

## **The purpose of the CPU – The fetch - execute cycle:**

A computer is an electronic device which takes input, processes data and delivers an output.

### **The fetch – execute cycle:**

- Fetches the next instruction from the RAM
- Brings it back to the CPU
- Decodes/understands the next instruction and works out what it needs to do
- It executes the instruction
- Goes back to the RAM for more information
- Perform calculations
- Store information into RAM

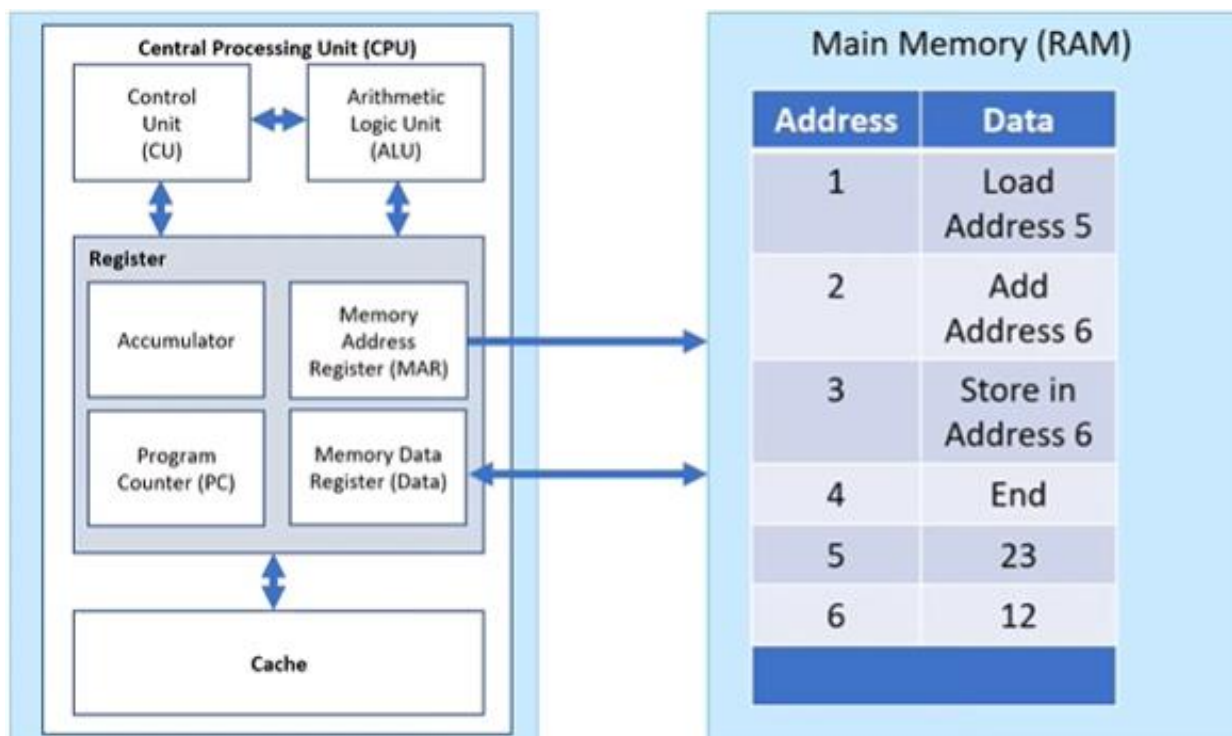
1GHz (Giga hertz) = 1 billion cycles per second

## **CPU components and their function:**

### **Components of the CPU:**

- Arithmetic Logic Unit (ALU) – Carries out calculations and makes logical decisions
- Control Unit (CU) – Monitors hardware, manages I/O signals and manages the FDE cycle
- Cache – Provides fast access to frequently used data located onboard the CPU
- Registers – Super fast pieces of onboard memory

## Von Neumann Architecture:



## **Registers:**

- Program Counter (PC) – Holds the address of the next instruction to be executed and increments its contents by one
- Memory Address Register (MAR) – Holds the address of where data is to be fetched or stored
- Memory Data Register (MDR) – Holds the data fetched from, or to be written to memory
- Accumulator (ACC) – Holds the results of calculations

### **Fetch – execute cycle:**

- Program counter is checked
- Address found in PC is used by MAR which is then used to fetch data from RAM and bring it into MDR
- PC increments its contents by one
- CU decodes instructions
- We might head back to RAM and fetch data and add it to the ACC, or jump to another instruction, or write data held in the ACC into RAM

## **Common characteristics of CPU:**

### **Clock speed:**

- Measured in Hz
- Number of FDE cycles which can be executed per second

### **Cache size:**

- Temporary storage of data
- Located very close or onboard the CPU
- Stores frequently used data
- Fast access compared to RAM

### **Number of cores:**

- A core is another processing unit
- A core has the same things as CPU
- Multiple programs can be ran at the same time with more number of cores
  
- CPU cores have to communicate with each other which takes time and some programs may not allow you to use multiple cores

If you want a fast computer, you will need to keep a balance of everything. Increasing one thing does not change it as much.

### **Embedded systems:**

An embedded system is a computer system with a dedicated function within a larger mechanical and electrical system.

(A computer system that is built into another device)

### **Examples of embedded systems:**

- Traffic lights
- Washing machine
- Freezer
- Digital clock
- Coffee machine
- Kettle