

# What is Linux?

---

- A computer **operating system** (OS).
- Based on the **UNIX** OS (a major **server OS**).
- **Free** and **open source** software (**FOSS**).
- Available **free of cost**.
- Runs on **nearly every hardware platform**:
  - mainframes, PCs, cell phones, embedded processors
- Heavily used for **servers**.
- Heavily used in devices with **embedded processors**.

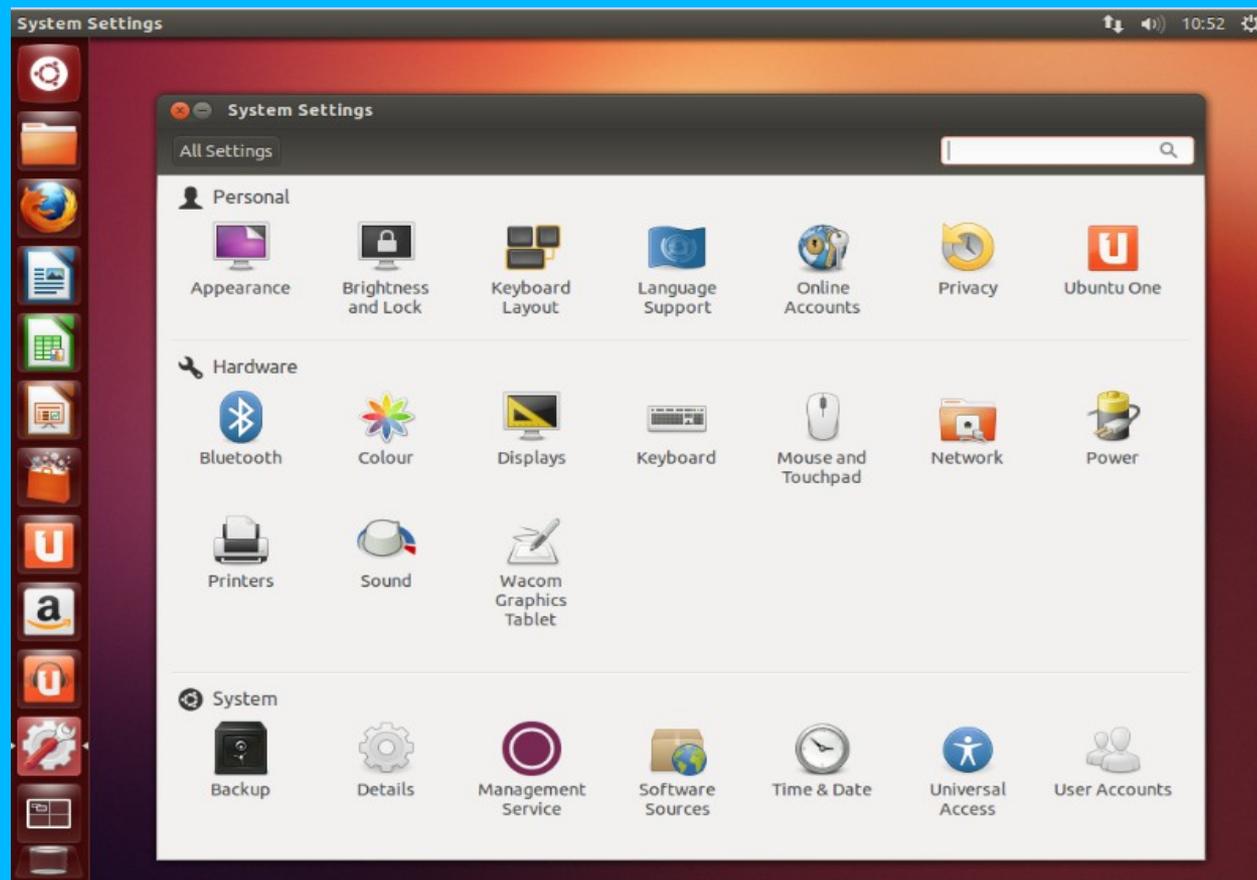
# Linux??

---

- “But I have never heard of Linux, so it must not be very commonly used.”
- “Nobody uses Linux.”
- “Everyone runs Windows.”
- “Linux is too hard for anyone but computer scientists to use.”
- “There's no malware for Linux because Linux is so unimportant.”

# Have You Used Linux?

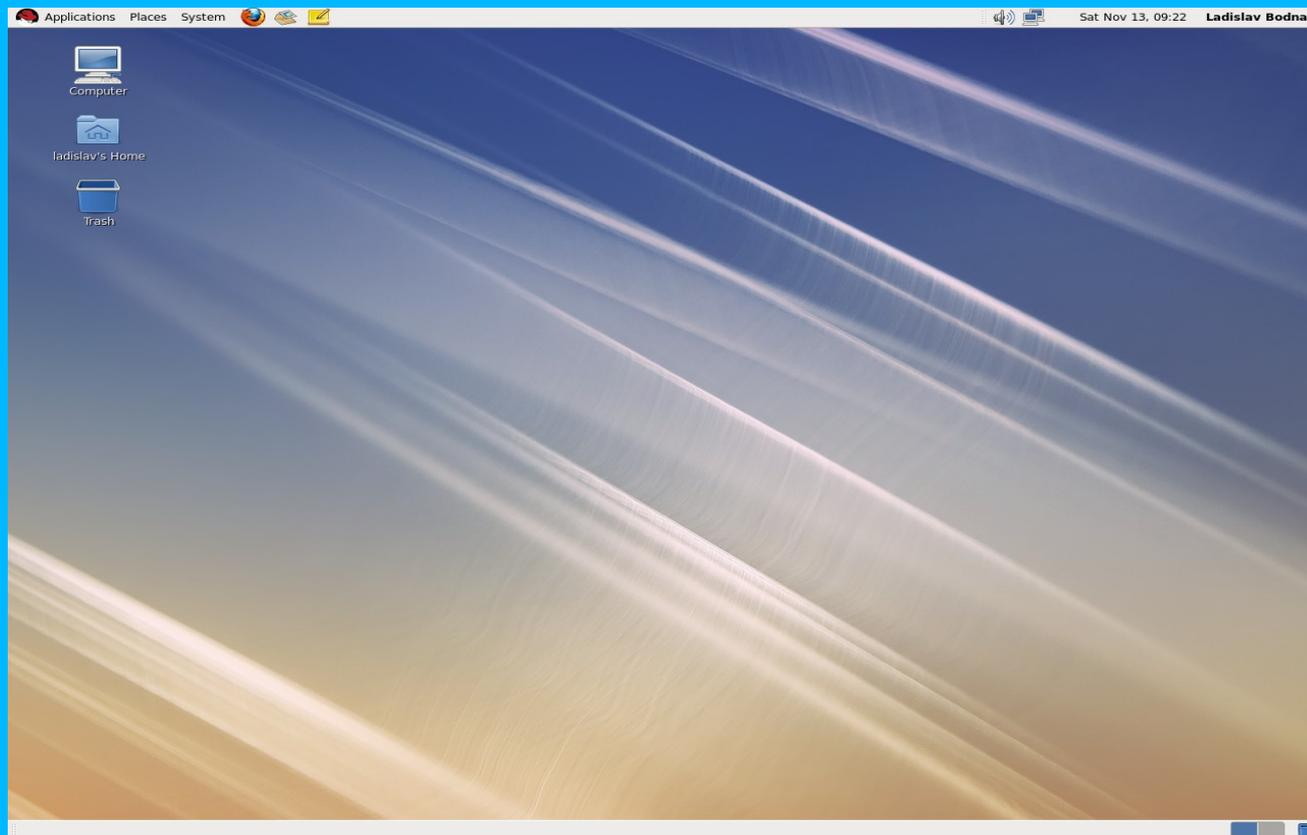
- Desktop OS?
  - many **distributions**: Ubuntu, Red Hat, etc.



# Have You Used Linux?

---

- Desktop OS?
  - many **distributions**: Ubuntu, Red Hat, etc.



# Have You Used Linux?

---

- Cell phones or tablets or netbooks?
  - **Android** and **Chrome OS** are Linux based



# Have You Used Linux?

---

- Routers?
  - many routers and other network devices run Linux
  - projects like DD-WRT are based on Linux



# Have You Used Linux?

---

- NAS (Network Attached Storage) devices?
  - most run Linux



# Have You Used Linux?

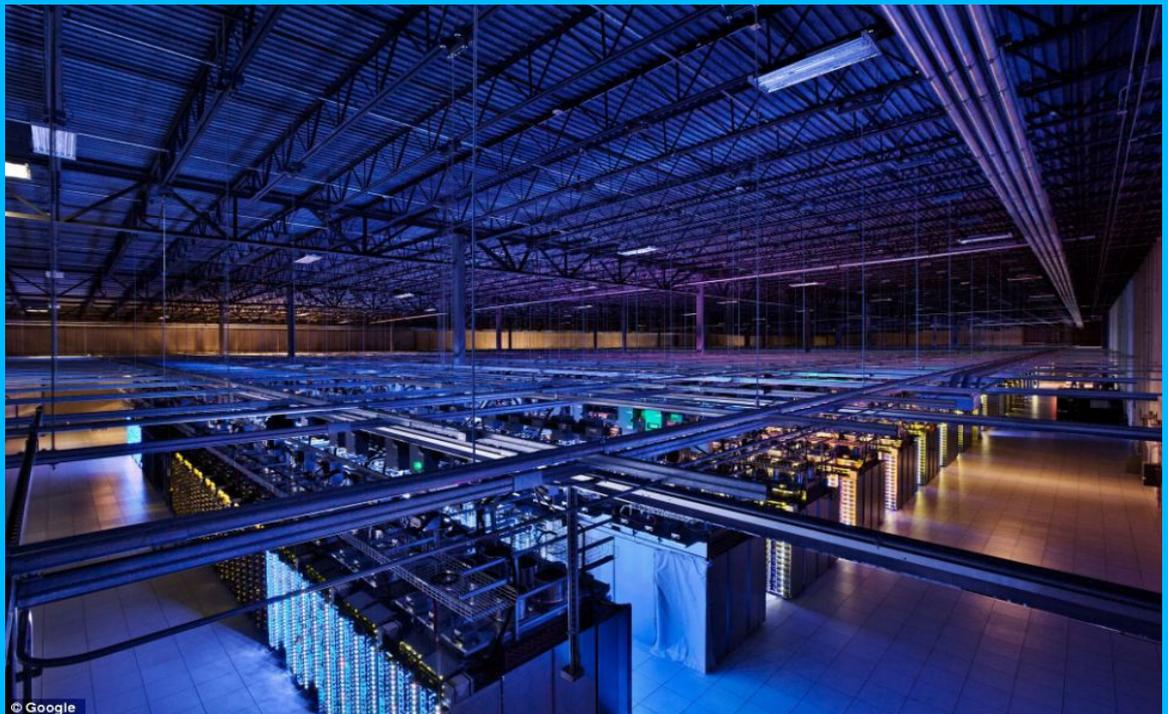
---

- Multimedia devices?
  - many run Linux



# Have You Used Linux?

- Servers?
  - **Google, Amazon, and the NY Stock Exchange** all run on Linux-based systems
  - Google runs in excess of **two million** Linux servers



# Have You Used Linux?

---

- Servers?
  - W3Tech reports that about 65% of website servers run Linux or UNIX
- Supercomputers?
  - of the top 500 supercomputers in the world, all but 23 run some version of Linux (TOP500.org)
- Cloud Computing?
  - the base OS for **Amazon's** 500,000 **EC2** servers is Linux (guest OS's run in virtual machines)

# Linux!

---

- So in reality, Linux is now a critically important and much used operating system.
- Linux' importance will only increase as more devices contain powerful processors and as more computing moves “to the cloud.”
- The only place where Windows continues to dominate is desktop computing.
- Modern Linux distros are just as easy for desktop users as Windows however.

# What is an Operating System?

---

- An **OS** is a **layer of software** that sits between users/programs and the bare computer hardware.
- Makes the hardware much **easier to use**.
- Allows programs to run **safely & efficiently**:
  - control memory and CPU use by each program
  - allow multiple programs to run “in parallel”
  - prevent programs from interfering with one another
  - allow users to store files (**filesystem**)
  - control access to files, printers, etc.

# What is an OS? (contd.)

---

- A complete OS is typically implemented as a set of components, arranged in **layers**:
  - **application software**: allows users to get things done
  - **GUIs/window managers**: graphical interface to OS
  - **Shells**: the **command line** interface to OS
  - **libraries**: higher level programming interface
  - the **kernel**: the OS core
  - **device drivers**: interface between kernel and hardware

# Linux History

---

- Began as project by Finnish computer science graduate student **Linus Torvalds** to create an OS he could use on PCs.
- Version 0.01 was made available during 1991.
- One of the first **Internet-based collaborative programming projects**.
- An important **FOSS** project.
- Linus continues to serve as the main director for Linux kernel development.

# What is FOSS?

---

- **FOSS:** Free and/or Open Source Software (also **FLOSS:** Free/Libre/Open Source Software)
- **Free** software:
  - free as in “free speech” vs. “free beer”
  - freedom to use, copy, distribute, and modify
- **Open Source** Software:
  - source code (original program) is available to users
- Software can be free but not open source (e.g., Java), or possibly open source but not free.

# What is FOSS? (contd.)

---

- vs. Proprietary, Closed Source Software:
  - restrictions on use (e.g., EULAs)
    - how many instances can run, what machines or OS's can run on, need for activation, reverse engineering illegal
  - binary/executable only—cannot examine/modify code
- Genesis of FOSS movement:
  - **GNU** project
  - begun in 1984 by Richard Stallman of MIT
  - goal was to build a free complete UNIX-like system
  - much software in a Linux distribution is from GNU



# What is a Linux Distribution?

---

- Most people install a Linux **distribution**.
- A distribution is a packaging of:
  - Linux (kernels) + device drivers
  - shells (bash, csh, etc.)
  - GUI (X11, Xfree, X.org)
  - window managers (KDE, Gnome, etc.)
  - boot managers (LILO, GRUB)
  - application software
  - installation and maintenance tools

# What is a Distribution? (contd.)

---

- Many Linux distributions are available:
  - e.g., Ubuntu, RedHat, Fedora, Mageia, Suse, Mint, Debian, Ubuntu, Kubuntu, Slackware, Gentoo, Arch, Puppy, MEPIS, PCLinuxOS, Knoppix, etc.
  - good overview site: [Distrowatch.com](http://Distrowatch.com)
- Distributions differ in several ways:
  - look and feel, target users, software selection, packaging method, release cycle, installation and maintenance tools, security emphasis, desktop vs. server focus, licenses, support, cost, hardware optimization, etc.

# Why Use Linux?

---

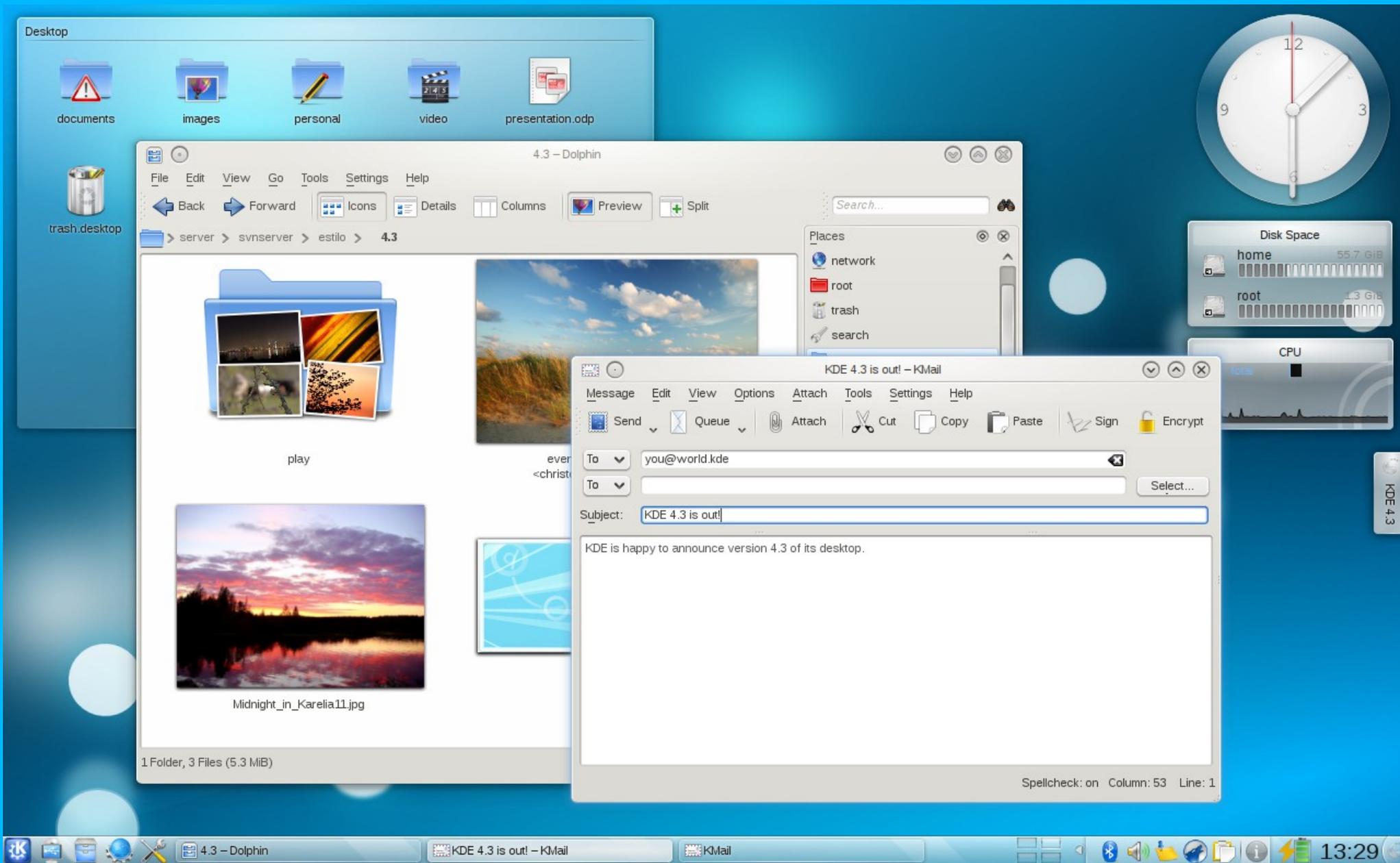
- Many distributions are available completely **free** (as in “free beer”) for downloading from Internet.
- Avoids giving money to Microsoft.
- Freedom from **restrictive licenses** (no need to activate, can install on multiple machines, etc.).
- Supporting and participating in FOSS.
- More control over upgrades, security patches, etc.
- **Package management systems** make large amounts of software easy to find and install.

# Why Use Linux? (contd.)

---

- Administration to keep up-to-date requires much less effort than with Windows machines.
- More flexible than Windows/Mac:
  - can recompile/specialize kernel
  - runs on many platforms and reads many filesystems
  - many distributions with different goals and looks
  - multiple GUIs (**window managers**) available
    - e.g., KDE, Gnome, FluxBox, FVWM, IceWM, etc.
  - window managers highly customizable
  - large amounts of FOSS software easy to install

# KDE Desktop



System Info  
 romaN@genti  
 kernel-2.6.11-gentoo-r4  
 KDE: 3.4.0  
 MB Temp: 45 °C

10°C  
 P: 1013  
 H: 87 %  
 R: 10°C  
 3 kph  
 Meist wolkig  
 Taq: Di: Mi: Do: Fr:  
 8/0 7/12 6/11 6/12 6/13

eMail  
 pop3.arcor.de 0 neu

amarok  
 Title - Artist | Album | Length  
 My Shoes Promo Album 8:19 Dido - Sand  
 0:07:28  
 160 kbps - 44 KHz

Befehlsfenster - Konsole  

```
romaN@genti ~ $ uname -a
Linux genti 2.6.11-gentoo-r4 #1 Fri Mar 25 00:15:14 GMT 2005 i686 AMD Athlon(tm) XP 3000+ AuthenticAMD GNU/Linux
romaN@genti ~ $
```

CPU Info  
 62%  
 CPU Temp: 57.0 °C  
 CPU Fan: 3068 U/min  
 AMD Athlon(tm) XP 3000+

Memory Load  
 Ram: 547 of 1009 Mb  
 Swap: 0 of 1004 Mb

Network Info  
 incoming  
 13.1 Kb total: (31.2Mb)  
 outgoing  
 42.1 Kb total: (53.7Mb)

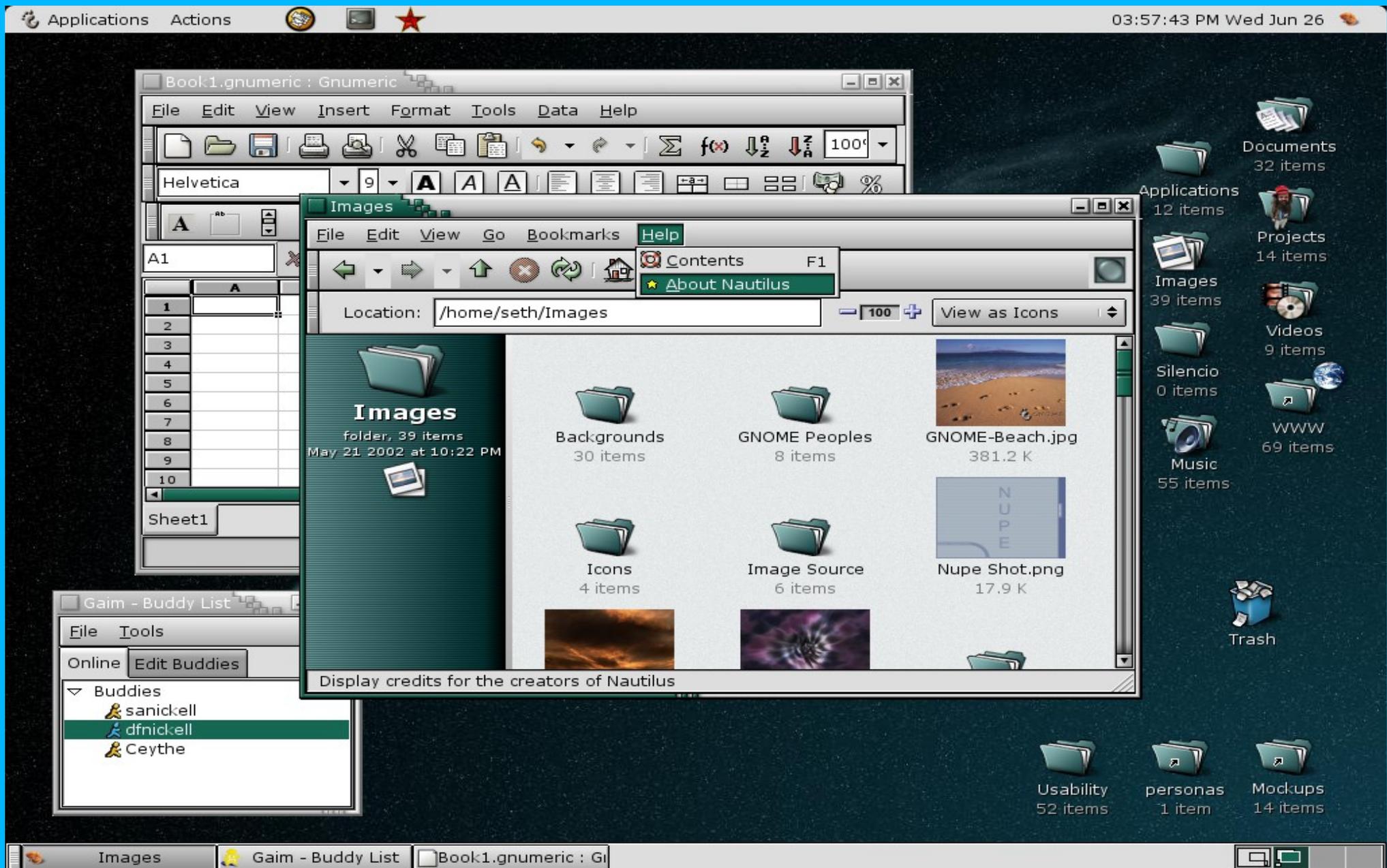
Disk Usage  
 /: 5276 of 10014 Mb 53%  
 Home: 14913 of 41358 Mb 37%  
 Games: 7468 of 23834 Mb 32%  
 Win: 25420 of 47998 Mb 53%

Time/Date  
 00:57  
 März 2005  

Mo	Di	Mi	Do	Fr	Sa	So
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

 Dienstag 29.  
 uptime: 0d 00h:31m

# GNOME Desktop

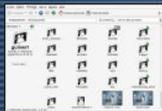




27 °C  
Bém  
H: 42 %  
P: 1020 mbar

Thu Fri Sat Sun Mon  
17 N/A 15 21 11 21 11 18 11 20

MLNet 2.5-4+2:  
Download: 1.4 MB/s  
Upload: 2.4 MB/s  
Downloaded: 100 files



- Home
- Terminal
- Office
- Internet
- Editeurs
- Multimedia
- Utilitaires
- Jeux
- Préférences
- Quitter
- Epiphany
- Evolution
- Xchat
- Amsn
- Gftp

gulivert

Eichier Édition Affichage Places Aide

- public\_html
- Templates
- tmp
- TransGaming\_Drive
- videos
- fvwm2rc-theme-1
- fvwm-4.png
- Strategie Radar.rtf

gulivert 20 éléments, espace libre : 4,5 Go

```

af_pre: 48000Hz 2ch Signed 16-bit (Little-Endian)
ao: [oss] 48000Hz 2ch Signed 16-bit (Little-Endian) (2 bps)
Building audio filter chain for 48000Hz/2ch/16bit -> 48000Hz/2ch/16bit...
Starting playback...
Vlacc: no config request - 512 x 368 (preferred csp: Planar YV12)
Vlacc: using Planar YV12 as output csp (no 0)
Movie-Aspect is undefined - no prescaling applied.
VO: [xv] 512x368 => 512x368 Planar YV12
No bind found for key MOUSE_BTN0          % 0.5% 1 0 99%
No bind found for key MOUSE_BTN0          % 0.6% 1 0 99%
No bind found for key MOUSE_BTN0          % 0.6% 1 0 97%
No bind found for key MOUSE_BTN1          % 0.7% 1 0 94%
No bind found for key MOUSE_BTN2          % 0.8% 1 0 93%
A: 8.4 V: 8.3 A-V: 0.024 ct: 0.098 201/201 4% 0% 0.7% 1 0 88%

MPlayer interrupted by signal 2 in module: sleep_rtc
gulivert@jack:/mnt/divx/DVD-rip$ cd
gulivert@jack:~$ gedit ./mplayer/config
gulivert@jack:~$ ls
BitTorrent/  Desktop/  Images/  Mail/  download/  Music/
GNOME/      Documents/  Music/  Music/  Music/
Strategie\ Radar.rtf  evolution/  mp/  public_html/
Templates/  fvwm-4.png  tmp/
TransGaming_Drive/  fvwm2rc-theme-1  tmp/
amsn_received/  mldonkey/  videos/

```

gulivert@jack  
Uptime: 7:39  
Linux version 2.6.4  
CPU Load: 55  
AMD Athlon(tm) XP 2800+ @ 2088.048  
RAM: 1005.32M/1010.36M  
Swap: 0/517.71M  
eth0 192.168.1.34  
in : 388.75MB  
out : 122.28MB  
in : 8.73KB/s  
out : 4.84KB/s max: 15.92KB/s  
max: 7.72KB/s

pop.bluewin.ch  
cedric.bapst  
0 (0B)  
pop.bluewin.ch  
gulivert  
0 (0B)

Think Shell  
Think Terminal



00:39:32 lume1 fr dvd r

System tray area with icons for network, volume, and other system functions.

# Why Use Linux? (contd.)

---

- Can be highly stable and easy to fix:
  - Linux servers often run for months without rebooting
  - software installation or configuration changes almost never require rebooting (mainly kernel updates)
  - configuration done via text files (vs. “registry”), so easily viewed/changed
  - don't need to buy “registry cleaning” software and the like just to maintain your system

# Why use Linux? (contd.)

---

- More **secure** than Windows and Mac:
  - immune to Windows **malware**, Linux malware rare
  - do **not** need to run **virus scanning software**
  - user privileges/permissions limit damage
  - limited integration/automation among applications
  - all applications separate from OS (unlike IE)
  - system and app patches available via package system
  - **remote exploits** rare (most patches for **local exploits**)
  - powerful **firewall** built into Linux kernel
  - much security software included

# Why Use Linux? (contd.)

---

- More sophisticated networking capabilities:
  - routing and NAT capabilities built in
  - distros include free servers (e.g., SSH, Apache)
  - remote access/control via SSH, VNC, or X11
  - encrypted access via SSH/SFTP
  - can mount remote filesystems (e.g., NFS, SMB)
  - understands all open network standards (e.g., IPv6, IPP, etc.) as well as many proprietary/closed
  - many applications network aware (e.g., Konqueror)

# Why Use Linux? (contd.)

---

- Can **interoperate** in mixed OS networks:
  - **Samba** can read and serve Windows file and print shares (using SMB/CIFS)
  - kernel supports SMB and NFS network filesystems
  - **CUPS** handles every network print server protocol
  - **OpenOffice** can read most MS Office documents

# Why Not Use Linux?

---

- Windows software does not run on Linux and much of the software you now use is not available for Linux (e.g., Office, Photoshop).
- Some multimedia formats are available only for Windows (e.g., browser plugins, WM/DRM).
- Almost no hardware comes with Linux drivers or instructions for installing under Linux.
- Linux can require more technical expertise to set up and use certain hardware and software.

# Why Not Use Linux? (contd.)

---

- Some new hardware may not have Linux drivers.
- Difficult to get Linux preinstalled, so must install (not too difficult but “scary” for many people).
- Support staff generally ignorant of Linux so cannot use “traditional channels” for support.
- Many businesses require use of MS products.
- May be harder to exchange some files.
- Availability of games more limited.

# So How Can One Try Out Linux?

---

- Many Linux distributions are available **free** (of cost).
- CD/DVD installation disc **images** will be available for download (burn as image, not as data file).
- Among the more popular distributions in the US:
  - Ubuntu, Kubuntu, Mint
  - Fedora and CentOS (free Red Hat)
  - Mageia and PCLinuxOS
  - Suse (openSuse)
  - Debian

# How Try Linux? (contd.)

---

- DVD install discs contain most necessary software, while CDs contain only the basics.
- All distributions have **online software repositories** to get additional software as well as **updates**.
- Most free of cost versions will **not** contain any proprietary (non-open) software, such as Flash player, MP3 support, etc.
- Most have “unofficial” repositories with these.

# How Try Linux? (contd.)

---

- There are five ways to run Linux:
  - (1) run it directly from a “**live**” **CD/DVD**
  - (2) install it on a USB “**flash drive**” and run it from the flash drive (many distros support this)
  - (3) install it as a “guest OS” in a **virtual machine**
  - (4) install it on a **hard drive partition**, **boot** to the partition, and run from hard drive (normal install)
  - (5) a few distros have a “**Windows installer**” that can install Linux as a file inside of Windows and boot that file version when running Windows