8-Bit Microprocessor (8085)

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Microprocessor Architecture, 2019


بسم الله الرحمن الرحيم


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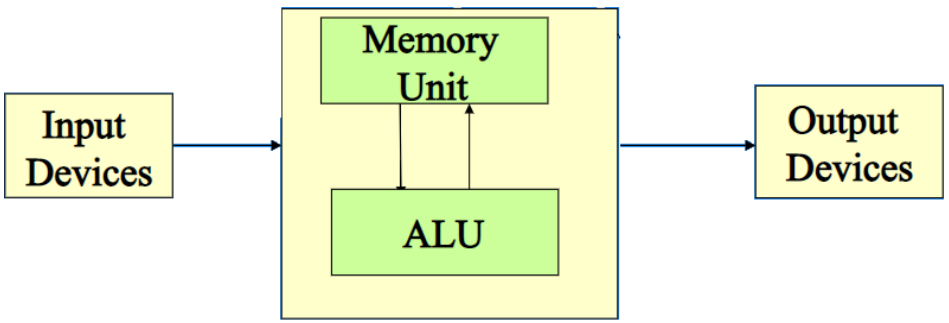
Introduction to Microprocessors

Definition

A computer: is a programmable machine that receives input, stores and manipulates data//information, and provides output in a useful format.

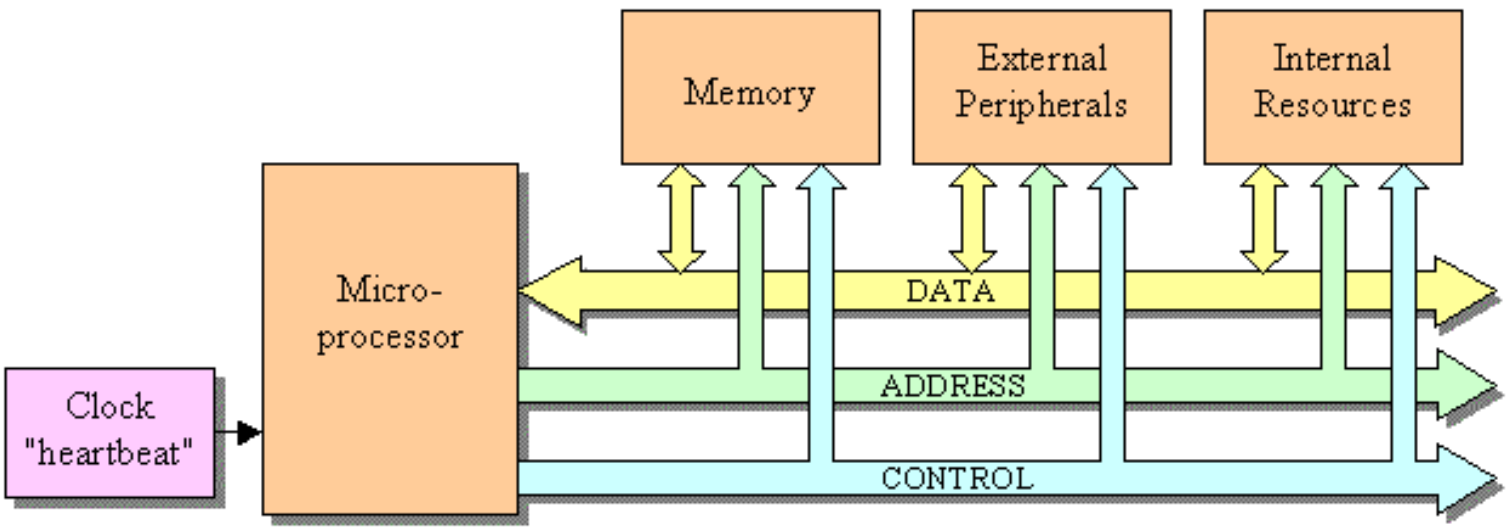


- CPU (ALU): Central Processing Unit[1]
- Memory.
- peripherals (Input/Output) .

[1] ALU represents the fundamental building block of the central processing unit (CPU) of a computer. Modern CPUs contain very powerful and complex ALUs.

Organization of A Microprocessor-based System (Microcomputer)

- Microprocessor
- Memory
  - ROM : Read Only Memory
  - RAM : Random Access Memory
- I/O
  - Keyboard
  - Display Device
- Clock: Square Wave Oscillator (Timing)
- System Buses (Communication)
  - Data Bus.
  - Address Bus.
  - Control Bus.

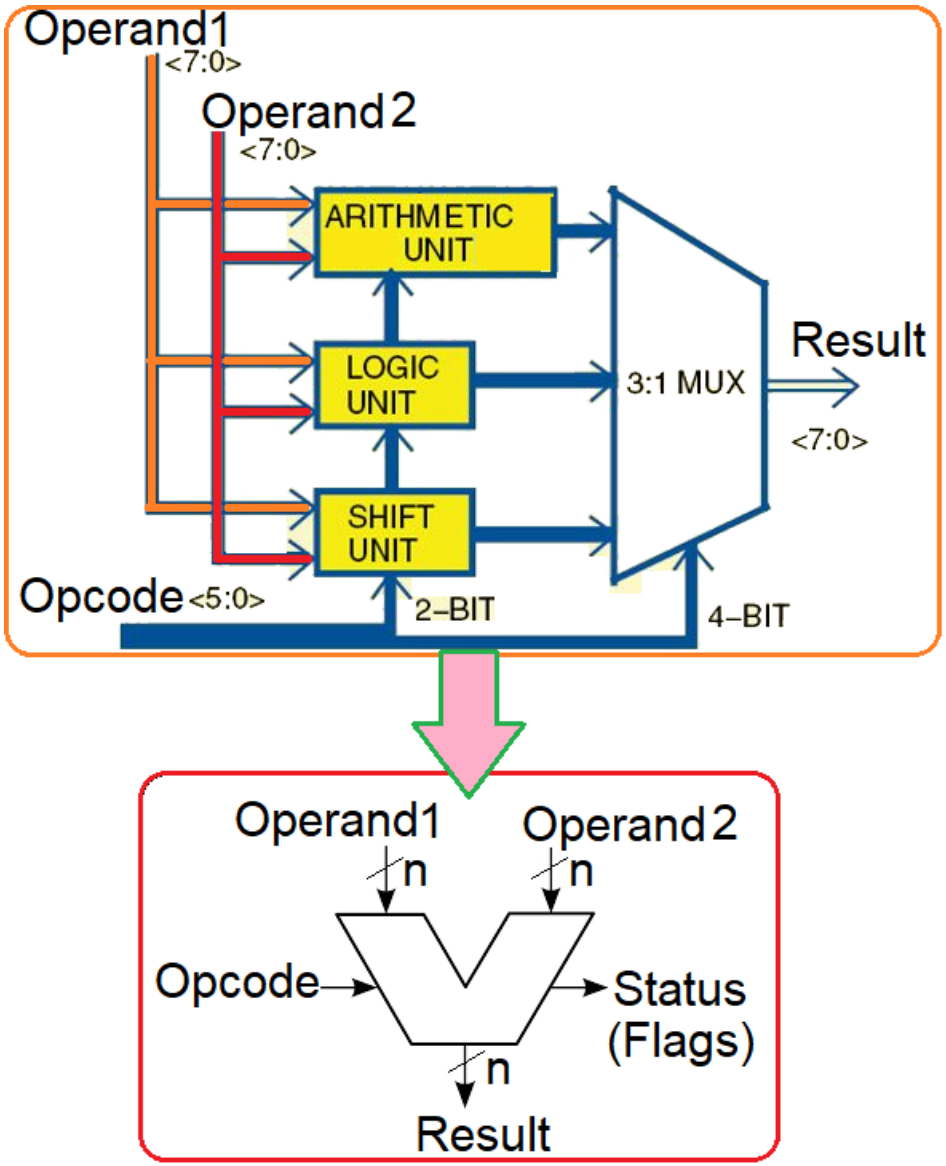


Microprocessor (CPU) components

- Arithmetic and Logic Unit (ALU).
- General and Special purpose registers.
- Timing and Control Unit.

Arthmatic and logic unit (ALU)

- Communicates & operates in binary numbers 0 & 1, called bits.
- Has a fixed set of instructions (machine language).
- operations:Addition, Subtraction, Increment, Decrement, Rotate, Logical AND, Logical OR, Logical XOR, Complement, Compare.

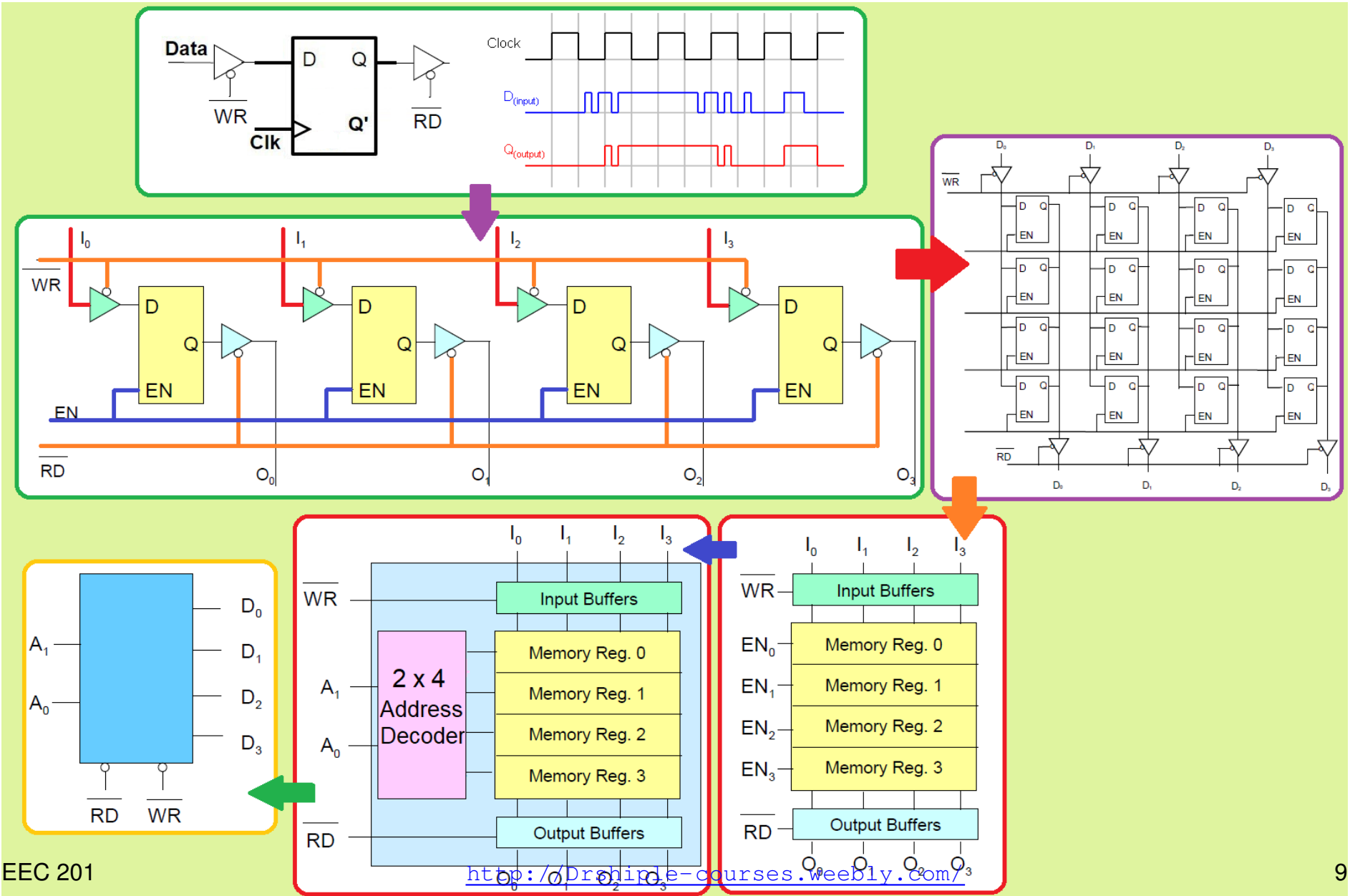


Memory

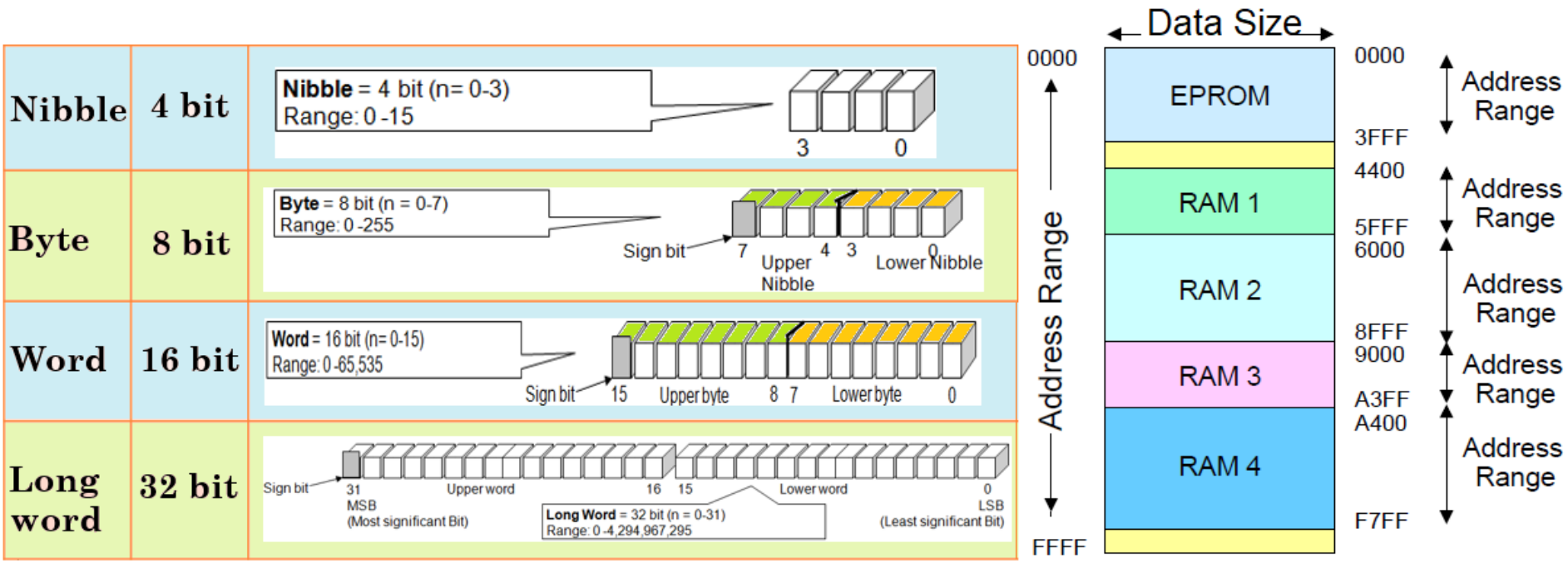
physical devices used to store data or programs (sequences of instructions) on a temporary or permanent basis.

RAM	ROM
Random-Access Memory	Read-Only Memory
Erased when the power is turned off (volatile)	Non-volatile.

Memory Elements



Memory address range



Calculate address bus bites needed for each memory segment?

System buses (communication)

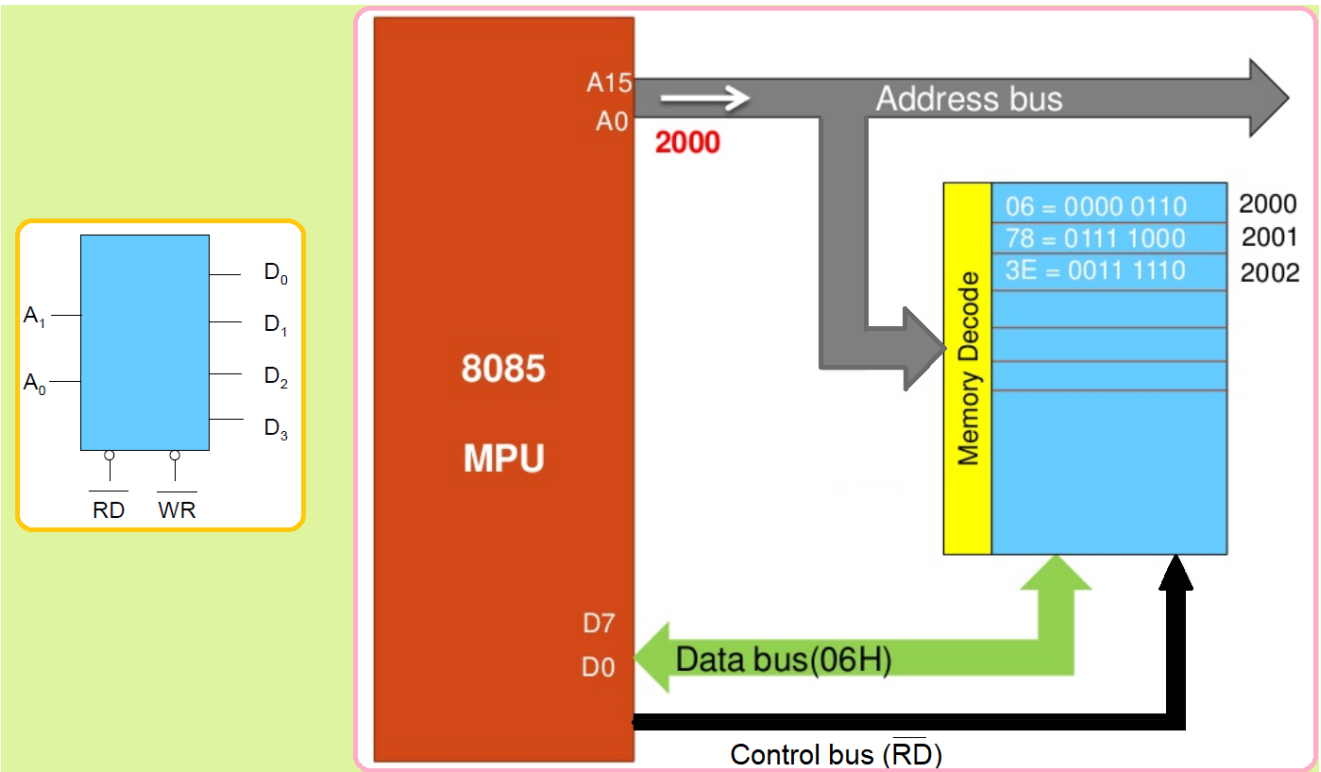
Address Bus:

- Unidirectional
- 16 bits

$$2^{16} = 2^6 \times 2^{10}$$
$$\approx 64 \times 1K$$
$$\approx 64K\ Byte$$

exactly = 65,536

$\because 2^{10} = 1024 \neq 1000$



Data Bus: why?

- Bidirectional
- 8 bits. (max numb?)

Control Bus:

- Comprised of various single lines ($\overline{RD}$, etc).
- 16 bits

Excercise

Calculate the memory size of 24 address lines and 16 data lines?
Memory size =$2^{24} = 16M$ bytes of addressable memory.

Software Flow