First Course

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26/09/2025

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User and group management

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Edition under LINUX/UNIX in text mode

Vim Basics

Operating_system

Definition

An operating system (OS) is the program that, after being initially loaded into the computer by a boot program, manages all of the other application programs in a computer

An operating system brings powerful benefits to computer software and software development. Without an operating system, every application would need to include its own user interface

we can make the parallel between the arcade game terminals which have their own non-interchangeable systems and our computers which can launch several programs in parallel without changing operating systems

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- Security management: access rights management, user management (password) ...

Linux

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- Free means open source but not necessarily gratis
- the GNU project (Gnu's not Unix) GNU General Public License (GPL)

History

Multics (1965)

Ken Thompson and **Dennis RITCHIE** created**Multics** (*MULTiplexed Information and Computing Service*) for Bell (AT&T firm)

UNIX (1973)

Denis Ritchie createdTCP/IP Protocol and re-write UNIX (from Multics in C langage)

FSF (1978)

Richard Stallman created**FSF** (Free Software Foundation). FSF want to createdand open source operating system.

BSD (1979)

Bill Joy createdBDS, a fork of Unix for university (berkley)

Minix (1980)

Andrew Stuart Tanenbaum createdMinix for educational purposes. it's a Unix-like operating system based on a microkernel architecture

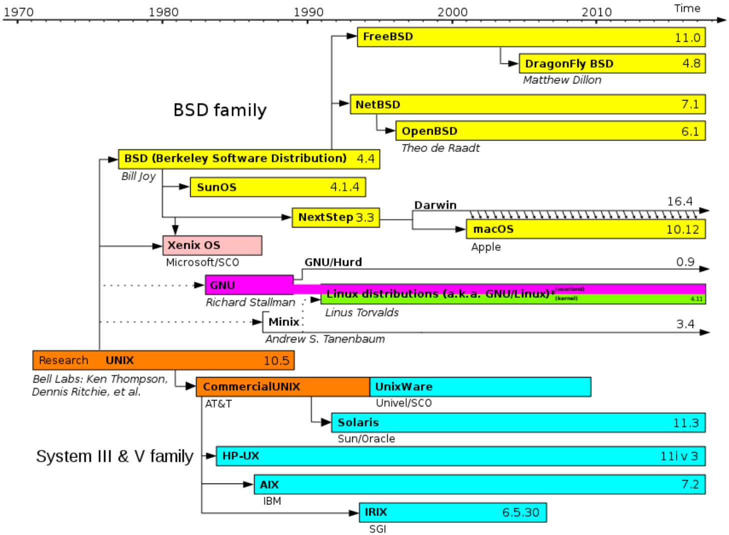
Linux (1991)

Linus Torvalds created linux inspired by **Tanenbaum**'s work on minix

GNU/Linux (1992)

First version of Linux (0.01) was under is own licence. The first version in GNU GPL is 0.99

History of Unix / Linux

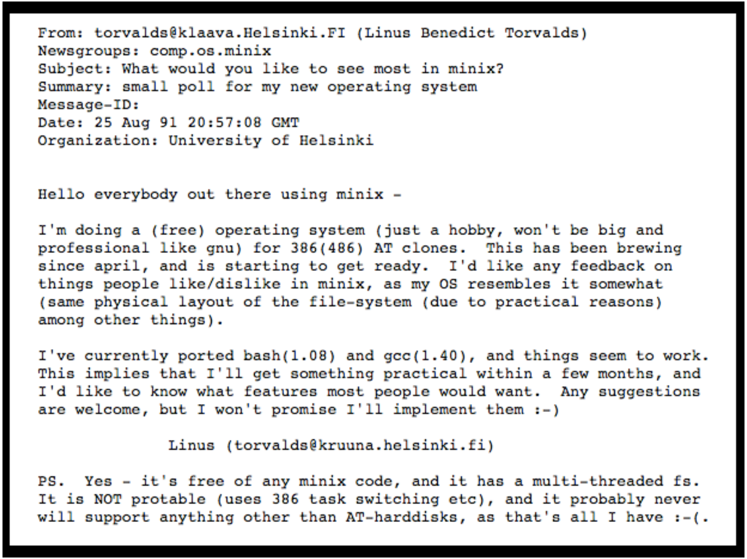


*The penetration of GNU utilities varies between distributions, some projects use GNU's implementation of the Linux kernel (Linux-libre). Some operating systems mentioned here include GNU utilities to a lesser degree.

Figure 1: unix-tree

fun fact 1 : bottle in the sea

Here is the original post (Usenet) of Linus Torvals to the newsgroup “comp.os.minix.”:[16]



```
From: torvalds@klaava.Helsinki.FI (Linus Benedict Torvalds)
Newsgroups: comp.os.minix
Subject: What would you like to see most in minix?
Summary: small poll for my new operating system
Message-ID:
Date: 25 Aug 91 20:57:08 GMT
Organization: University of Helsinki


Hello everybody out there using minix -

I'm doing a (free) operating system (just a hobby, won't be big and
professional like gnu) for 386(486) AT clones.  This has been brewing
since april, and is starting to get ready.  I'd like any feedback on
things people like/dislike in minix, as my OS resembles it somewhat
(same physical layout of the file-system (due to practical reasons)
among other things).

I've currently ported bash(1.08) and gcc(1.40), and things seem to work.
This implies that I'll get something practical within a few months, and
I'd like to know what features most people would want.  Any suggestions
are welcome, but I won't promise I'll implement them :-)

              Linus (torvalds@kruuna.helsinki.fi)

PS.  Yes - it's free of any minix code, and it has a multi-threaded fs.
It is NOT protable (uses 386 task switching etc), and it probably never
will support anything other than AT-harddisks, as that's all I have :-(.
```

Figure 2: post

fun fact 2 : Name

Linus Torvalds had wanted to call his invention Freax, a portmanteau of “free”, “freak”, and “x” (as an allusion to Unix).

The Linux distribution

Install Linux ?

When you have to switch to Linux , you come across the notion of Linux distribution . Initially, this is not necessarily very clear, especially since you have to quickly choose which Linux distribution to install.

Linux vs the World

Unlike Windows or MacOSX, Linux is not owned by any organization, company or publisher.

Linux is under the GNU license and the code is free. There is a differences between Linux and a Distribution (ubuntu, debian, red hat ...)

The part of Linux

Thus, different groups of developers and volunteers helped by computer companies each develop free projects.

In Linux, there are various open source software:

- The Linux kernel is the heart of the operating system.

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- The X server that produces a graphical desktop

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- The Linux kernel is the heart of the operating system.
- The GNU shell utilities in graphic or in terminal and the different commands that we enter
- The X server that produces a graphical desktop
- and the desktop environment that runs on the X server to provide a graphical desktop

Definition

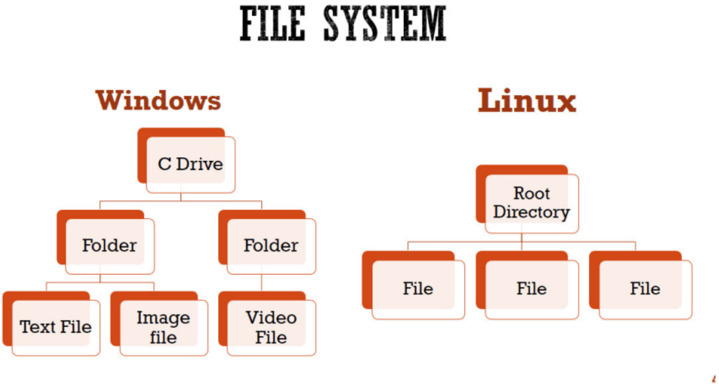
A Linux distribution harmonizes all these sets to provide specific versions of free software. It also offers installation software to allow you to install Linux on a PC, tablet or other types of devices. Then, in order not to have to compile each software, it offers a system of packages .

File system

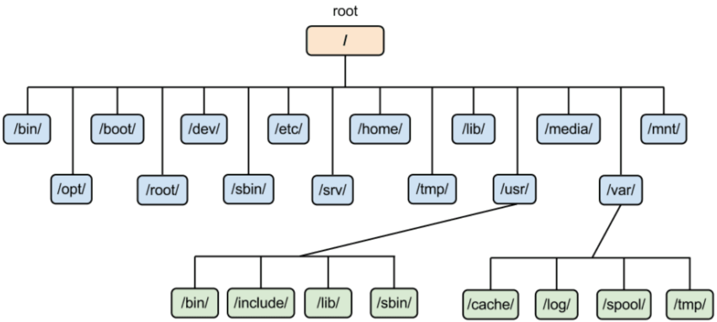
File system

*F*ileSystem *H*ierarchy *S*tandard or it defines the tree structure and the contents of the main directories of the file systems of the GNU / Linux operating systems and of most Unix systems. We are at version 3 since 2015

Windows


FILE SYSTEM
Windows
C Drive
Folder
Folder
Text File
Image file
Video File
Linux
Root Directory
File
File
File

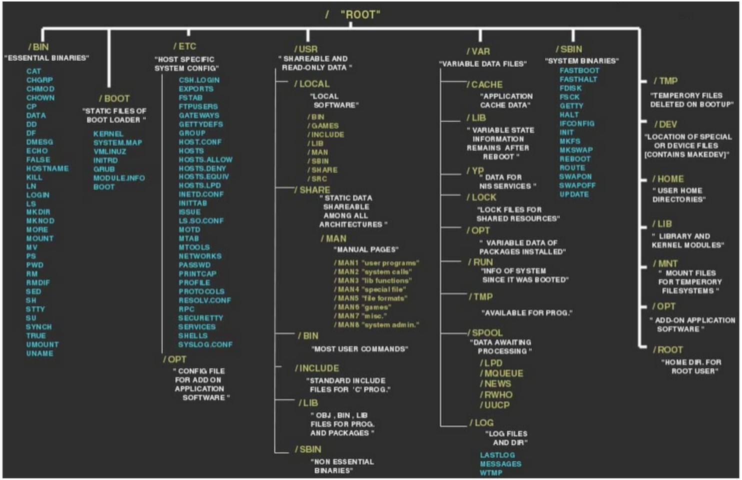
Linux


root
/
/bin/
/opt/
/boot/
/root/
/dev/
/sbin/
/etc/
/srv/
/home/
/tmp/
/lib/
/usr/
/media/
/var/
/mnt/
/bin/
/include/
/lib/
/sbin/
/cache/
/log/
/spool/
/tmp/

Detail of linux tree

Directory	Contenu
/bin	Binaries (executables = essential commands)
/boot	Static files for the boot loader
/dev	Device Driver Files
/etc	System configuration files
/home	User personal directories
/lib	Shared libraries and essential kernel modules
/media or /mnt	Mount points for removable media
/proc	Virtual directory for system information
/root	Home directory for the root user
/sbin	Essential System Executable
/tmp	Temporary files
/usr	Secondary hierarchy
/var	Variable data
/opt	Directory for other software

Scop on linux tree



Using commands

man - RTFM

The man command is a built-in manual for using Linux commands. It allows users to view the reference manuals of a command or utility run in the terminal.

The man page (short for manual page) includes a command description, applicable options, flags, examples, and other informative sections

command

the vast majority of linux command have a man.

So if you want to know who to use a command you just simply prepended your command to man :

```
username@hostname:/tmp$ man ls
LS(1)                               User Commands

   LS(1)

NAME
       ls - list directory contents

SYNOPSIS
       ls [OPTION]... [FILE]...

DESCRIPTION
    List information about the FILEs (the current directory by default).
    Sort entries alphabetically if none of -cftuvSUX nor --sort is specified.

       Mandatory arguments to long options are mandatory for short options too.
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Special path caracters

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- “..” (dot dot) : is the top directory (parent directory)
- “∼” (tilde) : is the directory of the logged user
- “∼username” : is the directory of the user

Prompt

The default BASH prompt is the one you see when you first open a terminal or command line. It usually looks something like this:

```
username@hostname:~$
```

- if you see a **$** : you are a simple user

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```
username@hostname:~$
```

- if you see a **$** : you are a simple user
- if you see a # : you are a root (so be carefull)

Where am i ?

```
username@hostname:~$
```

With this prompt, you have a clue of where you are in the tree line

The default PROMPT (PS1) have just before the loggin type (user/root) your actual tree line

“∼” is your HOME DIRECTORY : /home/username

if you have doubts use the command : `pwd`

```
username@hostname:~$ pwd
/home/username
```

Navigate

Change current directory : `cd` “Change Directory”

Display the name of the current directory : `pwd` “Print Working Directory”

How to reach a file

Absolute path

```
username@hostname:~$ cd /home/username/Documents
username@hostname:~/Documents$ pwd
/home/username/Documents
username@hostname:~$ cd /tmp
username@hostname:/tmp$ pwd
/tmp
```

We can see that the path is complete from the first FSH folder. Therefore it is understandable on the whole tree structure of the files.

We can say : “from slash”

Relative path :

```
username@hostname:~$ cd ./Documents/videos
username@hostname:~/Documents/videos$ pwd
/home/username/Documents/videos
username@hostname:~/Documents/videos$ cd ../
username@hostname:~/Documents$ pwd
/home/username/Documents
```

Create / Move / Delete

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- `ls` “LiSt” ==> List the files in a directory

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- `mkdir` “MaKe DIRectory” ==> Create a directory

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- `cp` “CoPy” ==> Copy a file
- `mv` “MoVe” ==> Move or rename files
- `rm` “ReMove” ==> Delete a file
- `ls` “LiSt” ==> List the files in a directory
- `mkdir` “MaKe DIRectory” ==> Create a directory
- `rmdir` “ReMove DIRectory” ==> Delete an empty directory

Create a file

On linux you have a lot if possibility to create a file:

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Create a file

On linux you have a lot if possibility to create a file:

- with an application with ‘save as’
- with a CLI application
- with a reditrecting the information in a file
- or simply using the ‘touch’ command

touch create file

touch allow you to create a file if it do not exit

```
username@hostname:~$ ls
Document
username@hostname:~$ touch MyFile
username@hostname:~$ ls
Document
MyFile
```

touch modify a file

touch allow you to modifiy the ‘modification date’ of a file if it exist

```
username@hostname:~$ touch MyFile
username@hostname:~$ stat ./MyFile
[...]
Modif. : 2022-08-22 18:06:13.555251643 +0200
[...]
username@hostname:~$ touch MyFile
username@hostname:~$ stat ./MyFile
[...]
Modif. : 2022-08-22 18:07:25.805479158 +0200
[...]
```

Stat

```
username@hostname:~$ stat ./MyFile
  Fichier : MyFile
   Taille : 0               Blocs : 0            Blocs d'E/S : 4096   fichier vide
Périphérique : fd01h/64769d œInud : 17961180    Liens : 1
Accès : (0664/-rw-rw-r--)  UID : ( 1000/username)   GID : ( 1000/username)
Accès : 2022-08-22 18:21:26.346538143 +0200
Modif. : 2022-08-22 18:21:26.346538143 +0200
Changt : 2022-08-22 18:21:26.346538143 +0200
  Créé : 2022-08-22 18:21:26.346538143 +0200
```

Option and argument

For all the next command you have to use this template : COMMAND ORIGIN DESTINATION

COPY

to copy an existing file :

```
username@hostname:~$ cp MyFile MyCopyFile
```

to copy an existing directory :

```
username@hostname:~$ man cp
[...]
       -R, -r, --recursive
              copy directories recursively
[...]
username@hostname:~$ cp /home/username/Documents ./BackupDocument
username@hostname:~$ ls
Documents BackupDocument MyFile MyCopyFile
```

Here, i am using COPY from an absolute path to a relative path

MOVE

Move can be used to move a file a rename it :

```
username@hostname:~/Documents $ ls
OrigFile
username@hostname:~/Documents $ mv /home/username/Documents/OrigFile ./RenameFile
username@hostname:~/Documents $ ls
RenameFile
```

DELETE EMPTY DIRECTORY

to delete a directory you have to use : **rmdir** This command allow you to delete directory only.

```
username@hostname:~ $ ls -l
drwxrwxr-x 2 username username 4096 août  31 11:53 NormalDirEmpty
username@hostname:~ $ ls -l NormalDirEmpty/
total 0
username@hostname:~ $ rmdir NormalDirEmpty
username@hostname:~ $ ls -l
total 0
```

DELETE NON EMPTY DIRECTORY

```
username@hostname:~ $ ls -l
drwxrwxr-x 2 username username 4096 août  31 11:53 NormalDir
username@hostname:~ $ ls -l NormalDir/
total 0
-rw-rw-r-- 1 username username 0 août  31 11:53 NormalFile
username@hostname:~ $ rmdir NormalDir
rmdir  NormalDir/
rmdir: impossible de supprimer 'NormalDir/': Le dossier n'est pas vide
```

DELETE FILES

to delete a file you have to use : **rm**

This command allow you to delete files and directory.

```
username@hostname:~ $  man rm
[...]
 -r, -R, --recursive
        remove directories and their contents recursively
[...]
username@hostname:~ $ ls -l
drwxrwxr-x 2 username username 4096 août  31 11:53 NormalDir
username@hostname:~ $ ls -l NormalDir/
total 0
-rw-rw-r-- 1 username username 0 août  31 11:53 NormalFile
username@hostname:~ $ rm -r NormalDir
username@hostname:~ $ ls -l
total 0
```

File types

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On UNIX systems everything is represented as a file. The different types of files are:

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- Physical files: (-: normal file)
- The directories: (d: directory)
- Physical and symbolic links
- Special files

Physical files

A physical files are the usual files on Linux. They could be text, videos, raw, database ...

```
username@hostname:~/NormalDir$ ls -l
total 2508
-rw-r--r-- 2 guillaume guillaume 1234    août  30 13:57 NormalFile.txt
-rw-r--r-- 2 guillaume guillaume 4567    août  30 13:58 NormalFile.mkv
-rw-r--r-- 2 guillaume guillaume 7890    août  30 13:59 NormalFile.doc
```

Directories

A directory ... like on all other operating system ...

```
username@hostname:~/EmptyDir$ ls -la
total 2524
drwxrwxr-x  3 guillaume guillaume    4096 août  31 11:10 .
drwxrwxr-x 22 guillaume guillaume   12288 août  31 11:10 ..
```

. : curent directory **..** : parent directory **-a** : All files (classic files and hidden files)

Physical links

Allows you to give several names / access paths to the same file by pointing to a file number. A file can therefore have several names, and will exist as long as it has at least one name.

The file number is contained in the inode table. The inode is the hard disk database for files and directory path.

The command to use for a **Physical links** is : **ln**

```
username@hostname:~/LinkDir$ ls -l
total 2508
-rw-r--r-- 1 guillaume guillaume 1280601 août  30 13:59 OriginFile
username@hostname:~/LinkDir$ ln ./OriginFile ./PhysicakLinkFile
username@hostname:~/LinkDir$ ls -l
total 2508
-rw-r--r-- 2 guillaume guillaume 1280601 août  30 13:59 OriginFile
-rw-r--r-- 2 guillaume guillaume 1280601 août  30 13:59 PhysicakLinkFile
```

Symbolic links

A symbolic link is a file that points to another file.

If you delete the target file, the link is “dead”

If you remove the link, the target file is not impacted.

This is the closest thing to a shortcut in Windows.

```
username@hostname:~/LinkDir$ ls -l
total 2508
-rw-r--r-- 1 guillaume guillaume 1280601 août  30 13:59 OriginFile
username@hostname:~/LinkDir$ ln -s ./OriginFile ./SymbolicLinkFile
username@hostname:~/LinkDir$ ls -l
-rw-r--r-- 1 guillaume guillaume 1280601 août  30 13:59 OriginFile
lrwxrwxrwx 1 guillaume guillaume      24 août  31 11:21 SymbolicLinkFile ->
   OriginFile
```

File permissions

User Group and Other

On linux ALL the write are based on 3 notions :

- user

User Group and Other

On linux ALL the write are based on 3 notions :

- user
- group

User Group and Other

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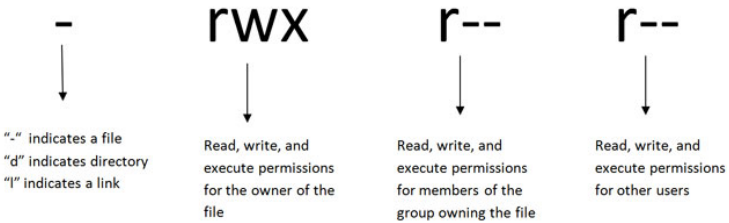
- user
- group
- other

Octal write base



“-“ indicates a file
“d” indicates directory
“l” indicates a link

Read, write, and execute permissions for the owner of the file

Read, write, and execute permissions for members of the group owning the file

Read, write, and execute permissions for other users

All Octal write

u g o

754

access	r	w	x	r	w	x	r	w	x
binary	4	2	1	4	2	1	4	2	1
enabled	1	1	1	1	0	1	1	0	0
result	4	2	1	4	0	1	4	0	0
total		7			5			4	

How to change the rights

How to change the rights

The `chmod` command allows you to change the access permissions of a file or directory

```
chmod g+w fic1
```

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- `chmod u+rx,g-w fic2`

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- `chmod o-x rep`
- `chmod u+rx,g-w fic2`
- `chmod u=rwx,g=rx,o=- fic`

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- `chmod g+w fic1`
- `chmod o-x rep`
- `chmod u+rx,g-w fic2`
- `chmod u=rwx,g=rx,o=- fic`
- `chmod -R a+r rep2`

How to change the rights

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- `chmod g+w fic1`
- `chmod o-x rep`
- `chmod u+rx,g-w fic2`
- `chmod u=rwx,g=rx,o=- fic`
- `chmod -R a+r rep2`
- `chmod 750 fic3`

User root

GOD MODE

On any UNIX system, there is a superuser, usually called `root`, who has full authority.

He can freely access *ALL* the resources of the machine.

This user has their UID and GID set to 0.

root:x:0:0:root:/root:/bin/bash

su

su is the command which allows to change user

Exemple :

```
username@hostname:~$ whoami
username
username@hostname:~$ su - root
password :
root@hostname:~# whoami
root
```

sudo

sudo is the command that allows you to perform an action in the context of another user. To configure sudo you need to edit the /etc/sudoers files

Switch User DO

Example :

```
username@hostname:~$ whoami
username

username@hostname:~$ sudo -u root whoami
[sudo] username password :
root
```

User and group management

Login

When a user logs in, he provides a login name and password.

If the connection is successful, a shell is launched and the user is in his working directory, which is initially his login directory.

This information is placed in the /etc/passwd, /etc/shadow and /etc/group files.

```
Linux login : gastier
Password:
Last login: Sun Nov 1 12:07:37 CET 2017 on pts/3
Linux anakin 5.8.0-59
You have new mail.
gastier@watchmen:~$
```

/etc/passwd file

login:*passwd*:*UID*:*GID*:*GCOS*:*homedir*:*shell*

- *login*: login name

/etc/passwd file

login:*passwd*:*UID*:*GID*:*GCOS*:*homedir*:*shell*

- *login*: login name
- *passwd*: clear password or x if the password is hashed and therefore stored in the shadow file

/etc/passwd file

login:*passwd*:*UID*:*GID*:*GCOS*:*homedir*:*shell*

- *login*: login name
- *passwd*: clear password or x if the password is hashed and therefore stored in the shadow file
- *UID* (User Identification): user identification number

/etc/passwd file

login:*passwd*:*UID*:*GID*:*GCOS*:*homedir*:*shell*

- *login*: login name
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- *GCOS*: description, usually contains the first and last name
- *homedir* (home directory): connection directory
- *shell*: command to be executed during connection (usually the command interpreter: / bin / bash)

/etc/shadow file

user1:1Sh1R1/Sl$FfPQjULAhevhi4n7AV.xg.:14393:0:99999:7:::

- login name

/etc/shadow file

user1:1Sh1R1/Sl$FfPQjULAhevhi4n7AV.xg.:14393:0:99999:7:::

- login name
- hashed password

/etc/shadow file

```
user1:1Sh1R1/Sl$FfPQjULAhevhi4n7AV.xg.:14393:0:99999:7:::
```

- login name
- hashed password
- date of the last password change

/etc/shadow file

user1:1Sh1R1/Sl$FfPQjULAhevhi4n7AV.xg.:14393:0:99999:7:::

- login name
- hashed password
- date of the last password change
- number of days to wait before being able to change the password

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user1:1Sh1R1/Sl$FfPQjULAhevhi4n7AV.xg.:14393:0:99999:7:::

- login name
- hashed password
- date of the last password change
- number of days to wait before being able to change the password
- number of days after which the password must be changed

/etc/shadow file

user1:1Sh1R1/Sl$FfPQjULAhevhi4n7AV.xg.:14393:0:99999:7:::

- login name
- hashed password
- date of the last password change
- number of days to wait before being able to change the password
- number of days after which the password must be changed
- number of days before the expiration of the password and during which the user is notified

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user1:1Sh1R1/Sl$FfPQjULAhevhi4n7AV.xg.:14393:0:99999:7:::

- login name
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- date since which the account is deactivated

/etc/shadow file

user1:1Sh1R1/Sl$FfPQjULAhevhi4n7AV.xg.:14393:0:99999:7:::

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- date of the last password change
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- date since which the account is deactivated
- expiry date of the account

/etc/shadow file

user1:1Sh1R1/Sl$FfPQjULAhevhi4n7AV.xg.:14393:0:99999:7:::

- login name
- hashed password
- date of the last password change
- number of days to wait before being able to change the password
- number of days after which the password must be changed
- number of days before the expiration of the password and during which the user is notified
- date since which the account is deactivated
- expiry date of the account
- reserved field

/etc/group file

groupname:*passwd*:*GID*:*members*

- *groupname*: The name of the group

/etc/group file

groupname:*passwd*:*GID*:*members*

- *groupname*: The name of the group
- *passwd*: encrypted password

/etc/group file

groupname:*passwd*:*GID*:*members*

- *groupname*: The name of the group
- *passwd*: encrypted password
- *GID* (Group Identification): group identifier

/etc/group file

groupname:*passwd*:*GID*:*members*

- *groupname*: The name of the group
- *passwd*: encrypted password
- *GID* (Group Identification): group identifier
- *members*: members of the group, separated by a comma

/etc/group file

groupname:*passwd*:*GID*:*members*

- *groupname*: The name of the group
- *passwd*: encrypted password
- *GID* (Group Identification): group identifier
- *members*: members of the group, separated by a comma
  - *Exemple : isen:x:1000:alice,kevin*

User and group management

User and group management

Create a new user

There is 2 way to create a user :

- useradd

Create a new user

There is 2 way to create a user :

- useradd
- adduser

useradd

useradd can be “scripted” and used with arguments. It’s a non interactive command

```
isen@hostname:~$ sudo useradd isen
isen@hostname:~$ sudo useradd isen-with-options -m -s /bin/bash
```

Excepted the error, like all linux commands, if nothing happend ... it’s ok :)

adduser

adduser is a prompt comman. It ask you all the minimal information to create a user.

```
isen@hostname:~$ sudo adduser isen
Ajout de l'utilisateur « isen » ...
Ajout du nouveau groupe « isen » (1002) ...
Ajout du nouvel utilisateur « isen » (1002) avec le groupe « isen » ...
Le répertoire personnel « /home/isen » existe déjà.  Rien n'est copié depuis « /
    etc/skel ».
Nouveau mot de passe :
Retapez le nouveau mot de passe :
passwd : le mot de passe a été mis à jour avec succès
Modification des informations relatives à l'utilisateur isen
Entrez la nouvelle valeur ou « Entrée » pour conserver la valeur proposée
     Nom complet []: Isen User
     N° de bureau []: 01128736
     Téléphone professionnel []: 8917623498
     Téléphone personnel []: 891726398
     Autre []: isen.fr
Ces informations sont-elles correctes ? [O/n] O
```

How to change the owner of a file

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The `chown` command allows you to change the owner of a file

- `chown isen fic2`

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How to change the group of a file

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- The `chown` command allows you to change the group at the same time as the owner:
  - `chown isen:isen fic2`

Edition under LINUX/UNIX in text mode

Edition under LINUX/UNIX in text mode

Under Linux, there are several text-based word processors. Text-based mode simply means editing in a terminal Which implies no menus, no images, no formatting

Advantages

```
* Ultra-fast
* Default on most UNIX/LINUX distributions
* Portable and cross-platform
* Network-accessible
* Very powerful
* Programmable
* Scalable
* Simplified configuration file management.
```

Disadvantages

```
* Requires practice
* Difficult to learn
* Aesthetically poor
```

Terminal-style text editor

Here are the most common and most used text editors under Linux.

- Vi/Vim

In this course, we will focus on Vim, which is a more accessible port of Vi.

Vim is THE most widely used and practical tool for editing code and configuration files.

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- nano
- jupp / joe

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Vim

Vim Basics

Modes in VIM

In VIM, there are three main modes for using this word processor.

- Interactive mode

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- Insert mode

Modes in VIM

In VIM, there are three main modes for using this word processor.

- Interactive mode
- Insert mode
- Command mode

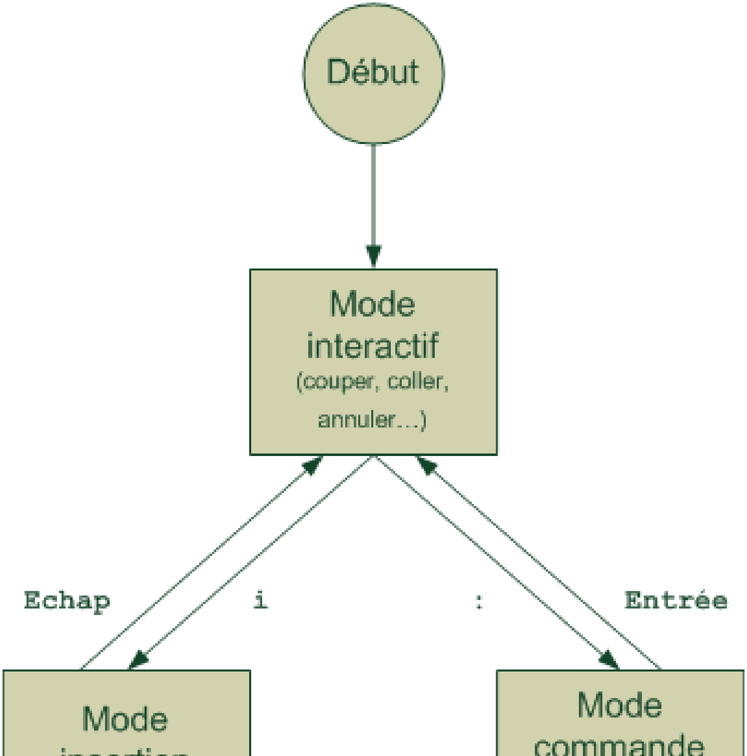
Interactive mode

This is the default mode you start with when launching Vim. You are therefore in interactive mode. In this mode, you cannot write text.

This mode allows you to: copy/paste/delete/select...

To move around in vi, you use the HJKL keys, which correspond to Left Down Up Right respectively.

To move around in vim, you use the Left Down Up Right arrow keys.



Début

Mode interactif (couper, coller, annuler…)

Echap

i

:

Entrée

Mode insertion

Mode commande

- v: Selects a portion of the text

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- x: Deletes the current character (cut)

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- Combo keys:
  - yw/dw: Copy/cut the word

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- x: Deletes the current character (cut)
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- d: Cuts a line or a word
- p: Paste
- Combo keys:
  - yw/dw: Copy/cut the word
  - yy/dd: Copy/cut the current line

Insert mode

This is the most ‘classic’ mode. You type text and it is inserted at the cursor location.

There are several ways to enter this mode. One of the most common is to press the i (insert) key.

Very important: To exit any mode, press the Esc key.

Command Mode

In command mode, you can also:

This mode is the most comprehensive and, above all, the one that gives Vim its full power.

It allows you to run commands such as “quit,” “save,” etc. You can also use it to enable Vim options:

- syntax highlighting (:syntax on)

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- syntax highlighting (:syntax on)
- display line numbers (:set number)
- intelligent indentation (:set smartindent)

Executing a Command in VIM

While in command mode, you can retrieve information from the shell (the console) such as ls, locate, cp, etc.

- either by typing certain commands like:

To activate this mode, you must be in interactive mode and press the colon “:”. You will validate the command with the Enter key and then return to interactive mode.

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  - “:ls”

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- or by launching a subshell:

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Executing a Command in VIM

While in command mode, you can retrieve information from the shell (the console) such as ls, locate, cp, etc.

- either by typing certain commands like:
    - “:ls”
    - “:locate”
- or by launching a subshell:
- “:sh” (for this mode, once the session ends with exit or CTRL+d, the shell returns control to VIM).

To activate this mode, you must be in interactive mode and press the colon “:”. You will validate the command with the Enter key and then return to interactive mode.

action on the file

In command mode, you can also:

- replace text:

```
:s/old/new/g
```

```
/string
```

To find the next occurrence of ‘string’, press “n”. When the document finds nothing at the end of the document, it tells you to start over.

```
:w
```

```
:q
```

action on the file

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- save:

```
:w
```

```
:q
```

action on the file

In command mode, you can also:

- replace text:

```
:s/old/new/g
```

- find text:

```
/string
```

To find the next occurrence of ‘string’, press “n”. When the document finds nothing at the end of the document, it tells you to start over.

- save:

```
:w
```

- quit:

```
:q
```