Computer Organization & Architecture

Computer Organization frequently called Micro Architecture. Computer Architecture comprises logical functions such as,

- Instruction sets
- Registers
- Datatypes
- Addressing Modes .... etc.,

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- Computer Organization consists of physical units like,
  - Circuit Designs
  - Peripherals
  - Adders .. etc.,

The significant Components of CO are ALU, CPU, Memory .. etc.,

Computer Architecture

1. It's the way hardware components are connected together to form a computer system.
2. acts like Interface between H/w & S/w
3. Used to know functionalities of a system
4. First it should be formed
5. deals with high level design issues
6. It Involves
   - Instruction sets
   - Addressing Modes
   - Data types
   - Cache Optimization

Computer Organization.

1. It is concerned with the structure and behavior of a computer system as seen by the user
2. deals with Connection among components
3. to know how system units are arranged & Interconnected
4. Its based on Architecture
5. deals with low level design Issues
6. It Involves Physical Components like,
   - Circuit Design
   - Adders, Signals
   - Peripherals

Introduction

Evolution of Computing Devices:

ENIAC (Electronic Numerical Integrator & Computer) was the first computing system designed in early 1940's.

ABC (Atanasoff-Berry Computer) design was first digital electronic computer.

Initially vaccume tubes were used, After that Transistors Invented in 1947, later Integrated Circuits in 1959.

In 1983, Lisa was launched first PC with GUI, dual floppy disk drives, 5 GB Hard drive & 1 MB of RAM.

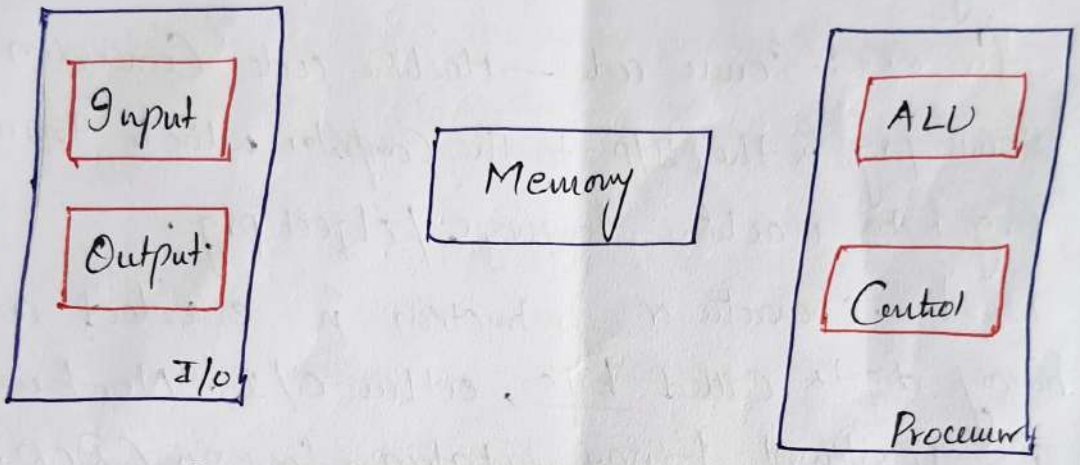
In 1990, apple released Macintosh portable

In 1990, Intel released Touchstone Delta Super Computer.

So like this, we have upgraded with Devices & their using technologies with highend tools, Memory, OS..etc.,

Functional Units: A Computer consists of 5 functionally independent main parts.

Input unit
Memory unit
Arithmetic & Logic unit
Output unit
Control unit



The I/P unit accepts coded info from human operators, from electromechanical devices such as keyboards or some other devices. The information received is either stored in Memory, performing operations by using ALU with the desired operations. Finally results are sent back to the outside world through o/p unit. All of these actions are coordinated by Control unit (CU).

Information handled by computer can be categorized as either

Instructions
or
Data.

Instructions/Machine Instructions are explicit commands that,

- Information passing between Computer & the I/O devices
- Specify the arithmetic & logic operations to be performed.

A list of Instructions that performs a task is called a program. Usually it stored in the memory. The processor then fetches the Instructions that make up the prg from the memory one after another & performs the desired Operations.

The Computer is completely Controlled by the "Stored Program".

Data are numbers and encoded characters that are used as operands by the Instructions.

for exn: Source code — Machine code Conversion

Here Source prg is the I/P to the Compiler which translates the source prg into Machine language / object prg.

Each Number, Character or Instruction is encoded as a string of binary digits called bits, either 0/1. Numbers are represented in positional binary notation, for exn (BCD - Binary Coded Decimal, in which each decimal digit is encoded by 4 bits).

Alpha-numeric Characters are also expressed in terms of binary codes. Two exn for this are

ASCII (American Standard Code for Information Interchange)

EBCDIC (Extended Binary coded Decimal Inter-change code)

In ASCII, each Character is represented with 7-bit code

In EBCDIC, each .. .. 8-bit code.

Input Unit : Joysticks, trackballs, Mouse, KB, Microphones, Camera, Touch Screen

Output Unit : Monitor, printers, plotters, speakers, projector, Headphone Soundcard, Video Card .. etc.,

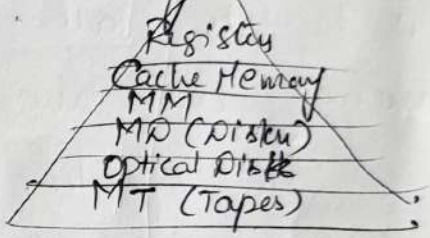
ALU : Ex: Sum of 2 nos.

Nos located in Memory, bring into processor

Addition done by ALU,

Sum stored in memory / retained in processor

Some times you may store them in registers for fast accessing. So depending on Memory hierarchy we can use.



Memory : Used to store prgs & data.

Primary Secondary

Primary is fast memory, Initially prg is stored here. It has large no. of semiconductor storage cells in the form of bits, group of bits called as words, each associated with unique address with successive locations.

The no. of bits in each word is referred as word length of the Computer. Ex: 16 to 64 bits. Depending on this only system storage capacity & speed will be assessed.

Ex: RAM, ROM, Cache Memory, PROM, EPROM, Registers.

Secondary is used when large amounts of data & many prgs have to be stored, we can access them infrequently.

Ex: Hard Disk, Floppy Disk, Magnetic tapes, Magnetic Disks, Optical Disks (CD-ROMs)

CU : The memory, ALU, I/O units store & process information & perform Input & Output Operations. The Operation of these units are coordinated & Controlled by CU.

I/O transfers, consisting of I/O operations are controlled by the instructions of I/O prgs that identify the devices involved & the info to be transfered. The actual timing signals that govern the transfers are generated by the Control units. These signals determine when a given action is to take place. Data transfer between the processor & the memory are also controlled by CU.

The operation of a computer can be summarized as;

① The Computer accepts info in the form of prgs & data through an I/P unit & stores it in the memory.

② Info stored in the memory is fetched.

③ processed info leaves the computer through an o/p unit.

④ All activities inside the machine are directed by CU.

Basic Operational Concepts:

The primary function of a computer system is to execute a prg, seq of instructions. These instructions are stored in computer memory. Data should be taken from I/P devices, processing the data by using ALU and controlled by CU, finally result will be forwarded to O/P unit.

The processor contains no of registers for temporary storage of data & some special function Registers like PC, IR, MAR & MDR