

Applications software features (some)

Word processor

- Different fonts with possibilities of bold, italic etc.
- Different page size and columns.
- Header and footer

Spreadsheet

- Calculations
- Graphs
- Functions

DBMS

- Tables
- Relationship between tables
- Reports

Web browser

- Search for information
- Bookmarks
- History of visited pages

Presentation software

- Adding text, pictures and videos
- Animation of text
- Master slide

Desktop publishing

- Merging text with words
- Having an index
- Can insert tables and graphs.

Architecture: Parts of a computer

1. **Input device:** to give data (values) to the computer and instructions e.g keyboard, mouse etc

2. **Output device:** the user receives results from the computer e.g. printer, speakers etc
3. **CPU:** Central Processing Unit – it processes data i.e. it works the commands
4. **Main memory:** mainly the RAM (Random Access memory). Main memory is volatile i.e. when the computer is switched off all the contents disappear. All programs that are being executed are all inside the RAM. Each location of main memory has an address. For example in the following diagram, that shows a part of RAM, there is the value 31 at location 30455.

30452	
30453	
30454	65
30455	31
30456	-8
30457	
30458	
30459	

5. **Secondary storage:** e.g. hard-disk, pen drive (USB drive) is not volatile i.e. it keeps the data even when the computer is switched off. It can hold a lot of data and programs. It holds the programs and data so that when they are needed they are copied in the RAM.

	Capacity	Technology	Direct or Sequential	Cost
Pen drive	64 GB	Electronic	D	\$
Hard disk	2 TB	Magnetic	D	\$\$\$
SSD	250 GB	Electronic	D	\$\$\$\$
CD	700 MB	Optical	D	\$
DVD	4.7 GB	Optical	D	\$\$
Floppy disk	1.2 MB	Magnetic	D	-
Tape	150 TB	Magnetic	S	\$\$

6. **System bus.** It consists of three buses between the CPU and RAM. A bus carries information from one place to another.
 - a. Data bus: it carries data from the CPU to RAM and vice versa.

- b. **Address bus:** it carries addresses from the CPU to the RAM. The width of the address bus decides how large is the RAM. If n is the number of locations in the RAM and b is the width of the address bus then $n=2^b$.
 - c. **Control bus:** it carries a command. This command is either 'read' or 'write'.
7. **Cache:** fast RAM. In cache the computer puts the most frequently used data and programs.
8. **ROM:** stands for Read-Only Memory. It is not volatile. It holds the bootstrap loader. This is a program that starts the process of copying the operating system from secondary storage to RAM. ROM also holds programs that are frequently used by the computer.
9. **Fetch-execute cycle.** This is the the process performed by the CPU. Also called the Fetch-Decode-Execute cycle. It describes how a CPU executes instructions one after the other. The order is the following:
- 1. Bring the next command from main memory.
 - 2. Interpret this command.
 - 3. Execute this command.
 - 4. Return to step 1.
10. **Arithmetic and Logic Unit (ALU):** A part of the CPU. It performs the arithmetic and the logic calculations for example it can find the answer of $2.3+8.44$ and also of $(a>b)$ AND $(b==c)$. If $a=4$, $b=1$ and $c=1$ the result of the last expression is 'true'. If $a=8$, $b=4$ and $c=5$ the result would be 'false'.
11. **Control Unit (CU):** This is also a part of the ALU. Its role is to:
- 1. instruct RAM to send the next instruction
 - 2. interpret the instruction sent by RAM
 - 3. instruct the ALU what to do
12. **Bootstrap loader:** a program that starts the process that leads to the operating system being loaded into RAM. The OS is the first program loaded inside the RAM.
13. **Hertz (Hz):** unit for the speed of processors. 1Hz represents one operation in one second. 4MHz, for example, represents 4 million operations per second. 2GHz indicates 2 billion operations per second.

14. Byte (B): 8 bits. Note that 'b' stands for bit while 'B' stands for byte.

KB	2^{10} bytes	1024 bytes
MB	2^{20} bytes	About a million bytes
GB	2^{30} bytes	About a billion bytes
TB	2^{40} bytes	About a trillion bytes

15. **Memory read:** (THE CPU READS FROM MEMORY) this refers to the process where the CPU reads information from RAM for example if the Control bus carries a 'read' instruction and the Address bus carries the value 2377 this would mean that the CPU would like to read the contents of address 2377 from RAM.

16. **Memory write:** (THE CPU WRITES IN RAM) this refers to the process where the CPU would like to write a value in RAM for example in the case where the Control bus carries a 'write', the Data bus carries 58 and the Address bus carries a 650622 this would mean that the CPU would like to write the value 58 at the location whose address is 650622.

17. **Registers:** a register is a location inside the CPU. Some registers are the following:

- a. **PC:** Stands for Program Counter. This holds the address of the next instruction to be executed.
- b. **CIR:** Stands for Current Instruction Register. It holds the instruction being executed.
- c. **Accumulator:** it can hold a value and also make operations on it.
- d. **MDR:** stands for Memory Data Register. It works with the data bus. Data to be sent to RAM is placed here before it is carried to RAM. The register also holds data that has been sent by the RAM.
- e. **MAR:** It stands for Memory Address Register. An address is placed here by the CPU before being carried to RAM.