LNX70

An introduction to Linux

Contents

1. Introduction

What is Linux ?

Customization of your working environment

Software installation

The command line interface

Some applications

The goal of this course is to provide an introduction and overview of the GNU/Linux system, showing the practical and political aspects in relation to the growth of the Free and Open source software community.

2. What is Linux ?

In this chapter, you will discover all aspects of the GNU/Linux system, more commonly called "Linux" : its origins, the license used for its development and the links between the current operating system and other, more classical ones.

In this chapter

2.1 Goals

Free software and Open source

People and groups around the community

Some licenses

- GPL
- LGPL
- MPL
- SISSL
- BSD

UNIX : base concepts

Linux : base concepts

Distributions

Platforms hardware

Installation

2.2 Free software & Open source

Open source = Free software

Free software = Freeware

Free software (GPL or BSD kind of licenses) :

- Freedom to use, to copy and to modify.
- Freedom of distribution and resale.
- Only constraint : the authors' rights must be respected.
- In consequence, generally free software. If it is sold, the requested price covers only the costs of distribution, the associated technical support, etc.

Open source software :

- Source code can be accessed by everyone.
- The constraints and the rights guaranteed to users vary according to the license, for example MPL (Mozilla Public License) and SISSL (Sun Industry Standard License Source).

Some goals of the GPL license :

- Users enjoy almost as many rights as the software's authors. Those rights are inalienable as long as the user respects the terms of the license.
- Project development in community.

2.3 Some actors and structures of the Open source

People

Universities

Governments

Firms like IBM, Sun and others

Every Open source project has an official website :

- Example: mozilla.org, openoffice.org, scribus.net, apache.org, etc.

The organization of Open source projects became possible with the growing popularity of Internet. The effective management of each project may depend on the contributors' will or on the methods sometimes used in the commercial software engineering world.

- Project and sub-project management, with projects leaders.
- CVS, SubVersion, GNU-arch to ensure continuous synchronization of the contributors' work.
- E-mail, list groups and newsgroups, for the users and the contributors.

2.4 Free software licenses

2.4.1 GPL - GNU General Public License

Currently the most known license. The softwares under this license are « free », as in « free speech », not as in « free beer ». Some interesting facts about the GPL :

- The GPL, once applied to the source code, is irrevocable.
- The source code of GPL-ed applications must be within easy reach, for example available on a separate CDROM in a Linux distro.
- Everyone is entitled to use programs in GPL. However, if some development has been made to their sources, the price to pay is the sharing, under GPL license, of these developments.
- The GPL ***does not forbid*** to sell GPL-ed programs (otherwise nobody would be able to sell Linux distributions). It ensures that the source code will always be available, even if the developers go bankrupt.

2.4.2 LGPL - GNU Library GPL

On limit of the GPL when you are writing code, is that if you published a library of functions needing static linking, every software build upon it must also be published under the GPL. When developing commercial softwares, it is not always acceptable. The LGPL has been created with the aim of authorizing developers to write closed applications on Free software libraries.

Please note that the Linux kernel is published under the GPL, not the LGPL. It is, therefore, delivered with a special authorization for linking a proprietary code. After all, there is no possibility to link dynamically a code to any kernel.

2.4.3 BSD License, MIT License

The BSD Unix-like systems are distributed under this kind of license. The only restriction is that the original authors get credit when it is due. Otherwise, users and coders can do what they want with the source files and, contrary to the GPL, they are not required to share their own modifications. This explains why you can find BSD codes in the sources of a well-known windowed environment.

If the BSD license was born at the Berkeley University in California, and another license comes from MIT on the East Coast, the MIT license is even more lax than the BSD one...

2.5 Open source licenses

2.5.1 Dual licensing

Commercial firms increasingly take part in Open source developments or contribute with the sources of one of their applications. For example Netscape once contributed the code given to Mozilla.

Dual licensing is a clever concept, since it enables a company to preserve its rights on the exploitation of an application, or at least on the version "closed sources" (proprietary version of the application).

2.5.2 MPL - Mozilla Public License

Since the beginning of the Mozilla project, the MPL license has been increasingly used. In fact, after GPL/LGPL, it is the most frequently used license in the development of Open source programs.

The essential difference between the LPG and the MPL is that the MPL clearly defines the way in which proprietary development can be made and that it explicitly authorizes to mix proprietary codes with Open source codes.

2.5.3 SISSL - Sun Industry Standard Source License

Inspired by the MPL, the SISSL license is the alternative created by Sun for the publication of the source code common to StarOffice and OpenOffice.org. The characteristic is that it forbids "to dismember" OpenOffice.org and to separate the various applications.

2.6 UNIX : base concepts

Unix is the operating system on which most of the technologies used nowadays in Internet were created. Unix was originally developed as a private research project by a small group of people at Bell Laboratories, starting in 1969. Their aim was to build an operating system which would be :

- simple and elegant,
- written in a high level language rather than assembly language,
- allow the re-use of code.

Most previous operating systems were extremely heavy and written in assembly language. Unix was mostly written using the C language, ensuring its portability. The name Unix comes from a pun relating to an AT&T project : Multics.

This portability is probably the main reason behind the success of the Unix OS. In the 70s, AT&T gave the source code to universities and US government agencies, and later began to sell it to other companies and entities :

- SVR4 (AT&T, USL, Novell, SCO, etc.)
- BSD (California's Berkeley University)
- etc.

UNIX is a multi-process and multi-user system.

Under UNIX, the file concept is totally central. Everything is represented as files : access to devices, memory, directories, named pipes, etc.

UNIX philosophy : no complex tools. You can assemble simple tools to solve complex tasks.

2.7 Linux : base concepts

From the first release of the Unix OS in 1969 to this day, the story of Unix has been particularly rich. Multiple clones of the original system were developed, like the BSD (1977) or the Coherent OS (1983), all written completely from scratch by little teams of programmers. Those Unices (plural of Unix) were mostly published either under restrictive or completely open contracts (like the BSD project).

In 1991, following a long tradition of system designers, a Finnish student called Linus Torvalds released the first version of a hobby operating system, dubbed Linux.

Linux is the first OS to be distributed under the GPL licence, ensuring an homogeneous development of its core part, the kernel.

As an exhaustive Unix clone, Linux implements most of the AT&T System V and BSD Unix commands. It has been written from scratch and tries to follow the POSIX standard.

Linux is the kernel of the system. We should, therefore, speak of GNU/Linux when we refer to the whole OS.

Every Linux system (as well as every UNIX system) is structured in layers :

Applications	DB, browser, mail, client, etc.	Desktop environment, graphical interface		
System (GNU)	Software tools, libraries of functions, compilers, etc.			
Kernel (Linux)	Base kernel	Module	Module	
Hardware	CPU	RAM	Hard disk	Peripherals

2.8 Linux distributions

A distribution is made of a range of components creating a complete operating system :

- The Linux kernel
- The GNU system (libraries, tools, ...)
- Installer program
- A choice of applications made by the distro-maker

All Linux distributions have a common basis. However, due to the diversity of the open source again, each has its own particularities :

- Program versions
- Preset kernel, system, application, etc.
- Choice of applications
- Color of the box (probably the most important criteria)

Well-known distributions :

- Red Hat : the leader of the enterprise market. Red Hat originated the packaging tool set RPM.
- Debian : the reference community distro, known for its emphasis on security and its installation tool set APT.
- Slackware : the older one, with an emphasis on system simplicity, the more UNIX-like distribution.

Each distribution has its derivatives, made possible by the GPL license :

- Forked from Red Hat : Mandrake, SuSE, etc.
- Forked from Debian : Xandros, Lycoris, Linspire, Knoppix, Libranet, etc.

2.9 Hardware platforms

Linux can be installed alone on a computer, or in tandem with another OS (Windows, MacOS, ...). The CoLinux has even the ambition to run Linux simultaneously with another OS.

Linux exists for a multitude of hardware platforms :

> Intel (AMD, Cyrix, ...) x86, Motorola 68000 (old Macs, Amiga, Atari,...), PowerPC (new Macs, IBM, ...), SPARC (Sun), MIPS (SGI, PS2), ARM (Palm, embedded systems, ...), etc.

Linux works as well on a mainframe as on a PDA.

Linux is versatile and can function with very limited hardware resources :

- Intel 386
- 4Mo RAM
- Without keyboard, mouse and screen (good for industrial appliance, washing machines, robots, etc.)

2.10 Installing Linux

Partitioning the hard drive

Use of the partitions

Detail of the hard drive layout

Boot up process

Connection to the system

2.11 Partitioning the hard drives

A partition is a slice of the disk drive space, which can be used as an independent disk drive.

An IDE disk drive contains between 1 and 4 partitions called *primaries.*

An IDE disk drive contains between 0 and 8 partitions called *logicals.*

A minimum of one partition is needed to install Linux.

Each partition can be used for very different purposes :

- One partition for MS-Windows
- One for a Linux distribution
- One to store data files
- A virtual memory partition for the Linux distro
- ...

2.12 Typical use of the partitions

For a desktop computer, two partitions are ideal :

- one for the swap (virtual memory),
- / or root (contains all files and programs).

However, it is still possible to dispatch different directories around different partitions :

- /home (contains all normal user accounts directories),
- /var (contains files with a tendency to grow),
- /usr (contains every user land applications and sources of the Linux kernel).
- /boot (contains the boot loader and the available kernels binaries).

2.13 Details of a hard drive layout

The Master Boot Record, or MBR, is the first block loaded in RAM and run by the processor, when the computer is in boot process.

The small software located in the MBR is called the boot loader.

When Linux or Linux/Windows are installed, a boot loader will be installed in the MBR, which allows to select any operating system to boot.

- Typical boot loaders are LILO and GRUB.

When Windows is installed, it writes its own boot loader in the MBR. Should one wish to run two OS on the same computer, it is highly recommended to install MS-Windows before Linux.

Example:

MBR Lilo Grub	Windows /dev/hda1	Swap /dev/hda2	Linux /dev/hda3

2.14 The boot process

1. When the computer is switched on, a hardware test starts before the BIOS is copied in RAM and runs.
2. The BIOS finds the first drive, copies its MBR content on RAM and runs it.
3. The MBR content is a « boot loader ». This boot loader copies the kernel of the operating system on RAM. It then controls the system.
4. The kernel checks the system and prepares all further stages (devices initialization, memory management, etc.)
5. The kernel launches a first program, *init*, which will be - as in every Unix system - the process parent of every other process.
6. Init will load and execute a list of programs and services (login, web server, network, ...) and will stop once every other program has been switched off too.

2.15 Connecting to the system

It is necessary to connect or log in before using a Linux system.

Every user must have a user name and password.

- User ID and password

When the log in is successful, an environment is set and real work may begin.

- Graphical interface
- Command line interface

At each connection, the user enters his/her $HOME directory.

Several levels/modes of execution co-exist in a UNIX of Linux system, typically :

- Single user mode (code 1)
- Multiple user mode (code 3)
- Boot up, system initialization mode (code S)
- Shut down mode (code 0)
- Other modes based on one of the above (single user + networks access, multiple user + graphical interface, ...)

Every user has a default configuration, which can be personalized.

2.16 Demonstration

KNOPPIX Linux or MandrakeMove :

Does not need to be installed on a system

Runs from the CD

Does not endanger the system

Allows to safely test Linux

Automatically detects most hardware peripherals

Has a graphical interface (KDE for both)

2.17 Exercize 1

1) Install Linux with OpenOffice.org.

2) Select the default options.

3) Reboot the computer and log again in the system.

4) Look at the boot process and name the different phases.

3. Customize a working environment

In the UNIX world, graphical user interface or GUI is an application like any other (its ability to handle the screen and the mouse) and can be customized by users. In this chapter we will discover the softwares to be used in order to adapt the graphical environment to your needs.

In this chapter

3.1 Goals

Graphical environment concepts

Configuration tools

System configuration

Appearance of the graphical interface

3.2 Graphical user interface concepts

The most frequently used graphical interface in the UNIX world is called :**X Window System version 11 Release 6,** generally designated X11 or even X.

X11 is built under a client/server model :

- X11 is a display server, which gets commands from its clients.
- The clients are the applications (Netscape, OpenOffice, ...) !

Working design :

In theory, each layer can be found on another computer, communications between layers being made by network links (even if these layers are on the same computer).

X client applications (Mozilla)
Desktop manager (KDE)
Windows manager (KWM)
Display server (X11R6)
Display hardware (graphic card, monitor, keyboard, mouse)

3.3 Configuration tools

Each layer of the system has many configuration options and generally a configuration software (graphical or not).

Some tools allow to modify parameters of multiple layers.

System configuration tools can manage :

- system users (creation, updating, removing),
- hardware configuration,
- boot process, services daemons, etc.,
- software installation or uninstallation.

Configuration tools for the Desktop Managers allow to :

- configure the Windows Manager,
- configure the Desktop Manager,
- display information about the system.

3.4 System configuration

All options are written into a configuration file text.

Graphic utilities facilitate the configuration.

There are several options to proceed :

- via the command line,
- via a graphic interface.

The configuration files are gathered in /etc.

Graphic interfaces are either generic, or designed for distribution :

- Webmin : system configuration web interface,
- YAST : written by Suse Linux,
- Mandrake Control Center : written by Mandrake,
- ...

3.5 YAST2 (Suse)

This control software allows:

- to add and remove software,
- to configure the hardware,
- to configure the network and the advanced services,
- to configure security,
- to manage users,
- to configure and personalize the system parameters.

3.6 Appearance of the GUI

Appearance :

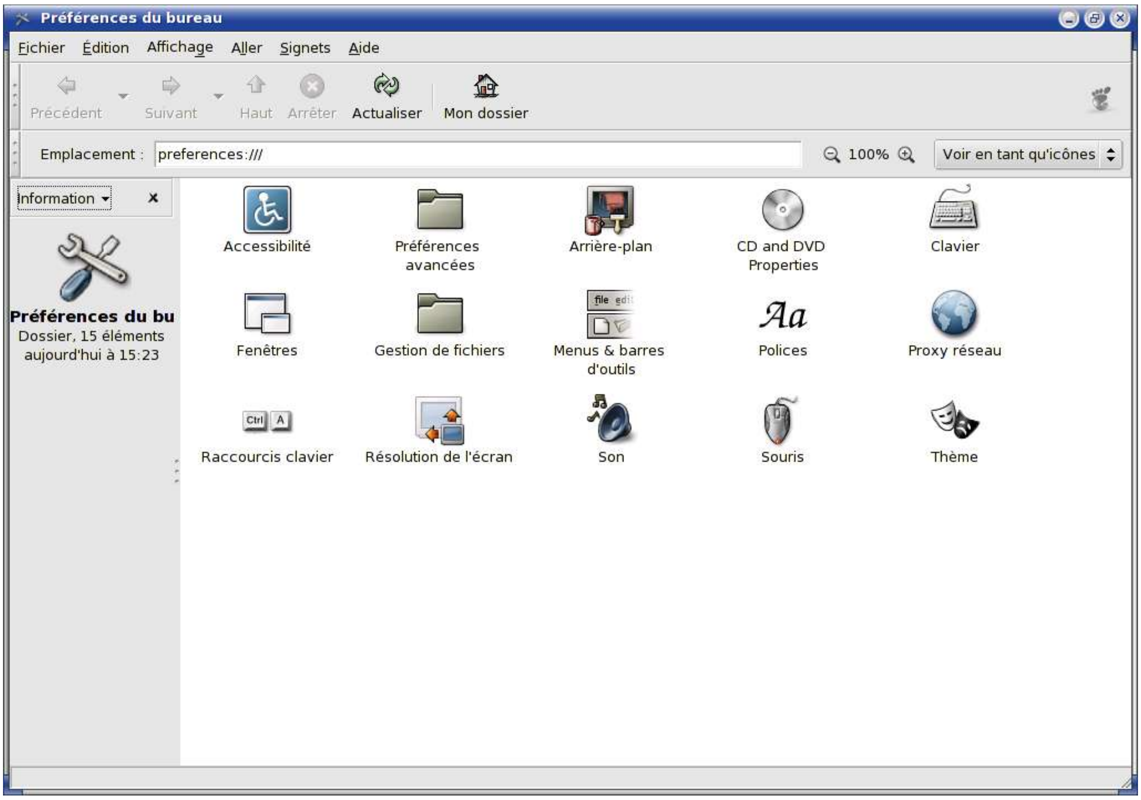
- Menus
- Desktop themes
- Taskbar
- ...

Behavior of the graphic interface:

- The mouse focus
- Position of the windows
- Decoration of the windows
- ...

3.7 GNOME control center

Configuration tool of the GNOME desktop manager



Emplacement : preferences:///

Voir en tant qu'icônes

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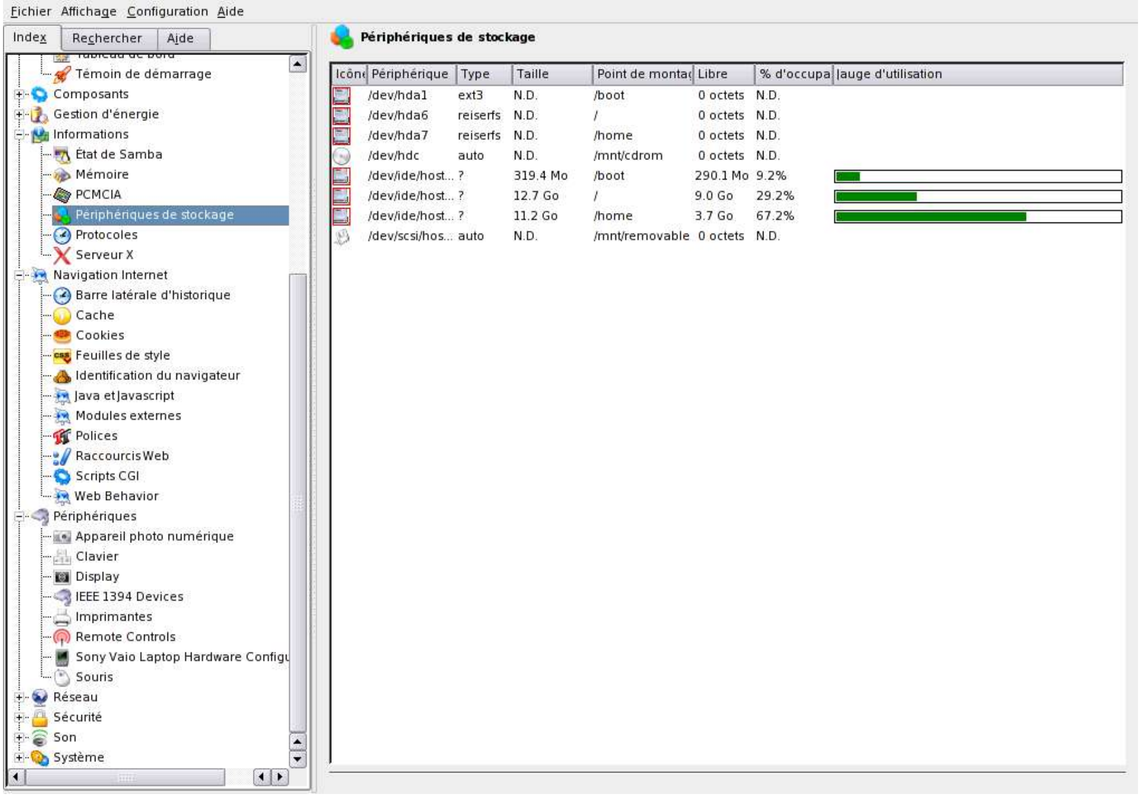
3.8 KDE control center

Configuration tool of the KDE desktop manager



Icône	Périphérique	Type	Taille	Point de montag	Libre	% d'occupa	Jauge d'utilisation
	/dev/hda1	ext3	N.D.	/boot	0 octets	N.D.	
	/dev/hda6	reiserfs	N.D.	/	0 octets	N.D.	
	/dev/hda7	reiserfs	N.D.	/home	0 octets	N.D.	
	/dev/hdc	auto	N.D.	/mnt/cdrom	0 octets	N.D.	
	/dev/ide/host...	?	319.4 Mo	/boot	290.1 Mo	9.2%	
	/dev/ide/host...	?	12.7 Go	/	9.0 Go	29.2%	
	/dev/ide/host...	?	11.2 Go	/home	3.7 Go	67.2%	
	/dev/scsi/hos...	auto	N.D.	/mnt/removable	0 octets	N.D.	

3.9 Demonstrations

Configuration system :

1) Run a program on a computer, then display it on another.

2) Create a new user on the system.

3) Configure the network.

Appearance and behavior :

1) Change the number of desktops.

2) Modify the mouse focus scheme.

3) Change the desktop theme.

3.10 Exercize 2

1) Create a new user

2) Install the sound on the system (if there is a soundcard).

3) For password security, set a minimum size of 6 characters, and a maximum size of 8 characters.

4) Change the default run level to 3 and reboot the system.

- Log in
- Execute the command startx
- Change the run level to 5

5) What are the keyboard and timezone settings ?

3.11 Exercize 3

1) For each desktop, customize the wallpaper.

2) Change the desktop theme.

3) Move the taskbar to the left of the screen.

4) Select a screen saver.

5) Change the console type from Konsole to xterm.

6) Do not display anything when you type the password.

4. Migrating from Windows to Linux

In this chapter, we will describe a range of applications able to replace MS-Windows world tools.

In this chapter

4.1 Goals

Applications :

- OpenOffice.org
- Scribus
- Mozilla
- The Gimp and CinePaint
- Sodipodi and Inkscape
- KDevelop
- Kontact
- KOrganizer
- KMail

Migrating from MS-Office to OpenOffice.org.

4.2 OpenOffice.org

Dual licensed, LGPL and SISSL.

Available in different languages (~30th of june 2004).

Updated regularly.

Compatibility with more than 200 types of files, coming from a great diversity of other productivity suites.

Works on most OS platforms (Windows, Linux, MacOS, Solaris).

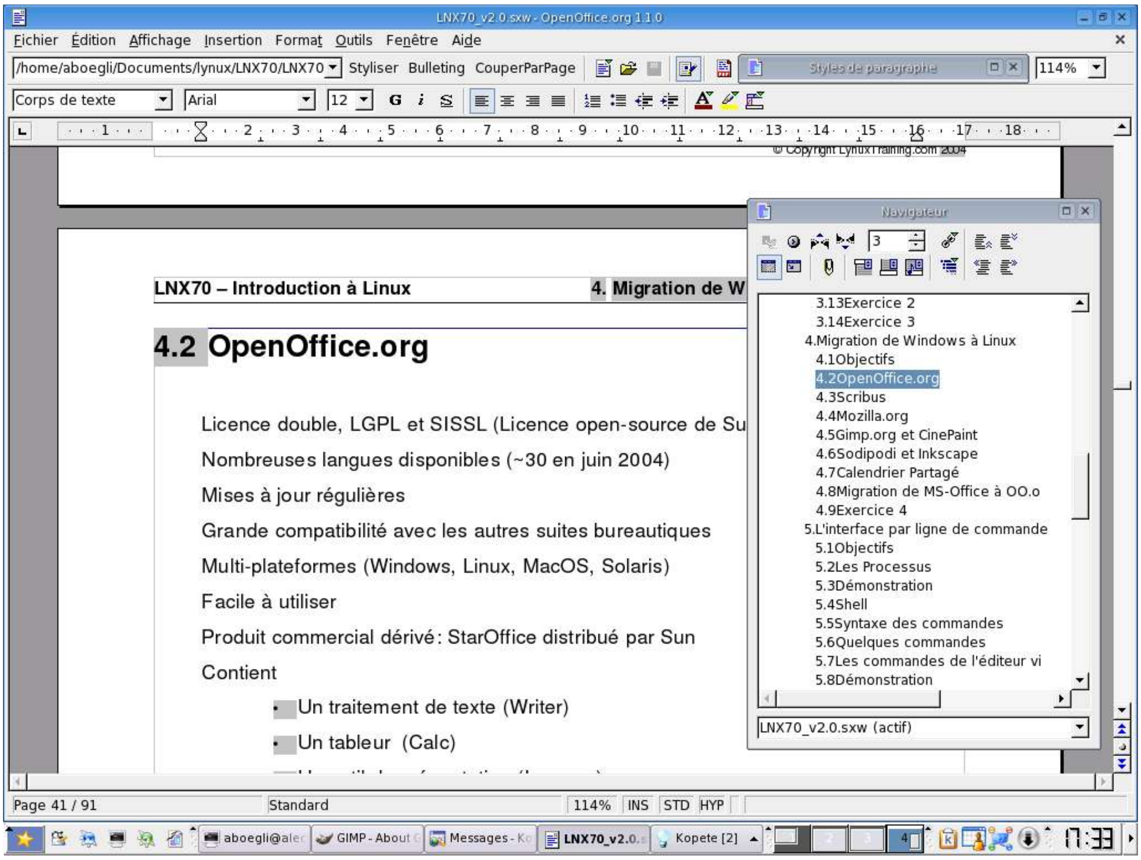
User friendly.

Derivative product : StarOffice from Sun.

Contains :

- A text processor (Writer)
- A spreadsheet (Calc)
- A slide show tool (Impress)
- A graphic editor (Draw)
- Connection tools against various databases.

Equivalent to Microsoft's MS-Office.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4.2 OpenOffice.org

Licence double, LGPL et SISSL (Licence open-source de Su

Nombreuses langues disponibles (~30 en juin 2004)

Mises à jour régulières

Grande compatibilité avec les autres suites bureautiques

Multi-plateformes (Windows, Linux, MacOS, Solaris)

Facile à utiliser

Produit commercial dérivé: StarOffice distribué par Sun

Contient

- Un traitement de texte (Writer)
- Un tableur (Calc)

3.13Exercice 2
3.14Exercice 3
4.Migration de Windows à Linux
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4.2OpenOffice.org
4.3Scribus
4.4Mozilla.org
4.5Gimp.org et CinePaint
4.6Sodipodi et Inkscape
4.7Calendrier Partagé
4.8Migration de MS-Office à OO.o
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5.2Les Processus
5.3Démonstration
5.4Shell
5.5Syntaxe des commandes
5.6Quelques commandes
5.7Les commandes de l'éditeur vi
5.8Démonstration

4.3 Scribus

GPL licensed.

Complete desktop page layout program.

Updated regularly.

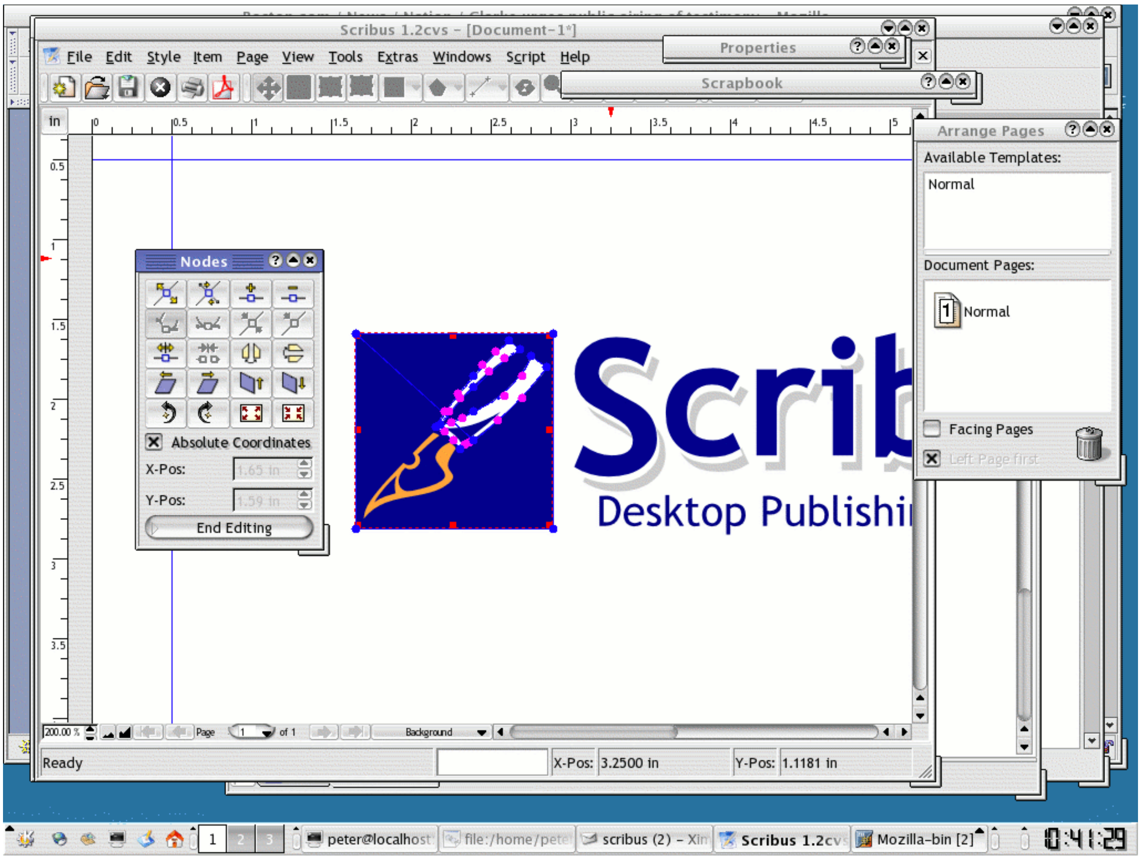
Great compliance with the printing industry standards (DTP, color management, PDF).

User friendly.

Contains :

- Frame-based layout editing
- Color management system
- Professionnal PDF output
- Support for the SVG standard format in collaboration with the Inkscape project.

Equivalent in functionalities to Adobe's InDesign or Quark's Xpress. Scribus is an extremely lively project, providing the open-source users with professional layout tools.



4.4 Mozilla.org

MPL licensed.

Updated regularly.

Great W3C standard compliance.

Supported on many platforms (Windows, Linux, MacOS, Solaris, AIX, HPUX, OpenVMS, OS/2).

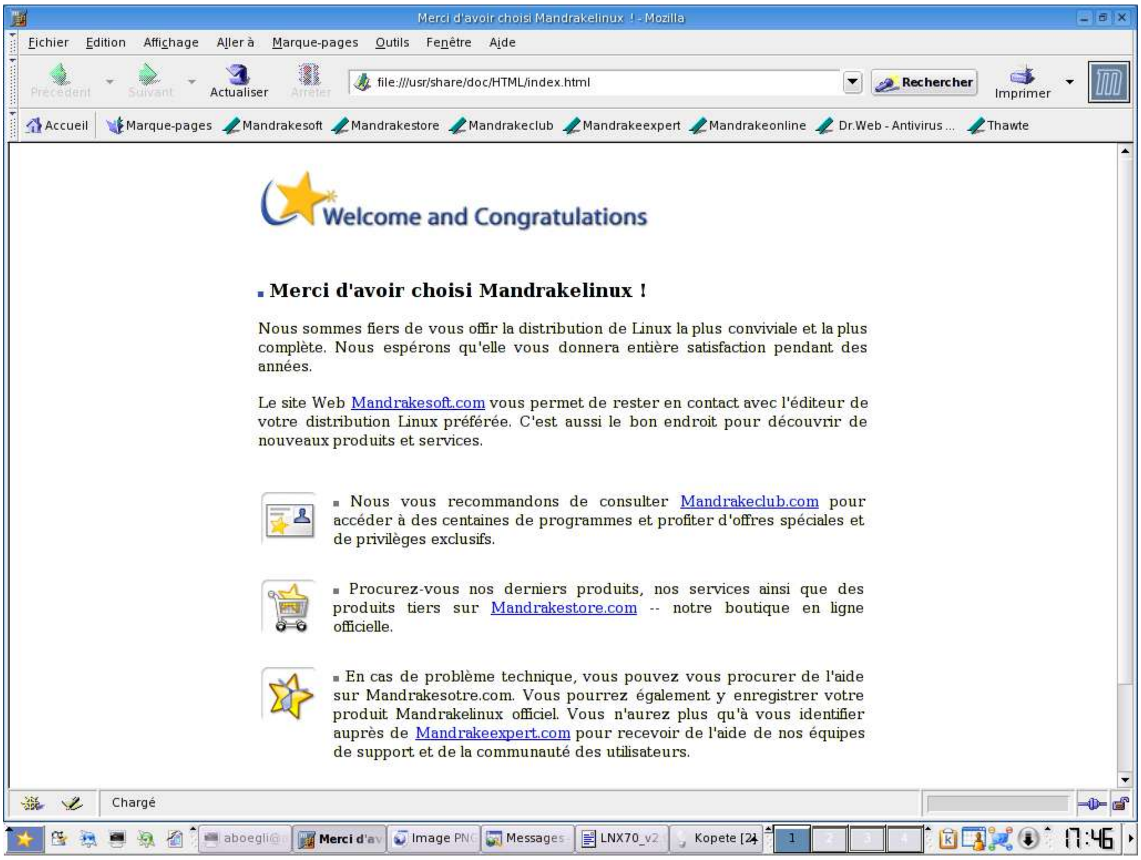
User friendly.

Derivative product : Netscape.

The suite contains :

- A browser
- A mail client
- An HTML composer
- An address book.

Equivalent to the couple Internet Explorer + Outlook Express from Microsoft. The Mozilla project forked in two sub-projects, Firefox (web browser) and Thunderbird (mail client).



Merci d'avoir choisi Mandrakelinux !

Nous sommes fiers de vous offir la distribution de Linux la plus conviviale et la plus complète. Nous espérons qu'elle vous donnera entière satisfaction pendant des années.

Le site Web Mandrakesoft.com vous permet de rester en contact avec l'éditeur de votre distribution Linux préférée. C'est aussi le bon endroit pour découvrir de nouveaux produits et services.

- Nous vous recommandons de consulter Mandrakeclub.com pour accéder à des centaines de programmes et profiter d'offres spéciales et de privilèges exclusifs.
- Procurez-vous nos derniers produits, nos services ainsi que des produits tiers sur Mandrakestore.com -- notre boutique en ligne officielle.
- En cas de problème technique, vous pouvez vous procurer de l'aide sur Mandrakesotre.com. Vous pourrez également y enregistrer votre produit Mandrakelinux officiel. Vous n'aurez plus qu'à vous identifier auprès de Mandrakeexpert.com pour recevoir de l'aide de nos équipes de support et de la communauté des utilisateurs.

4.5 Gimp.org and CinePaint

GPL licensed.

Updated regularly.

Great compatibility with graphic file formats.

Multi-platforms (Windows, Linux, MacOS).

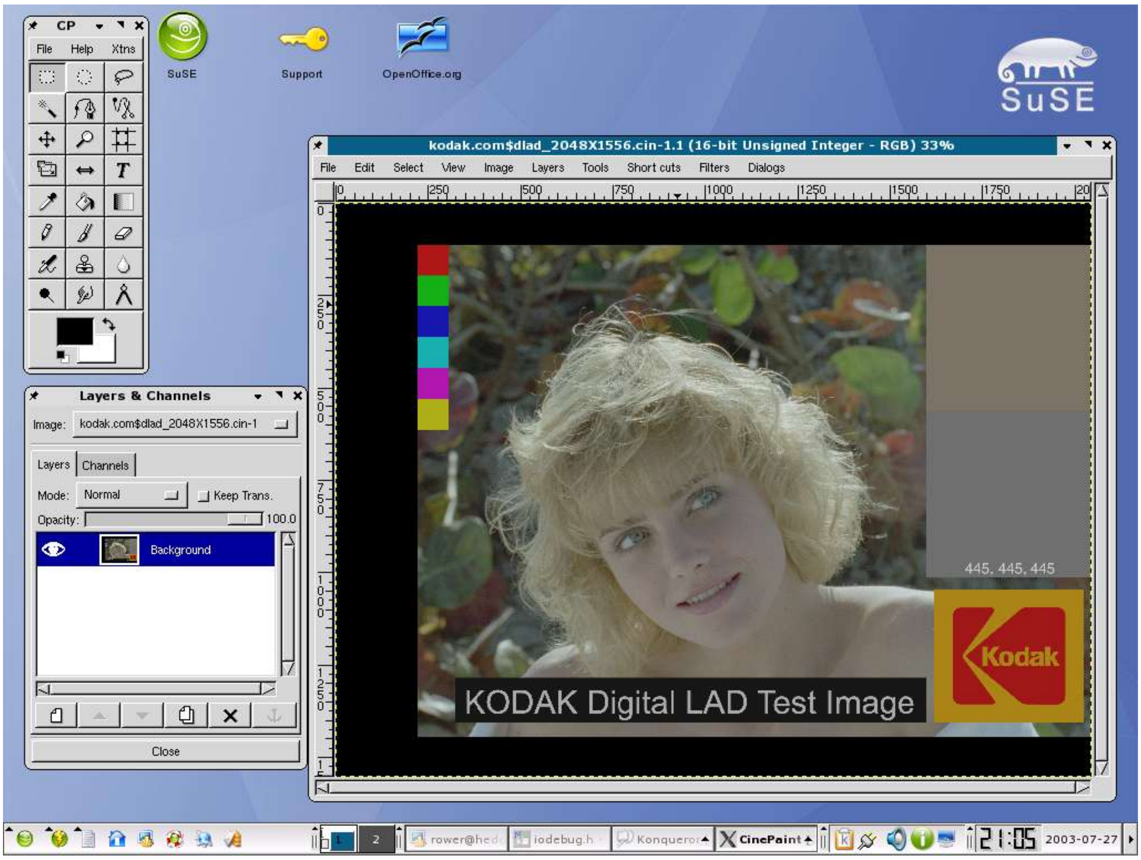
User friendly.

Similar commercial products : PhotoShop, Paint Shop.

The Gimp contains :

- A set of graphical functions in raster mode (Bitmap)
- Layer support
- A set of tools for writing and automatizing tasks.
- etc.

CinePaint is a spawn of the Gimp project, designed for the movie industry. It is currently *the only* "deep-painter" available on the market. In other words : the only software able to work in real colors (www.cinepaint.org).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4.6 Sodipodi and Inkscape

GPL licensed.

Updated regularly.

Based on the W3C standard format SVG.

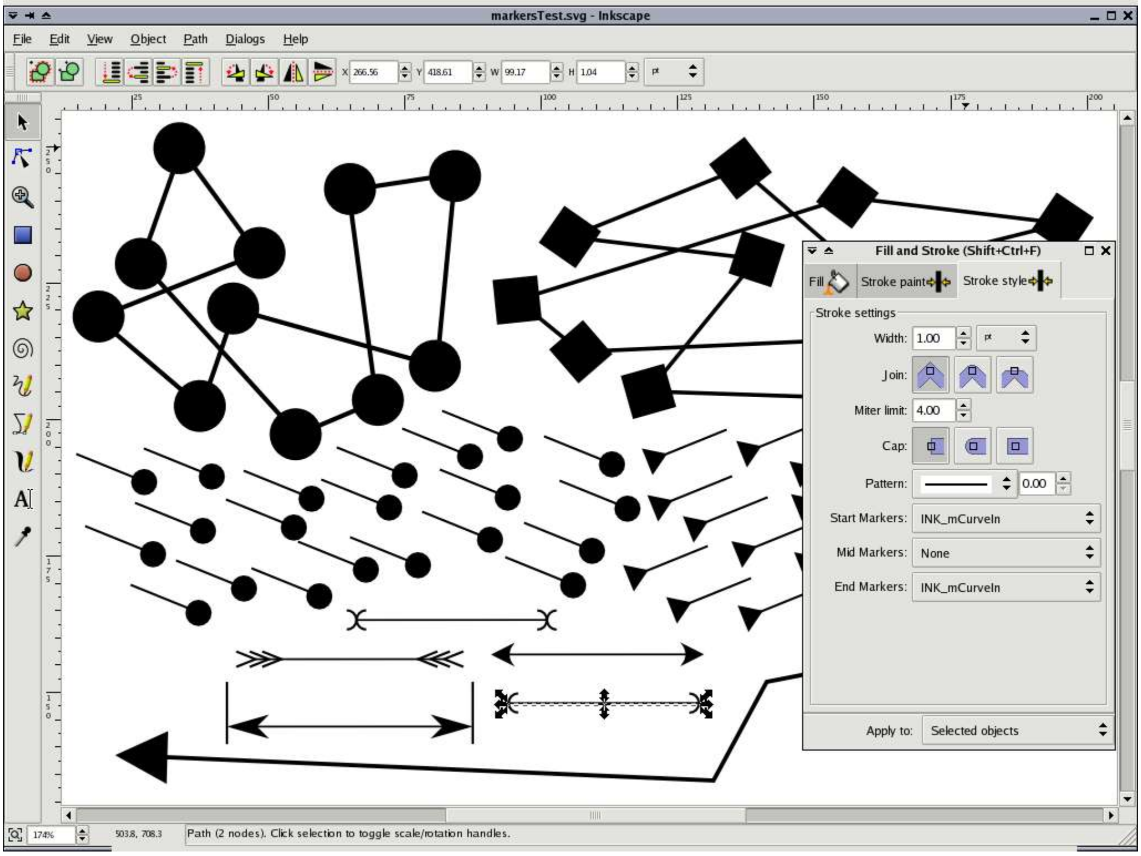
User friendly.

Similar commercial products : Illustrator, Corel Draw.

Sodipodi and Inkscape contain :

- A set of vectorial graphics functions.
- Layer support
- A set of tools for writing and automatizing tasks
- Etc.

Inkscape is a spawn of Sodipodi, designed specifically to work in the SVG format, in order to created SVG icons, fonts, etc. It is not an alternative to Illustrator.



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Start Markers: INK_mCurveIn

Mid Markers: None

End Markers: INK_mCurveIn

Apply to: Selected objects

Path (2 nodes). Click selection to toggle scale/rotation handles.

4.7 KDevelop

GPL licensed.

Updated regularly.

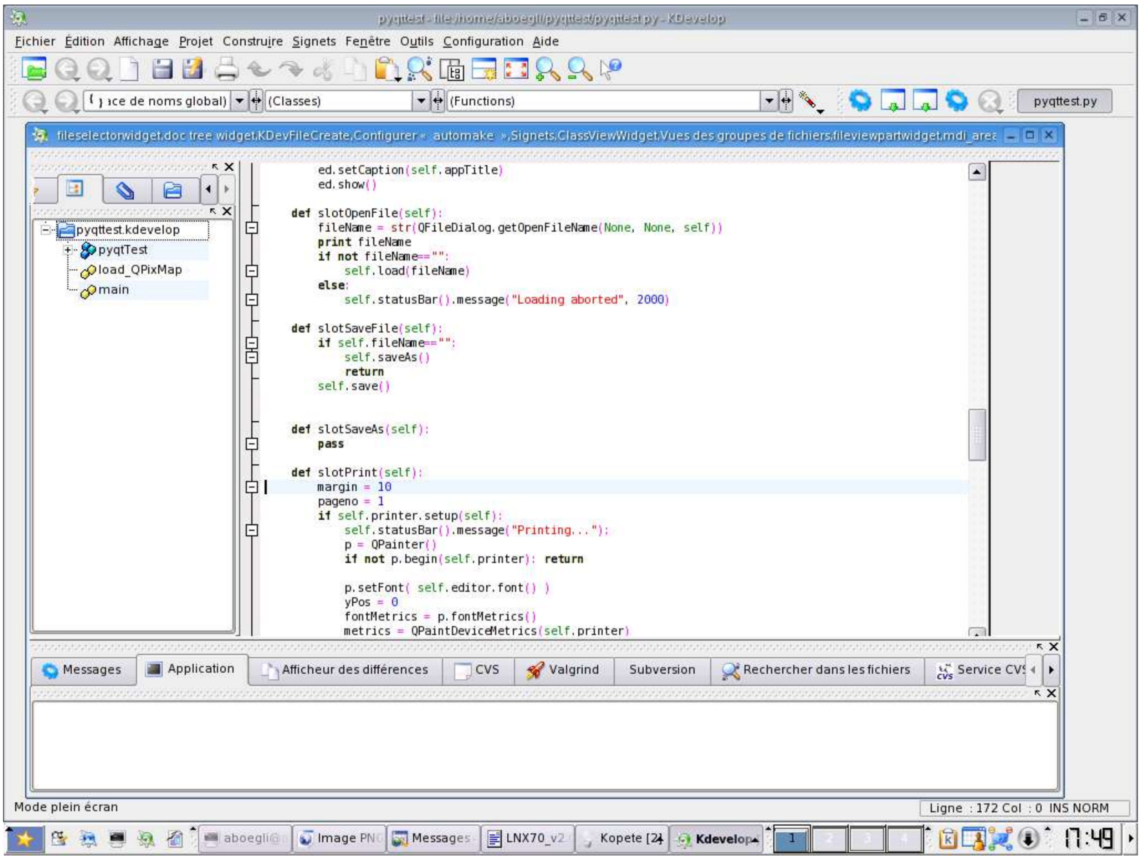
Completely integrated in the KDE desktop environment.

User friendly (at least for a developer).

Similar commercial products : Visual Studio, Borland C++Builder, etc.

KDevelop contains :

- A syntax styling code editor
- A project management tool
- Tools for writing and automatizing project operations.
- etc.


pyqttest - file:/home/aboegli/pyqttest/pyqttest.py - KDevelop
Fichier Édition Affichage Projet Construire Signets Fenêtre Outils Configuration Aide
(Classes)
(Functions)
pyqttest.py
fileselectorwidget,doc tree widget,KDevFileCreate,Configurer « automake »,Signets,ClassViewWidget,Vues des groupes de fichiers,fileviewpartwidget,mdi_area
pyqttest.kdevelop
pyqtTest
load_QPixMap
main
Messages
Application
Afficheur des différences
CVS
Valgrind
Subversion
Rechercher dans les fichiers
Service CVS
Mode plein écran
Ligne : 172 Col : 0 INS NORM
aboegli@
Image PNG
Messages
LNX70_v2
Kopete
Kdevelop
17:49

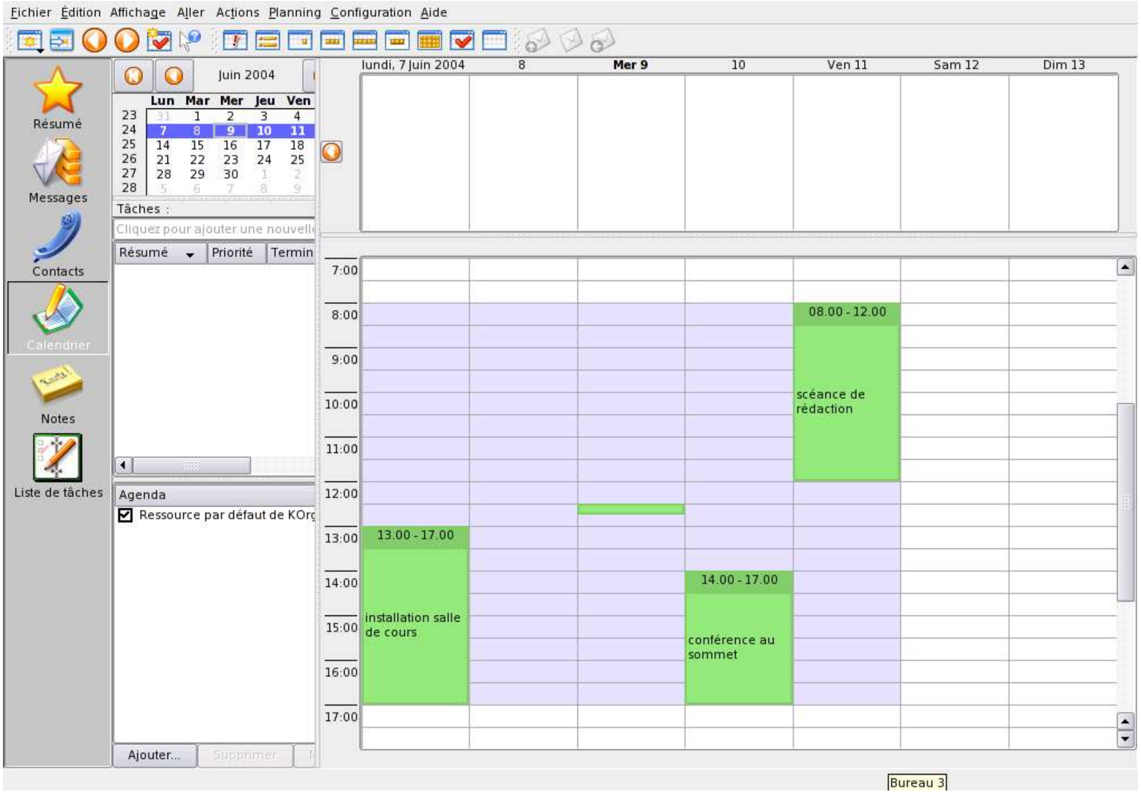
```
        ed.setCaption(self.appTitle)
        ed.show()

    def slotOpenFile(self):
        fileName = str(QFileDialog.getOpenFileName(None, None, self))
        print fileName
        if not fileName=="":
            self.load(fileName)
        else:
            self.statusBar().message("Loading aborted", 2000)

    def slotSaveFile(self):
        if self.fileName=="":
            self.saveAs()
            return
        self.save()


    def slotSaveAs(self):
        pass

    def slotPrint(self):
        margin = 10
        pageno = 1
        if self.printer.setup(self):
            self.statusBar().message("Printing...");
            p = QPainter()
            if not p.begin(self.printer): return

            p.setFont( self.editor.font() )
            yPos = 0
            fontMetrics = p.fontMetrics()
            metrics = QPaintDeviceMetrics(self.printer)
```

4.8 Kontact

Kontact offers the following functions :

- Shared planner (KOrganizer)
- Mail client (KMail)
- Address book (KAddressBook)
- Connection manager to Palm or other palm computer (Kpim)
- "Post-it"-like notes (Knotes).

Kontact is delivered by default with each KDE desktop environment installation.



4.9 Migrating from MS-Office to OO.o

Word to OO.o Writer

Excel to OO.o Calc

PowerPoint to OO.o Impress

Additional information about the migration may be found on the project website (www.openoffice.org).

4.10 Exercize 4

If Mozilla is not installed, download the latest version from the Internet with the mail client.

1) Create a client names database in the Mozilla address book.

2) Import the database into OpenOffice to generate a mailing.

3) Create an Impress presentation about available games on your Linux distribution. Take pictures of the interfaces with KSnapShot.

5. The command line interface

In this chapter, we will detail the use of a UNIX-style system, without graphic interface (no mouse or windowed applications), including navigating in the file system and many other useful tricks.

In this chapter

5.1 Goals

Processes

Shells

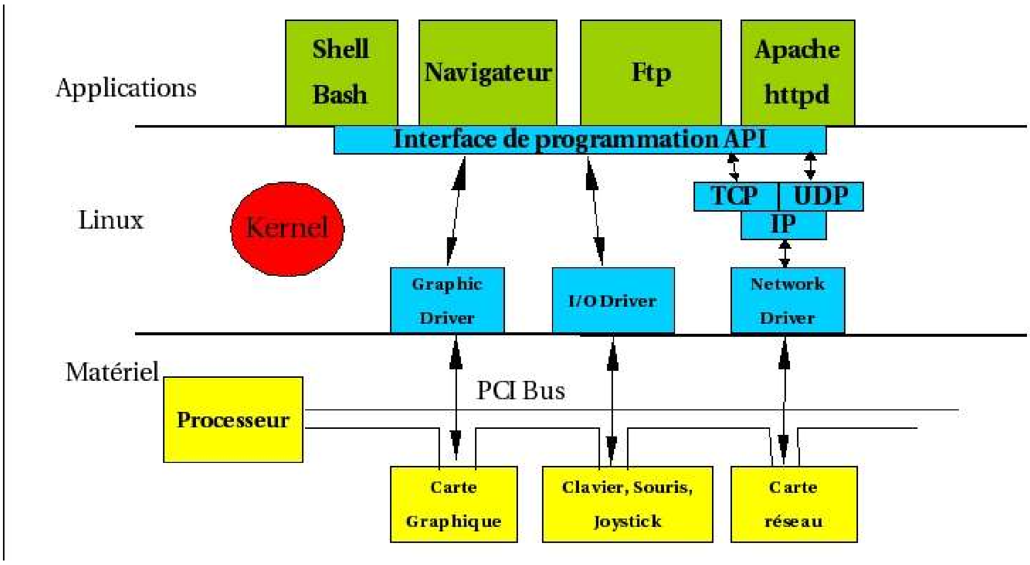
Commands syntax

Some commands

Online manuals and help

5.2 Processes

Each process has a personal address space and cannot access those of other processes.



5.3 Demonstration

1) Print the list of processes

2) Erase a process

3) In KSysGuard, edit the data page and displa the system information.

5.4 Shell

A shell is a process able to interpret expressions and execute commands.

Several kind of shells exist. Under Linux, the most popular is Bash (Bourne Again Shell).

Bash, as any other shell, allows to customize the working environment.

• .bashrc	Runs at each execution of bash.
• .bash_profile	Runs at each new log in.
• .bash_logout	Runs at each log out.

Shell allows to access the system commands :

- Working on files and directories
- Text editing
- etc.

5.5 Commands syntax

The commands syntax is displayed as follows :

```
command [options] [parameters]
```

Options are generally preceded by an hyphen ('-'), some commands coming from the *BSD world, like `tar` and `ps` also accept options without the hyphen.

Examples:

```
pwd
ls -ld or ls -l -d or ls -d -l
rm -r /tmp/toto
cat ../readme helpme > save
more /etc/passwd /etc/hosts /etc/group
find . -name *.[ch] -print
date "+day is %a"
```

Commands can also be saved in a file, and be used as script.

5.6 Some commands

File manipulation :

- Pwd : Print Working Directory
- Ls : LiSt
- Mkdir : MaKe DIRectory
- Rmdir : ReMove DIRectory
- Cp, Mv : CoPy, MoVe

Process manipulation :

- Ps : ProcesS
- Kill : erares a process or, more generally, sends a signal
- Nice : changes the priority of a process
- Top : shows a process in real time

Text editing :

- Echo : prints the text in argument on screen
- Cat : shows the file content
- Grep : locates text in files
- Vi : text editor

Redirects and piping : <, >, **|**

5.7 The vi editor

vi (vee-eye) is a text editor common to all UNIX systems. Contrary to the vast majority of text editors, vi starts and works by default in a mode called "Command mode". It must explicitly be switched on "Insert mode" to write new text.

Switch to Insert mode :

- i before the cursor
- I at the beginning of the line
- a after the cursor
- A at the end of the line
- o on the next line

  O on the previous line

Delete

- dw delete the current word
- dd delete the line
- D delete to the end of the line
- x delete the character under cursor

Cursor move

- l one space to the right
- h one space to the left
- j one line below
- k one line above
- $ to the end of the line
- ^ to the beginning of the line
- w next word
- e end of the word

5.8 Demonstration of the vi editor

Insert and command modes

Search words

Last line commands

Creating a .bashrc file with a welcome message.

Check if the message is displayed.

5.9 Online manuals and help

Online manuals provide information about commands, their options and parameters.

```
man mkdir
man call
```

Most commands can also be run with the "--help" option.

```
ls --help
```

To search an occurrence in the man pages, the -k (for keyword) option or the alias `apropos` may be used.

```
man -k compress
apropos compress
```

5.10 Exercize 5

1) Explain the use of the history command.

2) Explain the use of the touch command.

3) With the help of the cal command find the day corresponding to December 13, 1702.

4) With the help of the date command, display the following string of characters :

```
Today, it is Wednesday
```

where "Wednesday" is the day of the week.

5) With the help of the desktop task manager, erasel all your bash sessions.

5.11 File system

A file system is a data structure which overlay the real datas on a bloc device. The file system is generated by the formatting operation.

Linux supports many types of file systems, including non-Unix ones.

- ext2, ext3, reiserfs, FAT32, NTFS,..

A file system has a tree structure, with a root directory.

Browsing the file system can be done with both absolute (from the root) and relative (from the current working directory) paths.

Every device of the system can be accessed through a file in the file system.

All files and directories have access permissions, defined for all users. The permissions modes are :

- Execution
- Read access
- Write access

In the Unix world, filename extensions are not significative. Desktop managers may possibly use them to match files with the corresponding icons.

Warning : filenames and names are all case sensitive !

5.12 File system tree

Each user has a workspace in the /home directory.

The super user, *root*, has every rights, and its own workspace, /root.

5.13 System directories

/bin : commands

/sbin : system commands

/etc : configuration files

/dev : devices files

/lib : common shared libraries

/tmp : temp directory

/mnt : mount point for removable devices

/var : working directory for spooling and other

/proc : system information directory

/usr/bin : other commands

/usr/sbin : other system commands

/usr/lib : other libraries

. : current directory

.. : parent directory

5.14 Changing the current directory

To print the current working directory, use the pwd command (Print Working Directory).

```
pwd
```

To change the current working directory, use the cd command (Change Directory).

```
cd [dir]
```

Examples:

```
pwd
/home/rarrigoni

cd ../jo # Va dans le répertoire HOME de jo

cd # Retourne dans mon répertoire HOME

cd /tmp # Va dans le répertoire /tmp

cd .. # Va dans le répertoire /

cd - # Va dans le répertoire /tmp
```

5.15 Display the content of a directory

To list the content of a directory (files and other directories), use the ls command (LiSt).

```
ls [options] [files]
```

Some options for ls are :

- -l print result in long format
- -F add a character to the filename to identify its type.
- -a show all files, including hidden ones
- -R show recursively the content of a sub directory.
- -d do not descent in sub-directories

Examples:

```
ls -l /bin/ls
-rwxr-xr-x 1 root root 46784 mar 23 2002 /bin/ls

ls -ld /bin
drwxr-xr-x 2 root root 2144 nov 5 11:55 /bin

ls -d /*/
bin/   dev/  home/    lib/  opt/   root/  sys/  usr/
boot/  etc/  initrd/  mnt/  proc/  sbin/  tmp/  var/

ls -a .
.bash_history .bash_profile .bashrc ...

ls -dF /etc .bashrc /bin/ls .bashrc /bin/ls* /etc/
```

5.16 File types

The ls long format appears as follows :

```
ls -l /etc/hosts
-rw-r--r-- 1 root root 677 Jul 5 22:18 /etc/hosts
```

The first character (in that case an hyphen '-') stands for the type of file displayed. There are 7 types of files, without referring to their content.

- b stands for block device files (media, disk, etc.)
- c stands for character device file (data streams, keyboard, mouse, etc.)
- p is for the "named pipes", or FIFO (first in, first out) channels between applications.
- s is for the sockets files (files which are part of a network port)
- d is for the directories
- l for the symbolic links
- and '-' for any other file types.

Names of hidden files are all starting with a dot '.'

```
.bash_profile
```

The file extension (.txt, .jpg, etc) is optional, Linux will recognize them in any case.

5.17 Exercize 6

1) Type the following :

```
mkdir test2
cd test2
mkdir -p general/bin/system
mkdir general/bin/user
rmdir general/bin # Qu'est ce qui ce passe?
du # Quel est la taille de general?
rmdir general/bin/user
du # Quel est la taille de general?
rmdir general/bin/system general/bin general
cd
rmdir test2
```

2) What option of the command is used to show the size of directories in bytes ?

3) What option of the command shows the total size in blocs and in bytes of the /etc directory ?

5.18 Display the content of text files

To view the content of text files, you may use a paging software. However, if only the first or last lines are of interest, you may also use the head and tail commands :

Allow – more or less - to view a document page by page.

Head displays the first lines in a file.

Tail displays the last lines in a file.

Examples:

```
more /etc/profile
head -n 10 /etc/profile
head -c 100 /etc/profile
tail -n 6 /etc/profile
```

5.19 Copy files

If you need to copy files, use cp.

```
cp [options] source destination
```

- Source and target can be a file or a directory.

Some available options :

- -i interactive copy : requests confirmation before rewriting on the target.
- -r recursive : copies also the directories and their subtrees.
- -f force : rewrites the target file.

The default behaviour is to silently clobber the target.

Examples:

```
cp *.[a-z] /tmp
cp readme readme.orig
cp ls /bin
cp -ri bin/* /bin
```

5.20 Remove files

To erase files, use the rm command.

```
rm [options] files
```

- Files can be both simple or special ones, like directories.

Some available options :

- -i interactive remove : requests confirmation before deleting the target.
- -r recursive : removes also the directories and their subtrees.
- -f force : erases the target file.

Warning : An undelete command does not exist.

Examples:

```
rm *.[a-z]
rm readme readme.orig
rm ls /bin
rm -rfi /bin
cd; rm -rf * .*
```

5.21 Exercize 7

1) Copy the .bash_history file in the /tmp directory.

2) Copy the directory /etc with its subtrees in a new directory /etc in your $HOME working directory.

3) Delete all files and directories in your /etc directory.

4) Remove that /etc directory with rmdir.

6. Install new softwares

Since the OS of a computer is only the framework for using software, we will explain in this chapter the installation of software from source code (if they are available) or from packages of Debian or RPM style.

In this chapter

6.1 Goals

Compiling software

Packages

Installer tools

Examples : .tar.gz, RPM, Mozilla, OpenOffice.org

6.2 Compiling software

The archive contains the source code of the software itself.

Previously the GNU Compiler Collection (gcc) must be installed, as well as the Make tool (or possibly some others).

Compiling the executable file and installing it into the system is generally handled by a Makefile.

To compile and install :

```
./configure
make
make install
```

6.3 Packages

Packages are archives designed to simplify both the installation and managing of softwares.

The archives contain :

- The software itself
- Documentation
- Information about dependencies needed by the software.

The package managing system :

- Keeps an accurate list of all installed packages
- Keeps a database of dependencies between packages
- Has a repository of all files that came with some packages

The Installation, the update and the removing of packages are then greatly simplified.

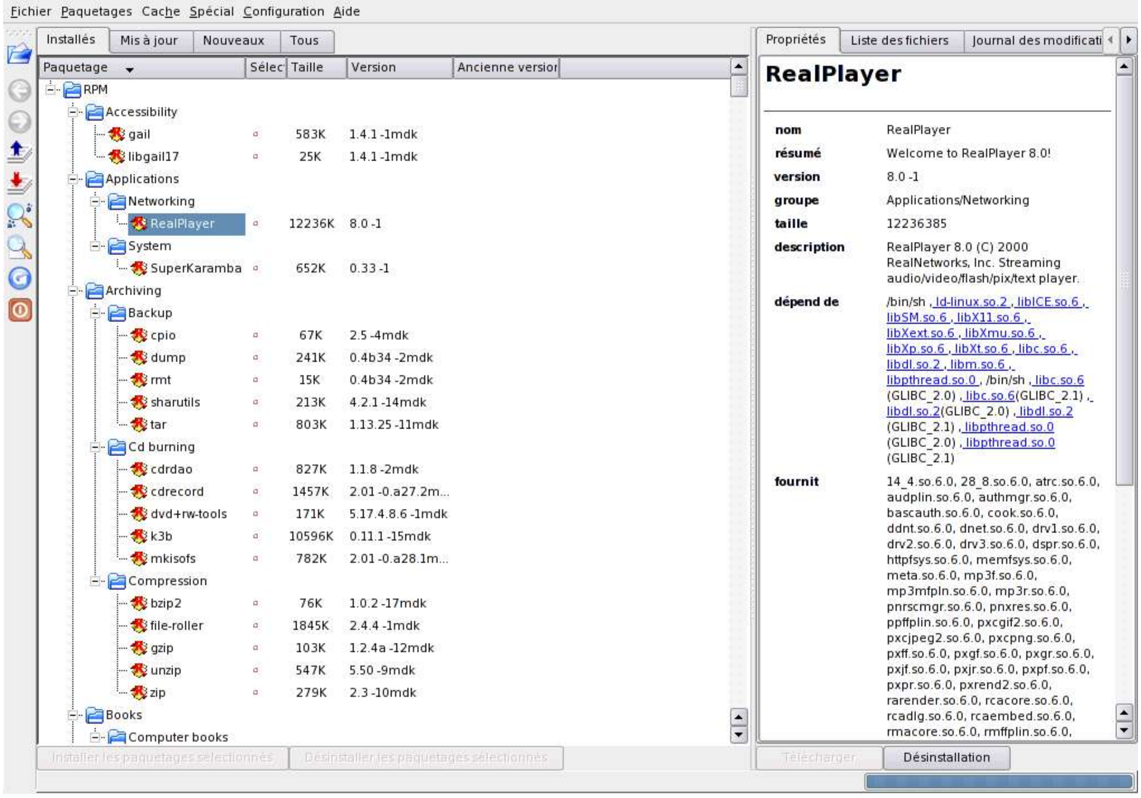
6.4 Installers

Specific graphic tools facilitate the installation of new applications (as in MS Windows).

They can contain all necessary files, or download them from Internet.

Currently no standard exists. Each distro has its own system : Aptitude for Debian, YaST for SuSE, DracInstall for Mandrake, etc.

Please note that in KDE the application KPackage exists. It is a graphical interface to the Debian and RPM packaging structure.


Fichier Paquetages Cache Spécial Configuration Aide
Installés
Mis à jour
Nouveaux
Tous
Propriétés
Liste des fichiers
Journal des modificati
Installer les paquetages sélectionnés
Désinstaller les paquetages sélectionnés
Télécharger
Désinstallation

Paquetage	Sélec	Taille	Version	Ancienne version
RPM				
Accessibility				
gail	□	583K	1.4.1 -1mdk	
libgail17	□	25K	1.4.1 -1mdk	
Applications				
Networking				
RealPlayer	□	12236K	8.0 -1	
System				
SuperKaramba	□	652K	0.33 -1	
Archiving				
Backup				
cpio	□	67K	2.5 -4mdk	
dump	□	241K	0.4b34 -2mdk	
rmt	□	15K	0.4b34 -2mdk	
sharutils	□	213K	4.2.1 -14mdk	
tar	□	803K	1.13.25 -11mdk	
Cd burning				
cdrdao	□	827K	1.1.8 -2mdk	
cdrecord	□	1457K	2.01 -0.a27.2m...	
dvd+rw-tools	□	171K	5.17.4.8.6 -1mdk	
k3b	□	10596K	0.11.1 -15mdk	
mkisofs	□	782K	2.01 -0.a28.1m...	
Compression				
bzip2	□	76K	1.0.2 -17mdk	
file-roller	□	1845K	2.4.4 -1mdk	
gzip	□	103K	1.2.4a -12mdk	
unzip	□	547K	5.50 -9mdk	
zip	□	279K	2.3 -10mdk	
Books				
Computer books				

RealPlayer

nom	RealPlayer
résumé	Welcome to RealPlayer 8.0!
version	8.0 -1
groupe	Applications/Networking
taille	12236385
description	RealPlayer 8.0 (C) 2000 RealNetworks, Inc. Streaming audio/video/flash/pix/text player.
dépend de	/bin/sh , ld-linux.so.2 , libICE.so.6 , libSM.so.6 , libX11.so.6 , libXext.so.6 , libXmu.so.6 , libXp.so.6 , libXt.so.6 , libc.so.6 , libdl.so.2 , libm.so.6 , libpthread.so.0 , /bin/sh , libc.so.6 (GLIBC_2.0) , libc.so.6(GLIBC_2.1) , libdl.so.2(GLIBC_2.0) , libdl.so.2 (GLIBC_2.1) , libpthread.so.0 (GLIBC_2.0) , libpthread.so.0 (GLIBC_2.1)
fournit	14_4.so.6.0, 28_8.so.6.0, atrc.so.6.0, audplin.so.6.0, authmgr.so.6.0, bascauth.so.6.0, cook.so.6.0, ddnt.so.6.0, dnet.so.6.0, drv1.so.6.0, drv2.so.6.0, drv3.so.6.0, dspr.so.6.0, httpfsys.so.6.0, memfsys.so.6.0, meta.so.6.0, mp3f.so.6.0, mp3mfpln.so.6.0, mp3r.so.6.0, pnrscmgr.so.6.0, pnxres.so.6.0, ppffplin.so.6.0, pxcgif2.so.6.0, pxcjpeg2.so.6.0, pxcpng.so.6.0, pxff.so.6.0, pxgf.so.6.0, pxgr.so.6.0, pxjf.so.6.0, pxjr.so.6.0, pxpf.so.6.0, pxpr.so.6.0, pxrend2.so.6.0, rarender.so.6.0, rcacore.so.6.0, rcadlg.so.6.0, rcaembed.so.6.0, rmacore.so.6.0, rmffplin.so.6.0,

6.5 Demonstration

Installation of a .tar.gz archive

Installation of an application through its RPM package

Installation of Mozilla and OpenOffice.org

6.6 The rpm tool

Some Linux distros use the rpm tool (RPM Package Manager, or Red Hat Package Manager) for the installation of applications.

RPM maintains a database of all installed softwares and their dependencies. Applications and installation scripts are packaged as "RPM packages".

To install a new software :

```
rpm -i [paquetage].rpm
```

The package will be installed only if each of its dependencies could previously be solved.

To update a package :

```
rpm -U [paquetage].rpm
```

Old files from the former package will be deleted and replaced by the new ones.

To erase, or uninstall, a package :

```
rpm -e [paquetage]
```

The package will be erased provided that no other packages depend on it.

To question the RPM database, use the -q option.

```
rpm -q -i apache
```

- Option -i stands for "information about the following package".

Some other useful options :

- -l: For listing all the files of a package.

```
rpm -q -l pciutils
/sbin/lspci /sbin/setpci /usr/share/doc/package/pciutils /usr/share/pci.ids
```

- -f file: to display the names of the packages where the file figures.

```
rpm -q -f /sbin/lspci
pciutils-2.1.9-58
```

- -a: List all installed packages.

7. Some applications

Finally, the following chapter will detail the possible uses of the GNU/Linux system, as well as some products written by the Free and Open Source communities.

In this chapter

7.1 Goals

File search

File editing

Audio CD playing

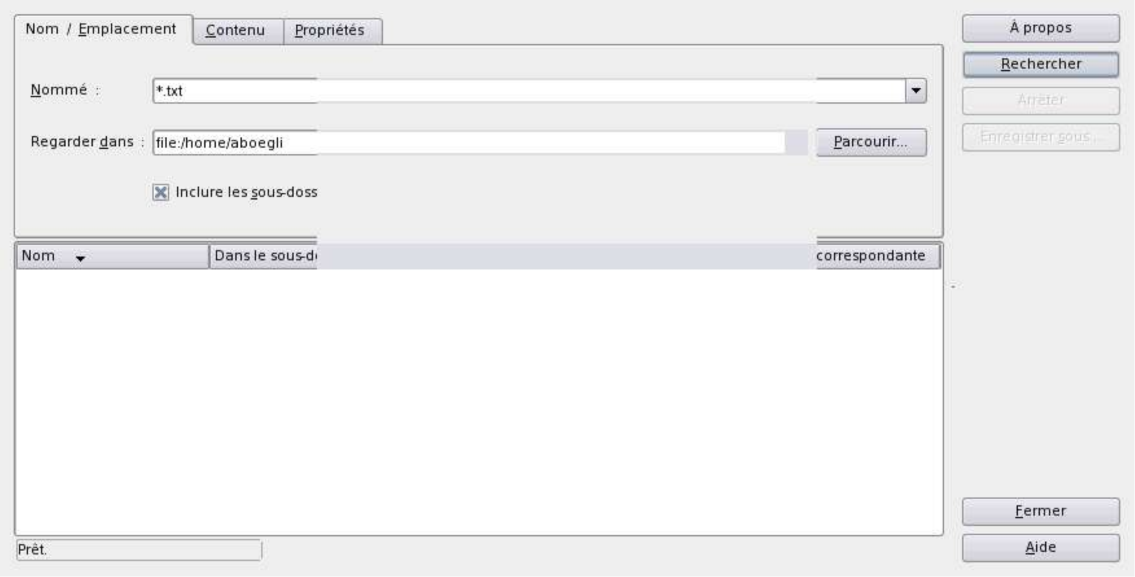
CDs burning

Image viewing

Image editing

7.2 File searching

To search a file, use the find command or a graphical interface.



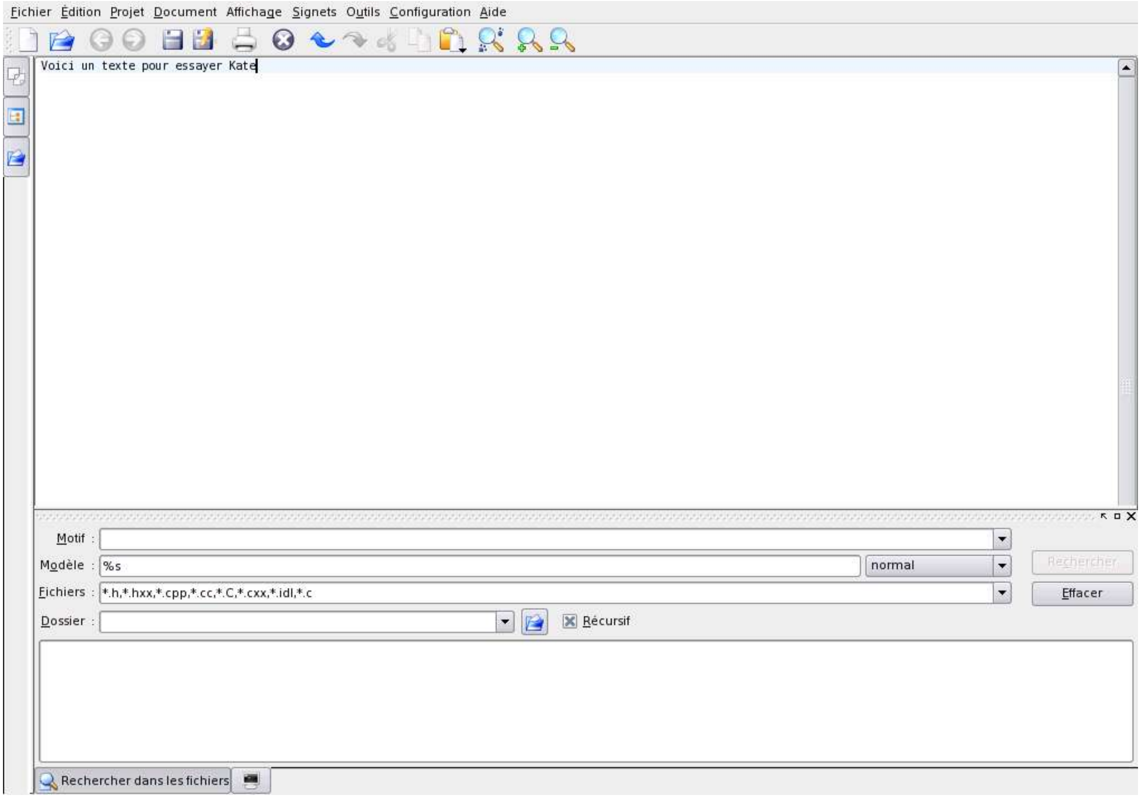
Nommé : *.txt

Regarder dans : file:/home/aboegli

☒ Inclure les sous-doss

7.3 File editor

Many file editors, in graphical or console mode, exist. Here is an example with Kate :


Fichier Édition Projet Document Affichage Signets Outils Configuration Aide
Rechercher
Effacer
Rechercher dans les fichiers

```
Voici un texte pour essayer Kate
```

Motif :
Modèle : %s normal
Fichiers : *.h,*.hxx,*.cpp,*.cc,*.C,*.cxx,*.idl,*.c
Dossier :
☒ Récursif

7.4 Exercize 8

1) Find all files ending with ".pdf".

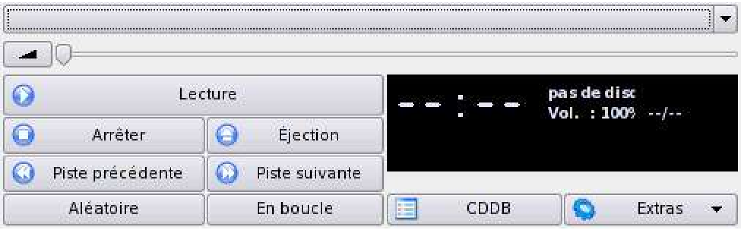
2) Find all files in the /etc directory bigger than 500 bytes.

3) Find all files that have been accessed over the last 4 hours.

4) Create a text file containing your last name. Save it. In the system, search all files containing your last name.

7.5 Audio CD player

Audio CDs do not have a real file system. An appropriate software can directly read them and play the music.

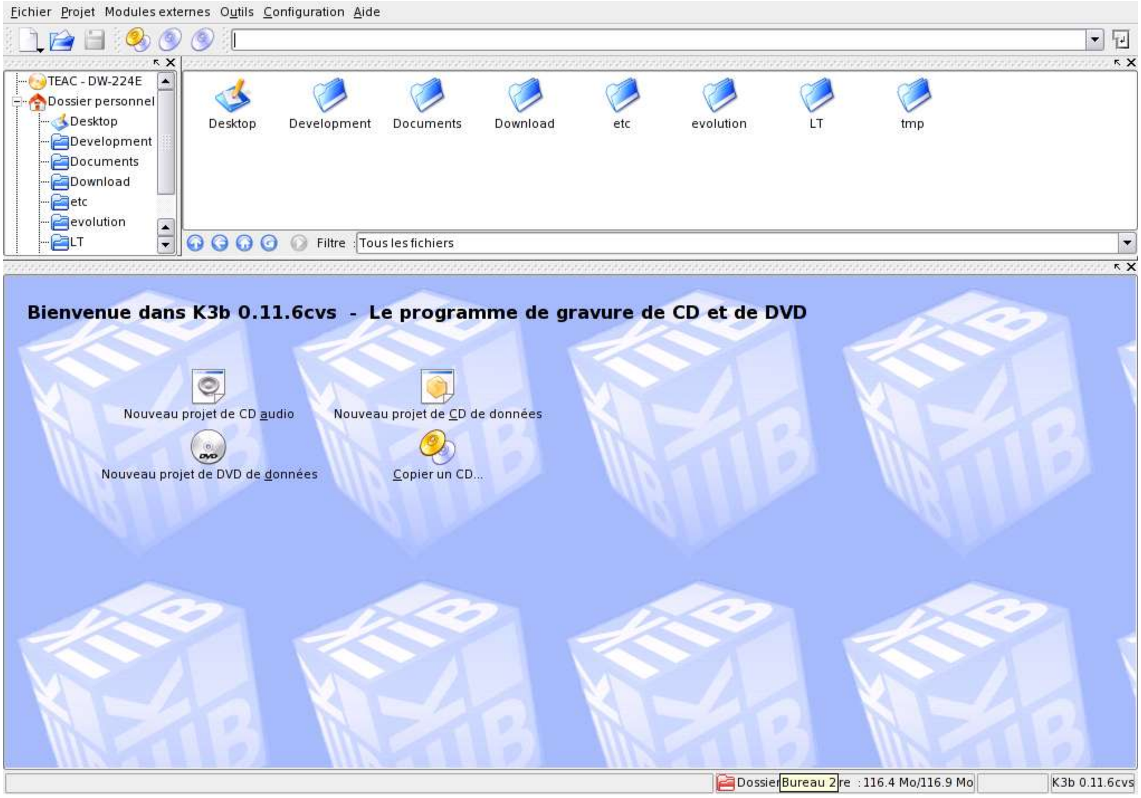


7.6 CD writer

CDs are burnt in two simples stages :

- Prepare the ISO image (file system ISO9660). Get an ISO file of a pre-existing CDROM or create it manually.
- Burn the CD.

Under KDE, the standard application for preparing and burning CDs is now K3B.



Bienvenue dans K3b 0.11.6cvs - Le programme de gravure de CD et de DVD

Fichier Projet Modules externes Outils Configuration Aide
TEAC - DW-224E
Dossier personnel
Desktop
Development
Documents
Download
etc
evolution
LT
tmp
Filtre
Tous les fichiers
Nouveau projet de CD audio
Nouveau projet de CD de données
Nouveau projet de DVD de données
Copier un CD...
Dossier Bureau 2 re : 116.4 Mo/116.9 Mo
K3b 0.11.6cvs

7.7 Exercize 9

1) With KOnCD, prepare an image backup.iso of your $HOME directory and burn it on a CD.

7.8 Image viewing

Many applications allow to visualize images and pictures.

* kview, xv, gqview, etc.

7.9 Graphic image manipulation

The Gimp is a powerful graphic tool suite, unlike Photoshop.

7.10 Downloading digital pictures

Most digital cameras are recognized and many applications allow to download images.

Example : gtkam

7.11 Exercize 10

1) Take some pictures and upload them with gtkam.
2) Visualize the pictures with gqview.
3) Edit some pictures with the Gimp.

7.12 Some typical operations

Switch on and off the virtual memory.

Access a floppy disk or a CDROM through the shell.

Set up repeating tasks with cron.

Explain how to add a new disk drive.