



A Look Beyond Windows

An Introduction to the Development, Features, and Usability of
the Linux Operating System

Version 1.5 November 2004

Presented by Robert Joseph Korn

A Brief Overview

History of Linux

Features Supported Under Linux

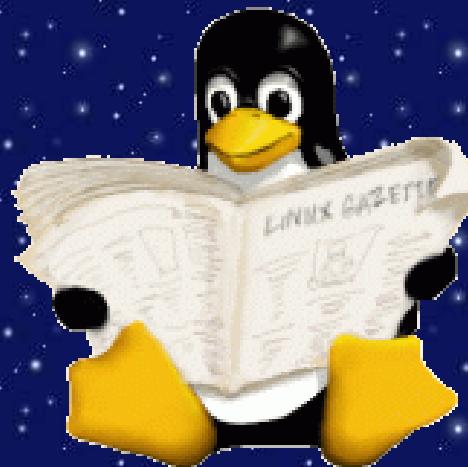
A Few Myths About Linux

Unresolved Issues in Linux

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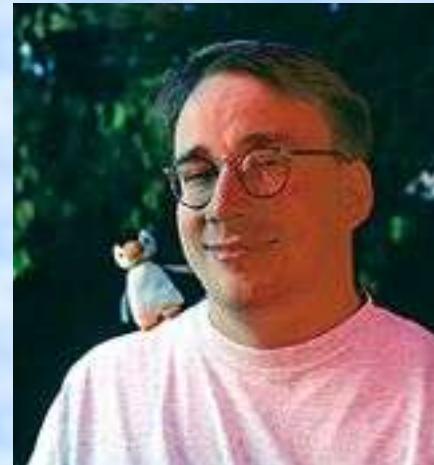
Linux 3

Where do you want to go tomorrow?

The Origins of Linux

The Beginning

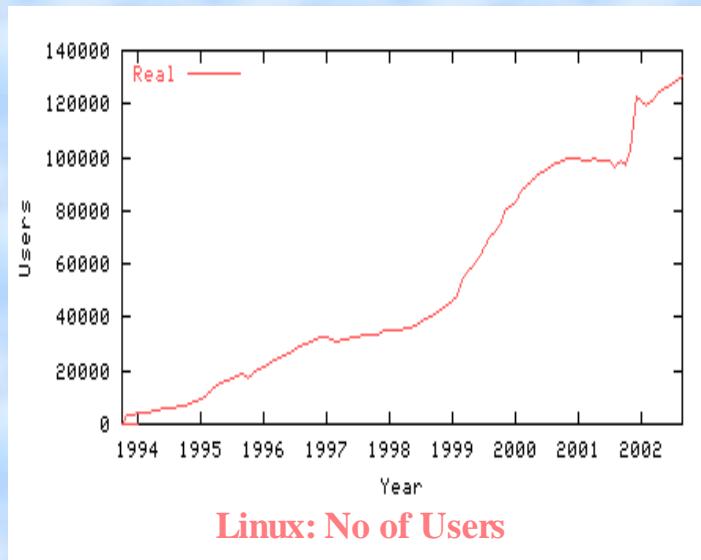
The core of the Linux operating system was coded by a Finnish programmer called **Linus Benedict Torvalds** in 1991, when he was just 21! He had got a new 386, and he found the existing DOS and UNIX too expensive and inadequate.



In those days, a UNIX-like tiny, free OS called **Minix** was extensively used for academic purposes. Since its source code was available, Linus decided to take Minix as a model. In his own words, 'I wanted to write a better Minix than Minix.'

Growing and Growing...

In order to encourage wide dissemination of his OS, Linus made the source code open to public. At the end of 1992 there were about a hundred Linux developers. Next year there were 1000. And the numbers multiplied every year.

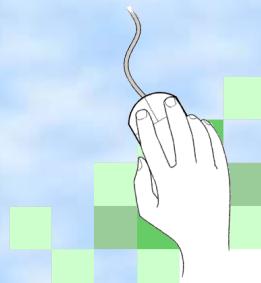
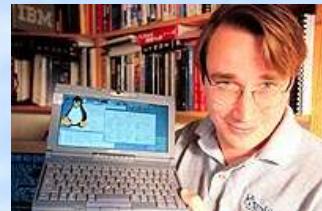
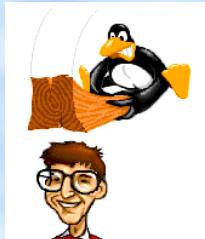


Source: The Linux Counter

Recent estimates say about 18 million people use Linux worldwide. This doesn't include non-personal computers, such as server machines on the Internet and other networks.

Linux Today

Though Linus never imagined it, Linux quickly became a general tool for computing. People stopped looking at Linux as a toy, and began to think about it seriously. Today there are tens of thousands of applications that can be run on Linux, from Office Suites to 3D games. Hundreds of *Linux User Groups* the world over discuss ways to make Linux work better.



Distributions of Linux

In tune with the power-of-choice tradition of Linux, many companies and communities now offer it along with lots of applications. Though the OS is the same, the bundled software do vary from one distribution to another. **Mandrake, Red Hat, SuSE, Debian, Gentoo, Lycoris, Slackware, and Turbolinux** are just a few of the distributions available. Usually the distributors charge a nominal fee for the media and for technical support in the future. **Debian** is a high-quality non-commercial distribution of Linux.

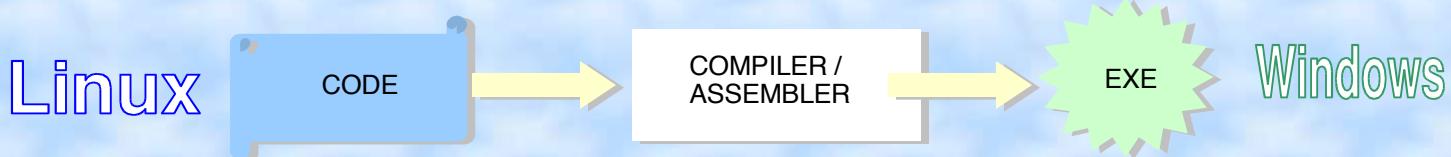


Open Source – What does it mean.

Any software, at heart, contains binary instructions -- a continuous stream of 0's and 1's -- to the processor so that it works the way it is supposed to. Encoding software directly in binary is a tedious, if not impossible, proposition for todays computers.

So a programmer uses an English-like higher-level language to write software. This program text is the source code; it is *compiled* or *assembled* to obtain the final executable.

Microsoft give away only the executable; Linux also gives you the source code -- hence it is *open-source*. Does this matter? A lot. Buying closed-source software is somewhat like buying a car with its hood welded shut.



Features of Linux

Why Linux is Built Upon UNIX

- UNIX has been time-tested for 30+ years, which is eons by computer age
- The basic **design** of UNIX is *elegant*, being the brain-child of two master programmers: Thompson and Ritchie. Ritchie also co-invented the C language.
- UNIX developed with contributions from many different sources; today it hosts a huge collection of excellent software
- UNIX is very well-documented, and source code is available for much of the system, unlike MS Windows, for example.



Thompson and Ritchie, the creators of UNIX, working on a PDP-11 machine.

Features Supported in Linux: True Multitasking

The OS handles all scheduling of processes (and kernel threads).

No application can hog the resources unless the system administrator specifically defines it as high-priority.

This leads to smoother performance and better load-balancing

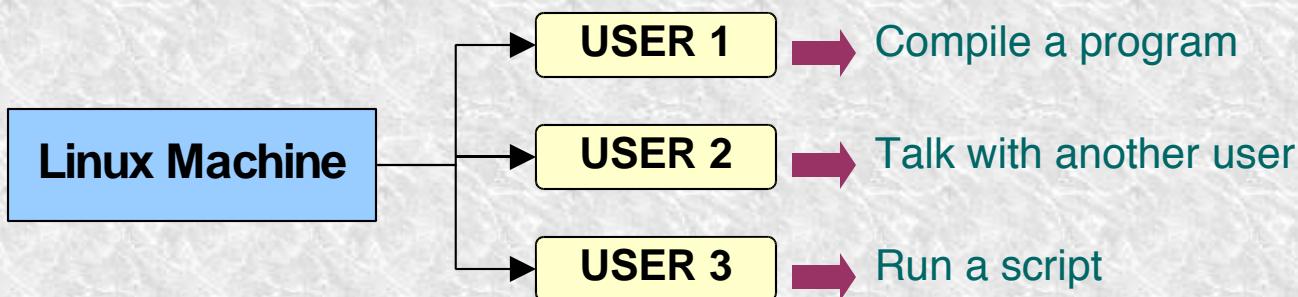


Multitasking under Linux:
The number of apps you can run is limited only by the memory you have.

All applications in Linux run in their own **private memory space**. This means that a poorly-written application cannot tamper with the memory of another application (or the kernel). If an application does try to access memory it doesn't own, it is immediately halted by the operating system, without disturbing any other process on the system

Multi-User and Customisable

UNIX was designed with the notion that multiple people would be sharing use of the system at the same time. Several people can log into a Linux machine and each of them can run whatever programs he likes. UNIX applications are written from scratch with the idea that multiple people will be using them, and each may have entirely different preferences. Many people can use the *same application* at the *same time* according to *their liking!*

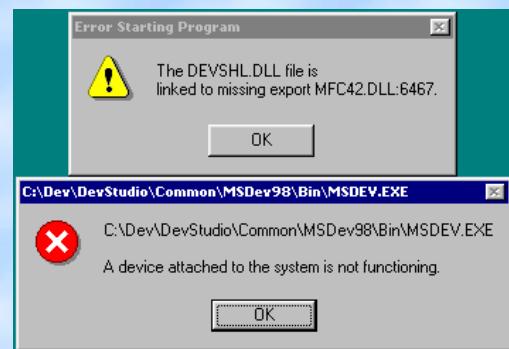


Easy Remote Administration and DLL Handling

Because of the fundamental design of UNIX, every application can *run* on one machine and *display* its interface on another. This is extremely useful for **remote administration**

Windows allows the use of **DLLs** (Dynamic Linker Libraries) to modularise applications and reuse code. But *version conflicts* often arise, which might make some applications or even the whole OS useless

Linux also handles DLLs (called *shared objects*), but it checks the version of the shared object each application is asking for, and then loads the correct version.



A DLL Goof-up in Windows

Efficient Memory Management

Linux is outstanding in the area of memory management. It will use every scrap of memory in a system to its full potential. The Linux kernel occupies just 2 MB, whereas NT takes 16 MB!



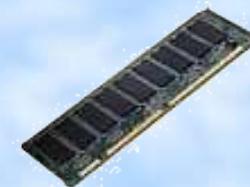
*How shall I get 64 MB
AGAIN for Win 2000?*

When building a simple web server a machine with only 32mb of memory is still perfectly usable under Linux. A similar setup under windows 2000/3 or XP would require at least 256mb memory.

Efficient Memory Management (Contd.)

Demand-loading is very useful as well. Linux only loads into RAM the portions of a program that are *actually* being used, which reduces overall RAM requirements significantly. At the same time, when swapping is necessary, only *portions* of programs are swapped out to disk, not entire processes. This helps to greatly enhance *multiprocessing* performance.

Finally, any memory not being used by the kernel or applications is automatically used as a *disk cache*. This speeds access to the disk so long as there is unused memory.



*Why waste money on
upgrades when you can
use it with Linux?*

GNU, FSF and Linux

Richard Stallman is the founding father of the *Free Software Foundation*, which aims to code software and give them away for free. One of the pilot projects of the Free Software Foundation is GNU which stands for “GNU's Not *UNIX*”.



This goat is the logo of GNU

Stallman liked UNIX so much that he thought it should be given away for free. The GNU project, started in 1984, has developed thousands of software which do all that the original UNIX tools did, but with a difference: they are much better, cost nothing, and come with the source code.



Images: gnu.org

GNU and Linux share a symbiotic relationship. While the Linux kernel still lies at the core, GNU software make the system much more functional. Hence the awkward but accurate: *GNU/Linux*

Powerful File System

Linux normally uses its own **high-performance file system**, which uses disk space much more efficiently, optimises for speed on reading and writing, and automatically prevents fragmentation. The Linux file-system literally does not need a defragmenter, though one is available. Linux also has a Journaled file system available to provide excellent data protection.

Linux can also read and write all FAT variants (FAT12, FAT32), Windows NT's NTFS, OS/2's HPFS, and many others you've never heard of. Often it can use them faster than their native operating system can!

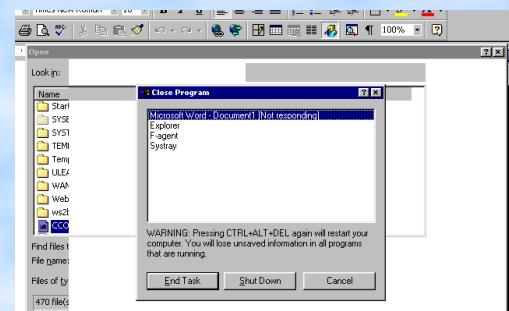


*Linux can use your
hard disc better*

Linux has the Unmatched Stability of UNIX

Linux enforces a strict *separation* between the kernel and other applications. Most services like mail, file and print serving, web serving and so on are applications, and can usually be changed dynamically. At worst, a specific application may need to be restarted, and not the whole system. Reboots are only for kernel updates and hardware changes. UNIX systems have uptimes in terms of *years*!

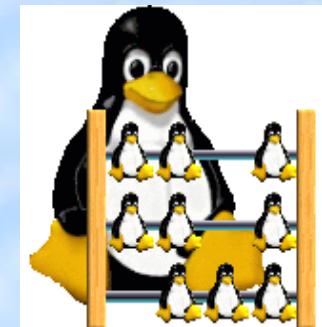
Linux also provides the ability to *dynamically increase swap space* and then *reduce* it later without a reboot, unlike Windows, where it grows and grows until a restart



MS Word has frozen

Built-in Networking Support

TCP/IP networking and the Internet was originally developed on UNIX systems, and most of the high-power networking in the world is done on UNIX. About **75%** of the web servers on the Net run a version of UNIX.



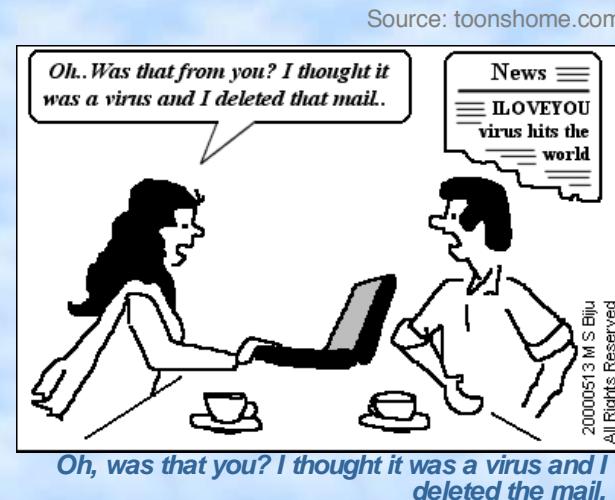
Linux is network ready

In fact, Linux has the *largest market share* for the entire Internet, running 25.7% of the **news servers**, 26.9% of the **web servers**, and 33.7% of the **FTP servers** in the world. Apart from extremely fast and reliable networking, dozens of major and minor network services are usually provided when you get Linux. *Web servers, file and print servers, ftp servers, NIS servers, IRC servers, news servers*, and more are available for free or very little cost.

High Level of Security

Linux is a very secure operating system, much more secure than Windows 9x and even Windows NT.

The majority of viruses are windows based. Linux is immune to these threats. There were a few viruses that targeted Linux but Linux has a file permission structure which greatly limits the damage a virus can do



Linux is less prone to *hacker attacks* than most OSes. This is partly because of its design and its open-source nature.

Linux vs Windows

Linux is emerging as a strong competitor to Windows. It has given enough scare to Microsoft, that it circulated a memo on the damaging effects of Open-Source revolution! This table, built by a Microsoft certified NT professional, shows a feature by feature comparison of Linux and Windows NT.

Component	Linux 2.x	Windows NT Server 4.0
Operating System	Free, about \$49 for a CDROM	Depends on no. of users: \$899 to \$3999
Kernel Source Code	Yes	No
Web Server	Apache	IIS
Telnet Server	Yes	No
POP3 / SMTP Server	Yes	No
X-Window Server	Yes	No
C / C++ Compilers	Yes	No
No. of file systems supported	32	4
Disk quotas support	Yes	No
No. of GUIs	4	1
Free Online Technical Support	Yes	No
Platforms	x86, SPARC, PowerPC, StrongARM	Intel x86, Alpha
SMP Support	Up to 16. Beowulf supported	2 in Workstation, 4 in Server. No Beowulf

A Few Myth's About Linux

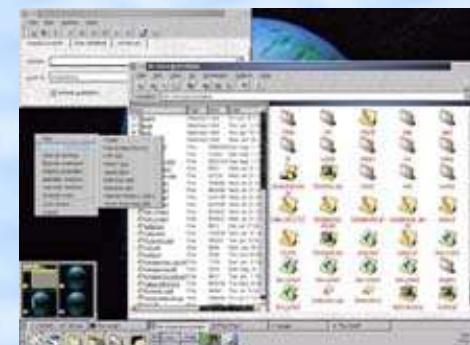
◆ **Linux is open, so insecure**

- ◆ When programmers find a piece of bug in the source, they quickly try to *fix* it, rather than capitalise on it. Since the code is available to all there are enough “eyes” to catch and resolve most security problems quickly.



◆ **Linux is not as polished as Windows**

- ◆ KDE 2.2 was rated by *PC Magazine* as the most user-friendly GUI, beating WinXP!



- ◆ **There are not many applications for Linux**

- ◆ As of today, there are over 15,000 major applications built for the Linux platform. You can code in C, Java, perl, php, etc.; listen to music; browse the Web; play an action game; watch a movie; and even modify this slideshow with OpenOffice!



*You can do everything in Linux
as in Windows*

- ◆ **Linux does not have a centralized authority**

- ◆ Linux might be coded by programmers around the world, but there *is* a group of people headed by Linus who have the ultimate say on it. They decide on the next version of Linux

- ◆ The various UNIXes are fragmenting into a plethora of incompatible versions

- ◆ UNIX systems now broadly adhere to ANSI and POSIX standards, that allow software to be **source-compatible** across different platforms, ranging from embedded micro-controllers to supercomputers. The X/OPEN standard allows a common desktop across all platforms. On the Intel x86 platform, for example, Linux can run SCO UNIX binaries, and FreeBSD can run Linux binaries. At a pre-release Solaris 10 event at Sun headquarters in NYC, Sun developers touted how Solaris can run Linux binaries.

Caldera UnixWare
DEC Digital UNIX
FreeBSD
HP-UX
IBM AIX
Linux
SGI IRIX
Sun Solaris

Some Issues with Linux

Linux is not very beginner-friendly

Linux can be overwhelming for a new user from Windows. Stop comparing Linux with Windows every once in a while, and you will gradually appreciate Linux.

Installing Linux is difficult

Installing Linux is an adventure for a novice accustomed only to Windows. Ever heard of swap partitions and mount points?

It is sometimes hard to work with Linux software

To quote Stallman, 'Freedom is much more important than technical superiority or ease of use.' Patience!

There is a lack of user-friendly help in Linux

Be prepared to read long technical manuals, and subscribe yourself to your local Linux user-group mailing lists!

Linux is still heavily command-dependent

Though KDE and GNOME are great GUIs, you still cannot forgo commands. Sooner or later, you will use the prompt.

Linux is choosy on hardware

Most hardware works well in Linux, but a few, especially win-modems and certain brands of printers, video-cards, and sound-cards, can be notoriously uncooperative. As more firms realise the power of Linux, getting drivers won't be a problem.

Linux is the fastest growing server operating system in 2000, with a growth rate of 166%. Source: IDC

Major Supporters of Linux

Linux has found a large following, from a broad spectrum of organisations. Here is a short list of major supporters and users of Linux.



Click on any logo to visit the company's Web-site. [Full list](#).

Why Use Linux ?

- Linux has *legendary stability*. Blue screens are unknown; crashes, very rare.
- Linux is *ideal for networking*: You can freely set up a functional and stable router, firewall, Web server, mail server, or FTP server right out of the box.
- Linux can *talk with many other systems*, including NT, NetWare and Sun. It supports *multiple-processes* and *-processors*, and a variety of *file systems*.
- *Low resource requirements* of Linux means you can bring even a 486 to glory
- Linux gives you *choice* from GUIs and shells to everything. The *range* of applications is *huge*, and *powerful package management systems* exist.
- Linux is *reliable, secure, easily upgradeable*, and has an *open design, logical file system layout* and *supportive community*, which make it a *zero-maintenance system*
- Linux comes with the *world's best compilers* and *development tools*, complete with *version control software*. It is a *programmer's heaven*.
- And finally, the best part: *Linux is free*. You can share it with everyone.

Do You Want the Whole Story ?

Revolution OS

Wonderview Productions ; Distributed by Seventh Art Releasing, 2003.

Format: [DVD] /

Description: 2 videodiscs (155 min.) : sd., col. ; 4 3/4 in.

Summary: Revolution OS depicts the inside story of the hackers and computer programmers who rebelled against Microsoft to create the Linux operating system. Disc 2 includes 70 minutes of additional interviews.

Credits: Music, Christopher Anderson-Bazzoli.

Performers: Narrator, Susan Egan ; featuring: Linus Torvalds, Richard Stallman, Bruce Perens, Eric Raymond, Larry Augustin, Brian Behlendorf and Michael Tiemann.

Additional Authors: Torvalds, Linus, 1969-
Stallman, Richard.
Perens, Bruce.
Raymond, Eric S.
Augustin, Larry M., 1962-
Behlendorf, Brian.
Tiemann, Michael, 1959-
Egan, Susan.
Moore, J. T. S.
Seventh Art Releasing (Firm)
Wonderview Productions (Firm)

Copy/Holding information

Library	Call No.	Shelf area	Status
MIDDLETOWN THRALL LIB	DVD 005.0922 REV	DVD INSTRUCTIONAL	checked In

After a Short Break.....

*We'll take a look at the contents of
the The Open CD and boot up
Knoppix Live for a Demo*

*For more information or to download these slides go to
www.wvpcug.org or **www.korn.net/wvpcug***

*If you have any questions or comments I can be reached at
rjk@korn.net*