

## Presentation guide for unit 6

### Input/output/systems

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This unit is dedicated to Input/Output systems and peripheral devices. The following concepts are covered in this topic.

1. Peripherals
2. Buses
3. I/O modules and techniques

#### 1. Peripherals

The unit begins with a classification of the different types of peripherals that can be connected to a computer. A peripheral is any external device that is connected to a processor through input/output (I/O) units or modules. They are used to store information or communicate the computer with the outside world. Examples of devices include magnetic disks and solid state disks.

It describes the structure of a magnetic hard disk, which stores information on a surface that is magnetized. The capacity of a hard disk is also analyzed and the access time to this type of disks is analyzed in detail. Finally, other aspects related to these disks are discussed: the storage interface, the functions of the disk controller, the disk cache, the scheduler and power consumption, and strategies that can be used to save power when using the disks.

This section ends by describing the solid-state disks that are based on Flash memory. It describes the basic operation of a Flash memory and how read and write operations are performed on a cell. Different types of Flash memory and the problem of leveling the wear of Flash memory cells are described.

#### 2. Buses

A bus is a communication path between two or more devices and is made up of several bit transmission lines. The different types of buses are presented: data, address and control, and the following characteristics associated with the buses are analyzed:

- Bus width
- Frequency
- Transfer speed
- Bandwidth
- Bus hierarchy

#### 3. I/O modules and techniques

The I/O units or modules make the connection between the processor and the peripheral devices. The topic describes the functions of the I/O modules:

- Control and timing
- Communication with the processor or memory
- Communication with the peripheral
- Buffering
- Error detection.

The following shows and describes the simplified model of a typical I/O module with its different signals and registers. Finally, the three input/output techniques that allow exchanging data between the processor or memory and the I/O modules are described:

- Programmed I/O
- I/O by interrupts
- Direct Memory Access (DMA) I/O

## Material

As material associated with this unit is included the theory material and a collection of exercises proposed and resolved on the aspects covered in the subject. In other resources, a link is provided where a simulator of energy consumption of a disk can be found.

## Recommended bibliography

- “Problemas resueltos de estructuras de computadores” (GARCIA CARBALLEIRA, Félix et al.).
- “Computer organization and design. The hardware/software interface” (PATTERSON, David, et al).
- libro “Computer Organization and Architecture” (STALLINGS, William).