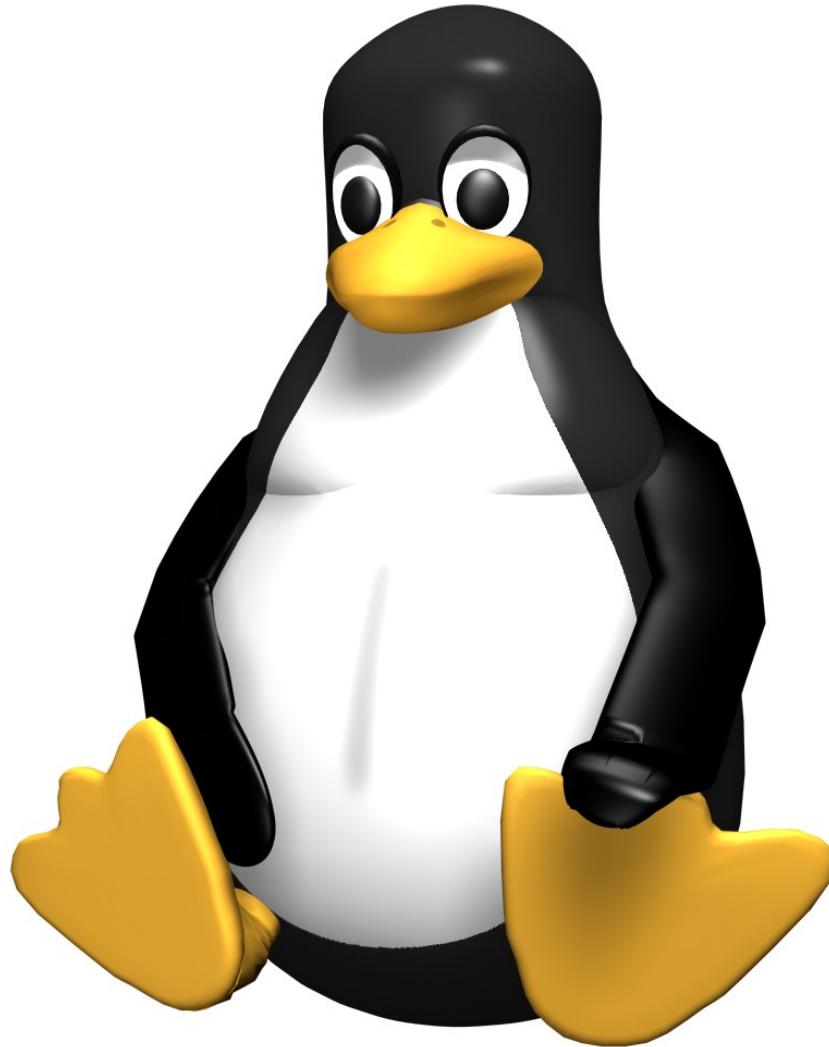# Linux: a short presentation

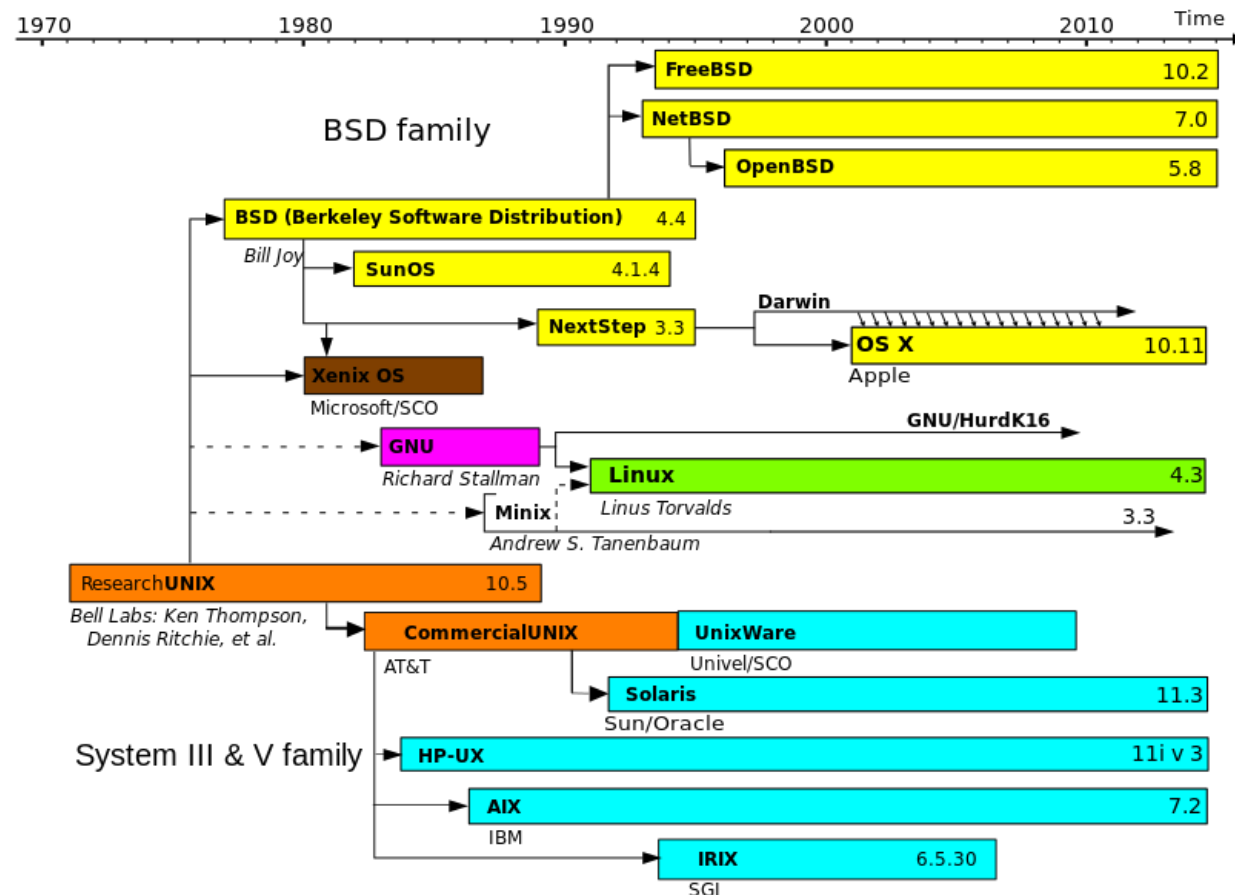**J-L Ferrer**
Juin 2017

Unix implementation

POSIX (IEEE1003) compliant

Author of the first kernel: Linus Torvalds
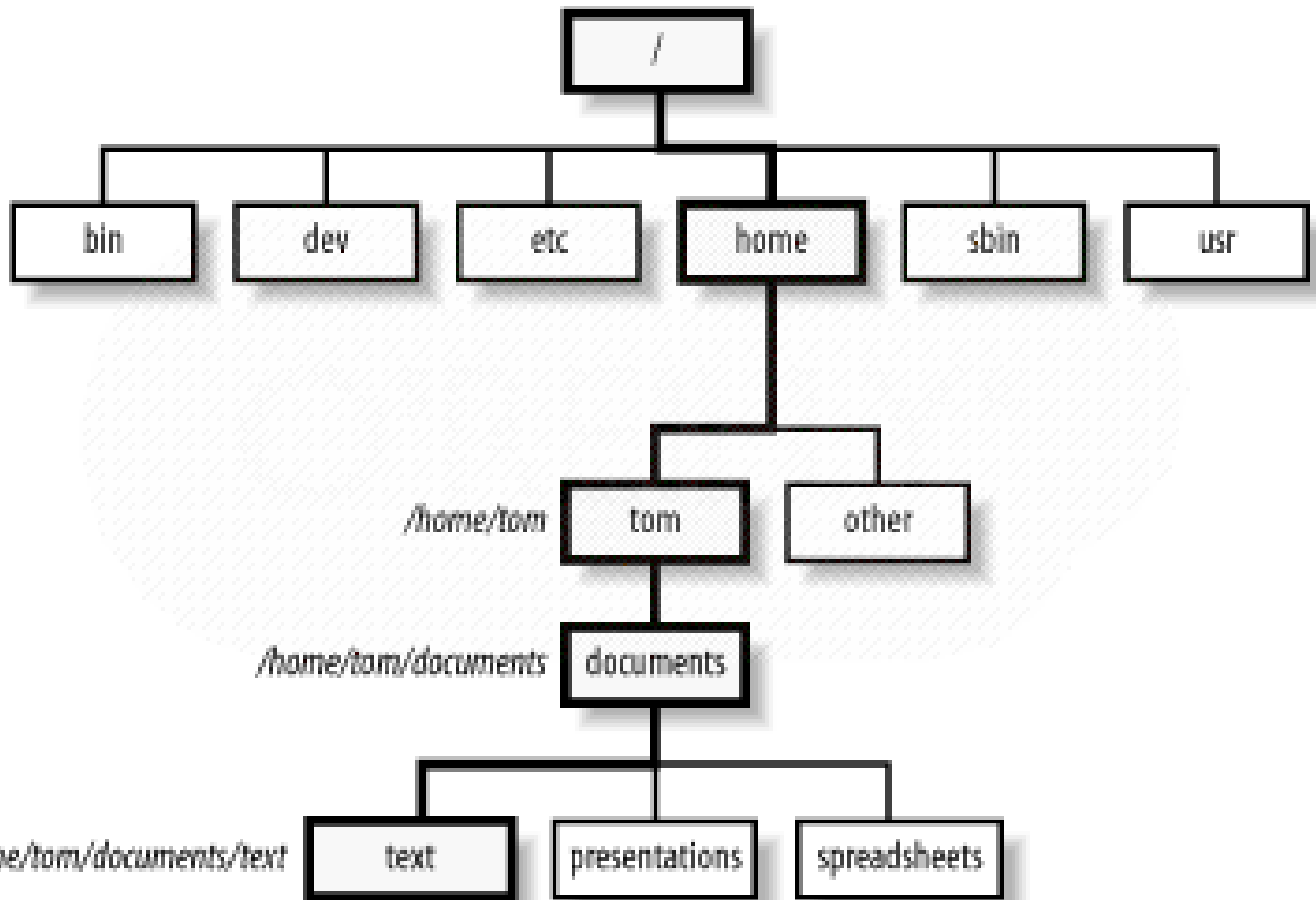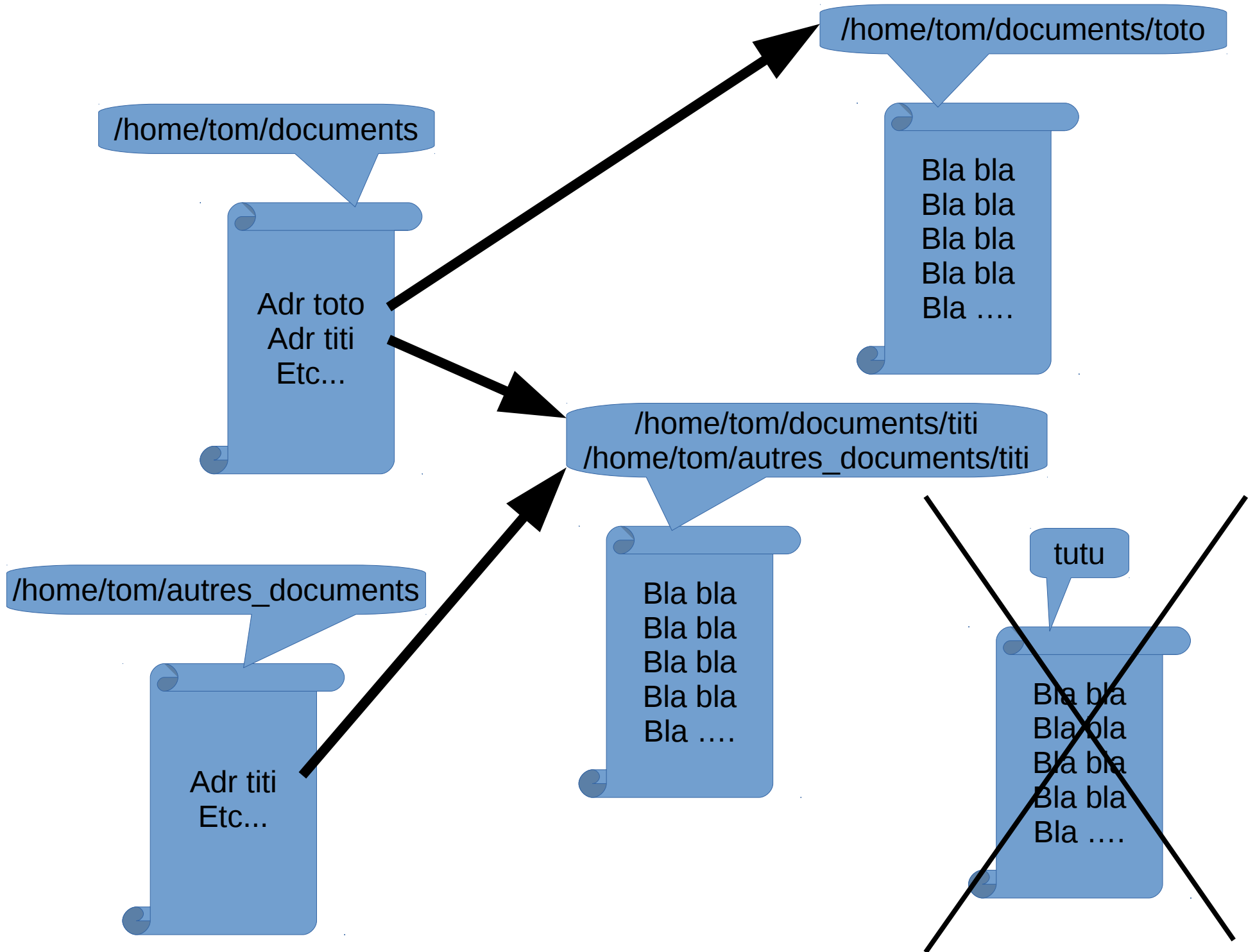
First release: 5 Oct 1991

Initially free and open source software

Developed now as Open Source, under GNU GPL etc...

By Guillem, Wereon, Hotmocha & Christoph S.

Linux directory structure

```
                              ┌─────────┐
                              │    /    │
                              └────┬────┘
        ┌──────────┬──────────┬────┴─────┬──────────┬──────────┐
   ┌────┴───┐ ┌────┴───┐ ┌────┴───┐ ┌────┴───┐ ┌────┴───┐ ┌────┴───┐
   │  bin   │ │  dev   │ │  etc   │ │  home  │ │  sbin  │ │  usr   │
   └────────┘ └────────┘ └────────┘ └────┬───┘ └────────┘ └────────┘
                                    ┌─────┴─────┐
                            ┌───────┴──┐   ┌────┴─────┐
              /home/tom     │   tom    │   │  other   │
                            └────┬─────┘   └──────────┘
                         ┌───────┴────┐
         /home/tom/documents │ documents │
                         └───────┬────┘
              ┌────────────┬─────┴──────┬─────────────┐
        ┌─────┴───┐ ┌──────┴──────┐ ┌───┴──────────┐
/home/tom/documents/text │ text │ │ presentations │ │ spreadsheets │
        └─────────┘ └─────────────┘ └──────────────┘
```

/ is the root directory

/boot is where Linux keeps files needed for booting up

/etc contains the configuration files for the system:

        /etc/inittab is a file that describes the processes started on boot

        /etc/fstab contains descriptive information about CD-roms...

        /etc/passwd contains the user definitions

/bin, **/usr/bin** contain the most important system programs (binaries)

/sbin, **/usr/sbin** contains system admin programs

/usr is the directory that stores user applications

        /usr/doc contains documentation for user apps

        /usr/share contains configuration files for user apps

        /usr/src contains source files for user apps

        /usr/include contains header files for the C compiler

        /usr/local apps and files on the local machine

/lib shared libraries for programs that are dynamically linked

/home is where the users keep their personal files

/root is the super user's home directory

/var variable data that, changing while the system is running

        /var/log contains log files like error reports

        /var/mail – incoming/outgoing mail is stored here

        /var/spool – holds files that are queued for some process

/tmp contains temporary files

/dev holds the devices

/mnt is a directory used for mount points

/proc virtual directory that contains information about the kernel

/lost+found is where Linux keeps files after a system crash

Special directories

The present directory: `.`

The directory above: `..`

Mask files: `.file_name`   (use `ls -a`)

Absolute path starts with "/"

   `/home/tom/documents/toto` (wherever you are)

Relative path: no "/" at beginning:

   `documents/toto` (assuming you are in `/home/tom`)

Default path exist, for commands, libraries, ...

Running commands

Starting point: find a terminal
    Konsole, xterm, or whatever

User interface:
    the shell (sh, csh, bash, …)
    Scripted language to interact with the system
    At the prompt of the terminal, in GUIs, ...

Commands
```
command_name    [options]    arguments...
```

Help
```
man   command_name
```

Commands for files/directories handling

```
pwd       shows what directory (folder) you are in
cd        changes directories
mkdir     creates a directory
ls        lists files in the present directory
    ls -l      lists all attributes
    ls -a      show hidden files
rm        deletes a file
    rm -rf     delete recursively
rmdir     deletes an empty directory
cp        copy a file
    cp file1 file2
mv        moves a file
ln        creates links
    ln -s file_name  link_name
```

File attributes as shown by the `ls` command

```
[root@desktop/root]# ls -l
total 1524
drwxr-xr-x     5 root        root        1024 Dec 23 13:48 GNUstep
-rw-r--r--     1 root        root         331 Feb 11 10:19 Xrootenv.0
```
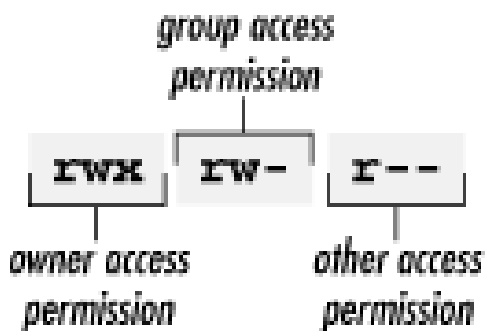   access modes   owner   group

chown   new_user   file_name
chgrp   new_grp   file_name

Access modes specify three permissions

                              group access
                               permission

                    rwx   rw-   r--

            owner access   other access
             permission   permission

chmod   644   file_name

More commands

```
top            dynamic list of running jobs
ps             full list of running jobs
   ps -ef
du             disk usage
df             disk space available
   du -sh
grep           find a character chain
more/less      output the content of a file
find           find a file
   find . -name "*.img"
file           file type
wc             lines/characters number in a file
whoami         if you don't know…
shutdown       shutdown the system (requires root privileges)
   shutdown -h 0
reboot         restart the system (requires root privileges)
```

The vi editor

vi   text editor

   i   insertion mode

   a   addition mode

   o   open line after the cursor

   Esc   back to command mode

In the command mode

   x   delete a character

   :d   delete line

   :w   save

   :q   quit

   :q!   force quit

   yy   copy line

   p   paste line

Crystallography practicals

French keyboard,
Open terminal

```
/bin/tcsh

alias ll ls -l


alias xds /usr/local/modules/xds/2017-03-02/xds

cp /usr/local/ccp4-7.0/include/ccp4.setup-csh.in ./
```
**edit: setenv CCP4_MASTER /xtal → /usr/local/
```
source ccp4.setup-csh.in

source /usr/local/modules/phenix/1.11.1/
                    phenix-1.11.1-2575/phenix_env.csh


cd /home/tp/Tutorials-RX/lyso-Gd_15May2013_udated2017
ln -s /home/tp/data-oleron/RX/lyso-Gd_SAD/img img
```