Basic Operational Concepts of Computer

Main Functional Units

- Input
- Memory Unit
- Arithmetic and Logic Unit
- Output Unit

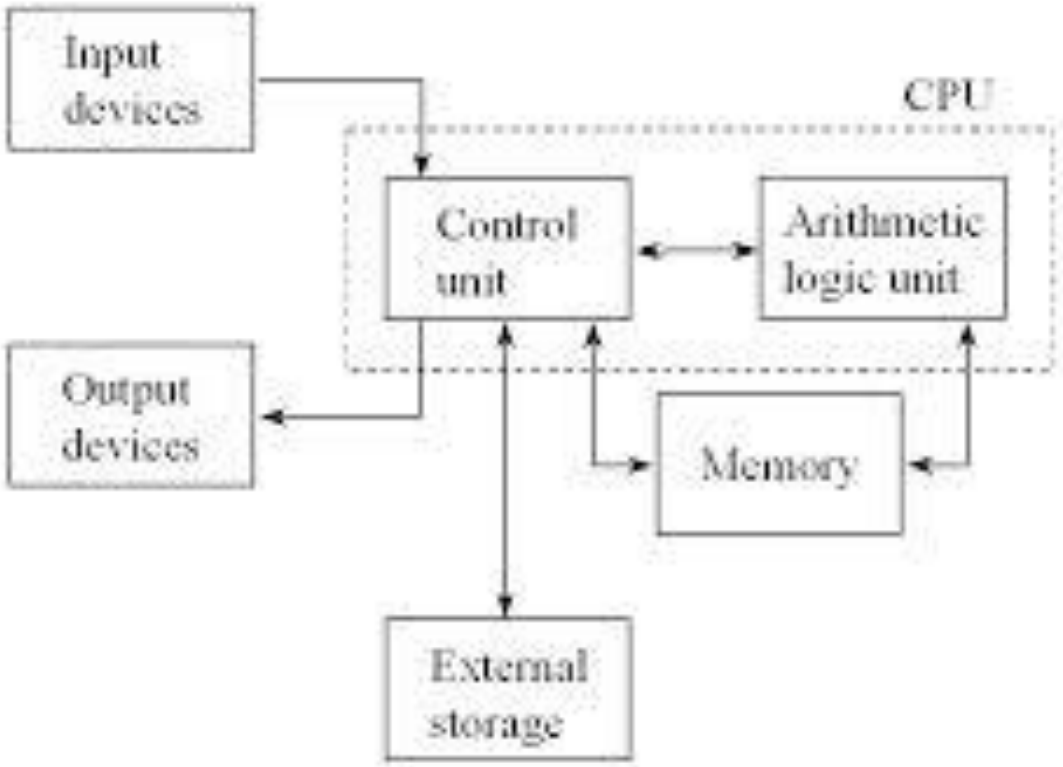
Operational Concepts

- Instructions are Vital Unit
  - Load LOCA, R1
  - Add R1, R0

- **Analyzing how processor and memory are connected :–**
- Processors have various registers to perform various functions :-
- Program Counter :- It contains the memory address of next instruction to be fetched.
- Instruction Register:- It holds the instruction which is currently being executed.
- MDR :- It facilities communication with memory. It contains the data to be written into or read out of the addressed location.
- MAR :- It holds the address of the location that is to be accessed
- There are n general purpose registers that is R0 to Rn-1

.Performance :-

- Performance means how quickly a program can be excecuted.
- Computer organization
- In order to get the best performance it is required to design the compiler, machine instruction set & hardware in a coordinated manner



- Connection B/W Processor & Memory
- 1) Memory
  2) MAR
  3) MDR
  4) PC
  5) IR
  6) General Purpose Registers
  7) Control Unit
  8) ALU

- **<u>Working Explanation</u>**
- A **PC** is set to point to the first instruction of the program. The contents of the **PC** are transferred to the **MAR** and a Read control signal is sent to the memory. The addressed word is fetched from the location which is mentioned in the **MAR** and loaded into **MDR**.

Performance

- **Computer performance** is the amount of work accomplished by a computer system.
- The word performance in computer performance means “How well is the computer doing the work it is supposed to do?”.
- It basically depends on response time, throughput and execution time of a computer system.

Response time

is the time from start to completion of a task. This also includes:

- Operating system overhead.
- Waiting for I/O and other processes
- Accessing disk and memory
- Time spent executing on the CPU or execution time.

- **Throughput** is the total amount of work done in a given time.
- **CPU execution time** is the total time a CPU spends computing on a given task. It also excludes time for I/O or running other programs. This is also referred to as simply CPU time.

Performance is determined by

- Performance = (1 / Execution time)

(Performance of A / Performance of B)

(Execution Time of B / Execution Time of A)

Example –

- Machine A runs a program in 100 seconds, Machine B runs the same program in 125 seconds

(Performance of A / Performance of B)

(Execution Time of B / Execution Time of A)

125 / 100 = 1.25

That means machine A is 1.25 times faster than Machine B.

time to execute a given program can be computed as:

- Execution time = CPU clock cycles x clock cycle time

Since clock cycle time and clock rate are reciprocals, so,

- Execution time = CPU clock cycles / clock rate

The number of CPU clock cycles can be determined by,

- CPU clock cycles

= (No. of instructions / Program) x (Clock cycles / Instruction (CPI))

= Instruction Count x CPI

Which gives,

- Execution time

= Instruction Count x CPI x clock cycle time

= Instruction Count x CPI / clock rate