

## Operating Systems 2: A More Detailed Description

### What is an OS?

The **operating system** (OS) is the manager of the computer. It manages programs and resources.

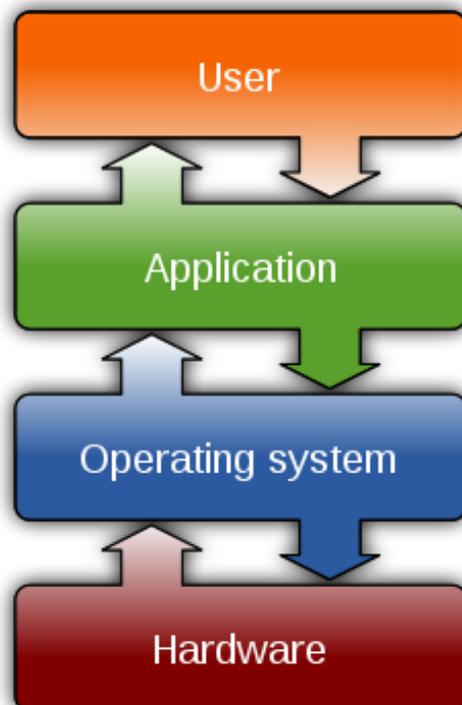
Some basic features of an operating system are:

- Running several applications concurrently in different windows.
- Easy to use graphics interface.
- Use of clipboard to exchange text and graphics data between applications, in particular the integrated use of spreadsheets, word processing and data bases.
- Managing of files: copying, deleting, renaming, creating of folders/directories.

The operating system is the most important system program (two examples of system software are an antivirus and a defragmenter).

The operating system:

- Is always present in the RAM
- Is the first program loaded in the RAM
- The program that loads the program in the RAM is called the **Bootstrap Loader**.



The operating system is the layer between the application and the hardware.

## *Shareable and Non-shareable Resources*

The operating system manages the **resources** of the computer (these are the CPU, memory, secondary storage, input devices, output devices and anything else that forms part of the computer system). Some resources are **shareable** (more than one program can use them at the same time) and the others are **non-shareable**.

Examples of shareable resources are:

- Program code (more than one user on a network can run the same program).
- Parts of RAM that are read-only e.g. database tables.
- CPU (running programs can share the CPU by means of time-sharing).

Examples of non-shareable information are:

- Printer
- Keyboard etc

## *Management*

The OS performs the management of:

- files
- memory
- CPU
- I/O

Let us look in more detail to each one of these.

### ***Files***

The OS keeps an index that indicates the location of the files in the RAM. Another data structure, for example the FAT, keeps track of the location of the files on secondary storage. The operating system can save files in empty places and mark as empty places where files have been deleted.

### ***Memory***

The OS, like a parker, decides where files should stay inside the RAM. Often, not the whole running program is copied in the RAM. Only the necessary part that is currently required is. If another part of the program is required and the RAM is full, the OS will decide which part of the memory will be freed so that the necessary code or data are placed inside the RAM.

Remember that the CPU works only on data and programs that are in the RAM.

## **CPU**

The CPU is shared between the programs requesting it. One common use of the CPU is time-sharing. This means that the OS will assign the CPU to programs one after the other, for example, the CPU runs program A for one second, then stops and continues program B, then stops and runs program C, then stops and runs program A again, then B again etc. It will appear that the CPU is running A, B and C concurrently.

## **Input/output**

The OS also controls the input and output of the computer. Let us consider the keyboard. The OS is always waiting for the event 'press a key' from the keyboard. When this event happens, the OS sees to it that the character pressed is displayed on the screen. Same for the mouse, the OS waits for an event to happen. An event here might be 'move the mouse', right click, left click etc. The operating system responds according to the event. If, for example, the left button is clicked, the OS will call the appropriate program to display a menu on the screen.

Likewise, the OS sees that the printer is not overwhelmed with documents to print. So, it keeps a record of the files to be printed in a queue so that when a document is printed (all the pages) another document is printed etc.

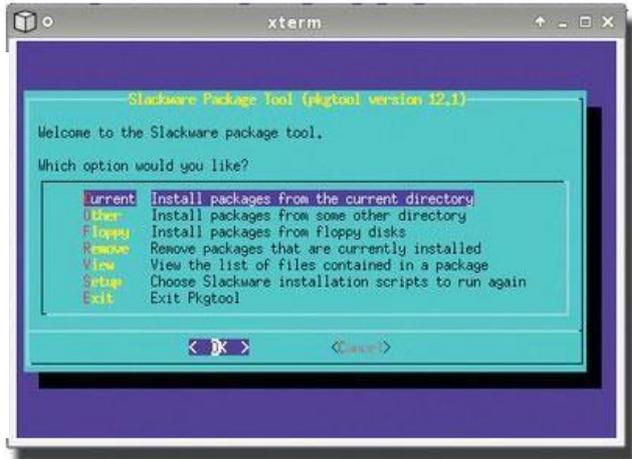
## **User Interfaces**

A User Interface, abbreviated UI, is the junction between a user and a computer program. The most commonly used UIs are the following:

- **Command-Driven Interface** (CLI): The user types the commands and from the keyboard.
- **Menu-driven interface** is one in which you select command choices from various menus displayed on the screen.
- **Graphical User Interface** (GUI): These use windows, icons, and pop-up menus. They have become standard on personal computers. Icons representing real world objects can be moved round the screen and have actions performed on them e.g. drag and drop. Even novice users find these types of systems easy to use.

Other user interfaces are:

- Touch screen (used in mobiles and some laptops)
- Voice input (natural language)
- Gestures



Three interfaces: command line, menus, and GUI



Using touch and gestures to input commands to the computer