Debian/GNU Linux

Introduction

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Agenda

First Steps in Linux - The Login

How to login

Directly

- xdm/kdm: by graphical display managers login prompt
- on the serial console (24x80 character terminal window)

Remotely

- from other computer (through network) from terminal window
  - ssh [-X] host name or host IP (ssh -l ke -X gorilla.risc.jku.at)

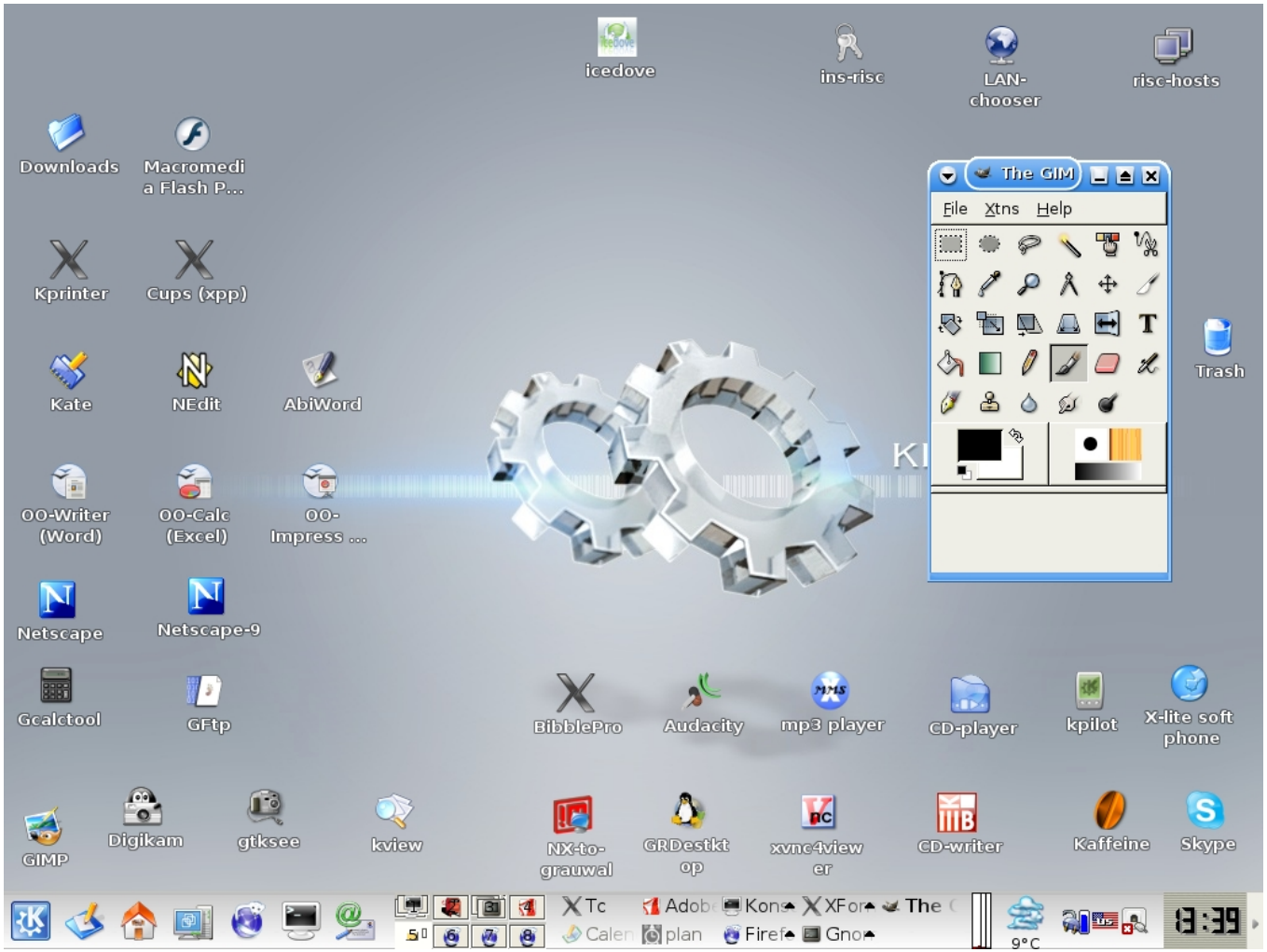
Working Environment

- GUI, see the KDE desktop
- shell in terminal window; command line input, closed by RETURN
  - some simple commands: ls; who; date; wc;

Logout

- KDE/X: use GUI
- shell: exit, logout, etc.

My KDE Screen



First Steps in Linux - The Login

How to change the password

in KDE with GUI: kdepasswd

In shell:

- passwd for a computer without networking
- yppasswd for network environment

First Steps in Linux - The Login

How to start an application in Linux

on the local computer

- click on the application's icon on the desktop
- start from the menue system
- start from the command line (shell)

start it on a remote computer

- using networking, X11, display local
- ssh -X gorilla.risc.jku.at kile

Agenda

Computer Environment at RISC

Linux Environment

Desktop Computers

- 55 Debian Linux PCs
- 3 MS Windows PCs (secretary)

Server Computers

- 12 Servers
  - 5 mailservers (incoming, smtp-auth, mailbox)
  - web-, ftp-, svnserver
  - fileserver
  - servers for virtualisation (2 older, 2 new)

Window 2003 Server

- Linux - Windows integration

Advantage of Linux

Using Linux

Advantage of Linux

- FREE, OpenSource Software by no cost !
- multitasking OS, multiuser OS
- native networking OS (to use remote resources)
- native graphical networking capabilities (X11)
- very stable, very secure OS
- wide Internet support (mailing lists, irc groups, etc.)
- wide free documentation
  - User Guides, HowTos, FAQs, etc.
- lot of FREE software packages are available
- the absolute leader OS in the server area

Linux Distributions

Using Linux

Distributions

- more as 100 different Linux distributions
  - in reality about a dozen main (full) distributions
- as a sign of the democracy in software development
- check: http://distrowatch.com/

Main Distributions

- Mint, Ubuntu, Fedora, Debian, OpenSuse, PCLinuxOS

Linux Distributions

Using Linux

Ubuntu - ancient African word: humanity to others

- Ubuntu Manifesto:
  - available free of charge, usable by people in their local language
- lot of sub-distribution (based on Ubuntu)

Mint - Ubuntu-based, more complete out-of-the-box experience

- including browser plugins, media codecs, support for DVD playback

Debian GNU/Linux - create a free Linux OS

- quality - over time pressure; lots of packages (25000)
- the most architectures supported:
  - alpha, amd64, arm, armel, hppa, i386, ia64, mips, mipsel, powerpc, sparc,
- the base for the most other Linux distributions (Ubuntu, etc)

Working with Linux

Using Linux

Today no difference in using Windows or Linux

- in both cases: you have to click, click, click ...

Problems of using Linux

- no perfect support for new or specific hardware
  - reason: the manufacturer do not give free the necessary information
- upgrade to new hardware not possible immediately
  - late announcement of the HW information for drivers

Agenda

Structure of Linux

The Kernel

Kernel: the conductor in the OS

- loaded by the boot loader at start of the OS
- managing processes (scheduler)
- managing memory (real and virtual); access to memory
- doing multitasking
- serves the File System
- manages rights and permissions (users, files)
- manages hardware units (I/O, hard disks, equipments, etc.)
- networking

Structure of Linux

Unix Processes

Process - a running program

- started by kernel;
- get CPU time slices (multitasking)
- priority: 0 to 64 (minimal)
- PID (process ID, sequential number)
- first process: kswapd0
  - for virtual memory management
- second process: init, PID=1
  - start and stop the system (i.e. all other processes)
- process state: see ps output
  - running (R) - stopped (T),
  - active (S) - idle (I) (waiting 20sec)

Structure of Linux

The Shell - an overview

Shell

- User Interface to the OS
- it runs in a terminal window
- is a command language interpreter
  - usable as an interactive login shell
  - shell script command processor
- interprets command line inputs; manages display output
  - includes a command-line editor
- included is a programming language (shell script)
  - commands, variables, expressions,
- includes a job control
- lot of built in commands for each specific area
- invokes programs; redirects input/output; makes pipelining

Agenda

The Linux file system

Structure and Components

File System

- tree structure, begins with the root (/) directory
- any number of (nested) subdirectories
- any number of files (file = leaf in the tree structure)

File Types

- ordinary files (text, executable, jpeg, wav, doc, etc.)
- special files (dev files = device description files)
- symbolic link (pointer to another file)
- subdirectories contains any type of files

Linux Root directory structure

```
/bin/ /boot /cdrom  /dev /etc /home /lib
/lost+found /media /proc /root /tmp /usr /var
```

The Linux file system

Symbolic link, path

Symbolic link:

- only one physical file; any number of symbolic link to it
- delete symlink: the physical file will not be deleted !

```
lrwxrwxrwx 1 ke ke 24 2008-10-21 22:04 oxygen.png -> ../oxy.png
```

Path

- the exact location of an object (file, subdir, etc.)
  - /usr/share/doc/latex-beamer/solutions/generic-talks
- absolute path; relative path (../rlogin-ssh)
- gives shell the directory list to search for executable commands
- commands: pwd - current location; cd - change dir
- echo $PATH

```
/usr/local/bin:/usr/bin:/bin:/usr/bin/X11:/usr/games:/zvol/timer/bi
/home/ke/bin:/usr/NX/bin:/usr/local/Adobe/Acrobat7.0/bin
```

The Linux file system

Symbolic link, path

file systems on the file server atlantis

Filesystem	1K-blocks	Used	Available	Use%	Mounted on
/dev/sda1	15377820	4914984	9681680	34%	/
/dev/sda3	15377852	7398996	7197696	51%	/zlocal/sda3
/dev/sda5	15377820	12158088	2438576	84%	/zlocal/sda5
/dev/sda6	15377820	13050212	1546452	90%	/zlocal/sda6
/dev/sda7	15377820	13734280	862384	95%	/zlocal/sda7
/dev/sda8	15377820	11910696	2685968	82%	/zlocal/sda8
/dev/sda9	15377820	12721576	1875088	88%	/zlocal/sda9
/dev/sda10	15377820	169368	14427296	2%	/zlocal/sda10
/dev/sda11	15377820	169368	14427296	2%	/zlocal/sda11
/dev/sda12	15377820	169368	14427296	2%	/zlocal/sda12
/dev/sda13	15377820	169368	14427296	2%	/zlocal/sda13
/dev/sda14	6261684	143664	5799936	3%	/zlocal/sda14
/dev/sdb1	15377820	169368	14427296	2%	/zlocal/sdb1
/dev/sdb2	15377852	169368	14427324	2%	/zlocal/sdb2
/dev/sdb3	15377852	169368	14427324	2%	/zlocal/sdb3
/dev/sdc1	480719056	7563748	448736108	2%	/zlocal/sdc1

Agenda

The user account

Overview

user identification by login:

- Linux: username, passwd
  - similar by gmail account or by XP Professional

further parts of the Linux user account:

- the home directory; the shell; the userś group; other parameters

location of the Linux home directory: /home/username

- (XP: Eigene Dateien, gmail: not visible)
- local /home/username not a usable solution in a networking environment
- problems by backup, by changing the workstation, etc.

LAN-wide home directory

The solution for a computer network

riscwide Home directory

- at RISC the home directories are located on a file server
  - the file server exports them by NFS to all other workstations
- you have always the same home directory
  - independently on which workstation you logged in
- advantage by backup
  - only the file server hard disk has to be backuped
- miscellaneous information must be distributed LAN-wide
  - see later: NIS, YP, etc.

special user in Linux: root (read/write rights for all files)

Parameters of the user account

Files related to accounts:

- /etc/passwd, /etc/group, /etc/shadow, /etc/gshadow
- /etc/passwd:

```
login name:password:UID:GID:real name,,,:home directory: shell
sysadmin:x:1000:1000:sysadmin at risc,,,:/home/sysadmin:/bin/bash
```

- /etc/group

```
sysadmin:x:1000:
```

additional information:

- real name, location (room number)
- work phone number, home phone number,
- shadow: additional information about:
  - password expires, last changed, has to be changed
  - account expires, etc.

Agenda

Permissions in Linux file system

Groups and attributes

Groups

- files and users have miscellaneous attributes
- the user belongs to a group in Linux (adm, root, audio, etc.)
- /etc/group file contains the groups

```
root:x:0:                cdrom:x:24:ke
daemon:x:1:              audio:x:29:ke
bin:x:2:                 video:x:44:ke
```

- more users may belong to a group

```
webadmin:*:10019:sysadmin,mkauers,wwindste
sysadmin:*:10017:sysadmin,ke,landerl,kesysadm
```

- the file gets attributes for the grouping: u/g/o
  - u: the user, who owns the file
  - g: all users in a group
  - o: other users not in the files group and not owner (others=world)

Permissions in Linux file system

attributes

Attributes

- files/directories get attributes for the grouping: u/g/o
- file attributes:
  - r: read; w: write; x: execute; -: no rights
  - special permissions: s: execution with rights of the owner
- directory:
  - r: list of files; w: create/delete file; x: change into directory; -: no
- ls -l /etc/passwd /etc/shadow
  - -rw-r–r– 1 root root 119 Nov 02 1999 /etc/passwd
  - -rw-r—— 1 root shadow 1079 2008-01-12 18:48 /etc/shadow
- ls -ld /etc/network
  - drwxr-xr-x 7 root root 4096 2009-05-15 08:43 /etc/network/

1.character:

- - file, d directory, l link, c char device, b block device

Permissions in Linux file system

umask - user mask

Umask is a shell variable and a function

- sets the default permissions for files and folders
- it consist of three octal digit (or four, 1st is special)
- the values of an octal digit are calculated:
  - 4 - read, 2 - write, 1 - execute, 0 - none (for files)
- Umask is confusing in that it is set up by defining what is NOT wanted

Examples

- 022 means the rights: 755 for dirs, 644 for files
- 000 means: 777 for directories, 666 for files

Permissions in Linux file system

umask - chmod

To find the proper permission wanted, subtract the umask

- Permissions for files = 666 - umask
- Permissions for directories = 777 - umask

Using umask

- umask (lists the current value)
- umask 022 (sets new values)

chmod

- change file/directory mode
- chmod values path

Agenda

File and directory management

Functions of File Managers

Functions

- create, remove directory, file
- copy, move file1 file2, directory1 directory2
- change permissions
- create symbolic links (for files, directories)

there are a lot of file managers in Debian

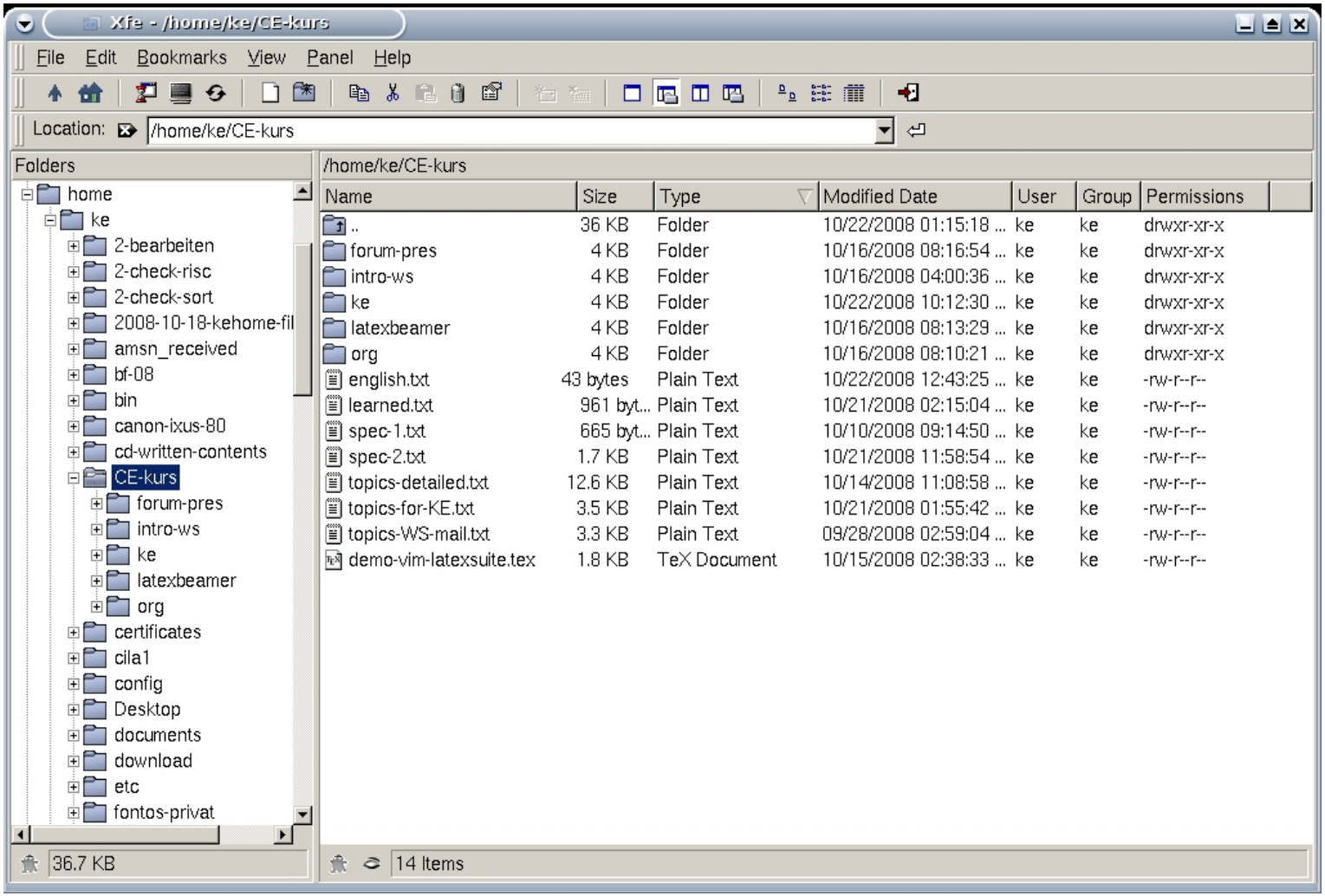
- get list with grep "file manager " squeeze-packages.txt

File Managers

- xfe: X file explorer
  - a lightweight file manager for X11,like Windows Explorer
- konqueror:
  - advanced file manager and the central unit in KDE
  - a web browser, document viewer, application starter

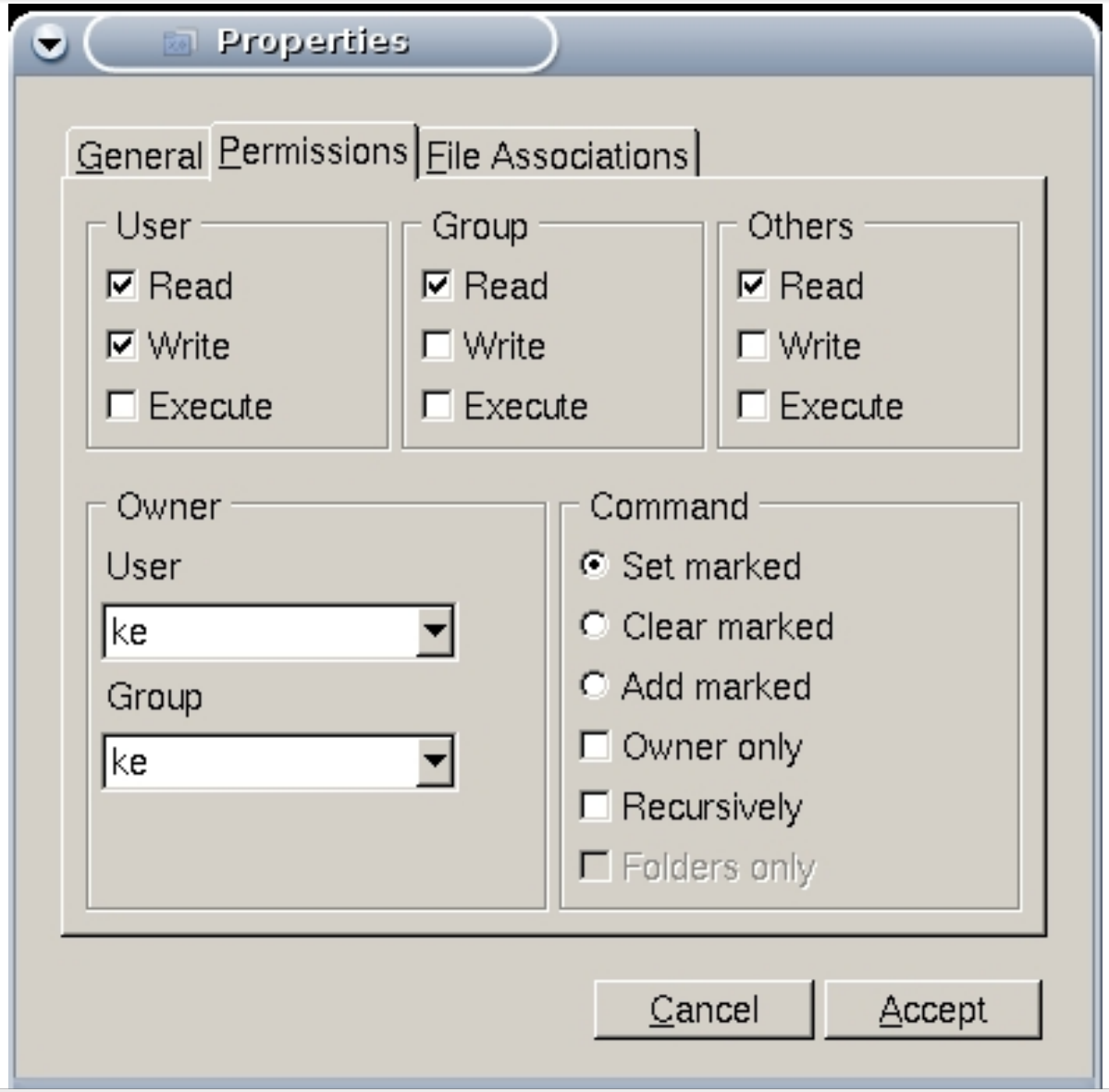
File Managers

xfe - X File Explorer



File Managers

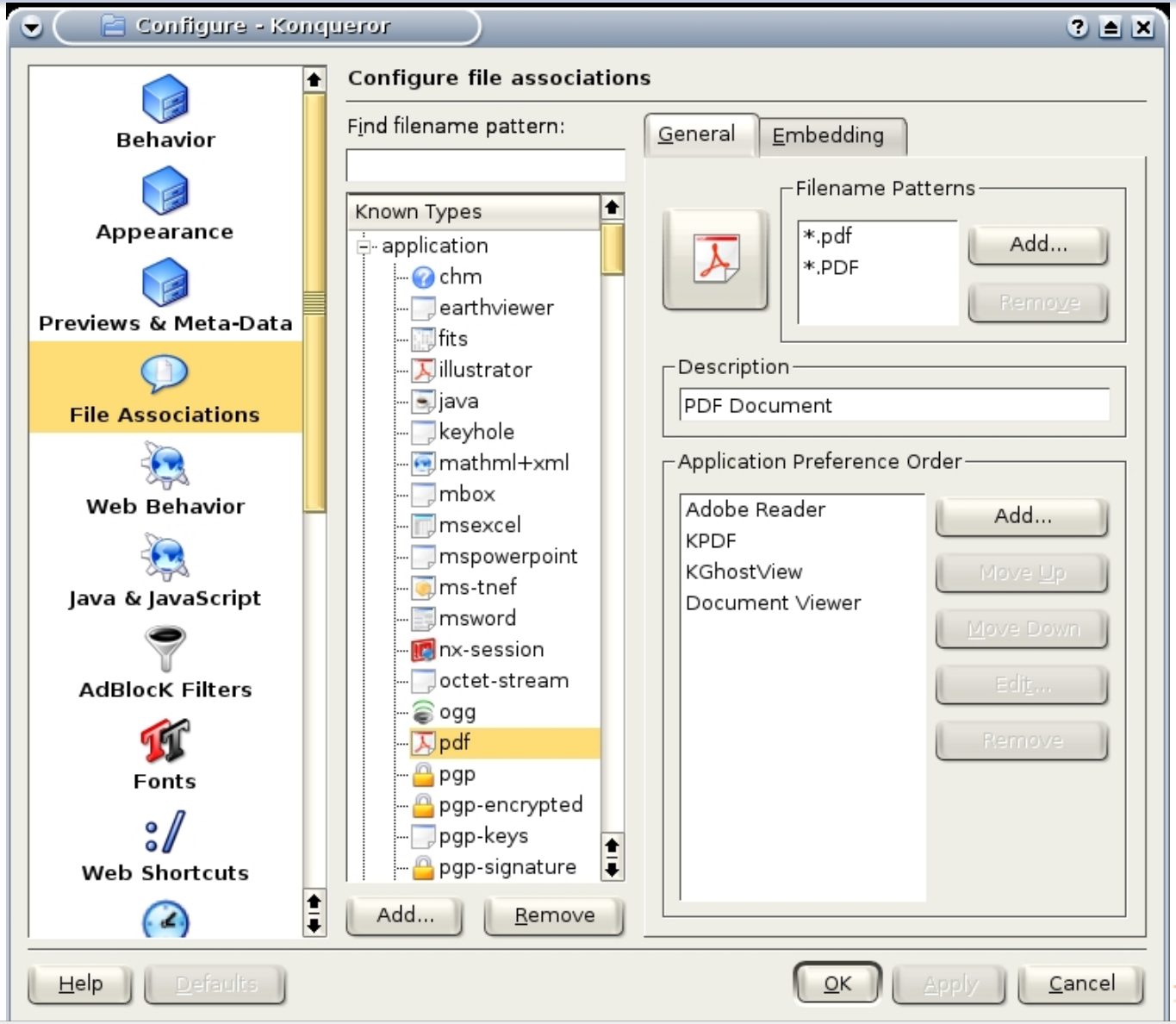
xfe - X File Explorer



Konqueror - Start window

Konqueror - Configuration

File associations



Konqueror - Configuration

on-line Demo

On-line Demonstration of Konqueror

Agenda

Editing function in Linux

Editing

- what kind of object do we want to edit
  - text file, audio file, jpeg image file, etc.
  - cd, dvd contents
- dozens of editor are available
  - check them with grep editor squeeze-all-packages.txt
  - 306 packages with 'editor'
  - 58 packages with 'text editor'
- general purpose text editors of different power
- special editors for specific objects
  - audacity, gimp, xfig
  - K3B CD/DVD creator

Office suites, Text editors

Open Office (OO)

- oowriter (Word processor), oocalc (Spreadsheet), ooimpress (Presentation), oodraw (Drawing), oobase (Database), oomath (Equation editor)

K-Office (KDE Office suite)

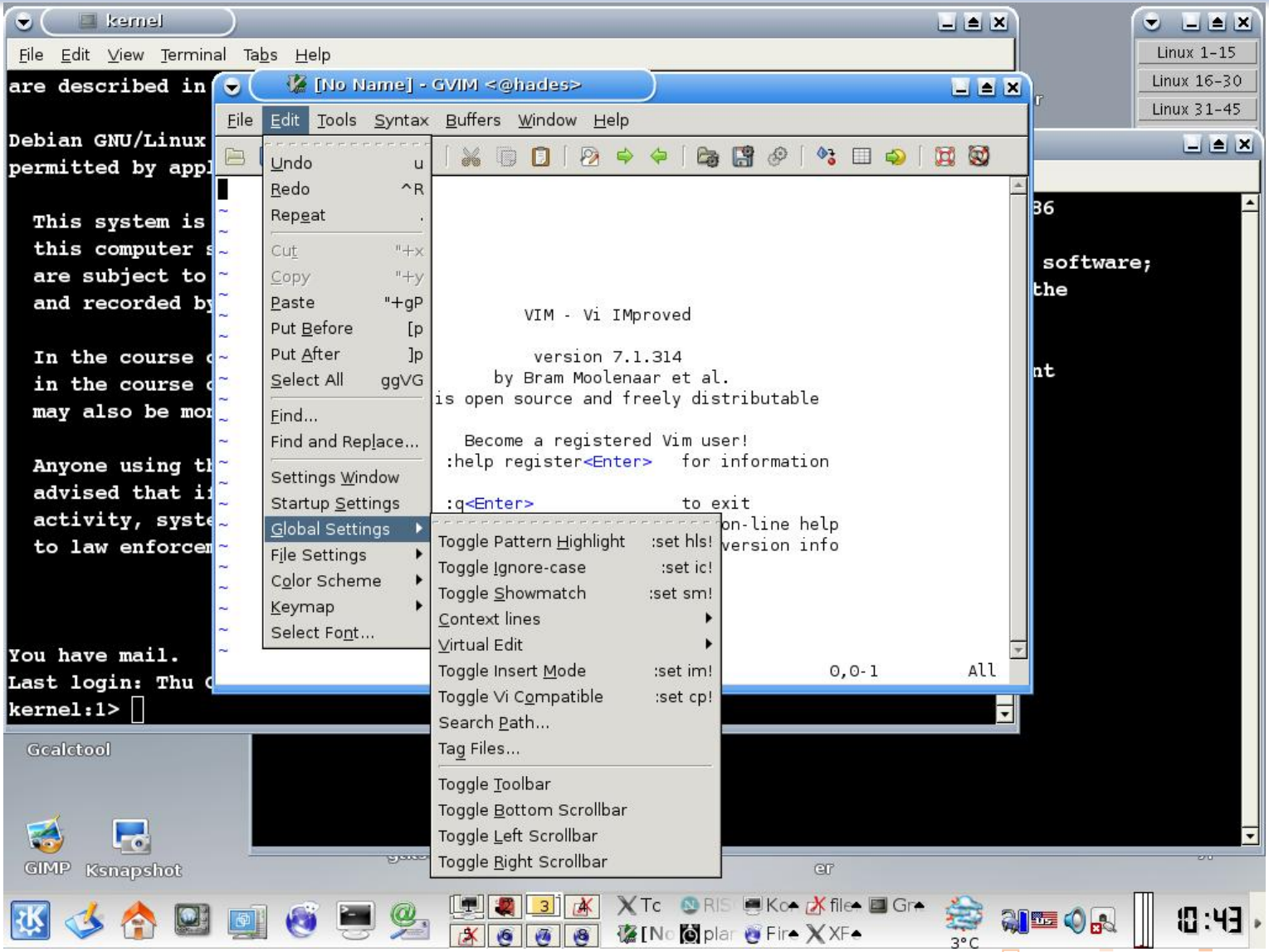
- kwriter, kspread, kpresenter, kformula, kthesaurus, etc.

Text Editors

- vi: historical times, but very powerful
- gvim: emacs-like, very powerful (www.vim.org)
- emacs: very powerful
- kate: advanced text editor for KDE

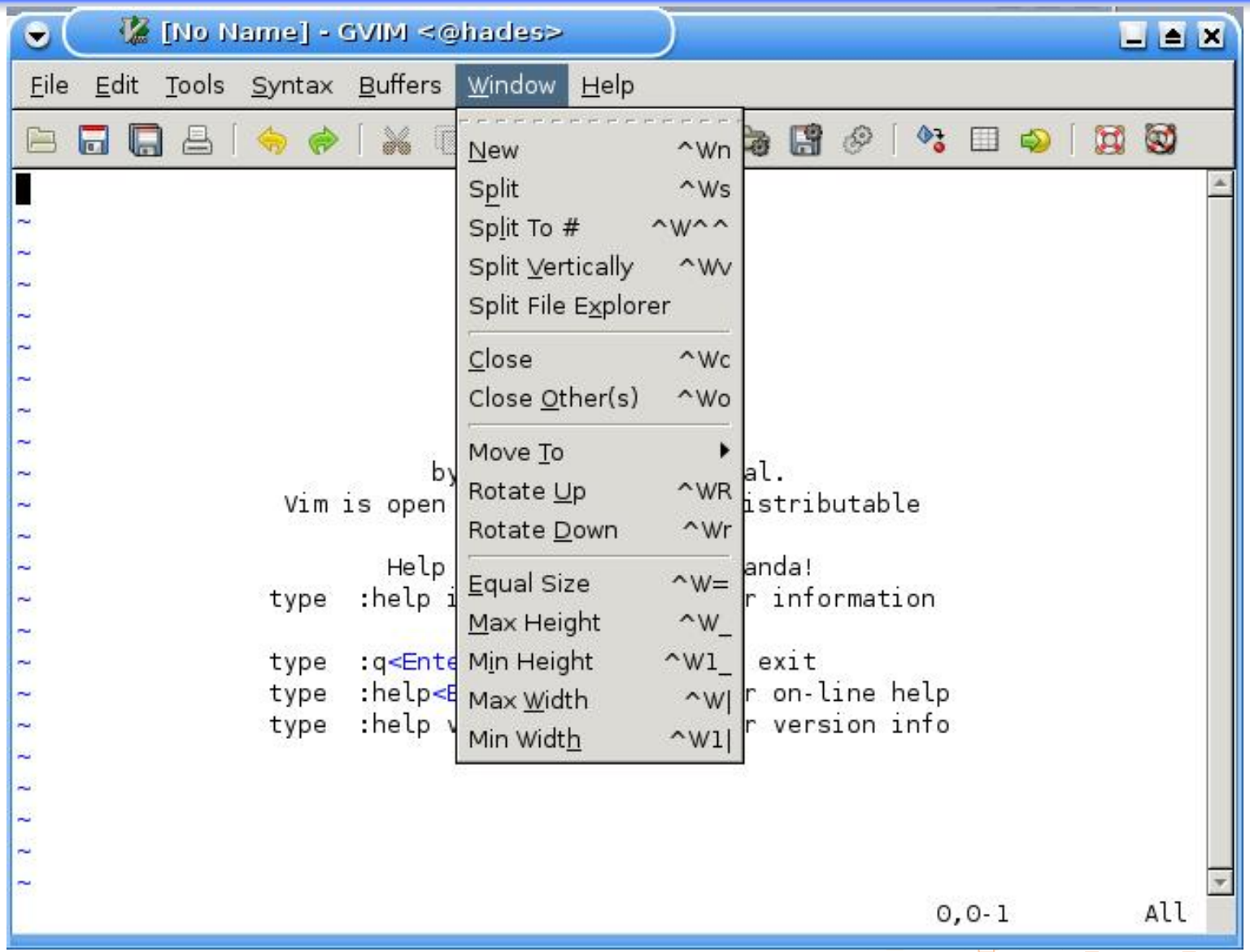
Text editor

Gvim



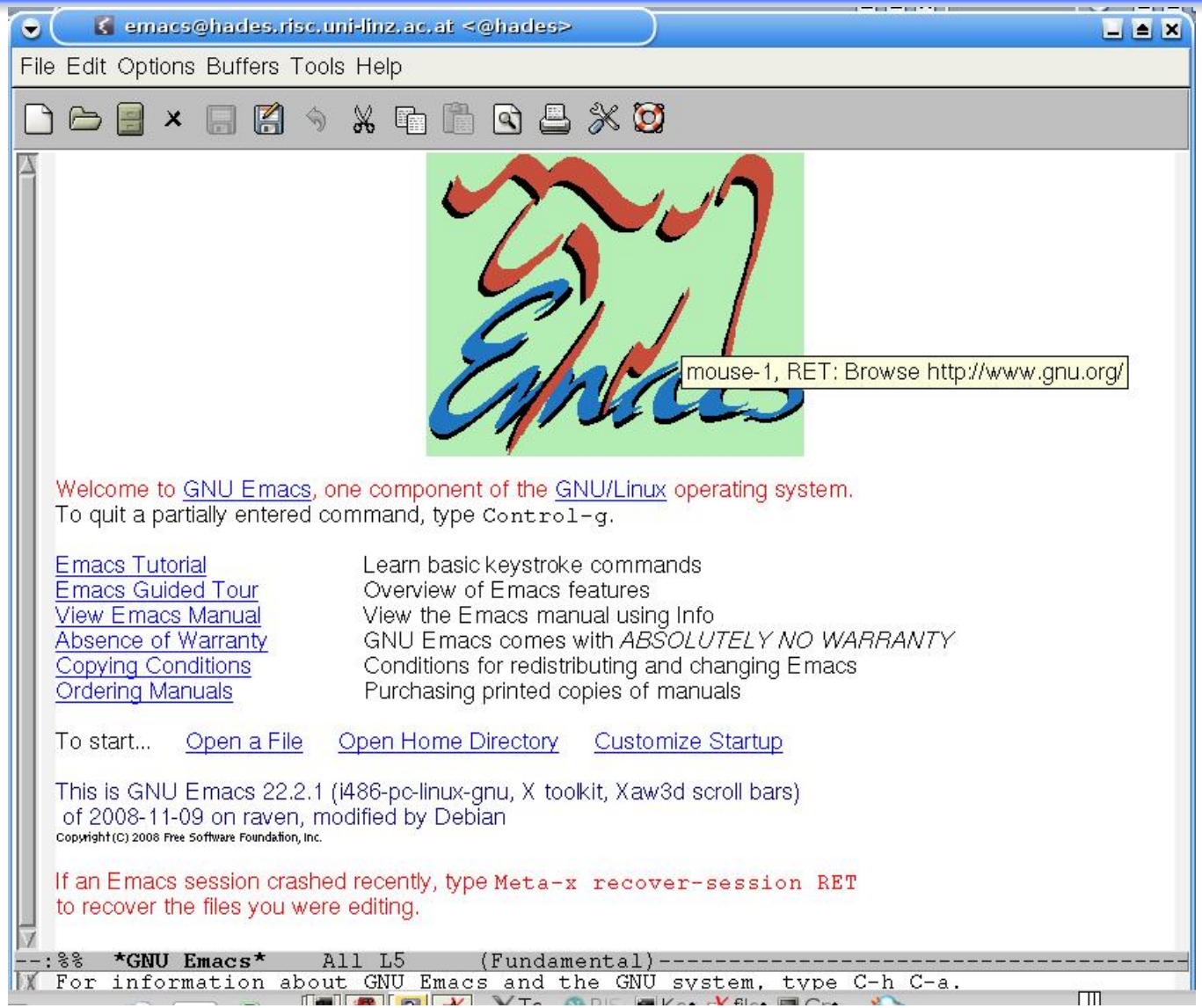
Text editors

Gvim



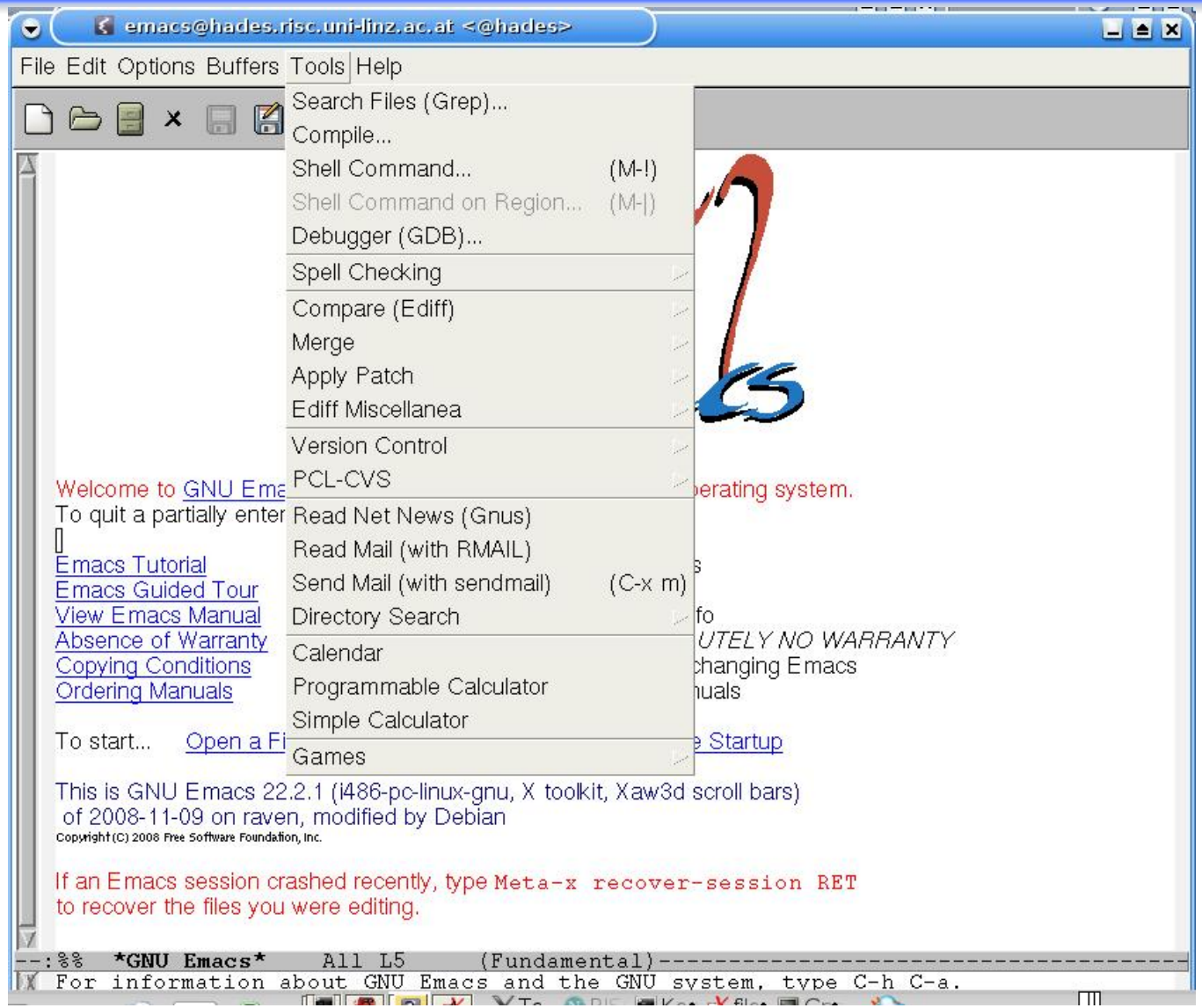
Text editors

Emacs



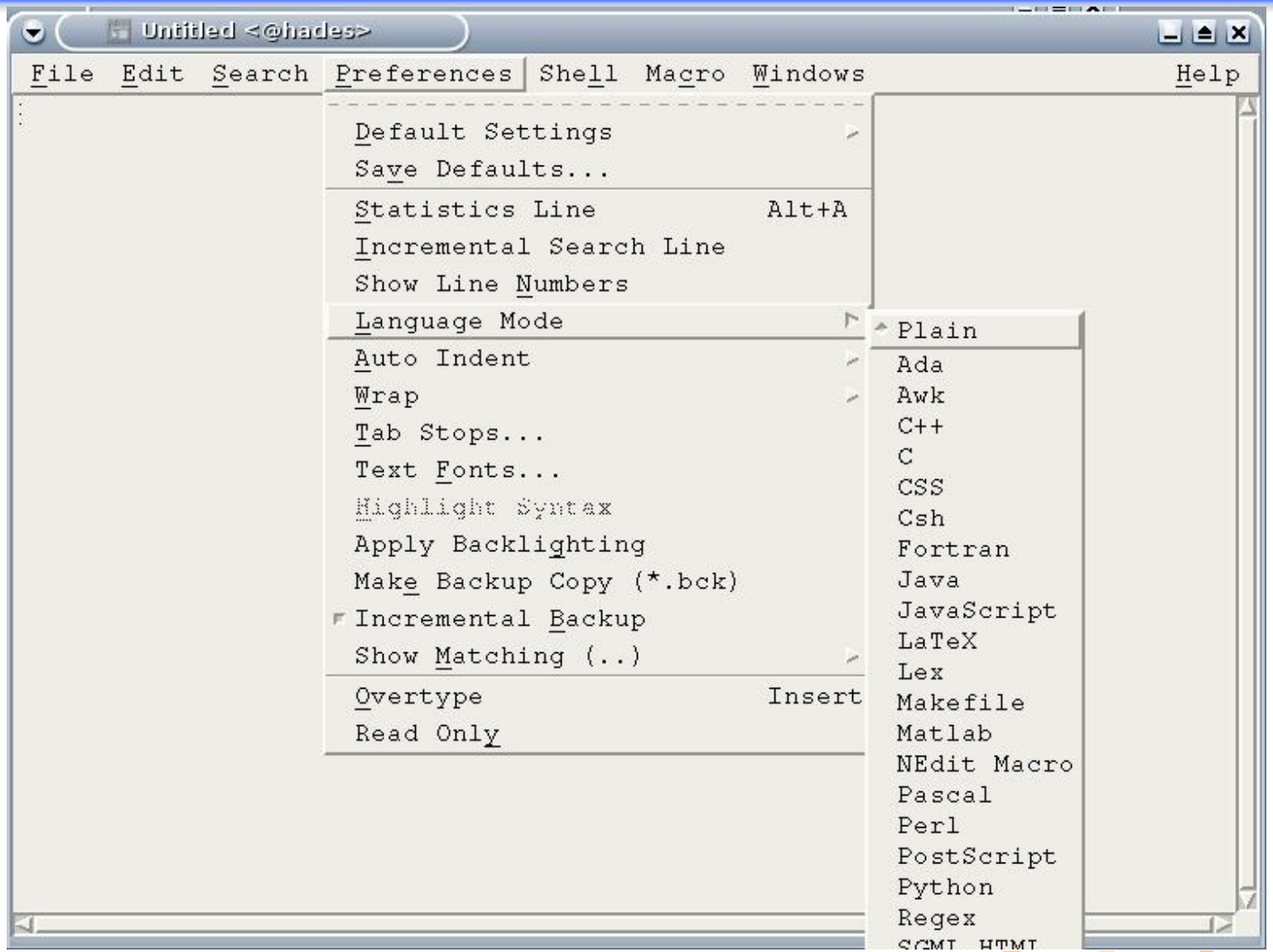
Text editors

Emacs



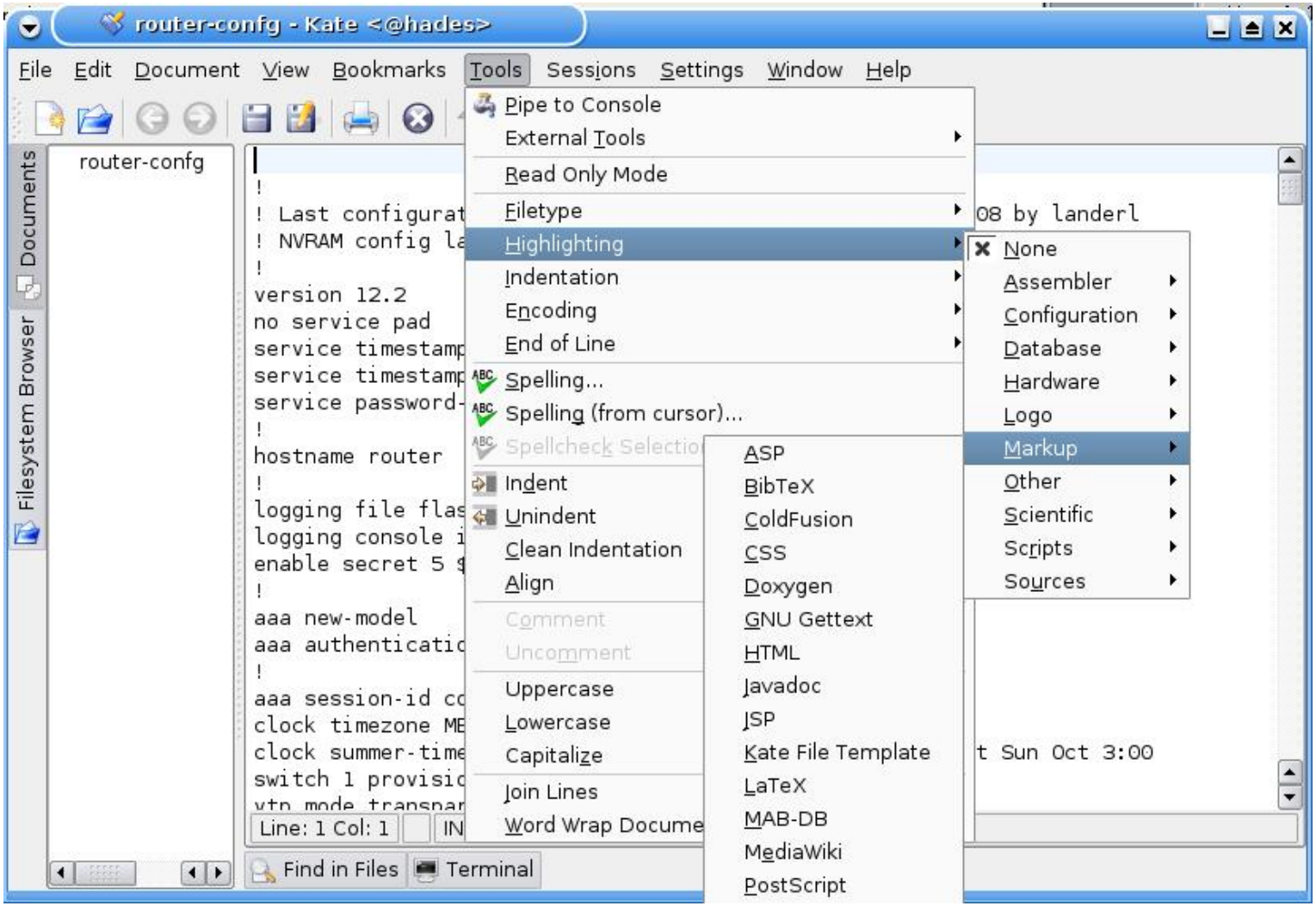
Text editors

Nedit



Text editors

Kate - KDE advanced text editor



Special editors

For object types

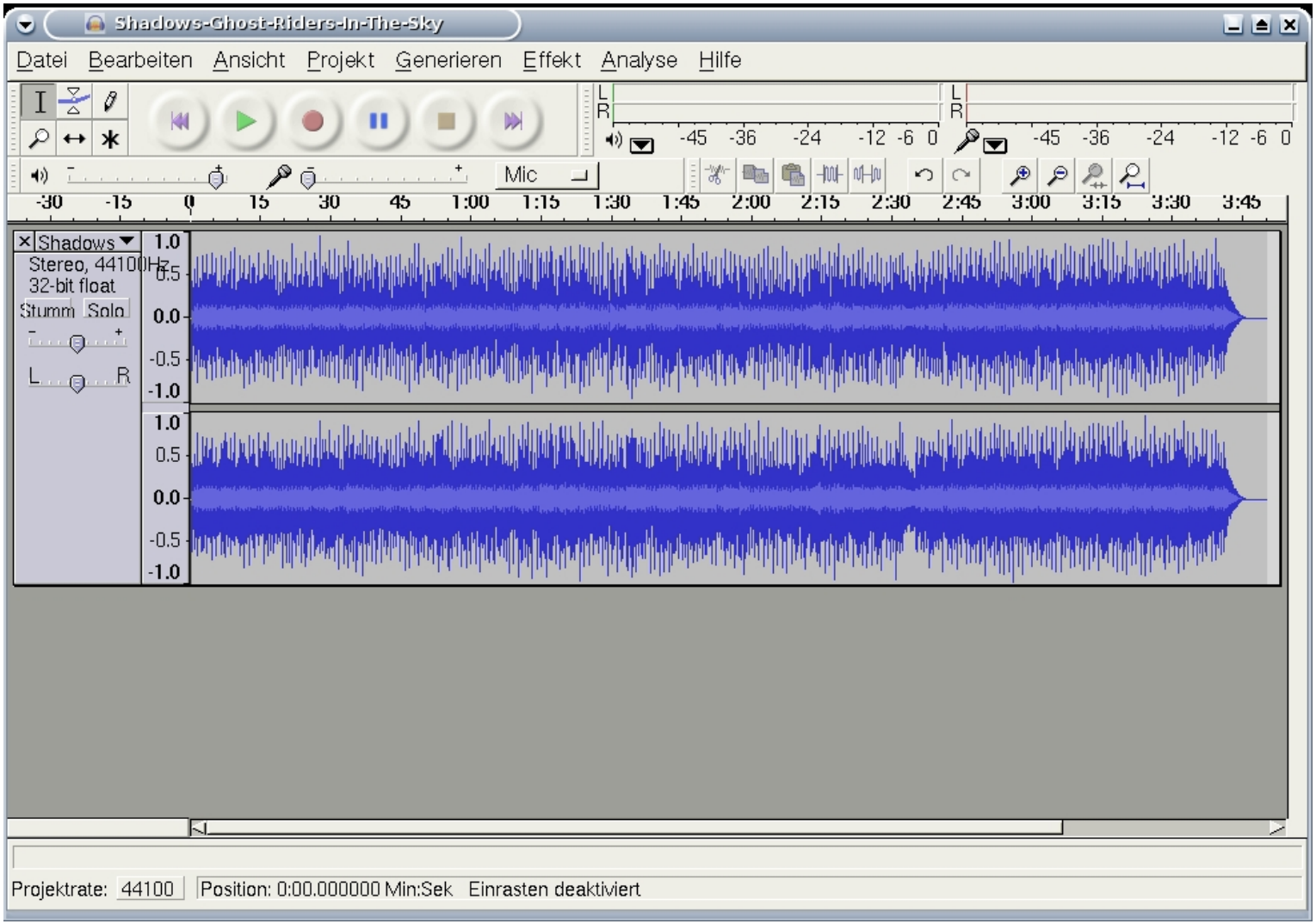
Object Editors

- audacity: a fast, cross-platform audio editor
  - audio recorder, converter, audio file manipulator
  - Linux, Windows, Mac versions available
- GIMP: the Gnu Image Manipulation Program
  - almost as powerfull as Photoshop
- K3B: the KDE CD and DVD creator

Special program - ksnapshot

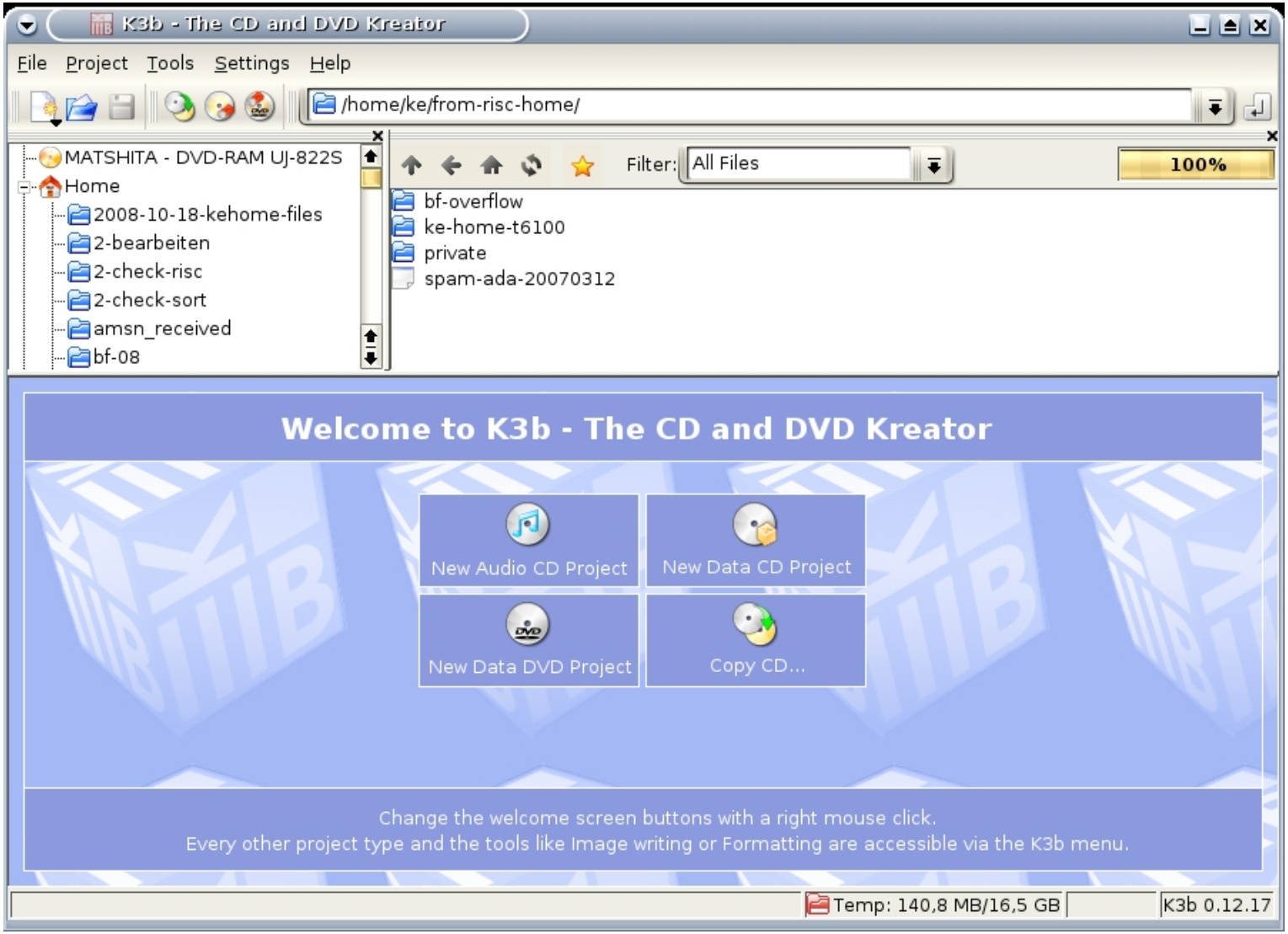
- to create screen shots about different parts of the screen

Object Editors - Audacity



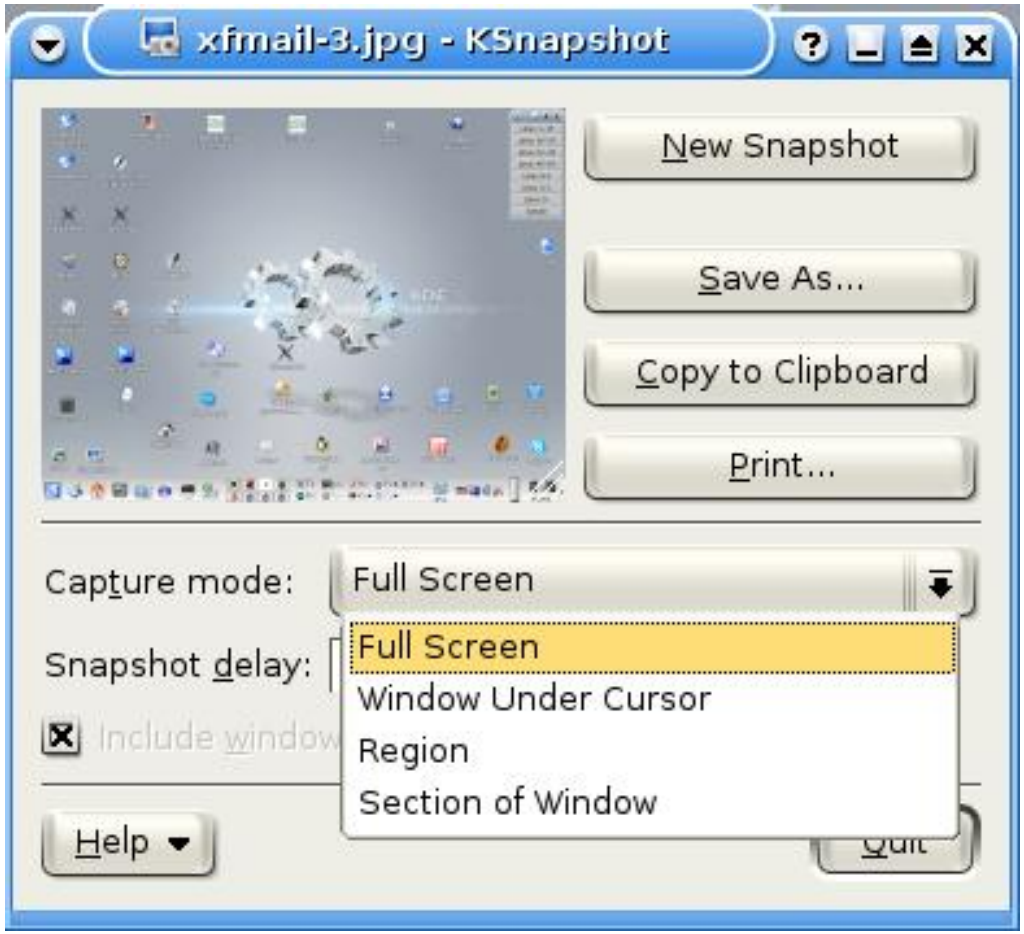
Object Editors - K3B

CD-DVD creator



Special program - ksnapshot

screen shot creator



Agenda

X Window System

The X-Server

X Window System

- X-Windows, Version 11: X11 - today: X.org
- Developed in 1984 at MIT
  - supported by DEC, HP, SUN, IBM
- Network-based graphics window system for Unix
- Uses the multitasking function of Unix
- A client-server model

X server

- runs on a host (in the network)
- controls the display (=graphics card) and keyboard/mouse
- binds to the D-K-M (in contrast to XVNCServer)
- intermediator between X-clients (applications) and D-K-M
- accepts client connections from local host (remote host)

X Window System

The X-client

X client

- connects to the X-server, to display its GUI
- most important X-clients
  - the X Window Manager; Xterm - the terminal emulator
- name begins with x (xterm, xclock, xcalc, etc.)
- any window on the screen is an X-client !

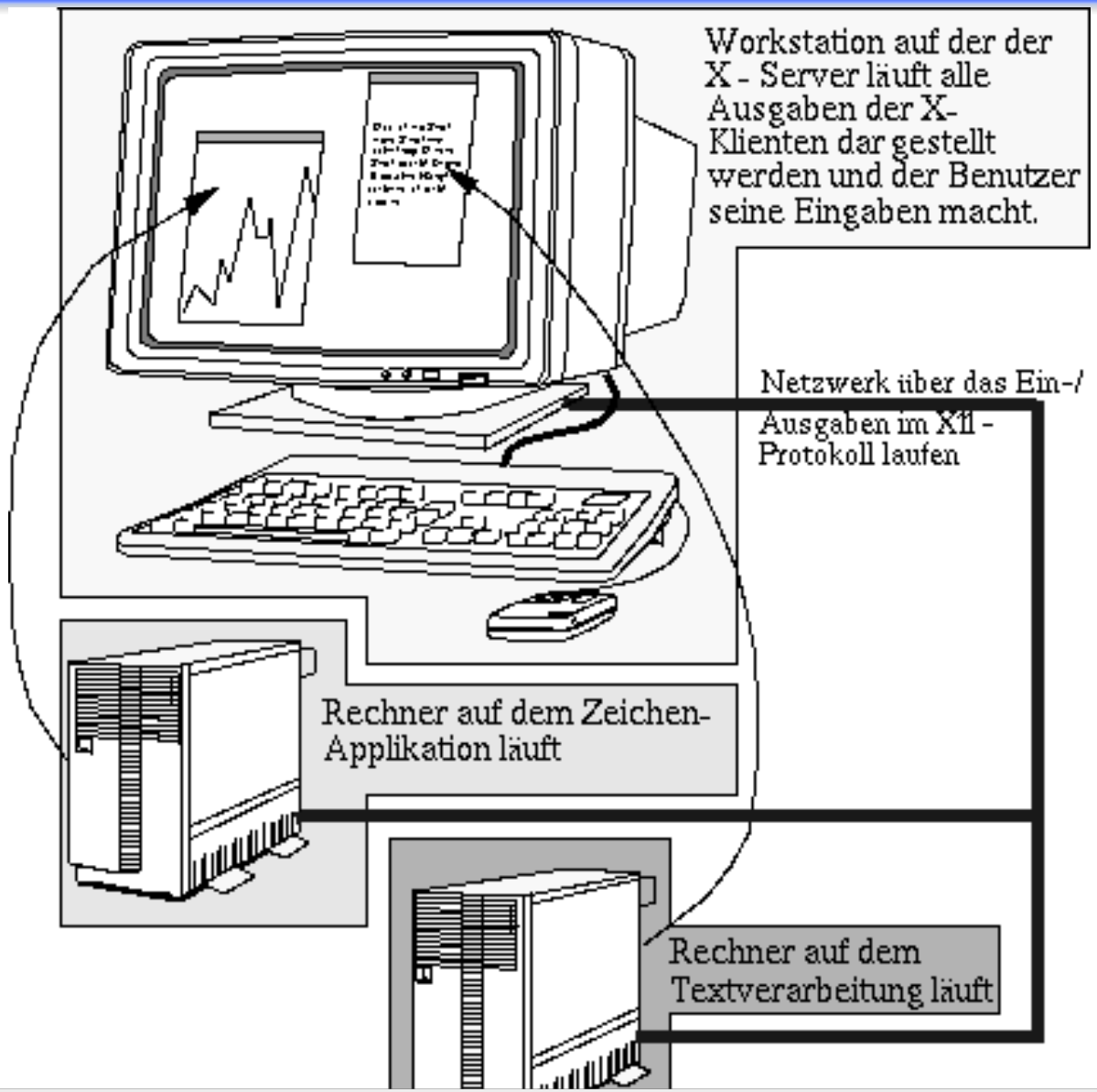
Networking feature of X-Window system

- host runs an X-server
- any X-client executed on the host connects to X-server
- any X-client executed on a remote host can connect to the X-server
  - it displays its GUI on the remote server !
- client and server (may) run on different hosts

Seperation between where a program runs and where its display is!

X Window System

X11 scenario



X Window System

Some components

Display Manager

- displays the graphical login window ("login manager")
- after successfull authentication starts an x-session
- restarting the display manager (Ctrl+Alt+Backspace)
  - finishes all programs in the session (new login window)

X Window Manager

- provides the frame around a window with its functions
- responsible to move, resixe, minimize, maximize, close any window
- responsible for the pointing device input
- provides part of GUI: look and feel; lot of WM; grep for it

X terminal emulator

- a window that functions as a standard terminal
- xterm the first version; try, use: gnome-terminal, konsole

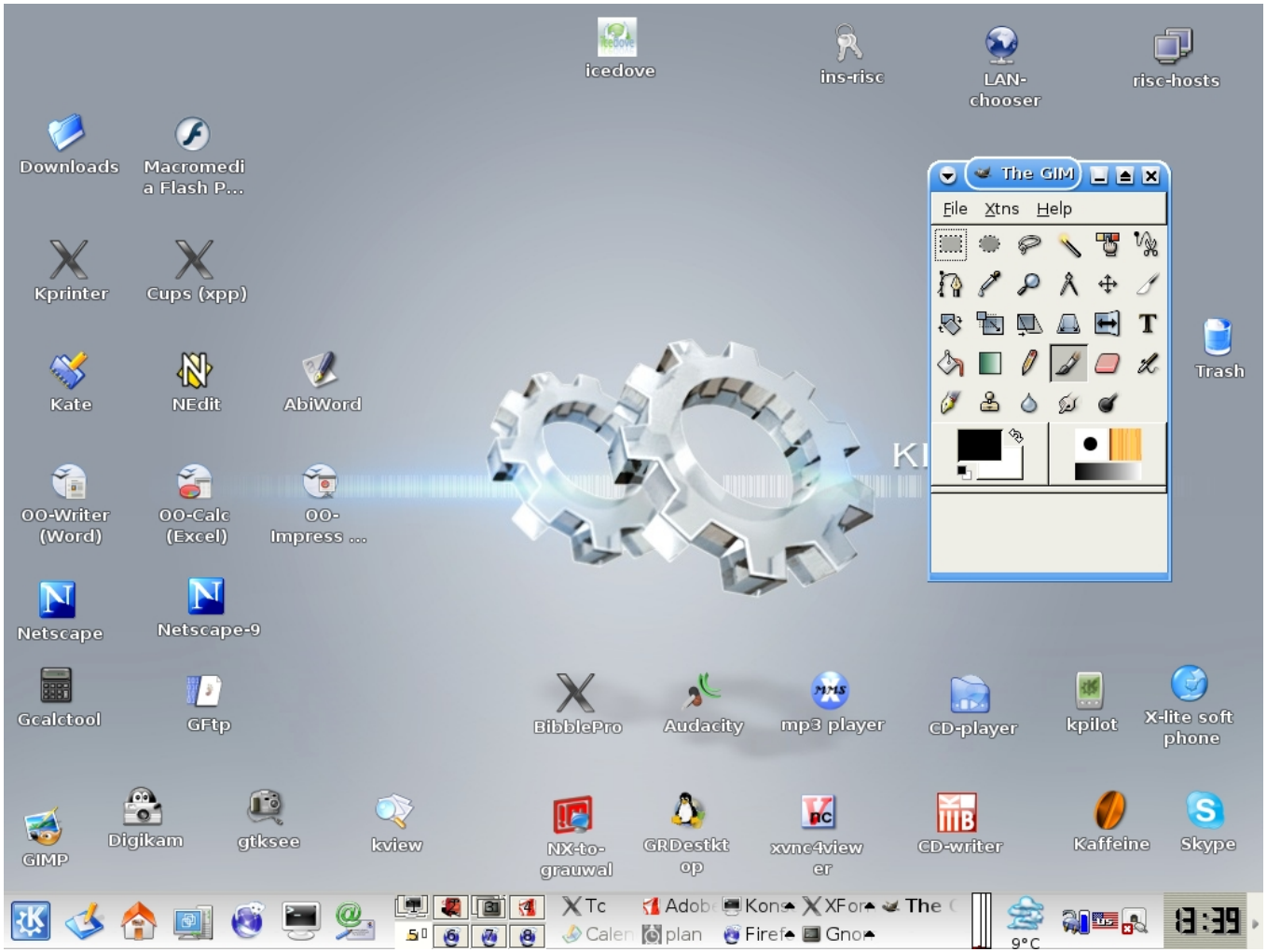
Agenda

The KDE Desktop, details

Desktop KDE

- KDE is a very big, powerful system (desktop environment)
- explore the KDE menu Application tree
- explore the KDE Application Debian tree
- customizing the menu bar
  - adding new applications and applets
  - virtual desktops
- creating desktop icons
- learn the KDE Control Center
- learn the KDE components
- learn the Help in KDE

My KDE Screen

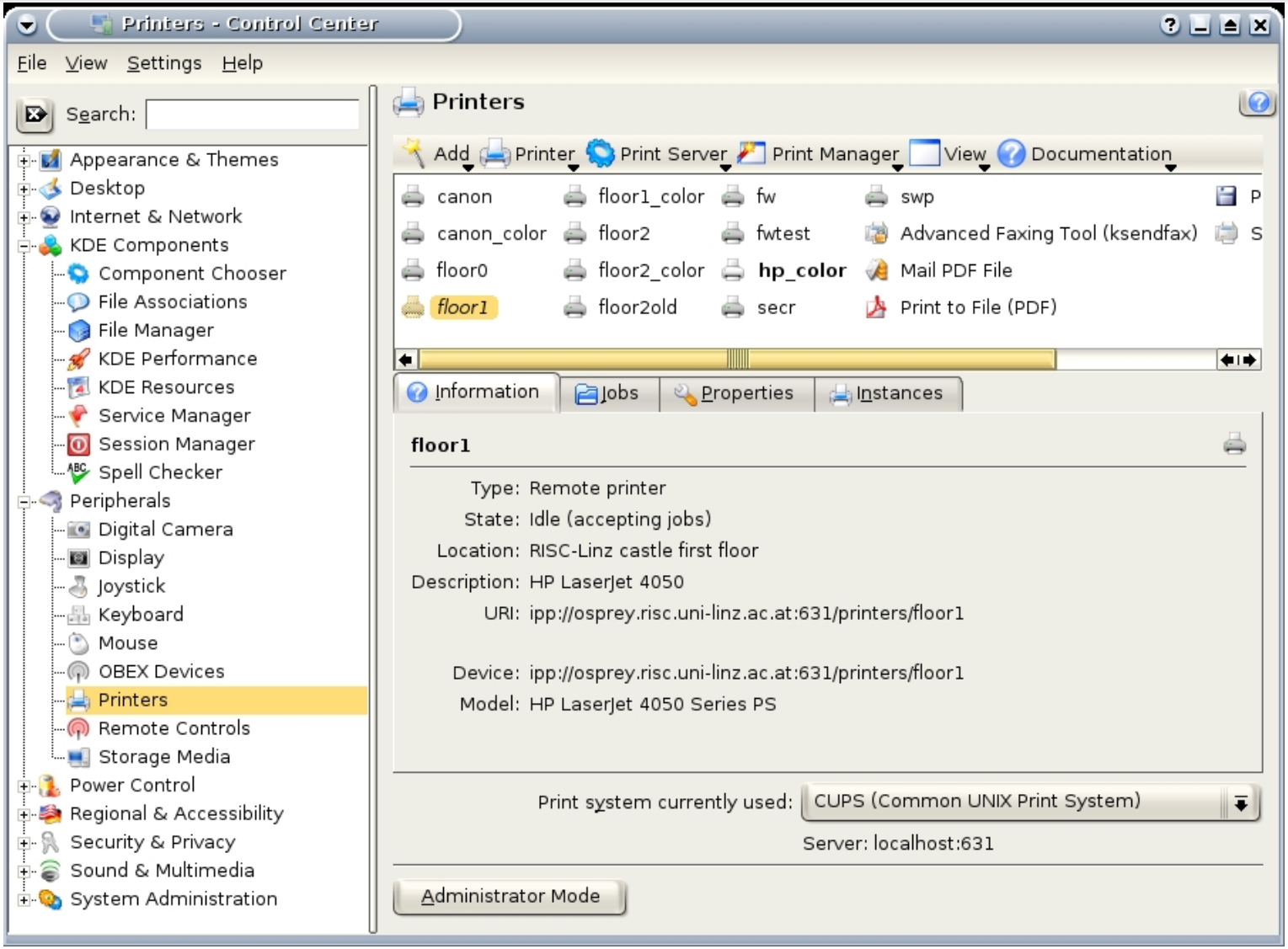


The KDE Control Center

Main KDE components:

- Desktop (Multiple Desktops)
- Internet and Network
  - bluetooth, WLAN, Samba
- KDE Components (File Association)
- Peripherals (Display, Keyboard, Printers, etc.)
- Power Control (Laptop Battery)
- Regional settings
- etc: Security, Sound, System Administration

KDE Control Center - Printer



End of Overview

Thanks for your attention !