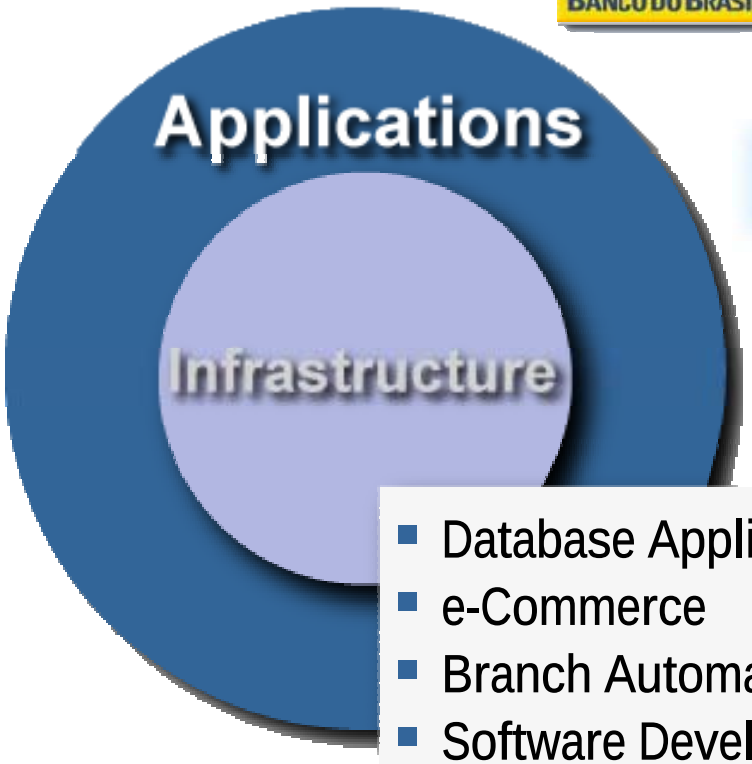
Source: IDC Directions 2005

Linux Evolution to Mainstream

Companies Started with Infrastructure Implementations

Linux Evolution to Mainstream

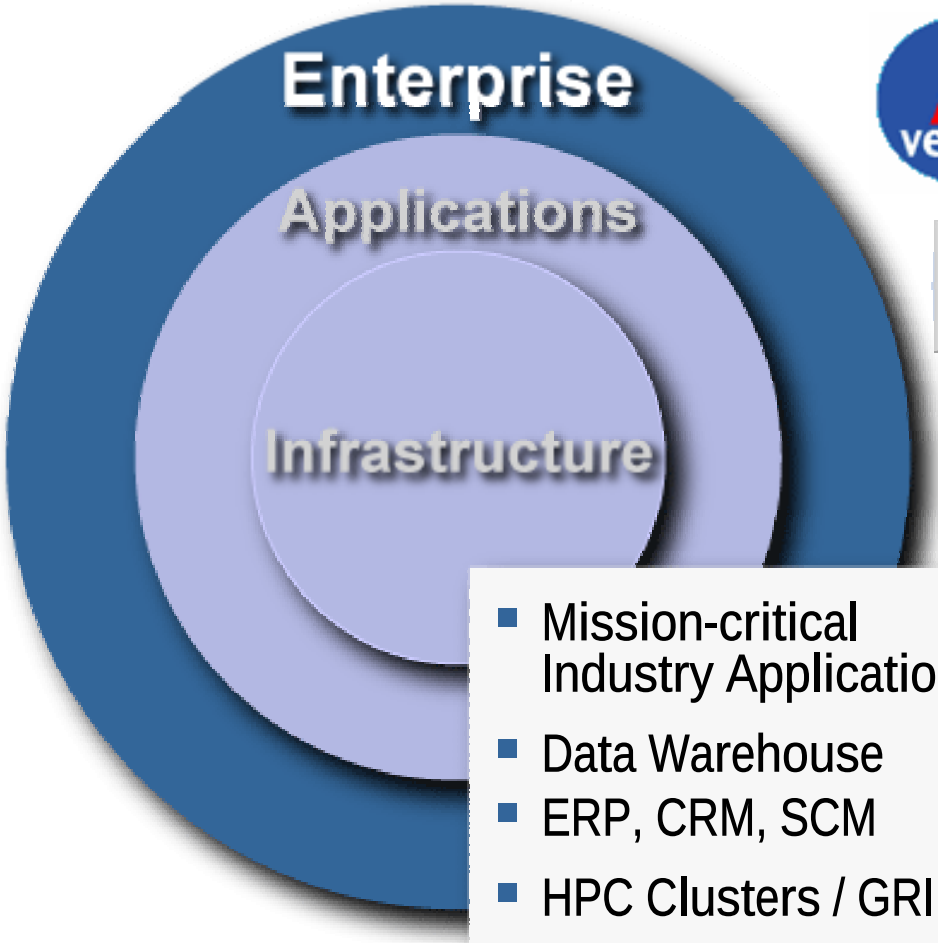
Database and Compute Intensive Applications Were Next



- Database Applications
- e-Commerce
- Branch Automation
- Software Development

Linux Evolution to Mainstream

Building on Success, Enterprise Applications Followed

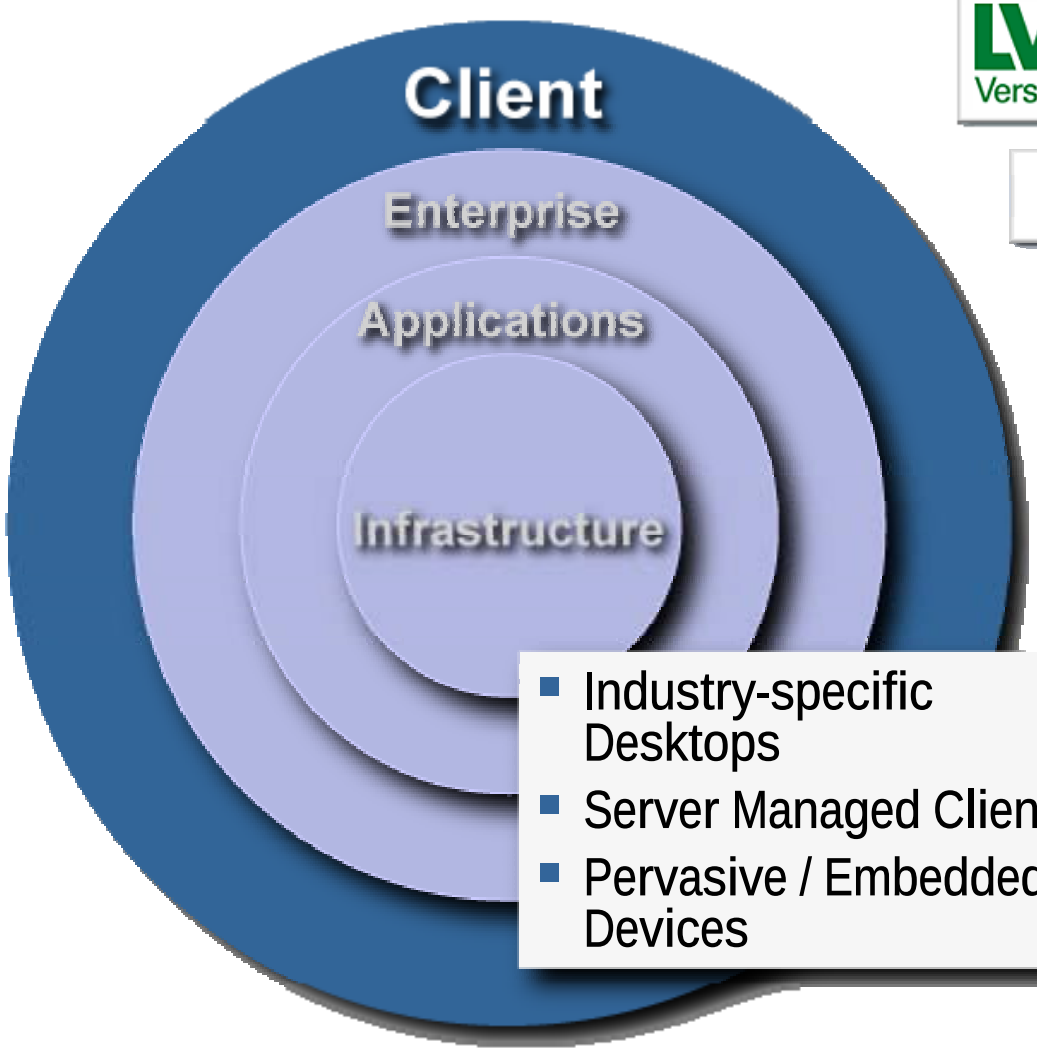


- Mission-critical Industry Applications
- Data Warehouse
- ERP, CRM, SCM
- HPC Clusters / GRID

UBS
Deutsche Bank
vedes
Standard Chartered
FAMILY DOLLAR
HERZBERG INSTITUTE OF ASTROPHYSICS
GREAT LAKES EDUCATIONAL LOAN SERVICES, INC.
MorganStanley
THE BOC GROUP
techron
Medizinal- und Stanztechnik Raron
National Research Council Canada
Goldman Sachs
Prudential Financial
Growing and Protecting Your Wealth®
SAP
RITCHIE BROS. Auctioneers
MOBATIME
LEHMAN BROTHERS

Linux Evolution to Mainstream

Companies Looking for New Options to Leverage Linux

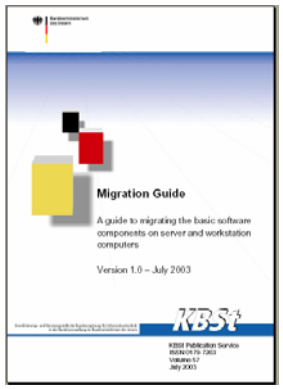


- Industry-specific Desktops
- Server Managed Clients
- Pervasive / Embedded Devices

LVM Versicherungen
CASAS BAHIA
GAD IT für Banken
Senato della Repubblica
NISSAY
PIONEER
BANCO DO BRASIL
TRÖBER LIGHTERS · GIFTS · INCENTIVES
CHUNCHEON CITY
L.STROETMANN
Kinki University
stadt schwäbischhall
CAIXA SEGUROS
Ravate rêver, réaliser
BPM Banca Popolare di Milano
NIKKEI NET 日本経済新聞社

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
- **Denmark Board of Technology**
  - Open-source software in e-government
    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



IBM and Linux

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IBM Linux Investments

Ready for IBM @server with Linux

Linux Partners
EAL2 **2003**
EAL3 **2004**
EAL4 **2005**

Patents
2005

Open Source Contributions
1998 to 2004
2005

Chiphopper
2005

Linux Technology Center 1999

Linux White Papers and RedBooks

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

Open Source Development Lab 2000

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

Business Partners

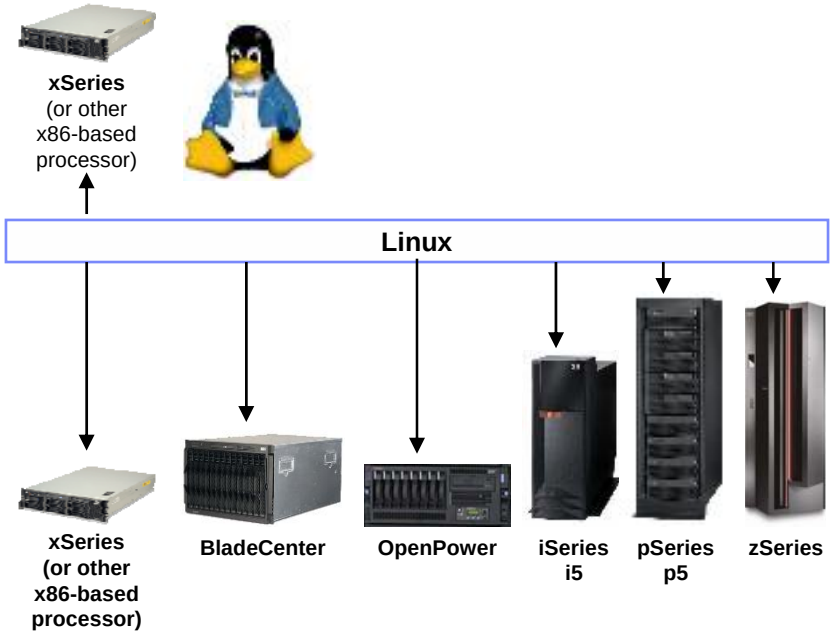
Linux Services
1999

ibm.com/linux

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



Ready for IBM @server with Linux

- 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

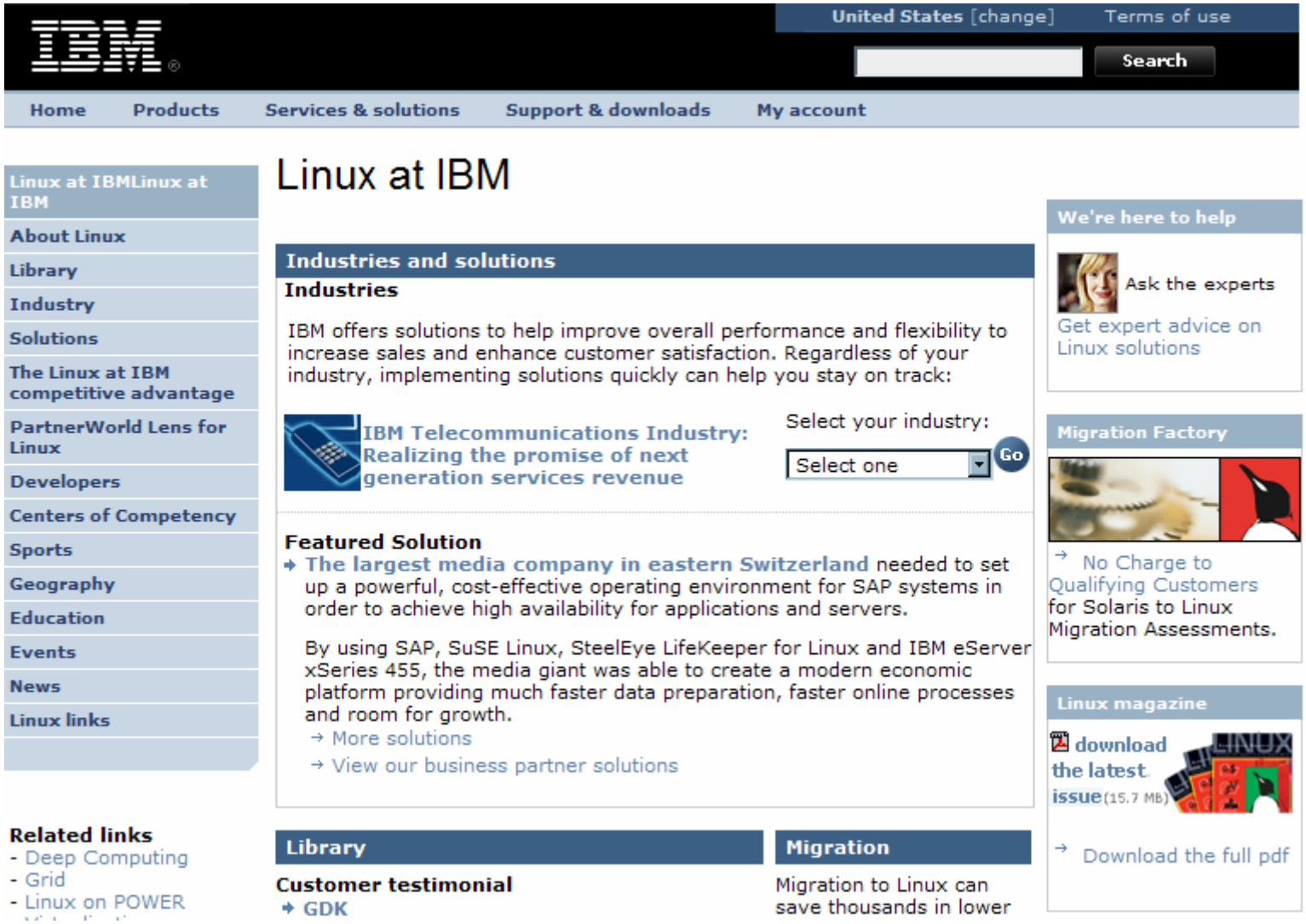
- **IBM well accepted by the Linux community**
  - 600+ developers world-wide
- **IBM engineers leading enterprise Linux focus**
  - Deeply involved in Linux kernel development
    - Linux on POWER and zSeries
  - Motivated community to focus on addressing scalability and threading issues
  - Defect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

IBM Open Source Contributions

- **IBM participates in over 130 Open Source projects**
  - Apache, PHP, CIFS, Samba, Geronimo, …
- **IBM projects contributed to Open Source include:**
  - Secure Mailer (as Postfix)
  - Andrew File System (as OpenAFS)
  - Eclipse (integrated development environment)
  - Cloudscape (to Apache as Derby database)
  - Research Hypervisor and Secure Hypervisor (to Xen)
  - Jikes (Java compiler)
- **500+ patents into a "patent commons" to help drive innovation and future software development**

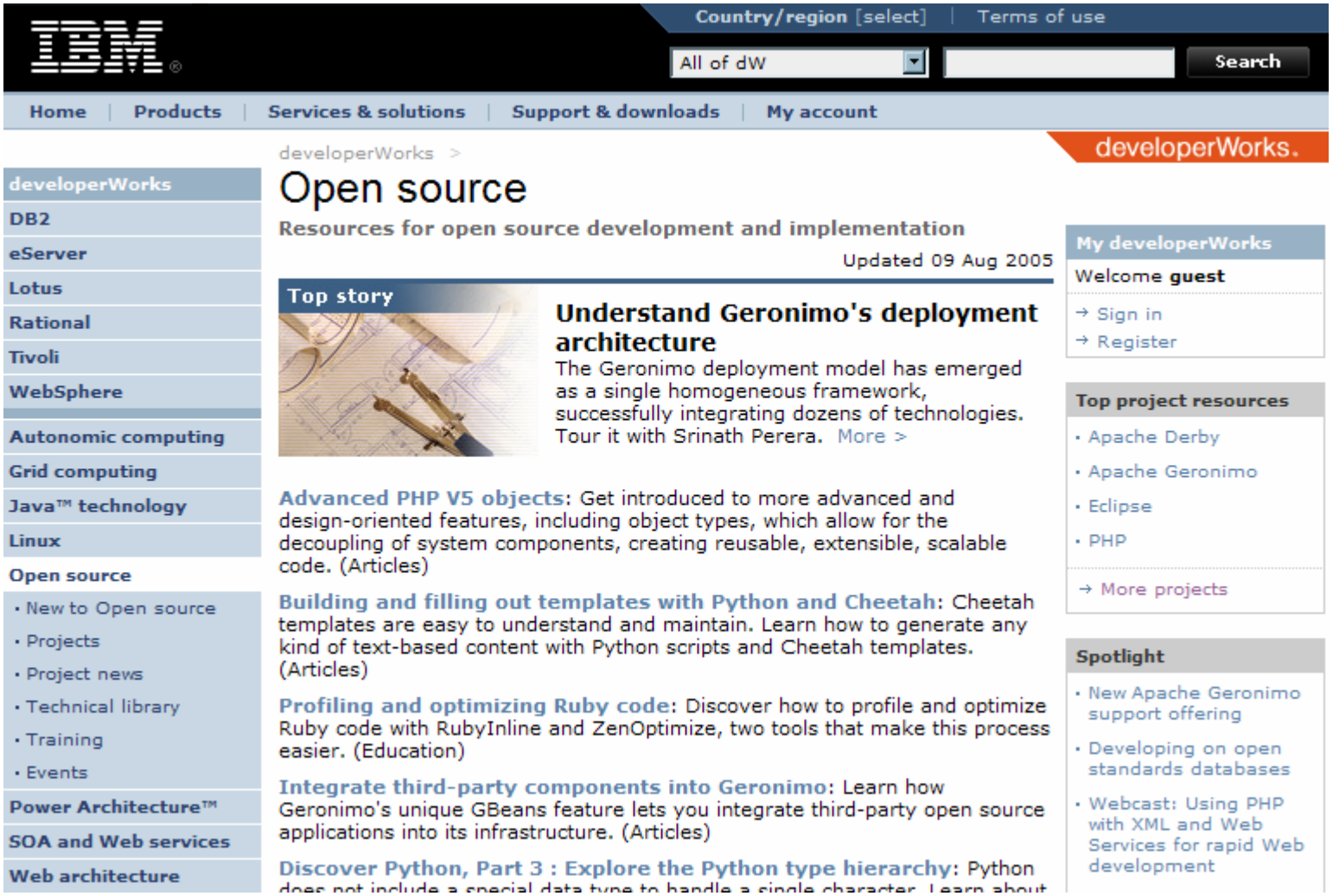
IBM Linux portal

ibm.com/linux



IBM developerWorks for Open Source

ibm.com/developerworks/opensource

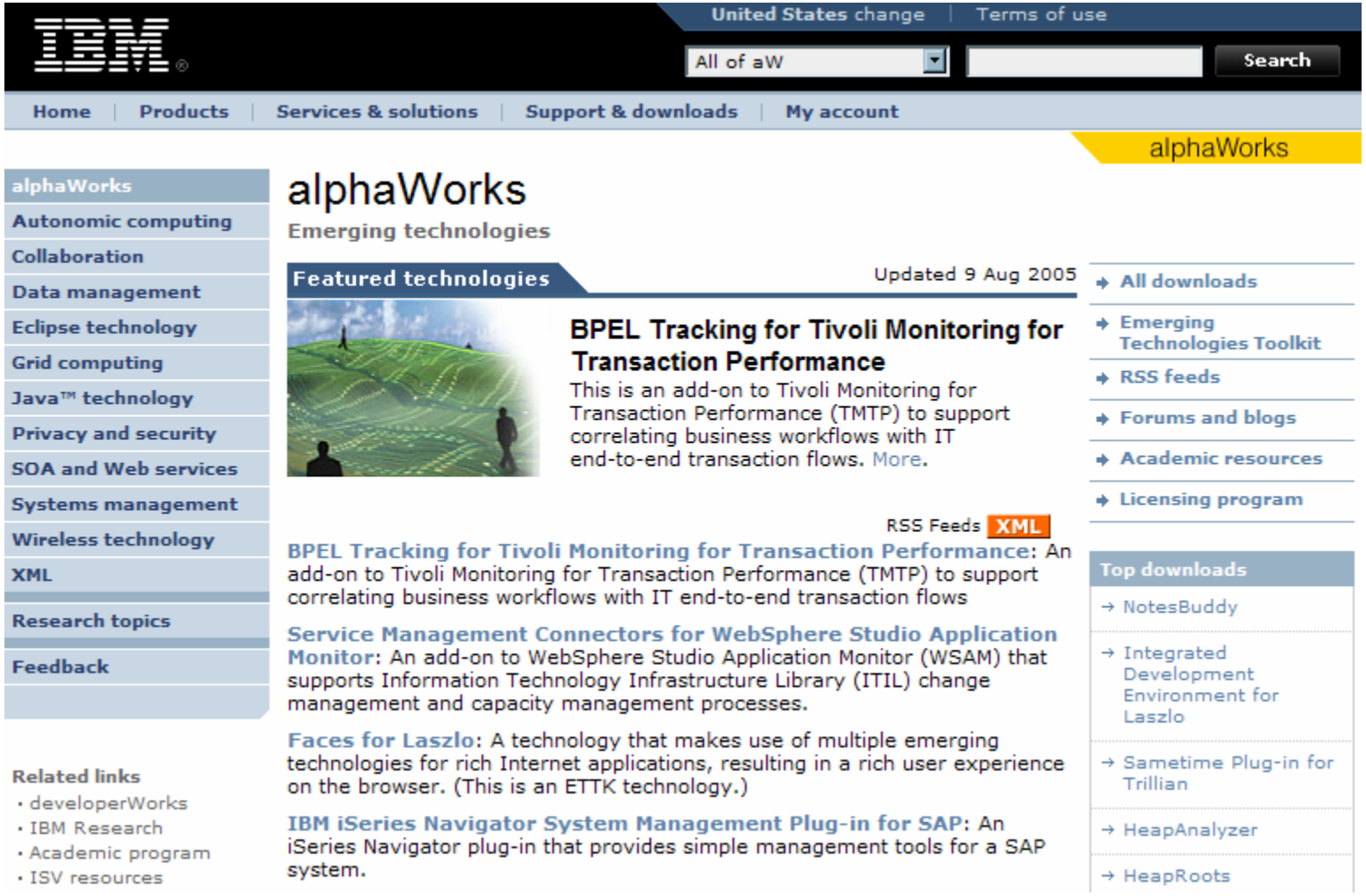


IBM developerWorks for Linux

ibm.com/developerworks/linux

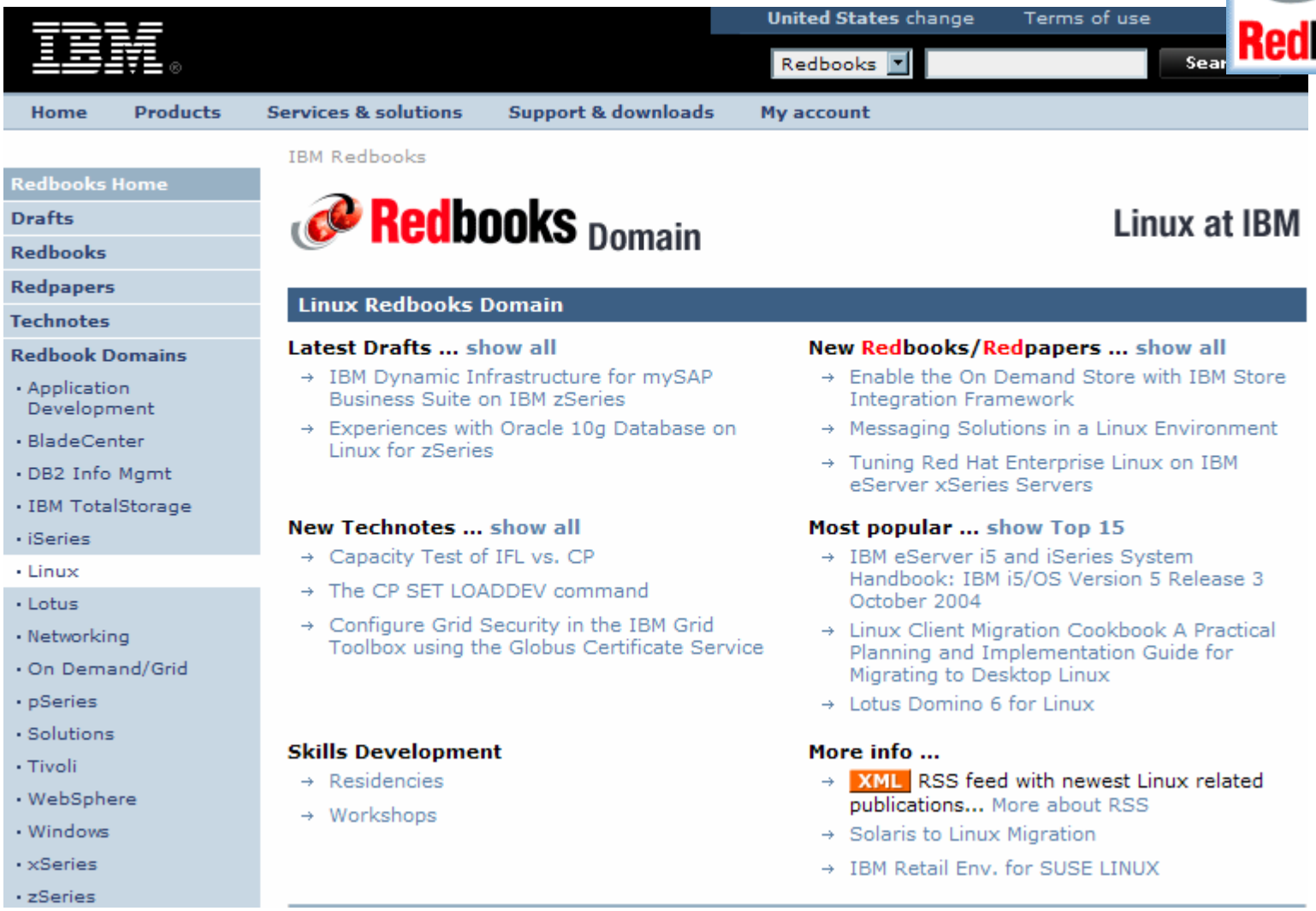
IBM alphaWorks

ibm.com/alphaworks



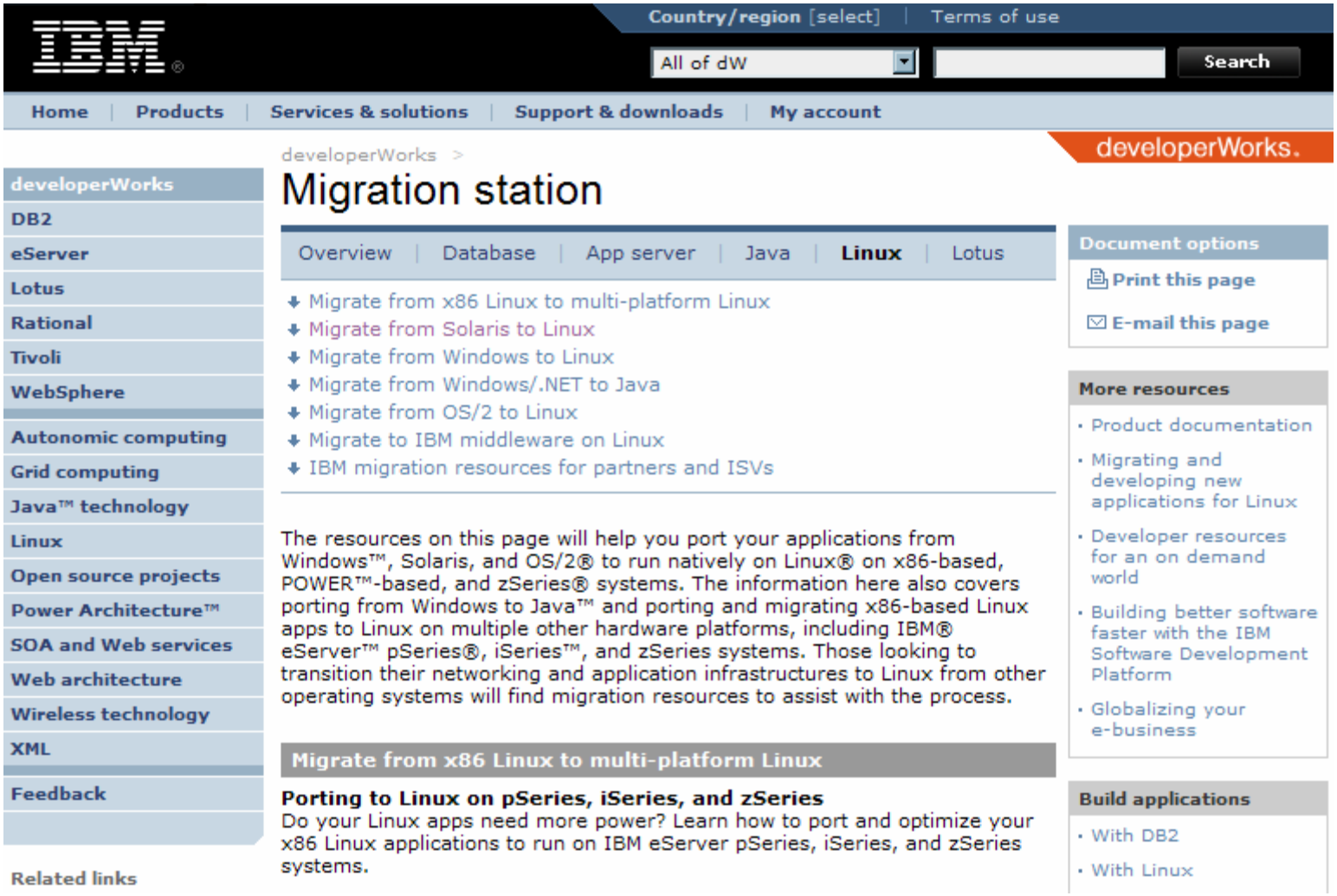
IBM Redbooks

ibm.com/redbooks/portals/linux



The IBM Migration Station

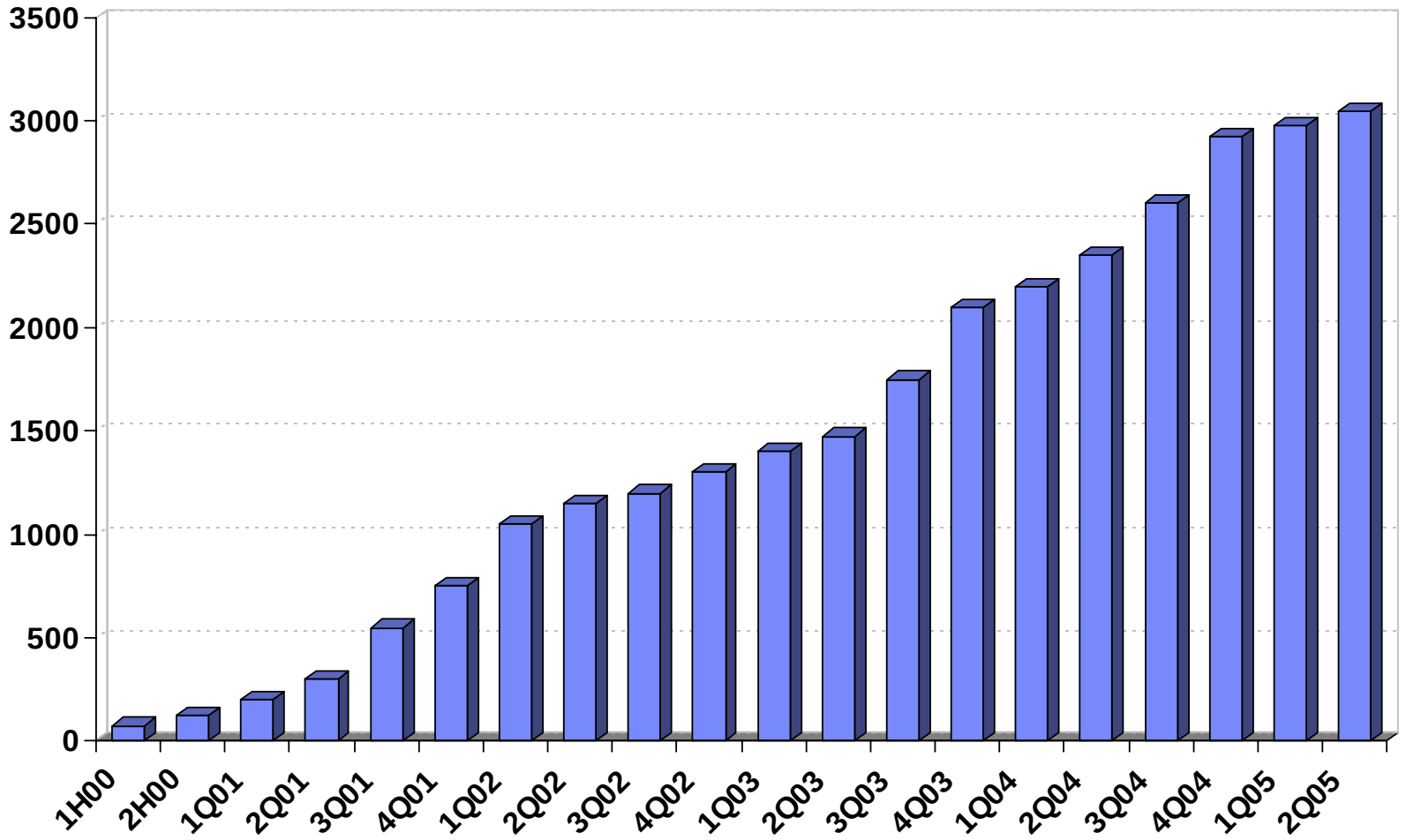
ibm.com/developerworks/ondemand/migrate/linux.html



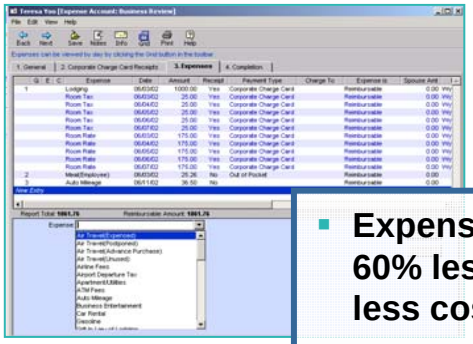
Linux: Transforming IBM's IT infrastructure
Providing Key Business Solutions

- **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

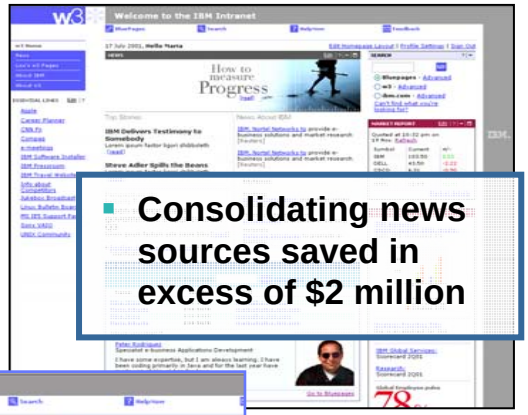
3044 Linux Servers in Production at IBM
At start of 2Q2005



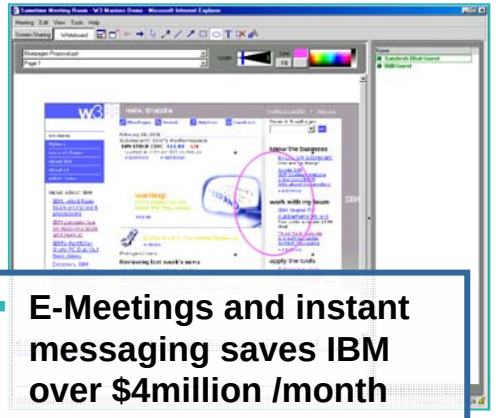
Intranet – "On Demand Workplace" at IBM



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

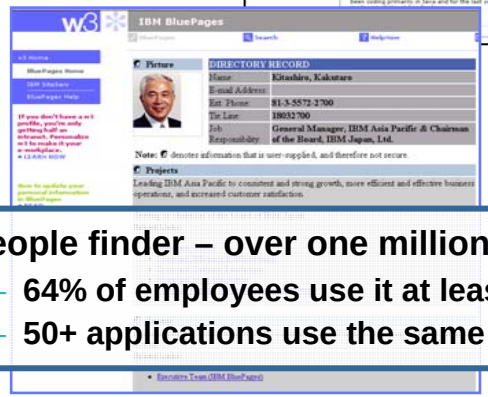


- Consolidating news sources saved in excess of $2 million

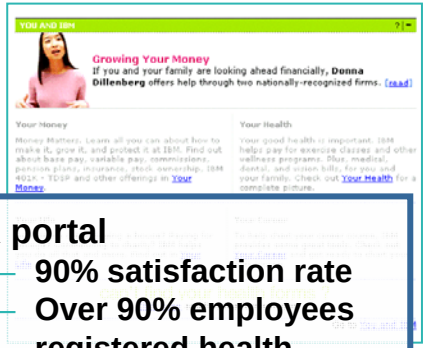


- E-Meetings and instant messaging saves IBM over $4million /month

- Worldjams, jukeboxes, personalized news, discussion forums



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



- 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

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

Workplace application development runs on Linux on zSeries

IBM Servers and Linux
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

- **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 350 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	Har
DB2 Administration Client	8.2	xSe

IBM @server® zSeries

Tivoli software	Version - Release	Hardware	Kernel/Distribution	Sources
			t Enterprise inux Enterprise 8 inux 1.0 rtal Manager: t Enterprise inux Enterprise 8 inux 1.0 AL: t Enterprise inux Enteprrise 8 inux 1.0	Software Announcement 203-315

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

IBM Global Services and Linux
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**

Summary

Next Steps

ON DEMAND BUSINESS™

- **Familiarize yourself with Linux**
- **View Linux as a valid alternative for IT systems**
- **Incorporate open source software development into IT strategies**
- **Look at Linux to see how it can lower costs, increase reliability and security, and improve service**

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Notices