



# Operating systems

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## **Chapter 2**

# **Introduction to Unix/Linux**

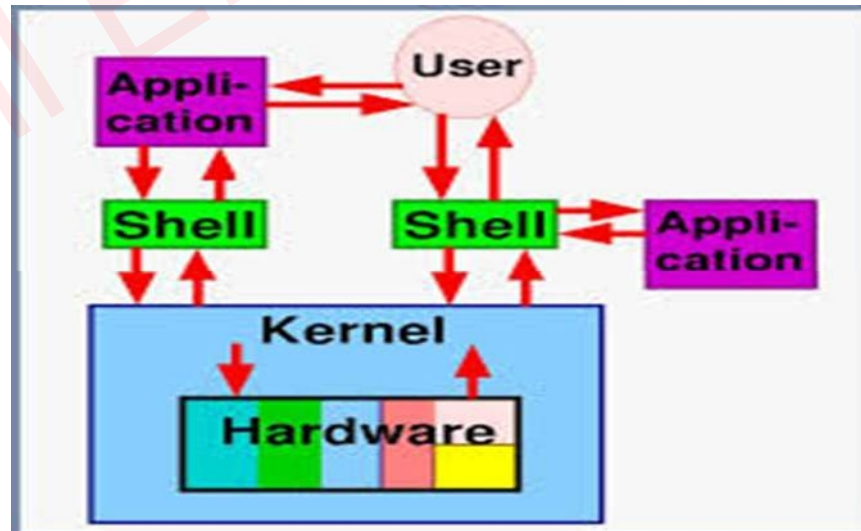
## What is Unix?

The Unix operating system is a set of programs acting as a link between the computer and the user.

The computer programs that allocate system resources and coordinate all the details of the computer's internal components are called the operating system or kernel.

## The Shell

Users communicate with the kernel via a program called the **shell**. The shell is a command-line interpreter. It translates commands entered by the user and converts them into a language understood by the kernel.



## Points to remember

- Unix was developed in 1969 by a group of AT&T employees Ken Thompson, Dennis Ritchie, Douglas McIlroy, and Joe Ossanna at Bell Labs.
- There are many different Unix variants available on the market. Solaris Unix, AIX, HP Unix and BSD are just a few examples. Linux is also a version of Unix available free of charge.
- Several people can use a Unix computer at the same time. Unix is therefore called a multi-user system.
- A user can also run several programs at the same time. Unix is therefore a multitasking environment.

## UNIX families

From the user's point of view, the various UNIX systems are very similar.

From an administration point of view, the various UNIX systems each have their own specific features (hardware-related commands vary, and there are manufacturer-specific extensions).

There are several attempts at unification:

- ❑ *System V Interface Definition from AT&T (SVID, SVID2, SVID3 in 1989)*
- ❑ *IEEE POSIX (POSIX1003.1 in 1990)*
- ❑ *X/OPEN Portability Guide (XPG4 at 1993) from X/OPEN consortium (created in 1984)*

**But...**

## UNIX families

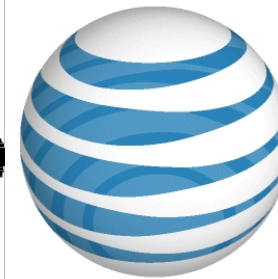
There are two basic versions of Unix:

- ❑ **AT&T System V**
- ❑ **Berkeley Software Distribution (BSD).**

The vast majority of all Unix variants are built on one of these two versions. The main differences between the two are the utilities available and the file implementation structure...



freeBSD



at&t

## The birth of LINUX

In 1991, **Linus Torvalds**, a Finnish student, started work on a Unix-like system called **Linux**.

**Linux** is just the kernel, while the parts with which most people recognize the tools, **Shell** and file system, are **GNU** creations.

The strength of Linux lies in its progressive licensing, which allows software to be freely distributed without any conditions. The only requirement for the end user is that any modifications made to the basic software must be made available to other members of the community, enabling the software to evolve at an incredibly rapid pace. The license under which Linux is distributed is called the **GNU Public License (GPL)**, available at <http://gnu.org/licenses/licenses.html>.



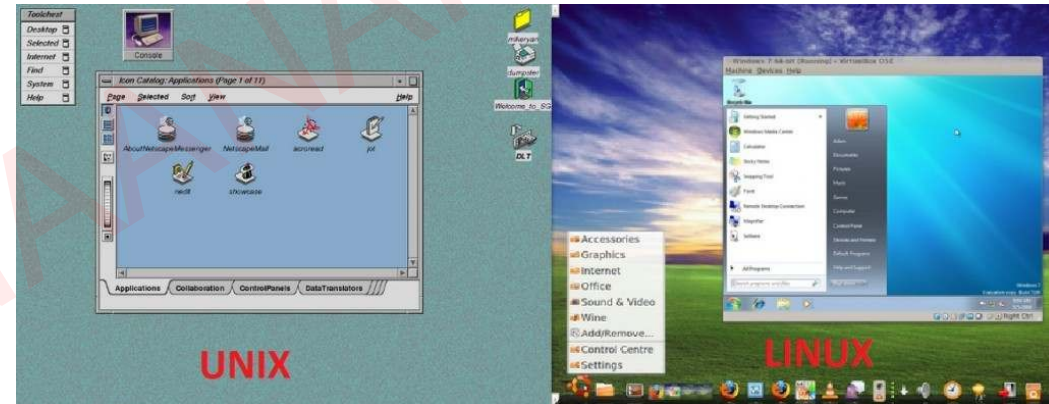
## UNIX VS LINUX

- UNIX is protected by copyright, and only large companies are authorized to use the UNIX name. IBM AIX, Sun Solaris and HP-UX are all UNIX operating systems. Most UNIX systems are commercial in nature.
- Linux is a Unix clone written from scratch by Linus Torvalds with the help of a team of hackers across the net. Linux is just a kernel surrounded by several applications and management systems, whereas UNIX operating systems are considered complete operating systems.
- Linux is free. You can download it from the Internet or redistribute it under GNU licenses. On the other hand. Most UNIX operating systems are not free.

## UNIX VS LINUX

### Examples of UNIX systems:

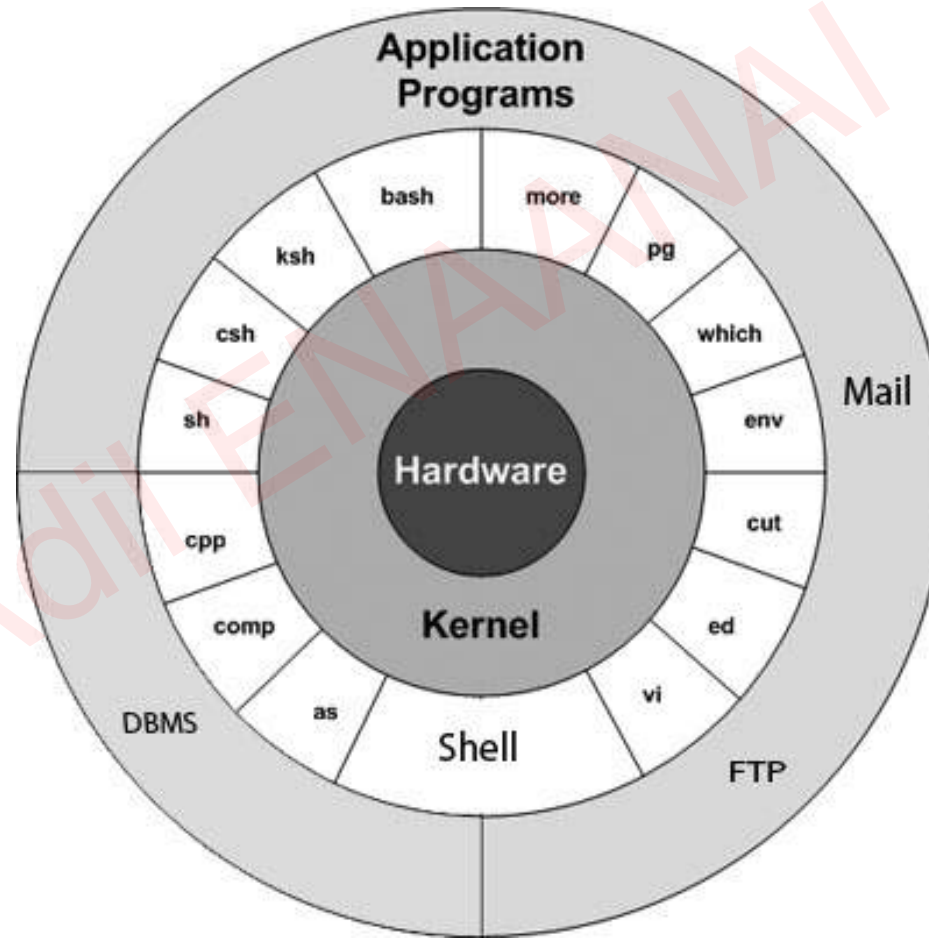
- 1.HP-UX
- 2.IBM AIX
- 3.Solairs Sun
- 4.Mac OS X
- 5.IRIX



### Examples of Linux distributions:

- 1.Redhat Enterprise Linux
- 2.Fedora Linux
- 3.Debian Linux
- 4.Suse Enterprise Linux
- 5.Ubuntu Linux

## UNIX architecture



## UNIX architecture

The main concept that unites all Unix versions is the following:

**Kernel** - The kernel is the heart of the operating system. It interacts with the hardware and performs most tasks, such as memory management, task scheduling and file management.

**Shell** - The shell is the utility that handles your requests. When you type a command on your terminal, the shell interprets the command and calls the desired program. The shell uses a standard syntax for all commands. C Shell, Bourne Shell and Korn Shell are the most famous shells available with most Unix variants.

## UNIX architecture

The main concept that unites all Unix versions is the following:

**Commands and utilities** - There are various commands and utilities you can use in your daily activities. `cp` , `mv` , `cat` and `grep` , etc. are just a few examples. There are over 250 standard commands, plus many more provided by 3 rd third-party software. All commands come with various options.

**Files and directories** - All Unix data is stored in files and directories. organized into files. All files are then organized into directories. These directories are then organized into a tree structure called a file system.

## CLI - Command Line Interface -

The Shell of an operating system can take two distinct forms:

- ☐ **Command\_Line Interface (CLI):** works with **text-based** instructions.
- ☐ Graphical shell providing a graphical interface for **(Eng - GUI: Graphical User Interface)**.

What we're interested in here is the text-mode Shell (CLI - Command Line Interface).

**Why!?**

## CLI - Command Line Interface -

- ☐ The native tool for controlling a Linux system
- ☐ It's a powerful tool: You can do everything from the command line, even manipulations you can't do with the graphical interface.
- ☐ It's resource-efficient: It doesn't require high-performance graphics cards, nor extreme amounts of memory.
- ☐ Tasks can be automated in interpreted language scripts.
- ☐ Communicating system manipulations remotely will be easier and will be interpreted in a unique way.
- ☐ ... there are more.



## CLI - Command Line Interface -

The most popular Shells :

Shell	Program	Description
Bourne shell	sh	disponible sur toute plateforme Unix
C shell	csh	shell développé pour BSD
Korn shell	ksh	Bourne shell amélioré par AT&T
Bourne again shell	bash	Shell distribué avec linux ; version améliorée de sh et csh

By default, the shell associated with a user account in Ubuntu is **Bourne Again Shell (Bash)**; all commands entered by a user in a terminal emulator are processed by **Bash**. Ubuntu also includes the **Bourne Shell (sh)** interpreter. Other shells, such as **Z Shell (zsh)** or **C-Shell (csh)**, can be easily installed using its package manager



## Shell access modes

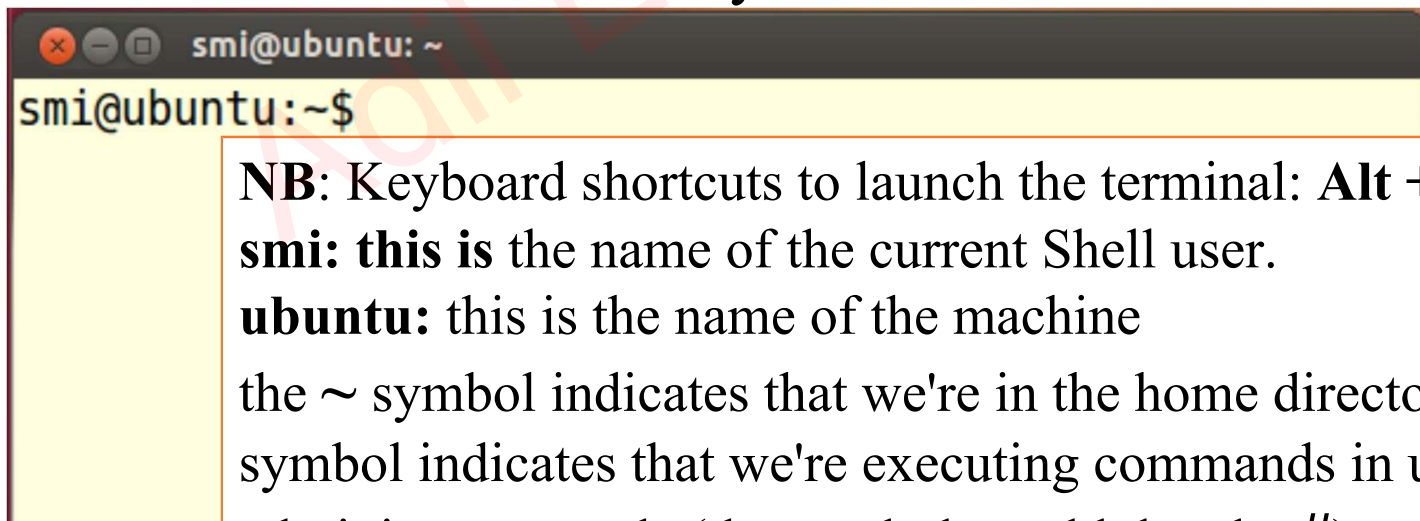
There are two possible ways of accessing the Shell, depending on the hardware resources available and the operating system or settings used:

- ☐ **Console mode**, which displays a single Shell in full screen mode, is the operating system's basic man-machine interface (accessible at system startup).
- ☐ **Terminal mode**, which emulates a console and displays in Shell in a portion of the screen.

## Shell terminal

All Shells look the same on-screen when running:

- ❑ A chain of characters displays that the Shell is waiting for the user to type something on the keyboard; this is the *prompt*.
- ❑ A cursor that moves as you enter data.



```
smi@ubuntu: ~$
```

**NB:** Keyboard shortcuts to launch the terminal: **Alt + Ctrl + t**  
**smi:** this is the name of the current Shell user.  
**ubuntu:** this is the name of the machine  
the ~ symbol indicates that we're in the home directory The \$ symbol indicates that we're executing commands in user mode, not administrator mode (the symbol would then be #)

## Commands: Syntax

A Unix command = A set of words separated by blanks, whose syntax is as follows:

<b>Command</b>	<b>[Options]</b>	<b>[Settings]</b>
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**Order:** The name of the order.

**Options :** Options can be used to change the behavior of a command, either a single option or several at the same time.

**Parameters:** Information required for the order function.

Square brackets [ and ] (which must not be typed) mean that options or parameters are **optional**. (in some commands, they are mandatory).

## Controls: Options

An option is introduced by the red sign " - ".

It often consists of a single letter, such as :

**\$ command -a**

If you want to execute a command with several options (a b and c) :

**command -a -b -c**

We can rewrite it more simply (by concatenating the options)

**command -abc**

Some options are verbose (written in integers)

(example: **all**), they will be confused with single-letter options!!!! -

**all = -a -l -a**

To do this, we run the options like this **--all**

## Controls: Options

Uppercase letters are different from lowercase letters

-a is an option

-A is another option different from -a

Options are commutative

**-a -b = -b -a = -ab = -ba**

## Orders : Documentation

Electronic documentation is available while the system is running: it's called online help.

The help command is **man**. It gives access to the manual of Unix commands.

Syntax of the man command :

**man [options] command**

with the option :

**man [section number] command**  
**man [-s section number] command**

Section numbers represent online help topics:

- 1: Normal controls
- 2: System calls
- 3: programming functions
- 4: C peripherals and drivers
- 5: file format
- 6: games
- 7: miscellaneous
- 8: Controls from management



# Demonstration

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