

Linux Enterprise Computing

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Overview

- ◆ What is Linux?
 - ◆ Development history
 - ◆ Application spectrum
 - ◆ Market analysis
- ◆ Is Linux ready for the enterprise?
 - ◆ Customer satisfaction
 - ◆ Production model
 - ◆ Business partners: support and services
- ◆ Outlook
 - ◆ Linux as an e-commerce platform

Linux

The facts



"Tux", the Linux mascot

- ◆ What is it?
 - ◆ A freely available, "best-of-breed" Unix
- ◆ What does it offer?
 - ◆ A unified computing platform from "embedded" to supercomputers
- ◆ What's all the fuzz about?
 - ◆ It's the fastest growing operating system
 - ◆ It has reached the commercially critical mass
 - ◆ It's becoming a serious competitor to Windows NT
- ◆ Why is it so successful?
 - ◆ It's fast, reliable - and free (on the Internet)
 - ◆ It epitomizes the production model of the Internet era:
"Open platforms"

Development history

"Best-of-breed Unix" with sustained exponential growth

Date	Technical	Version	User	Business	Linus Torvalds
1999	Improved scalability (SMP)	2.2	14m	PC Week: Linux Enterprise ready RedHat: \$1 bio IPO	Time Magazin: #15 Man of the Century
1998	10.000 developers	2.1.110	7.5m	IBM, Intel, Oracle, SAP, etc. take minority shares in RedHat	Forbes: Cover 8/98 Forbes: #1 Net Icon
1997	Weekly kernel updates	2.1	3.5m	InfoWorld: Linux User Community "Best Technical Support Award"	Job with Transmeta in the Silicon Valley
1996	SMP support, clustering support	2.0	1.5m	InfoWorld: RedHat Linux 4.0 "Desktop OS of the Year Award"	
1995	Multi-platform support (Alpha, etc.)	1.2	500k	RedHat: launch (distributor, i.e. packaging)	
1994	TCP/IP Universities use Linux for R&D	1.0	100k		
1993	More than 100 developers	0.99	20k	WWW big bang (Mosaic)	
1992	Fully functional x86 desktop	0.96	1000		
2/92	100 downloads	0.10	100	Internet & CD-ROM: Success of new distribution media	
9/17/91	Linus puts 1. kernel on Internet	0.01	1		



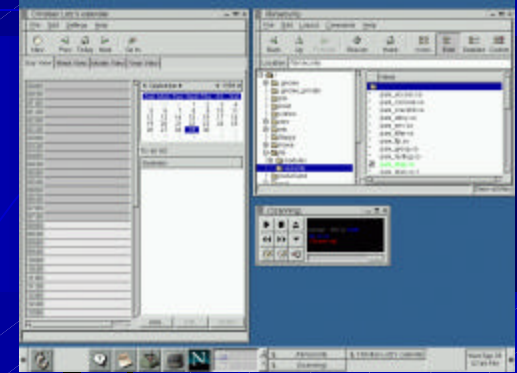
Quelle: Linux Usage, Microsoft, 1999

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Application spectrum

From "embedded" to supercomputers

- ◆ Supported microprocessor architectures
 - Digital Alpha, HP PA-RISC, IBM PowerPC
 - Intel x86 & Merced, SGI MIPS, Sun SPARC, etc.
- ◆ Embedded Linux
 - ◆ Space Shuttle, Columbia mission, April 1997
- ◆ Information appliances
 - ◆ Nokia DVB@Air (TV + cell phone + browser)
 - ◆ Cobalt Microserver (server appliance)
- ◆ Desktop (PCs): Virtually all vendors
 - Amiga, Atari, Compaq, Dell, Digital, HP, IBM, SGI, Siemens, Sony, Sun, etc.



Application spectrum

From "embedded" to supercomputers

- ◆ Server
 - ◆ IBM Netfinity, Digital AlphaServer, etc.
 - ◆ Internet infrastructure platform¹
 - ◆ 20% of all ISPs use Linux
 - ◆ 60% of all Linux shipments for Intra-/Internet server
- ◆ Parallel computers
 - ◆ "Titanic" was rendered on a Linux Alpha farm
- ◆ Supercomputer, TOP500 list
 - ◆ Place 129: CPlant "Beowulf" cluster
 - ◆ Sandia National Labs (nuclear simulations)
 - ◆ 368 Digital AlphaServers (368 GFLOPS)



¹ Source: IDC, 1999

Market share

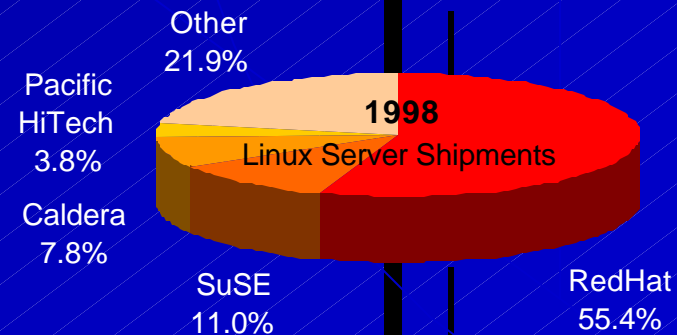
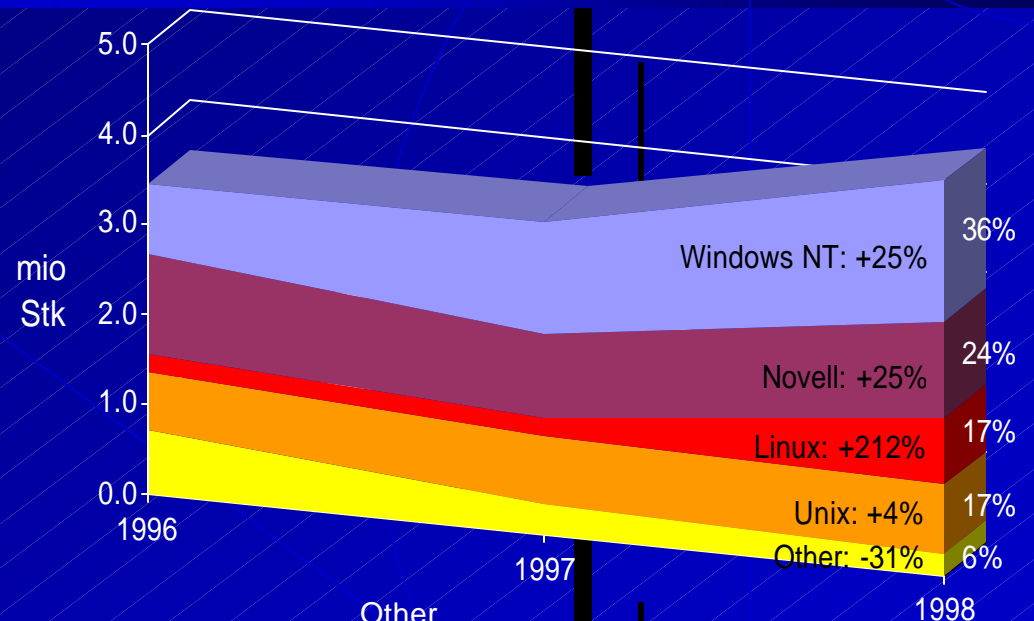
New installations, servers

- ◆ Compound annual growth rate through 2003 ¹
 - ◆ 25% commercial Linux installations
 - ◆ 12% all other server operating systems
 - ◆ 10% all other client operating systems

“Linux is our fastest-growing operating system.”
Mark Jevis, Senior VP Oracle

¹ Source: 1999 Linux Operating System Market Review, IDC

New server licenses
 Source: 1999 Linux Operating System Market Review, IDC



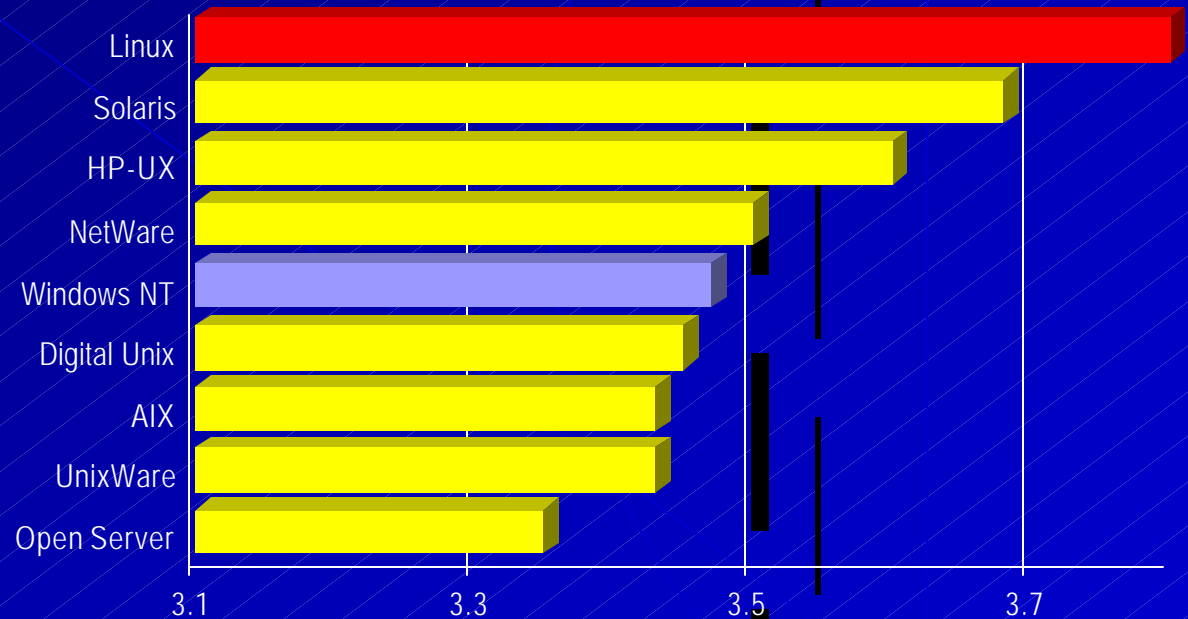
Competitive analysis

"Why is it so successful?"

- ◆ Customer satisfaction survey of the Fortune 1000 IT managers
- ◆ Evaluation criteria
 - ◆ TCO, price
 - ◆ Interoperability
 - ◆ Manageability
 - ◆ Availability
 - ◆ Flexibility
 - ◆ Functionality
 - ◆ Performance

Customer Satisfaction

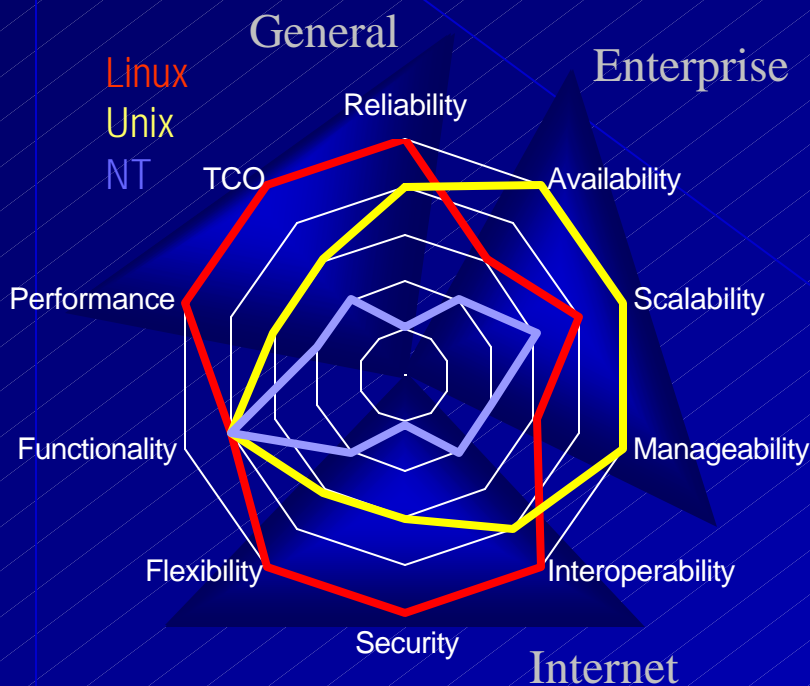
Source: 1998 International Ratings Survey of Unix and NT, Datapro Information Services



Scale from 0 to 5, with 5 being completely satisfied

Competitive analysis

"Fast and reliable"



"Linux will become the mainstay enterprise operating system." - ZDnet

	Windows NT	Linux	Unix
Reliability	1: "23x6" ¹	5: R&D focus	4: Legacy (e.g., BSD)
Availability	1: "23x6" ¹ 3: HA clustering (WolfPack)	3: Developing: • Fast recovery • HA subsystems • HA clustering	5: R&D focus: • Fast Recovery • HA subsystems • HA clustering
Scalability	3: < 8 CPUs PC deficiency	4: < 8 CPUs on PC	5: PC: < 8 CPUs Server: < 64 CPUs
Manageability	2: GUI focus - Automation?	3: Open platform enterprise tools?	5: Open system
Interoperability	2: Platform monopolization	5: Open platform All protocols...	4: Open system
Security	1: Security by obscurity	5: Open platform	3: Legacy (e.g., BSD)
Flexibility	2: Platform monopolization	5: Open platform	3: Open system
Functionality	4: Application range?	4: Application range?	4: Enterprise appl.
Performance	2: Resource Hog	5: R&D focus	3: Legacy
TCO	2: Manageability?	5: Price!	3: Price?

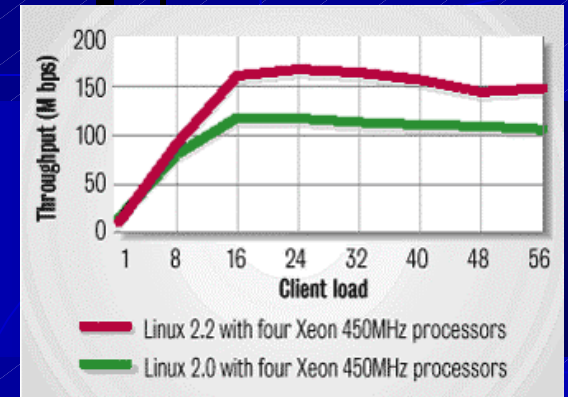
Sources: IDC, 1999; IBM Global Services - Market Intelligence; Eigenanalyse ¹ Bob Metcalfe, Microsoft

Competitive analysis Critique

- ◆ Availability
 - ◆ No HA Clustering
 - ◆ 3rd Party Solutions
 - Linux solution not before 3.0
 - ◆ No HA Subsystems
 - ◆ Journaling File System
 - ◆ Logical Volume Manager
 - ◆ Hot swap, memory scrubbing
 - Value adds: IBM AFS, etc.
- ◆ Manageability, Functionality
 - ◆ Lack of business applications and tools
 - Value adds: IBM Tivoli, DB2, Lotus Domino, etc.

◆ Scalability

- ◆ Best SAP R/3 Benchmark on 4 CPU Intel Server: Linux 2.2.11¹
 - ◆ Further improvements with 2.4
 - ◆ Mostly a function of the hardware
- “Windows NT scales better on non-PC platforms.”*
Jim Grey, Director Microsoft Research
- Linux is a multi-platform solution, but NT not anymore...



Samba 2.0 throughput
Source: The new Linux 2.2 Kernel, PC Week, 2/99

¹ Source: Siemens News 9/99; Siemens PRIMERGY 870/40 R/3 4.0B, SAP DB 6.2.10: 241 SD Users, 1210 SAPS

Open Source Software (OSS)

"From open systems to open platforms"

- ◆ What is OSS?
 - ◆ Source is freely available - hence Linux is freely available
 - ◆ Sole restriction: The source of all extensions must also be made freely available ("recursive openness")
 - ◆ Formal frame: "GNU Public License" ("GPL", MIT/FSF)
- ◆ What does OSS?
 - ◆ It creates a freely accessible and extensible "knowledge pool"
 - ◆ It can unleash global creative potentials and intrinsic parallelism
 - It is the production model of the Internet era

"As a production model, OSS will probably be respected equally as the assembly line or the JIT principle."

Bill Gurley, Benchmark Capital

Open Source Software (OSS) Critique

- ◆ “No long-term strategy, and no rigorous planning process”
 - Efficient problem solving model; but breakthrough innovations?
- ◆ “Experts in control points are a non-scalable (and replaceable) factor in the development process”
 - Taylorism is unsuitable for software development
 - The OSS production model scales with the Internet

“Given enough eyeballs, all problems are shallow.” - Eric Raymond
- ◆ “No IP protection implies risk for infrastructure investments”
 - Free IP avoids lock-in and thus increases investment protection

“The ability of the OSS process to harness the collective IQ of thousands of individuals across the Internet is simply amazing.”

Vinod Valloppilli, Microsoft

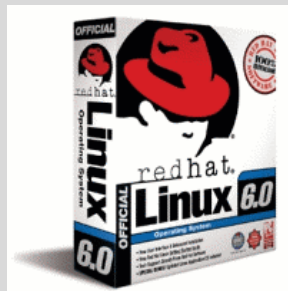
Contacts

Source code, distributors

- ◆ Download from the Internet (key site): www.linux.org
- ◆ Free support from Internet newsgroups
- ◆ “Distributions” (pre-configured, shrink-wrapped packages)

RedHat

Largest global distributor
Client market share: 54.8%¹
Strong presenc in US and UK
IPO on 8/11/99
Stock price gains up to 1000%



www.redhat.com

SuSE

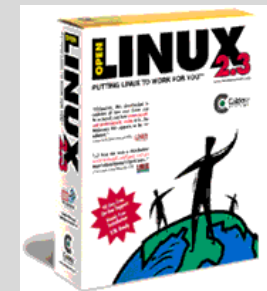
Largest German distributor
Client market share: 11.5%¹
Extensive professional services
Exclusive ISDN support



www.suse.de

Caldera

Third largest global distributor
Client market share: 6.3%¹
User-friendly GUI
Partition manager improves
coexistence with Windows



www.caldera.com

¹ 1998 market share of client/server shipments
Source: 1999 Linux Operating System Market Review, IDC

Contacts

Support and services

- ◆ Support (1st to 3rd Level)

- ◆ 24×7 on-site support
- ◆ 24×7 phone support
- ◆ Support databases
- ◆ Downloads
- ◆ Training courses
- ◆ Professional services

- ◆ IBM Global Services

- ◆ Full support via the existing Unix support infrastructure
- ◆ Project management
- ◆ Free Netfinity test systems plus service offering!

IBM Global Services
Multivendor Support Line
Hr. Martin Vogt

+41 – 1 – 643 – 5402
martin.vogt@ch.ibm.com
www.ibm.de/linux

SuSE GmbH
Nuremberg

+49 – 911 – 740 53 31
www.suse.de

ID Pro GmbH
Bonn

+49 – 228 – 42 14 4 0
www.id-pro.de

Innominate GmbH
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+49 – 30 – 30 88 06 – 0
www.innominate.de

Thinking Objects GmbH
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www.to.com

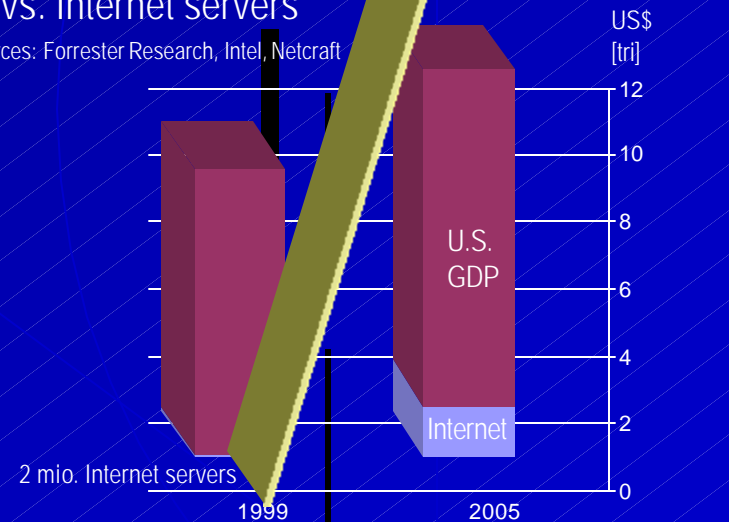
E-commerce

Internet infrastructure grows 2000% by 2005

- ◆ U.S. GDP realized on the Internet:
 - ◆ 1999: 1% (\$100 bio, ~65% annual growth)
 - ◆ 2005: > 10% (\$1.5 tri)
- Demand of Internet servers will increase at least tenfold:
 - ◆ Service diversification (software/service convergence)
 - ◆ Rich media (e.g., multimedia)
 - ◆ QOS (HA) requires additional slack
- 95% of the Internet servers by 2005 are yet to be deployed!
- > 20% of these servers will be running Linux ¹

U.S. GDP vs. e-commerce vs. Internet servers

Sources: Forrester Research, Intel, Netcraft



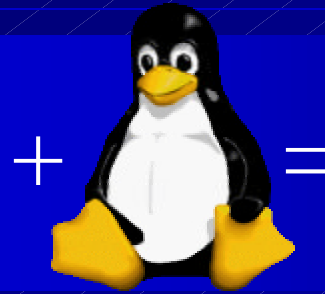
¹ Sources: IDC, 1999; Computer Associates, 1999

E-commerce Platform convergence

- ◆ Characteristic features of e-commerce servers
 - ◆ Traditional Internet platform (i.e. Linux) **plus**:
 - ◆ 24×7 availability
 - ◆ Each downtime minute, the company is not in the market
 - ◆ Massive I/O bandwidth and storage capacity
 - ◆ Manageability on enterprise quality level
 - ◆ Direct access to existing, traditional business applications and databases
- Platform convergence of Internet infrastructure (network periphery), intranet and traditional computer center
- Solution: Linux on the S/390 (“best of breed”)

Linux on S/390

Synergy effects



- ◆ Linux for S/390: expanding the application spectrum
 - ◆ Drastically reduced time to market with Linux applications
 - ◆ Reduced TCO with Linux as an Intra-/Internet accelerator
 - ◆ Example: “Application Service Providing” (ASP)
 - ◆ Significant expansion of the talent pool
- ◆ S/390 for Linux: infrastructure consolidation and virtualization
 - ◆ Example: SAN (system/storage area networks)
 - ◆ “Exploded mainframe” ⇒ Manageability, availability?
 - ◆ Example: Heterogeneous n-tier Intra-/Internet architectures
 - ◆ Availability in heterogeneous environment?
 - ◆ Manageability, e.g., upgrades, etc.?

Summary



- ◆ Fast, reliable and best TCO
- ◆ Fastest growing server operating system (17% market share)
- ◆ Unified platform from “embedded” to supercomputers
- ◆ Production model scales with the Internet
- ◆ Internet infrastructure platform (> 10 mio new servers by 2005)
- ◆ Deficits in the enterprise area are being resolved
 - ◆ Manageability: Software (e.g., IBM Tivoli, DB2, Domino)
 - ◆ Scalability, availability: Hardware (e.g., IBM S/390)
 - ◆ Professional services and support (e.g., IBM Global Services)
- ◆ The next step: www.linux.org oder www.ibm.com/linux