Fundamentals

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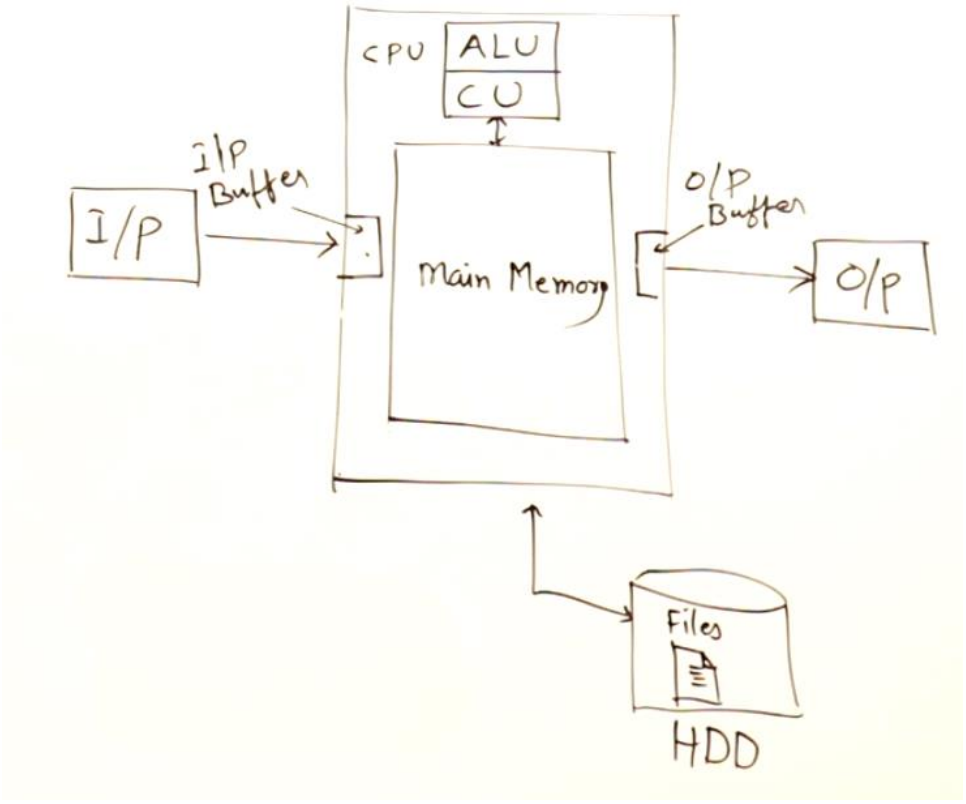
What is a Program?

A **Program** is a set of instructions given by a programmer to a computer/ machine to perform certain tasks.

What is an Operating System?

A **Operating System** is a program that help us manage the computer resources, especially the allocation of those Resources for another Programs.
Examples of Operating Systems are Windows, Linux, MacOS.



How Computer Works?

A computer works on binary language (aliased as Machine language). Firstly, any input or a program is checked for an error and after checking and removing errors it got converted to a machine language which later got performed or read
by a computer.

Main Components in main memory are:

1. **CPU** : It is a hardware component that performs data I/O, processing for a Computer System.

- **CU** : it is Called Control Unit which directs operations, basically instruct the memory logic unit and both I/O devices of the computer on how to respond to program's Instructions.
- **ALU** : Arithmetic Logic Unit is an combinational circuit that performs arithmetic and bitwise operations on integer binary number.

2. **INPUT BUFFER** : It is a temporary storage used in Computing to hold Data being received From the input devices such as Keyboard or a mouse.
   Whenever a input is passed via a keyboard or any other input device, the data is first get Stored here and then passed to the main memory.
3. **OUTPUT BUFFER** : It is a memory cache location where data is held until an output device is ready to receive/ read it.

What is a Low-level and High Level Languages?

A **Low-Level language** is a language that is more closer to a Computer than any other language such as Machine Language or Assembly Language. They allow us to directly Manipulate the memory, register, etc.

- Machine language basically is a Binary number combination (only 0's and 1's). They are directly operated by CPU.
- Assembly language is a way to write Programs that are very closer to how a computer works. It is at much higher level than binary language but it is still very hard to understand and write.

A **High-level Language** is a language that allow a programmer to write programs in much easier way than low level languages and increases readability for humans. They have syntax Closer to human understandable languages such as English. Examples, are C++, Java, Python, etc.

What is the difference Between a Compiler and Interpreter?

A **Compiler** is a Translator which takes a program written in high level language (such as C++,etc.) as an input and produces an output of Low-Level Language which is understandable by machine.

Compiler compiles whole program in one go. That is, if there's an error present in program it will not compile and throw an error. It will only Compile when there are no syntax errors are present.

Advantages of Compiler

• Compiled code runs faster in comparison to Interpreted code.
• Compilers help in improving the security of Applications.
As Compilers give Debugging tools, which help in fixing errors easily.

Disadvantages of Compiler

- The compiler can catch only syntax errors and some semantic errors
- Compilation can take more time in the case of bulky code.

An **Interpreter** is a translator which translates the program into machine language line by line. If there's an error present in a program at 3rd line then the interpreter will run the first 2 lines and then throw an error at 3rd line.

Advantages of Interpreter

- Programs written in an Interpreted language are easier to debug.
- Interpreters allow the management of memory automatically, which reduces
memory error risks.
- Interpreted Language is more flexible than a Compiled language.

Disadvantages of Interpreter

- The interpreter can run only the corresponding Interpreted program.
- Interpreted code runs slower in comparison to Compiled code.