

# Lecture-1

## Chapter-1

Computer Architecture and Organization-Jhon  
P. Hayes

## Computing and Computers

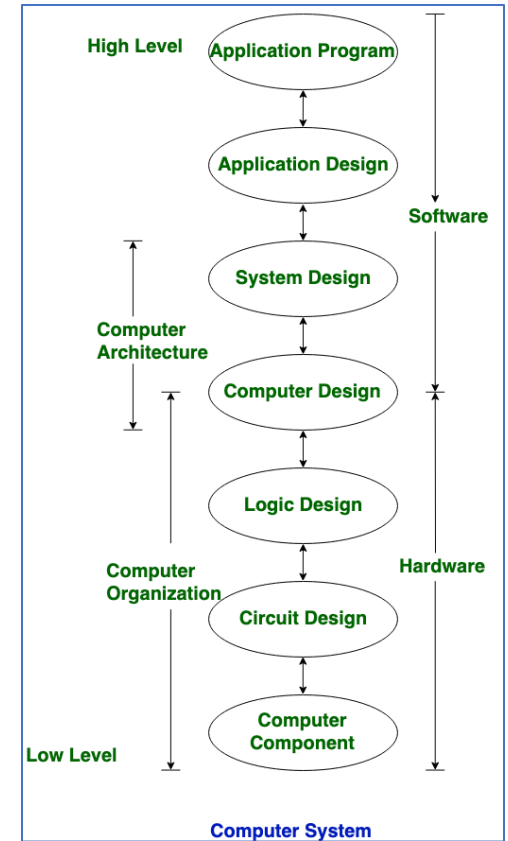
# Architecture & Organization

Architecture is those attributes visible to the programmer

- Architecture deals with the design of computers, data storage devices, and networking components that store and run programs, transmit data, and drive interactions between computers, across networks, and with users.
- Computer architects use parallelism and various strategies for memory organization to design computing systems with very high performance

Organization is how features are implemented

- Computer Organization is how operational parts of a computer system are linked together. It implements the provided computer architecture.
- Control signals, interfaces, memory technology. Circuit design. It deals with low-level design issues.



# Architecture & Organization

## Difference Between Computer Architecture and Computer Organization

Computer Architecture	Computer Organization
Architecture describes what the computer does.	The Organization describes how it does it.
Computer Architecture deals with the functional behavior of computer systems.	Computer Organization deals with a structural relationship.
Architecture indicates its hardware.	Where Organization indicates its performance.
Computer Architecture comprises logical functions such as instruction sets, registers, data types, and addressing modes.	Computer Organization consists of physical units like circuit designs, peripherals, and adders.
Architecture coordinates between the hardware and software of the system.	Computer Organization handles the segments of the network in a system.

# The Nature of Computing

Throughout history humans have relied mainly on their brains to perform calculation.

The earliest peoples used their fingers, pebbles (stone), or tally sticks for counting purposes.

The early computational aids that were widely used until quite recently are:

- The abacus
- And slide rule.

# The Nature of Computing

- An abacus is a mechanical device used to aid an individual in performing mathematical calculations. Used in 2700 B.C.
- An abacus is a calculating instrument that uses bits that slide along a series of wires or rods set in a frame to represent the decimal places. The right most column represent 1<sup>st</sup> decimal place, second column represent 2<sup>nd</sup> decimal place, and so on.



Fig: Abacus

# The Nature of Computing

## Slide rule

The slide rule, on the other hand, represents numbers by lengths marked on ruler like scales that can be moved relative to one another. By adding a length  $a$  on a fixed scale to a length  $b$  on a second, sliding scale, their combined length  $c = a + b$  can be read off the fixed scale. The slide rule's main scales are logarithmic so that the process of adding two lengths on these scales effectively multiplies two numbers. It has been in used till 1972.

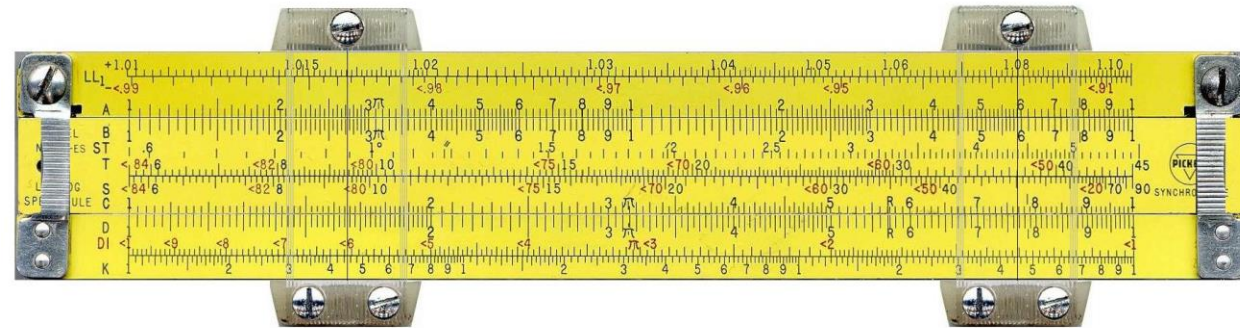


Fig: Slide rule

# The Elements of Computers

## **The brain versus the computer**

The brain is the center of the human nervous system, controlling our thoughts, movements, memories, and decisions.

With evolution, the human brain has become more and more complicated; many of its interesting properties are still not well understood by scientists.

Computers might be able to beat human brains every time when it comes to mathematical calculations, quantitative analysis, and game show questions, but that doesn't mean they're smarter overall.

# The Elements of Computers

## **The brain versus the computer**

Humans are better at analyzing new situations by recalling past experiences and making inferences about a new challenge. Humans are capable of qualitative analysis and emotional intelligence.

The brain performs two distinct functions: a control function that interprets the instructions and ensures that they are performed in the proper sequence and an executive function that performs specific steps such as addition, subtraction, multiplication and division. A pocket calculator often serves as an aid to the brain.



# The Elements of Computers

A computer has several key components that roughly correspond to those just mentioned, which are:

- Main Memory
- CPU
- ALU
- Input/Output

# The Elements of Computers

## Main memory

- corresponds to the paper used in the manual calculation. Its purpose is to store instructions and data.

## CPU (Central Processing Unit)

- is considered as the brain of a computer. It contains a program control unit (also known as an instruction unit) whose function is to fetch instructions from memory and interpret them.

## ALU (Arithmetic Logic Unit)

- which is a part of CPU's data processing or execution unit, carries out the instructions.

That's All  
Thank You