

chapter 0:

Computer Science : Definition

What is computer science?

- ❑ is the study of computers and computational systems.
- ❑ including their **design, development, and applications**.
- ❑ **Includes all domains:** mathematics, science, engineering, and art,...

What is a computer?

- A **computer** is a electronic machine that can be programmed, store, retrieve and processing data.
- This is a programmable machine that does exactly what you ask.
- This is a digital machine: it has two different states only (0/1).

The operation of the computer

1. A computer processes all types of information

↳ Binary 1 and 0.

For example : Letter "A" → **1000001.**

2. The workings of the computer is founded on an electronics circuits that moves and transforms electrical impulses (representing ones and zeros).



← The first PC d'IBM

The Macintosh
PC



I / Introduction

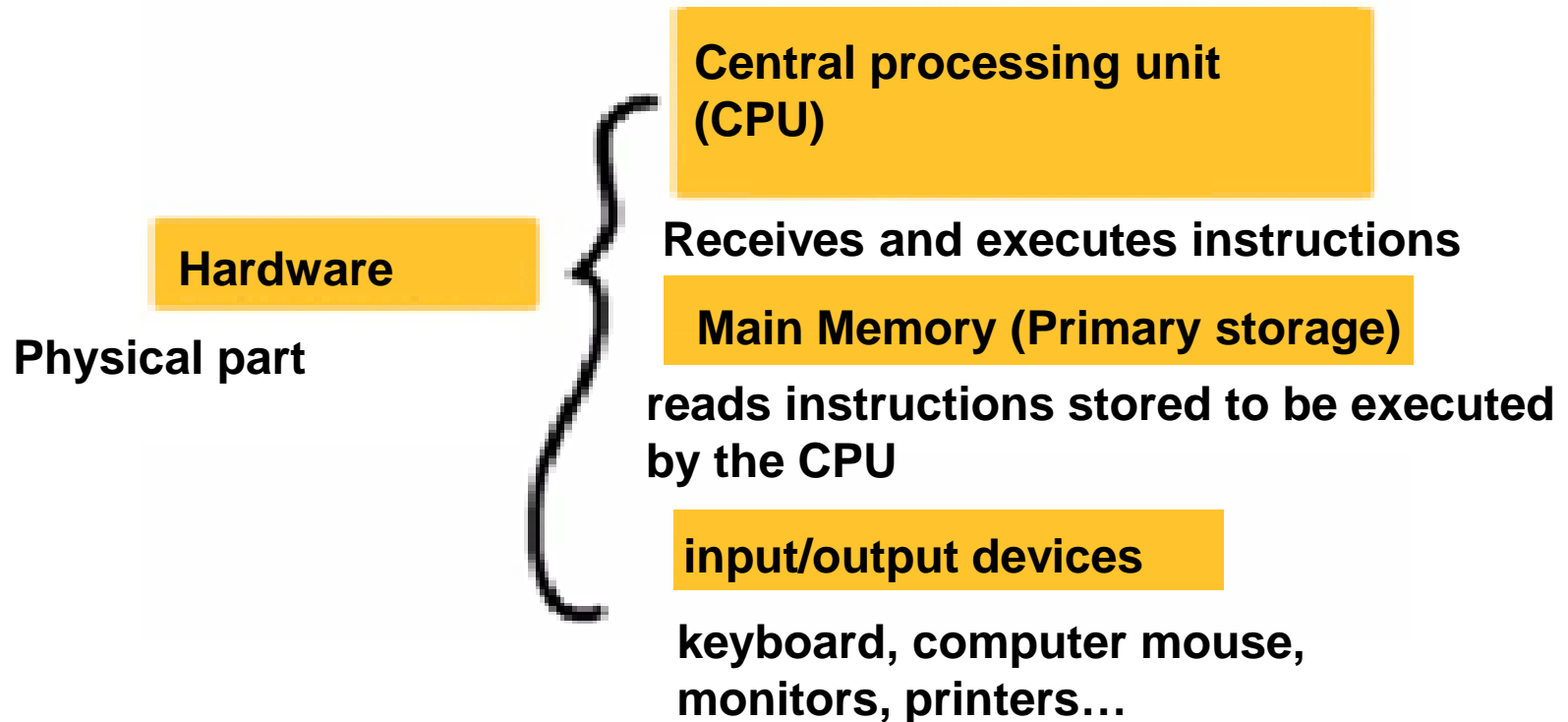
computer



logical part
program (software)

Physical part
Equipment (hardware)

I / Introduction :



CPU

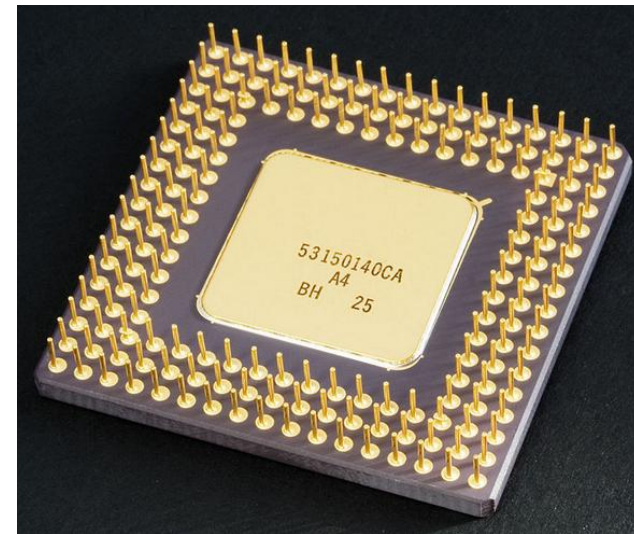
central processor or main processor

Its electronic circuitry executes instructions of a computer program, such as arithmetic, logic, controlling, and input/output (I/O) operations.

Most modern CPUs are implemented on integrated circuit (IC) microprocessors, with one or more CPUs on a single IC

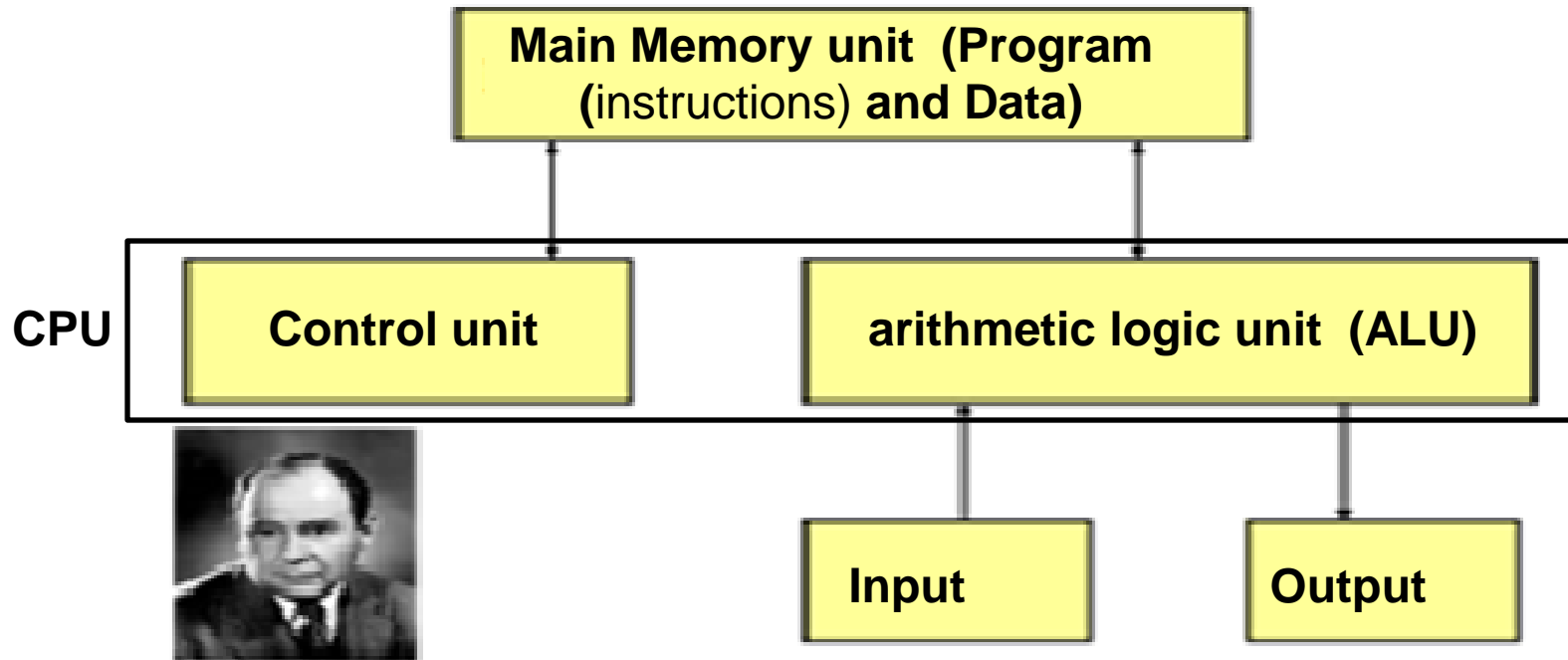


Intel 80486DX2 top



Intel 80486DX2 bottom

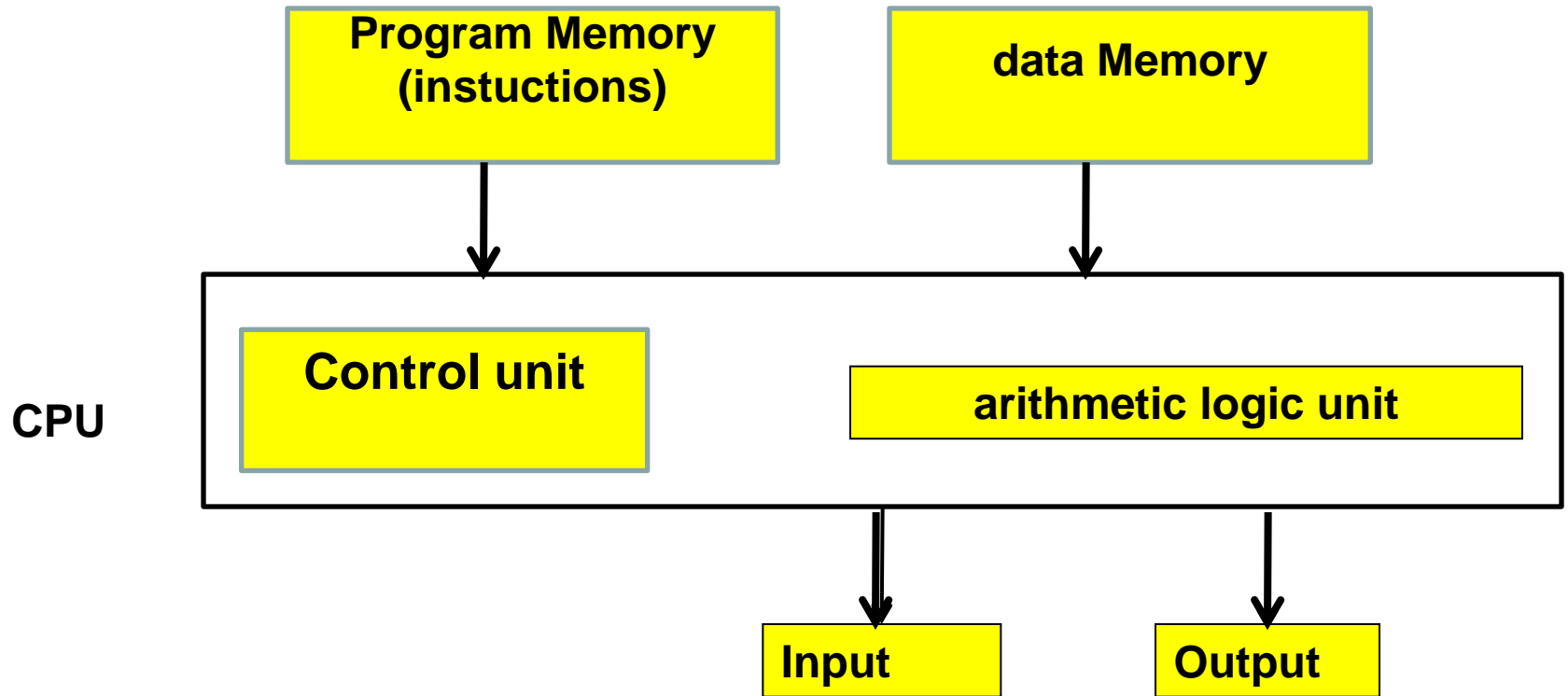
II / computer architecture :



John von Neumann in the 1940s

Von Neumann architecture

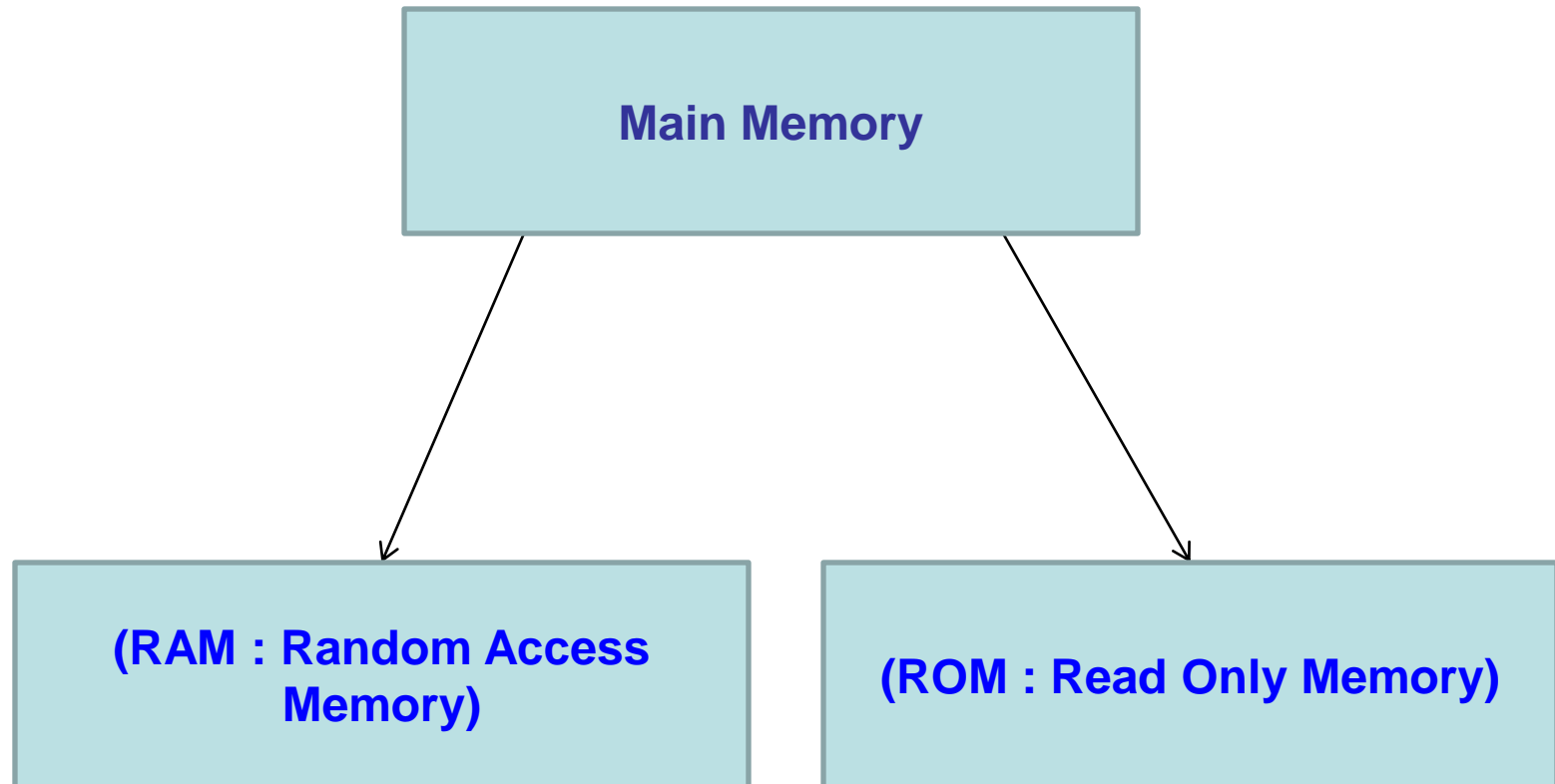
II / computer architecture



Harvard architecture

II / computer architecture (2)

Main Memory (2)



II / computer architecture (3)

Main Memory: RAM

- 1- Volatile Memory:** RAM is volatile memory, meaning it loses its data when the computer's power is turned off or restarted
- 2- Data Storage:** RAM stores both data and instructions for software applications and the operating system.
- 3- Data Width:** RAM modules have a specific data width, which determines how many bits of data can be accessed or manipulated in a single operation. 8, 16, 32, or 64 bits.
- 4- Fast Access:** RAM provides fast access to data that the CPU needs to perform calculations, manipulate data, and run applications.

II / computer architecture (4)

Main Memory: ROM

1- Non-Volatile: the data stored in ROM remains preserved even when the power supply is turned off.

3- Firmware Storage: ROM is often used to store firmware, which is software that is permanently programmed into a hardware device.

Examples: BIOS (Basic Input/Output System) and firmware in devices like routers, printers, and game consoles.

2- Read only: The limitation of ROM is that data stored in it is not easily changeable or upgradable, unlike data stored in writable storage like hard drives or flash memory.

II / computer architecture (5)

Main Memory: ROM /Varieties

Mask ROM (MROM): In mask ROM, data is permanently programmed during manufacturing through physical alteration of the hardware. This type cannot be modified once created.

Programmable ROM (PROM): PROM allows users to program data into the memory cells using special equipment. Once programmed, the data cannot be changed.

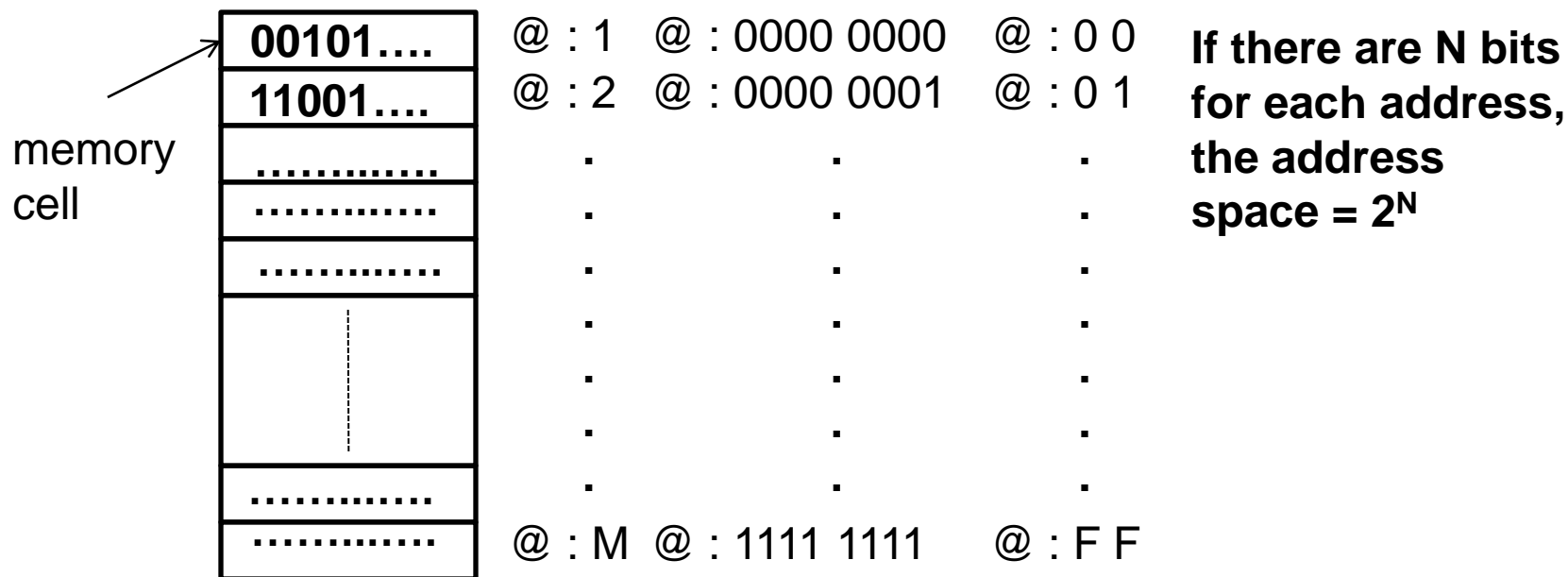
Erasable Programmable ROM (EPROM): EPROM can be erased and reprogrammed using exposure to ultraviolet (UV) light. EPROM chips typically have a window that allows UV light to reach the memory cells for erasing.

Electrically Erasable Programmable ROM (EEPROM): EEPROM is similar to EPROM but can be erased and reprogrammed electrically, without the need for UV light. It offers greater flexibility for updating data.

II / computer architecture (6)

Main Memory: address

Computers use memory addresses to read, write, and manipulate data stored.



The size of these memory cell varies depending on the architecture of the computer's memory system. For example, in many modern computers, the smallest addressable unit is 8 bits, known as a byte.

III/ The microcontrollers

Are a compact integrated circuit (IC) that contains a processor, memory, and input/output peripherals.

They are designed to perform specific tasks or control a particular system, like embedded systems.

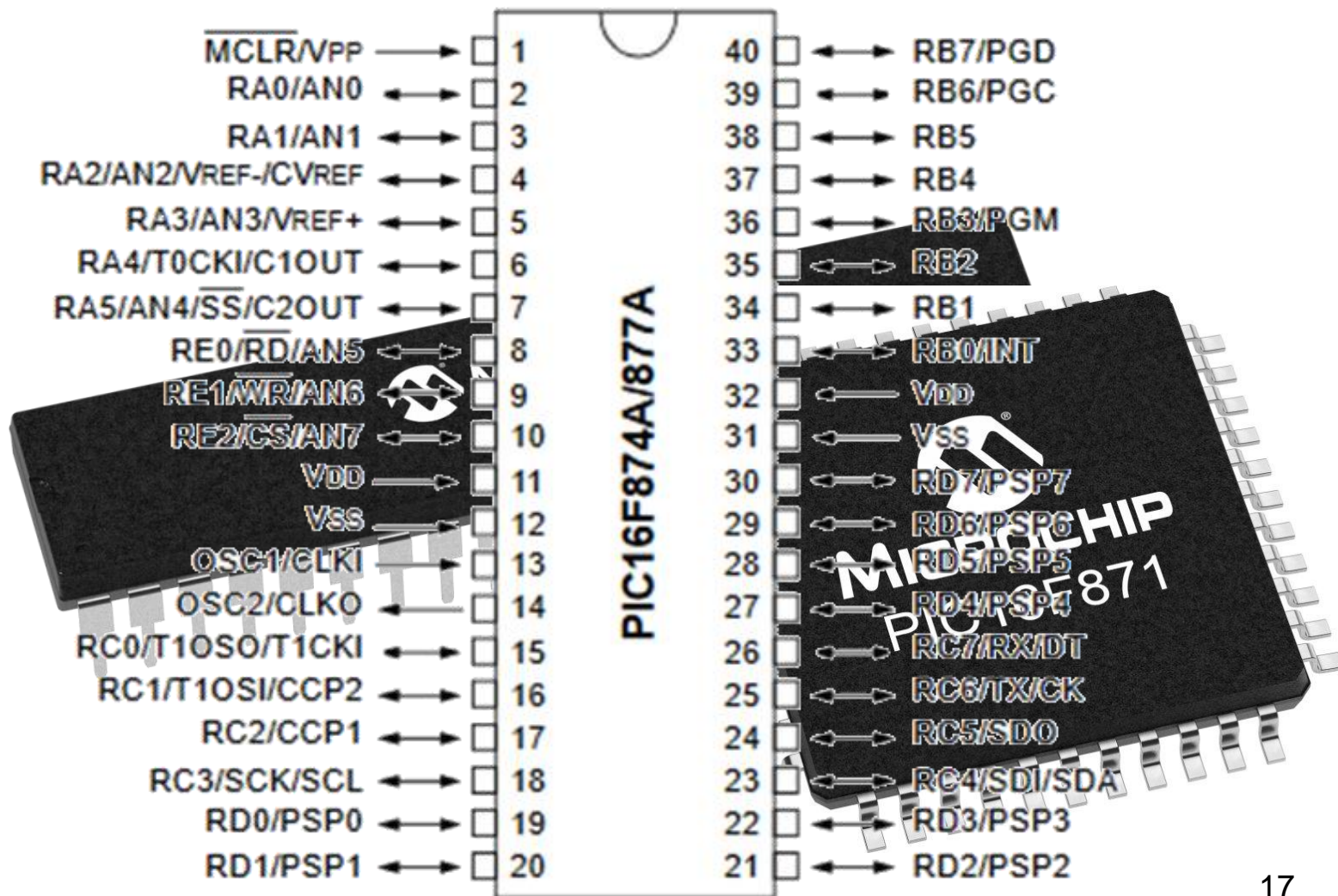
Optimized for efficiency, cost-effectiveness, and low power consumption.

Are used in a wide range of applications:

- **home appliances (microwaves, washing machines),**
- **automotive systems (engine control units, airbags),**
- **consumer electronics (TV remote controls, digital cameras),**
- **industrial automation (robotics, sensors),**
- **medical devices (blood glucose meters, pacemakers).**

III/ The microcontrollers (2)

PIC The microcontrollers



The Microcontroller card

These are of different types of cards or devices that incorporate microcontrollers for specific functions or applications.

These cards often integrate microcontrollers, memory, communication interfaces, and other components to provide specific functionalities.

They are used in various industries and applications to enable secure identification, authentication, data processing, and more

The Microcontroller cards (2)

Arduino Boards

Are open-source microcontroller platforms designed for building interactive electronic projects.

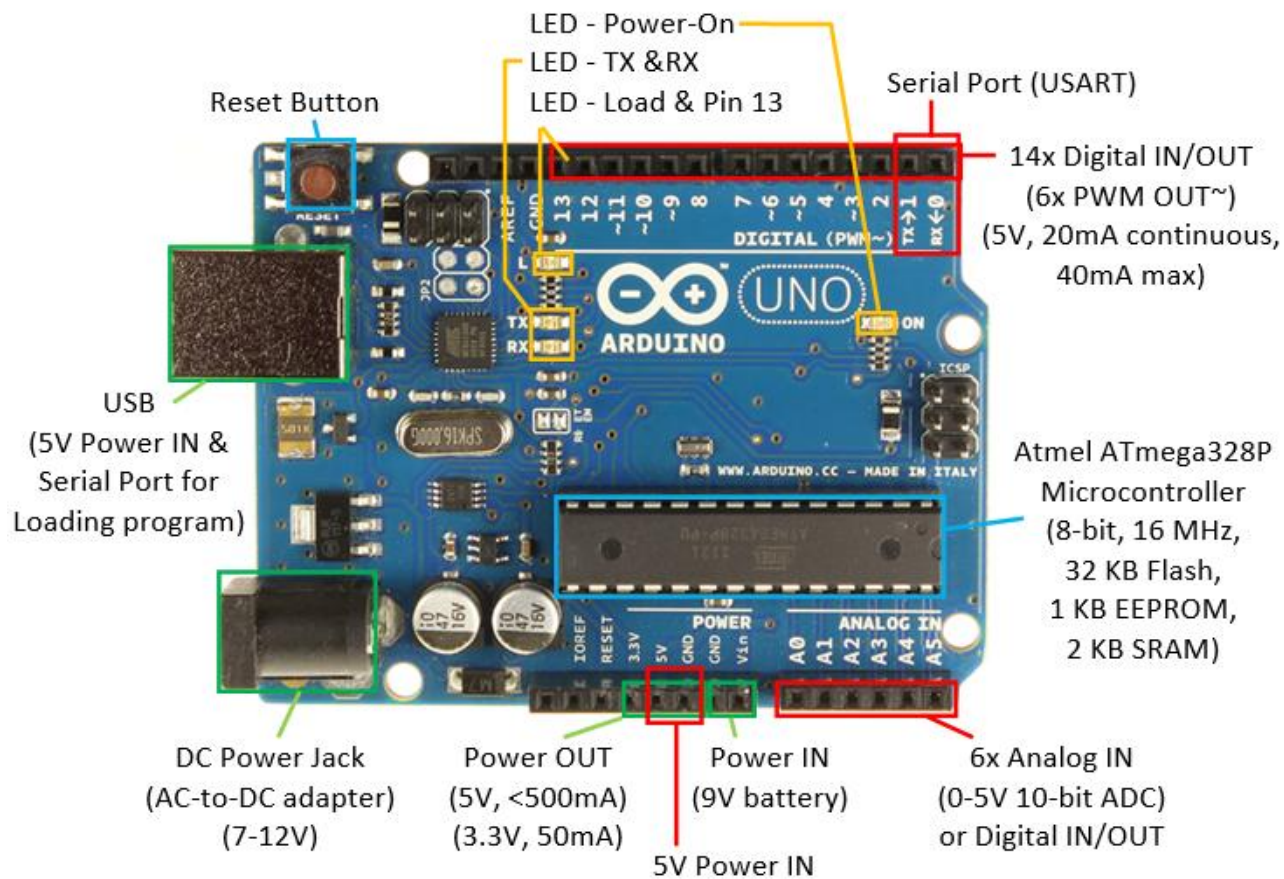
Arduino UNO

Microcontroller : ATmega328 16 MHz

Memory: flash: 32 kB, SRAM: 2 kB, EEPROM: 1 kB



The Microcontroller cards (2)



The Microprocessor cards

Raspberry Pi computers

are small, affordable, single-board computers developed by the Raspberry Pi Foundation.

These computers are designed to provide a low-cost platform for learning programming, experimenting with electronics, and creating various projects.

The Microprocessor cards (2)

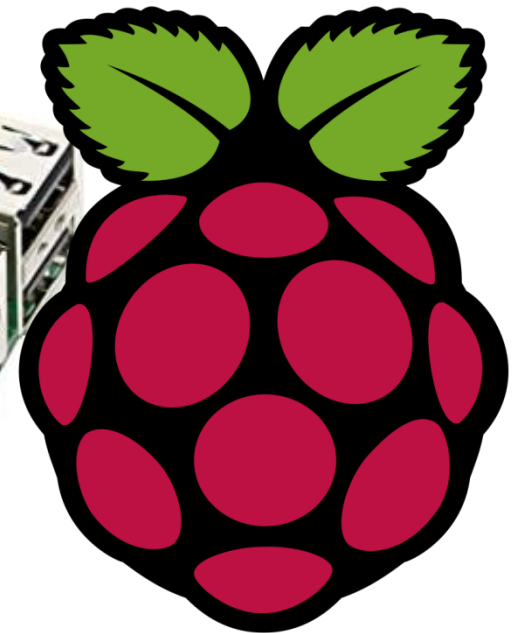
Raspberry Pi 3B+

Microprocessor Chip : 1.4GHz 64-bit quad-core,

Memorys: 1GB SDRAM, Micro SD

Network: dual-band wireless LAN, Bluetooth 4.2/BLE,
faster Ethernet.

Ports: HDMI, USB 2.0, CSI camera, DSI display, audio.



The Microprocessor cards (3)

