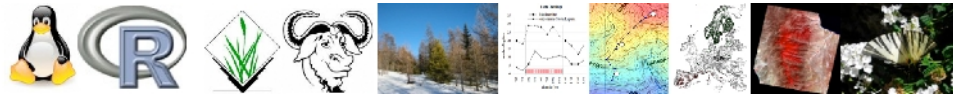


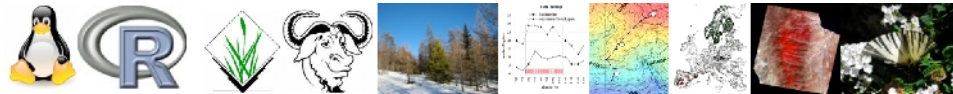
# UNIX/LINUX

Giuseppe Amatulli



# What is UNIX

- UNIX provides a range of tools that can be combined and manipulated to perform such a wide variety of jobs.
- originally developed for multi-user systems
- now is also run on 'stand-alone' machines under Linux-distribution



# Linux

**So, why do people use Linux/OpenSource?**

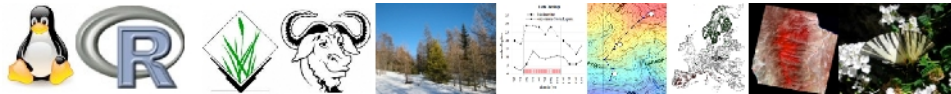
**Freedom:** free to download/test/install/modify/  
configure/develop/distribute/... it's fun!

**Security:** extremely stable and reliable, no viruses,  
interoperable: Unix, Windows, Mac, Novell, ...

**Applications:** thousands of free programs,  
programming languages, server services

**Versatility:** minimum HW requirements,  
extremely portable, very fast performance

**... and why do people still use MS-Windows?**

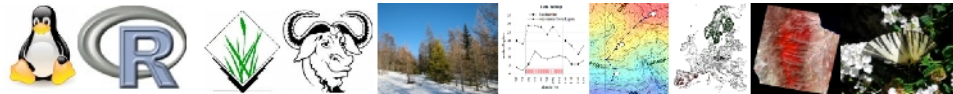


# Linux and Open Source

**Open source:** design, develop, and distribute software with full access to its source code.

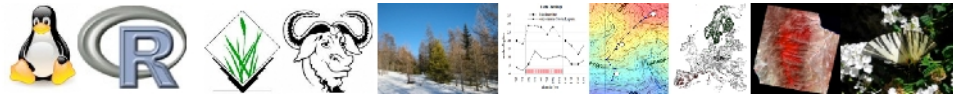
**Example:** Netscape/Mozilla Public License, **GNU**, **FOSS**, **OpenSource licences**, **FSF**

**Famous applications:**








# Linux and Open Source

- Running on workstations, web servers, mobile phones, robotics, book readers, Sony PlayStation, satellite receivers, routers, iPod, PC, laptop, **OLPC**, ...
- Available for different processor types, 32/64 bit: Intel x86, AMD, PowerPC, Sparc, IBM, Alpha, ARM, HP, MIPS, ...
- *Many* different flavors (~2000 distributions) differing in application fields (PC, robotics, etc.) target audience (security, web-server, client PC, GIS, etc.) provided applications (minimal/variety, multimedia, graphics, audio, language support, etc)



# Linux distributions

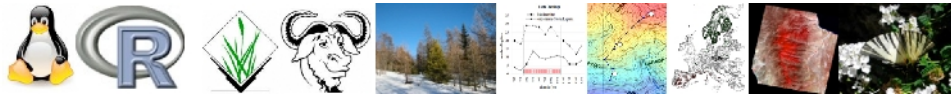
Distribution	Package format/tool	# packages	comments	Newbie → Expert [1-5]
Debian 	deb, apt	25.000	Biggest, base for many other distros	4
Fedora 	rpm, yum	8.000	Non-commercial version of <b>RedHat</b>	3
Ubuntu 	deb, apt	26.000	Versatile, most popular, commercial support	1
Mandriva 	rpm, urpmi	20.000	commercial support	1
OpenSUSE 	rpm, zypper	22.000	Non-commercial version of <b>Novell</b> (SLED)	2
Knoppix 	deb, apt	3.600	THE LiveCD	3
Slackware 	tgz, installpkg	500	Oldest, fast, techies	5
PCLinuxOS 	rpm, apt4rpm	12.000	Newcomer friendly, great forum support, mklivecd	1

# Different way to test linux

**Live media:** CD/DVD/USB-flashdrive with a bootable OS



- **Testing:** a Linux distribution (or install to a hard drive); new software; computer hardware; access files of the host system
- **System maintenance:** repair; restoration; network security testing; backup operating system for any computer; computer forensics
- **High security/non-invasive environment for a guest user:** crucial files cannot be permanently altered; enable high vulnerability tasks such as internet banking; visiting dangerous website (cracks, adult, ...)
- **Kiosk mode:** define a customized client system for demonstration mode  
The host system is untouched and available after a reboot



# Linux Package management

So, I just installed Windows/Linux! Now I need: Office suite, iPod, DVD/music-player, photo management, anti-virus, firewall, ...

## Software management

**1) Do:**

Browse/search Internet for information, trade-off features/price, opensource alternatives, etc.



Nothing, you have it already!



**2) Get:**

**program.exe**, drivers, serial code (register on website and pay \$; or search for crack: illegal and risk to infect the system, You don't do that, right?)



**Source:** program.tar.gz  
**Binary:** program.rpm, -.deb, ...

May look confusing and is very rarely needed because of :3)



**3) Install:**

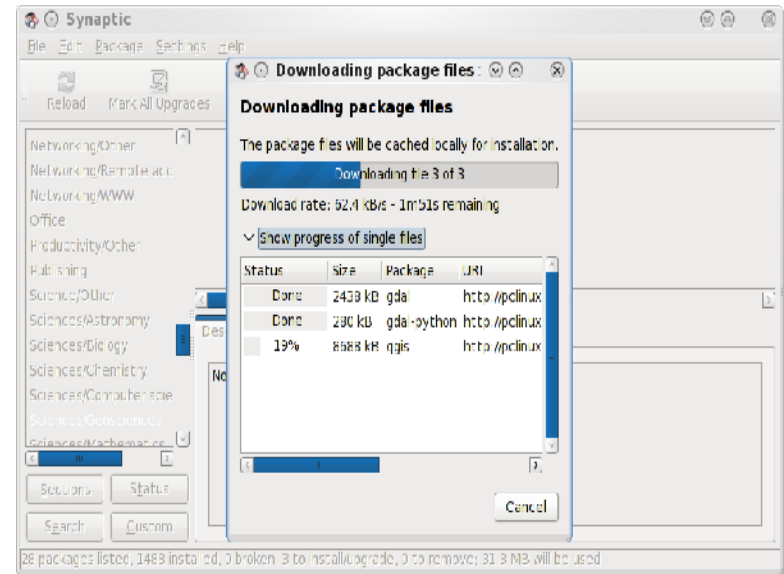
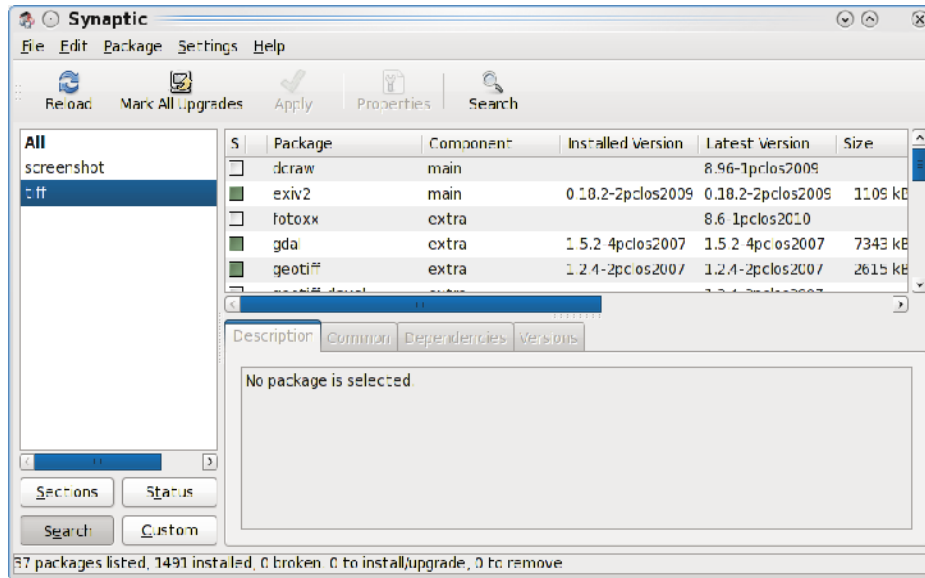
Double-click, click continue, yes, scroll down, yes, pretend to have read the 3 page license agreement, yes, continue, yes, yes, continue, yes, yes, reboot, ...

Just click Apply to have your **package manager** download & install (remove) any number of packages. No reboot, your package manager will do it all.

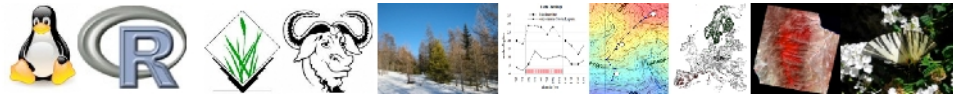


# Linux Package management

Synaptic (PCLinuxOS), YUM (Fedora), Zypp (OpenSuse)

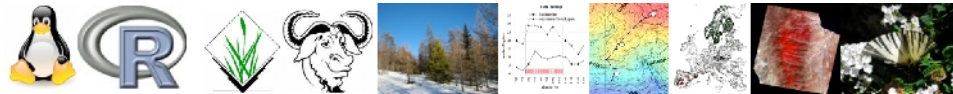


**Always use programs from your distribution's package manager! They are compiled for and tested to work with your distribution. Installing packages from outside your distribution software repository *may* be tedious and *may* destabilize your system!**



# LINUX/UNIX Features

- written in the high level language C
  - easy to install on new computing systems
- the UNIX operating system consists of
  - the kernel
    - Performs basic operating system functions such as accessing files, allocating memory, etc.
  - the shell
    - Provides the user interface to the kernel
    - C shell (csh) is the original default shell for interactive work



# The LINUX system

## Finding the forest for the (directory) trees

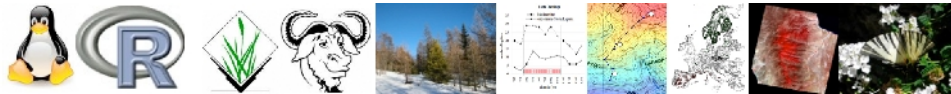
The LINUX directory structure

Who's root, what's root?

File System Hierarchy

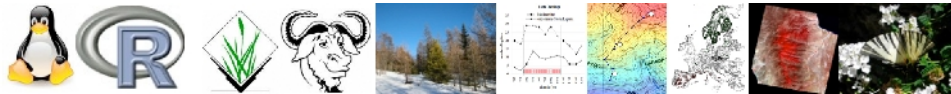
/home

System directories /dev /usr /var



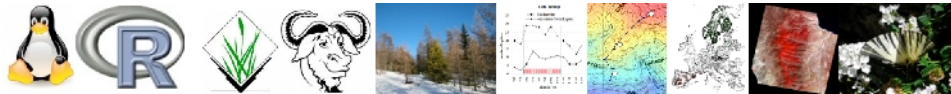
# Who's root ?

The system administrator (**Admin**)  
root has all permissions



# Who's root ?

*As root, you can screw up everything*

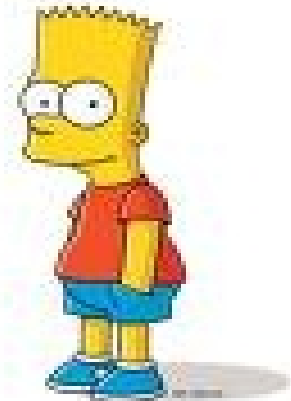
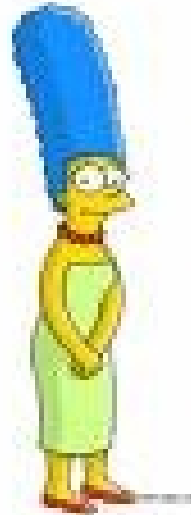


# Who's root ?

*As root, you can screw up everything  
...and everyone*



*As a regular user, you can only screw up your own data...*



# What's root?

**/** : is the root directory (My computer)

Primary mount point

Can be read by other users (not written)




**/root** : is home directory of root (My documents of Admin)

Can not be read by other users





newby experienced expert (root)

Name	Size	Type	Date Modified	newby	experienced	expert (root)
bin	107 items	folder	Thu 29 Mar 2007 07:00:12 PM CEST			
boot	13 items	folder	Thu 29 Mar 2007 07:00:12 PM CEST			
dev	200 items	folder	Tue 20 Oct 2009 10:57:21 AM CEST			
etc	248 items	folder	Mon 26 Oct 2009 11:22:46 AM CET	-		
forest	17 items	folder	Wed 03 Jun 2009 08:38:58 AM CEST	-		W
formap	8 items	folder	Wed 24 Jun 2009 12:35:31 PM CEST	W		W
geodata	3 items	folder	Wed 03 Jun 2009 08:38:58 AM CEST	W		W
home	26 items	folder	Mon 19 Oct 2009 10:55:03 AM CEST	W		W
inforest	12 items	folder	Wed 01 Jul 2009 03:12:54 PM CEST	W		W
lib	147 items	folder	Fri 24 Oct 2008 08:27:11 AM CEST	W		W
lost+found	? items	folder	Fri 03 Oct 2008 03:39:28 PM CEST			
media	0 items	folder	Wed 21 Oct 2009 10:04:06 AM CEST	-		-
misc	0 items	folder	Wed 03 Jun 2009 08:38:57 AM CEST	-		-
mnt	0 items	folder	Wed 11 Oct 2006 12:06:24 AM CEST	W		W
moving	21 items	folder	Tue 20 Oct 2009 04:41:44 PM CEST	-		-
net	0 items	folder	Wed 03 Jun 2009 08:38:57 AM CEST	-		W
opt	0 items	folder	Wed 11 Oct 2006 12:06:24 AM CEST	-		W
proc	198 items	folder	Wed 03 Jun 2009 08:37:42 AM CEST	R		W
root	? items	folder	Thu 22 Oct 2009 10:18:44 AM CEST	-		-
sbin	270 items	folder	Fri 24 Oct 2008 09:35:45 AM CEST	-		-
selinux	0 items	folder	Fri 03 Oct 2008 03:40:12 PM CEST	-		-
srv	0 items	folder	Wed 11 Oct 2006 12:06:24 AM CEST	-		-
sys	9 items	folder	Wed 03 Jun 2009 08:37:42 AM CEST	-		-
tmp	125 items	folder	Mon 26 Oct 2009 12:23:05 PM CET	-		-
usr	13 items	folder	Fri 03 Oct 2008 03:43:37 PM CEST	-		-
var	22 items	folder	Fri 03 Oct 2008 03:51:08 PM CEST	-		-

26 items, Free space: 91.0 GB



W  
W

# Home directory (**My documents**)

**Each user gets his/her own home directory (~)**

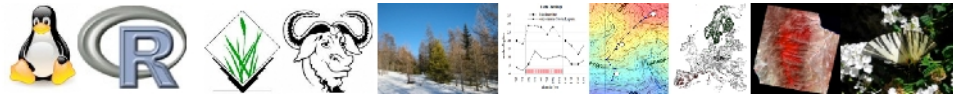
## **Home directory of Homer: /home/homer**

Homer goes home (\*): `cd /home/homer`  
equivalent to `cd ~`  
equivalent to `cd (empty)`



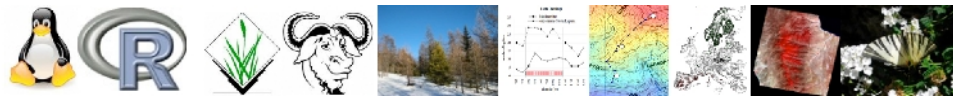
## **Home directory of Marge: /home/marge**

Homer goes to Marge: `cd /home/marge`  
equivalent to `cd ~marge`



# Essential (system) directories

- /bin** all standard commands and utils (ls, cp, ...)
- /sbin** essential system commands (init, mount,...)
- /lib** essential libraries for /bin and /sbin
- /boot** boot loader files (kernels, initrd, ...)
- /mnt** temporary mount point (usb stick, CD,...)
- /dev** file interfaces for devices



# **/usr (read-only user data)**

**/usr/bin** non essential user commands (zip, top,...)

**/usr/sbin** non-essential system commands (adduser, sshd)

**/usr/lib** libraries for */usr/bin* and */usr/sbin*

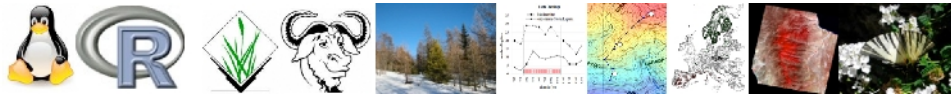
**/usr/src** source code (kernel source code)

**/usr/include** standard include files (for source code)

**/usr/X11R6** X Window system

**/usr/share** architecture-independent data  
(documentation, man pages)

**/usr/local** additional tree structure for new  
applications (bin, lib, src)



# **/var (variable data)**

**/var/lib** state information used by various applications (high scores,...)

**/var/lock** lock files (keeping track of resources currently in use)

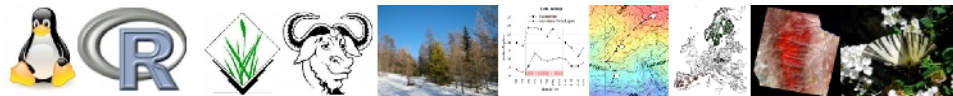
**/var/log** log files and statistics

**/var/mail** user's mail boxes

**/var/run** information on currently logged in users, running daemons,...

**/var/spool** print queues, unread mail, ...

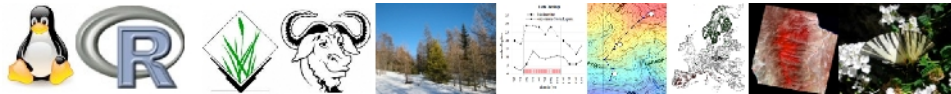
**/var/tmp** temporary files to be preserved between reboots  
(/tmp is cleaned after reboot !)



# File permissions

ls -l : (long) list of directory

```
-rw-rw-r-- 1 homer simpsons 100 2009-10-22 23:14 doughnut.txt
```

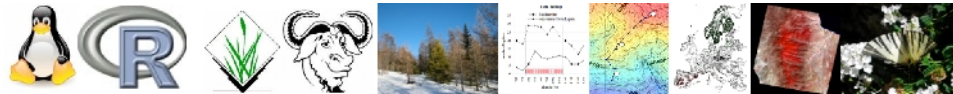


# File permissions

ls -l : (long) list of directory

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```

File type: regular file (-) or directory (d)



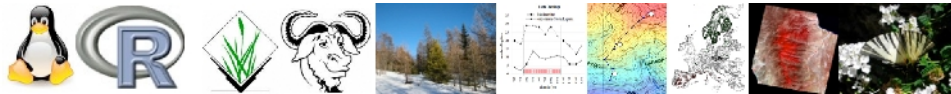
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File type: regular file (-) or directory (d)

user (owner) permissions: rwx (read/write/execute)





# File permissions

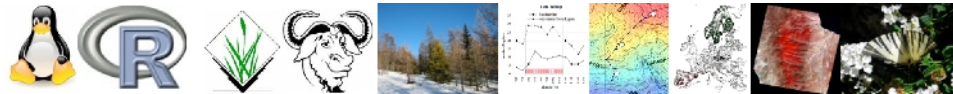
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group permissions: rwx (read/write/execute)



# File permissions

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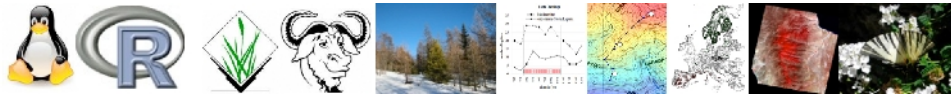
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other permissions: rwx (read/write/execute)



# File permissions

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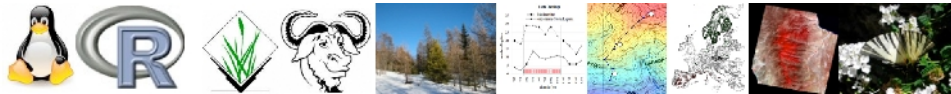
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other permissions: rwx (read/write/execute)

number of links



# File permissions

ls -l : (long) list of directory

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```

File type: regular file (-) or directory (d)

user (owner) permissions: rwx (read/write/execute)

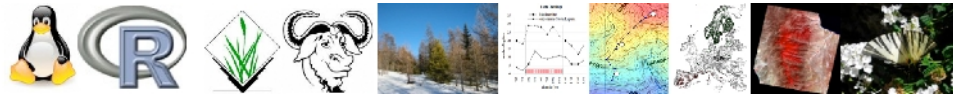
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other permissions: rwx (read/write/execute)

number of links

owner

group



# File permissions

ls -l : (long) list of directory

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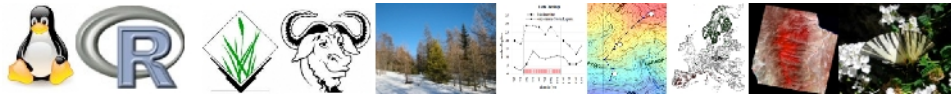
other permissions: rwx (read/write/execute)

number of links

owner

group

file size (in bytes, use ls -h for human readable format: MB, GB, ...)



# File permissions

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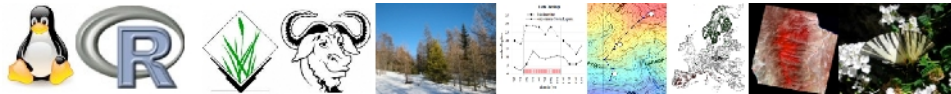
number of links

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time stamp (last modification)



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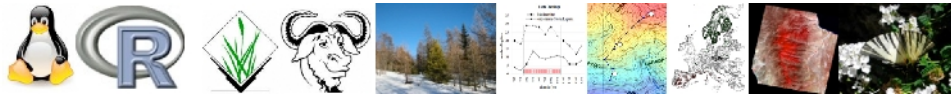
owner

group

file size (in bytes, use ls -h for human readable format: MB, GB, ...)

time stamp (last modification)

filename



# UNIX Shell

- Shell Type
  - sh Bourne shell
  - bash Bourne again shell
  - csh C shell
  - tcsh Teach C shell
  - ksh Korn shell

