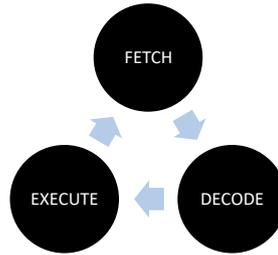


1.1.1 ARCHITECTURE OF THE CPU

The purpose of the CPU:

- The fetch-execute cycle

- Data and instructions **FETCHED** from main memory
- They are then **DECODED** and **EXECUTED**
- This is carried out in a continuous cycle

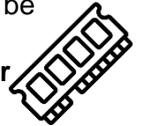


REVISION NOTE
You should learn what each register does and its role in the fetch execute cycle

Common CPU components and their function:

- ALU [Arithmetic and Logic Unit]
- CU [Control Unit]
- Cache
- Registers

- **ALU** performs calculations and logic checks.
- It may take several F-E-Cycles for a calculation to be finished.
- Intermediate results are stored in the **accumulator**
- **Cache** is VERY FAST memory.
- Instructions that are carried out frequently are stored here so that they do not have to be **FETCHED** [saving time]
- **Registers** = small amounts of high-speed memory contained within the CPU. Registers store data that is needed during the F-E-C



Von Neumann Architecture:

- MAR (Memory Address Register)
- MDR (Memory Data Register)
- Program Counter
- Accumulator

- **John Von Neumann** was a Hungarian mathematician who developed the idea that a computer could be used for many purposes and not just one.
- This was called the **stored program concept**.
- A processor based on **Von Neumann's architecture** would use memory to store data and instructions and would use the **fetch execute cycle** to retrieve and process instructions.
- Von Neumann's architecture makes use of a number of registers...



MAR - holds the address of the current instruction that is to be fetched from memory, or the address in memory to which data is to be transferred

MDR - holds the contents found at the address held in the MAR, or data which is to be transferred to primary memory

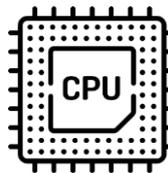
PC - holds the memory address of the next instruction to be fetched from primary memory

ACCUMULATOR – holds data while it is being processed and while

1.1.2 CPU PERFORMANCE

How common characteristics of CPUs affect their performance:

- Clock speed
- Cache size
- Number of cores



- The **clock** coordinates all the computer's components.
- It sends out a pulse the synchronises each component – the **frequency** of the pulses is known as the **clock speed**.
- It is measured in **Hertz**.
- *The higher the frequency, the more instructions can be processed in a given time*

1.1.3 EMBEDDED SYSTEMS

The purpose and characteristics of embedded systems

Example of embedded systems

- **Embedded systems** are small computer systems built inside larger devices or pieces of equipment
- They are designed to do one specific task (rather than range of task)
- Embedded systems have a simple user interface
- In addition, the software used to control or run the system is also very basic

- Each processing unit inside a CPU is called a **CORE**.
- **Each core can carry out the fetch execute cycle**
- *The more cores a CPU has, the more instructions it can process in a given time (i.e. **PARALLEL PROCESSING**)*

CACHE is very fast (and expensive) memory that can store frequently used data or instructions

single core CPU = 1 instruction **VS** dual core CPU = 2 instructions



WHICH OF THESE ARE NOT Embedded Systems?



DOES ONE TASK



DOES ONE TASK



CAN DO MANY TASKS