PABLO

Electrical and Electronic Engineering

SCHOOL OF ENGINEERING

COMPUTER LITERACY AND INFORMATION TECHNOLOGY (ELNG 155)

LECTURER:

NANA KANKAM OKATAKYIE ADU

CONTENTS

1. General overview of the computer.

2. Computer Maintenance and Fault diagnosis.

3. Introduction to Computer Networking.

4. Software.

5. Introduction to Operating Systems.

6. Digital Representations and Operations.

MODE OF DELIVERY

- Lectures
- Practical
- Assignments
- Group Design Projects

- Tutorials

READING MATERIALS

- Shelly Cashman Series Discovering Computers & Microsoft Office 365 & Office 2016: A Fundamental Combined Approach 1st Edition, ISBN-13: 978-1305871809, ISBN-10: 1305871804, Cengage Learning; 1st edition (February 16, 2016)

- Jennifer T. Campbell, Steven M. Freund, Mark Frydenberg, Mary Z. Last, Philip J. Pratt, Computers Made Easy: From Dummy To Geek, James Bernstein, ISBN-10: 1983154830 ISBN-13: 978-1983154836, Independently published (June 12, 2018)
- Jamrich Parsons, Dan Oja, Practical Computer Literacy, ISBN-10: 128507677X, ISBN-13: 9781285076775, Cengage Learning, 4th edition, 2013.

- Connie Morrison, Dolores Wells, Lisa Ruffolo; Computer Literacy BASICS: A Comprehensive Guide to IC3, ISBN-13: 978-1285766584, ISBN-10: 128576658X, Cengage Learning; 5th edition, 2014.

OBJECTIVES

- Enhance the knowledge of students in both computer hardware and software.

- Appreciate the roles computers play in our everyday life
- Develop future insight into the roles that computers will play in our daily lives.

UNIT ONE

GENERAL OVERVIEW OF THE COMPUTER

INTRODUCTION

- Computer literacy means acquiring the set of skills and knowledge to become a computer literate.

- Being a computer literate means: *having the knowledge,*

skill sets and the ability to use computers and related technology effective and efficiently. The knowledge and skill levels may range from basic use to the computer to advanced programming and problem solving.

INTRODUCTION

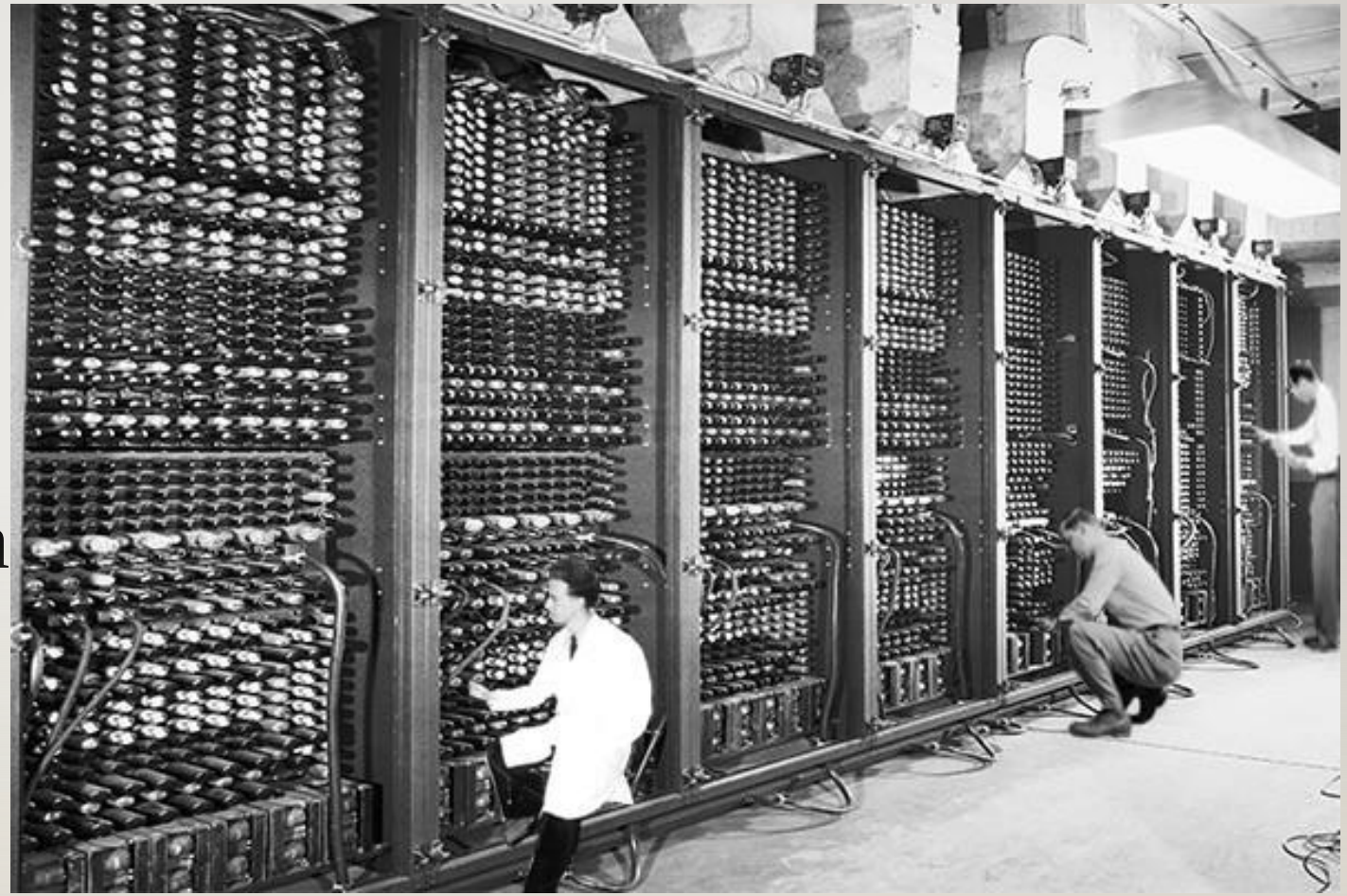
- A computer is an **analogue/digital electronic machine** that can be **programmed** to carry out **sequences of arithmetic or logical operations automatically**.

- Modern computers can perform generic sets of operations known as programs. These programs enable computers to perform a wide range of tasks.

HISTORY OF COMPUTERS

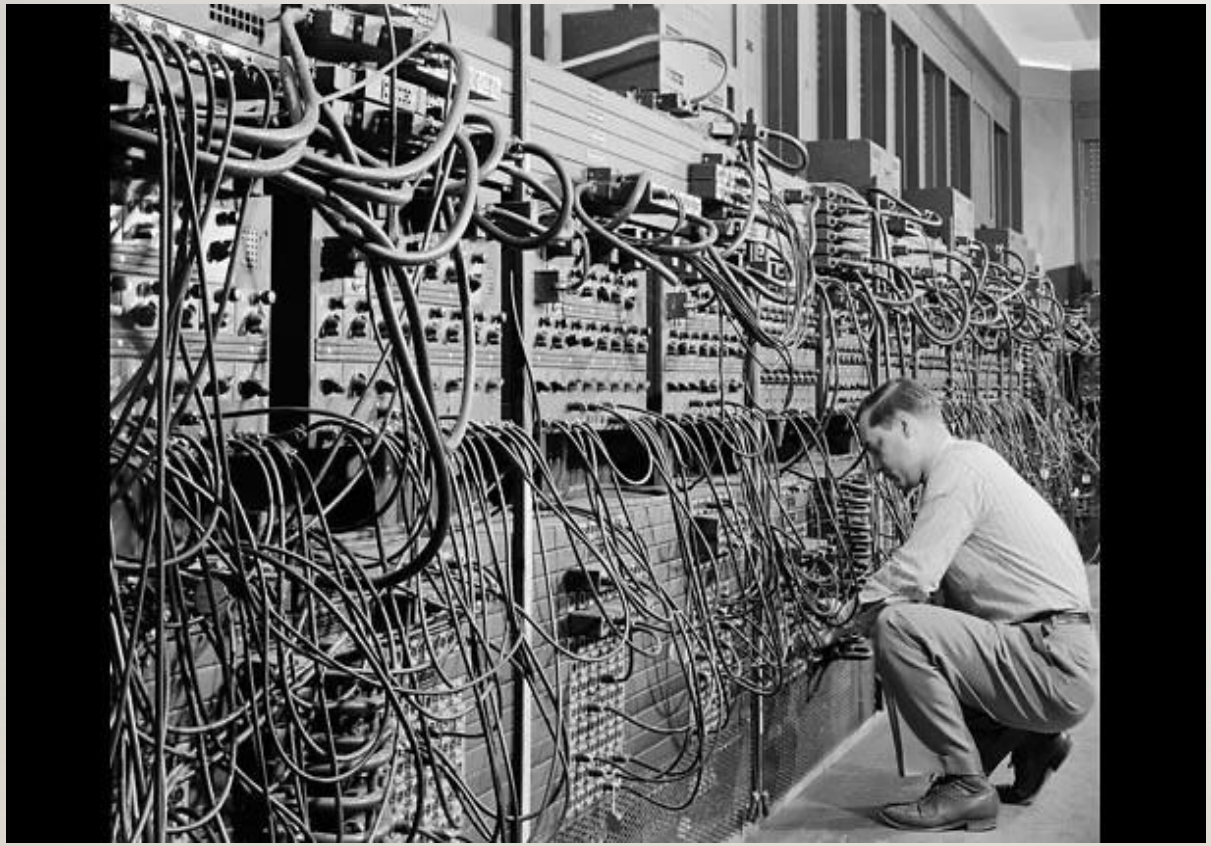
They were enormous, taking up entire rooms

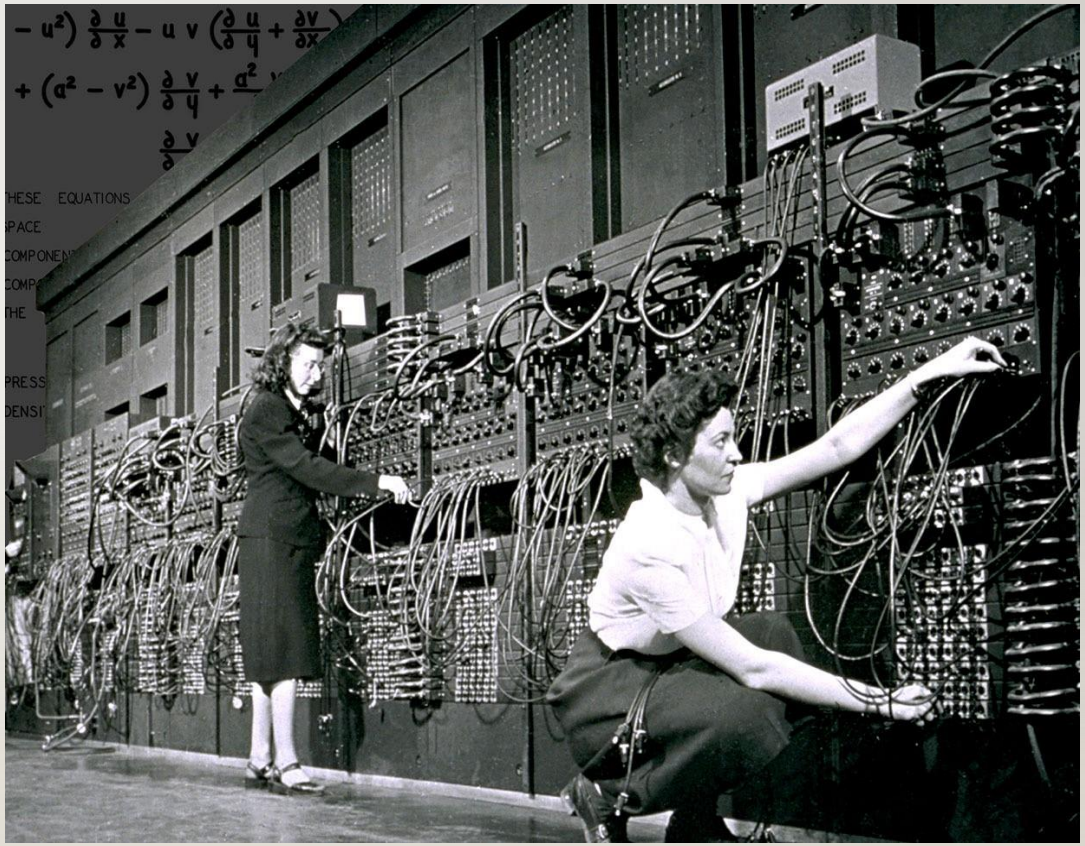
- First Generation Com



HISTORY OF COMPUTERS

- First Generation Computers (1940-1956)





HISTORY OF COMPUTERS

- First Generation Computers (1940-1956)

  - They used vacuum tubes as the basic components for memory, circuitry, and for the Central Processing Unit. (CPU)

HISTORY OF COMPUTERS

- First Generation Computers (1940-1956)

like electric bulbs

- Produced a lot of heat
- Installations used to “fuse” frequently.
- Therefore, they were very expensive and only large organizations could afford them.

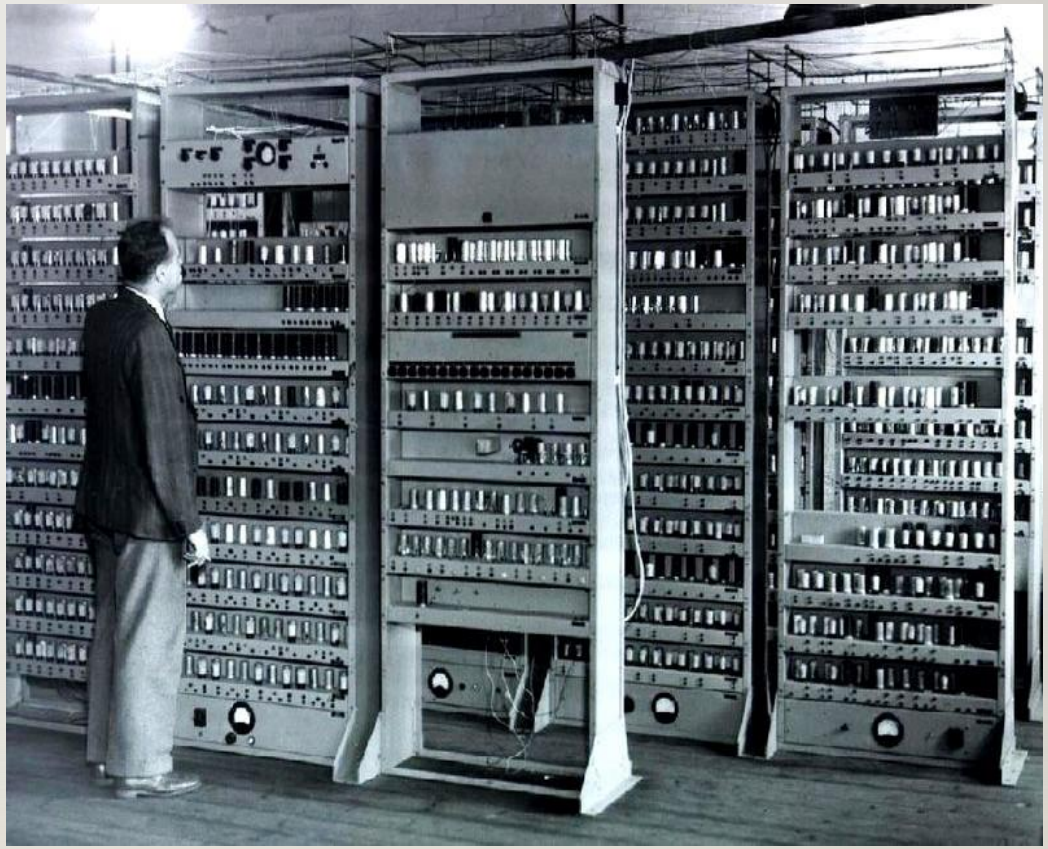
HISTORY OF COMPUTERS

- The vacuum tubes looked

HISTORY OF COMPUTERS

First Generation Computers (1940-1956)

- electricity.
- They generated a lot of heat which resulted many malfunctions.
- The maximum internal storage capacity was 20,000 characters.
- Could only solve one problem at a time.
- It took operators days or even weeks to set up a new problem



HISTORY OF COMPUTERS

They consumed huge quantities of

HISTORY OF COMPUTERS

- First Generation Computers (1940-1956)

  - Mainly used the Batch Processing Operating System.
  - Punch cards, paper tape, and magnetic tape were used as input and output devices.

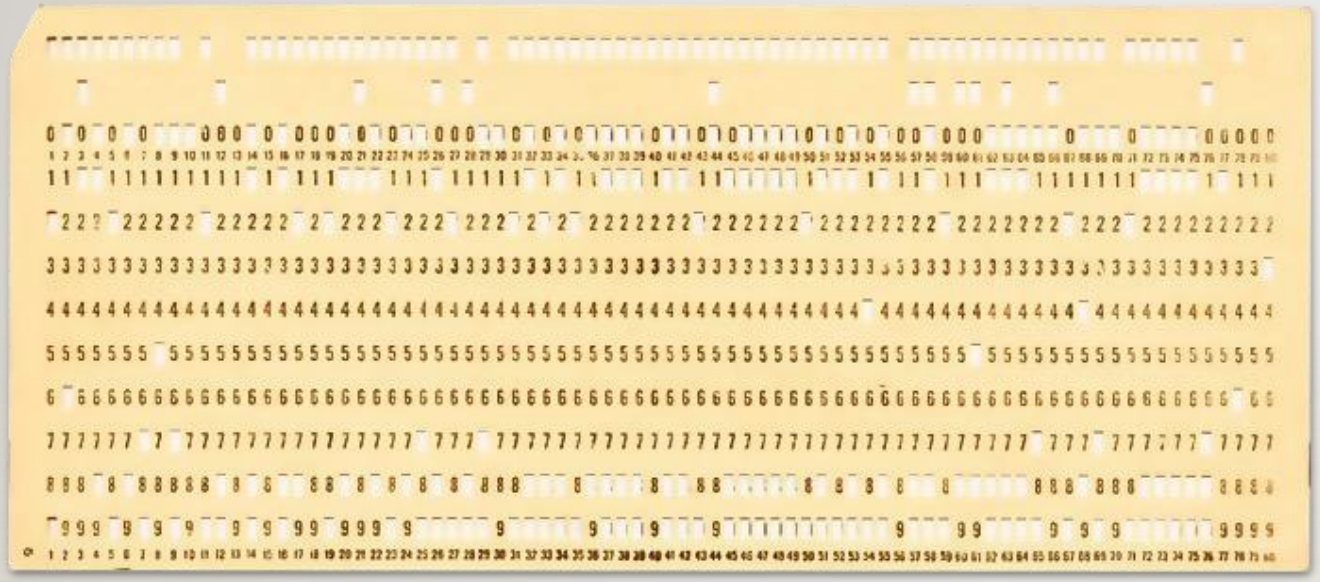
HISTORY OF COMPUTERS

- They used machine code as the programming language.

HISTORY OF COMPUTERS

- First Generation Computers (1940-1956)

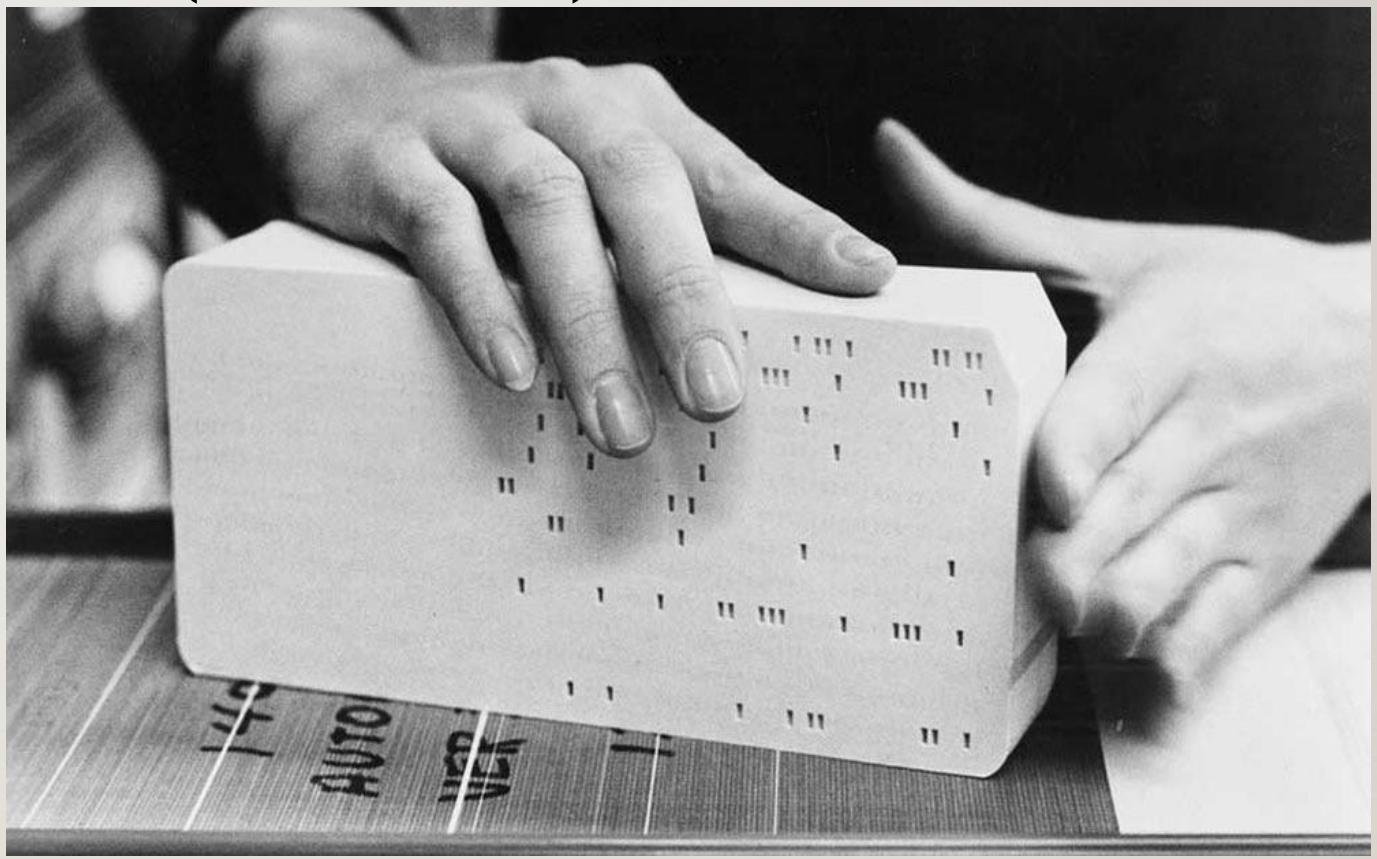
Example of a punch card



Punch Card in
Punch Card Machine

HISTORY OF COMPUTERS

- First Generation Computers (1940-1956)



A computer program made of punch cards

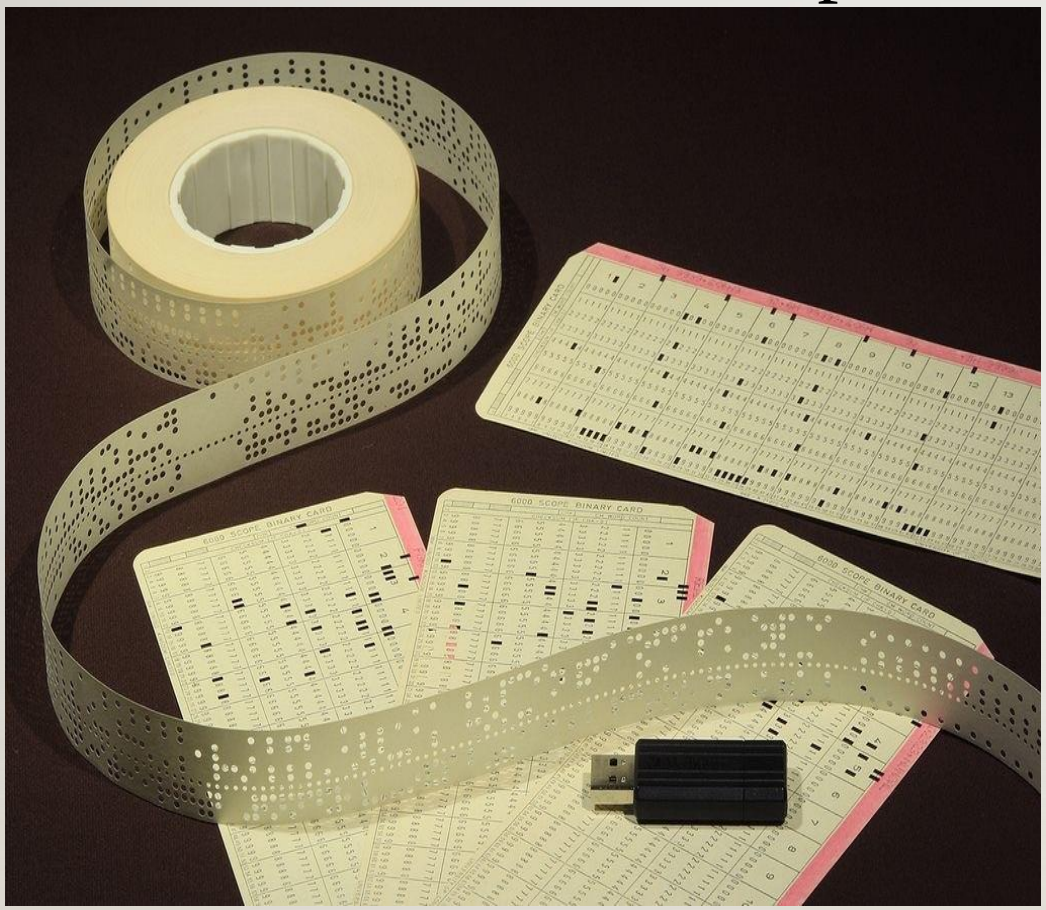
HISTORY OF COMPUTERS

- First Generation Computers (1940-1956)

Magnetic tapes as input and output devices

HISTORY OF COMPUTERS

- First Generation Computers (1940-1956)



HISTORY OF COMPUTERS

- First Generation Computers (1940-1956)

Some examples include:

- UNIVersal Automatic Computer (UNIVAC)
- Electronic Numerical Integrator And Calculator (ENIAC)

(EDVAC)

HISTORY OF COMPUTERS

- Electronic Discrete Variable Automatic Computer

First Generation Computers (1940-1956)

Pros

- Vacuum tubes were used as electronic component.
- Electronic digital computers were developed for the first time.

HISTORY OF COMPUTERS

- These computers were the fastest calculating devices of their time.
- Computations were performed in millisecond.

Cons

- Not portable.
- Limited commercial use
- They were unreliable.
- Induce a large amount of heat due to the vacuum tubes.

HISTORY OF COMPUTERS

- computers.
- Consisted of two types of devices These are:
  - ➢ Transistors, and
  - ➢magnetic core.
- The transistors helped to develop a better computer than the first-generation computers.

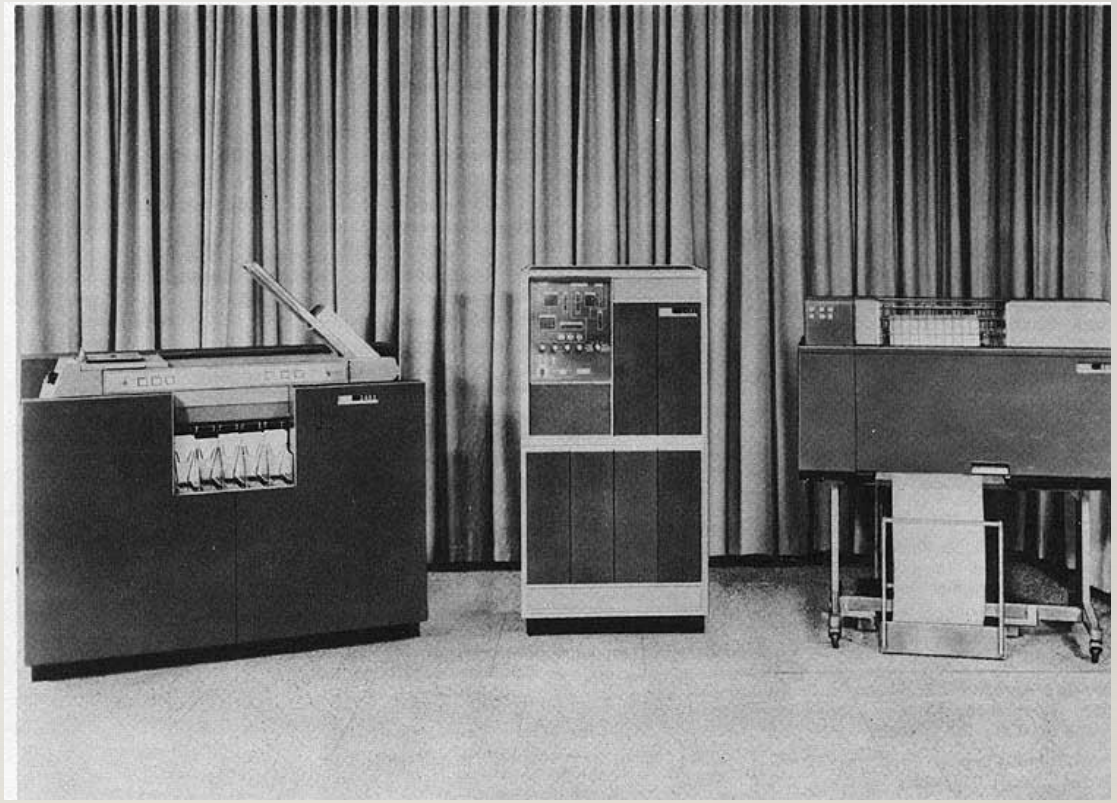
❑Second Generation Computers (1957-1963)

HISTORY OF COMPUTERS

They are also known as transistor

HISTORY OF COMPUTERS

CDC 1604



IBM 1400 Series

- Second Generation Computers (1957-1963)

HISTORY OF COMPUTERS

CDC 3600

IBM 1401

- Second Generation Computers (1957-1963)

HISTORY OF COMPUTERS

- Second Generation Computers (1957-1963)

HISTORY OF COMPUTERS

Second Generation Computers (1957-1963)

Characteristics of the second generation of computer are:

- **Smaller in size:** Small in size than the first-generation
- **Change in circuits:** Transistors in place of vacuum tubes
- **Power/ Energy Requirement:** Required less amount of energy.
- **Heat**: They produces less heat than the first-generation computer.

HISTORY OF COMPUTERS

- **Language used:** Assembly language is used instead of Machine

HISTORY OF COMPUTERS

Language

- **Speed:** Calculation of data could be done in microseconds.
- **Cost:** The cost was reduced
- Memory: magnetic storage disks and magnetic core as memory
- Language: Used high-level languages such as Fortran and Cobol.

Second Generation Computers (1957-1963)

Pros:

- They are smaller in size.

Cons:

- They generate less heat yet they still

HISTORY OF COMPUTERS

- More reliable
- Used less power
- Generates less heat.
- Was faster.
- Improved accuracy

needed a cooling system.

- They require frequent maintenance.
- The commercial production was difficult.

They were used only for some

Offered better portability.

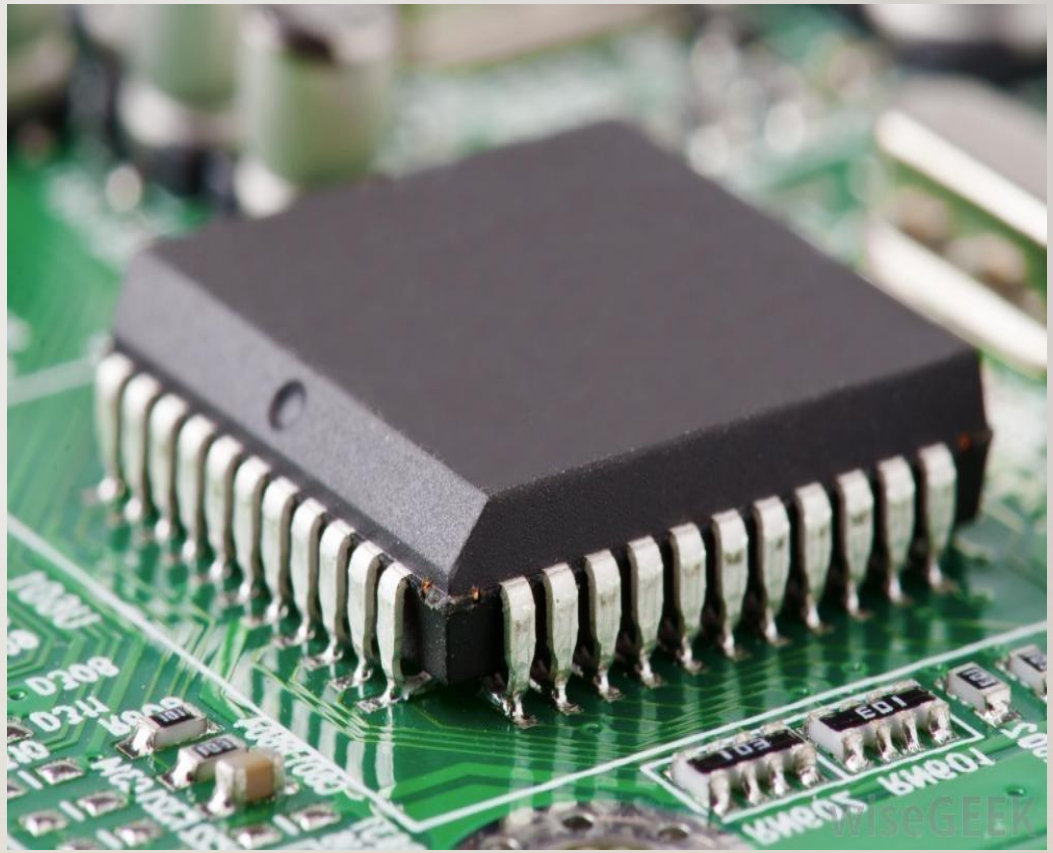
- specific purposes.
- They also use punch cards for input.

HISTORY OF COMPUTERS

-

HISTORY OF COMPUTERS

- instead of transistors
- An IC is a semiconductor material, that contains thousands of transistors miniaturized in it.
- With the help of ICs, the computer becomes more ***reliable, fast, required less maintenance, small in size, generates less heat, and is less expensive.***



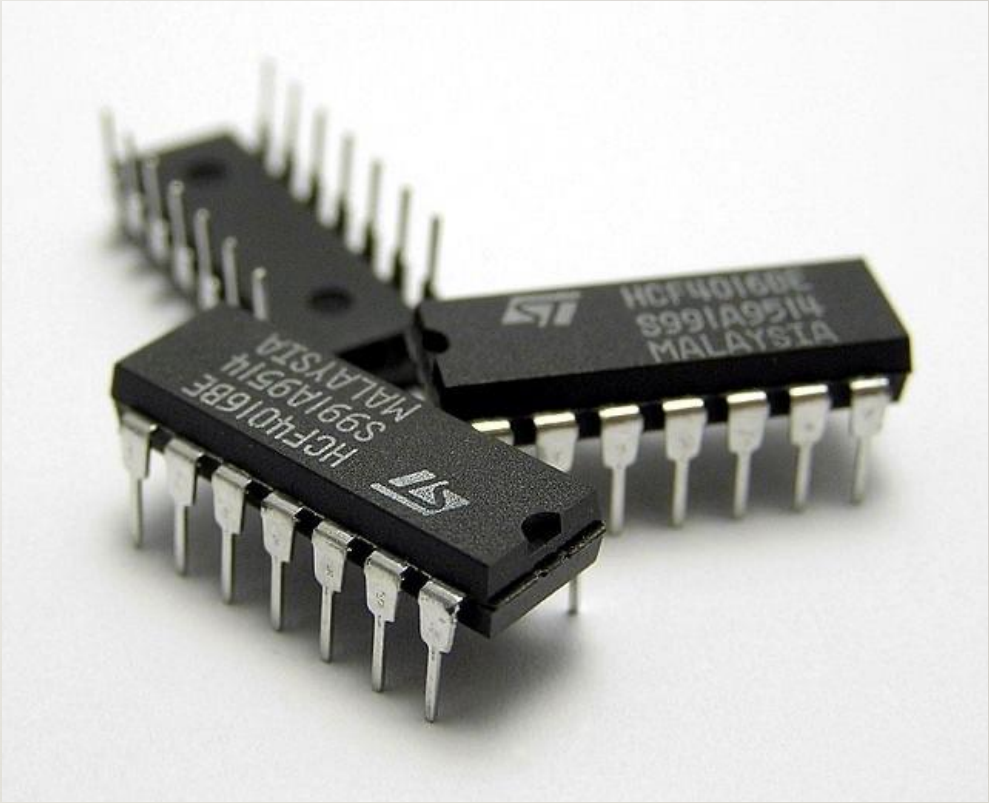
❑ Third Generation Computers (1965-1971)

HISTORY OF COMPUTERS

They used Integrated Circuits(IC)

HISTORY OF COMPUTERS

- It was developed by Robert Noyce of Fairchild Semiconductor and
- Jack Kilby (American electrical engineer) of Texas Instruments in 1958



- Third Generation Computers (1965-1971)

HISTORY OF COMPUTERS

Computers:

- Programming languages such as: BASIC, PASCAL, ALGOL-68, COBOL, FORTRAN – II, PASCAL PL/1.
- The punch cards were replaced with mouse and keyboards.
- The computers have higher storage capacity.

❑ Third Generation Computers (1965-1971)

HISTORY OF COMPUTERS

Characteristics of Third Generation

HISTORY OF COMPUTERS

Third Generation Computers (1965-1971)

Pros

- Required less space due to the use of ICs.
- A single IC can contain transistors, resistors, condensers, etc. on a piece of the silicon semiconductor substrate.

operations.

- They have less hardware failure as compared to previous generations.
- mouse and keyboards replaces punch cards
- They have high storage capacity and give more accurate results,
- The computers were portable and offer better speed.

HISTORY OF COMPUTERS

- Produces less heat and required less energy during

Third Generation Computers (1965-1971)

Cons:

- These computers still required air conditioning/cooling.

HISTORY OF COMPUTERS

- To manufacture IC, highly sophisticated technology was required.
- Maintaining IC chips were difficult.

HISTORY OF COMPUTERS

- (VLSI) circuits.
- VLSI circuits can have thousands of ICs on a single **silicon chip.**
- VLSI circuits contained about 5000 transistors
- Could store more data because of enhanced memory technology.
- Intel was the first corporation to build a microprocessor

❑ Fourth Generation Computers (1971-1980)

HISTORY OF COMPUTERS

Used Very Large Scale Integrated

HISTORY OF COMPUTERS

Fourth Generation Computers (1971-1980)

- Made it possible to have microcomputers.
- Became more ***powerful, compact, reliable, and affordable***
- Birthed the era of the Personal Computer (PC).
- In this generation, time-sharing, real time networks, distributed operating system were developed.
- High-level languages such as: C, C++, DBASE etc., were used in this generation

HISTORY OF COMPUTERS

Fourth Generation Computers (1971-1980)

Pros.

- Designed to be used for a wide range of purposes (general-purpose computers).
- Smaller and more dependable than previous generations of computers.
- There was very little heat generated.
- does not require a extensive cooling system.
- Quicker than previous generations.
- Portable and less expensive

HISTORY OF COMPUTERS

- The Graphical User Interface (GUI) technology was used to provide users with

HISTORY OF COMPUTERS

better comfort.

- Repair time and maintenance costs are reduced.
- Designed in a way to make it easy to produce commercially

.

Fourth Generation Computers (1971-1980)

The fabrication of the ICs necessitated the use of cutting-edge technologies

HISTORY OF COMPUTERS

Some examples include:

DEC 10

STAR 1000

-
-
-
- CRAY-1(Supercomputer)
- CRAY-X-MP(Supercomputer)

HISTORY OF COMPUTERS

PDP 11

HISTORY OF COMPUTERS

(Ultra Large Scale Integration) technology, resulting in the production of microprocessor chips having ten million electronic components

- Fifth Generation Computers (1980-till present)

HISTORY OF COMPUTERS

VLSI technology became ULSI

HISTORY OF COMPUTERS

Fifth Generation Computers (1980-till present)

Characteristics

- Fifth generation computer technology is still in development today
- Some applications, such as voice recognition being used today

- Use of superconductors
- Quantum computing
- Nano technology

HISTORY OF COMPUTERS

- They are based on artificial intelligence.
- Are able to process natural language
- Use parallel processing for high performance computing (HPC)

HISTORY OF COMPUTERS

- Fifth Generation Computers (1980-till present)

Artificial intelligence (AI): is a broad branch of computer science that deals with the development of **smart machines** that can perform human tasks without human intelligence and intervention.

1. Machine learning
2. Deep learning
3. Natural language processing
4. Computer vison

HISTORY OF COMPUTERS

Artificial intelligence

HISTORY OF COMPUTERS

- Fifth Generation Computers (1980-till present)

1. Machine learning:

It is a branch of artificial intelligence based on the idea that systems can learn from data, recognize patterns, and make decisions with minimal human intervention. machine learning is a specific subset of AI that trains a machine to learn.

HISTORY OF COMPUTERS

Artificial intelligence

HISTORY OF COMPUTERS

1. Machine learning:

***Image Recognition* -** Image recognition is one of the most common applications of machine learning. It is used to identify objects, persons, places, digital images, etc. The popular use case of image recognition and face detection is, **Automatic friend tagging suggestion used by facebook.**

- Fifth Generation Computers (1980-till present)

HISTORY OF COMPUTERS

Artificial intelligence

HISTORY OF COMPUTERS

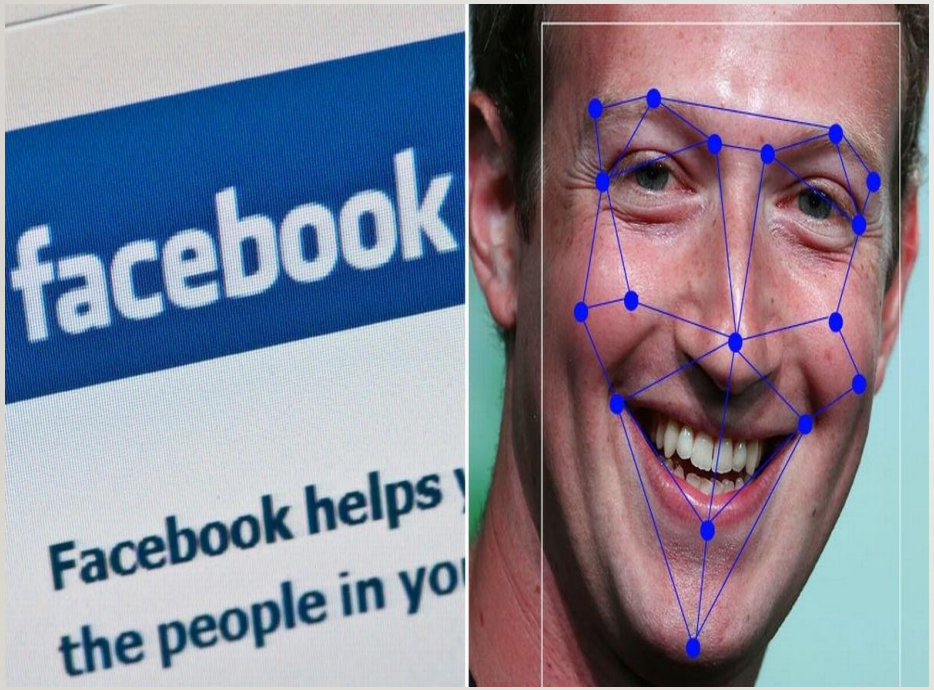


Image Recognition; Whenever you upload a picture with your Facebook friends, you automatically get a tagging suggestion with name.

The technology behind this is machine learning's **face detection** and **recognition algorithm**.

It is based on Facebook "**Deep Face**," project which is responsible for face recognition and person identification in the pictures.

- Fifth Generation Computers (1980-till present)

HISTORY OF COMPUTERS

Artificial intelligence

HISTORY OF COMPUTERS

Speech Recognition: While using Google, we get an option of "**Search by voice**," it comes under speech recognition, and it's a popular application of machine learning.

- Fifth Generation Computers (1980-till present)

HISTORY OF COMPUTERS

Artificial intelligence

HISTORY OF COMPUTERS

- Fifth Generation Computers (1980-till present)

HISTORY OF COMPUTERS

Artificial intelligence

Speech recognition: is a process of converting voice instructions into text, and it is also known as "**Speech to text**", or "**Computer speech recognition**." At present, machine learning algorithms are widely used by various applications of speech recognition. **Google assistant**, **Siri**, **Cortana**, and **Alexa** are using speech recognition technology to follow the voice instructions.

HISTORY OF COMPUTERS

- Fifth Generation Computers (1980-till present)

Expert systems: An expert system is a computer program that is designed to solve complex problems and to provide decision-making ability like a human expert. It performs this by extracting knowledge from its knowledge base using the reasoning and inference rules.

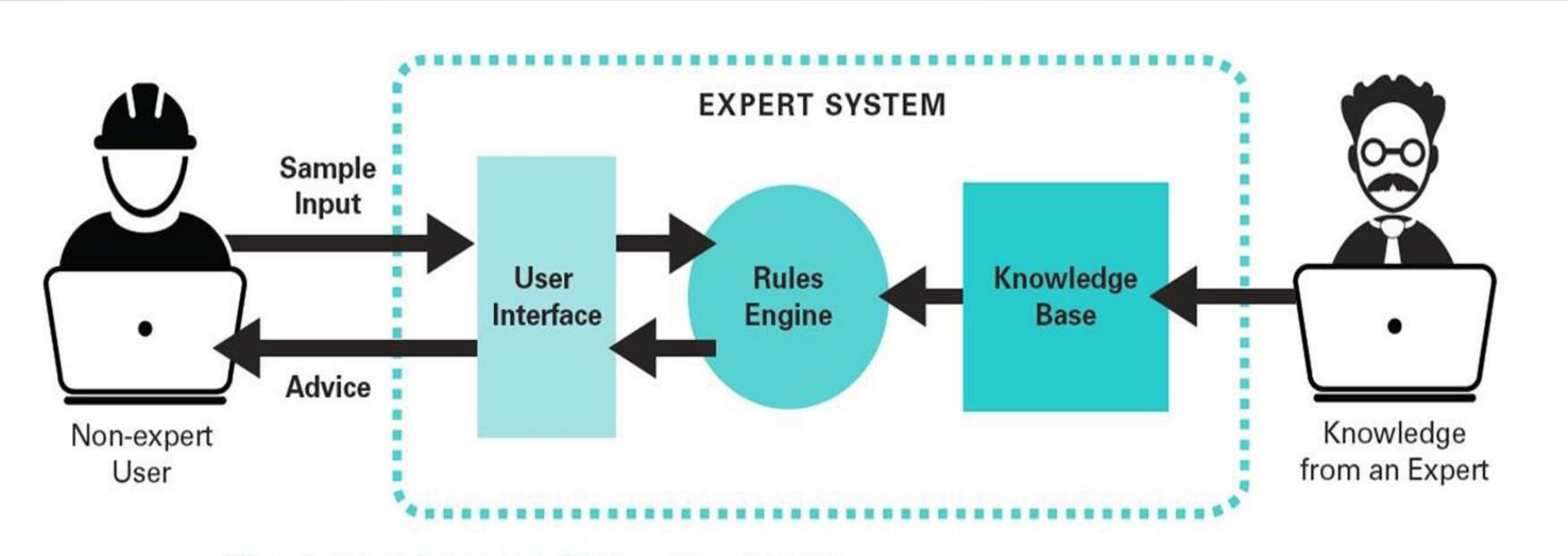
HISTORY OF COMPUTERS

Artificial intelligence

Machine learning:

HISTORY OF COMPUTERS

- Fifth Generation Computers (1980-till present)



HISTORY OF COMPUTERS

Artificial intelligence - Machine learning - Expert systems

HISTORY OF COMPUTERS

- Fifth Generation Computers (1980-till present)

HISTORY OF COMPUTERS

Artificial intelligence - Machine learning - Expert systems

HISTORY OF COMPUTERS

- Fifth Generation Computers (1980-till present)

Examples.

1. ***Deep blue V Gary Kasparov:***

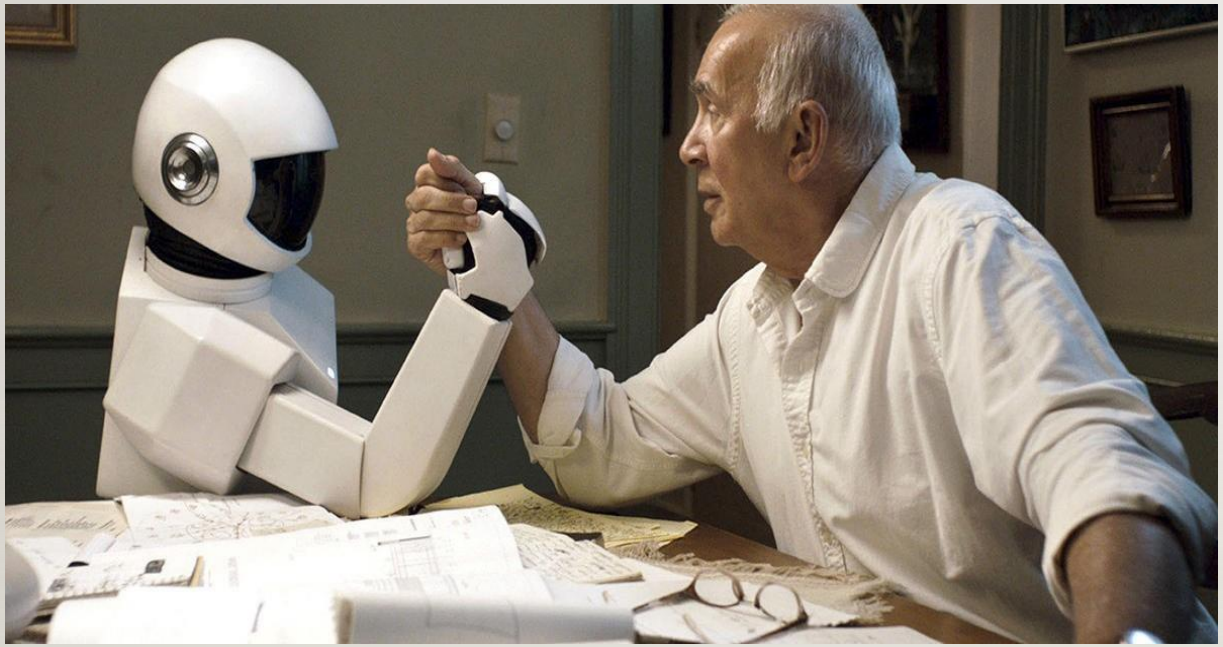
The first match was played in Philadelphia in 1996/7 and won by Kasparov by 4–2. A rematch was played in New York City in 1997 and won by Deep Blue by 3½–2½

HISTORY OF COMPUTERS

Artificial intelligence - Machine learning - Expert systems

HISTORY OF COMPUTERS

- Fifth Generation Computers (1980-till present)



Social robots: Shows how machine learning can ultimately be used.

Link

HISTORY OF COMPUTERS

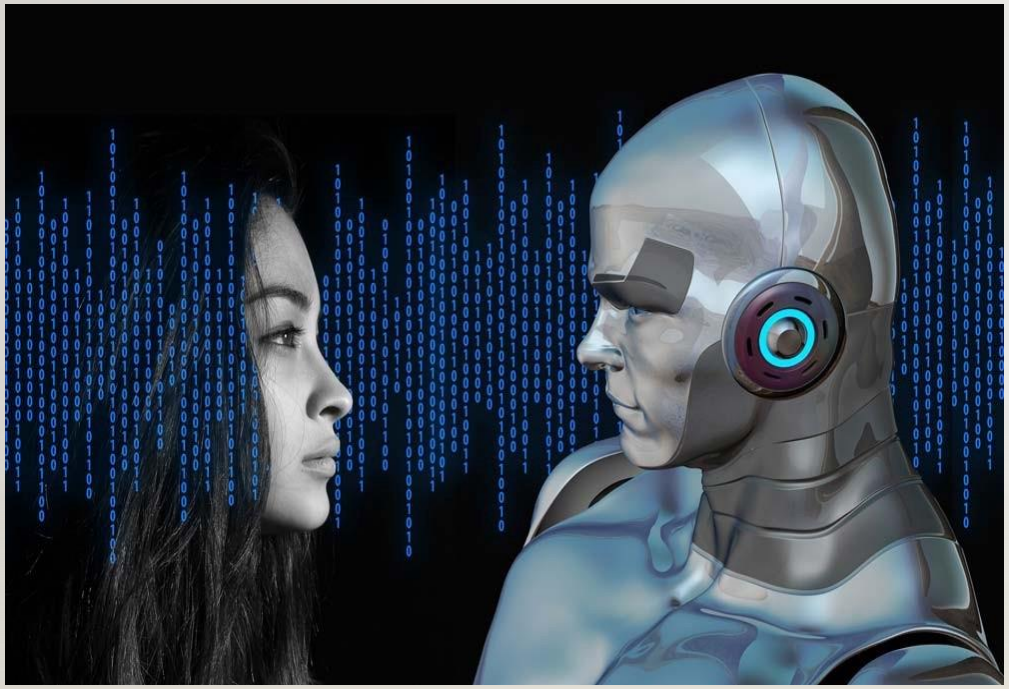
Artificial intelligence

Machine learning:

HISTORY OF COMPUTERS

- Fifth Generation Computers (1980-till present)

HISTORY OF COMPUTERS



Machine learning:

that on helping computers to understand the way that humans write and speak.

Natural language understanding (NLU) A sub-branch of NLP that deals with machine reading and comprehension.

The aim of NLP and NLU is to help computers understand human language well enough that they can converse in a natural way

HISTORY OF COMPUTERS

Artificial intelligence

Natural language processing (NLP) Branch of artificial intelligence focuses

HISTORY OF COMPUTERS

Fifth Generation Computers (1980-till present)

Artificial intelligence – Machine Learning – Natura Language Processing

Some real-world applications and use cases of NLP include:

- Voice-controlled assistants like Siri and Alexa.
- Natural language generation for question answering by customer service chatbots.
- Streamlining the recruiting process on sites like LinkedIn by scanning through people's listed skills and experience.
- Tools like Grammarly which use NLP to help correct errors and make suggestions for simplifying complex writing.

HISTORY OF COMPUTERS

- Language models like autocomplete which are trained to predict the next

HISTORY OF COMPUTERS

words in a text, based on what has already been typed.

- Fifth Generation Computers (1980-till present)

HISTORY OF COMPUTERS

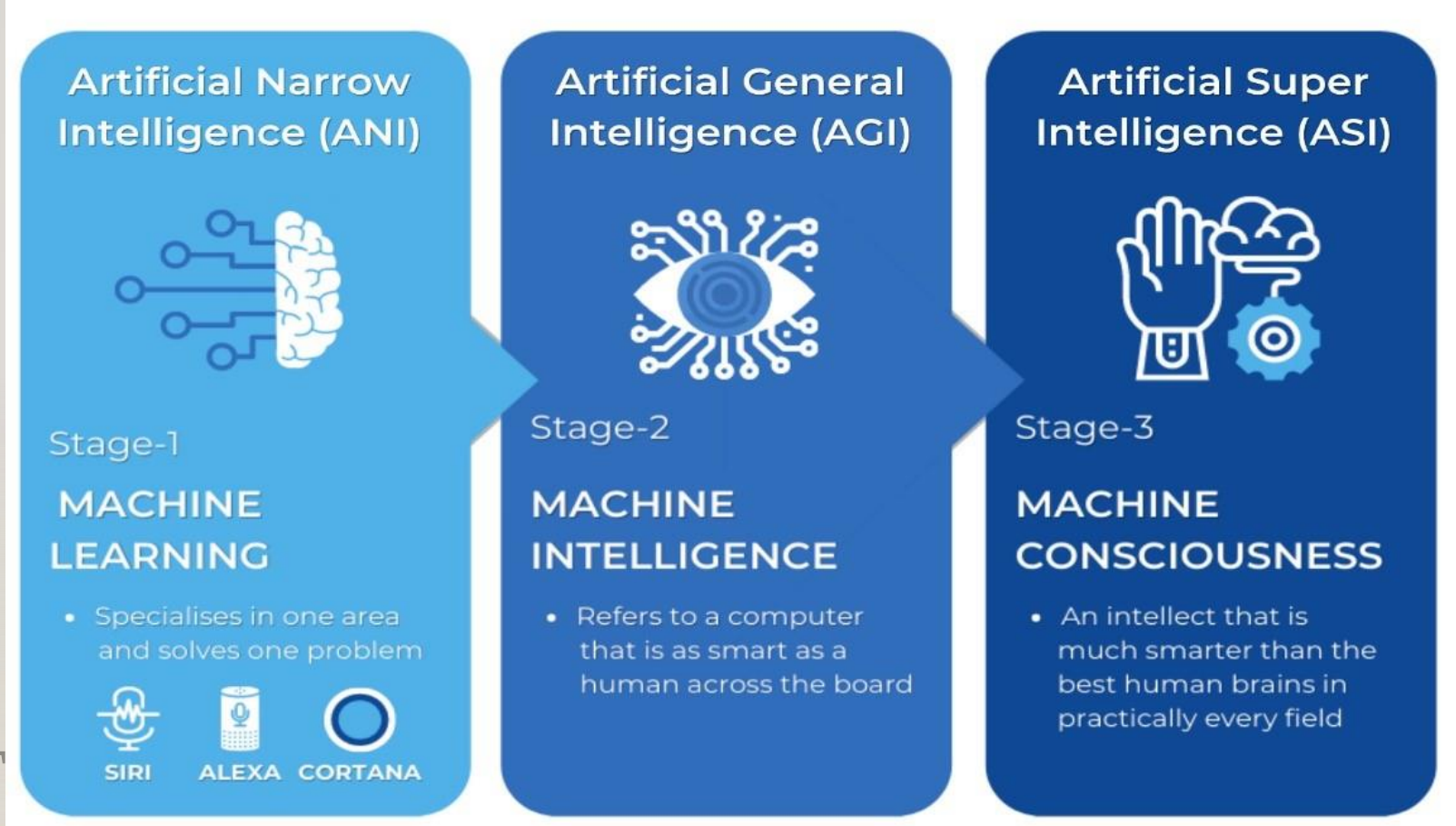
Artificial intelligence – Machine Learning – Natura Language Processing

existing www, with software programs and machine-interpretable metadata of the published information and data.
In other words, we add further data descriptors to existing content and data on the Web. As a result, computers are able to make meaningful interpretations similar to the way humans process information to achieve their goals.

HISTORY OF COMPUTERS

The Semantic Web. Is about an extension of the

HISTORY OF COMPUTERS



HISTORY OF COMPUTERS

Artificial intelligence: Stages of development

HISTORY OF COMPUTERS

- Fifth Generation Computers (1980-till present)

Parallel processing

Parallel computing refers to the process of breaking down larger problems into smaller, independent, often similar parts that can be executed simultaneously by multiple processors communicating via shared memory, the results of which are combined upon completion as part of an overall algorithm.

HISTORY OF COMPUTERS

The primary goal of parallel computing is to increase available

HISTORY OF COMPUTERS

computation power for faster application processing and problem solving.

- Fifth Generation Computers (1980-till present)

HISTORY OF COMPUTERS

Types of Parallel processing

Multi-core computing: A multi-core processor is a computer processor integrated circuit with two or more separate processing cores, each of which executes program instructions in parallel.

Dual-core, quad-core, octa-core

Distributed computing

Massively parallel computing

Symmetric multiprocessing

HISTORY OF COMPUTERS

A supercomputer is a computer with a high level of performance as compared to a general-purpose computer. The performance of a supercomputer is commonly measured in floating-point operations per second instead of million instructions per second. Since 2017, there are supercomputers which can perform over 10^{17} FLOPS

- Fifth Generation Computers (1980-till present)

HISTORY OF COMPUTERS

Super computers

HISTORY OF COMPUTERS

- Fifth Generation Computers (1980-till present)

Prefix	Abbreviation	Order of magnitude (as a factor of 10)	Computer performance	Storage capacity
giga-	G	10^9	gigaFLOPS (GFLOPS)	gigabyte (GB)
tera-	T	10^{12}	teraFLOPS (TFLOPS)	terabyte (TB)
peta-	P	10^{15}	petaFLOPS (PFLOPS)	petabyte (PB)
exa-	E	10^{18}	exaFLOPS (EFLOPS)	exabyte (EB)
zetta-	Z	10^{21}	zettaFLOPS (ZFLOPS)	zettabyte (ZB)
yotta-	Y	10^{24}	yottaFLOPS (YFLOPS)	yottabyte (YB)

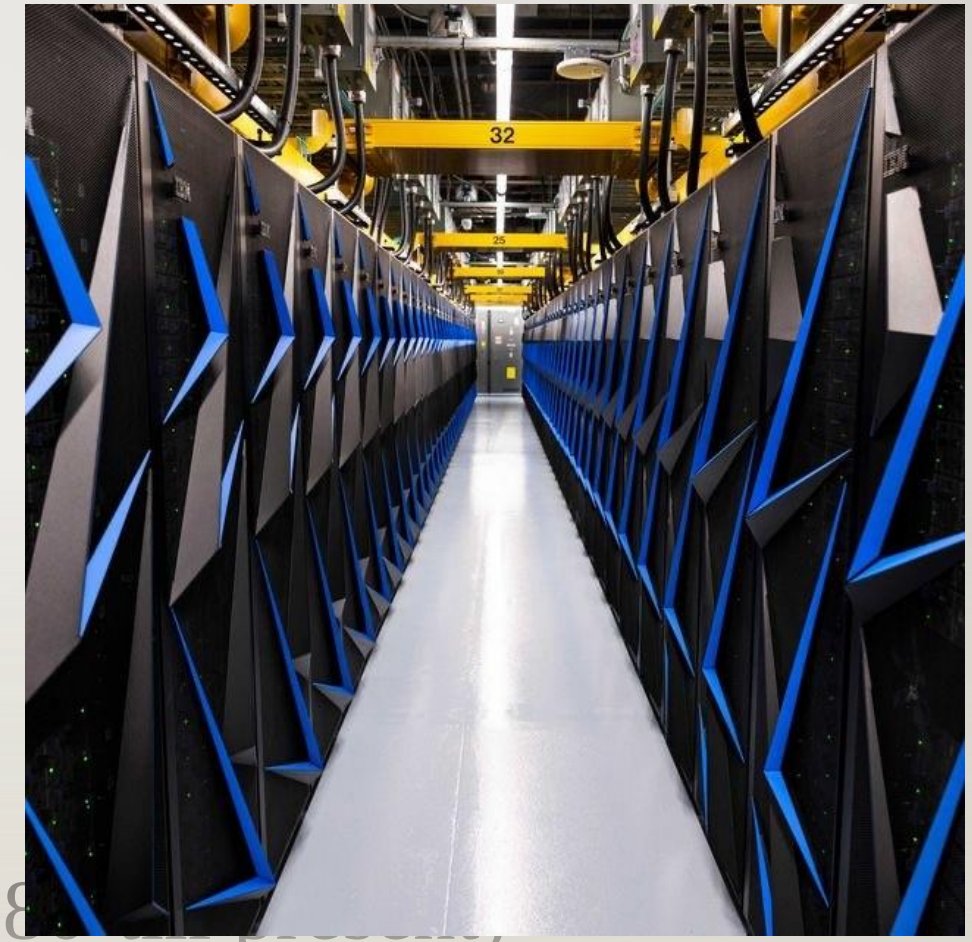
The rate, **fl**oating-point **o**perations **p**er **s**econd, is abbreviated as FLOPS.

HISTORY OF COMPUTERS

Understand measures of supercomputer performance and storage system capacity

HISTORY OF COMPUTERS

1.Summit Supercomputer
2.Sierra Supercomputer
3.Sunway Taihu Light Supercomputer
4.Tianhe-2 Supercomputer
5.Frontera Supercomputer
6.Cray-1
7.Fugaku
8.PARAM-Siddhi
9.ETA10
10.CRAY X-MP
11.Hydra supercomputer



Fifth Generation Computers (198[illegible] present)

HISTORY OF COMPUTERS

Some example of super computers

HISTORY OF COMPUTERS

- Fifth Generation Computers (1980-till present)

Characteristics of Supercomputer

There are some characteristics of supercomputers is given below 1.They can support more than a hundred users at a time.
2.This machine is also faster than the imagination of humans.
3.These computers are capable of doing all kinds of work.
4.Many people can work at the same time on a supercomputer.
5.These are the most expensive computers and can be made anytime.
6.Supercomputers have huge storage capacity.

HISTORY OF COMPUTERS

7.Supercomputers are so expensive that no ordinary person can afford it.

Assignment. (To be submitted on 19th March 2021 @ 5pm)

1. In the context of Machine Learning (ML), what is supervised and unsupervised Learning?
2. How can you train a ML model to be able to recognize objects, say apples?

HISTORY OF COMPUTERS

3. Mention 3 applications that can be used to train ML models

- Fifth Generation Computers (1980-till present)

Quantum computers

Quantum computing is a type of computation that harnesses the collective properties of quantum states, such as **superposition**, **interference**, and **entanglement**, to perform calculations. The devices that perform quantum computations are known as quantum computers

HISTORY OF COMPUTERS

Classical computers carry out logical operations using the definite position of a physical

HISTORY OF COMPUTERS

state. These are usually binary, meaning its operations are based on one of two positions. A single state - such as on or off, up or down, 1 or 0 - is called a bit.

- Fifth Generation Computers (1980-till present)

Quantum computers

Instead of bits, quantum computers use **qubits**. Rather than just being on or off, qubits can also be in what's called '**superposition**' state where they're both on and off at the same time, or somewhere in-between the two.

Qubit accommodate the state of uncertainty in computing

HISTORY OF COMPUTERS

Entanglement: Normally, if you flip two coins, the result of one coin toss has no

HISTORY OF COMPUTERS

bearing on the result of the other one. They're independent. In entanglement, two particles are linked together, even if they're physically separate. If one comes up heads, the other one will also be heads.

- Fifth Generation Computers (1980-till present)

Quantum computers

And if you can string together multiple qubits, you can tackle problems that would take our super computers millions of years to solve.

It is unlikely to have a quantum chip in our laptops or smartphones. There's never going to be an iPhone Q.

HISTORY OF COMPUTERS

This is because qubits are incredibly sensitive to interference. Anything can knock

HISTORY OF COMPUTERS

them out of their delicate superposition state. As a result, quantum computers have to be kept isolated from all forms of electrical interference, and chilled down to close to absolute zero. They are likely to be used by academics and businesses only,

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- Fifth Generation Computers (1980-till present)

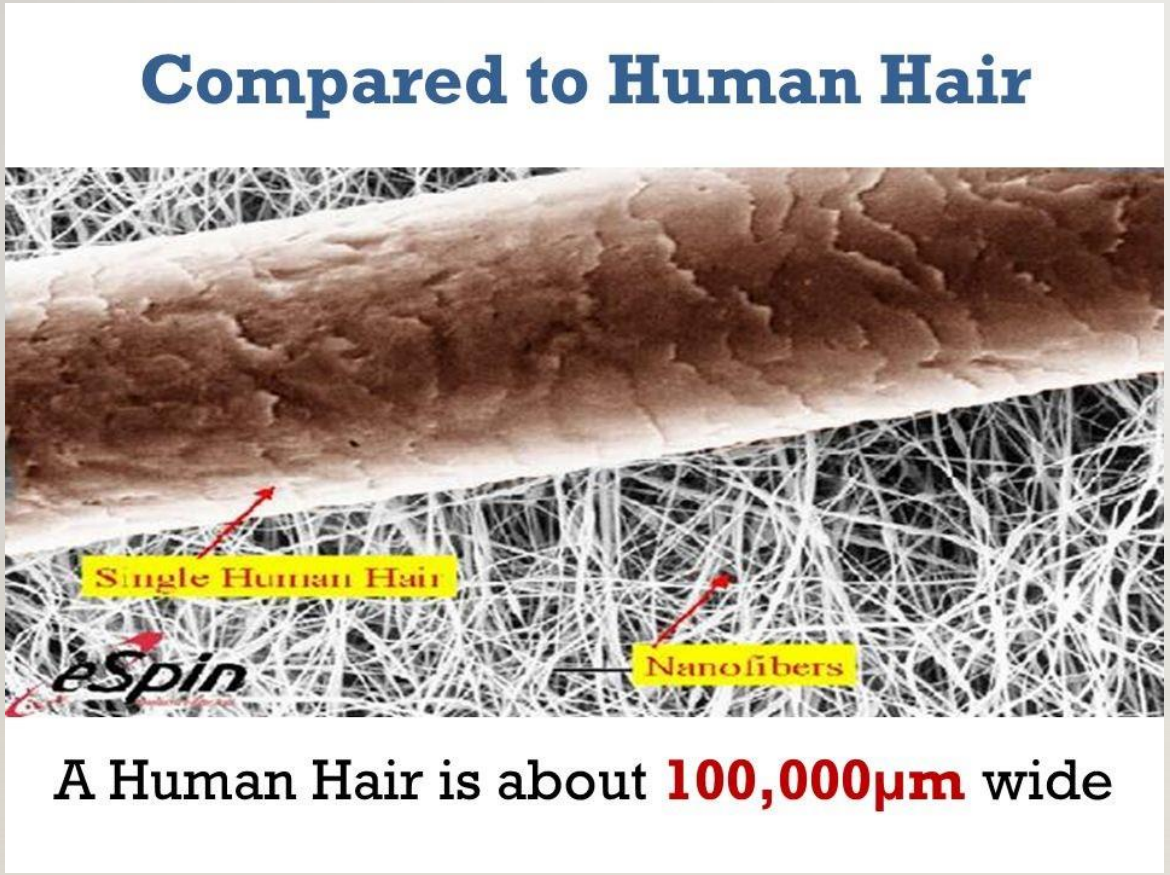
  Quantum computers

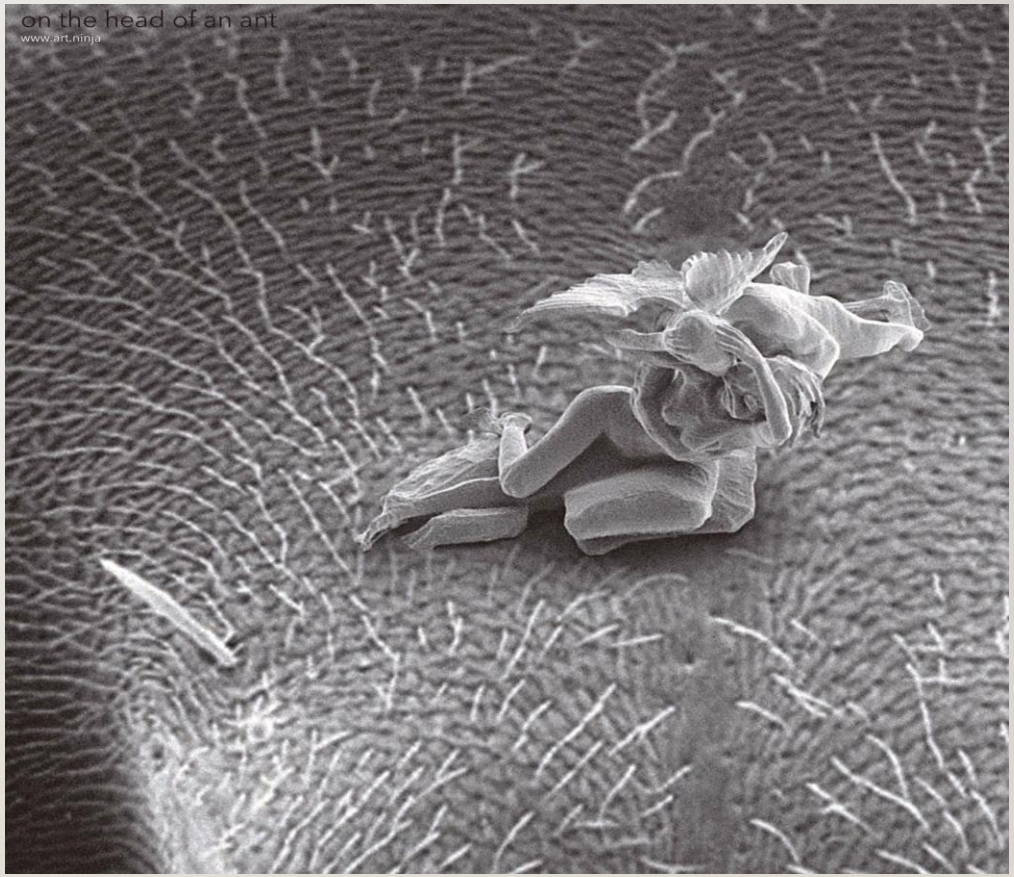
HISTORY OF COMPUTERS

Learn how to program quantum computer with Qiskit peograming language

HISTORY OF COMPUTERS

- Fifth Generation Computers (1980-till present)





HISTORY OF COMPUTERS

Nanotechnology, Nano engineering

HISTORY OF COMPUTERS

- Fifth Generation Computers (1980-till present)

Nanotechnology, Nano engineering

Nanotechnology is a field of research and innovation concerned with building 'things' - generally, materials and devices - on the scale of atoms and molecules. A nanometre is one-billionth of a metre:
The diameter of a human hair is, on average, 80,000 nanometres.

HISTORY OF COMPUTERS

At such scales, the ordinary rules of physics and chemistry no longer apply. *For*

HISTORY OF COMPUTERS

instance, materials' characteristics, such as their colour, strength, conductivity and reactivity, can differ substantially between the nanoscale and the macro scales. Eg. Carbon 'nanotubes' are 100 times stronger than steel but six times lighter.

- Fifth Generation Computers (1980-till present)

Nanobiotechnology
Nanoelectronics
Nanocoatings
Nanocomposites
Nanoplasmonics
Nanosensors
Smart Dust

Space
Cosmetics
Automotive Industry
Cement Industry
Construction
Displays
Nanomedicine

Green Industries
Sports Equipment
Nanobots
Nanotechnology Images

HISTORY OF COMPUTERS

Nanotechnology, Nano engineering (Some areas of application)

Food and Agriculture

Fight against Alzheimer's

HIV/AIDS treatment To fight and cure cancer

Detection of foodborne illnesses

Energy

Energy (graphene only)

Graphene Batteries

Ultracapacitors/Supercapacitors

3D Graphene

Furniture

Surgery

Environment

Disaster relief and development cooperation

INTRODUCTION TO THE CLASSICAL COMPUTERS

INTRODUCTION TO COMPUTER HARDWARE

The Computer Hardware

Computer system consists of two parts:

1.Computer Hardware

–A generic name for the various devices that make up a computer system. It is usually the part of the computer that you can physically see or torch

2.Computer Software

–Set of instructions that direct the computer hardware to perform a particular task

The Computer Hardware

The Computer Hardware

The Computer Hardware

Every computer has four major hardware components

1. The Casing
2. A Central Processing Unit
3. A monitor
4. Keyboard
5. Mouse

- Power supply Unit
- Casing
- CD-DVD Drive
- Hard disk drive (HDD)
- Motherboard
- Sound Card
- Video card
- Ram
- Cooling system

The Computer Hardware

The Computer Hardware

The Central Processing Unit (CPU)

The Computer Hardware

The Tower Casing

There are many types of casing available to choose form

The Computer Hardware

Tempered Glass Computer/ Chassis

The Computer Hardware

The Computer Hardware

An ATX computer case complies with the ATX **(Advanced Technology Extended)** computer tower specifications. This standard was introduced by Intel in 1995. The ATX standard is a format for manufacturers of computer hardware to ensures interoperability. The ATX case will accommodate an ATX **power supply** and ATX **motherboard**.

The Computer Hardware

The Extended ATX Tower

FULL TOWER (E-ATX)

Full tower, or Extended ATX, cases are generally larger than the standard ATX cases and almost always the most expensive off-the-shelf cases you can buy. E-ATX cases are mostly designed to be gaming or server cases, with lots of room inside for massive graphics cards (some high end GFX cards are up to 30cm long), water cooling radiators and case fans. Full tower cases usually have more expansion slots at the back, at least two, and up to four, front fans and a side panel window. These large cases are normally only suitable for E-ATX and ATX motherboards.

The Computer Hardware

The Midi/Mid Tower

Midi tower or mid tower were originally known simply as tower or ATX cases but since the arrival of E-ATX, the more descriptive name is used to show that they are between full and mini towers. Mid tower cases are where you will find the most choice, and probably the best value for money. You can spend a little or a lot and as long as you choose carefully, still get a case perfect for your build. ATX cases will usually accept ATX, Mini ATX and Micro ATX motherboards but it is worth double-checking before purchase. Our case is a midi tower.

The Computer Hardware

The Micro ATX Tower

Micro ATX, which are often labelled as mATX or cube cases, are perfect for those with a lack of space and who don't need to fit high end GFX cards, water cooling, etc. Just as with any other type of case, mATX cases are available in a range of styles and at a range of prices. Smaller doesn't need to mean cheaper and less innovative. Building a PC with a mATX case takes a bit more planning than the previous two sizes we have discussed. Most graphics cards that will fit in an ATX or E-ATX case, without you having to think about it, won't fit in many mATX cases. The same applies to large CPU coolers.

The Computer Hardware

The Micro ATX Tower

MINI ITX

The smallest of the four main case form factors, ITX or Mini ITX are most often cubes but you can also find some that are like mini tower cases. These allow for very compact builds, for media PCs and often include features that allow them to be moved around easily with carrying handles, etc. You will have to use a special ITX motherboard with this type of case but you should be able to fit a mid-size graphics card into many of them. The ITX form factor is a fairly recent addition to the PC case ranges and because they are quite specialist, your choice of styles will be slightly more limited than with more common sizes.

The Computer Hardware

The case support modular architecture and expansion

The Computer Hardware

The Central Processing Unit (CPU) – Power Supply Unit (PSU)

The Computer Hardware

The Central Processing Unit (CPU) – Power Supply Unit (PSU)

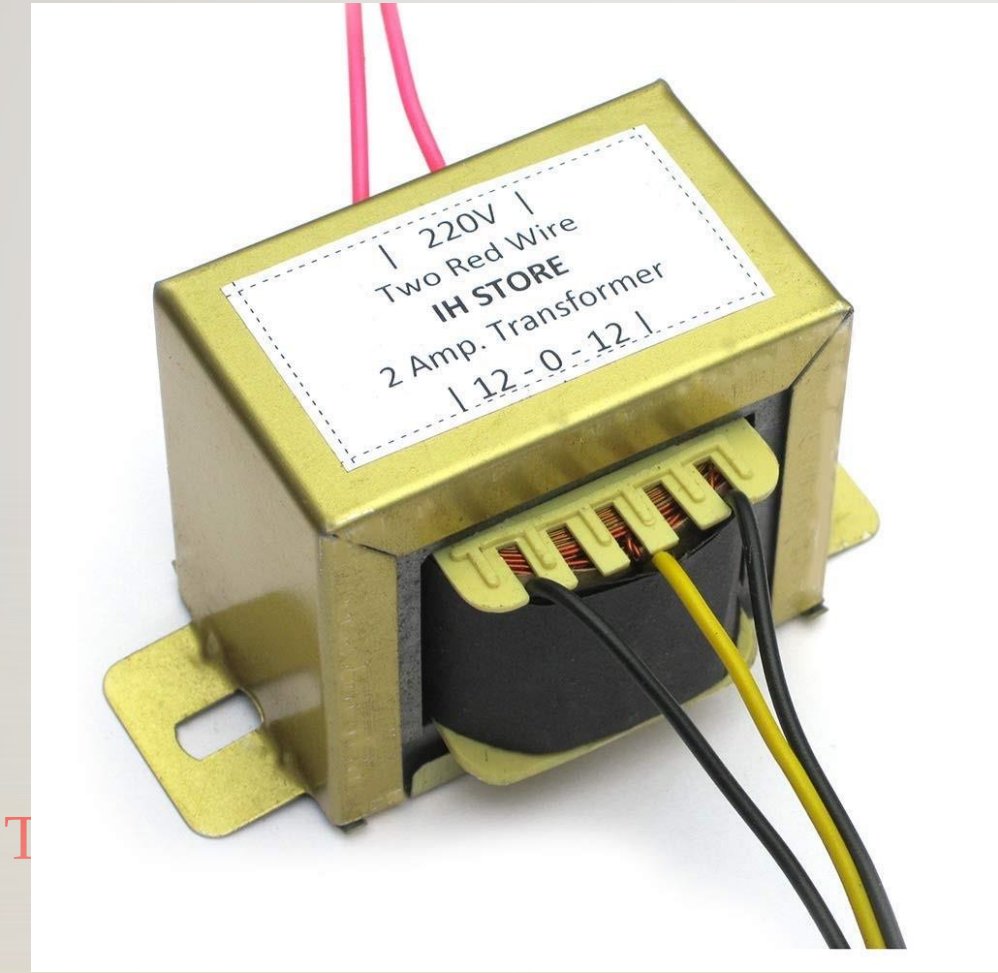
It is a hardware component of a CPU that supplies power to all other components of the PC.
The power supply converts a 110-115 or 220-230 volt AC (alternating current) into a steady low-voltage DC (direct current) usable by the computer

The Computer Hardware

The Central Processing Unit (CPU) – Power Supply Unit (PSU)

A power supply is an electronic circuit that converts the voltage of an alternating current (AC) into a direct current (DC) voltage. It is basically consisting of the following elements: **transformer, rectifier**, **filter** and **regulator** circuits

The Computer Hardware



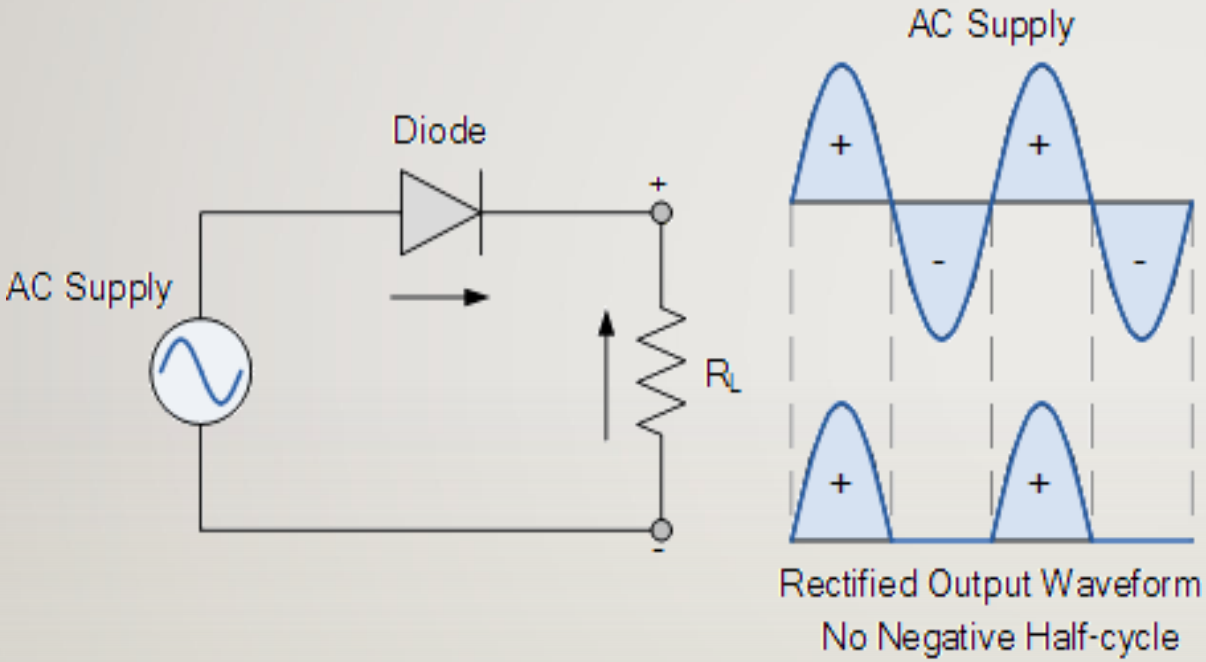
Step down transformer,

The transformer is a device that transfers electrical energy from the primary winding to the secondary winding without affecting the frequency. It is used either to step-up or step-down AC voltage.

T Power Supply Unit (PSU) -Transformer

The Computer Hardware

The Central Processing Unit (CPU) – Power Supply Unit (PSU) -Rectifier



Half wave rectifier

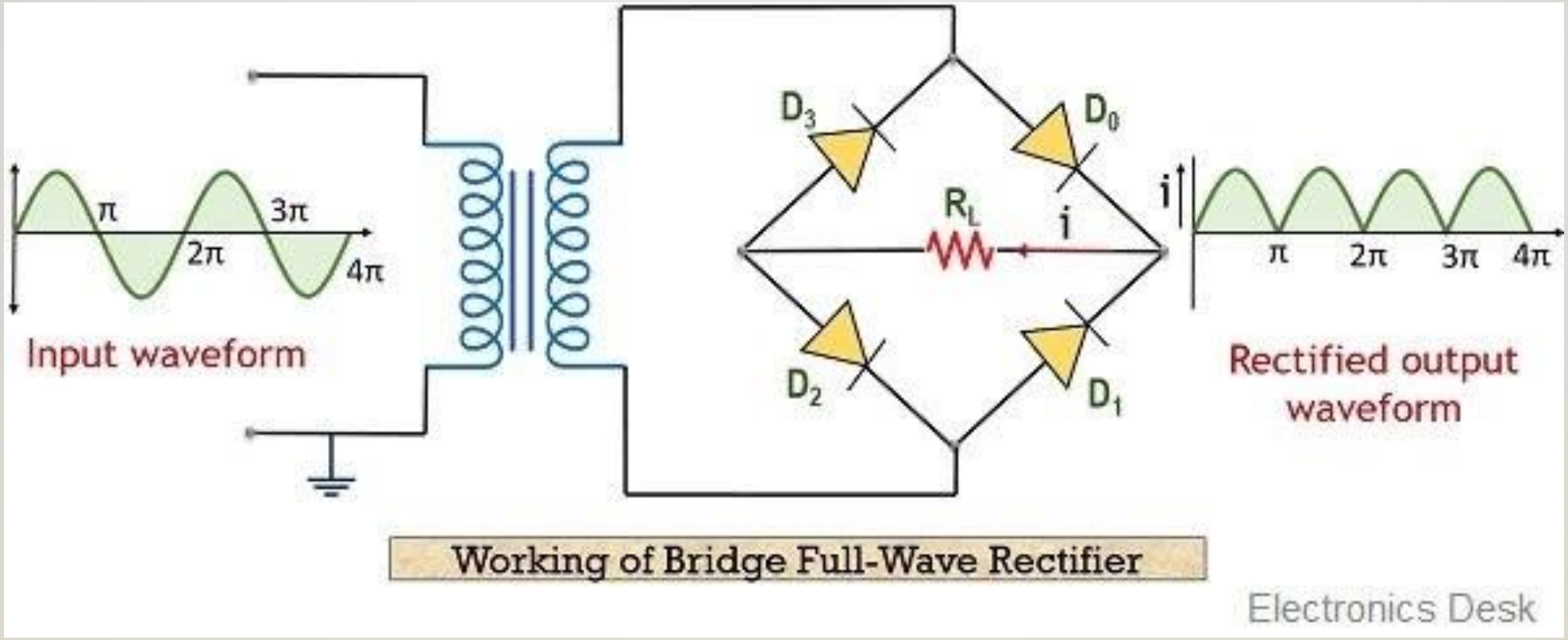
The rectifier is a device used to change the AC power into pulsating DC. The basic rectifier is the diode. A diode is a unidirectional device that operates as rectifier in the forward direction. The two basic types of rectifier half-wave and full-wave rectifiers

The Computer Hardware

Rectifiers,

The Computer Hardware

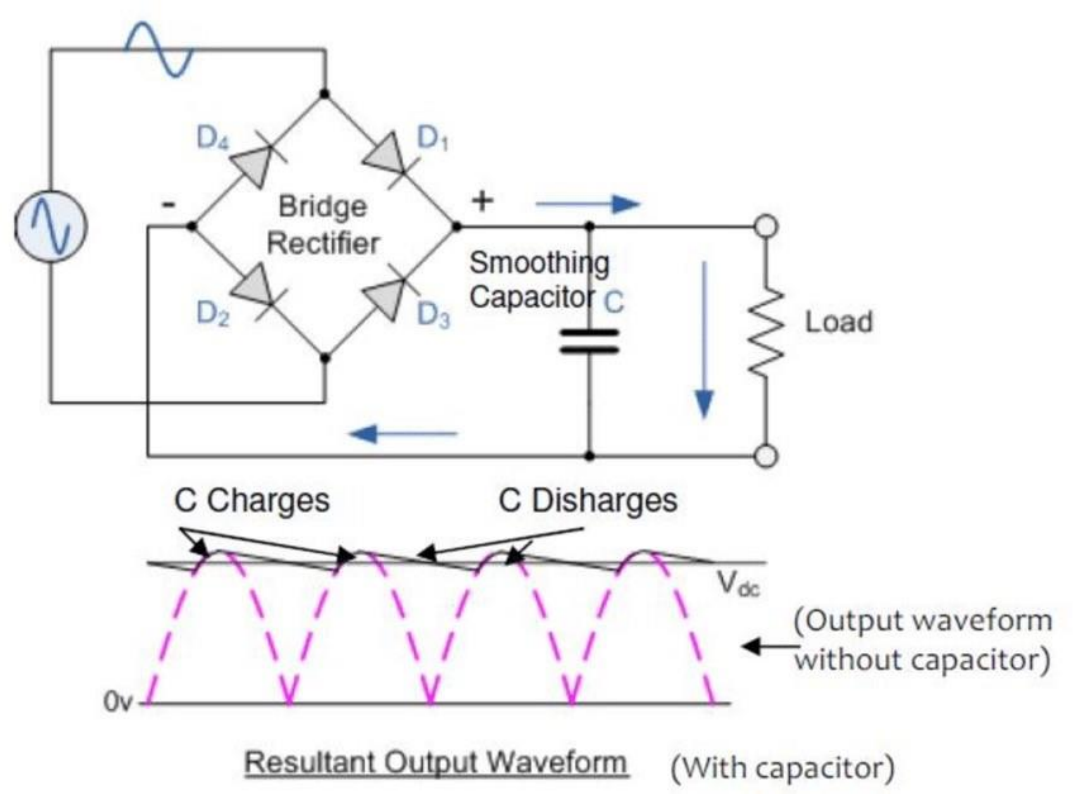
The Central Processing Unit (CPU) – Power Supply Unit (PSU) -Rectifier



The Computer Hardware

Full wave rectifier.

The Computer Hardware

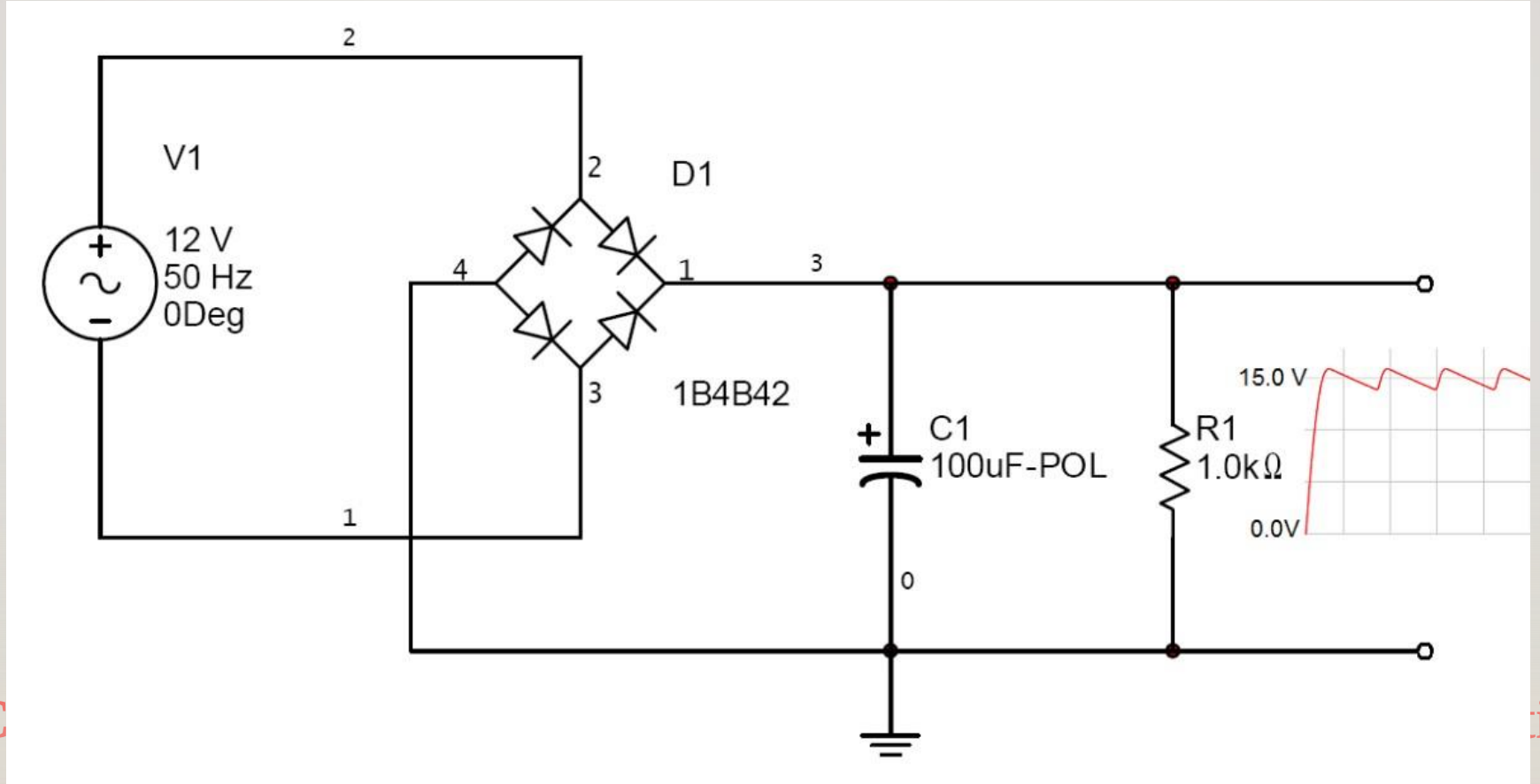


Filters

Filters,

The filter of the power supply is used to keep the ripple component from appearing in the output. It is designed to convert pulsating DC from rectifier circuits into a suitably smooth DC level. The two basic types of power supply filters are the **capacitance filter** (C-filter) and **Resistor-Capacitor filter** (RC-filter).

The Computer Hardware

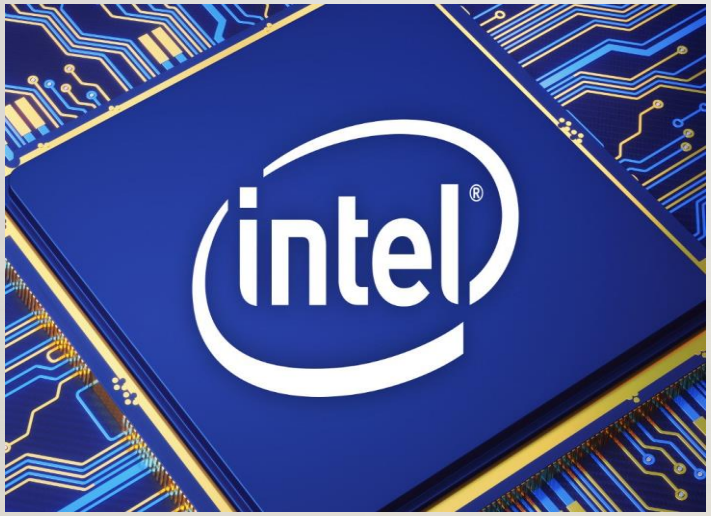


The C ifier

The Computer Hardware

The Central Processing Unit (CPU) – The mother board

There are two major types of Processors



AMD

The Computer Hardware

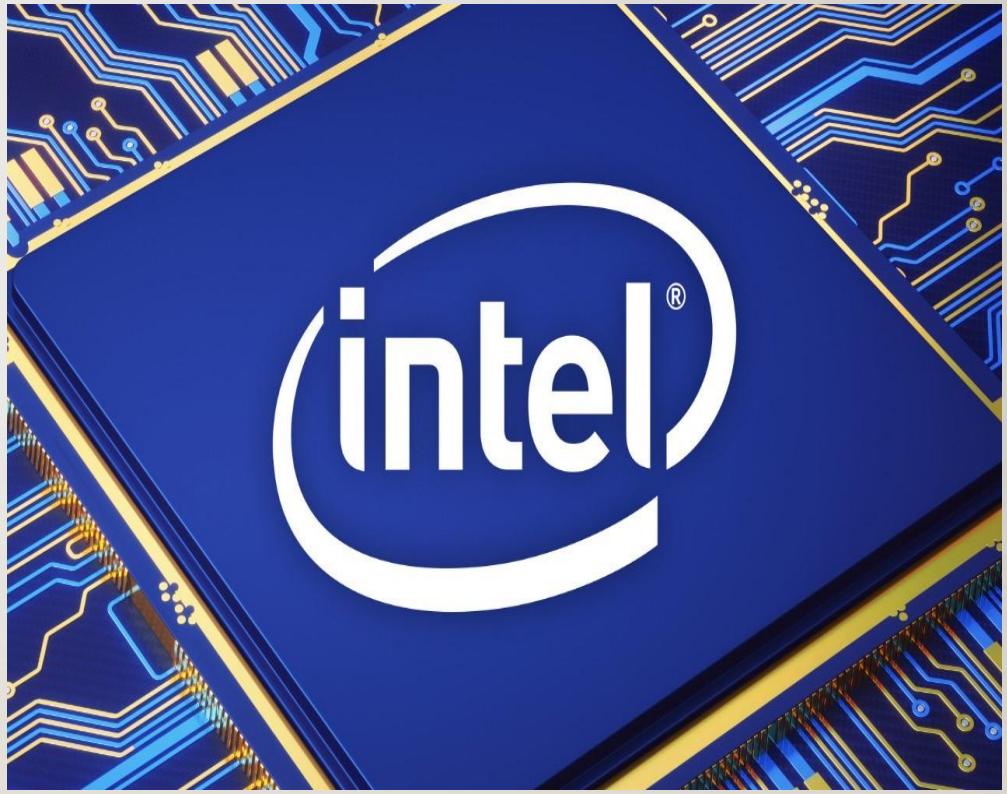
The type of processor informs the type of motherboard to use

The Computer Hardware

The Central Processing Unit (CPU) – The mother board

leaders

- They are known to make the fastest and most powerful processors
- They are relatively expensive



The Computer Hardware

- Intel processors are the market

The Computer Hardware

The Central Processing Unit (CPU) – The mother board

have some relatively good processors

- Less expensive

The Computer Hardware

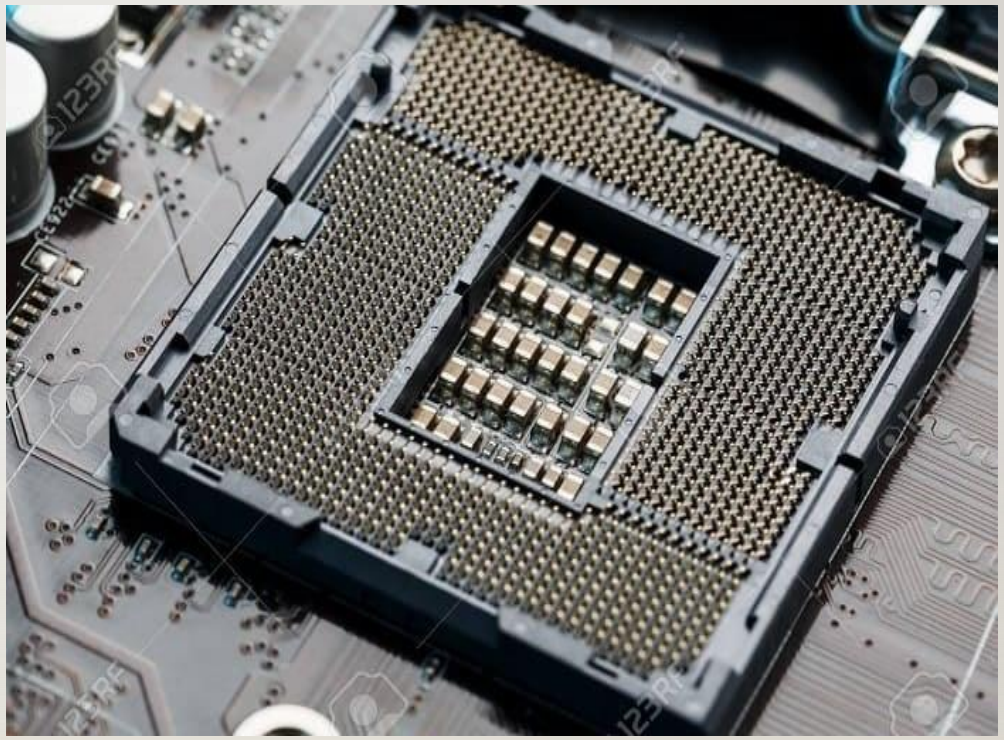
- AMD processors are not as fast or powerful as intel although they

The Computer Hardware

The Central Processing Unit (CPU) – The mother board

- Although all processors might look identical on the outside, they are continually being improved and updated and will only fit specific sockets.

- Search the market for a motherboard whose socket matches the processor you intend to use



The Computer Hardware

The Central Processing Unit (CPU) – The mother board

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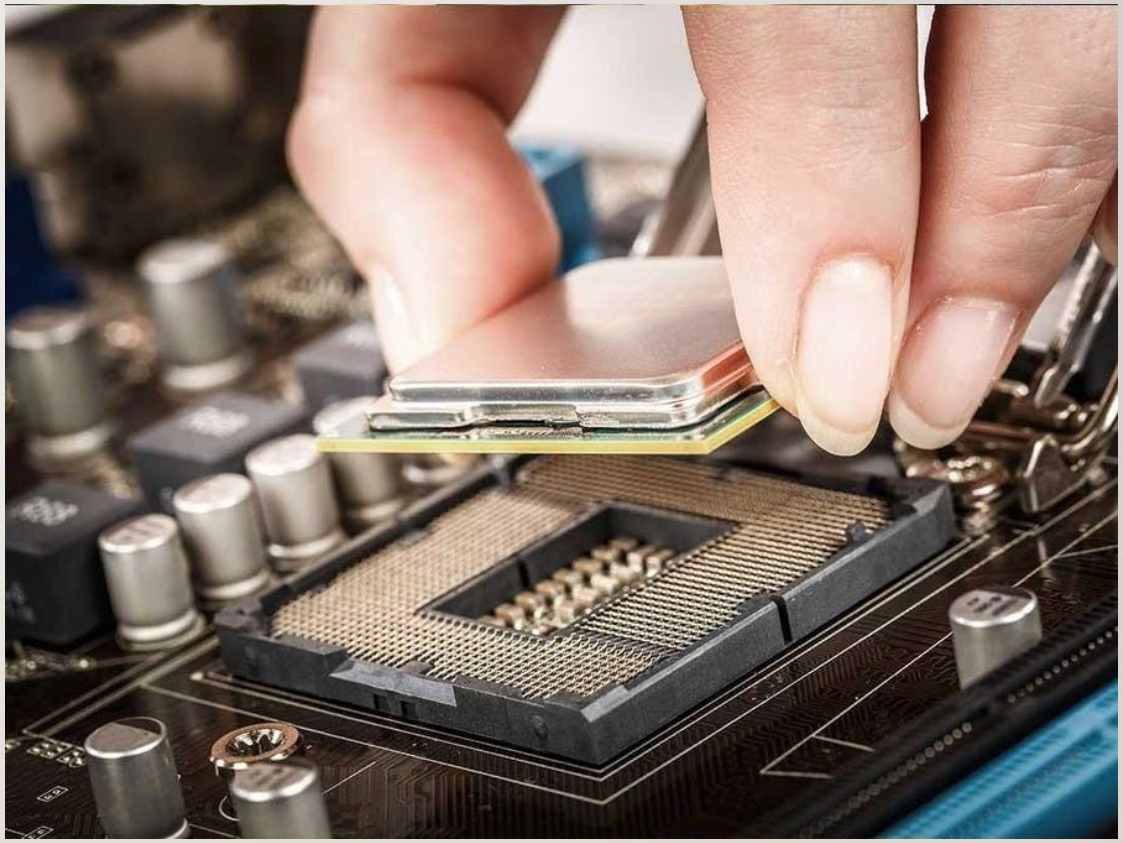
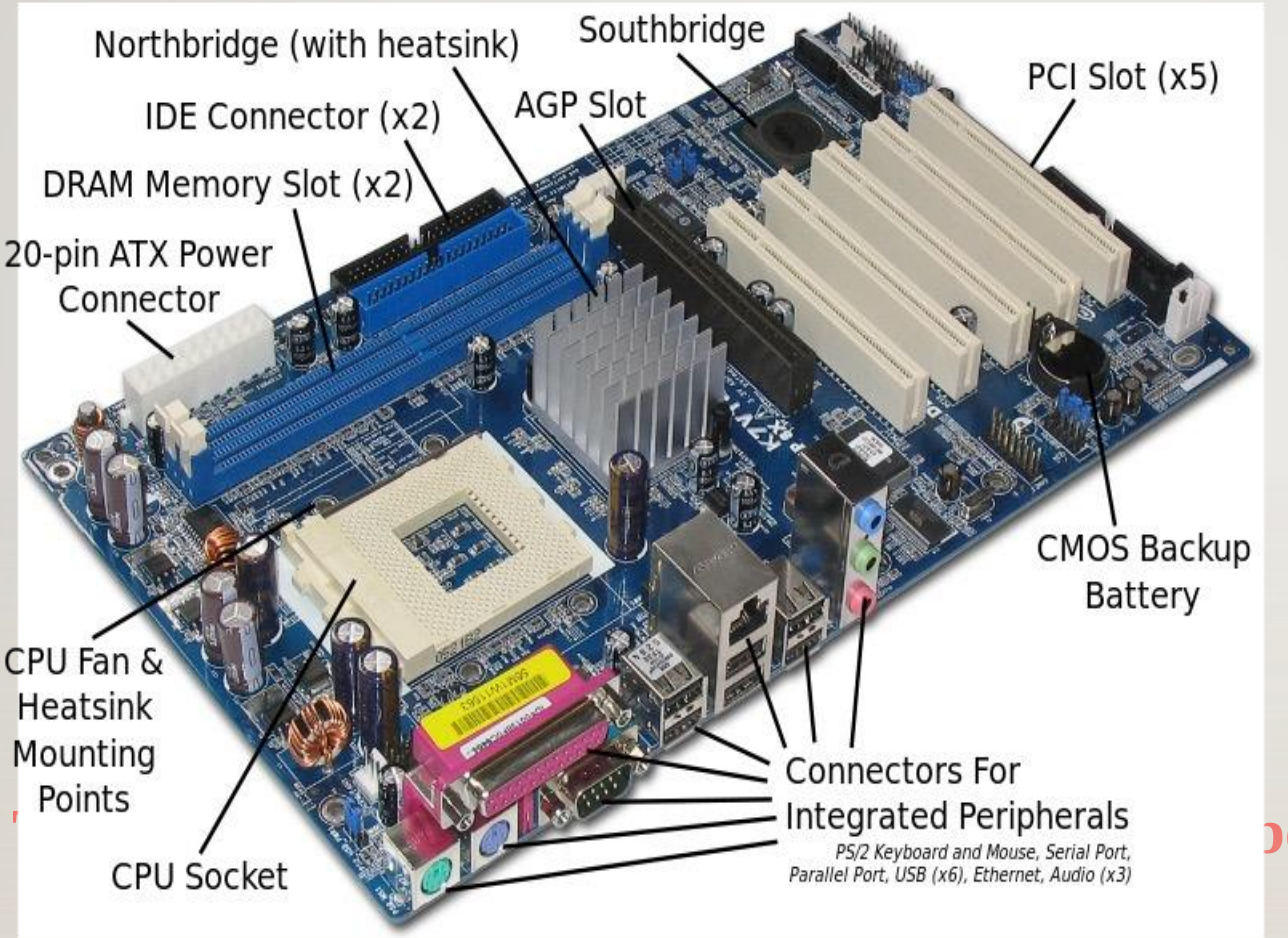
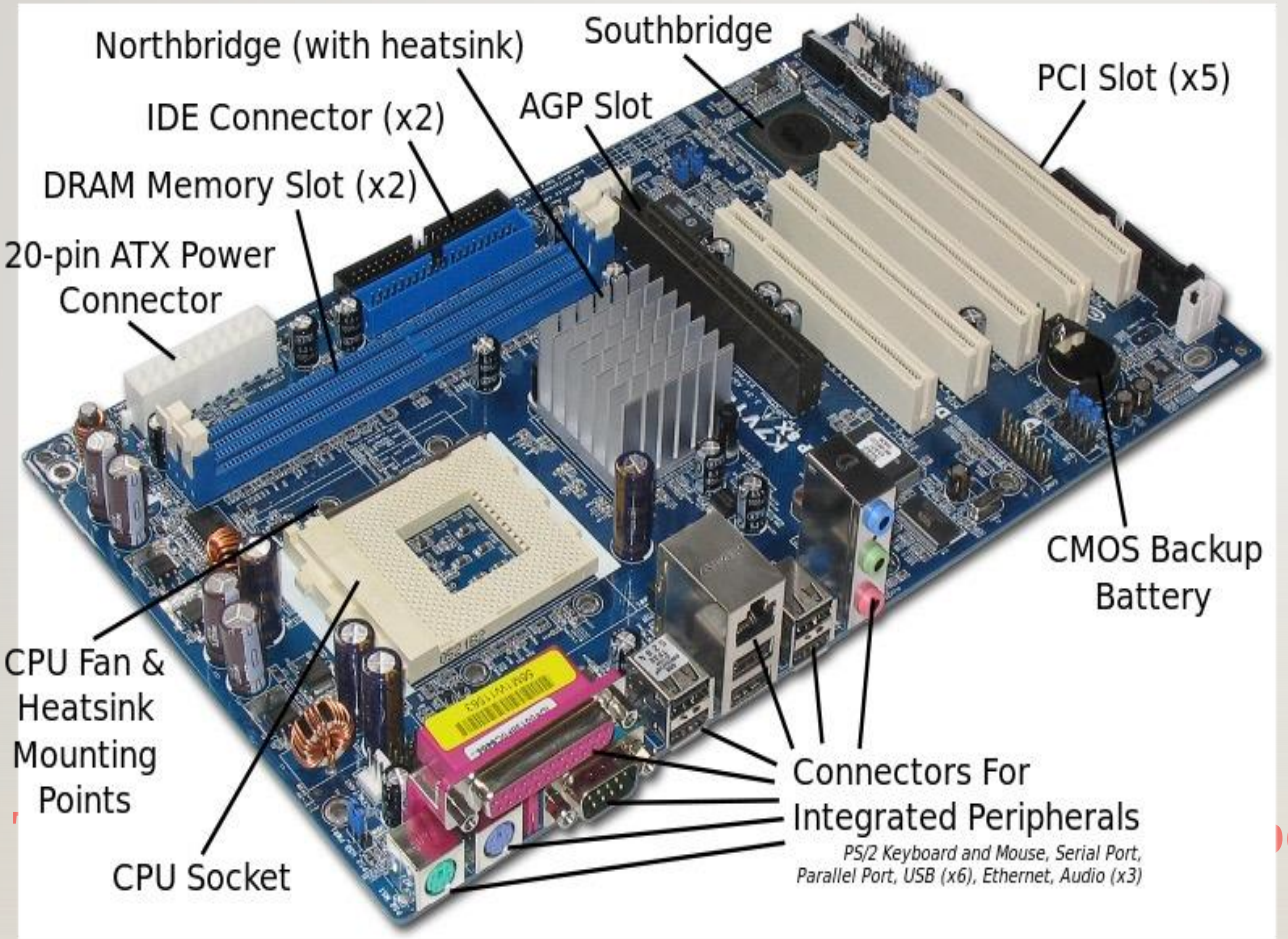


The Computer Hardware



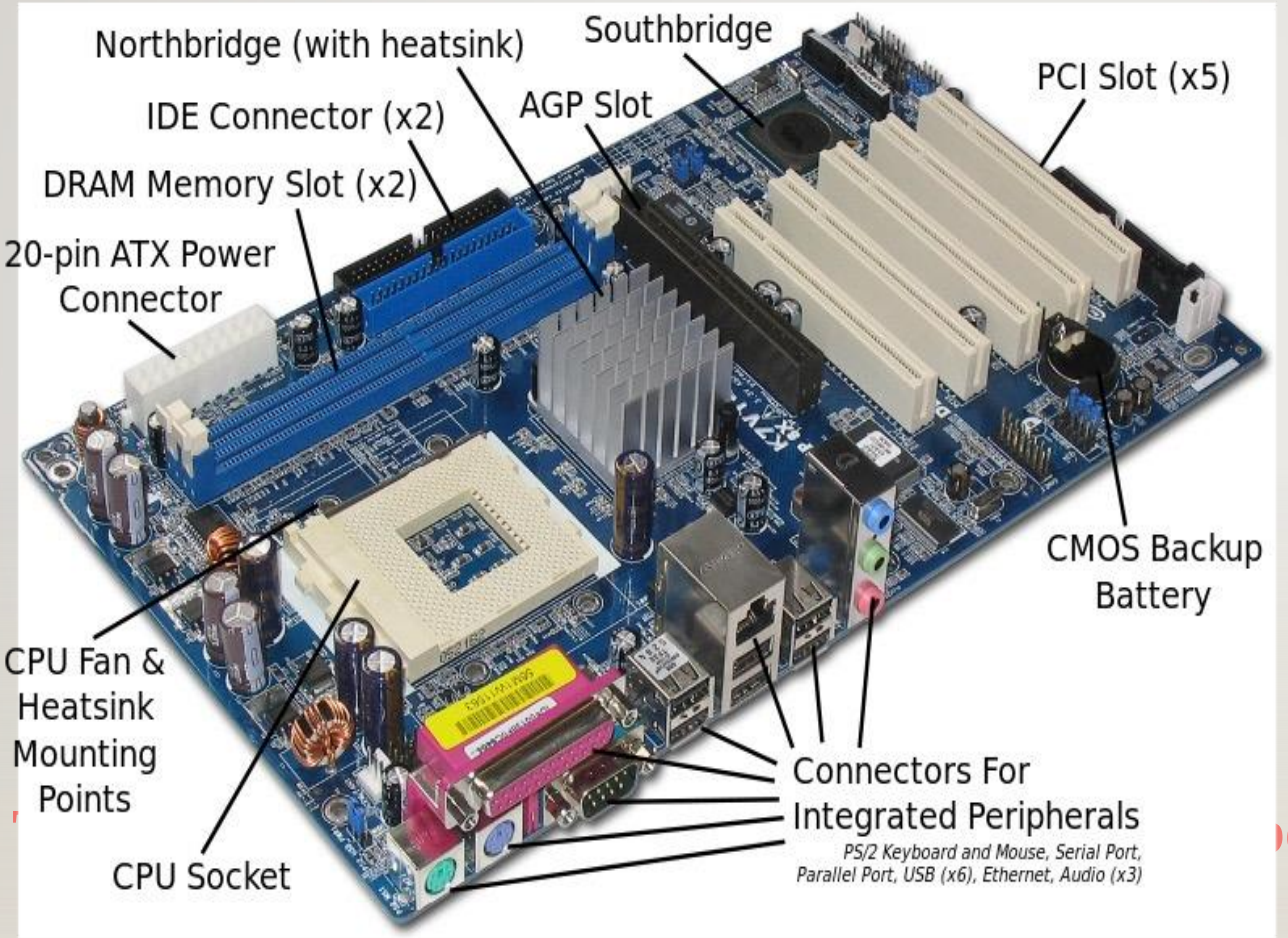
A motherboard provides connectivity between the hardware components of a computer such as the processor (CPU), memory (RAM), hard drive, and video card. There are several types of motherboards. They are usually designed to fit different types and sizes of computers.

The Computer Hardware



- Expansion slots (PCI Express, PCI, or AGP)
- 3-pin case fan connectors
- Heat sink
- 4-pin (P4) power connector
- Inductors
- Capacitor
- CPU socket
- Memory slot
- ATA / IDE disk drive primary connection
- 24-pin ATX power supply connector
- Northbridge
- South bridge

The Computer Hardware

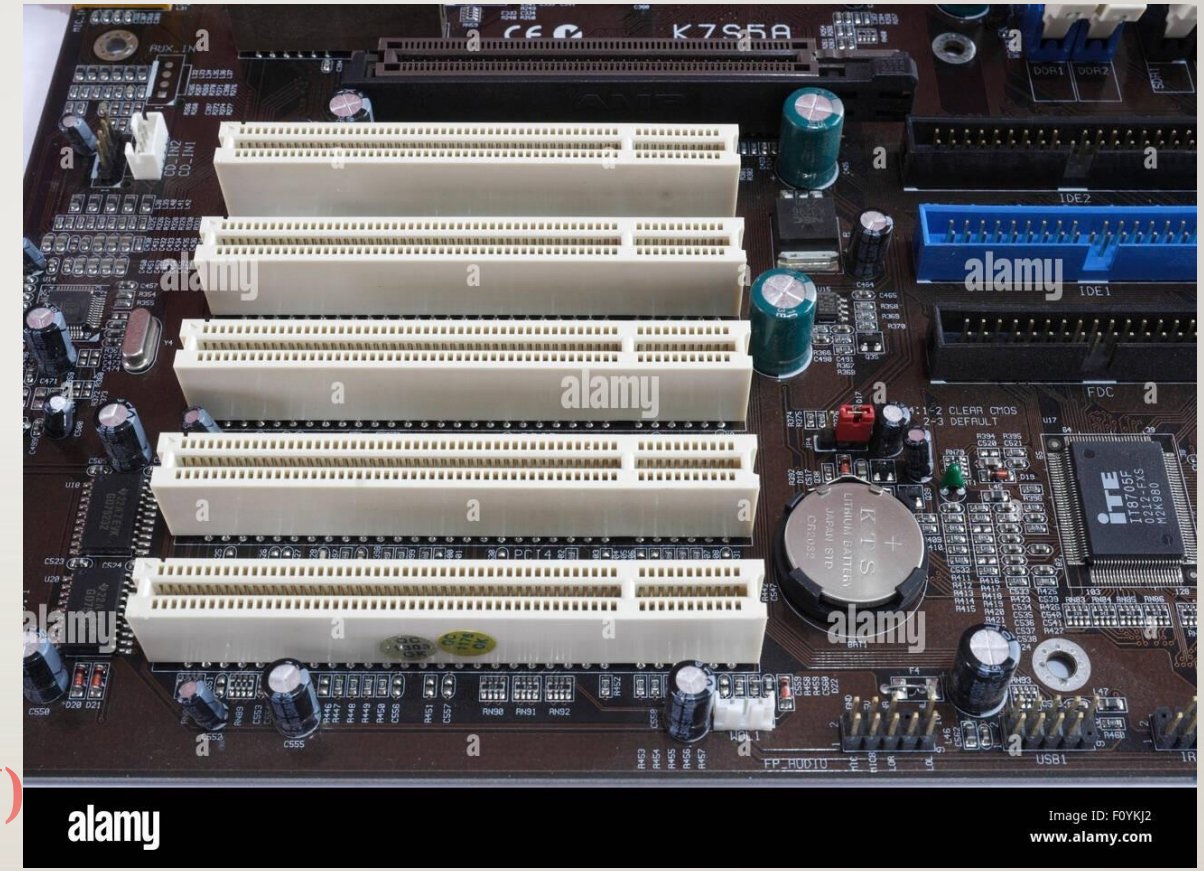


- Serial ATA connections
- Coin cell battery (CMOS backup battery)
- RAID
- System panel connectors
- Serial port connector
- USB headers
- Jumpers
- Integrated circuit
- SPDIF
- CD-IN

The Computer Hardware

Expansion or PCI slots

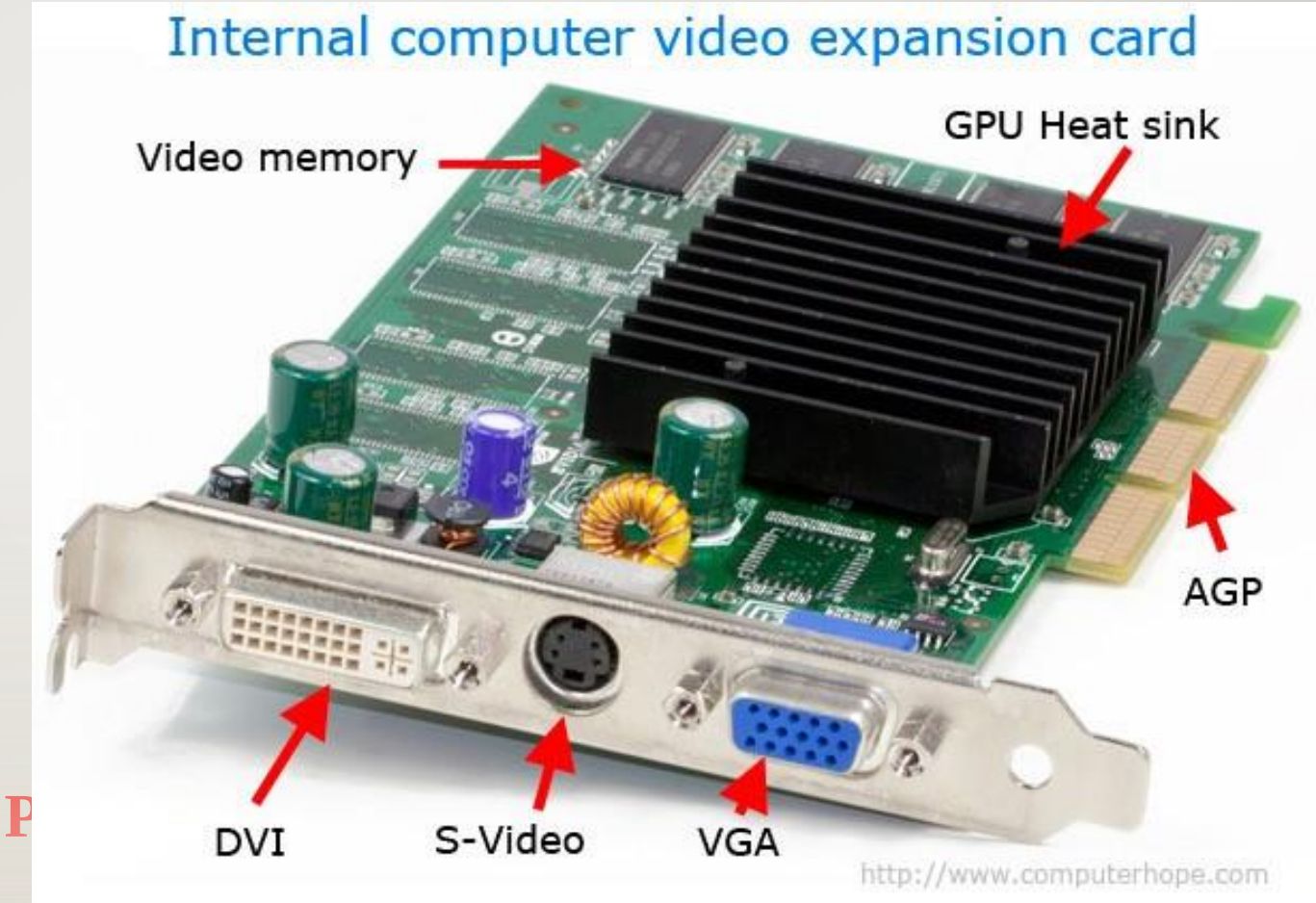
It is an installation point for a hardware expansion.
For example, if you wanted to install or upgrade a new video card in the computer, you'd purchase a video expansion card and install that card into the expansion slot.



The Central Processing Unit (CPU)

The Computer Hardware

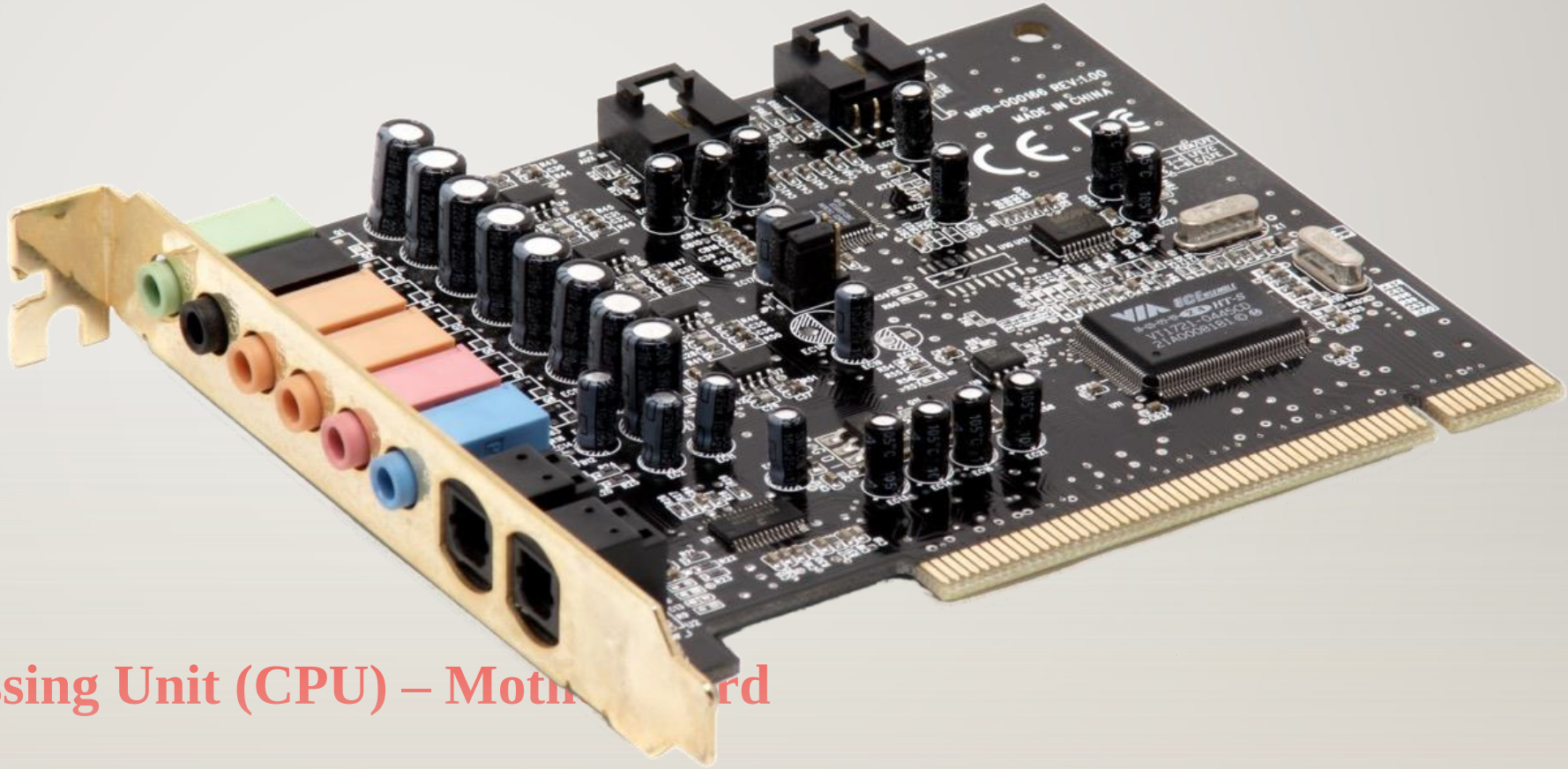
Video Card



The Central Processing Unit (CP

The Computer Hardware

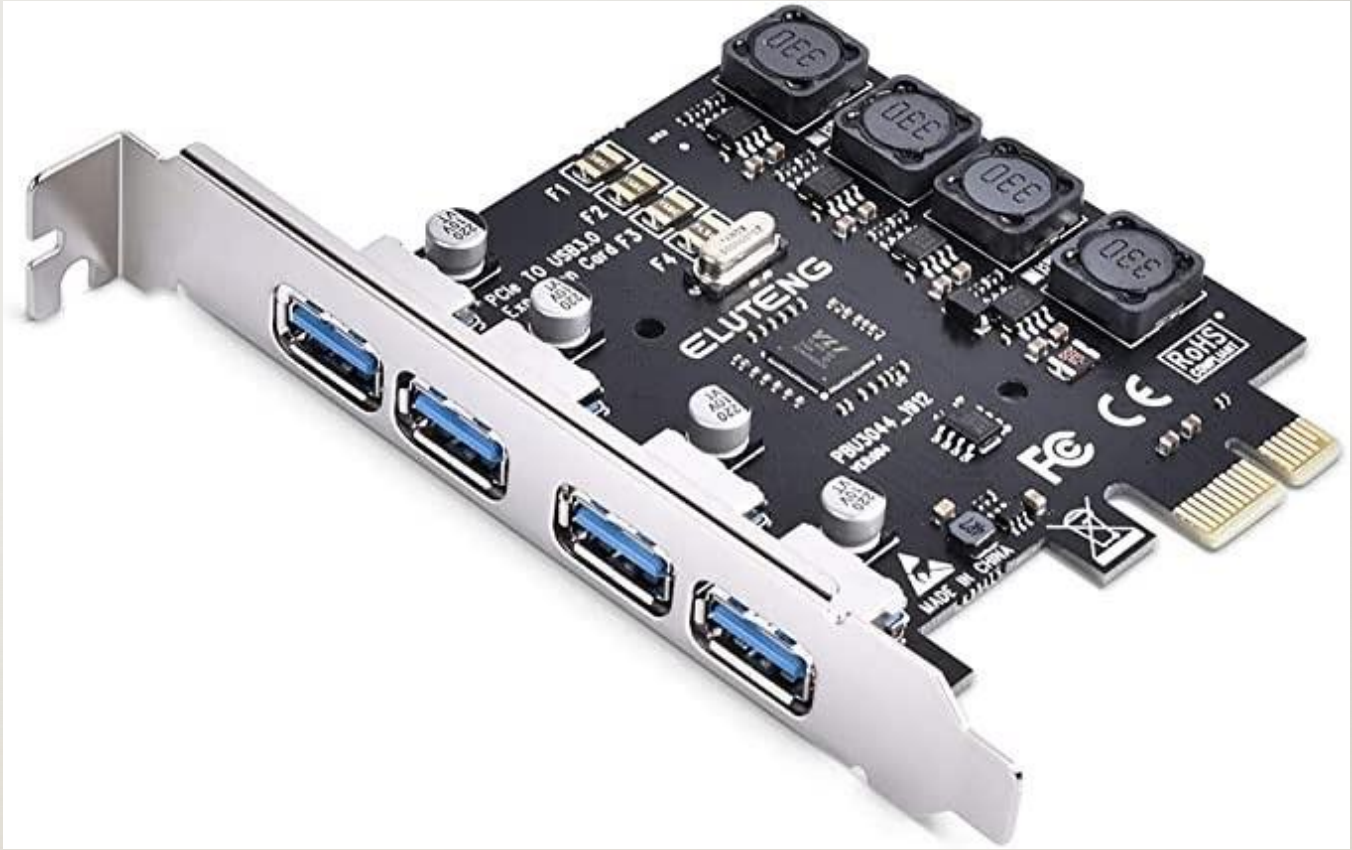
Sound Card



The Central Processing Unit (CPU) – Moth rd

The Computer Hardware

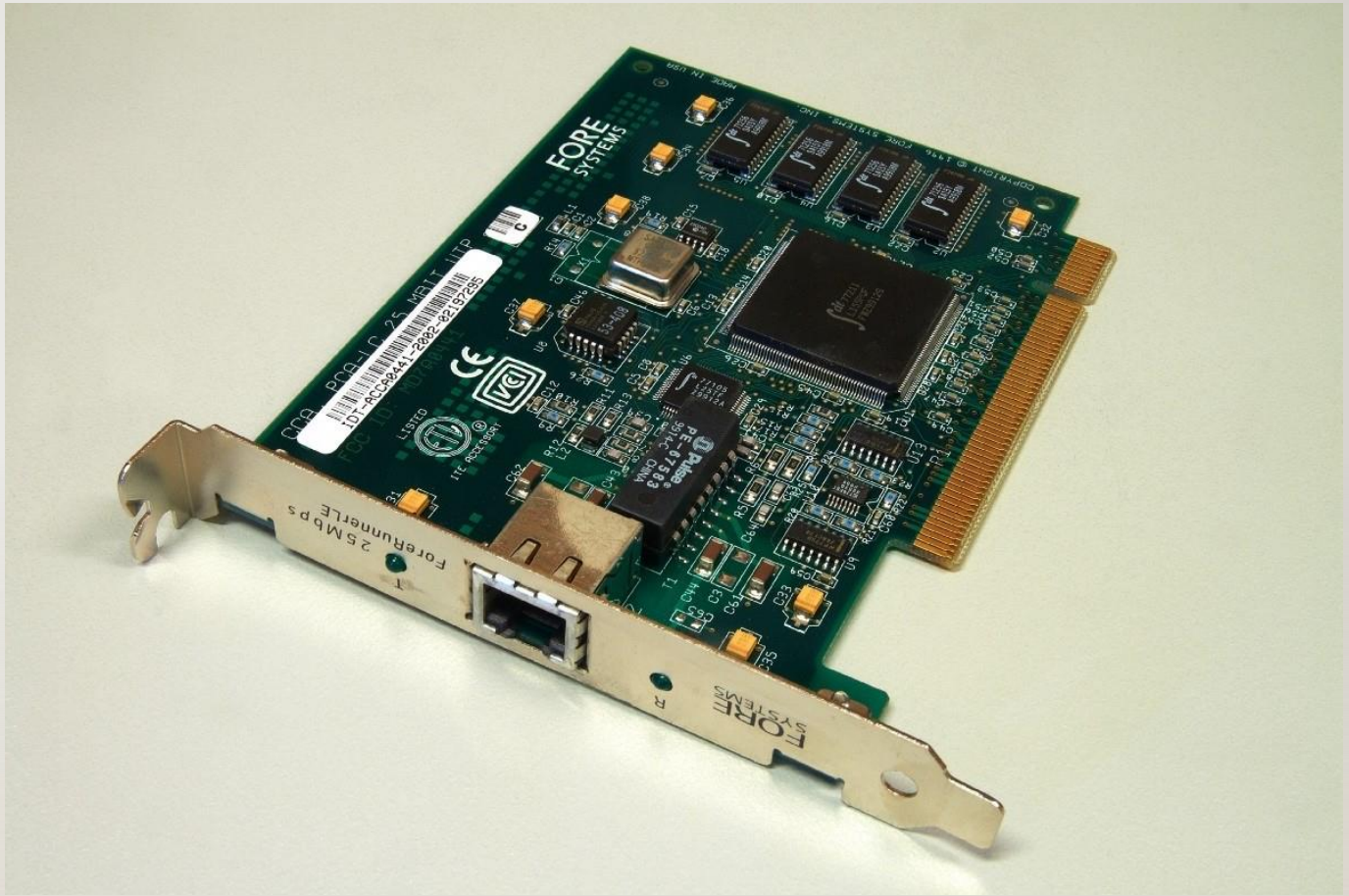
USB Expansion



The Central Processing Unit

The Computer Hardware

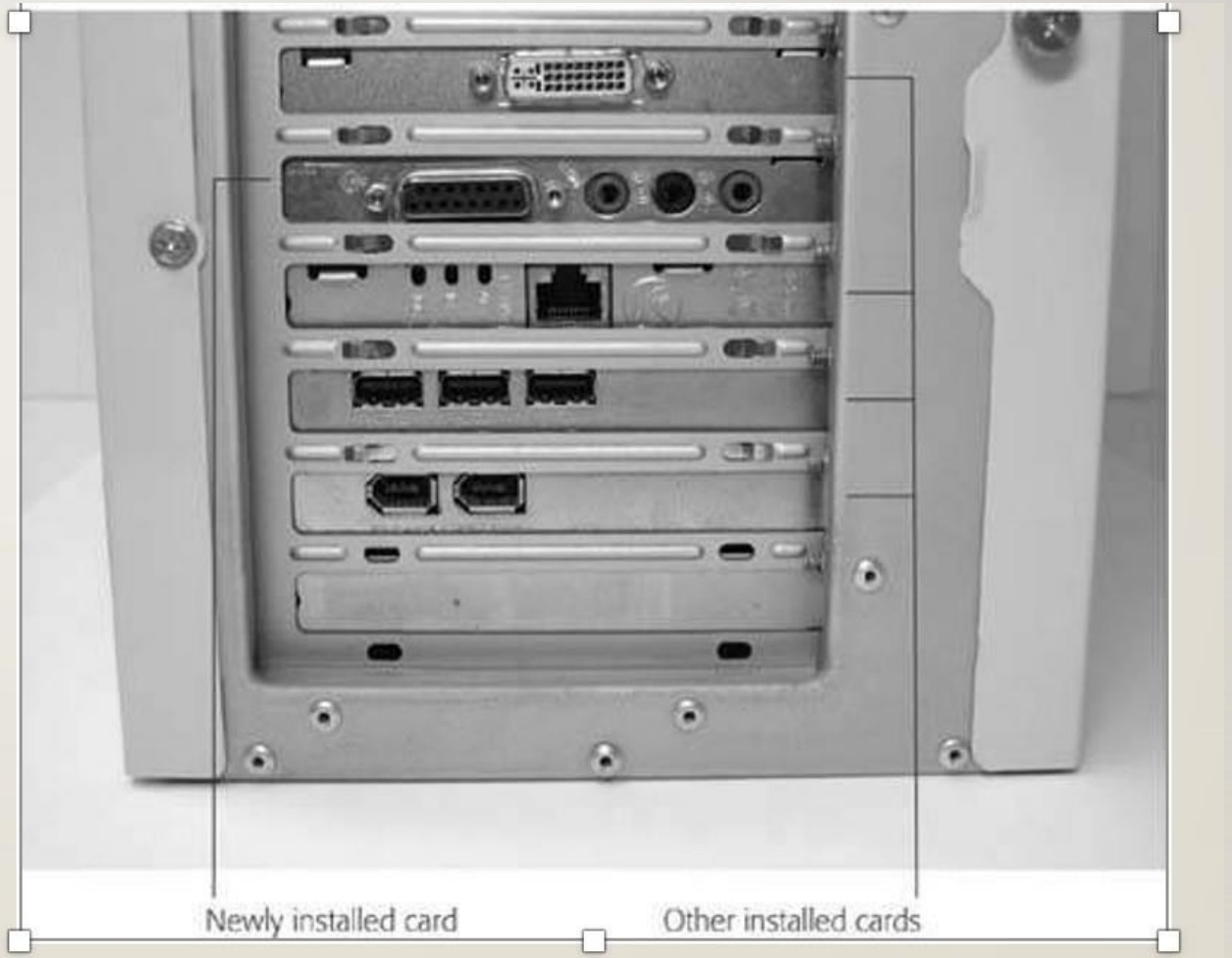
Network card



The Central Processing Unit

The Computer Hardware

USB Expansion



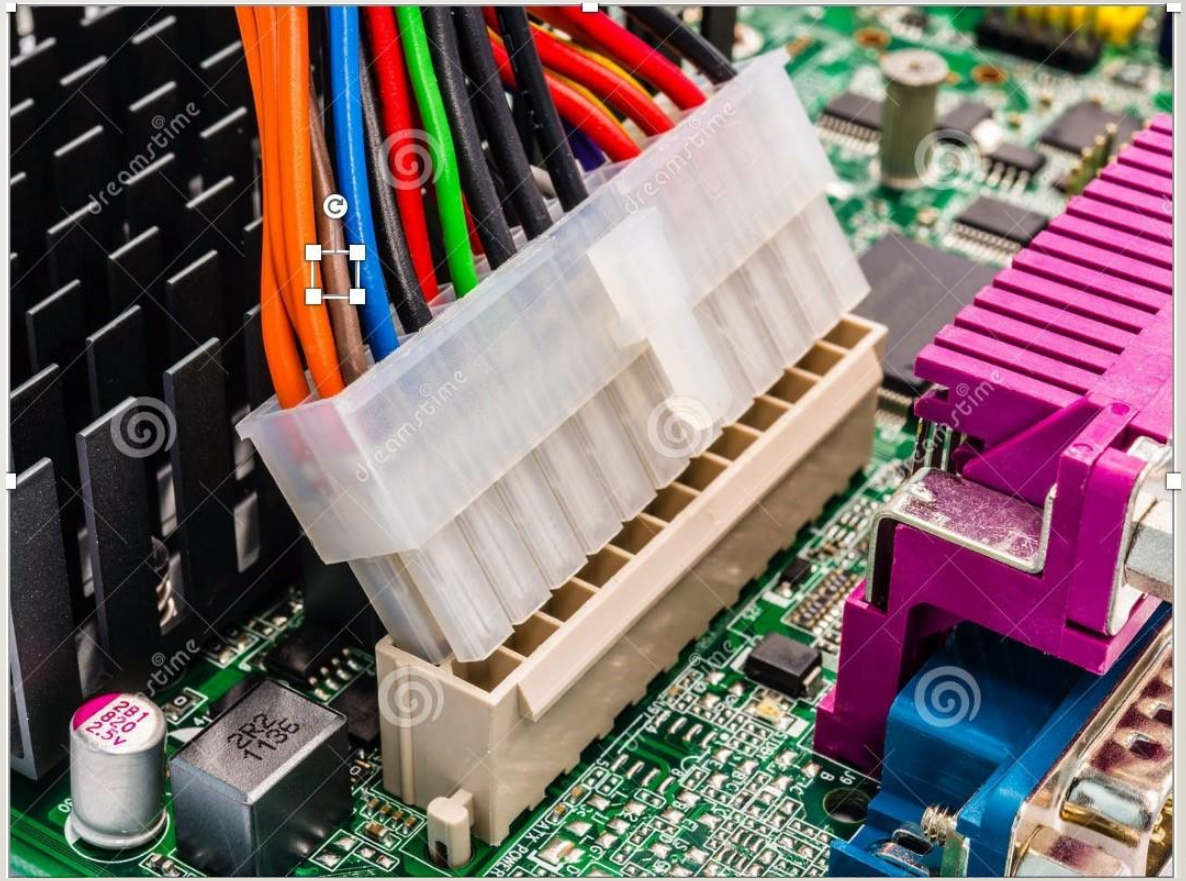
The Central Processing Unit (CP

The Computer Hardware

The Central Processing Unit (CPU) – Motherboard

Pinout

The ATX 24-pin power supply connector is the standard motherboard power connector in computers today. The connector itself is also called Molex 39-01-2240 connector.



The Computer Hardware

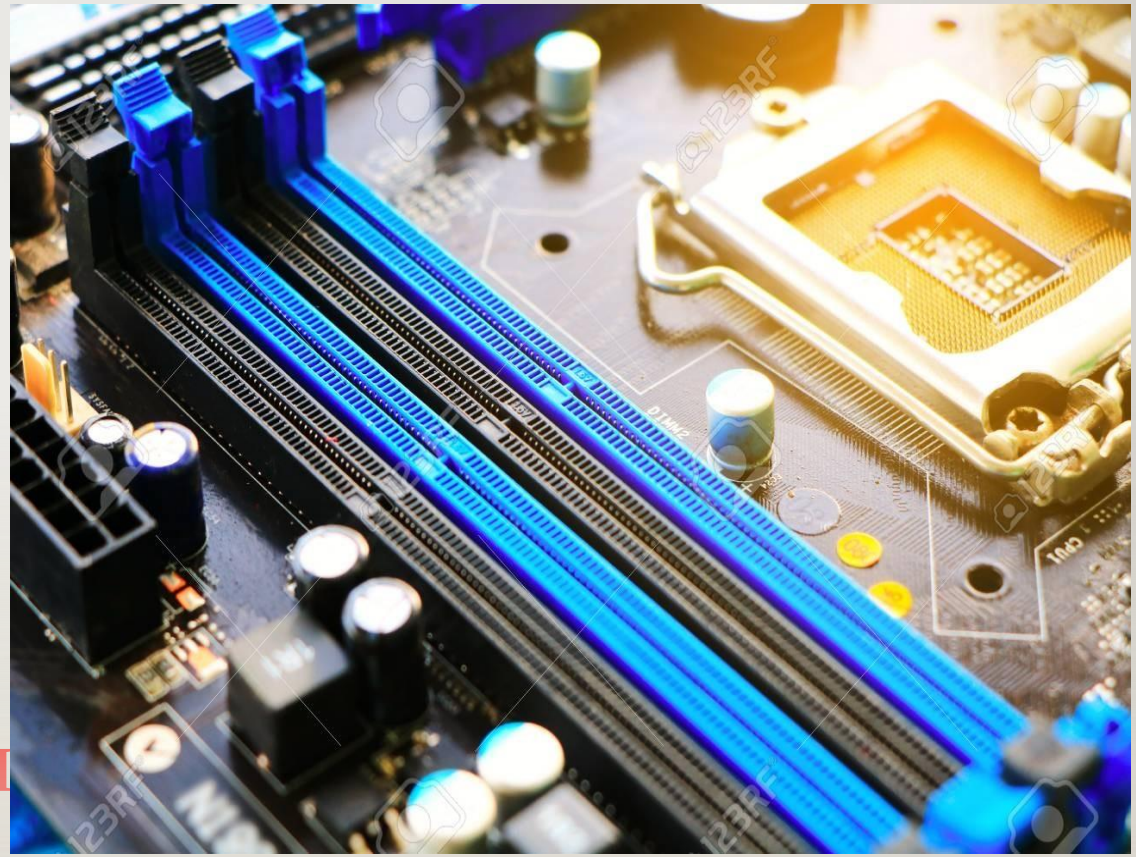
ATX 24-pin 12V Power Supply

The Computer Hardware

Motherboard RAM Slots

Also called Dual In-line Memory Module (DIMM). Typically, motherboards have a total of 4 RAM Slots or DIMMs. They work in pairs (dual-channel).

Some high-end motherboards may contain as many as eight slots, and in supercomputers, there may be multiple motherboards per system, up to 32 slots total.

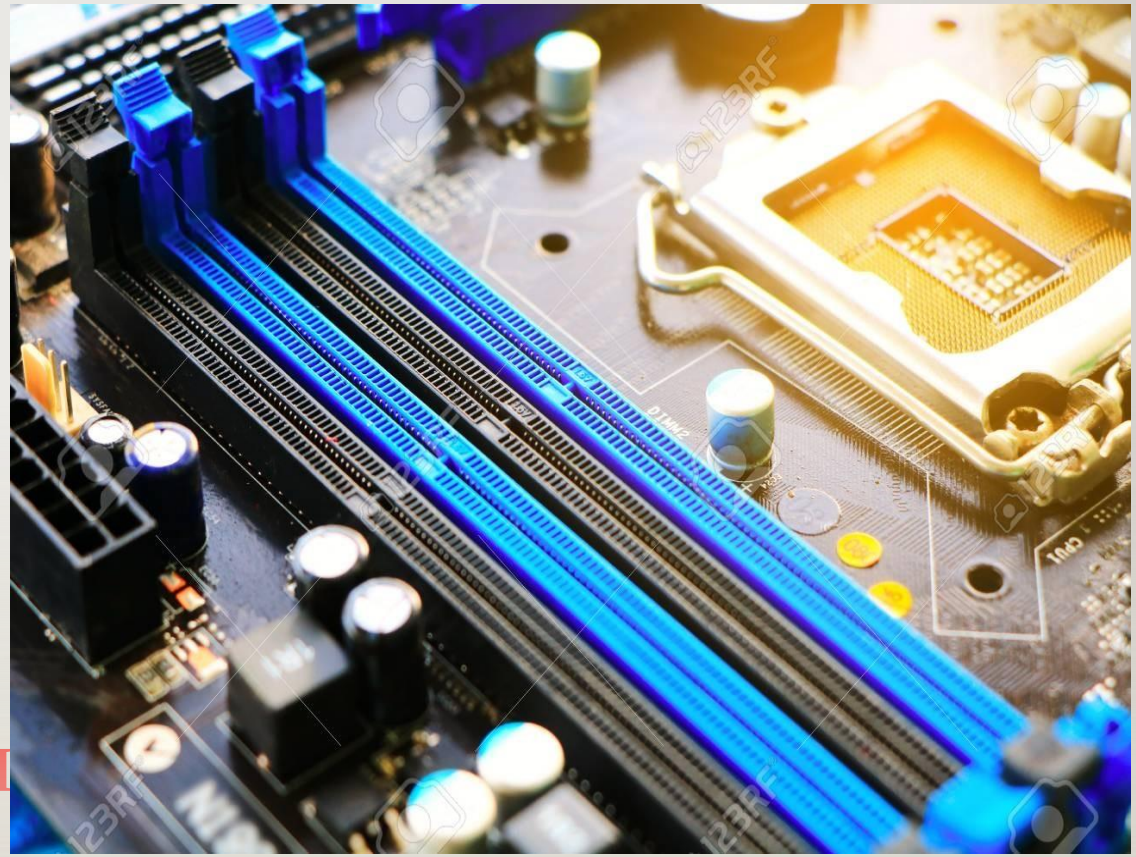


The Central Processing Unit (CPU) – M

The Computer Hardware

Motherboard RAM Slots

Modern motherboards allow two similar RAM modules—of the same speed and generation—to run in dual-channel for increased performance. However, to take advantage of dual-channel support, you must plug them into corresponding sockets, which are configured in pairs. understand the correct channel configurations.

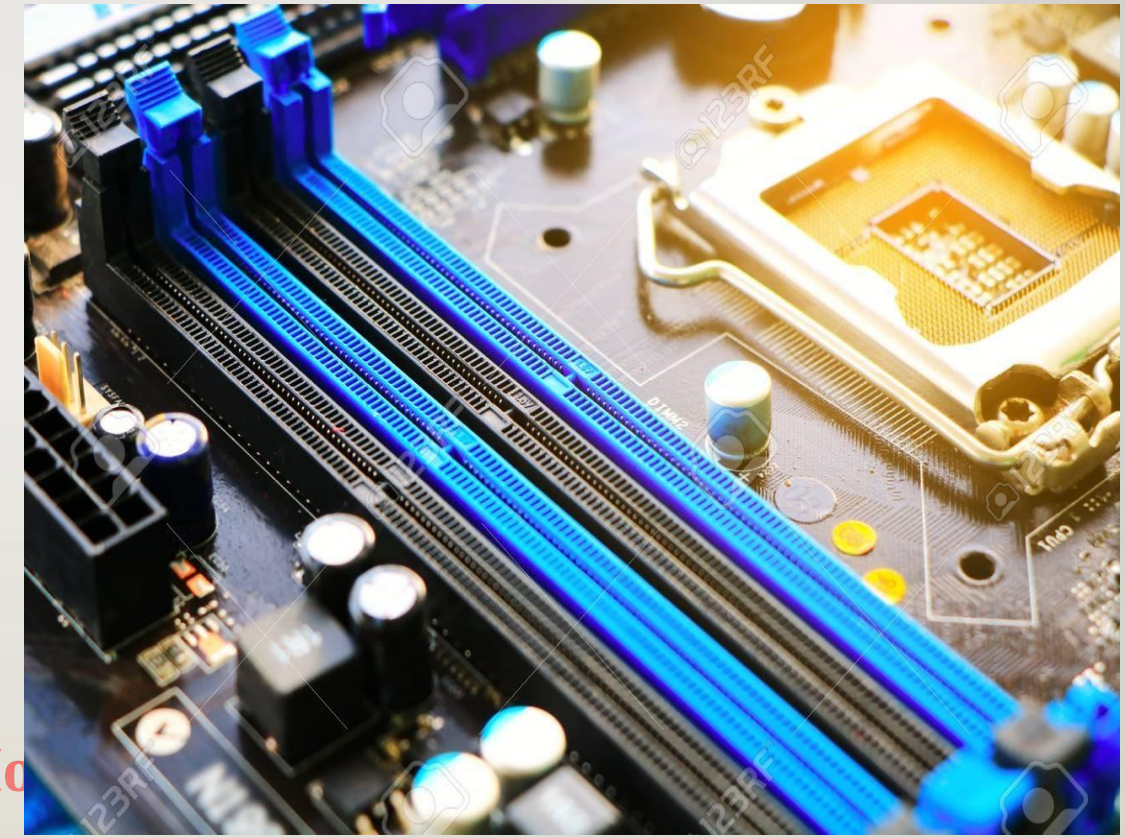


The Central Processing Unit (CPU) – M

The Computer Hardware

Motherboard RAM Slots

Usually, the pairs are slots 1 and 3 for the first channel and slots 2 and 4 for the second channel. Sometimes, motherboard manufacturers will color code the slots, or you will need to refer to the documentation (user manual) to understand the correct channel configurations.

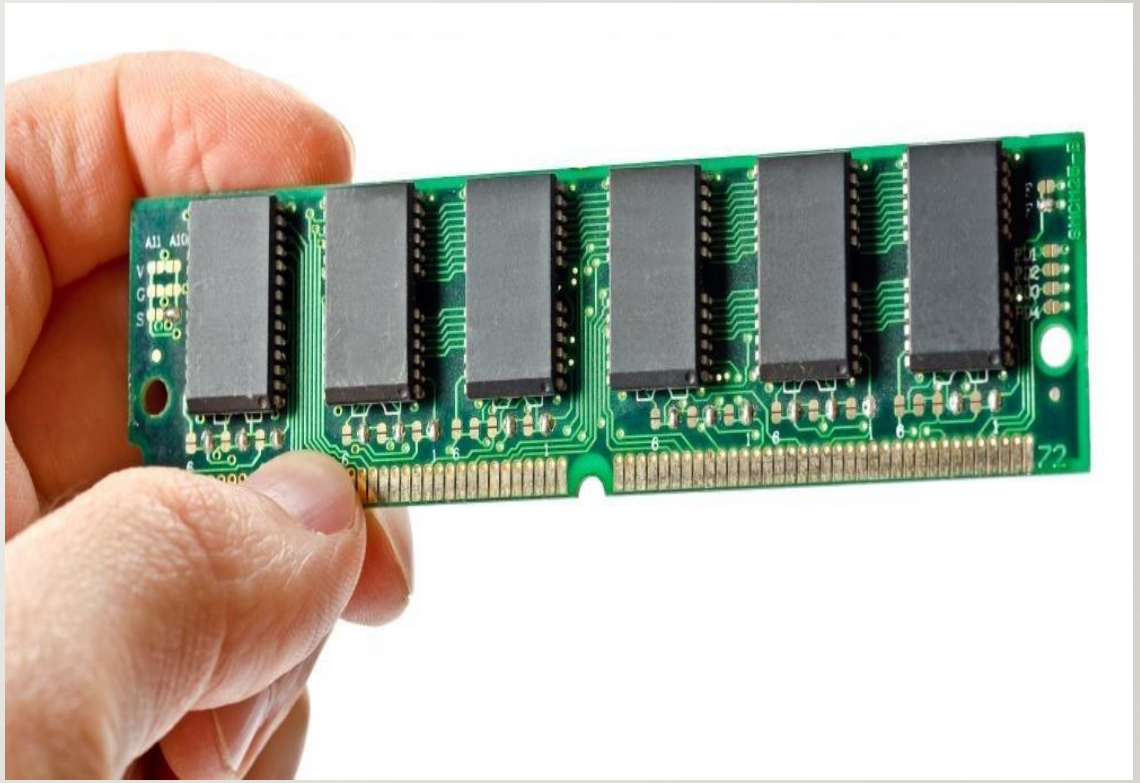


The Central Processing Unit (CPU) – Mo

The Computer Hardware

(RAM) Stick

The RAM is one of the most important components in determining your system's performance. RAM gives applications a place to store and access data on a short-term basis. It stores the information your computer is actively using so that it can be accessed quickly.



The Central Processing Unit (CPU) – Motherboard

The Computer Hardware

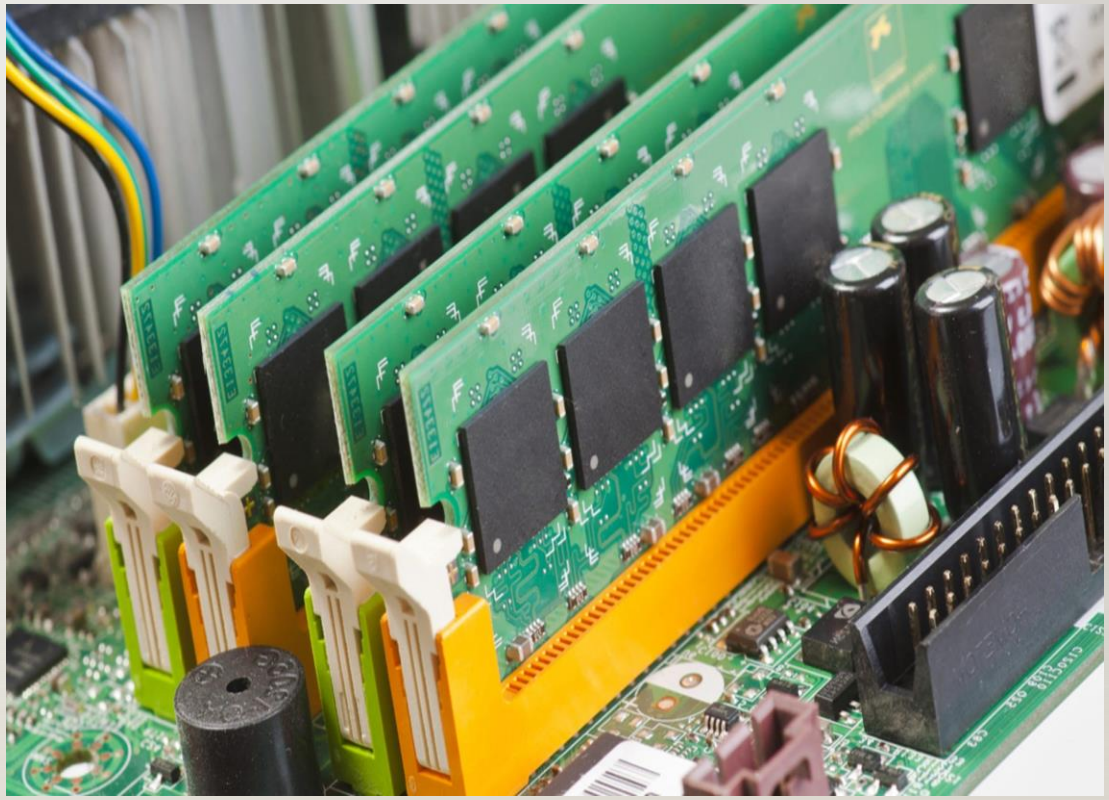
The Random Access Memory

The Computer Hardware

The Central Processing Unit (CPU) – Motherboard

(RAM)

Ideally, you would require at least 2 GB of RAM to use basic programs like Microsoft Word or surf the web. However, you should consider at least 4 GB of RAM if you want to use intensive apps. You might need 8-16 GB of RAM or more if you do lots of multitasking or use intensive programs.



The Computer Hardware

The Random Access Memory

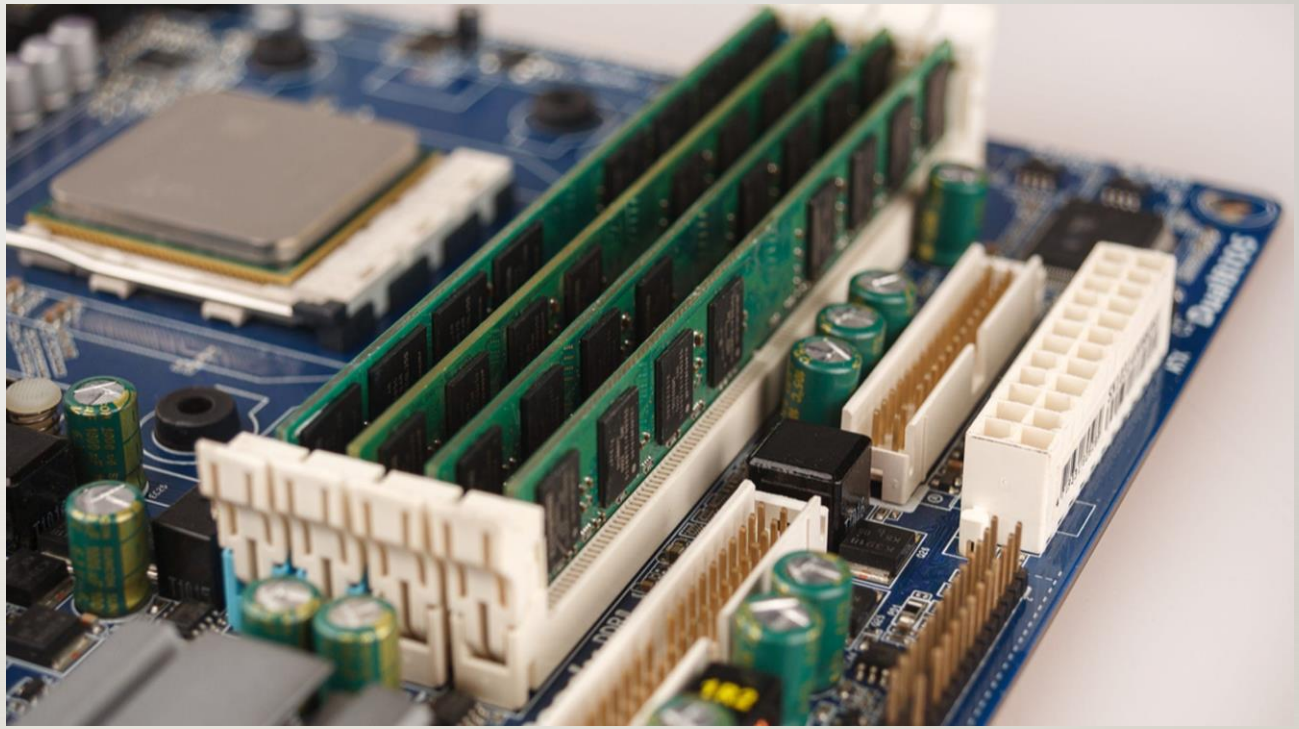
The Computer Hardware

The Central Processing Unit (CPU) – Motherboard

(RAM)

Two major types in the market.
These are: DDR-3 and DDR-4
and lately DDR-5

DDR means Double Data Rate
3 & 4and 5 refers to the versions



The Computer Hardware

Types Random Access Memory

The Computer Hardware

RAM SPEED

As of now, DDR3 RAM can only reach a maximum speed of 2133 MHz, while DDR4 goes from 2,133 MHz to 4266 MT/s (million transfers per second). DDR5 memory speeds range from 4800 to 7200 million transfers per second

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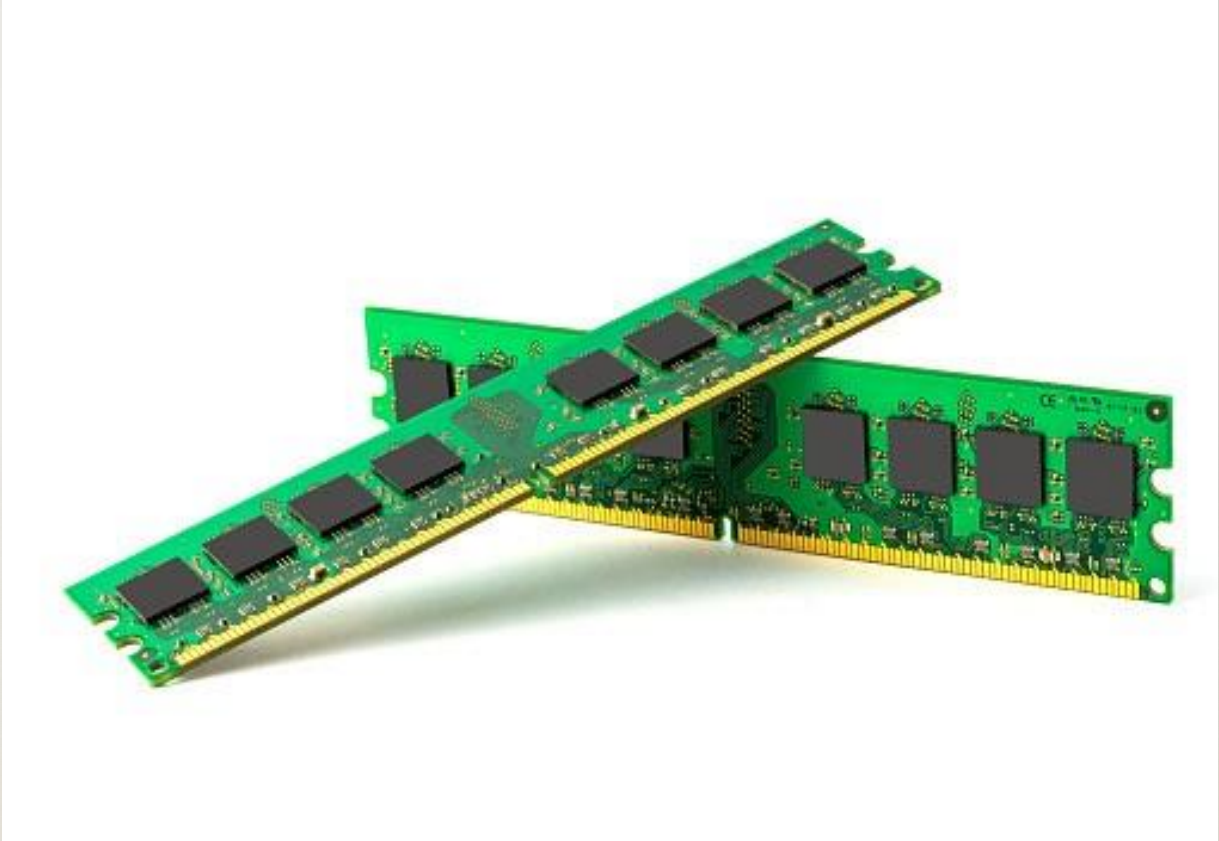
The Central Processing Unit (CPU) –



The Computer Hardware

RAM-CAPACITY

When it comes to capacity, DDR3 can only handle up to 16 GB per module, DDR4 up to 32GB per module and DDR5 up to 128 GB per module.

The Central Processing Unit (CPU) –

The Computer Hardware

The Central Processing Unit (CPU) – Motherboard

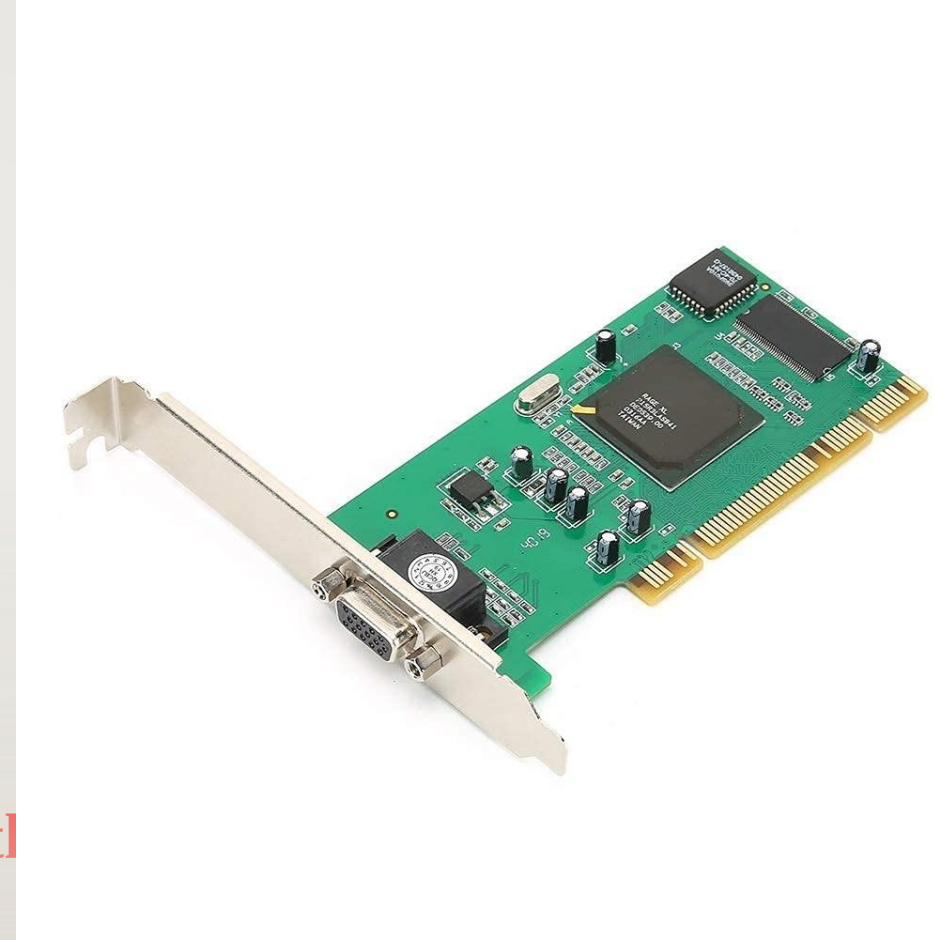
VIDEO GRAPHIC CARD

A video card is a component that is used to enhance the quality of images that are shown on a display unit. It is usually attached to the motherboard and controls, calculates and monitors an image's appearance on the monitor.

.

The Computer Hardware

The video card is an intermediate device that accelerates the video throughput. Videos cards are also known as **graphics cards, video adapters, display cards**, and graphic accelerators and **graphics processing unit (GPU)**



The Central Processing Unit (CPU) – Moth

The Computer Hardware

VIDEO GRAPHIC CARD

The Computer Hardware

The Central Processing Unit (CPU) – Motherboard

VIDEO GRAPHIC CARD

The Computer Hardware

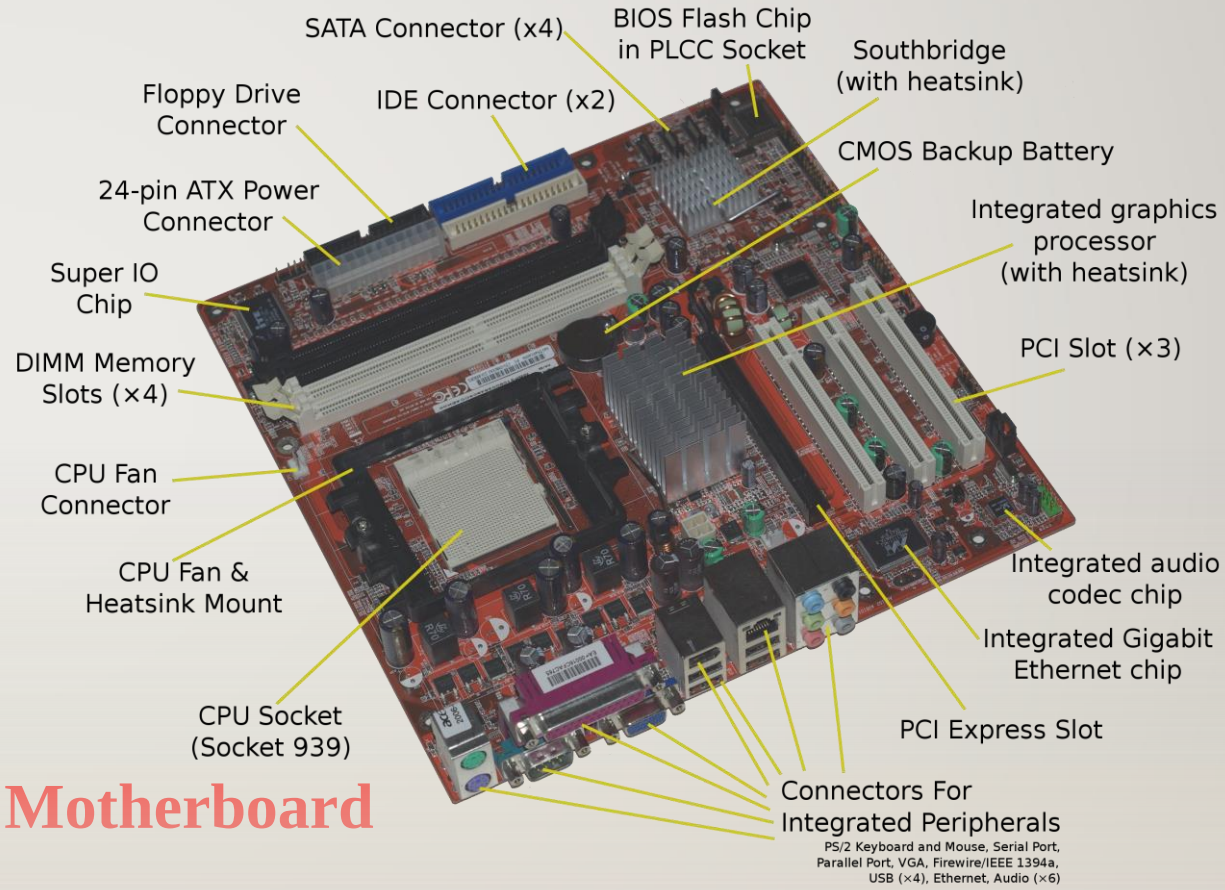
The GPU, has become one of the most important types of computing technology

The Computer Hardware

today. Its application is found in both personal and business computers. They are designed to use parallel processing technology to help accelerate the rendering of graphics. Over time, these devices have become more flexible and even programmable, therefore, enhancing their capabilities. The GPU is used in a wide range of applications, including graphics and video rendering. Although they're best known for their capabilities in gaming, GPUs are becoming more popular for use in creative production and artificial intelligence (AI).

The Computer Hardware

GPUs come in two basic types: **integrated** and **discrete**. An integrated GPU comes embedded alongside the CPU on the same mother board. The discrete type comes on a distinct chip that is mounted on its own circuit board and is typically attached to the computer PCI slot.



The Central Processing Unit (CPU) – Motherboard

The Computer Hardware

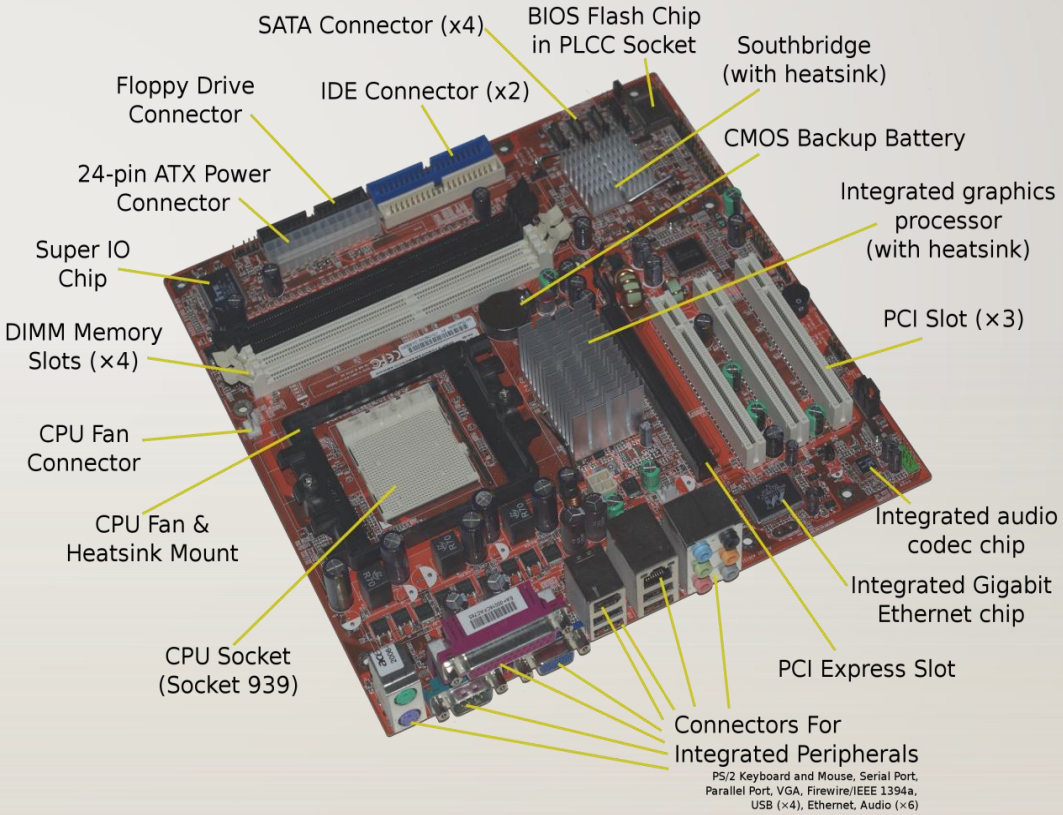
VIDEO GRAPHIC CARD/

The Computer Hardware

The Central Processing Unit (CPU) – Motherboard

VIDEO GRAPHIC CARD-INTEGRATED

Integrated graphics cards usually share the same memory with the CPU. They use between 1% to 5% of the available memory for graphics. For this reason, the computer system may slow down when performing a resource-intensive task such as playing a video game.



The Computer Hardware

The Central Processing Unit (CPU) – Motherboard

VIDEO GRAPHIC CARD-INTEGRATED

Integrated graphics cards are cheaper and therefore helps to make the general price of the computers more affordable. They also use less power compared to dedicated graphics cards. This helps to increase the battery life of the computer

The Computer Hardware

such as laptops. If the computer is meant for basic tasks such as general office work, web browsing, movie streaming, then a computer with an integrated graphics card may be the best option to go for.

The Computer Hardware

The Central Processing Unit (CPU) – Motherboard

VIDEO GRAPHIC CARD-DISCRETE / DEDICATED

Also known as **'Discrete graphics cards,'** these come with their own **processor and memory** which is different from that of the CPU. For instance, if you find a laptop with a dedicated graphics card of 3 GB, it means that the 3 GB memory is entirely separate from the computer's RAM.

The Computer Hardware

The Central Processing Unit (CPU) – Motherboard

The Computer Hardware

VIDEO GRAPHIC CARD-DISCRETE / DEDICATED

resource-intensive tasks like graphics design, video editing and high-end gaming. Due to their high-end use, dedicated graphics card generate a lot of heat. This problem requires the acquisition of additional colling for the card.

The Computer Hardware

Computers with dedicated graphics cards are suitable for professional users who do

The Computer Hardware

The Central Processing Unit (CPU) – Motherboard

The Computer Hardware

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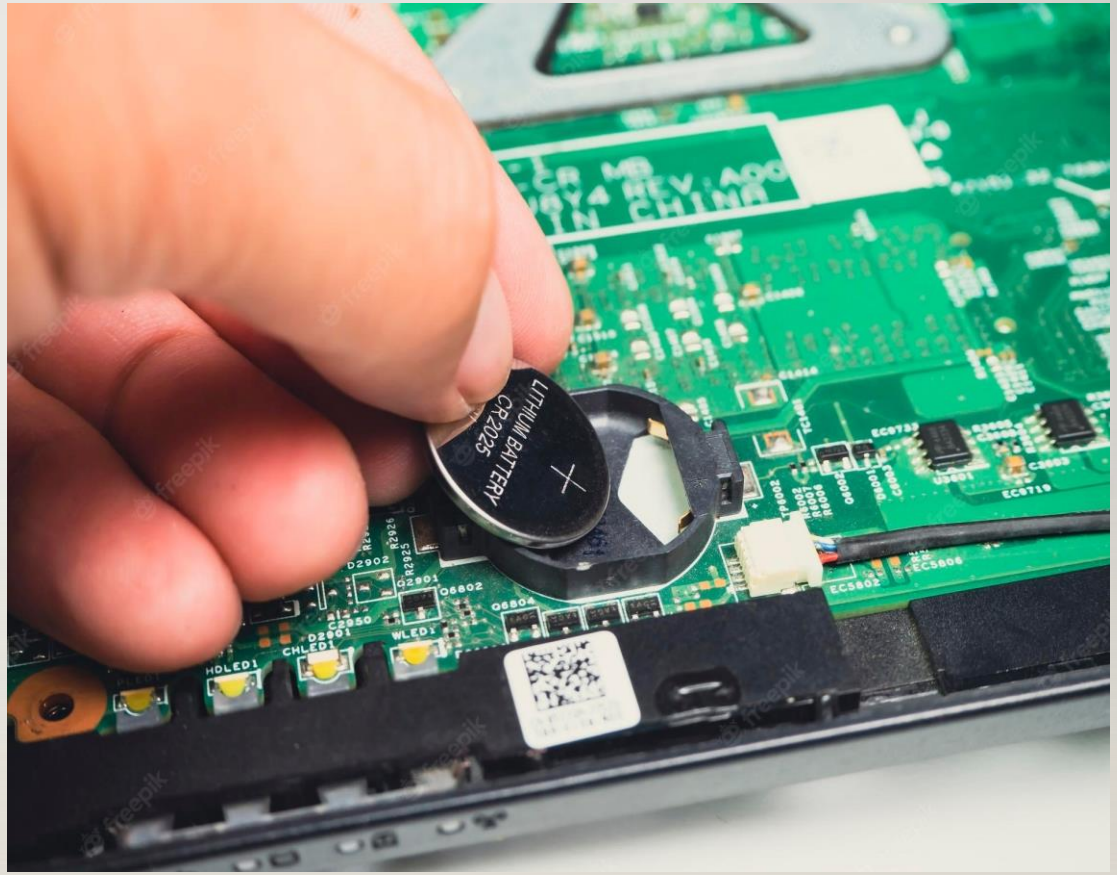
The CMOS BACKUP BATTERY

CMOS Battery gives 'backup power' to CMOS (Complementary Metal Oxide Semiconductor) of a computer to keep some parameter values such as the RTC (Real Time Clock) running even when the computer is powered off. These primary parameters shall be used anytime the system booted again.



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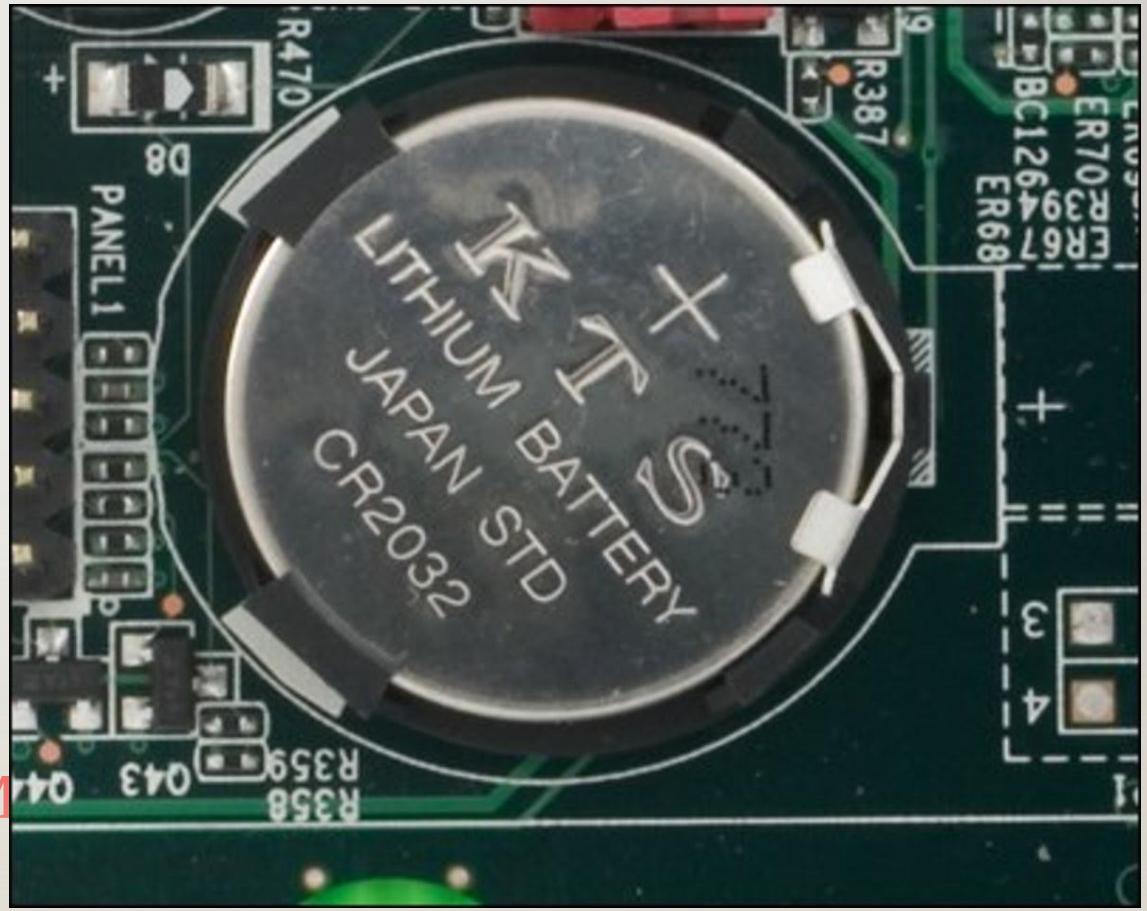
Many computers use CMOS memory to hold current time and date. The CMOS memory and the clock circuit that keeps the time are powered by a small battery called RTC, this is to ensure that the time is correctly updated anytime you turn-on the PC



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CABLI

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INTERNAL CONNECTORS
Flat Flex Connector(FFC)

FFC are a type of ribbon cable. The name comes from their flat and flexible structure. They are usually a straight connector, without any additional components. FFC cables usually consist of a plastic film within which multiple metallic connectors are embedded.

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INTERNAL CONNECTORS
Flat Flex Connector(FFC) or Ribbon cables

- The construction of FFC cables means they take up less space and offer greater flexibility and better EMI/RFI suppression.
- They are often used in high density electronic systems where high-flexibility is required, Eg. moving printer head, folding mobile-phones or where there are weight or space limitations.

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INTERNAL CONNECTORS

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Flexible Printed Connector(FPC),

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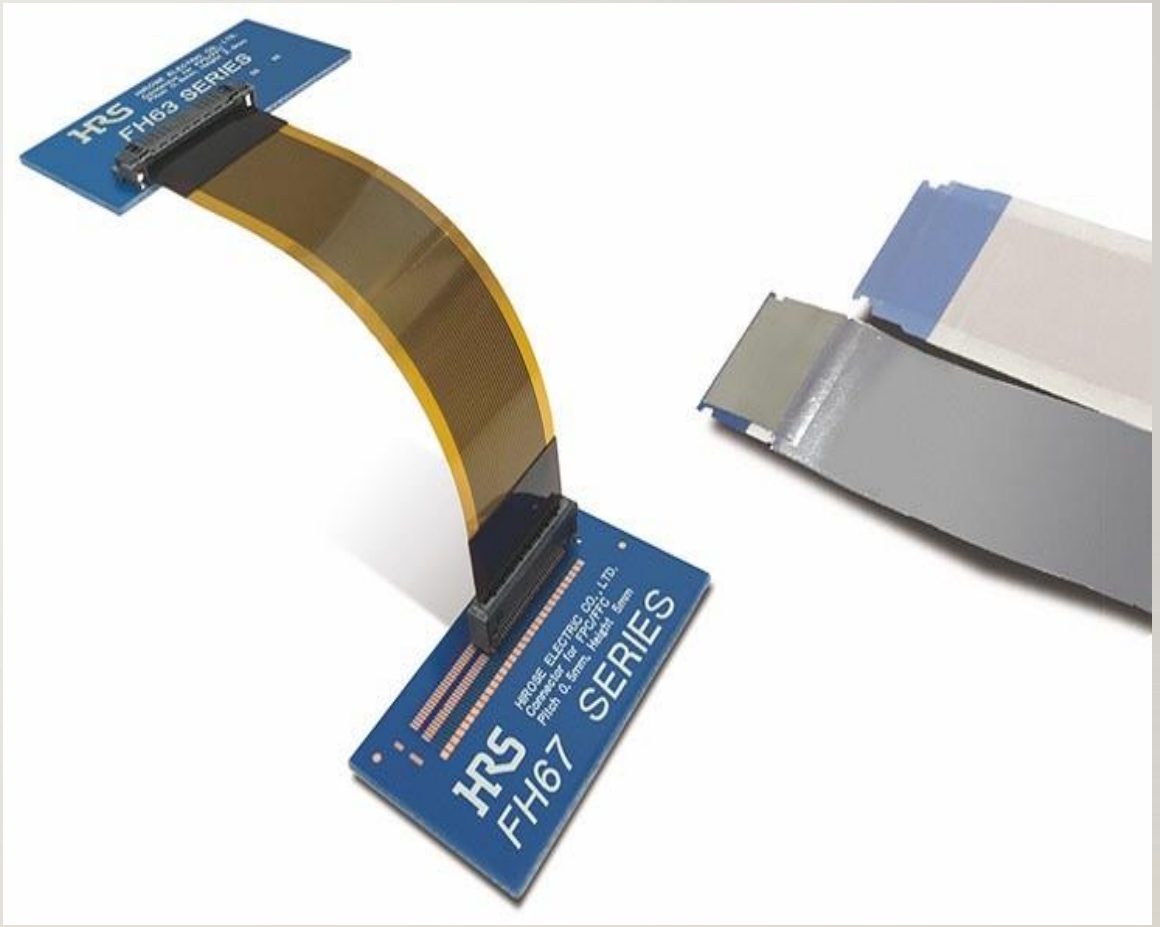
INTERNAL CONNECTORS
Flat Printed Connector(FPC),

- FPC is another example of flexible electronics and consists of a flexible polymer base on which a conductive circuit is printed, before sealing with a protective polymer coating.



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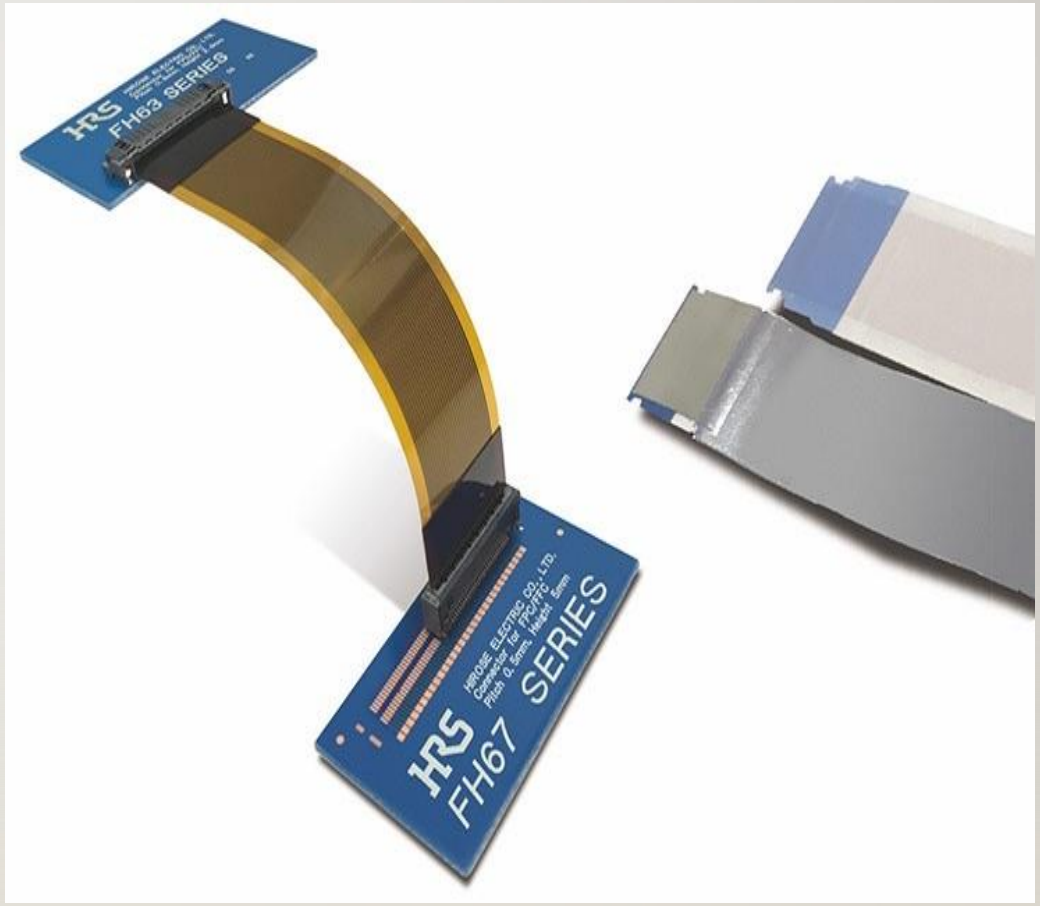
INTERNAL CONNECTORS
Flat Printed Connector(FPC),

- FPC doubles as a circuit board and a cable. It is lighter, thinner and offers increased flexibility as compared to the traditional “rigid” circuit board.
- Its flexibility increases its durability and reliability. They are ideal to use where weight and or space are constraining factors. They are used in several consumer electronics products including computers.



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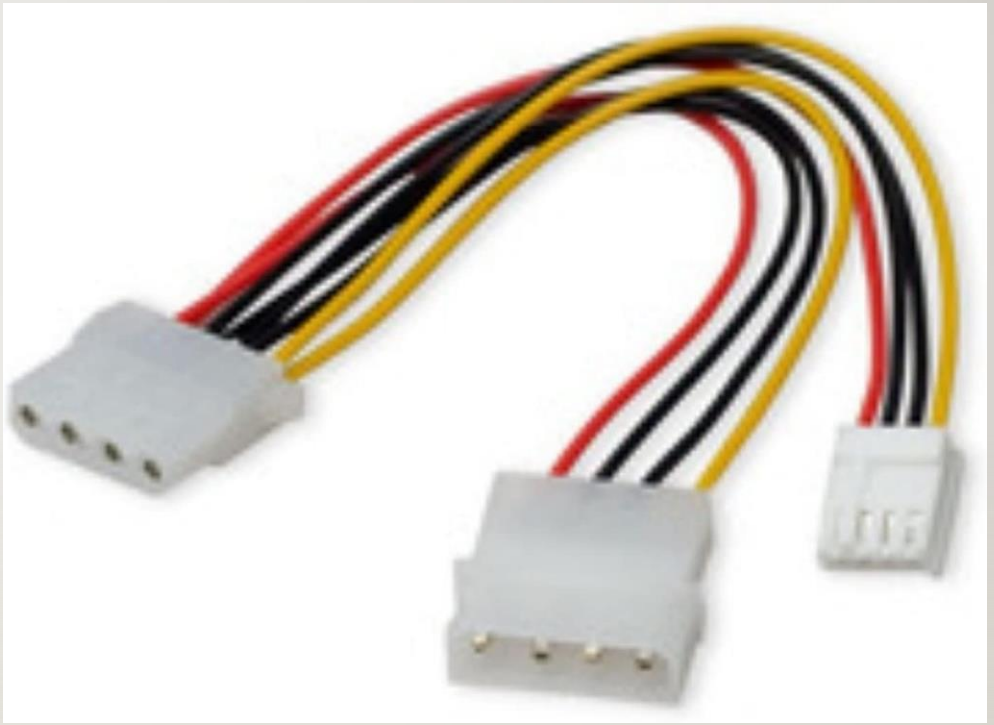
Molex Cables

Molex is a large company that manufactures electronic plugs and sockets. Their operations as far back as1940. Since Molex was the first company to make these connectors, the name Molex has stuck even up until today, even although these cables are also made by other companies.



INTERNAL CONNECTORS

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Molex Cables

Molex cables are used to power in desktop PCs. These connectors are used to supply power to the motherboard, fans, floppy drives, CD/DVD drive, video card, etc. Other manufacturers also manufacture compatible connectors however Molex is popular because of its simplicity, reliability, flexibility, and low cost

INTERNAL CONNECTORS