LUGOD Meeting
May 6, 2003
IBM and Linux

Roy Greenwood
Linux Evangelist
IBM Americas Linux Impact Team
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Agenda

IBM's Commitment to Linux
  • OSS, Focus Areas
  • IBM HW, SW, SVCs
Linux in the Marketplace
Linux at IBM
  • "we're eating our own cooking"
Linux on the IBM eServer platforms
Who's Using Linux
  • customers running their businesses on Linux
What's hot with Linux
  • client strategy
  • Grid computing
  • autonomic computing
IBM's Commitment to Linux
IBM Supports Linux 100%
IBM Linux Mission - a $1 Billion Commitment and Counting

- **Mission:** Accelerate maturation of standard, architecture-independent Linux into Enterprise
  - Or "Make Linux Better!"
- Extend value-net of System vendors, Linux companies, and existing Linux open source community to drive improvements back into Linux
- Linux Technology Center
- Linux Integration Center
- Linux Porting Centers
- Linux Distributor Partnerships
- Linux ISV Partnerships
- Linux Center of Competence
- IBM Product brands retain
  - Responsibility for platform or software specific enablement (unique device drivers, service processors, hardware RAS enablement....)
  - Product port, enablement, distribution, etc.
  - Linux solutions (HW + Linux (from one of the distros) + HW-dependent Linux elements (from one of the distros) + MW + apps + services) including full system test
  - Identification of Linux technical requirements --> Linux Technology Center
Member of the Linux Community

- IBM well accepted by the Linux community
- Linux Technology Center
  - 250+ Developers worldwide
  - 70+ active Open Source projects
  - 80% of IBM's contributions are accepted
- IBM engineers leading enterprise Linux focus
  - Deeply involved in v2.5 and 2.6 of Linux kernel development
  - Motivated community to focus on addressing scalability and threading issues
  - Defect support for a set of core Linux packages
  - Led formation of Linux Test Project to validate reliability, robustness, and stability of Linux distributions
  - Key participant and contributor to "Carrier Grade Linux" project
Experiences with the OSS Community

- Open source developers and traditional software developers have the same goals
  - Quality, high-performance, serviceable software that solves real customer problems

- Developers trained on proprietary SW can successfully become effective OS developers (hundreds of proof points)

- Linux community is enthusiastic about making Linux a mission-critical OS and supporting the necessary Enterprise features
  - Scalability, security, reliability, serviceability, performance, availability, manageability, standards, ...

- IBM is an accepted peer and partner in the Linux development community

- The OS community includes all of us
IBM Linux Distribution Partnerships

- **IBM Does Not Sell Their Own Linux Distribution**
- **Worldwide premier partnerships for hardware, software, services, solutions and marketing**
- **Product and/or geography based partnerships with other selected Linux Distribution companies**
Linux Distributors Combine their Power

**UnitedLinux = Open Industry Consortium**

- **Concept:**
  - Binary-compatible Linux distribution, branded "UnitedLinux"
  - Initial Members: Caldera, SuSE, Turbolinux, Conectiva
    - Open to others
    - "IBM will continue to support Red Hat Linux across its key hardware, software and services offerings, it will also fully support UnitedLinux, which will make it easier than ever before to create a wide variety of Linux-based solutions for any size e-business," Steve Mills, IBM senior vice president SWG

- **Business Model:**
  - Linux distributors add software and services on top of UnitedLinux.
  - Linux distributors maintain brand names with "UnitedLinux Inside"
  - UnitedLinux promotes the brand, issue memberships, certifications, pay royalties, manages requirements
  - SuSE acts as UnitedLinux systems integrator

- **Implementation:**
  - Cross-platform support for all IBM @server platforms, key middleware
  - Worldwide language support, standards based (e.g. LSB 1.1, LI18NUX)

IBM @server. For the next generation of e-business.
# IBM Focus Areas

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Software</th>
<th>Services</th>
<th>Alliances</th>
<th>Open Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Servers" /></td>
<td><img src="image" alt="All Major Applications" /></td>
<td><img src="image" alt="Support And Training Consulting" /></td>
<td><img src="image" alt="Distributor Partnerships" /></td>
<td><img src="image" alt="Code Contributions Technical Resources" /></td>
</tr>
<tr>
<td>zSeries, pSeries, iSeries, xSeries, ThinkPads, NetVista, Blades</td>
<td>WebSphere, Domino, DB2, Tivoli, VisualAge Java, MQ Series, ViaVoice, Connectors, Rational</td>
<td>Education Porting TCO Studies Redbooks, Supportline, Consulting Services OnDemand Client Desktop LSW</td>
<td>Distributors Caldera, Red Hat, SuSE, Turbolinux, United Linux</td>
<td>AlphaWorks DeveloperWorks LTC, LIC, OSDL, LCoC, LCDS, LIT, LSW</td>
</tr>
</tbody>
</table>
IBM's Commitment to Linux

Technical Support

ISV Porting Center

Linux Technology Center

Linux Whitepapers

OSDL

Linux Sales Specialists

Products

Linux Services

Linux - Enabled BP's

ibm.com/linux

Chart 13
IBM Services for Linux

Clusters
- Support Line
- x1300 Installations
- OEM Procurement
- Hardware Setup
- Software Installation

Middleware Enablement
- DB2
- WAS
- MQSeries
- ISV’s
- QuickStarts

Managed Operations

Training
- 5 languages; 20 countries
- All eServers
- Web-based and classroom
- Cluster workshops - New!

Web Hosting
- xSeries
- zSeries Linux
- e-Sourcing coming ’02

Workload Consolidation
- File/Print, Webserving
- Bynari, Sendmail coming ’02
- Linux Solution for e-Business
- Application Porting
- Solaris to Linux Migration

Technical Support
- Support Line
- Account advocate
- Advanced Support
- All eServers including clusters
- 24/7

Clusters Support Line
- x1300 Installations
- OEM Procurement
- Hardware Setup
- Software Installation

Middleware Enablement
- DB2
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- MQSeries
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Technical Support
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Chart 14
IBM's Products and Services for Linux

- xSeries
- zSeries
- iSeries
- pSeries
- POS
- Clusters
- Blades
- Storage Systems
- Open Source Consulting
- Workload Consolidation
- Solaris to Linux Migration
- Grid Consulting
- IBM JVM
- DB2 Universal Database (UDB)
- Intellistation
- WebSphere Commerce Suite
- WebSphere Application Server
- WebSphere MQ
- Lotus Domino
- Tivoli Storage Manager
- DB2 Universal Database (UDB)
- on demand Linux Services
- Thinkpad
- NetVista
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- DB2 Universal Database (UDB)
IBM Framework for eBusiness Product Portfolio

- **Tivoli**
  - Tivoli Storage Manager Client 4.2
  - Tivoli Enterprise Console 3.7.1
  - Tivoli Software Distribution 4.0
  - Tivoli Distributed Monitoring 4.1
  - Tivoli Workload Scheduler 8.1

- **Lotus Domino**
  - Rapidly develop and deploy collaborative applications with base eMail, group calendaring and discussion DBs
  - Advanced capabilities for managing work and information flow
  - Integration with database, ERP and transaction systems

- **IBM WebSphere & IBM MQSeries**
  - Application Servers
    - Speed transition from publishing to Web-based apps
    - Add dynamic data, business logic transactions, and/or connections
    - Runs on Apache Web Servers
  - MQ Series
    - Connect applications on Linux to applications on other systems

- **IBM DB2**
  - Best performing database for Linux, UNIX and NT/2000
  - Handles multimedia as well as conventional data
  - Optimized for Web applications
  - Delivers enterprise class reliability and availability
  - Attaches to Linux Apache Web servers

For more information, visit [www.ibm.com/linux/software](http://www.ibm.com/linux/software)
Application Focus Areas

Financial / Insurance Services
- Risk management
- Branch banking
- Payments

Communications
- Web & e-commerce infrastructure
- Carrier Grade Linux
- Digital content creation

Industrial
- Upstream petroleum
- Computer Aided Engineering
- Electronic Design Automation

Education / Government / Lifesciences
- GRID computing
- Lifesciences bioinformatics
- Higher education

Distribution / Retail
- Point of Sale
- Kiosk and store operations
Linux in the Marketplace
Next Generation e-business

More connectivity, more devices
- Data transaction servers
- Web application servers
- Appliance servers
- Pervasive devices

Next generation e-business
- Technology advances
- Increased integration
- Business innovation
- Standards and open source

“Linux will do for applications what the Internet did for networks”
Dr. Irving Wladawsky-Berger
Finding a Trend

The three shifts had things in common:
- $$ and people move towards the trend
- Community, Standards based
- Established industry players say, "Who needs it?"
Market Evolution

Crossing the "Chasm"

Early Adopters
Technology-centric

NetGen, Supercomputing, Universities

Mainstream
Business-centric, mainstream users

Core-business
Pervasive
Emerging ASPs
Retail/Dist. - Industrial
Finance / Insurance
Life Sciences
Small/Med Business
Service Provider

Scalability
Security
Availability
Reliability

Industry Acceptance


IBM eServer. For the next generation of e-business.
Linux will become the dominant server operating system in the United States by 2005.

*Stacey Quandt, Giga, Business 2.0,*

Linux will have a "breakout year" in 2002. Now it seems clear that Linux has become a viable alternative for enterprise use.

*IDC, Dan Kusnetzky*

By 2006, Linux will be a key foundation for a strategic, cross-development-platform environment, accelerating Unix server consolidation, while creating a powerful alternative to Windows .NET.

*Gartner*
**Linux and the Customer**

**Linux Value Factors**
- Cost Effective
- Reliability
- Performance
- Open Standards

**Customer Activity Evolution**

<table>
<thead>
<tr>
<th>2000</th>
<th>2001</th>
<th>2002</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firewall</td>
<td>S&amp;TC Clusters</td>
<td>Commercial clusters</td>
</tr>
<tr>
<td>Print/File</td>
<td>Infrastructure consolidation</td>
<td>Application Development and consolidation</td>
</tr>
<tr>
<td>Web Server</td>
<td>e-commerce</td>
<td>General business applications</td>
</tr>
<tr>
<td>e-mail</td>
<td>Replicated (e.g. Kiosks, in-store)</td>
<td>Expanding client &amp; embedded apps (e.g. Telco network)</td>
</tr>
<tr>
<td>Network</td>
<td>Embedded devices</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Client in emerging mkts</td>
<td></td>
</tr>
</tbody>
</table>

Source: IBM & Secondary Research

Source: IBM Market Research 2001

Chart 23
Linux... More than Just Cost

Question: Based on what you have seen or heard so far with Linux, how would you rate Linux on the following aspects?

- Reliability
- Acquisition Costs
- Performance
- Value of Open Source
- Security
- TCO
- Scalability

Attributes Rated "Outstanding"

Note: Includes responses from 500 Linux users

Source: IBM Market Research 2002
Linux Momentum Building ...

Source: IBM Market Research
Software Developers Adopting Linux

Chart 26
Linux at IBM
"We're eating our own cooking"

"But most unique about the Linux Web site is its brand-new pair of redundant, load-balanced, xSeries servers flawlessly running IBM's first-ever GWA production Web hosting environment from Southbury. Yes, that's right, our Linux site is running Apache server on Red Hat Linux."
Linux Value Summary for IBM

### Financial Value
- Replace outdated OSs with little additional capital.
- Selectively enables use of less expensive Intel hardware.
- Consolidate multiple server images on single H/W box without rearchitecture.
- Operating system is "free".

### Technical Value
- Opportunity to quickly replace outdated servers OS's.
- Opportunity to deliver feedback for product improvement to open source community and IBM product development.
- Scalable OS that begins lower on the H/W scale than AIX.

### Staffing Value
- Embracing "hot" technology attracts best technical talent.
- College I/T students deeply involved with Linux.
- Additional technical skill path alternative to NT to retain top talent.

### Marketing Value
- Demonstrate that we use what we sell.
- Leverage internally-developed Linux skills in services marketing opportunities.
- Enables selling IBM solutions as alternative to Microsoft/Sun/HP.
Internal IBM Linux Projects

Web Infrastructure

Linux Portal
Web Content Management System
Advanced Search Engine
e-Workplace Development Environment
Intranet Forums
e-Workplace Special Events
IBM Customer Order Web Portal (planned)
Internal IBM Linux Projects

Security
- Security Assessments
- Virus Detection
- Storage Architecture Security Directory
- e-mail Anti-Virus Scanners

Monitoring
- Performance Monitoring
- Asset Monitoring
- Operations: e-hosting and network management
Internal IBM Linux Projects

File Serving
- File & Print Servers

Manufacturing
- Microelectronics Wafer Mfg. & Test
- Electronic Design Automation
- Test Engineering
- Manufacturing Line Kiosks
- Software Development
- Open Source Bazaar
IBM Internal Linux Projects

Research

- Blue Gene Supercomputing Project
- Oceano Web Hosting Utility
Communications
Pager
E-mail

PDA functions
Calendar
To do

Interface
Touch screen
Roller
Wireless IR and RF

Future development
High resolution screen
Wireless internet services
A Commitment to Linux across the Entire Business
$10M+ in Savings

- Over 2,000+ production servers WW
- 100 customers, 30,000 internal users
- Linux on zSeries: Collaboration - replacing worldwide VM forums, 180+ VM guest images and 14 LPAR images
Linux on the IBM @server
Linux on IBM Hardware

IBM @server family

- **zSeries**
  - Legendary quality of service, security and scalability
  - Industry leading virtual partitioning for z/OS and Linux

- **iSeries**
  - Robust application integration and integrated operating system
  - High levels of security

- **BladeCenter™**
  - Highly manageable, modular infrastructure
  - Shared resources for business continuity
  - Performance density

- **Clusters**
  - Price and performance leadership in both UNIX and Linux environments

- **xSeries**
  - End-to-end portfolio on Intel processors
  - Revolutionary Enterprise X-Architecture technology for Intel

- **pSeries**
  - Outstanding performance and reliability
  - Uncompromising UNIX and Linux enablement

IBM @server. For the next generation of e-business.
What Is Linux for @server?

Runs native, in an LPAR and/or as a virtual guest

Pure Linux, an ASCII environment

Exploits IBM @server hardware
- 32 and 64 bit
- Floating Point
- Cryptography
- High Speed transport to traditional applications and data

High performance clusters with pSeries, xSeries and zSeries

Flexible virtualization on zSeries

Not a replacement for but Inter-operates with traditional @server operating systems on same or separate footprint
Industry's Broadest Linux Server Line

Linux for @server xSeries
The Point of Entry - Where Industry Standards Meet Enterprise Capabilities
- Appliance Servers
- Scalable Web Application Servers
  - xSeries 100
    - web servers
    - NAS servers
  - xSeries 330
  - xSeries 340
    - rack optimised
    - Clusters
    - Linux-ready
- General Purpose Servers
  - xSeries 220, 350, 370, 380
    - price/performance
    - High Availability
    - X-architecture
    - Clusters
- Data and Transaction Servers

Linux for @server pSeries
The Point of Integration - Where Linux Meets UNIX
- Native Linux 32 & 64
- Power3 / Power4 Floating Point Performance
- I/O Bandwidth and RAS
- Scientific & Technical, High End Clusters
- Toolbox for Linux Applications

Linux for @server iSeries
The Point of Coexistence - Where Linux Complements Integrated e-business Solutions
- Linux in a partition
- Integrates new ebusiness applications

Linux for @server zSeries
The point of consolidation - Linux Ascends to the Mainframe
- Pure Linux OS
- Exploits zSeries hardware
- Scalable, protected partitions
- Shared infrastructure
- Reduced cost of ownership

IBM @server. For the next generation of e-business.
## Basic eServer Comparison

<table>
<thead>
<tr>
<th></th>
<th>pSeries</th>
<th>iSeries</th>
<th>zSeries LPAR</th>
<th>zSeries z/VM</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Partitions / Maximum Linux Partitions</strong></td>
<td>16/16</td>
<td>32/31</td>
<td>15/15</td>
<td>Hundreds to thousands</td>
</tr>
<tr>
<td><strong>Server Deployment</strong></td>
<td>Possible reconfig of LPARs</td>
<td>Possible reconfig of LPARs</td>
<td>Possible reconfig of LPARs</td>
<td>Virtual server build only - no reconfig required</td>
</tr>
<tr>
<td><strong>Optimization</strong></td>
<td>Compute intensive / Floating point</td>
<td>Commercial small / medium business</td>
<td>Large scale servers I/O intensive (e-mail)</td>
<td>Large numbers light to moderate load servers</td>
</tr>
<tr>
<td><strong>Resource Sharing</strong></td>
<td>None</td>
<td>Virtual (shared) or dedicated I/O</td>
<td>Shared CPU &amp; I/O</td>
<td>Complete virtual sharing</td>
</tr>
<tr>
<td><strong>Dynamic Reconfiguration</strong></td>
<td>Future</td>
<td>Yes, OS/400 Only</td>
<td>Yes (Requires z/OS or z/VM)</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Interpartition Communication</strong></td>
<td>Physical Ethernet</td>
<td>Virtual LAN</td>
<td>HiperSockets</td>
<td>IUCV / VCTC HiperSockets</td>
</tr>
<tr>
<td><strong>OS Required</strong></td>
<td>None</td>
<td>OS/400</td>
<td>None</td>
<td>z/VM</td>
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</table>
Operating System Selection - Where Linux Fits Best

Where Linux Works Best

- On Intel architecture for traditional workloads
- On iSeries, pSeries and zSeries when many servers are needed
- For cost-sensitive environments
- For high availability applications
- For environments where open standards are crucial (e.g. governments)
- Where the application is available on Linux and not on other platforms
Positioning of IBM Operating Systems

- **zOS**
  - High-volume transaction processing and data acquisition/management
  - Top-end, mission critical core business applications

- **zVM**
  - Hundreds or thousands of Linux servers
  - Fast, easy server on demand
  - Application development and testing

- **OS/400**
  - Transaction processing
  - Ease-of-use, low total cost of ownership
  - Integrated system
  - Many third-party line of business applications available

- **AIX and Linux Affinity Toolkit**
  - High-end, high-performance industrial-strength Unix
  - Best-of-both-worlds with AIX + the AIX integrated Linux affinity toolkit to run Linux applications
IBM Blade Center

**The Technology That Outperforms**

- **Performance Density**
  - 2X density of existing 1U rack solutions
  - Latest, highest performance Intel processors
  - Comprehensive set of storage alternatives

- **Affordable Availability**
  - Unprecedented redundancy
  - No single point of failure = 24x7 availability

- **Network Integration**
  - Integrated Ethernet Switch = increased density
  - Simple management of switches with Common Director interfaces

- **Modular Scalability**
  - Ideal platform for "Scale Out" enterprise applications
  - Power/packaging/cooling designed with room to grow
  - Infiniband ready = investment protection
Linux for xSeries

Rapid Deployment with Confidence
- Linux Certification and Support Programs across 4 Linux Distributions
- Installation, Setup and Configuration Support for Linux Operating Systems
- 24 X 7 Direct Telephone and e-mail Support from IBM HelpCenters

IBM ServerProven Program
- Tested and Validated Configurations for all xSeries Servers
- Ensure maximum performance and functionality
- Install quickly, start up easily and run reliably
- Easily identify a business application validated on IBM Servers
- Validated, optimized and documented solutions
- Includes non-IBM hardware, OS and middleware
- IBM Director

IBM Cluster Architecture and Design

IBM Integrated Platform for ebusiness

Distributed, remote server implementations
xSeries: Broad Product Line Support for Linux

- **Clusters:**
  - 1300 Linux Cluster

- **Scalable Servers**
  - Uni to 4-Way SMP
  - xSeries 200
  - xSeries 220
  - xSeries 232
  - xSeries 240
  - xSeries 250

- **Universal Tower Servers**
  - Uni to 4-Way SMP
  - Excellent SMB Option
  - xSeries 220
  - xSeries 232
  - xSeries 240
  - xSeries 250

- **Rack Optimized Servers**
  - Uni to 8-Way SMP, 1U to 8U
  - xSeries 200
  - xSeries 220
  - xSeries 232
  - xSeries 240
  - xSeries 250

- **Blade Servers**
  - eXcaliber

- **Customer Segment Focused Solutions**
  - Small Business Solutions
  - Telco Solutions

- **IA-64**
  - 4-Way SMP
  - xSeries 380

- **Appliances**
  - Internet Caching Appliance
  - xSeries Appliance for Caching powered by WebSphere

- **Clusters:**
  - xSeries 135

- **Blade Servers**
  - eXcaliber

- **PWS**
  - IntelliStation Z Pro
  - IntelliStation M Pro
  - IntelliStation E Pro

- **Server Consolidation**
  - Distributed Enterprise
  - High Availability

- **SMB Applications**
  - Excellent SMB Option

- **Small Business Solutions**
  - Telco Solutions

- **Focused Solutions**
  - Telco Solutions

- **Small Business**
  - Telco Solutions

- **SMB Applications**
  - Excellent SMB Option

- **Clusters:**
  - Internet Caching Appliance

- **Blade Servers**
  - eXcaliber

- **PWS**
  - IntelliStation Z Pro
  - IntelliStation M Pro
  - IntelliStation E Pro
Linux on @server xSeries & Netfinity

- **Appliance Servers**
- **Web Application Servers**
- **General Purpose Servers**
- **Data and Transaction Servers**

**xSeries 100**
- Web servers
- Network Attached Storage servers

**xSeries 330**
- Rack optimized
- Clusters
- Linux-ready

**xSeries 340**

**xSeries 200's**
- Price/Performance
- High Availability

**Netfinity 6000+**
- X-architecture
- Clusters

**The X-architecture for a Linux deployment**
- Systems Management with IBM Director for Red Hat Linux
- ServeRAID
- Hot swap hard file, power supply
- Hot Add, hot swap ultrabay
Native Linux for RS/6000 (32-bit)
- Telco: pSeries 640: 5U Rack - NEBS
  Level 3 compliant
- ISP: B50 rack mountable servers
- Scientific: 43P Model 150, 170, 270

Native Linux for pSeries (64-bit)
- Developing 64-bit Linux port for POWER RISC
- 4Q01: pSeries 640, pSeries 620/660

Exploit Power3/Power4 Floating Point, 64-Bit Performance, I/O Bandwidth and RAS

Applications:
- Telco NEBS
- Number crunching
- High I/O bandwidth
- Coexist with AIX
AIX Toolkit for Linux Applications

- **AIX Toolbox for Linux Applications in AIX**
  - Linux source compatibility
  - Integrated to take advantage of enterprise reliability, availability, scalability, and manageability features
  - Popular "Linux - GNU" tools, utilities, look & feel on AIX

- **ISV**
  - Develop on Linux, deploy on AIX
  - Popular "Linux - GNU" tools, utilities, look & feel on AIX

- **Business Partners**
  - Develop custom value added applications for clients

- **AIX Users**
  - Ability to start with small Linux/Intel servers, and scale up with AIX
  - Consolidation of emerging Linux applications on existing AIX systems to reduce cost of ownership
pSeries Characteristics

- **Compute intensive performance**
  - Exploit POWER3/POWER4 Floating Point and 64-Bit Performance

- **Application Flexibility**
  - Scientific & Technical, High Performance, Commercial
  - 32-bit moving to 64-bit
  - Run Linux applications in an LPAR or use the AIX Toolbox for Linux applications to recompile
  - Optimize Linux applications with AIX back ends

- **Server Consolidation**
  - Up to 16 logical partitions

- **Resource Sharing**
  - Any resource can be dedicated to any partition
  - pSeries Linux on p690 will support 1-4 CPUs
  - I/O Support (RIO, Ultra SCSI III, CD-ROM, 10/100 Mb Ethernet, Gigabit Ethernet, Fibre Channel)
  - Inter-partition communication via network adapters

**Results:**
- High performance
- Flexible
- Exploit Linux through AIX5L or on Linux in an LPAR
Linux and iSeries

What does Linux Bring to iSeries

- Applications
  - ebusiness infrastructure
  - New generation of web-based applications
  - Provides flexibility and choice of environment
  - Ease delivery of open source components
- Resources and Skills
  - Leverage virtual world-wide development team
  - Broad skill base to deliver iSeries solutions
  - Leverage other IBM investments in Linux

What does iSeries Bring to Linux

- Ability to consolidate multiple Linux servers
- A reliable, scalable server to run Linux
- Resource sharing and management
- Integration with OS/400
- Low Cost of Ownership

IBM eServer iSeries Wins "Best of Show"
LinuxWorld
San Francisco, CA  August 28-30

IBM eServer. For the next generation of e-business.
**Linux on iSeries**

Consolidate up to 31 Linux servers on one iSeries server
- Linux runs in iSeries logical partition
- Move processor, memory, and I/O resources between partitions
- Supported with V5R1 or V5R2 on iSeries Model 270, 820, 830, 840, 890

I/O Flexibility
- Virtual - Linux shares OS/400 managed disk, tape, CD-ROM, and LAN resources
- Direct - Linux owns I/O resources

Standard Linux from Leading Distributors: SuSE, Turbolinux, and Red Hat
- Based on a 2.4, 64 and 32-bit PowerPC kernel
e-business Implementation Types for Linux on zSeries

Server Consolidation
- Infrastructure Servers Consolidation
  - Intel based, file, proxy, firewall, DNS
- Distributed applications servers
  - Unix based, Sendmail, Oracle

Application Integration
- Consolidation of middle tier Unix servers
- Leverage z/OS data server back-end

Server Hosting
- Web hosting, messaging, e-mail
IBM Middleware for Linux for zSeries

Connectors
- DB2 Connect™, Version 8.1; MQSeries® clientVersion 5.2, MQSeries server (beta)
- CICS® Transaction Gateway, Version 4.0; IMS™ Connect, Version 7

WebSphere Family
- WebSphere® Application Server Advanced Edition, Version 4.02
- Including Java™ Development Kit, Version 1.3.0 & JIT
- WebSphere Personalization, Version 3.5
- WebSphere Commerce Suite, Version 5.1
- WebSphere Host on-Demand, Version 5.0.3

Data Management
- DB2 Universal Database™, Version 8.1
- DB2® Intelligent Miner™ Scoring, Version 8.1
- DB2 Net Search Extender, Version 8.1

Tivoli
- Tivoli Storage Manager Client 4.2
- Tivoli Enterprise Console 3.7.1
- Tivoli Software Distribution 4.0
- Tivoli Distributed Monitoring 4.1
- Tivoli Workload Scheduler 8.1

Future
- Tivoli Storage Manager Server
- Tivoli Business Systems Manager 2.1
- Tivoli Manager for SAP R/3 App Server
- Tivoli Policy Director 3.8
- Tivoli Inventory 4.2
**IBM S/390 & zSeries Integrated Facility for Linux**

**Business As Usual**  
Typical z/OS environment on a 3-way processor

**Add IBM zSeries Integrated Facility for Linux engines**  
Traditional environment price remains the same  
Cost of IBM zSeries Integrated Facility for Linux and Linux distribution

**Add IBM software for Linux on zSeries**  
Traditional environment price remains the same  
Cost of IBM zSeries Integrated Facility for Linux, Linux distribution, z/VM, and IBM middleware (e.g. MQSeries and DB2 Connect)
A dramatic impact to the bottom line

**Traditional Server Farm**

- Discrete servers incur incremental expense for hardware, maintenance, power, cooling, floor space
- Connectivity requires kilometers of cables
- Time to deploy new servers requires days at best
- High availability ensured by spares and re-boots
- 100% continuous availability is cost prohibitive

**Server Farm and Network in a Box**

- Reduce costs without sacrificing server autonomy
- Pooled physical resources
- Virtual, high-speed, inter-server connectivity
- Deploy new servers on-demand
- Architecture designed for high availability
- Mainframe infrastructure & practices, i.e. comprehensive disaster recovery, continuous availability

IBM @server. For the next generation of e-business.
more value with zSeries

Intangible, inherent values

- Mainframe serviceability
- Mainframe reliability
- Productivity: ease of management of a large population of servers based on a common logical image
- Maintain one application per server; business reqmnt, ISV reqmnt
- Speed to deploy new servers for development, test and production
- Integrated, high speed connection to legacy S/390 applications
- Integrated, high speed connection to z/OS
- Practiced, proven disaster recovery

Environmental considerations

- Floor space
- Power and cooling costs
- UPS - Back up power

CIOView can help to build a complete picture!
A *Virtual Machine* simulates the existence of a dedicated real machine, including processor functions, storage, and input/output resources.
Customers running their business on Linux
## Linux is ubiquitous

### Financial / Insurance
- Aviva
- Banco de la Provincia de Beunos Aires
- Banco Mercantil
- CareFirst Blue Cross Blue Shield
- The Credit Index
- Credit Union of Central Alberta
- Deutsche Bank
- E*Trade
- GEICO
- Guide One Insurance
- GAD
- Hill House Hammond
- HSBC Trinkaus & Brurkhardt
- Hub International
- Instituto Federal Electoral
- Millennium Partners
- JPMorgan Chase
- Merrill Lynch
- Lehman
- Morgan Stanley
- AIG
- NYSE/SIAC
- Northern Trust
- Salomon Smith Barney
- Goldman Sachs
- CSFB

### Technology
- Brookhaven National Lab
- Chevron
- Comp. Generale de Geophy
- Gene Formatics
- Jet Propulsion Laboratory
- LINEO
- Phillips Petroleum
- Royal Dutch Shell
- Structural Bioinformatics

### Education
- Advanced School for Cmptg & Img
- Arizona State University
- Boston University
- Clarkson U
- Tufts U
- Clemson
- Colorado State University
- Daito Bunka University
- Kyoto Sangyo University
- Manchester Inst. of Information Delivery
- Marist College
- Beijing University
- Tamkang University
- Trinity College Dublin
- University of Nebraska
- University of Geneva
- University of New Mexico

### Public
- Consejeria Sanidad Murcia
- Consejo Generale del Notariado
- City of Orem, UT
- City of St. Louis
- German Federal Ministry of Int.
- Massachusetts Trial Courts
- New South Wales Dept of Ag.
- Oklahomna Dept of HS

### ISPs/ASPs
- Aleos
- ASP Movers
- BRFree
- COMSAT Venezuela
- CLS ARGOS
- Dimension Enterprises
- Dreamball
- Exxcom
- FileFlow
- iMobile Computing, Inc.
- Infocom Technologies, Inc.
- Infocrossing/ACTS
- InterServ
- Jindal Information Sys.
- Mazu Networks
- Narmada Commun.
- Oni Way
- Qnet Infosystem
- SERCON
- Sonera Entrum
- WorldGate Private Networks
- Vasnet Comm. Pvt. Ltd.
- Verizon
- ATT

### Health
- Wisconsin Physicians Srvcs
- CareFirst BCBS
- HMA

### Service
- Akamai
- Aso Humaney Center
- BizAid Technologies
- Cendant Corporation
- Weather
- Wimbledon
- VeriSign
- 123 Immo

### Manufacturing
- Elektro-Material AG
- Daimler-Chrysler
- FERMAX Electronica, S.A.E.
- Ford Werke
- Grede Foundries, Inc.
- Hero-Honda Motors, Ltd
- Honeywell
- Kodak
- Motorola
- Newell Rubbermaid
- POSDATA
- R.J. Reynolds
- Samsung
- Volvo
- Winnebago
- Yamaha Canada
- YKK
- GE

### Distribution/Retail
- FedEx Freight
- KB Toys
- Konica Business Technology
- Lawson Products
- NaITO & Co., Ltd.
- Petroleo Ipiranga
- SUPervalu
- Amazon.com
- Boscov’s
- Burlington Coat Factory
- Confirm.com
- DeoDeo
- Devoto-Grupo Casino
- GreetingGifts
- Lawson
- L.L. Bean
- Mosca Hermanos S.A.
- Perfumerias San Roque S.A.
- Price Chopper
- Sherwin-Williams
- Tommy Hilfiger

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*Chart 59*
Workload Consolidation Success

Hundreds of Successful Customers

IBM @server. For the next generation of e-business.
Distributed Linux Success
Financial / Insurance Services

- CareFirst BlueCross BlueShield
- Merrill Lynch
- E*TRADE
- CornerCap
- Banknorth Group, Inc.
- GEICO Direct
- CFG
- Salomon Smith Barney
- Banco do Brasil

IBM server. For the next generation of e-business.
Communications
Distribution / Retail

- RJ Reynolds Tobacco Holdings, Inc.
- Satellite
- Shimano
- Habib's
- Casas Bahia
- K-B Toys
- Omaha Steaks

IBM eServer. For the next generation of e-business.
Industrial
Education / Government / Health

- Ohio State University
- Tamkang University
- Ministério da Defesa
- Biomedicum
- Humber College
- The College of New Jersey
- Clemson University
- Molecular Mining
- Oklahoma DHSS Excellence
- Energy.gov
- Saint Louis County
- IBM eServer
  For the next generation of e-business
What's Hot and What's Not
**Client-side Linux**

**History of use inside of IBM**

Zero budget effort for 2 years  
LTC: Colaborated with Codeweavers on Notes support  
and started Filter project for SmartSuite files into  
OpenOffice  
Community worked out many Laptop support issues  
Built custom Redhat Image and network installed RPM  
Now more than 5000 users  
All volunteer, technical types, mostly developers  
Establishing as mainstream option for "Client for  
e-buisness"  
Piloting Ximian Red Carpet
Linux Client - IGS Partnering with Ximian and CodeWeavers

Overview

Linux Client Offering

- Linux Client Consulting
- Piloting
- Platform Customization
- Application porting, rewriting or re-purposing partnering with CodeWeaver/WINE
- Roll-out, training

Support for running MS Office, Lotus Notes on Linux

Tools and expertise for re-purposing & testing other packaged applications and custom applications

- Bundled desktop offering, enhanced GUI
- Includes StarOffice suite
- Red Carpet - Software distribution and system management
- Groupware client - interoperable with MS Exchange
## Financial Case for Linux on the Desktop (capital expenditures)*

<table>
<thead>
<tr>
<th></th>
<th>Product</th>
<th>MS Windows Client</th>
<th>Product</th>
<th>Linux/Ximian Client</th>
<th>Total Savings per Client</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OS</strong></td>
<td>Windows XP</td>
<td>$175.00</td>
<td>Linux Distro</td>
<td>$25.00</td>
<td>$150.00</td>
</tr>
<tr>
<td><strong>Desktop</strong></td>
<td>Windows XP</td>
<td>$150.00</td>
<td>Ximian Desktop</td>
<td>$45.00</td>
<td></td>
</tr>
<tr>
<td><strong>CAL</strong></td>
<td>n/a</td>
<td>$30.00</td>
<td>CAL assuming use of MS servers</td>
<td>$30.00</td>
<td></td>
</tr>
<tr>
<td><strong>Office Suite</strong></td>
<td>Office XP</td>
<td>$255.00</td>
<td>StarOffice 6.0</td>
<td>$40.00</td>
<td>$215.00</td>
</tr>
<tr>
<td><strong>Cost/client</strong></td>
<td></td>
<td>$460.00</td>
<td></td>
<td>$140.00</td>
<td>$320.00</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td></td>
<td>$4,600,000.00</td>
<td></td>
<td>$1,400,000.00</td>
<td>$3,200,000.00</td>
</tr>
</tbody>
</table>

Savings of 70%, 85% if you use OpenOffice and no MS servers
Two thin Client Linux options

IBM & Neoware Alliance
Neoware has provided award winning thin clients since 1995 and focuses on providing customer investment protection and multi-use devices
Alliance with Neoware Systems, Inc. under which IBM has licensed thin client technology to them, formed a marketing relationship for Neoware’s products through Options by IBM, and a services/support agreement for Neoware’s customers
Neoware had $20M annual revenue before the IBM Alliance. Stock value on NASDAQ "NWRE" is about 4x previous level.
Embedded Red Hat Linux and Thin Client Appliances
Depopulated PCs using server boot capability. This is what Sherwin Williams is using for 5000 POS terminals
Customer purchases a managed hosting solution ... in a virtual instead of a physical environment

You get equivalent functionality as a physical environment ... *but* with the unique e-business on demand benefits

**Equivalent hosting cage functionality:**
- Floor space and power
- Server capacity
- Storage
- Bandwidth
- IGS Managed services
- Backup and recovery
- Monitoring and security services

**e-business on demand benefits**
- Fast provisioning
- Pay only for capacity needed
# Linux Virtual Services - benefits

<table>
<thead>
<tr>
<th>Feature</th>
<th>IT Benefit</th>
<th>Business Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pay only for the capacity needed</td>
<td>No need to do capacity planning</td>
<td>Avoid paying for unused capacity</td>
</tr>
<tr>
<td>Reduce expenses by consolidating multiple distributed servers</td>
<td>Increase operational efficiency</td>
<td>Reduce the cost of running and maintaining a complex server farm</td>
</tr>
<tr>
<td>&quot;Pay as you go&quot;</td>
<td>TCO Benefits over distributed computing environments</td>
<td>Reduce large up front capital expenses</td>
</tr>
<tr>
<td>Fast deployment of service</td>
<td>Improves time for application deployment</td>
<td>Reduce time to market from concept to service delivery, first mover advantage or a fast follower capability</td>
</tr>
<tr>
<td>Have pool of extra capacity which to tap into when needed</td>
<td>Minimizes the need of detailed long range capacity planning</td>
<td>No need to incur in the costs of over deploying servers to accommodate possible future needs</td>
</tr>
<tr>
<td>Migrate to a more efficient and scalable operating system</td>
<td>Have a much more scalable environment which is supported by a wider hardware mix</td>
<td>Reduce the cost dependency on proprietary operating systems</td>
</tr>
</tbody>
</table>
Autonomic Computing

Self-Optimize
(Dynamic Service Level Attainment)
- Clustering
- Dynamic LPAR
- Intelligent Resource Director
- Quality of Service
- eWLM

Self-Configure
(Define "on the fly")
- Hot Swappable Disks
- Hot Swap PCI
- Wireless System Configuration - SNAP
- Auto discovery and update of firmware

Self-Heal
(Business Continuance)
- Virtual IP Takeover
- LightPath Diagnostics
- Chipkill ECC Memory, Dynamic bit steering
- Automatic Deallocation
- Processors, Cache, LPAR
- Electronic Service Agent

Self-Protect
(Safeguard Assets)
- Self-protecting kernel
- Digital Certificates
- Enhanced encryption
- LDAP enhancements
- Enterprise ID Management (EIM)

http://www.research.ibm.com/autonomic

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Autonomic Computing Summary

- **Lower Total Cost of Ownership**
  - EZSetup Wizards
  - Wireless Systems Management
  - Comprehensive Management Tools

- **On Forever - No Downtime**
  - No Single Point of Failure
  - Online Detection, Repair and Recovery
  - High Availability Clustering
  - Heterogeneous Disaster Recovery

- **Improved End User Responsiveness**
  - Partitioning
  - Clustering
  - Heterogeneous Workload Mgt
  - Automated Systems Operations

- **No Unauthorized Access**
  - Single Integrated Security Strategy
  - Enterprise Identity Mapping
  - Credential Services
Grid Computing - The Next Frontier

Coordinates resource sharing and problem solving within or between physically dispersed organizations

Grid middleware is being developed by hardware suppliers, ISVs and the open source community to support more flexible use of IT:

- Resource sharing
- Virtual organizations
- eSourcing
- Collaborative and very large scale computing
- IT resources 'on tap'
- Novel service offerings or business models

National Digital Mammography Archive

- Archive, Storage and retrieval for use by clinicians
- Training and Teaching for Radiology Departments
- Computer Assisted Diagnostics as a service
- 2000 Hospitals x 7 TB per yr x 2 = 28 PB per yr

http://www.research.ibm.com/autonomic
Distributed Computing Over the Internet Using Open Standards

- Virtual, collaborative organizations sharing applications and data in an open heterogeneous environment
- A vast aggregation of geographically dispersed computing resources
Grid Computing

Macrocosm – Distributed Resources and Applications

- Storage
- Data
- Applications
- Processing
- I/O
- Operating System

....a single unified image
Customer References (Grid)

- **Research References**
  - UK National Grid
  - Netherlands national Grid
  - Distributed Terascale Facility
  - Blue Grid

- **Data Sharing Grids**
  - North Carolina BioGrid
  - University of Pennsylvania
  - San Diego Super Computer Center

- **Application/Web Services Grids**
  - Galileo
  - Storebrand ASA
  - Hewitt Associates
  - Bekins
Wrapup
Enterprise Linux Forum

June 4 - 6 at Santa Clara County Convention Center
- June 4 Pre-Conference Workshop
- June 5 - 6 Conference and Expo

Only event dedicated to Linux in the datacenter

Keynote Presentations
- The evolution of the virtual environment, where does Linux fit?
  - Dan Kusnetzky - IDC
- Technology Evolves, eBusiness on Demand - Dan Powers,
  VP Grid Computing Strategy, IBM

www.enterpriselinuxforum.com
Some Important Web Sites and Documents

<table>
<thead>
<tr>
<th>Web Site</th>
<th>URL</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM Linux</td>
<td><a href="http://www.ibm.com/linux">www.ibm.com/linux</a></td>
</tr>
<tr>
<td>IBM Linux Software</td>
<td><a href="http://www.ibm.com/linux/software">www.ibm.com/linux/software</a></td>
</tr>
<tr>
<td>IBM Linux zSeries</td>
<td>www-1.ibm.com/eserver/zseries/os/linux</td>
</tr>
<tr>
<td>IBM developerWorks</td>
<td><a href="http://www.ibm.com/developerworks">www.ibm.com/developerworks</a></td>
</tr>
<tr>
<td>IBM Linux iSeries</td>
<td>www-1.ibm.com/servers/eserver/iseries/linux/</td>
</tr>
<tr>
<td>IBM Linux pSeries</td>
<td>www-1.ibm.com/servers/eserver/pseries/</td>
</tr>
<tr>
<td>eserver solutions Linux Community Portal</td>
<td><a href="http://www.ibm.com/servers/enable/linux/">www.ibm.com/servers/enable/linux/</a></td>
</tr>
<tr>
<td>Red Hat</td>
<td><a href="http://www.redhat.com">www.redhat.com</a></td>
</tr>
<tr>
<td>SuSE</td>
<td><a href="http://www.suse.com">www.suse.com</a></td>
</tr>
<tr>
<td>TurboLinux</td>
<td><a href="http://www.turbolinux.com">www.turbolinux.com</a></td>
</tr>
<tr>
<td>Free Software Foundation</td>
<td><a href="http://www.gnu.org">www.gnu.org</a></td>
</tr>
<tr>
<td>General Linux</td>
<td><a href="http://www.linux.org">www.linux.org</a></td>
</tr>
<tr>
<td>Linux IBM Services</td>
<td>www-1.ibm.com/services/e-business/linux.html</td>
</tr>
</tbody>
</table>
Getting Started with Linux

The IBM Software Evaluation Kit for Linux

- IBM DB2 Universal Database Enterprise Server Edition (ESE) V8.1 for Linux
- IBM DB2 Migration Toolkit V1.1 for Linux
- IBM Directory Server V5.1 for Linux
- IBM Lotus Domino 6 for Linux (English)
- IBM Tivoli Access Manager Base 4.1 for Linux
- IBM WebSphere Application Server V5 for Linux
- IBM WebSphere Studio Site Developer V5 for Linux
- IBM WebSphere MQ V5.3.1 for Linux
- IBM WebSphere SDK for Web Services for Linux

http://www-3.ibm.com/software/is/mp/linux/sek/
Free 2-day workshop in San Mateo

Course highlights

- Configuring the Linux operating system
- Installation and configuration for the following middleware:
  - DB2 Universal Database Version 8.1
  - Lotus Domino 6 for Linux
  - IBM Directory Server Version 5.1
  - IBM Tivoli Access Manager Base Version 4.1
  - WebSphere Application Server Version 5.0
  - WebSphere MQ Version 5.3
  - WebSphere Studio Site Developer Version 5
- Web application architecture concepts
- J2EE overview (Struts)

www.developer.ibm.com/spc/events/ddi_linux.html?ca=dsp-1ql1dwzl
No Value but cute

Good evening Mr. Gates, I'll be your server today!
The Penguinista Has Spoken

Roy Greenwood
IBM Americas Linux Impact Team
rwgreenw@us.ibm.com
(408)-463-4728