CHAPTER 1: FUNDAMENTALS OF FREE AND OPEN-SOURCE SOFTWARE
FREE AND OPEN SOURCE

1. Introduction

This chapter explores the origins, philosophy, and socio-economic implications of free software. It provides the theoretical foundation necessary to understand the evolution of modern computing and the mechanisms of open collaboration.

1.1. History of the Free Software and Open Source Movement

1.1.1. The Era of Collaboration (1960–1970)

In the early days of computing, software was considered a complement to hardware. In research centers such as MIT and Bell Labs, sharing source code was the norm among researchers. It was a culture of "hacking" in the noble sense of the term: tinkering to improve.

1.1.2. The Closure of Code (1980)

With the advent of personal computing, companies began to view software as a lucrative product. Proprietary licenses emerged, prohibiting users from studying, modifying, or sharing the programs. Richard Stallman, a researcher at MIT, rejected this system, which he considered anti-social.

1.1.3. The Emergence of Open Source (1998)

In 1998, the Open Source Initiative (OSI) was created to promote free software among businesses by emphasizing technical efficiency rather than radical ethics. This led to the widespread adoption of technologies such as Linux, Apache, and MySQL.

1.2. Difference Between "Free Software" and "Open Source"

Although both often use the same licenses, their motivations differ:

- **Free Software:** Prioritizes ethics and user freedom. Non-free software is considered an injustice.
- **Open Source:** Prioritizes development methodology. It is argued that open-source code leads to better, more secure software.

1.3. Richard Stallman's Philosophy and the GNU Project

1.3.1. The Four Fundamental Freedoms

To be free, software must guarantee:

Freedom	Meaning
Freedom 1	Run the program for any purpose.
Freedom 2	Study how the code works and adapt it.
Freedom 3	Redistribute copies (help others).
Freedom 4	Improve the program and publish the changes.

1.3.2. The GNU Project and Copyleft

Launched in 1983, the GNU Project aimed to create a complete free system. To protect these freedoms, Stallman invented **Copyleft**: a legal rule that requires anyone modifying free software to redistribute their modifications under the same free license.

1.4. Economic and Social Impact

1.4.1. Global Impact

Open-source software has created a service-based economy (maintenance, support) rather than a revenue-based one. It is the driving force behind the Cloud, Artificial Intelligence, and the modern Internet.

1.4.2. Focus on Algeria

For Algeria, the challenges are many:

- **Digital Sovereignty:** No longer being technically dependent on foreign powers.
- **Economy:** Reducing the outflow of foreign currency associated with the purchase of proprietary licenses.
- **Local Development:** Fostering local expertise by enabling developers to study the world's best systems.

Chapter 2

Legal Framework and Licenses

Software License

A software license is a legal contract through which the author **authorizes** or **prohibits** certain uses of their work.

It determines:

- Copying rights,
- Modification rights,
- The terms of redistribution,
- And the user's obligations.

The Copyright Model

The principle of copyright is that all rights are reserved: copying, modification, and redistribution are **prohibited.**

Copyright is a model used for proprietary software, such as:

- Windows
- Microsoft Office
- Photoshop

The Copyleft model

Copyleft is the opposite of copyright; it preserves the freedom of the code in all derivative versions and allows:

- Use
- Modification
- Redistribution

Permissive licenses

Permissive licenses offer a great deal of freedom; they can be:

- Modified
- Reused
- and even integrated into proprietary software.

License compatibility:

There are several examples of free licenses; some are compatible while others are not.

Example:

MIT + GPL: can be combined, so they are compatible.

Apache 2.0 + GPLv2: cannot be combined, therefore incompatible.

Implications for Algerian educational institutions and businesses:

Educational institutions	Algerian businesses
• Reduced licensing costs • Access to source code for learning • Promotes research and innovation	• Reduced reliance on foreign software vendors • Local adaptation of software • Compliance with legal requirements
Linux, LibreOffice, Moodle	Free software is a lever for digital sovereignty.

Chapter 3: Free operating systems

1. Introduction

1.1 Definition

An operating system (OS) is software that manages hardware, runs programs, and provides the user interface.

1.2 Main Functions

- Hardware management (CPU, RAM, disk)
- Program execution
- User interaction

1.3 GNU/Linux

Linux: The Kernel

It is the system's engine. Its role is to act as the link between hardware and software. It manages memory, the processor, and components.

GNU: The Tools

It is the toolkit that surrounds the core. These are the programs and libraries that allow the user to give commands to the computer (such as copying a file, listing folders, or launching software).

1.4 Philosophy of Free Software

- Freedom of use
- Freedom to study
- Freedom to modify
- Freedom to distribute

2. Features of Linux

- Open source
- High security
- Stability
- Flexibility

3. Linux distributions

3.1 Definition

A distribution is a complete Linux-based system.

3.2 Examples

- Ubuntu (easy)

- Debian (stable)

- Fedora (innovative)

- Linux Mint (simple)

4. Installation

Methods:

1. Direct installation

This erases everything on the hard drive to install only Linux. **Result:** Windows disappears and Linux becomes the only operating system.

2. Dual Boot

Install Linux alongside Windows on a separate partition of the hard drive. **Result:** When you start up your PC, you'll see a menu where you can choose to boot either Windows or Linux.

3. Virtual Machine (VirtualBox)

We install software (VirtualBox) on Windows that simulates a computer. **Result:** Linux appears in a single window, like a browser or a game, without modifying your current system.

5. Linux Terminal

5.1 Definition

It is a **text-based interface** (often called the "Command Line" or "Console") that allows you to interact with the computer by typing commands on the keyboard instead of using the mouse.

5.2 Why use it?

- **Speed:** Perform complex tasks (e.g., renaming 100 files) in a single second.
- **Automation:** Create scripts to repeat tasks without human intervention.
- **Full control:** Access advanced system settings that are not available through the graphical interface.
- **Lightweight:** Uses very few resources (memory and CPU).

5.3 REPL Principle

The terminal operates in a continuous loop called **REPL**:

1. **Read:** The terminal waits for you to type a command and reads your input.
2. **Eval (Evaluate):** The system analyzes the command and executes it.
3. **Print:** The result of the execution (or an error message) is displayed on the screen.
4. **Loop:** The terminal returns to the beginning and waits for the next command.

Category	Command	Description
Navigation	`ls`	Displays the contents of the current folder.
Navigation	`ls -l`	Displays details (permissions, size, date).
Navigation	`ls -a`	Displays everything, including hidden files (those that start with a period).
Navigation	`ls -h`	Displays file sizes in a readable format (KB, MB, GB).
Navigation	`ls -lha`	Combination: details, hidden files, and readable file sizes.
Navigation	`cd [folder]`	Change directories to enter a folder.
Navigation	`cd ..`	Go up one level in the directory tree (parent folder).
Navigation	`cd ~`	Go directly to the user's home directory (Home).
Navigation	`pwd`	Displays the full path of the directory you are currently in.
Files	`cp [source] [dest]`	Copies a file to another location or name.
Files	`mv [source] [dest]`	Moves or renames a file or folder.
Files	`rm [file]`	Permanently deletes a file.
Files	`rm -r [folder]`	Deletes a folder and all its contents (recursively).
Files	`rm -f [file]`	Forces deletion without asking for confirmation.

Category	Command	Description
Files	`mkdir [name]`	Creates a new folder.
Files	`mkdir -p [path]`	Creates an entire folder structure (e.g., a/b/c) all at once.
Files	`touch [name]`	Creates an empty file or updates its modification date.
Files	`cat [file]`	Displays the entire contents of a file in the terminal.
Files	`echo 'text'`	Displays the text in the terminal or writes it to a file.
System (sudo)	`sudo apt update`	Updates the list of available software.
System (sudo)	`sudo apt install`	Installs new software.
System (sudo)	`sudo apt upgrade`	Installs the latest versions of existing software.
System (sudo)	`sudo reboot`	Restarts the computer immediately.

Paths

There are two ways to specify a file's location:

- **Absolute Path:** Always starts with the root directory `/`. This is the full address (e.g., `/home/user/Documents`).
- **Relative Path:** Depends on your current location. Use `.` (current) or `..` (parent). (e.g., `cd ../Downloads`).

Chapter 4: Free Office Solutions

1) Chapter Objective

This chapter aims to highlight the importance of free office solutions and to master the use of LibreOffice as an alternative to Microsoft Office.

2) LibreOffice: An Alternative to Microsoft Office

LibreOffice is a free and open-source office suite that allows you to perform various tasks:

- Creating text documents
- Performing calculations using spreadsheets
- Creating presentations

It is compatible with Microsoft Office while using open formats.

3) The main modules of LibreOffice

LibreOffice consists of several modules, each dedicated to a specific function:

- **Writer**: word processor (equivalent to Word)
- **Calc**: spreadsheet (equivalent to Excel)
- **Impress**: presentation tool (equivalent to PowerPoint)

a) Writer (word processor)

Writer is used for writing and formatting documents. Main features:

- Document drafting (reports, letters, etc.)
- Formatting text (font, size, color, etc.)
- Inserting images and tables

Example: writing an internship report.

b) Calc (spreadsheet): Calc allows you to perform calculations and analyze data.
Main functions:

- Performing automatic calculations using formulas
- Creating tables and charts

c) Impress (presentation)

Impress is used to create visual presentations. Main features:

- Creating slides
- Inserting images and graphic elements
- Adding animations and presenting projects

Example: Giving a Presentation

4) Open document formats

An open format is a format that is accessible to everyone without restriction.

Examples:

- odt: text documents (Writer)
- ods: spreadsheets (Calc)
- odp: presentations (Impress)

Advantages:

- Free
- Sustainability
- Compatibility with multiple software programs

5) Setup in the Algerian context

For optimal use of LibreOffice in Algeria, it is recommended to:

- Install the languages (French and Arabic)
- Check and enable auto-correction
- Configure the formats: date (dd/mm/yyyy) and currency (DZD)
- Customize the keyboard (Arabic / French)

6) Conclusion of the chapter

LibreOffice is an effective, free, and suitable office suite to replace Microsoft Office, particularly in educational and professional settings in Algeria.