INTRODUCTION TO COMPUTER

اعداد

م.م ايناس إسماعيل عمران

COMPUTER DEFINITION

• A computer : is an electronic device that is designed to work with information.

Or a computer is a physical machine that is able to store , process, and manipulate data and display the results very fast .

The purpose of computer is to process data into information.

• The Basic Operation of Computer…

1. Takes DATA, then…
2. Processes the DATA, and then…
3. Displays the results.

Parts of the Computer

PARTS OF COMPUTER



INPUT DEVICES

- KEYBOARD
- MOUSE
- JOYSTICK
- DIGITAL CAMERA

PROCESSING DEVICE

OUTPUT DEVICES

- MONITOR
- PRINTER
- SPEAKERS

STORAGE DEVICES

- HARD DISK
- DISKETTE
- COMPACT DISC (CD)

PART OF COMPUTER
COMPUTER SYSTEM CAN BE DIVIDED INTO :

1. **Hardware Part (H/W)** : the physical equipment's of the machine. the hardware components can be divided into:

- External Devices Like The Monitor, Keyboard , Mouse ..Etc.
- Internal Devices Like Cpu; Memory; Hard Disk… Etc.

2.**Software Part (S/W):** The Collection Of Computer Programs, Procedures And Documentation That Perform Tasks On A Computer System Like Windows XP; MS Word; And MS Excel…… Etc. Computer Software Can Be Divided To Three Parts: Systems Software , General Purpose Software , And Special Purpose Software .

3.User Part: The Person Who Activates The Machine. Users are either general users or specialist users.

Some Of The Fields That Depend Widely On Computers :

- 1. Education
- 2.Medical Science
- 3. Military
- 4.Traveling
- 5. Business
- 6. Communications
- 7.Industry
- 8. Entertainment And Movies
- 9.Banking
- 10.Mathematical And Scientific Research

In What Ways Is A Computer Used?

- TODAY WE CAN…
- send electronic mail (e-mail) to a friend.
- view and edit digital pictures on your computer.
- listen to your favorite music on the internet.
- watch the latest DVD on your computer.
- with the use of the internet and a web camera, talk and see someone from another country with the use of computer.
- pay your bills online.

Advantages Achieved From Using Computer Systems

1. Reducing The Time Needed For Job Completion .

2. Cost Efficient, It Decreases The Cost Of The Operations In These Manners:

A- Decreasing The Number Of Human Workers

B- Using Simulated Programs Like The Ones Used In Training The New Pilots.

3. Enhance The Quality Of Work.

4. Continuity

5.The Ability To Store Amount Of Data And Retrieve Them.

COMPUTER CLASSIFICATIONS

Computers Are Classified Into Many Types According To :

First : According To The Size Of Computer, Computers Are Divided To The Following Types :

1. Supercomputer : The Biggest Of Size And Most Expensive In Price Than Any Other Type . It Can Process Trillions Of Instructions In Seconds. It Is Used By Governments For Their Different Calculations And Heavy Jobs.

2. Mainframe :Can Also Process Millions Of Instructions Per Second And Is Capable Of Accessing Billions Of Data. This Computer Is Commonly Used In Big Hospitals And Air Line Reservation Companies. This Computer Is Very Expensive.

COMPUTER CLASSIFICATIONS

3. Minicomputer – This Computer Less Than Mainframe In Work And Performance. These Are The Computers Used By The Small Type Of Business Personals , Colleges , Etc.

4. Microcomputer - These Computers Can Be Divided Into:

A) Personal Computer (PC) : This Is The Computer Mostly Preferred By The Home Users. These Computers Are Lesser In Cost Than The Computers Given Above And Also Small In Size.

B) Laptop And Notebook Computer : It Is A Small Size And Low Weight Computer.

COMPUTER CLASSIFICATIONS

Second: According To The Purpose Of Use, The Digital Computers Can Be Classified To:

1. **General Purpose Computers** ;Is Designed To Perform Almost All The Need Of The Society And Can Be Used By All Users . They Can Be Used For Payroll ,Graphs, Business, Etc.

2. **Special Purpose Computers** ;Which Can Be Used By Some Users And These Computer Are Designed To Handle Specific Problem. Example The Computer Used For Airline Reservation, satellite Tracking ,Etc.

Introduction :: Computer Organization

technology has made incredible improvement in the past half century. In the early part of computer evolution, there were no stored-program computer, the computational power was less and on the top of it the size of the computer was a very huge one. Today, a personal computer has more computational power, more disk storage, smaller in size and it is available in affordable cost. This rapid rate of improvement has come both from advances in the technology used to build computers and from innovation in computer design.

Introduction (cont.)

The task that the computer designer handles is a complex one: Determine what attributes are important for a new machine, then design a machine to maximize performance while staying within cost constraints.

Computer organization :refers to the operational units and their interconnections that realize the architectural specifications. Examples of organizational attributes include those hardware details such as control signals, interfaces between the computer and peripherals, and the memory technology used.

Basic Computer Model and different units of Computer

- **The model of a computer can be described by four basic units. These basic units are:**
- **❍ Central Processor Unit**
- **❍ Input Unit**
- **❍ Output Unit**
- **❍ Memory Unit**

Basic Computer Model and different units of Computer(cont.)

A. Central Processor Unit [CPU] :

Central processor unit consists of two basic blocks :

- **The program control unit has a set of registers and control circuit to generate control signals.**
- **The execution unit or data processing unit contains a set of registers for storing data and an Arithmetic and Logic Unit (ALU) for execution of arithmetic and logical operations.**

B. INtput Unit

With the help of input unit data from outside can be supplied to the computer.. Example of input devices: Keyboard, Mouse, Floppy disk, CD-ROM drive etc.

Basic computer (cont.)

C. Output Unit :

With the help of output unit computer results can be provided to the user or it can be stored in storage device permanently for future use. Example of output devices: Printer, Monitor, etc.

D. Memory Unit :

Memory unit is used to store the data and program. CPU can work with the information stored in memory unit. This memory unit is termed as primary memory or main memory module..

Basic computer (cont.)

- **There are two types of semiconductor memories :**

- **Volatile Memory : RAM (Random Access Memory).**

- **Non-Volatile Memory : ROM (Read only Memory), PROM (Programmable ROM) EPROM (Erasable PROM.**

Random-access memory (RAM)

- **is a form of computer data storage that stores data and machine code currently being used. A random-access memory device allows data items to be read or written in almost the same amount of time inside the memory.**
- **Data stored in these chips is volatile -- it is lost when power is turned off.**

Read Only Memory(ROM)

- Data stored in these chips is non volatile -- it is not lost when power is turned off.
- On turn on, the computer loads BIOS from ROM
- Data stored in these chips is either unchangeable or requires a special operation to change
- Applications: Video games, calculators, etc

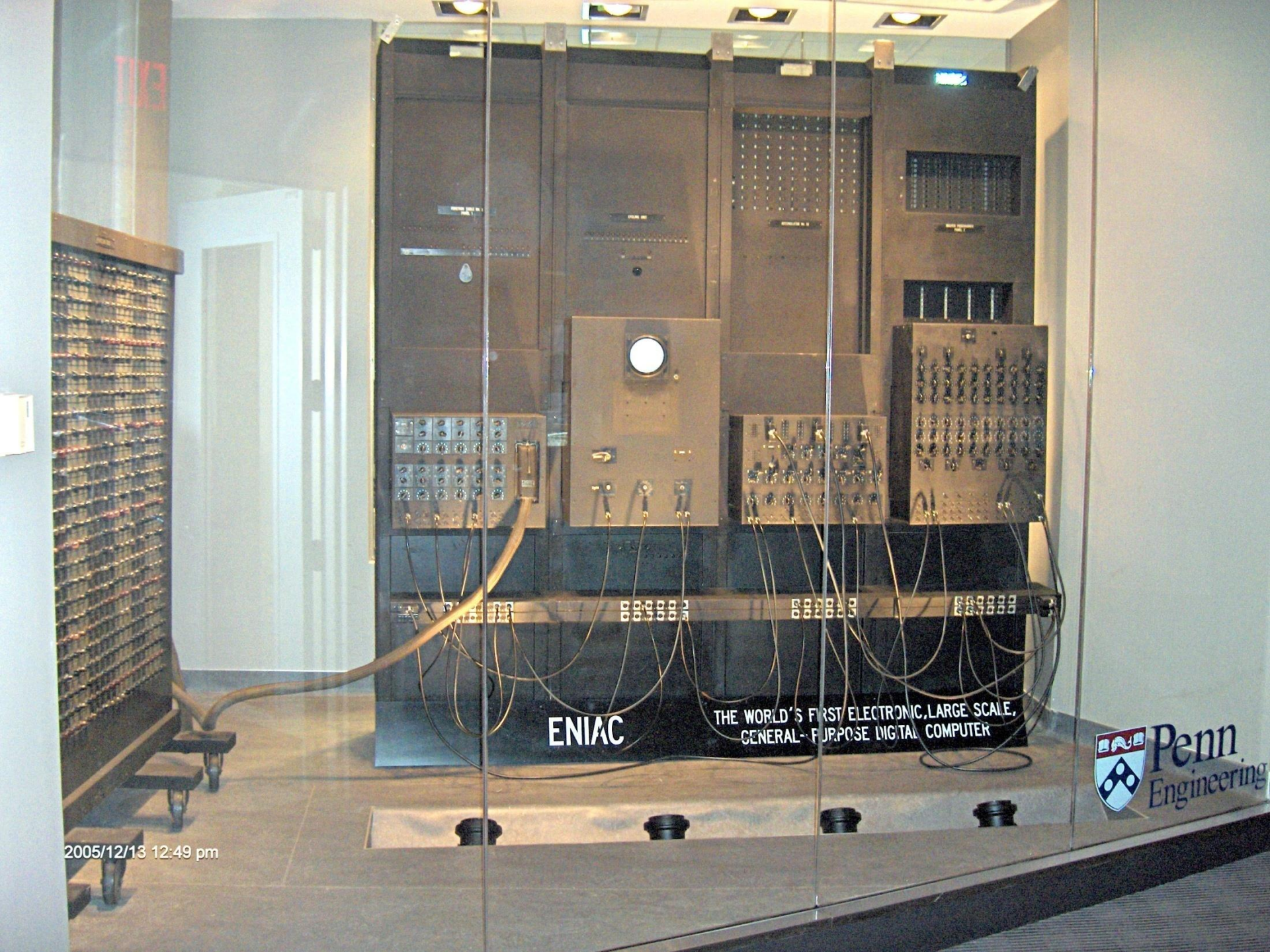
Secondary Memory :

- There is another kind of storage device, apart from primary or main memory, which is known as secondary memory. Secondary memories are non volatile memory and it is used for permanent storage of data and program.
- Example of secondary memories:

- Hard Disk, Floppy Disk, Magnetic Tape ------ These are magnetic devices.
- CD-ROM ------ is optical device

Computer Generations

- **First Generation : computers were huge , slow , expensive , and often undependable.**
- **In 1946 two Americans (Eckert and John) built the ENIAC (Electronic Numerical Integrator and Computer) which used vacuum tubes instead of the mechanical switches.**
- **The ENIAC used thousands of vacuum tubes which took up a lot of space and gave off a great deal of heat.**
- **Very costly**
- **Slow input and output devices**


ENIAC
THE WORLD'S FIRST ELECTRONIC, LARGE SCALE,
GENERAL- PURPOSE DIGITAL COMPUTER
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- **Second Generation :1959-1964 (the Era of transistors)**
- **In1947 three scientists (john, William , and Walter); invented What Would replace the vacuum tube forever, This invention Was the transistor .**
- **The transistor was faster than the vacuum tube.**
- **more reliable ,smaller, much cheaper to build and no heat compared to vacuum tubes.**

Some computers of this generation were:

IBM 1620

IBM 7094

CDC 1604

CDC 3600

UNIVAC 1108

COMPUTER - SECOND GENERATION

Third Generation: 1965-1970 (Integrated Circuits)

➢" **The integrated Circuits" –or semiconductor chip,** packs huge number of transistors onto a single Wafer of silicon.

➢**(Robert and jack) of Texas discovered integrated circuits.** Placing such large numbers of transistors on a single chip vastly increased the Power of a single computer and shrinking both size and cost of computers and enhancing its power.

Some computers of this generation were:

IBM-360 series
Honeywell-6000 series
PDP(Personal Data Processor)
IBM-370

Fourth Generation:1971-Today (The Microprocessor)

- "This generation can be characterized by both

1. using (Very Large Scale Integrated (VLSI) circuits. (millions of transistors put onto one integrated circuit chip).
2. And the design of the Microprocessor_ a single chip that could do all the processing of a full _scale computer. Faster speeds and more calculations could be reached by computers by putting millions of transistors onto one single chip.

Some computers of this generation were:

DEC 10

STAR 1000

PDP 11 CRAY-1(Super Computer)

CRAY-X-MP(Super Computer)

- **COMPUTER - FIFTH GENERATION**
- **The period of fifth generation is 1980-till date**
- **in 1981 entered the PC (personal computer)market.**
- **In the fifth generation, the VLSI technology became ULSI (Ultra Large Scale Integration)technology, resulting in the production of microprocessor chips having ten million electronic components.**

Today Intel and Pentium Processors are widely Used .

Some computer types of this generation are:

- **Desktop**
- **laptop**
- Laptop
- NoteBook

Input Technologies

a) keyboards

Is the most common input device the keyboard is designed like a typewriter but with additional function keys.

b) Mice and trackballs

A mouse is hand held device used to point a cursor at a desired place on screen, such as an icon, cell in a table. A variant of the mouse is the trackball, which is often used in graphic design, the user holds an object much like a mouse but rather than moving the entire device to move the cursor is move only the ball.

c) Touch screen

Is a technology that divides the computer screen Into different areas. Users simply touch the desired area (often buttons or squares) to trigger an action.

d)a stylus

Is a pen style device that allow the user to touch options of predetermined menu.

e) Joysticks

Is used mainly at workstations that can display dynamic graphics, they can also used to play video games. Many games require a joystick for the proper playing of the game.

f) Voice input for PCs (microphones)

Early voice recognition systems offered very poor results, due to the limitations of the software combined with hardware limitations. It takes a lot of CPU processing power to convert the spoken word into text which appears on the screen. Things are changing rapidly and recent systems allow you to talk to a PC and see text appear on the screen. Most of these systems require an initial training period, where you train the software to respond to your particular voice. While still not perfect this is a key technology of the future.

g) Web Cams

Ever since it was invented, the Web has become increasingly interactive. You can now use a small digital movie camera (a Web cam) existed on the PC monitor to allow two-way communication involving not just text Communication but sound and video communication as well.

h) Light Pens

A light pen is used to allow users to point to areas on a screen and is often used to select menu choices.

i) Scanners

A scanner allows you to scan printed material and convert it into a file format which may be used within the PC. You can scan pictures and then manipulate these inside the PC using a graphics application of your choice. In addition, you can scan printed text and convert this not just to a picture of the text but also to, actual text which can be manipulated and edited as text within your word-processor. There are a number of specialist programs, generically called OCR (Optical Character Recognition) programs which specifically designed for converting printed text into editable text within your applications.

j) Digital Cameras

A digital camera can be used in the same way a traditional camera can, but instead of storing images on rolls of film, the images are stored digitally in memory housed within the camera. These pictures can easily be transferred to your computer and then manipulated within any graphics programs which you have installed on your computer.

Output Technologies

a) Monitors

Are the video screens used with most computers that display input as well as output like television sets, monitors come in a variety of sizes and color/resolution quality .and like television sets, the common desktop monitor uses cathode ray tube (CRT) technology to make beams of electrons to the screen. The points on the screen known as pixels, the more pixels on the screen, the better resolution.

- Here are some other useful facts about monitors:
- 1-portable computers use a flat screen that uses liquid crystal display (LCD) technology not (CRT)
- 2-LCDs use less power than CRT monitors but cost six to eight times what an equivalent CRT
- **b) Printers**
- **There are three types of printers:**

1-impact printers:

- Work like typewriters, using some kind of striking action, It mechanically strike the papers using pin (2 to 9) to transfer the ink on a ribbon to the paper.

- these devices cannot produce high-resolution graphics, and they are relatively slow, noisy, and subject to mechanical failure, although inexpensive, they are becoming less popular.
- **2- Non impact printers**
- Come in styles laser printers. Are higher speed, high _quality devices that uses laser beams to write information on photo, laser printers produce very high quality resolution text and graphics. Non-impact printers have advanced instead of using metal pins, they can use drops of ink measured in micrometers. Non-impact printers are also much quieter, making it possible for them to be used out in the open in office settings.

- **3-Inject printers**
- work differently, by shooting fine streams of colored ink onto the paper to create digital image. These are less expensive than laser printers, but offer less resolution quality.
- **c) Plotters**
- Are printing devices that use computer-directed pens for creating maps and architectural drawings.
- **d) Voice output**
- A voice output system constructs the voice equivalent to textual words, which can then be played through speakers.

- **Port type:**
- **External Ports** (available at the back of the computer)
- provides the availability to plug in speakers, headphones, microphones.

- **Serial Port**
- The serial port is a socket located at the back of your computer which
- enables you to connect items to the computer, such as a modem. They are labelled as COM1 or COM2.

- **Parallel Port**
- The parallel port is a socket located at the back of your computer which enables you to connect items to the computer, such as a printer. It is commonly labelled as LPT1 or LPT2.

- **Universal Serial Bus (USB) Port**
- The Universal Serial Bus is a new item within the PC. You will see one or more USB sockets at the back of the system unit, allowing you to plug in devices designed for the USB. These devices include printers, scanners and digital cameras.

- **Computer Performance**
- Know some of the factors which impact on a computer's performance, such as: CPU speed, RAM size, the number of applications running.
- **Factors Affecting performance**
- **CPU Clock speed:** The computer clock speed refers to the number of pulses per second for the processor Include how fast the CPU will run. The higher the clock speed the faster the computer will work for you. Clock speed is usually measured in MHz (megahertz, or millions of pulses per second) or GHz (gigahertz, or billions of pulses per second).

- The original IBM PC ran at 4.77 MHz whereas modern PCs will run at over 2000 MHz, Today's personal computers run at a clock speed in the hundreds of megahertz and some exceed one gigahertz.
- **RAM size:** As a rule the more memory you have the faster the PC will appear to operate. Windows also uses the hard disk a lot, so logically the faster the hard disk can operate then again the faster the PC will appear to run.

- **Hard Disk Speed and Storage:** Hard disks are also measured by their speed, defined by the disk access time, which is measured in milliseconds.
- The smaller this access time the faster the hard disk will store or retrieve data. The data storage capacity of hard disks continues to increase as new products are released. The disk storage capacity is measured in Gigabytes 23(GBytes). 1 GByte is equivalent to 1024 Mbytes.

- **Free Hard Disk Space:** To get the most out of your Windows based PC, you not only need a fast hard disk but also a large hard disk with plenty of "spare space". This is due to the fact Windows is constantly moving data between the hard disk and RAM (Random Access Memory). Microsoft Windows will create many so-called “temporary files” which it uses for managing your programs. In fact, if you have very little free hard disk space you may find that Microsoft Windows will not be able to run your programs at all.

- **De-fragmenting Files:** If you are running Windows you may find that if you click on the Start menu, select Programs, and then select the Accessories / System tools group, there is a de-fragmentation program. Running this periodically may noticeably speed up the operation of your PC. When you use a PC, over a period of time the files get broken up into separate pieces which are spread all over the hard disk. De-fragmentation means taking all the broken up pieces and joining them back together again.

- **Multitasking Considerations:** Windows is a multitasking system, which means that it can run more than one program at a time. However the more programs which are running at the same time, the slower each one will run.
- To some extent this slowing effect depends on what each program is doing.
- Editing a large, full color picture for instance can take up a lot of CPU time.

Computer Memory

- **A-Primary storage**
- There are two basic categories of memory:
- **RAM (Random Access Memory)** The memory is the part of the computer that holds information (data and instruction) for processing so name because small amounts of data and information that will be immediately used by the CPU are stored there

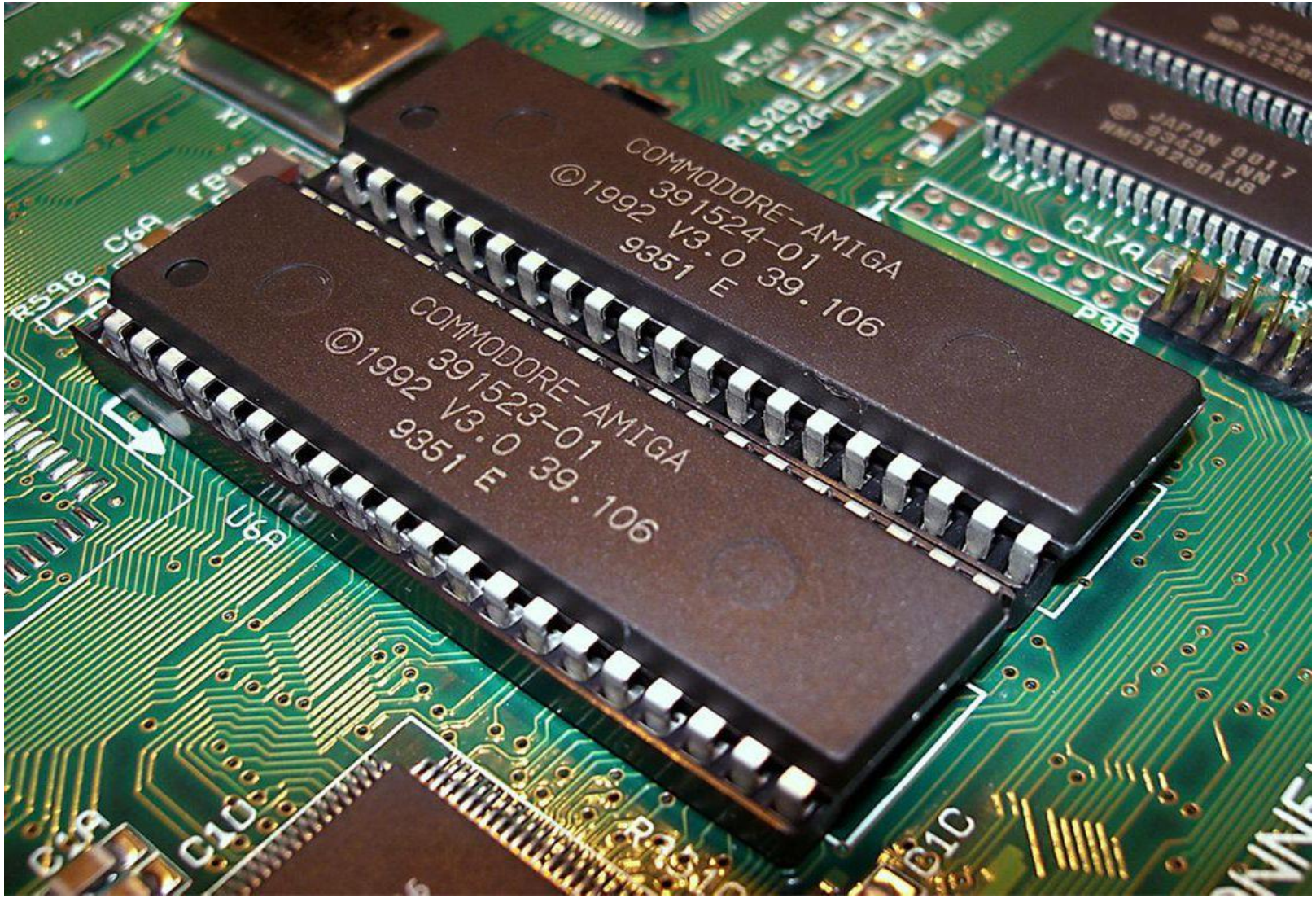
The specific functions of main memory

- The RAM is where instructions, values are stored at runtime
- The RAM can be accessed a lot faster than secondary storage, In general the time between primary memory in nanoseconds.
- All data and instructions are lost when the power is turned off (volatile)
- Each instruction & piece of data in the RAM has a unique address

Read Only Memory (ROM)

- **Read-only-memory (ROM)** is the place (a type of chip) where certain critical instructions are secured. ROM is nonvolatile and retrieve these instructions when the power to the computer is turned off. The (read only) means that these instructions can be read only by the computer and cannot be changed by the user.

ROM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Primary Storage Devices

- **ROM –**
- Read Only Memory.
- Permanent memory.
- Non-volatile memory.
- Can't be edited.
- Stores important program from system software, regarding functioning of computer. (Booting)

- **RAM –**
- Random Access Memory.
- Volatile memory.
- Temporary memory.
- Holds data up to saving
- Bring required programs when user opens a file.

B-Secondary Storage

where much larger amount of data and information (an entire software program, for example are stored in Hard disk

- **There are two methods for accessing the data from it :**

1. **Sequential –** This is the method in which we search the data sequentially or line by line until you find the desired data. E.g.. Magnetic tape, etc.
2. **Direct –** This is the method in which computer can go directly to the information that the user wants. e.g. magnetic disk, optical disk, etc.

Magnetic tape

Optical Disk vs Magnetic Disk

VS

Memory Capacity

- **Bit:** All computers work on a binary numbering system, i.e. they process data in ones or zeros. This 1 or 0 level of storage is called a bit. Often hardware is specified as a 32-bit computer, which means that the hardware can process 32 bits at a time. Software is also described as 16 bit, 32 bit or 64 bit software.

Memory Capacity

- CPU process only **0s** and **1s,** all data are translated through computer languages into series of these binary digits, or bits.

Eight bits are needed to represent a character. This 8-bit string is known as a byte. The storage capacity of a computer is measured in bytes. **The byte memory capacity is as follows**:

1- Byte: A byte consists of eight bits.

2- Kilobyte: A kilobyte (KB) consists of 1024 bytes.

3- Megabyte: A megabyte (MB) consists of 1024 kilobytes, (1024*1024) byte approximately 1,000,000 bytes.

4- Gigabyte: A gigabyte (GB) consists of 1024 megabytes, (1024*1024*10240byte) approximately 1,000,000,000 bytes.

5- Terabyte: A terabyte (TB) consists of approximately 1,000,000,000,000 bytes.

Abstract

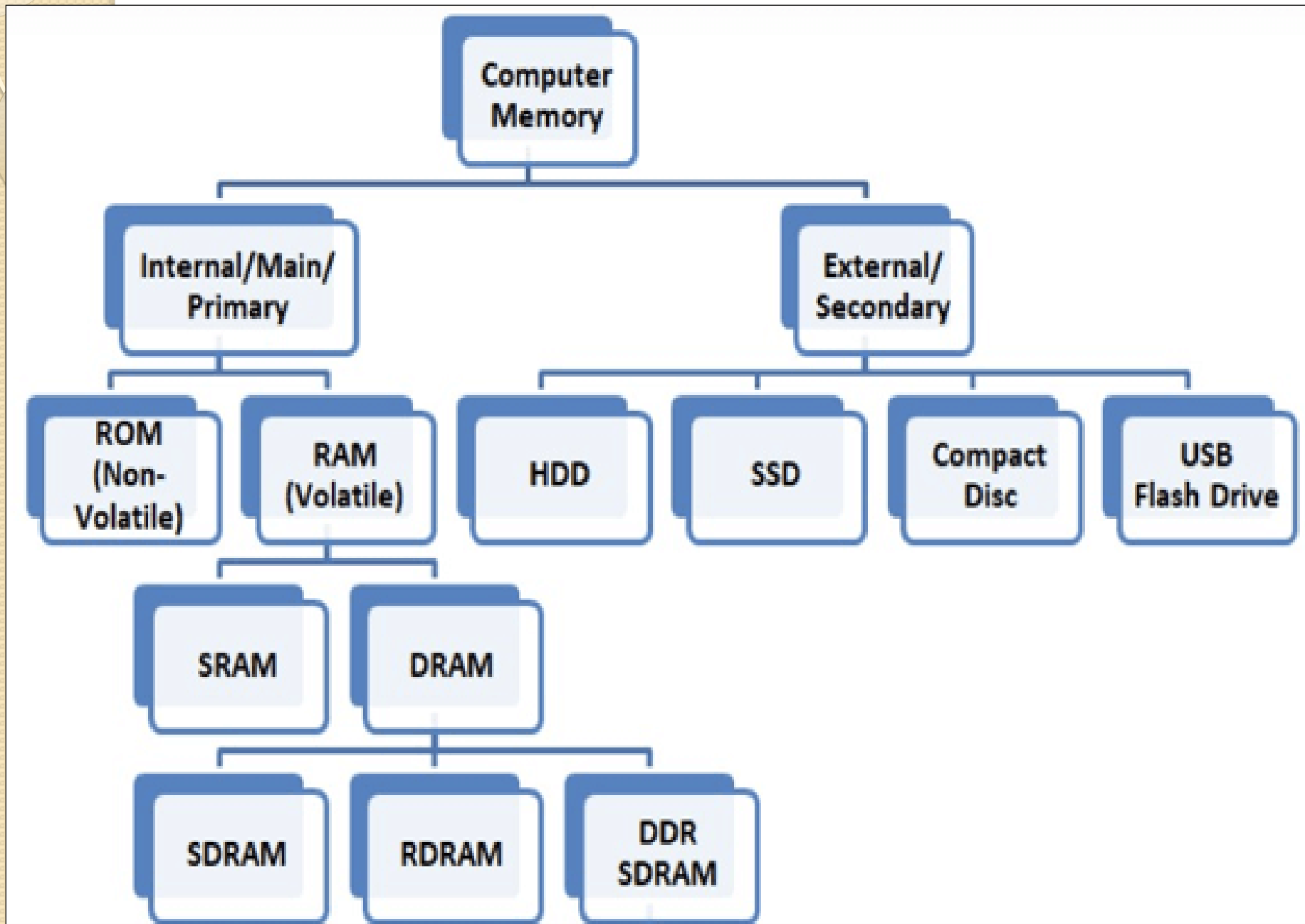
- **The primary memory** stores currently executing instructions.

RAM is Random Access Memory which loses its contents when the computer is switched off (it is volatile). instructions and data can be loaded into it.

ROM is non-volatile and is used to store programs permanently (the start-up or " boot " instructions, for example), the computer cannot store anything in this type of memory.

secondary storage (also known as backing store) such as tapes or discs

Memory Type (Abstract)



HDD AND SSD

- A **hard disk** drive (**HDD**) is a traditional storage device that uses mechanical platters and a moving read/write head to access data. A solid state drive (**SSD**) is a newer, faster type of device that stores data on instantly-accessible memory chips

Difference Between HDD AND SDD

SSDs in general are more reliable than **HDDs**

Because not having moving parts.

SSDs commonly use less power and result in longer battery life because data access is much **faster** .With their spinning disks, **HDDs** require more power when they start up than **SSDs**.

Type of RAM

The RAM chips are of two types-

Dynamic RAM(DRAM)

A form of volatile memory which also requires the stored information to be frequently re-read and re-written, or refreshed, otherwise it would vanish.

Static RAM (SRAM)

A form of volatile memory similar to DRAM with the exception that it never needs to be refreshed.

Difference Between Static RAM & Dynamic RAM

EDO DRAM: 3

- أنواع ذاكرة الوصول العشوائي يوجد أنواع عديدة من ذاكرة الوصول العشوائي تستخدم في الحواسيب ومنها الآتي:
- ١ :**SRAM** هي اختصار لـ (بالإنجليزية static random access memory)، أي ذاكرة الوصول العشوائي الثابتة، وسميت بالذاكرة الثابتة لأنّها تحتفظ بالبيانات مخزنة، طالما أنّ الحاسوب موصول بالطاقة الكهربائية، لكنها لا تستطيع ذلك بمجرد قطع التيار الكهربائي عن الحاسوب، غير أنّها أسرع من ذاكرة الوصول العشوائي النشطة التي تحتاج إلى إجراء عملية إنعاش بين حينٍ والاخر، وهي تقوم بتخزينِ بياناتٍ أكثر لأنّها تضم في تركيبها رقاقاتِ ذاكرةٍ أكثر، وغالباً ما تستخدم ضمن الذاكرة الأساسية الثابتة في وحدات المعالجة الرئيسية للحواسيب، بينما تستخدم ذاكرة الوصول العشوائي النشطة من أجل بيانات نظام تشغيل الحاسوب وبرامجه، وملفاته.

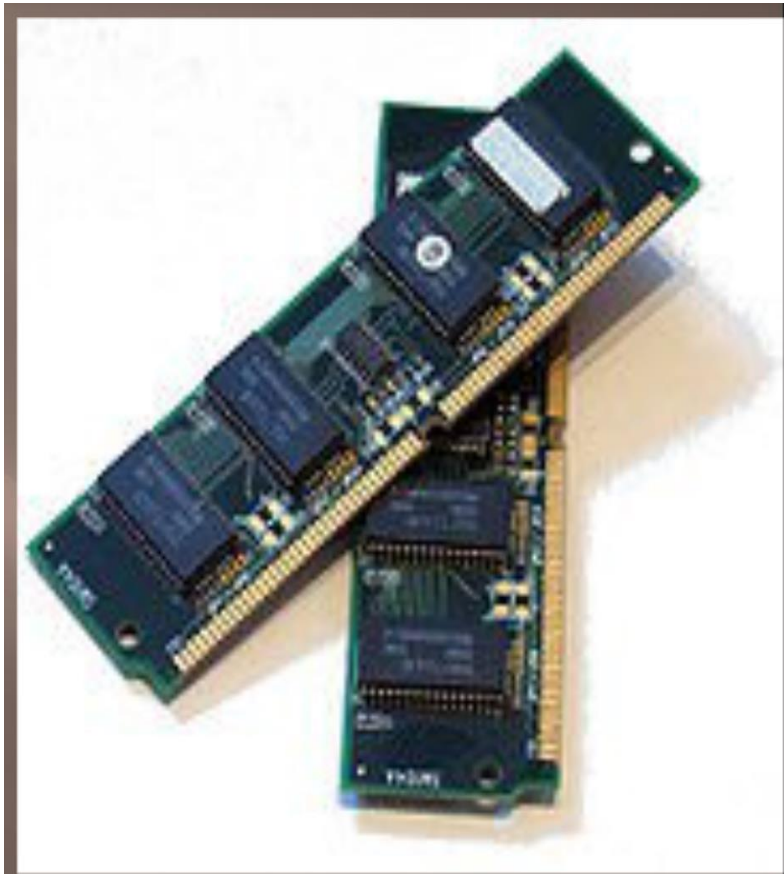
Type of RAM

- **DRAM: 2** هي اختصار لـ(بالإنجليزية dynamic : random access memory)، أي ذاكرة الوصول الديناميكية أو النشطة، وهي ذاكرة تخزن البيانات لمدّة قصيرةٍ جداً (أقل من ثانية)، ولذلك هي تحتاج إلى عملية إنعاش بشكلٍ دائم للحفاظ على تدفق المعلومات، وهي تعمل بهذا الشكل، حتّى لو بقي الحاسوب مرتبطاً بالطاقة الكهربائية، ويحتوي تركيبها على ناقل transistor ومكثف capacitor ، يتعاملان مع كل وحدة معلوماتٍ على حدة، حيث يعمل المكثف كحامل لكل وحدة بيانات، بينما يقوم الناقل بقراءة حالةِ هذه المكثف، أو تغيير حالته، حتّى يخزن فيه وحدةً من المعلومات

Type of RAM

3-EDO DRAM: Its keep the data valid until it receives an additional signal.

It has a dual-pipeline architecture that allows the memory controller to simultaneously read new data while discharging the old.



Type of RAM

- 3 **EDO DRAM:** هي اختصار لـ(بالإنجليزية: Extended Data Output DRAM)، أي؛ ذاكرة الوصول العشوائي النشطة الموسعة أوالمضاعفة، وتتميز بقدرتها على تخزين البياناتِ لمدّة أطول، كما أنّها تتركب من قطاعات، يمكن لكل قطاعٍ منها أن يضم ٢٥٦ بايتاً بشكل متزامن، مما يساعد على تنفيذ البرامج بصورة متعاقبة، وبسرعةٍ أفضل، دون تأخير أو انتظار .

Type of RAM

4-SDRAM has a synchronous interface, meaning synchronized with the clock speed that the microprocessor is optimized for. This tends to increase the number of instructions that the processor can perform in a given time.

Type of RAM

- **SDRAM:4** هي اختصار لـ(بالإنجليزية: Synchronous DRAM)، أي ذاكرة الوصول العشوائي النشطة المتزامنة، ويعني التزامن أنّها تستطيع بصورةٍ أوتوماتيكية أن تزامن عملياتها، مع البيانات في النظام ووحدة المعالجة الرئيسية (CPU)، مما يعني أنّ وحدة المعالجة الرئيسية لا تعود بحاجةٍ لانتظار عمليات المعالجة في الذاكرة، إنما تتلقى البيانات منها بصورةٍ متزامنة مع طلبها لهذه البيانات، وتتميز هذه الذاكرة بمعدل نقل بياناتٍ عالي لا يقل عن ٥٢٨ ميجابايت لكل ثانية .

Type of RAM

5: DDR SDRAM:

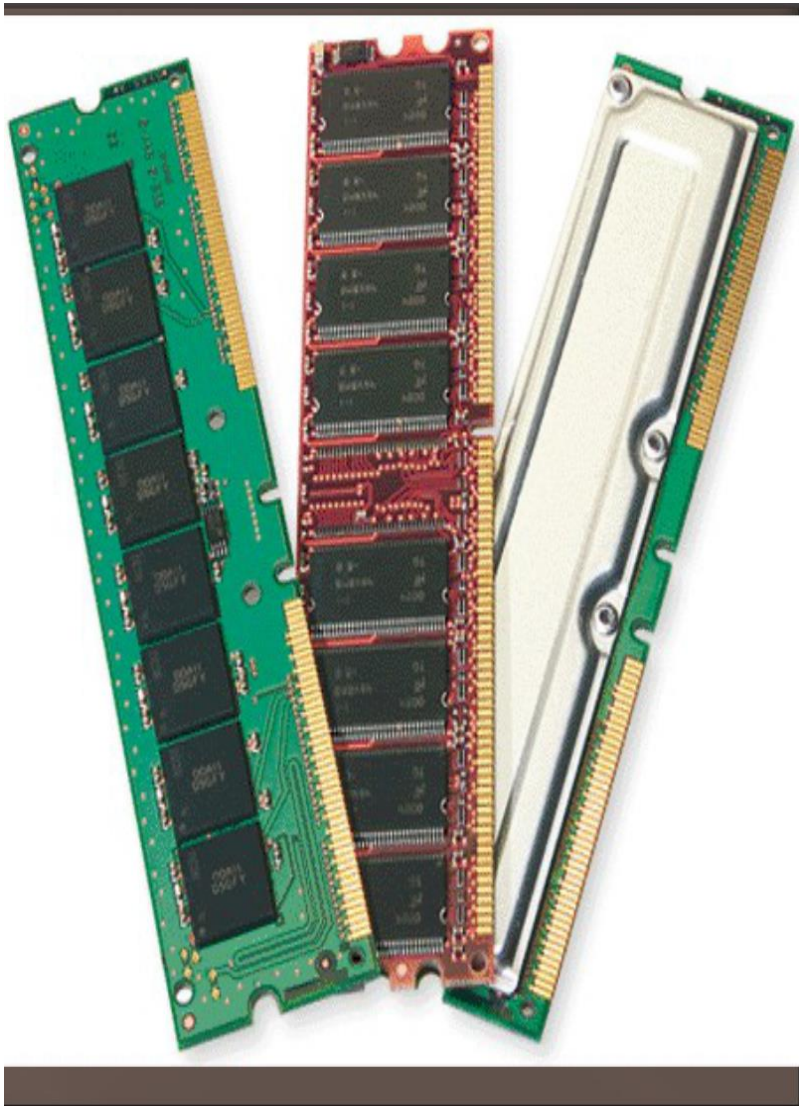
Unlike SDRAM, it can do two operations per cycle so it can faster than SDRAM

Type of RAM

- **DDR SDRAM: 5**:هي اختصار لـ (بالإنجليزية: Double Data Rate Synchronous Dynamic RAM)، أي؛ ذاكرة الوصول العشوائي المتزامنة المضاعفة، إذ تتميز عن بقدرتها على القيام بأكثر من مهمة واحدة في كل دورةِ معالجة بيانات تقوم بها، بمعنى أنّها تملك معدل نقل بيانات مضاعف، كما أنّها أكثر سرعةً من **SDRAM**، وأقل استهلاكاً للطاقة منها، بينما يصل معدل نقلها للبيانات إلى ١٠٦٤ ميجابايت لكل ثانية

Type of RAM

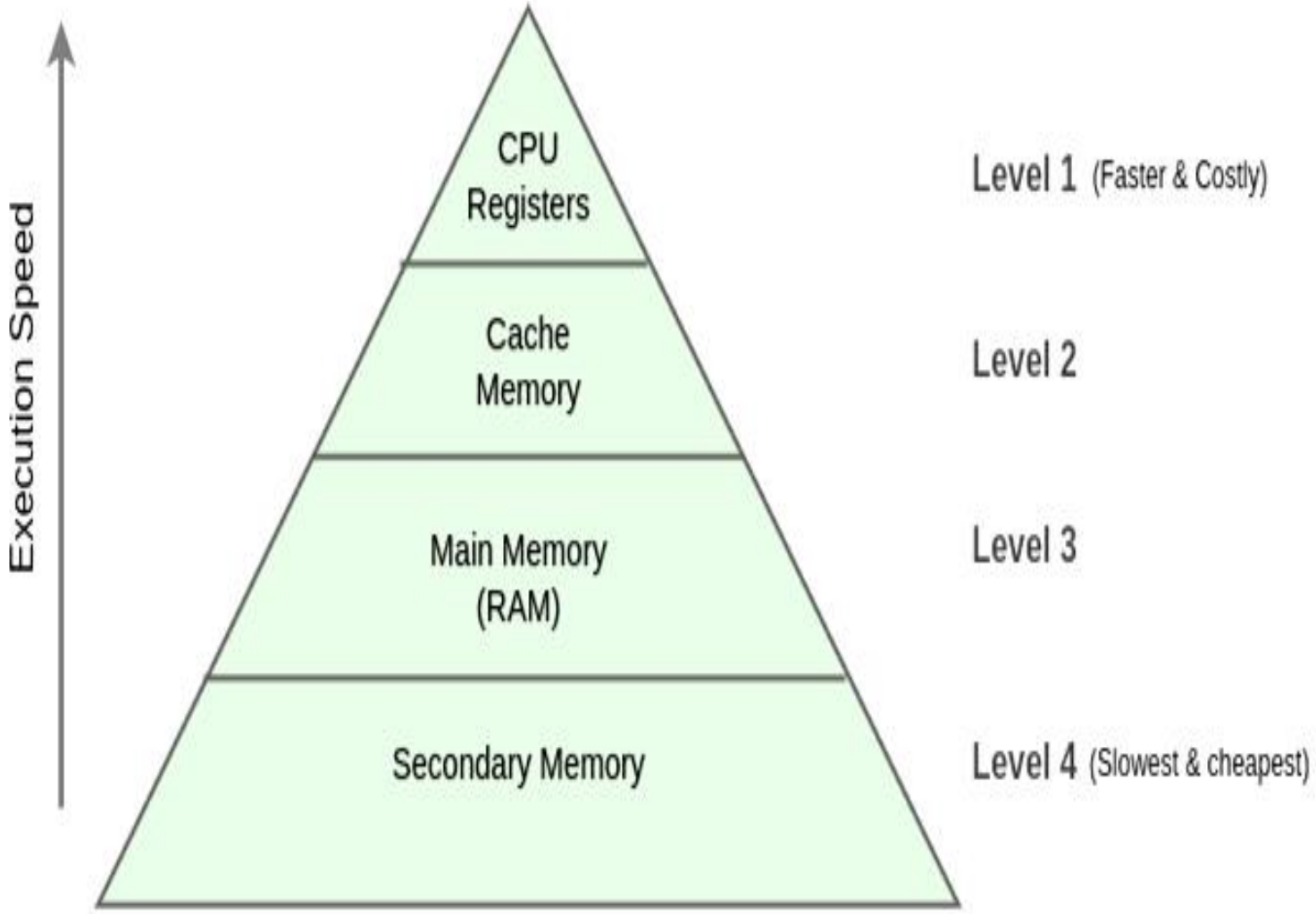
6-RDRAM: **It is a type of synchronous DRAM, designed by the Rambus Corporation It is fairly fast and has tried to address some of the complex electrical and physical problems involved with memory.**



Type of RAM

- **6 RDRAM:** هي اختصار لـ(بالإنجليزية Rambus Dynamic RAM):، أي ذاكرة الوصول العشوائي المرتبطة بـ رامبوس، وهي تختلف جذرياً في تركيبتها عن سابقاتها، رغم اشتراكها بوجود pins :، غير أنّها مصممة لتعمل رقاقاتها بشكلٍ متوازي مع بعضها، مما يوفر سرعة نقلٍ عاليةٍ جداً تصل إلى ٨٠٠ ميغاهيرتز في الثانية أو ١,٦٠٠ ميجابايت لكلّ ثانية، وترتبط رقاقاتها بنظام تبريد يعمل على تخفيف الحرارة الناتجة عن سرعة النقل العالية للبيانات،ويوجد ثلاث أنواع منها PC600, PC700, PC800 :

Memory Hierarchy



Type OF ROM

Read-only memory (**ROM**) is a type of non-volatile memory **used** in computers and other electronic devices. Data stored in **ROM** cannot be electronically modified after the manufacture of the memory device.

1. PROGRAMMABLE READ-ONLY MEMORY (PROM)

Is essentially a blank version of ROM that you can purchase and program once with the help of a special tool called a programmer. so PROMs are more exposed to damage than conventional ROMs.

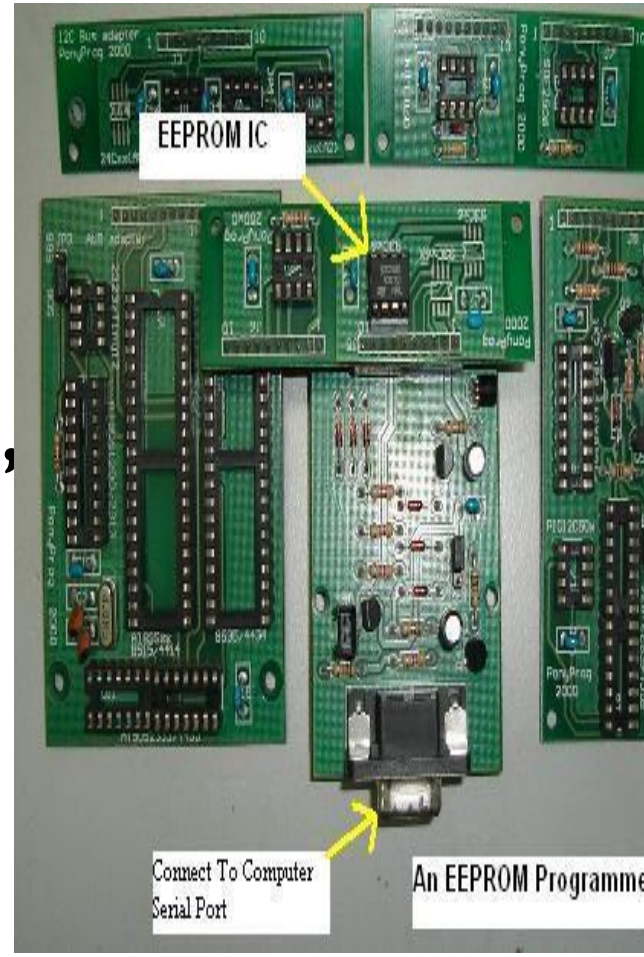
•therefore, a PROM can only be programmed once.

Type OF ROM

- [١] ذاكرة القراءة فقط القابلة للبرمجة: (بالإنجليزية: Programmable Read Only Memory) ويشار إلى هذا النوع باختصار (PROM) وتحتوي هذه الذاكرة على بيانات يتم وضعها من قبل الشركات باستخدام برنامج خاص، ثمّ يتم قراءة هذه البيانات من قبل الكمبيوتر وهذا الأمر مشابه تماماً لنسخ المعلومات على قرص مضغوط لمرة واحدة ثمّ القيام بالقراءة منه مرات عديدة.

ELECTRICALLY ERASABLE PROGRAMMABLE READ-ONLY MEMORY (EEPROM)

It allows its entire contents (or selected) to be electrically erased by exposing it to electrical charge at one byte at a time, Then rewritten electrically, So that they need not be removed from the computer (or camera, MP3 player, etc.)



Type OF ROM

- [٢] ذاكرة القراءة فقط القابلة لإعادة البرمجة: (بالإنجليزية Erasable Programmable Read Only Memory) وفي هذا النوع من أنواع ذاكرة القراءة فقط يكون إعادة البرمجة للذاكرة أمراً ممكناً من قبل الشركات المتخصصة على العكس من سابقتها التي تُبرمج لمرة واحدة فقط.

3.ERASABLE PROGRAMMABLE READ-ONLY MEMORY (EPROM)

It can be erased by exposure to strong ultraviolet light (typically for 10 minutes or longer), then rewritten with a process that again Requires some specific application

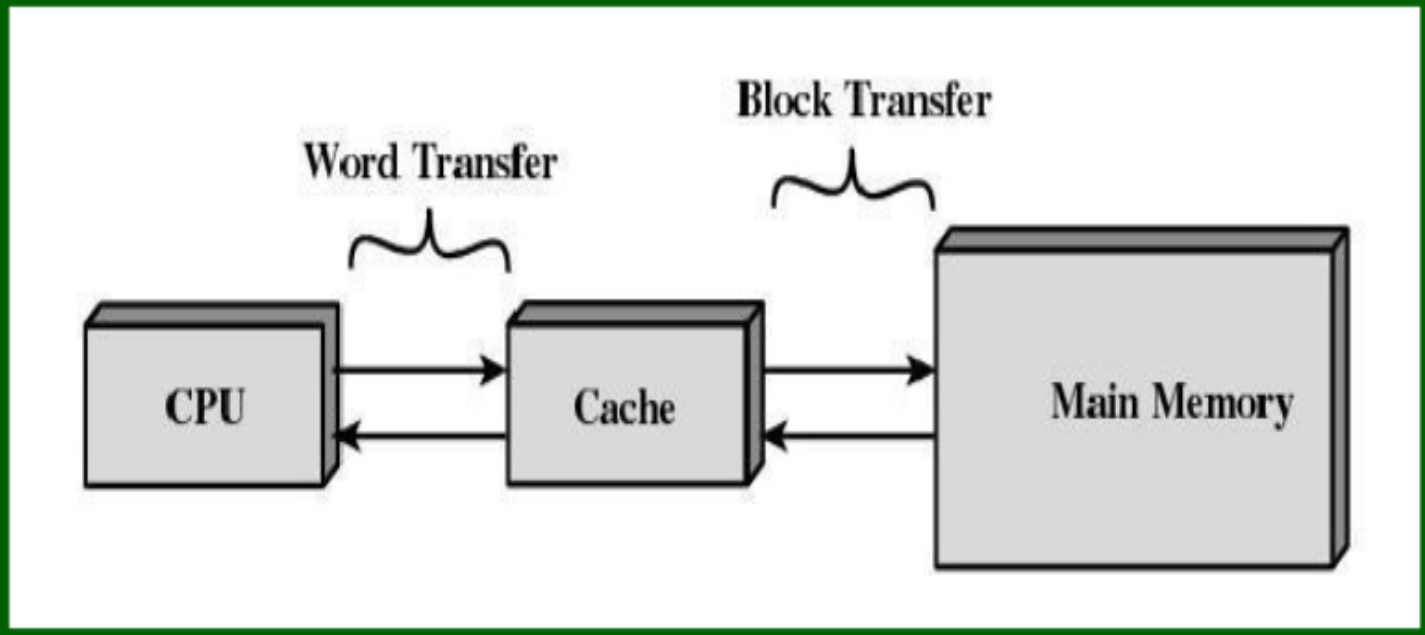
Type OF ROM

- [٣] ذاكرة القراءة فقط القابلة لإعادة البرمجة الإلكترونية: (بالإنجليزية Electronically Erasable Programmable Read Only Memory) وتمتاز هذه الذاكرة بأنّه يمكن إعادة برمجتها من خلال استخدام برنامج خاص فلم يعد هناك حاجة للشركات المتخصصة لتقوم ببرمجة هذا النوع من أنواع الذاكرة، وقد أصبح هذا النوع هو المستخدم في اللوحات الأم.

Cache Memory

is an extremely fast **memory** type that acts as a buffer between **RAM** and the CPU. It holds frequently requested data and instructions so that they are immediately available to the CPU when needed. **Cache memory** is used to reduce the average time to access data from the Main **memory**

Cache Memory



The fastest memory in computer

Type of cache memory

- **Level 1 (L1) cache**
- Built inside the CPU.
- It works at half CPU clock speed.
- **Level 2 (L2) cache**
- Built external to CPU, in the motherboard.
- Nowadays both L1 and L2 are integrated in the CPU to reduce access time and further improve system performance.

Secondary Storage Device

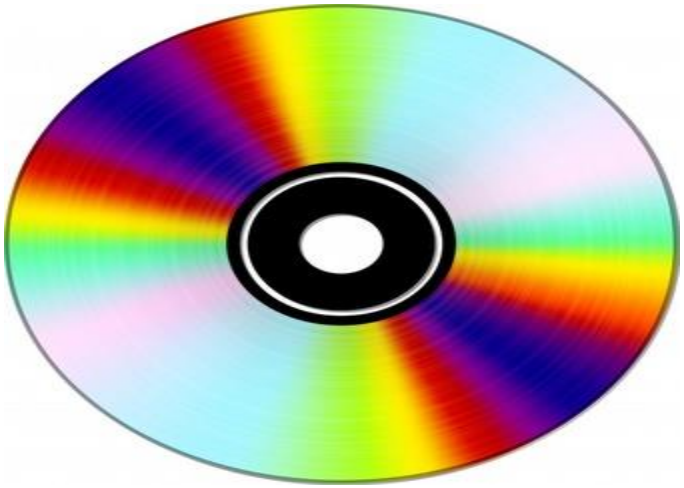
- **There is another kind of storage device, apart from primary or main memory, which is known as secondary memory. Secondary memories are non volatile memory and it is used for permanent storage of data and program.**
- **Example of secondary memories:**

- **Hard Disk, Floppy Disk, Magnetic Tape ------ These are magnetic devices.**
- **CD-ROM ------ is optical device**

Optical storage device- CD

CD-ROM : compact disc -read-only memory that contains data. Computers can read—but not write to or erase.

Ex: CD of video game.



CD-RW : Compact Disc- Read Write. in CD-RW compact disc data can be written, read, erased, and re-written.

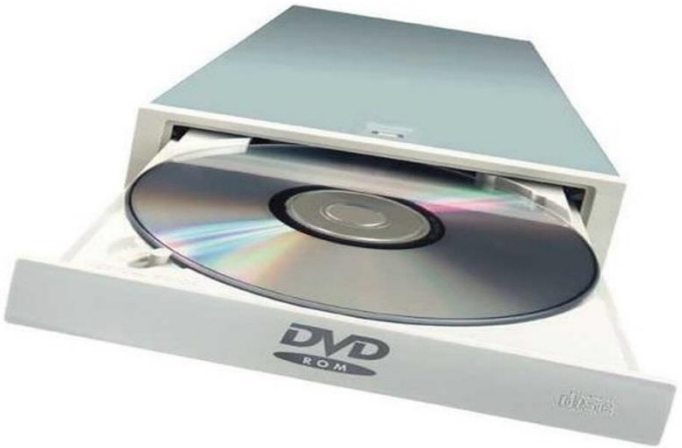
Advantages & Disadvantages :

- **Advantages :**
- Small and portable
- Very cheap
- Most computers can read CDs. If there is no CD drive, a DVD drive can usually read them

- **Disadvantages :**
- easy to scratch
- Smaller storage capacity than a hard drive or DVD
- Slower to access than the hard disk

Optical storage device- DVD

DVD-ROM : (Digital Versatile Disk-Read Only Memory) A new type of read only compact disc that can hold a minimum of 4.7GB.



DVD-RW : (Digital Versatile Disk-Read –write Memory) The data on a DVD-RW disc can be erased and recorded over many times without damaging the medium.

Advantages & Disadvantages :

- **Advantages :**
- Very large storage capacity
- DVD players can read CDs
- DVDs are now mass produced so they are relatively cheap

- **Disadvantages :**
- DVDs do not work in CD drives
- They can be easily damaged by breaking or scratching

Optical storage device- Blu-Ray

- **Blu-ray** : Its main uses are for storing high-definition video, PlayStation 3 video games, and other data, with up to 25 GB. The disc has the same physical dimensions as standard DVDs and CDs.

- **Advantage :**
- Huge storage capacity
- Higher resolution.
- More robust discs.

- **Disadvantage :**
- Very expensive

Magnetic storage device- Floppy disk

- **Floppy disk :** It can only store up 1.44Mb of data. All disks must be formatted before data can be written to the disk. Formatting divides the disk up into sections or sectors onto which data files are stored.
- **Advantage :**
  - ✓Small – easy to carry
  - ✓Cheap
  - ✓Useful for transferring small files
- **Disadvantage :**
  - ✗Easy to be damage
  - ✗Small storage capacity
  - ✗Many new computer don't have floppy disk drives

Magnetic storage device- Hard disk

1-Hard disk : the main storage device in computer , all of your data files and applications software are stored on it. It contains a number of metal platters which have been coated with a special magnetic material .The data is stored in magnetic material.

Type of Hard Disk

1-Fixed hard discs : Used to store operating systems, software and working data. Any application which requires very fast access to data for both reading and writing to.

2-Portable hard discs : Any application which requires extremely large storage capacity where speed of access is not an issue. Uses serial access for reading and writing.

Solid state device- Flash memory & Memory stick

- **Flash Memory :** Memory sticks are available from 1 Gb up to 8 Gb. They are typically small, lightweight, removable and rewritable. They usually have a removable cap which covers and protects the part of the stick which is inserted into a USB port.
- **Advantage :**
  - ✓Hold more data than CD
  - ✓More reliable than floppy disk.
  - ✓More portable than floppy disks or CDs/DVDs.
- **Disadvantage :**
  - ✗Lost easily
  - ✗More expensive than floppy disks, CDs and DVDs

Introduction

- The purpose of a PC is to load and run application software such as word processing, computer-aided engineering, windows or games. An application package is designed for a specific operating system such as MS- DOS, Unix or windows 95 .etc. The operating system provides an environment for different software packages to installed and run.

Introduction

- The link between the operating system and the hardware components of the PC is provided by BIOS (Basic input /output system). BIOS is a set of short routines which are stored in a ROM or an EPROM device hence the name ROM BIOS.

The function of BIOS

- BIOS routines are stored in a ROM or EPROM chip with memory addresses located in the upper segment of real memory. The number and size of BIOS depend on the manufacturer of the chip and its version, with later versions containing more complex programs.

BIOS Categories

- BIOS routines may be divided in to two categories:
- **1. startup routines.**
- The startup routines are initiated when the system is switched on(cold start) or has been reset (warm start). They include such programs as the initial power on self-test(post) and system initialization.

BIOS Categories

- **2. Basic low level input/output routines.**

The I/O routines, which include such programs as print routines and disk read/write, are called when the operation system or an application package wishes to carry out these basic tasks, this helps to ensure compatibility of PC's which have different hardware element or configurations.

The boot -up process

- when a computer system is switched on, a procedure known as boot-up or start-up is initiated by the CPU which a many other things runes BIOS and loads the operating system to get the computer ready for use.

The boot -up process

- Upon power-up(by turning the mains switch on), the power supply performs a self-test procedure which successful and the corrects voltages are established on its output lines, sends a power good(PG) signed to the timer chip on the motherboard. The timer responds by taking the result to start -up the CPU .

Steps of boot up process

- **Step1. bootstrap.** The CPU searches for starting address FFFF:0000 where first instruction is stored. This instruction, which is a jump instruction, direct the processor to the staring address where BIOS is located.
- **Step 2 . post.** The first action of bios is to test the system, a routine known as post(power on self-test).
- **Step 3. initialization.** Following a successful self-test, BIOS carries out a system initializing routine.

Steps of boot up process

- **Step 4.loading the operating system.** This involves the BIOS looking for, loading executing two hidden System files: IO.sys and MSDOS.sys.
- **Step 5. loading CONFIG.sys and COMMOND.COM.** the operating system takes action to establish the operating environment of the system as specified by the user. in the first instance, searching the root directory for a file called CONFIG.sys. if one is found, DOS reads and executes all its statement before loading the DOS kernel, a file called COMMAND.COM. if CONFIG.sys cannot be found, COMMAND.COM is loaded regardless. The system is now under the control of COMMAND.COM.

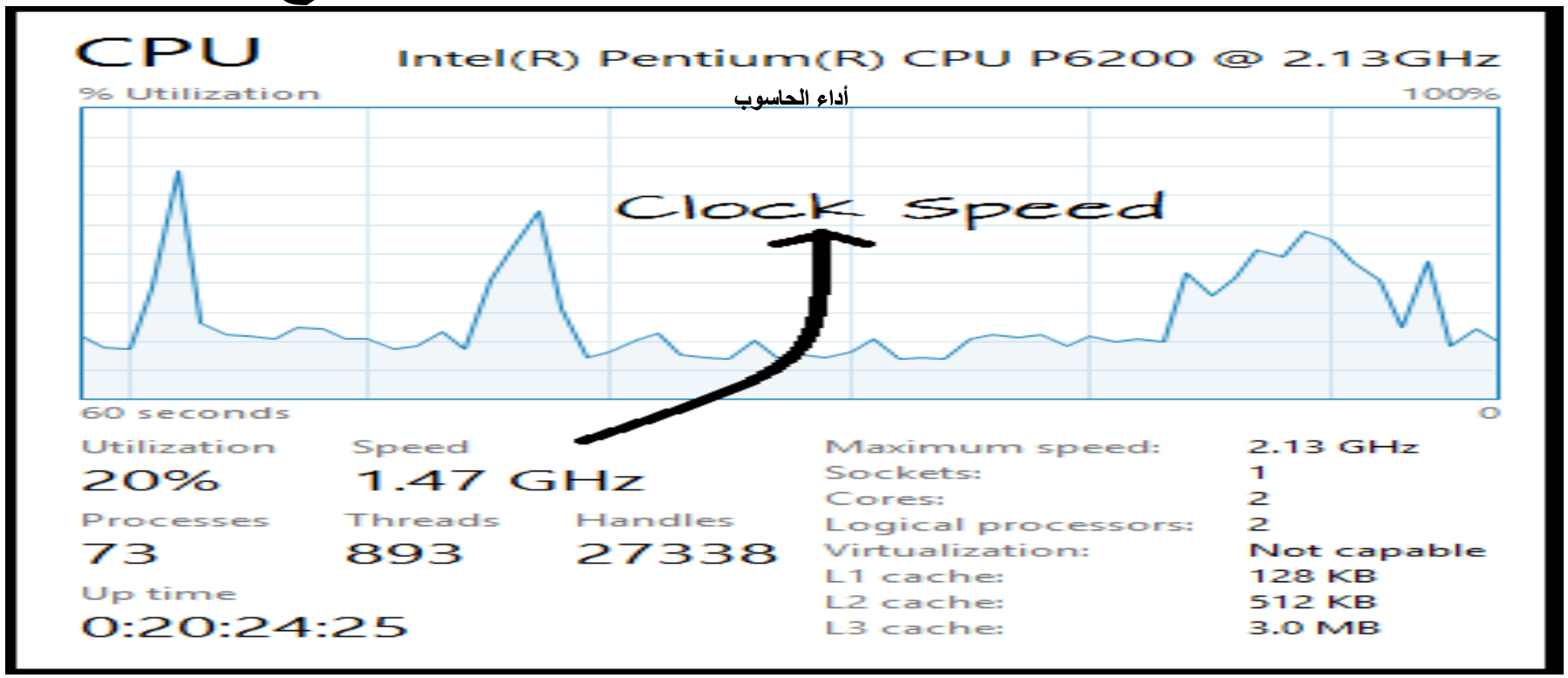
Steps of boot up process

- **STEP 6. loading AUTOEXEL.BAT**. the CPU looks for a batch file called AUROEXEL.BAT. if it is present, Dos loads it into memory, executes its commands and displays the DOS prompt. If AUTOEXEL, BAT is not present, DOS will request DATE and TIME, before displaying the DOS prompt.
- The system is now ready for DOS commands or application programs.

- **Computer Performance**
- Know some of the factors which impact on a computer's performance, such as: CPU speed, RAM size, the number of applications running.
- **Factors Affecting performance**
- **CPU Clock speed:** The computer clock speed refers to the number of pulses per second for the processor Include how fast the CPU will run. The higher the clock speed the faster the computer will work for you. Clock speed is usually measured in MHz (megahertz, or millions of pulses per second) or GHz (gigahertz, or billions of pulses per second).

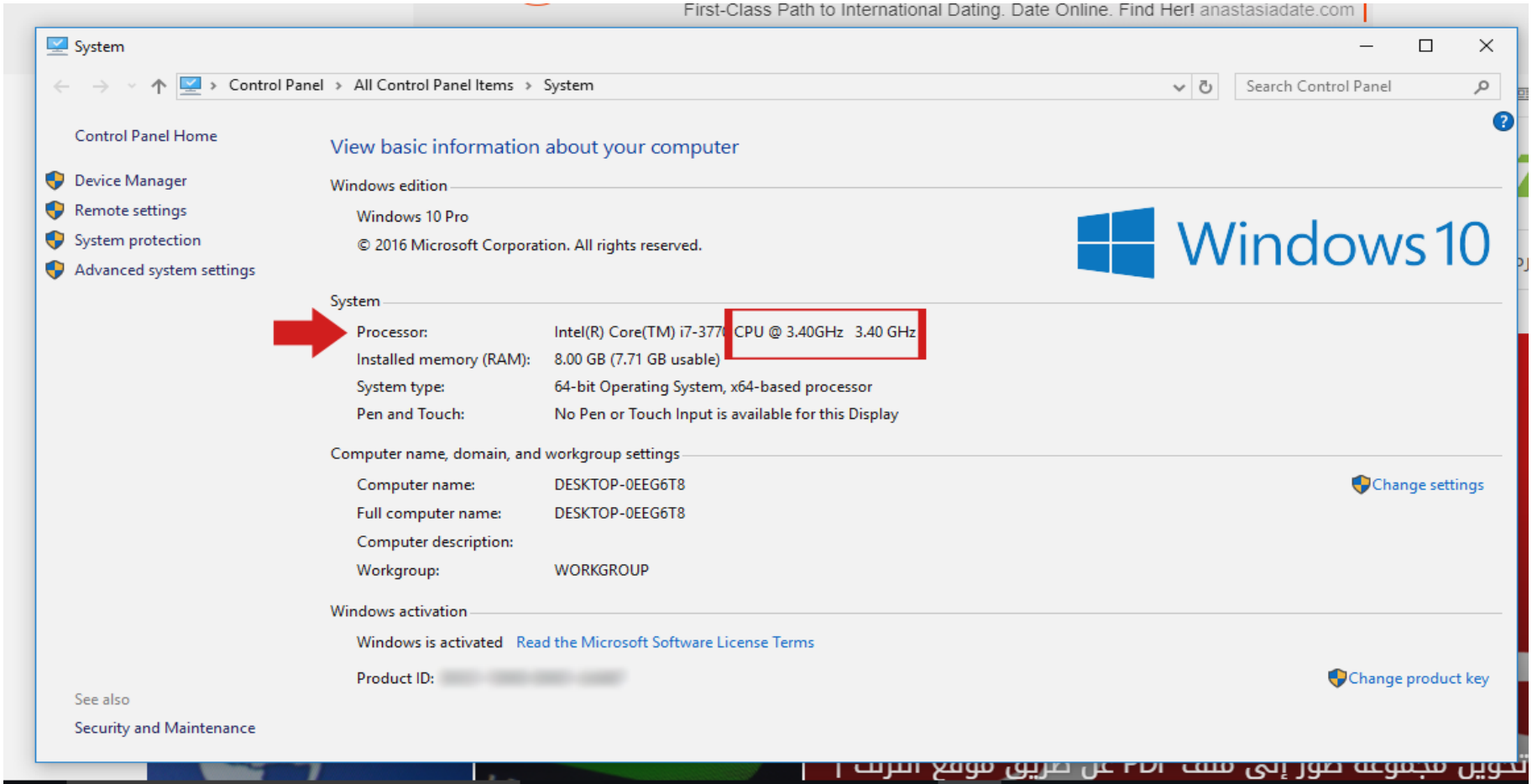
CPU clock speed

- سرعة الحاسوب تعتمد على سرعة CPU وكل CPU لديه سرعة محددة تسمى clock speed والتي تقاس اما بميغاهرتز او كيكا هرتز وكلما كانت سرعة المعالج اكبر كانت لدية القدرة على تنفيذ الايعازات بصورة اسرع



كيفية معرفة CPU SPEED

R.C ➡ MY COMPUTER ➡ PROPERTIES ➡ SYSTEM



- The original IBM PC ran at 4.77 MHz whereas modern PCs will run at over 2000 MHz, Today's personal computers run at a clock speed in the hundreds of megahertz and some exceed one gigahertz.
- **RAM size:** As a rule the more memory you have the faster the PC will appear to operate. Windows also uses the hard disk a lot, so logically the faster the hard disk can operate then again the faster the PC will appear to run.

Memory size

هو حجم الذاكرة المستخدمة في الحاسوب فكلما كانت الذاكرة اكبر كلما كان اداء الحاسوب افضل، فلو كنت من محبي الألعاب فاليوم يفضل ان تحصل على قطعتين أو ٤ قطع من الذاكرة وأن يكون الحجم الكلي تقريباً بين ٨ GB أو ١٢ GB، بينما أن كنت من المصممين ممن يستخدمون برامج 3D ماكس وغيرها من برامج التصميم التي تحتاج الى حجم ذاكرة كبير، فيفضل أن تحصل على ذاكرة بحجم كبير فإن كانت لوحتك قادرة على استيعاب ذاكرة كلية بحجم ٣٢ GB...اما إن كنت مستخدم عادي فالذاكرة بحجم ٢ GB أو ٤ GB كافية جداً في الوقت الحالي.

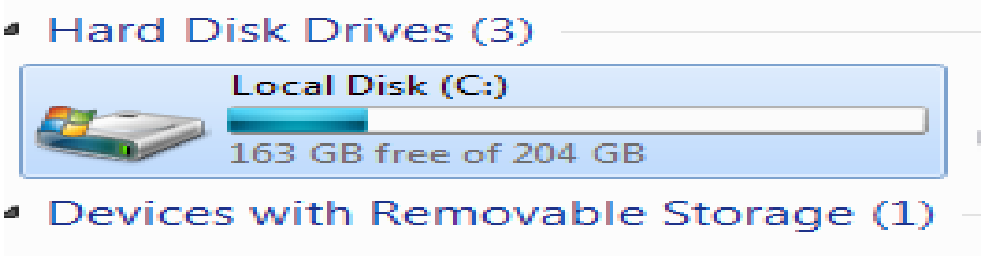
- **Hard Disk Speed and Storage:** Hard disks are also measured by their speed, defined by the disk access time, which is measured in milliseconds.
- The smaller this access time the faster the hard disk will store or retrieve data. The data storage capacity of hard disks continues to increase as new products are released. The disk storage capacity is measured in Gigabytes 23(GBytes). 1 GByte is equivalent to 1024 Mbytes.

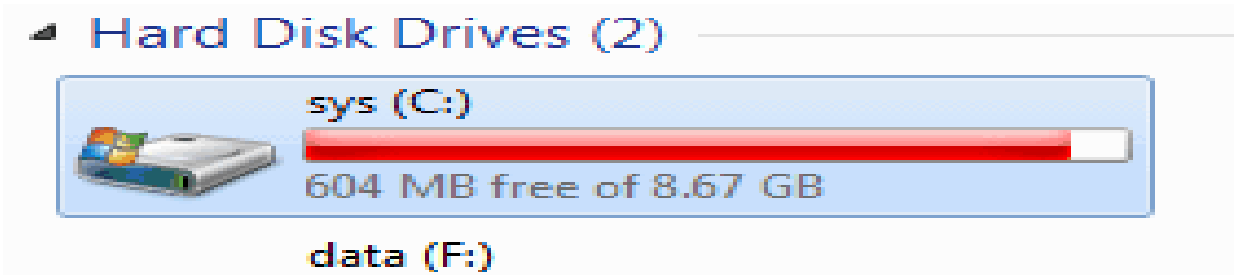
Hard Disk Speed and Storage

- سرعة الهارد تعتمد ايضا على وقت الدخول فكلما كان الهارد اسرع نستطيع فتحه بصورة اسرع اي عندما نضغط على ايعاز OPEN لفتح الهارد دسك يحتاج فقط ثواني لفتحة اما وحدة الخزن للهارد دسك فيجب ان يكون بالكيكابايت من اجل ان يعمل الحاسوب بصورة اسرع

Free Hard Disk Space

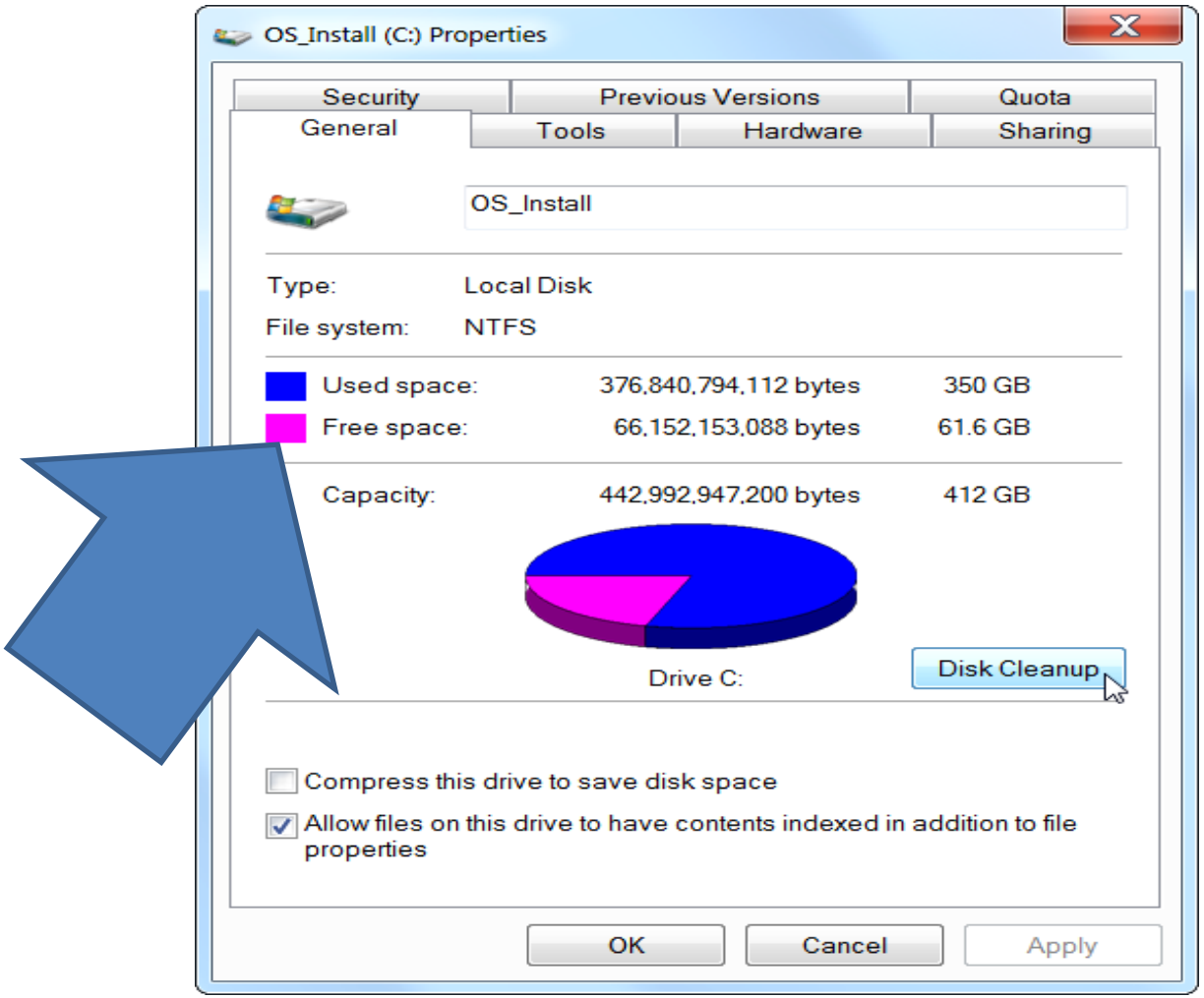
- سرعة الحاسوب تعتمد على المساحة الإضافية من hard disk اي كلما كانت المساحة الاضافية اكبر كلما كان الحاسوب له القدرة على تنفيذ البرامج بصورة اسرع
- نلاحظ من الصورة الاولى هناك مساحة كبيرة من الهارد فهو غير ممتلى لذا الحاسبة تكون سرعتها عالية اما الصورة الثانية الهارد يكون ممتلى ولايوجد مساحة لذا سرعة كمبوتر تكون ابطى





لمعرفة حجم الفراغ في HARD DISK

R.C → HARD DISK → PROPERTIES



- **De-fragmenting Files:** If you are running Windows you may find that if you click on the Start menu, select Programs, and then select the Accessories / System tools group, there is a de-fragmentation program. Running this may noticeably speed up the operation of your PC. When you use a PC, over a period of time the files get broken up into separate pieces which are spread all over the hard disk. De-fragmentation means taking all the broken up pieces and joining them back together again.

De-fragmenting Files

- هي عملية اعادة تهيئة للهارد من اجل ربط جميع الملفات مع بعضها لتقليل المساحة المستخدمة من الهارد
- click on the Start menu ⟹ Programs ⟹ Accessories / System tools group, there is a ⟹ de-fragmentation program

- **Multitasking Considerations:** Windows is a multitasking system, which means that it can run more than one program at a time. However the more programs which are running at the same time, the slower each one will run.
- To some extent this slowing effect depends on what each program is doing.
- Editing a large, full color picture for instance can take up a lot of CPU time.

Multitasking Considerations

- الحاسوب هو متعدد المهام فيمكن ان يقوم باكثر من وظيفة في نفس الوقت فمثلا نستخدم برنامج MUSICلاستماع الى الاغاني ويمكن القيام بعملية طباعة على برنامج الوورد ولكن فتح اكثر من برنامج في نفس الوقت يبطى عمل حاسوب لكلا البرنامجين.

CONTROL UNIT

- CPU is partitioned into *Arithmetic Logic Unit (ALU)* and *Control Unit (CU)*.

- The function of control unit is to generate relevant timing and control signals to all operations in the computer.

- It controls the flow of data between the processor and memory and peripherals

FUNCTIONS OF CONTROL UNIT

- The control unit directs the entire computer system to carry out stored program instructions.
- The control unit must communicate with both the arithmetic logic unit (ALU) and main memory.
- The control unit instructs the arithmetic logic unit that which logical or arithmetic operation is to be performed.
- The control unit co-ordinates the activities of the other two units as well as all peripherals and auxiliary storage devices linked to the computer.

DESIGN OF CONTROL UNIT

Control unit generates control signals using one of the two organizations:

- Hardwired Control Unit
- Micro-programmed Control Unit

HARDWIRED CONTROL UNIT

- It is implemented as logic circuits (gates, flip-flops, decoders etc.) in the hardware.
- This organization is very complicated if we have a large control unit.
- In this organization, if the design has to be modified or changed, requires changes in the wiring among the various components. Thus the modification of all the combinational circuits may be very difficult.

MICRO-PROGRAMMED CONTROL UNIT

- A micro-programmed control unit is implemented using programming approach. A sequence of micro-operations are carried out by executing a program consisting of micro-instructions.
- Micro-program, consisting of micro-instructions is stored in the control memory of the control unit.
- Execution of a micro-instruction is responsible for generation of a set of control signals.

COMPARISON BETWEEN HARDWIRED AND MICRO-PROGRAMMED CONTROL UNIT

Attributes	Hardwired Control	Micro-programmed Control
Speed	Fast	Slow
Cost of Implementation	More	Cheaper
Flexibility	Not flexible, difficult to modify for new instruction	Flexible, new instructions can easily be added
Ability to Handle Complex Instructions	Difficult	Easier
Decoding	Complex	Easy
Applications	RISC Microprocessor	CISC Microprocessor
Instruction Set Size	Small	Large
Control Memory	Absent	Present
Chip Area Required	Less	More

Introduction

- The CPU sends various data, instructions and information to all the devices and components inside the computer.
- in the bottom of a motherboard there are a whole network of lines or electronic pathways that join the different components together.
- This network of wires or electronic pathways is called the **Bus**.

System buses

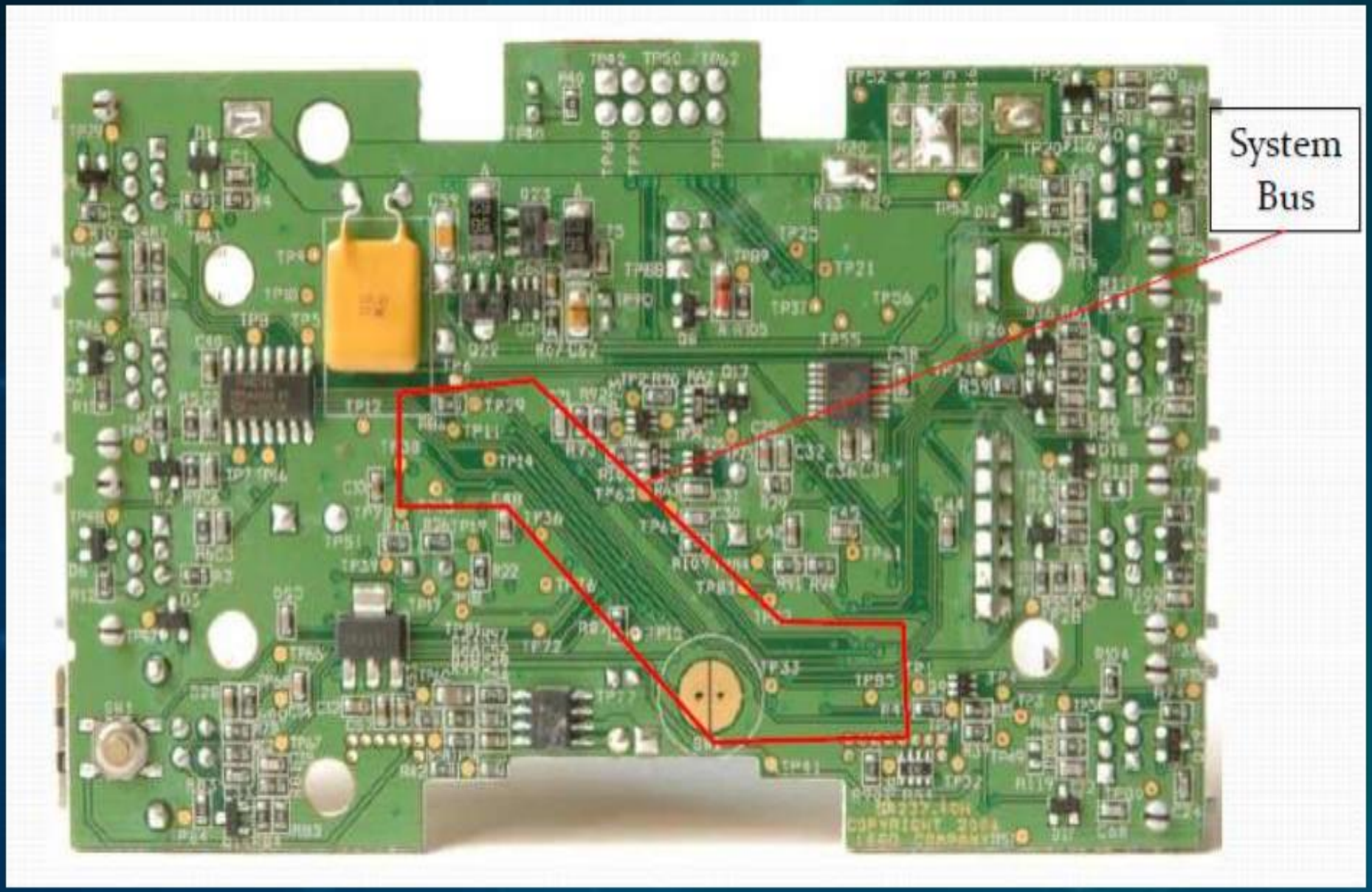
What is a Bus:

It is means of transmitted data from one device to another device, or one device to multiple devices.

Typically, a bus consists of multiple communication pathways, or lines. Each line is capable of transmitting signals representing binary 1 and binary 0.

For example, an 8-bit unit of data can be transmitted over eight bus lines.

- Bottom of motherboard



Type of buses

- **Internal bus**

  The internal bus, also known as internal data bus, memory bus or system bus, connects all the internal components of a computer, such as CPU and memory, to the motherboard.

- **External bus**

  The external bus, or expansion bus connect the different external devices, such as printer etc., to the computer.

System bus usually is separated into three functional groups:

1.Data Bus:

- A collection of wires through which data is transmitted from one part of a computer to another.
- The data bus may consist of 32, 64, 128, or even more separate lines.
- The number of lines being referred to as the width of the data bus. Because each line can carry only 1 bit at a time, the number of lines determines how many bits can be transferred at a time.

2.Address Bus:

- Address bus is used to access a particular memory location.
- Or in other words, the information used to describe the memory locations travels along the address bus.
- The CPU sends address to a particular memory locations
- The address bus consists of 16 , 20 , 24 or more parallel signal lines.

3-Control Bus:

Control bus is used to provide the different control signal generated by CPU to different part of the system.

- Because the data and address lines are shared by all components, there must be a means of controlling their use.

Memory chip

memory size :number of location* bit width

number of locations and the bit width. For example, a chip with 512 locations and a 2-bit data width, has a memory size of 512×2=1024 bits.

Since the standard unit of data is a byte(8 bits), the above storage capacity is normally given as 1024/8 =128 bytes.

A memory capacity is a way of specifying how many bits can be stored in a particular memory device or complete memory system. The capacity of memory depends on **two** parameters, **the number of words**(m) and **the number of bits per word** (n).

Memory capacity = (number of word) × (number of bits per word)

= m (word) * n (bits)

= m*n bits

EX:-

A certain memory chip is specified as 2K×8 :

1. How many words can be stored on this chip?
2. What is the words size?
3. How many total bits can this chip store?

SOL:-

1. 2K =2 × 1024 = 2048 words
2. The word size is 8-bits (1 byte).
3. Capacity = 2048 × 8 = 16,383 bits = 16 KB.

EX:- A certain memory chip is specified as 2K × 16

1. How many words can be stored on this chip?
2. What is the words size?
3. How many total bits can this chip store?

Solution:-

1. 2K = 2 × 1024 = 2048 words
2. The word size is 16-bits(2 byte).
3. Capacity = 2048 * 16 = 32,768 =23 KB.

Programming languages

- Programming languages provide the basic building blocks for all systems and application software. Programming languages allow people to tell computers what to do and are the means by which software systems are developed, we will describe the five generations-levels-of programming languages:

1) Machine language

- Is the lowest-level computer language, consisting of the internal representation of the instructions and data. This machine code-the actual instructions understood and directly executable by the CPU is composed of binary digits. Machine language is the only programming language that the machine actually understands, therefore, machine language is considered the first-generation language.

1) Machine language

- .all other languages must be translated into machine language before the computer can run the instructions because computer's CPU is capable of executing only machine language programs.

- Machine language is extremely difficult to understand and use by programmers. as a result, increasingly more user-friendly languages have been developed.

2) Assembly language

- Assembly languages are considered second-generation languages, it is more user-friendly because it represent machine language instructions and data locations in primary storage, which people can more easily use.
- Compared to machine language, assembly language eases the job of the programmers.

Translating an assembly language program into machine language is accomplished by system software program called an assembler.

3) Procedural language

- Called third-generation language
- Procedural language are much closer to natural language (the way we talk) and therefore, are easier to write, read. Procedural language use common words.
- There are three examples of procedural languages FORTRAN, COBOL, and C.

4) Non procedural languages

- Called fourth-generation language.
- They can be used by non technical users to carry out specific functional tasks.
- These languages simplify the programming process as well as reduce the number of coding errors.
- They are common in database applications as query languages, report generators.

5) Natural languages

- Are called fifth –generation languages or" intelligent language"
- They are use tables.
- Most of these languages are still experimental because the programs that are translate natural language into machine – readable form are extremely complex and require a large amount of computer resources.