

Debian/GNU Linux

Introduction

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1 1st steps

2 Linux

3 Structure

4 Filesystem

5 Account

6 Permissions

7 File management

8 Editing

9 X Window

Agenda

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First Steps in Linux - The Login

How to log in, log out

Directly

- xdm/kdm/gdm: 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, GNOME, etc. desktops
- shell in terminal window; command line input, closed by RETURN
 - some simple commands: `ls`; `who`; `date`; `wc`;

Logout

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

My GNOME 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

- start from the menu system (tree structure)
- (double)click on the application's icon on the desktop
- start from the menu bar after you put there the icon
- start from the command line (shell)

start it on a remote computer

- using networking, X11, display local, running remote
 - `ssh -X gorilla.risc.jku.at kile`
- using VNC, having remotely a graphical display
- using x2go client, having remotely a graphical display

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Computer Environment at RISC

Linux Environment

Desktop Computers

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

Server Computers

- 18 Debian Linux Servers
 - 5 mailservers (2x incoming, 2x smtp-auth, user mailbox)
 - web-, ftp-, svn-, moodle-, vpn-, etc. server
 - fileserver (home directories for all users)
 - compute servers for RISC (e.g.: qftquadX: 380 GB RAM, 4x E5-2680 @2.8GHz, 10 cores/CPU) X=1,2,3,4
 - servers for virtualisation (2x)

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, the best for your privacy
- 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 is the best operating system regarding security and privacy and using hardware resources !! Migrate to it, learn it, enjoy it !

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 (2), Debian (10), Ubuntu (3), Mageia (1), Fedora (5), PCLinuxOS (1), OpenSuse (2). ()= (HW architecture)
 - Mint - Ubuntu, Debian
 - Mageia - Mandriva - Red Hat

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 - The Universal Operating S.

- quality - over time pressure; lots of packages (25000)
 - the most stable and secure OS, best for your privacy
- the most architectures supported:
 - alpha, amd64, arm, armel, hppa, i386, ia64, mips, mipsel, powerpc, sparc,
- the base for the most other Linux distributions (Ubuntu, Mint, 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

Difference: MS Windows distribution - Manufacturer's distribution

- all HW drivers for the given model are included !
 - you do not get the MS Windows OS, BUT the manufacturer's version of MS Windows! Big difference !
 - you can not use this MS Windows on another PC
- using MS Windows-7 Campus licence DVD (almost no drivers)
 - we have a lot of work installing all HW drivers for the given laptop

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Structure of Linux

three main parts

The Kernel

The Linux Process

The Shell

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
 - virtual memory is the swap partition
- 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 the output of the **ps** command
 - 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

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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

- 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)
- commands: pwd - current location; cd - change dir
- gives shell the directory list to search for executable commands
 - the path is stored in environment variable
 - echo \$PATH
 - /usr/local/bin:/usr/bin:/bin:/usr/bin/X11:/usr/games:
/zvol/timer/bin:/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

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The user account

Overview

user identification by login:

- Linux: username, passwd
 - similar by gmail account or by Windows-7

further parts of the Linux user account:

- the home directory; the shell; the user's group; other parameters

location of the Linux home directory: `/home/username`

- (XP: Eigene Dateien, gmail: not visible)
- `/home/username` on the local computer is no 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 hard disk of the file server has to be backedup
- 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,

- /etc/shadow file

- additional information about: password expires, last changed, has to be changed account expires, etc.
- contains the password of the user
- is readable only by ROOT

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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 permissions
- `ls -l /etc/passwd /etc/shadow`
 - `-rw-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 = $666 - \text{umask}$
- Permissions for directories = $777 - \text{umask}$

Using umask

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

chmod

- change file/directory mode
- chmod values path

Permissions in Linux file system

using chmod

```
gorilla:/zlocal/sda3> pwd
/zlocal/sda3
gorilla:/zlocal/sda3> ls -ld kerdei/
drwxr-x--- 3 ke root 4096 Sep 25  2011 kerdei/
gorilla:/zlocal/sda3> chmod 700 kerdei/
gorilla:/zlocal/sda3> ls -ld kerdei/
drwx----- 3 ke root 4096 Sep 25  2011 kerdei/
gorilla:/zlocal/sda3> chmod 750 kerdei/
gorilla:/zlocal/sda3> ls -ld kerdei/
drwxr-x--- 3 ke root 4096 Sep 25  2011 kerdei/
gorilla:/zlocal/sda3> chmod g-rw kerdei/
gorilla:/zlocal/sda3> ls -ld kerdei/
drwx--x--- 3 ke root 4096 Sep 25  2011 kerdei/
gorilla:/zlocal/sda3>
```


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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

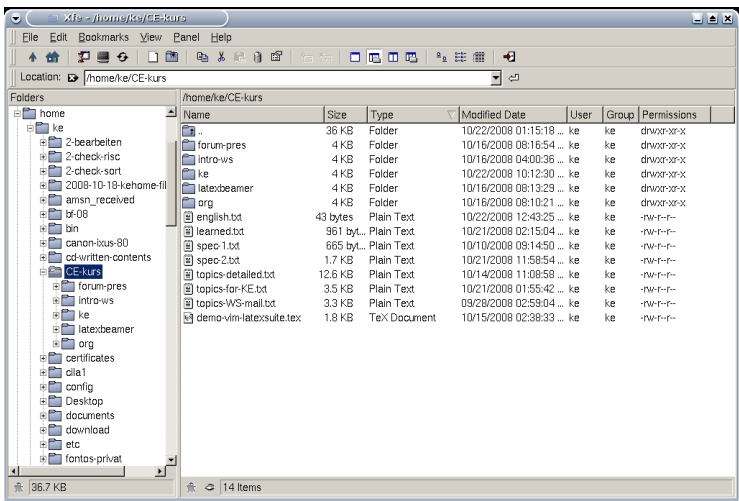
- get list with `grep "file manager" wheezy-packages.txt`

File Managers

- xfe: X file explorer
 - a lightweight file manager for X11, like Windows Explorer
- nautilus:
 - gnome file manager

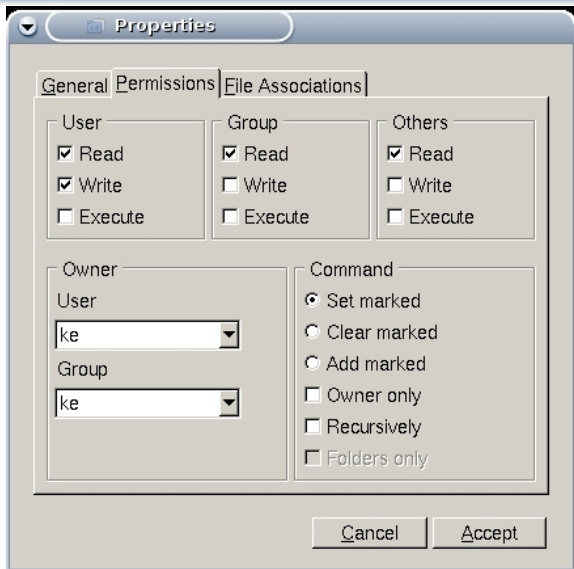
File Managers

xfe - X File Explorer

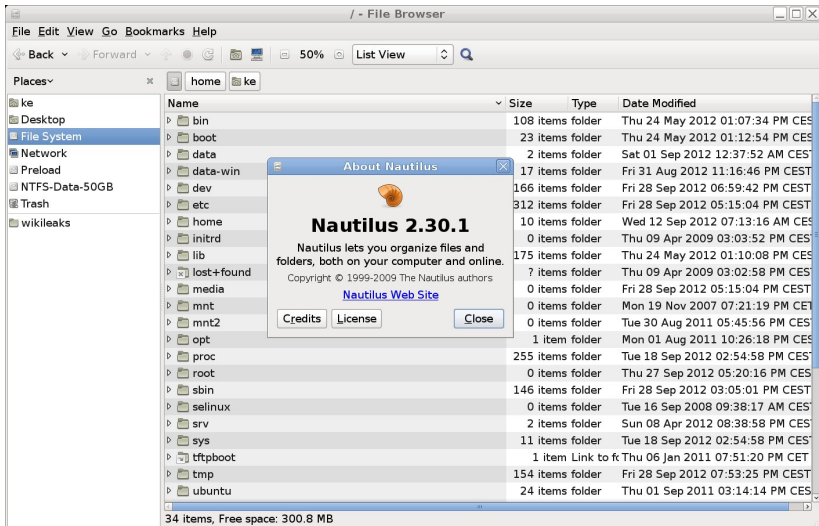


File Managers

xfe - X File Explorer



Nautilus



File managers

on-line Demo

On-line Demonstration of the file managers

- GNOME

- nautilus
- dolphin

- KDE

- konqueror

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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 wheezy-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

Libre Office (OO)

- lowriter (Word processor), localc (Spreadsheet), loimpress (Presentation), lodraw (Drawing), lobase (Database), lomath (Equation editor)

K-Office (KDE Office suite)

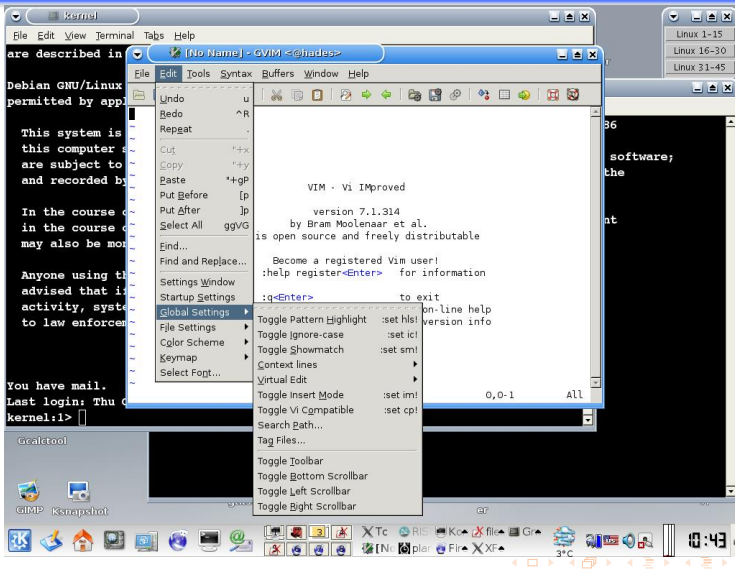
- kwriter, kspread, kpresenter, kformula, kthesaurus, etc.

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

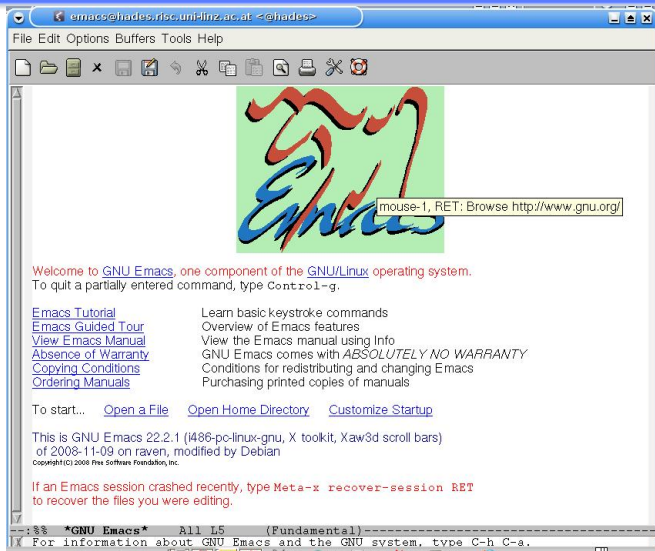
Text editor

Gvim



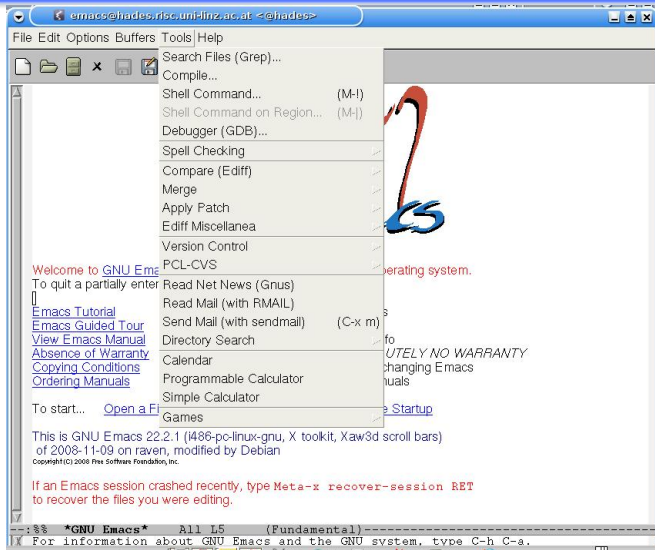
Text editors

Emacs



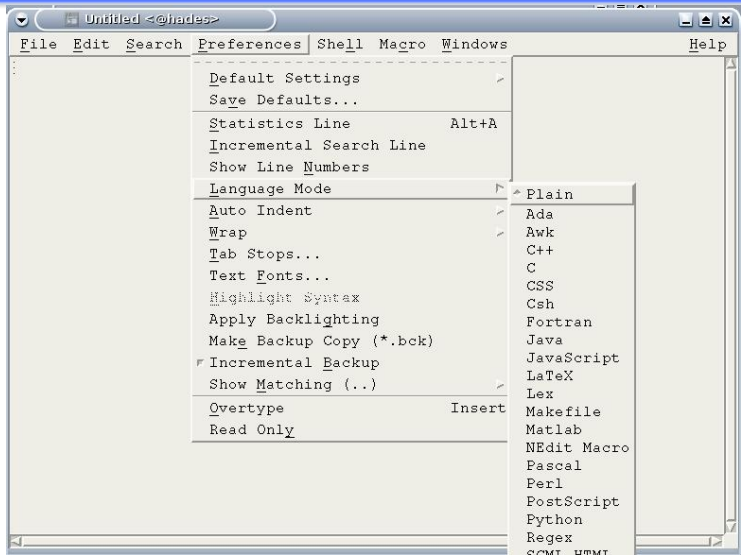
Text editors

Emacs



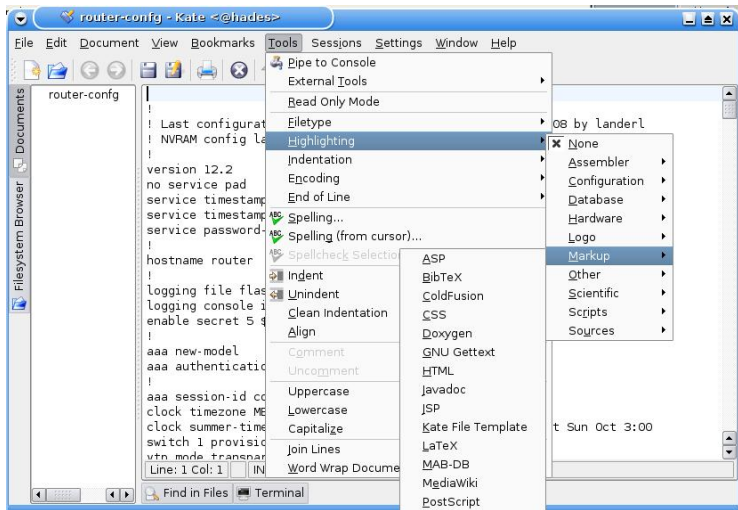
Text editors

Nedit



Text editors

Kate - KDE advanced text editor



Special editors

For object types

Object Editors

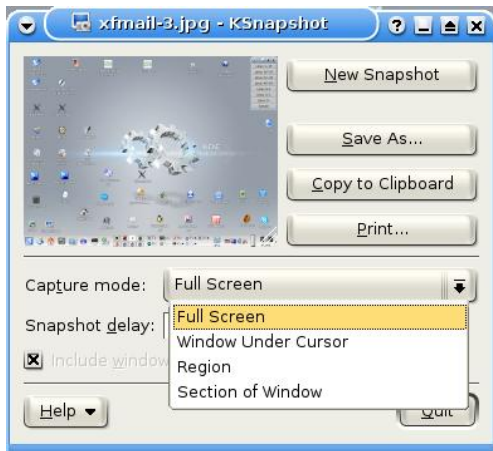
- **audacity**: a fast, cross-platform audio editor
 - audio recorder, converter, audio file manipulator
 - Linux, Windows, Mac versions available
- **GIMP**: the Gnu Image Manipulation Program
 - almost as powerfull as Photoshop
- **K3B**: the KDE CD and DVD creator

Special program - ksnapshot

- to create screen shots about different parts of the screen

Special program - ksnapshot

screen shot creator



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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)
- mediator 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 !

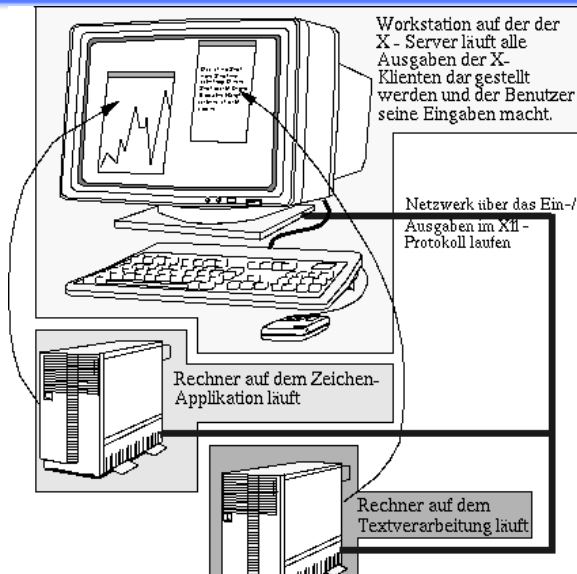
Networking feature of X-Window system

- 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 successful 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, resize, 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

Desktop Systems

Window Managers

Window Managers

- xdm - X window manager
- kdm - KDE window manager
- gdm - GNOME window manager

Desktop systems

- KDE, GNOME, Xfce, Icewm

Window Managers

- kde-window-manager, amiwmm, evilwm, icewm, jwm, metacity
olvwmm, sawfish, xfwmm4

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The Gnome Desktop, details

Gnome desktop

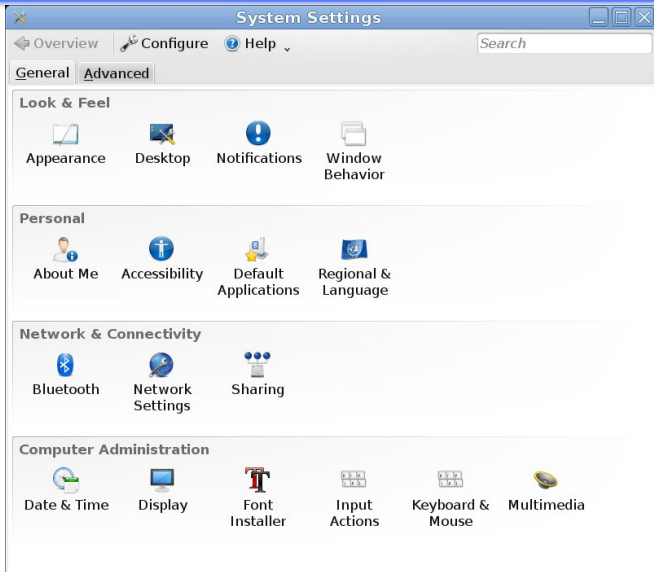
Desktop Gnome

- Gnome is a big, powerful system (desktop environment)
- explore the Gnome menu Application tree
- explore the Gnome Application Debian tree
- creating desktop icons
- customizing the menu bar
 - adding new applications
 - adding new applets
 - virtual desktops
- learn the Gnome Menu:
 - System/Preferences
 - System/System Settings

My GNOME Screen



GNOME System Settings



The Gnome Utilities

Gparted

gparted - the GNOME partition editor

- it lists the connected hard disks
- you can initialize a hard disk or SSD
 - create a partition table
- creates partitions of different types
 - formats them
- deletes partitions (be careful)
- resize/move partition
- with a GUI

live demonstration of the use of gparted

End of Overview

Thanks for your attention !