

Differences between Computer Architecture and Computer Organization.

Computer Architecture

Computer Architecture is a blueprint for design and implementation of a computer system. It provides the functional details and behaviour of a computer system and comes before computer organization. Computer architecture deals with 'What to do?'

Computer Organization

Computer Organization is how operational parts of a computer system are linked together. It implements the provided computer architecture. Computer organization deals with 'How to do?'

Following are some of the important differences between Computer Architecture and Computer Organization.

Sr. No.	Key	Computer Architecture	Computer Organization
1	Purpose	Computer architecture explains what a computer should do.	Computer organization explains how a computer works.
2	Target	Computer architecture provides functional behavior of computer system.	Computer organization provides structural relationships between parts of computer system.
3	Design	Computer architecture deals with high level design.	Computer organization deals with low level design.
4	Actors	Actors in Computer architecture are hardware parts.	Actor in computer organization is performance.

Sr. No.	Key	Computer Architecture	Computer Organization
5	Order	Computer architecture is designed first.	Computer organization is started after finalizing computer architecture.

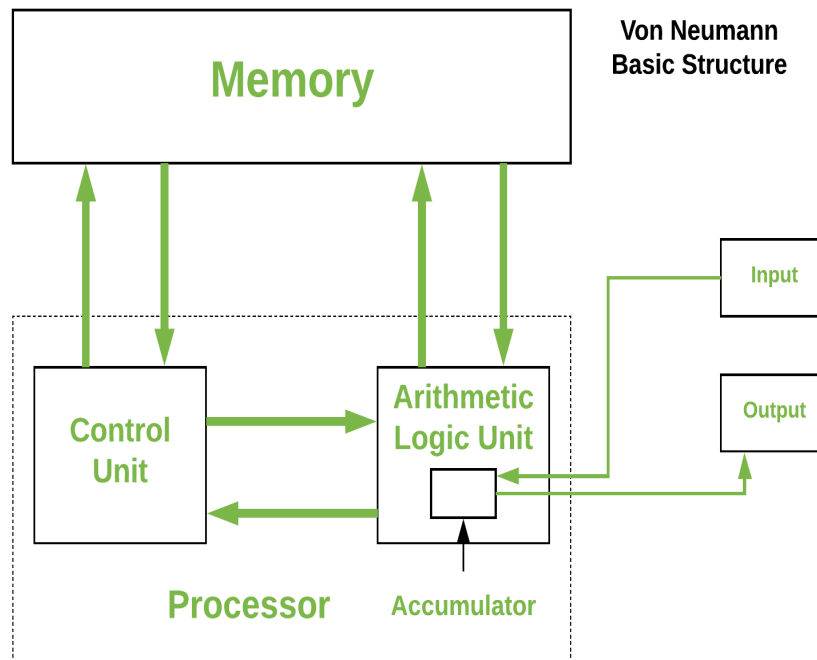
Computer Organization | Von Neumann architecture

Historically there have been 2 types of Computers:

1. **Fixed Program Computers** – Their function is very specific and they couldn't be programmed, e.g. Calculators.
2. **Stored Program Computers** – These can be programmed to carry out many different tasks, applications are stored on them, hence the name.

The modern computers are based on a stored-program concept introduced by John Von Neumann. In this stored-program concept, programs and data are stored in a separate storage unit called memories and are treated the same. This novel idea meant that a computer built with this architecture would be much easier to reprogram.

The basic structure is like,



It is also known as **IAS** computer and is having three basic units:

1. The Central Processing Unit (CPU)
2. The Main Memory Unit
3. The Input/Output Device

- **Control Unit –**

A control unit (CU) handles all processor control signals. It directs all input and output flow, fetches code for instructions and controlling how data moves around the system.

- **Arithmetic and Logic Unit (ALU) –**

The arithmetic logic unit is that part of the CPU that handles all the calculations the CPU may need, e.g. Addition, Subtraction, Comparisons. It performs Logical Operations, Bit Shifting Operations, and Arithmetic Operation.

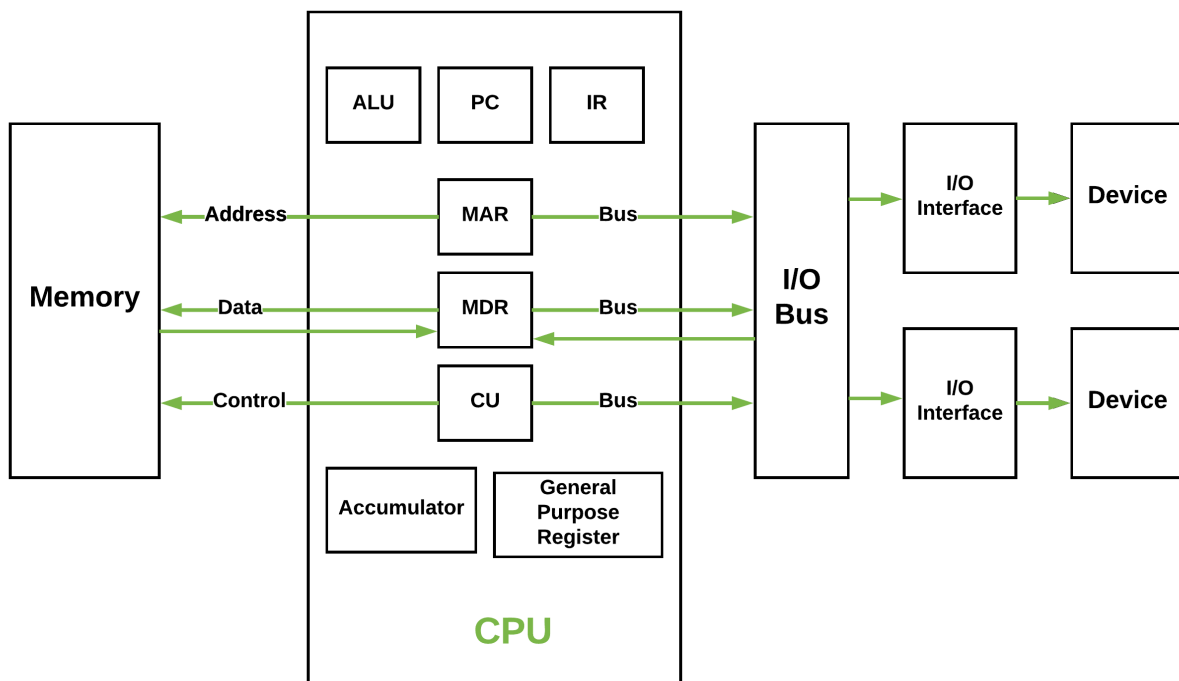


Figure – Basic CPU structure, illustrating ALU

- **Main Memory Unit (Registers) –**
 1. **Accumulator:** Stores the results of calculations made by ALU.
 2. **Program Counter (PC):** Keeps track of the memory location of the next instructions to be dealt with. The PC then passes this next address to Memory Address Register (MAR).
 3. **Memory Address Register (MAR):** It stores the memory locations of instructions that need to be fetched from memory or stored into memory.
 4. **Memory Data Register (MDR):** It stores instructions fetched from memory or any data that is to be transferred to, and stored in, memory.
 5. **Current Instruction Register (CIR):** It stores the most recently fetched instructions while it is waiting to be coded and executed.
 6. **Instruction Buffer Register (IBR):** The instruction that is not to be executed immediately is placed in the instruction buffer register IBR.
- **Input/Output Devices –** Program or data is read into main memory from the *input device* or secondary storage under the control of CPU input instruction. *Output devices* are used to output the information from a computer. If some results are evaluated by computer and it is stored in the computer, then with the help of output devices, we can present it to the user.

- **Buses** – Data is transmitted from one part of a computer to another, connecting all major internal components to the CPU and memory, by the means of Buses. Types:
 1. **Data Bus:** It carries data among the memory unit, the I/O devices, and the processor.
 2. **Address Bus:** It carries the address of data (not the actual data) between memory and processor.
 3. **Control Bus:** It carries control commands from the CPU (and status signals from other devices) in order to control and coordinate all the activities within the computer.