COA-Notes   15/10/23 - Su

# Chapter #2: Computer Evalution & Performance.

2.1   A Brief history of Computers.

→ First generation: Vacuum tube.

→ ENIAC (Electronic Numerical Integrator and Computer). was designed and developed in University of Pennsylvania. by John Mouchly and John Eckert.

→ ENIAC was the first general purpose electronic digital Computer.

→ It was built from 1943 to 1946 and operated until 1955.

→ It uses decimal system instead of binary, weighing 30 tons, occupying 1500 square feet and consuming 140 kW of power, consisted of 1800 vaccum tubes.

→ Major drawback was that it had

to be programmed manually by setting switches and plugging and unplugnig cables.

Von Neuman Machine:

→ Stored-program concept is the idea -that a process could be facilated if represented in a form suitable for storing in memory along with data and instructions.

→ EDVAC (Electronic Discrete Variabl (oupt)
→ IAS (Institute of Advane Study).
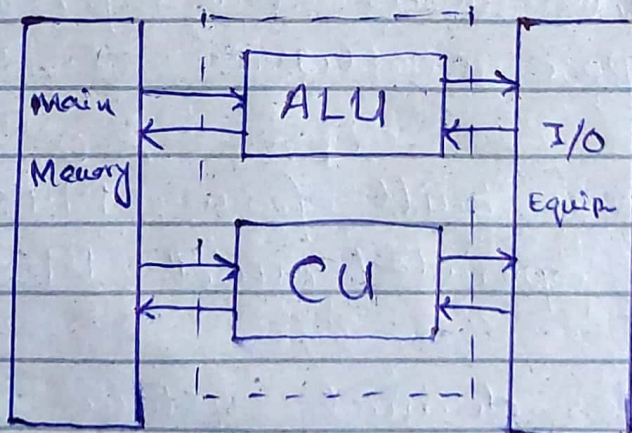
Structure of IAS Computer

→ IAS has

· Main memory : Stores data + instrut
· Has ALU. Capable of operation on binary
· Control unit, which interprts

instructions in memory and cause them to be executed.
- I/o equip operated by cu.

→ 'Word' has no universal definition. Typically if a processor has a fixed-length instruction set, then the instruction length equals word length.

→ opcode (operation code).

→ Memory Buffer Register (MBR): used to ~~store/receive~~ exchange word b/w memory and I/o-unit.

→ MAR (Memory Address Register): Specifies the address in memory of word to be written from or read into MBR.

→ IR (Instruction Register): Contains 8-bit opcode instruction being executed.

→ IBR (Instruction Buffer Register):

hold temperarly the right hand instruction from a word in memory.

→ PC (Program Counter): Contains the address of next instruction to be fetched from memory.

→ AC (accumulator) and MQ (Multiply Qoutient): hald temporarly operands and results of ALU.

→ IAS operates by performing an instruction cycle; which has two sub cycles:
  • Fetch cycle; in which opcode of next instruction is loaded to IR and address to MAR.
  • execute cycle; Once the opcode is in the IR, the execution is performed in ALU.

→ IAS computer has a total of 21 instruction. They can be grouped as:
  • Data transfer

• Unconditional branch
• Conditional branch
• Arithemetic:
• Address modify.

Commercial Computers:

→ 1950s saw birth of computer industry with two companies IBM and Sperry.

→ In 1947, Eckert and Mauchly formed Eckert-Mauchly Computer Corporation. Their first successful machine was UNIVAC I (universal Automatic Computer).

→ UNIVAC I was first successful commercial computer.

→ UNIVAC II had greater memory capacity and heigher performance than UNIVAC I.

→ IBM, the major manufactorer of punched-card processing equipments delivered its first electronic

stored-program computer, The 701 in 1953. it was intended for scientific use

→ 702 was used for buisnesses. had also hardware features.

The second generation: Transistors
→ major change came with replacemet of vaccume tube with by transistors.
→ Transistor is smaller, cheape, disipate less heat and work as a vaccume tube.
→ Transistor was invented in 1947 in Bell Labs, first useb by NCR and RCA for full transistorised computer
→ Second generation also introduce more complex arithemitic logic unit, contral units, use of High level programming languages and provision of system-software with the computers.

→ IBM introduce the 7000 series from 1952 to 1964. The successive members show increase performace, increase capacity and low cost.

→ Data channel is an independant I/O module with its own processor and its own instruction set. In computer with such devices, the CPU doesn't execute detail I/O instructions. rather executed by special-purpose processor in data channel.

→ Another new feature was multiplexor, the central termination point for data channels, CPU and monitors. memory. alowing these devices to work independently.

The Third Generation: Integrated Circuits.

→ 1958 came with era of microelectronics.

→ A digital computer must perform data storage, movement, processing and control unit.

→ 2 fundamental devices;
- gates: a device that implenet a simple boolean or logical function
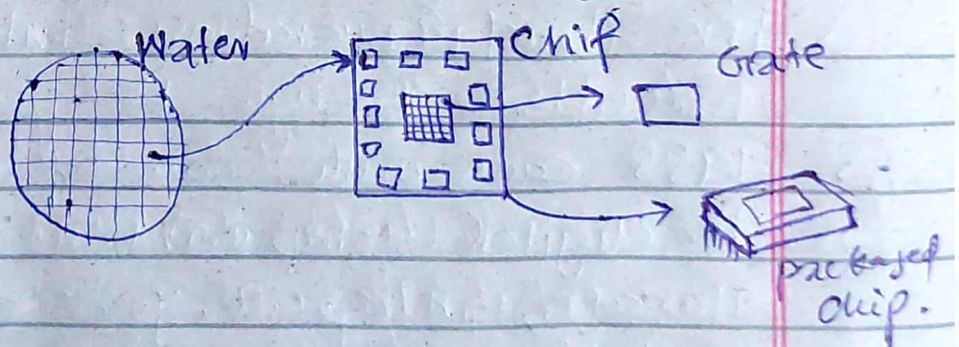- Memory cell; a device that can store one bit of data, the device can be in any one of two

stabl state at any time
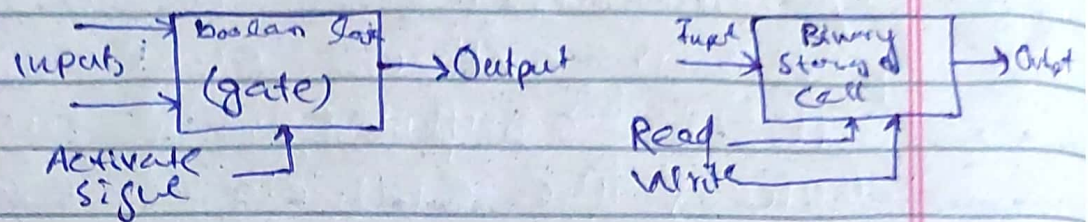
→ Digital computer have four
fundamental funtions:
- Data Storage : provided by memory cells
- Data Processing : provided by gates
- Data movemet : path among devices for
  data to trave ih.
- Contral : paths to carry contral signals

→ SSI — small scall integration

→ The PDP-8 used a structure
that is now virtually universal
for microcomputers : the bus
structure. The PDP-8 called
it omnibus, consists of 96
seperate signal paths.

* $1k = 2^{10} = 10^3$, $1M = 2^{20} = 10^6$, $1G = 2^{30} = 10^9$

Later Generations:

→ LSI = >1000

VLSI = >10,000

ULSI = > 1,000,000

→ In 1950s and 1960s mostly memory was constructed from tiny rings of ferromagnetic material. Take $\frac{1}{1,000,000}$th of second to read data.

→ In 1970 first capacious semiconductor memory was produced by Fairchild. about size of a single core, could hold 256 bits of memory. Take $\frac{1}{70,000,000,000}$th of a second to read a bit.

→ Since of 1970, semiconductor memory has been Through 13 generations.

→ The intel 4004 in 1971, was the first chip to contain all of the components of a CPU on a single chip. The micro-processor was born.

→ Data bus width: the number of bits of data brough into or sent out of processor at a time