CSC109- Introduction to Information Technology

UNIT-1 Introduction to computer

Analog and Digital Computer

- An **analog computer** or **analogue computer** is a type of computer that uses the continuously changeable aspects of physical phenomena such as electrical, mechanical, or hydraulic quantities to model the problem being solved.
- In contrast, digital computers represent varying quantities symbolically and by discrete values of both time and amplitude
- An Analog computer or Analogue computer is a computer which uses continuously changeable entities like mechanical, electrical, hydraulic, etc. quantities in any problem which is being solved.
- Analog computers operate on mathematical variables in the form of physical quantities that are continuously varying

Analog : advantages and disadvantages

- The advantages of analog computers are that they show the solutions in a simple and graphical manner in little time
- The disadvantages of analog computers are that they are not versatile and they are not very accurate.
- The accuracy of the analog computers is rather limited and dependent on a number for factors like spread in circuit parameters, inaccurate assembly, wiring problems, external influences like magnetic field, changes in ambient temperature and pressure, etc.

Digital computers

- Digital computers perform various computational as well as some other general purpose tasks.
- The information in these computers is represented by variables that take a limited number of discrete values.
- Digital computers deal with mathematical variables in form of numbers that represent discrete values of physical quantities.
- Each variable is converted into numbers and each number into binary form, i.e. 0 and 1. It is this combination of 0 and 1 that does all the calculations.
- All modern computers, laptops, and calculators are all digital computers.

Digital computers Cont….

- Those computers work on a digital signal.
- These signals are used to represent data as a sequence of discrete values; at any given time it can only take on one of a finite number of values.
- Digital computers use the binary number system, which has two digits i.e., 0 and 1.
- A binary digit is called a bit. Here the information is represented in the groups of bits.

Digital computers Cont…

- The advantages of a digital computer are that they are accurate, Versatile, fast, re-programmable and the outputs are least affected by outside disturbances.
- In contrast to analog computers, digital machines work on numbers

Analog Computer Vs Digital Computer

- The analogue computer works on a continuous signal.
- The output is a voltage signal, they are not exact values and are in graphical form.
- These computers use a network of resistors and capacitors.
- Analogue computers have a limited ability to act as a digital system.
- Analogue computers are slower in speed.
- These computers are mainly used in the field of science.

Analog Computer Vs Digital Computer Contd..

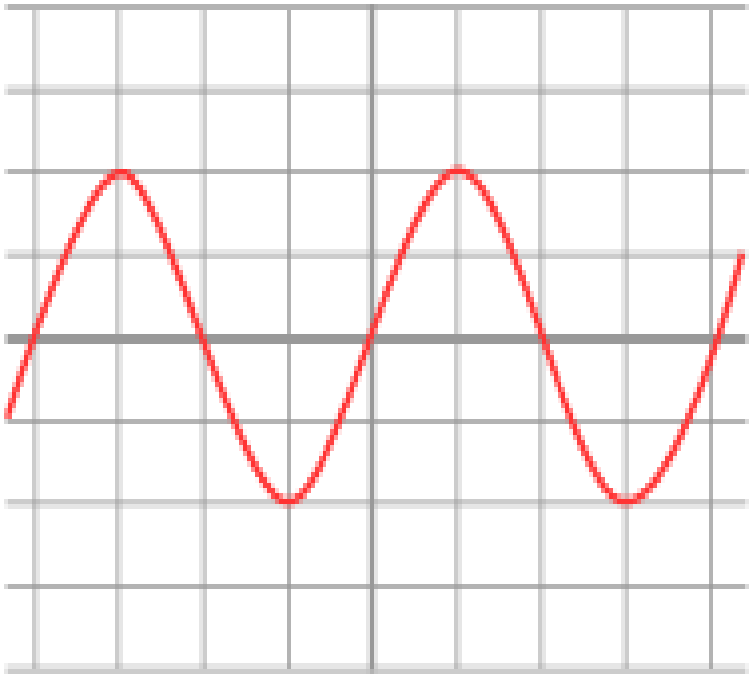
- The digital computer works on a discrete signal. This signal has two states, on or off.
- The outputs are in numbers, exact values are seen on displays.
- Here a large number of logic gates, microprocessors and on-off switches are used.
- The digital computers can emulate the behavior of analogue computers.
- Digital computers are quite fast. The analogue computers measure the analogue quantities like voltage, temperature, etc.

Analog Computer Vs Digital Computer Cont…

- These computers can be used in all fields of life.
- The digital computers calculate mathematical operations, complex calculations, media streaming, etc.
- Digital computers are quite easy to use.
- Storing data in digital computers are quite easy as they just stores either 0 or 1 which can be easily stored.
- Analogue computers are a bit difficult to use.
- The data storing in analogue computers are quite difficult as they use continuous signals which are difficult to store

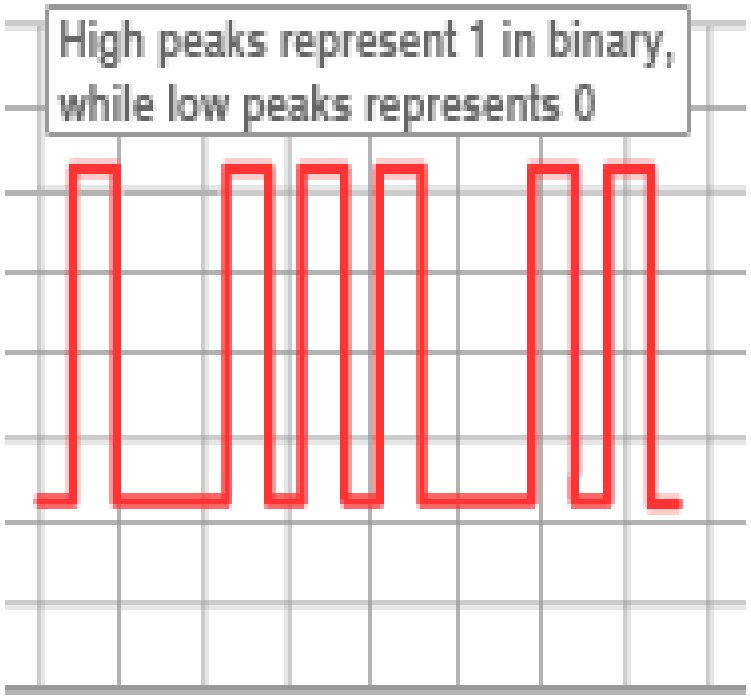
Analog Computer Vs. Digital Computer

Analogue signal



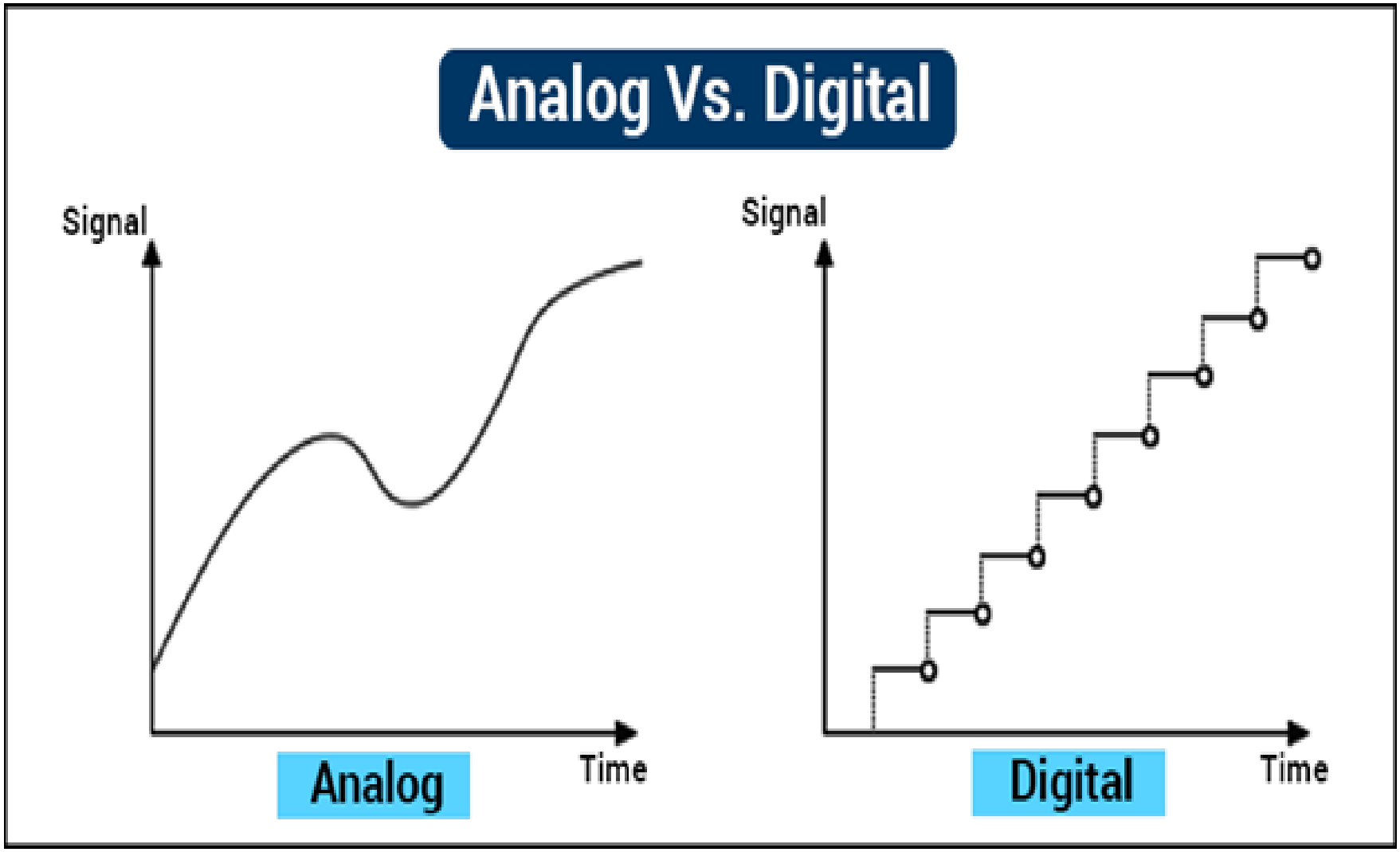
Analogue signals work by transmitting sounds and pictures as continously varying waves.

Digital signal



Digital information is sent as computerised pulses of information, coded as 1s and 0s.

Analog Computer Vs. Digital Computer



Analog Vs Digital computers

Vs.

Analog Computer

Digital Computer

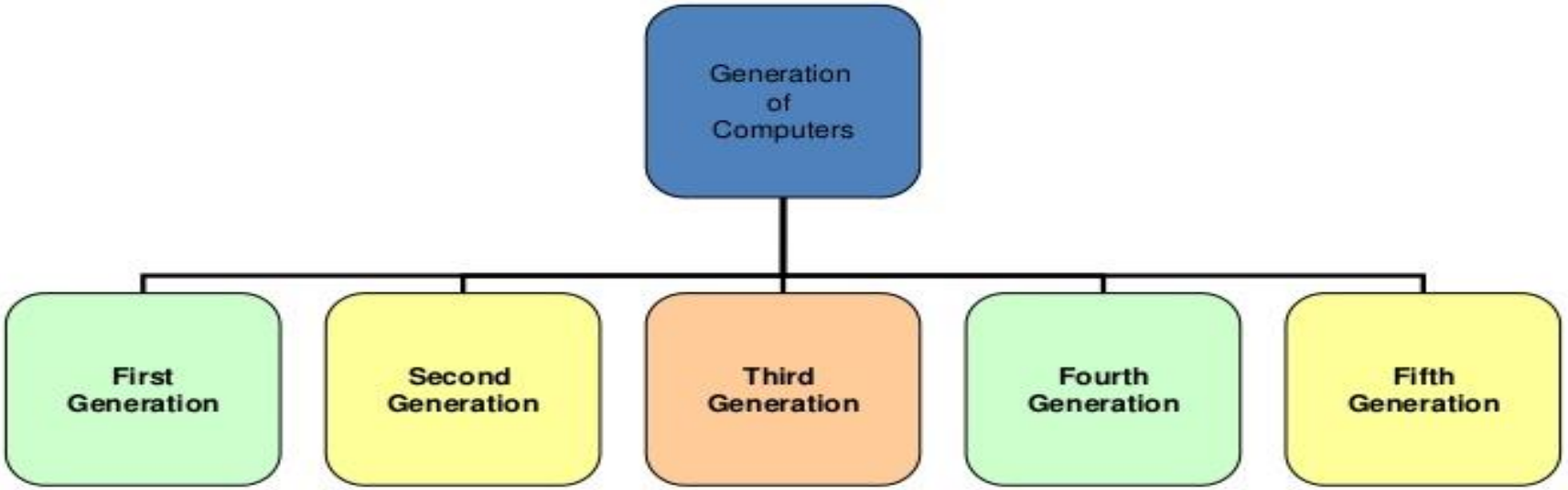
Basic differences between analog and digital

Analog	Digital
Its functions on physical analog system.	It functions on discrete numbers system.
The calculations in this system are primarily converted to equations and later converted into electrical signals.	The calculations in this system are converted into binary numbers (i.e., 1s and 0s).
To function, it requires physical analog.	To function, it requires discrete numbers.
It gives output in the form of ‘graph’.	It gives output in the form of discrete values.
Accuracy comparatively is less.	Accuracy is very high.
Performs at a low speed.	It performs at a very high speed.
Difficult to make changes, as it is less flexible.	It is highly flexible.
It has memory of low capacity.	It has memory of high capacity.
Its application is limited to certain applications.	Its application is applicable to a number of applications.
It is hardly applicable for the business applications.	It is very much suitable for the business applications.
It cannot process alpha-numeric data.	It can process alpha-numeric data.
It requires RF technology.	It requires IP networking.
Static channel assignment.	Automatic channels exist as required.

Generation of Computers

Generation of Computers

Based on the characteristics of various computers developed from time to time, they are categorized as generation of computers.



What are the generations of computer?

- 1951 – 1959: *First Generation* – Vacuum Tubes. These early computers used vacuum tubes as circuitry and magnetic drums for memory. ...
- 1959 – 1963: *Second Generation* – Transistors. ...
- 1963 – 1975: *Third Generation* – Integrated Circuits. ...
- 1975 – 2010: *Fourth Generation – Microprocessors.*
- 2010 -Till date: *Fifth Generation* – Artificial Intelligence

Generation of Computers

INTRODUCTION

The first electronic computer was designed and built at the University of Pennsylvania based on vacuum tube technology. Vacuum tubes were used to perform logic operations and to store data.

Generations of computers has been divided into five according to the development of technologies used to fabricate the processors, memories and I/O units.

Generation of Computers

- A generation refers to the state of improvement in the development of a product. This term is also used in the different advancements of computer technology. With each new generation, the circuitry has gotten smaller and more advanced than the previous generation before it. As a result of the **miniaturization**, **speed**, **power**, and **memory** of computers has proportionally increased. New discoveries are constantly being developed that affect the way we live, work and play

Generation of Computers

First Generation Computers

Time Period : 1951 to 1959
Size : Very Large System

Technology : Vacuum Tubes
Processing : Very Slow

First Generation Computers

Characterized By:-

Magnetic Drums

- Magnetic Tapes
- Difficult to program
- Used machine language & assembly language

Generation of Computers

Second Generation Computers

Time Period : 1959 to 1963
Size : Smaller

Technology : Transistors
Processing : Faster

Second Generation Computers

Characterized By:-

- Magnetic Cores
- Magnetic Disk
- Used high level language
- Easier to program

Generation of Computers

Third Generation Computers

Time Period	: 1963 to 1975
Technology	: ICs (Integrated Circuits) Incorporated many transistors & electronic circuits on a single chip
Size	: Small as compared to 2nd generation computers
Processing	: Faster then 2nd generation computers

IC (Integrated Circuit)

Characterized by:-

- Minicomputers accessible by multiple users from remote terminals.

Generation of Computers

Fourth Generation Computers

Time Period	: 1975 to Today
Technology	: VLSI (Very Large Scale Integration) Incorporated many millions of transistors & electronic circuits on a single chip
Size	: Small as compared to first generation computer
Processing	: Faster then first generation computer

VLSI (Very Large Scale Integration)

Characterized by:

The personal computer and user friendly micro-programs, very fast processor chip high level language, OOP (Object Oriented Programming)

Generation of Computers

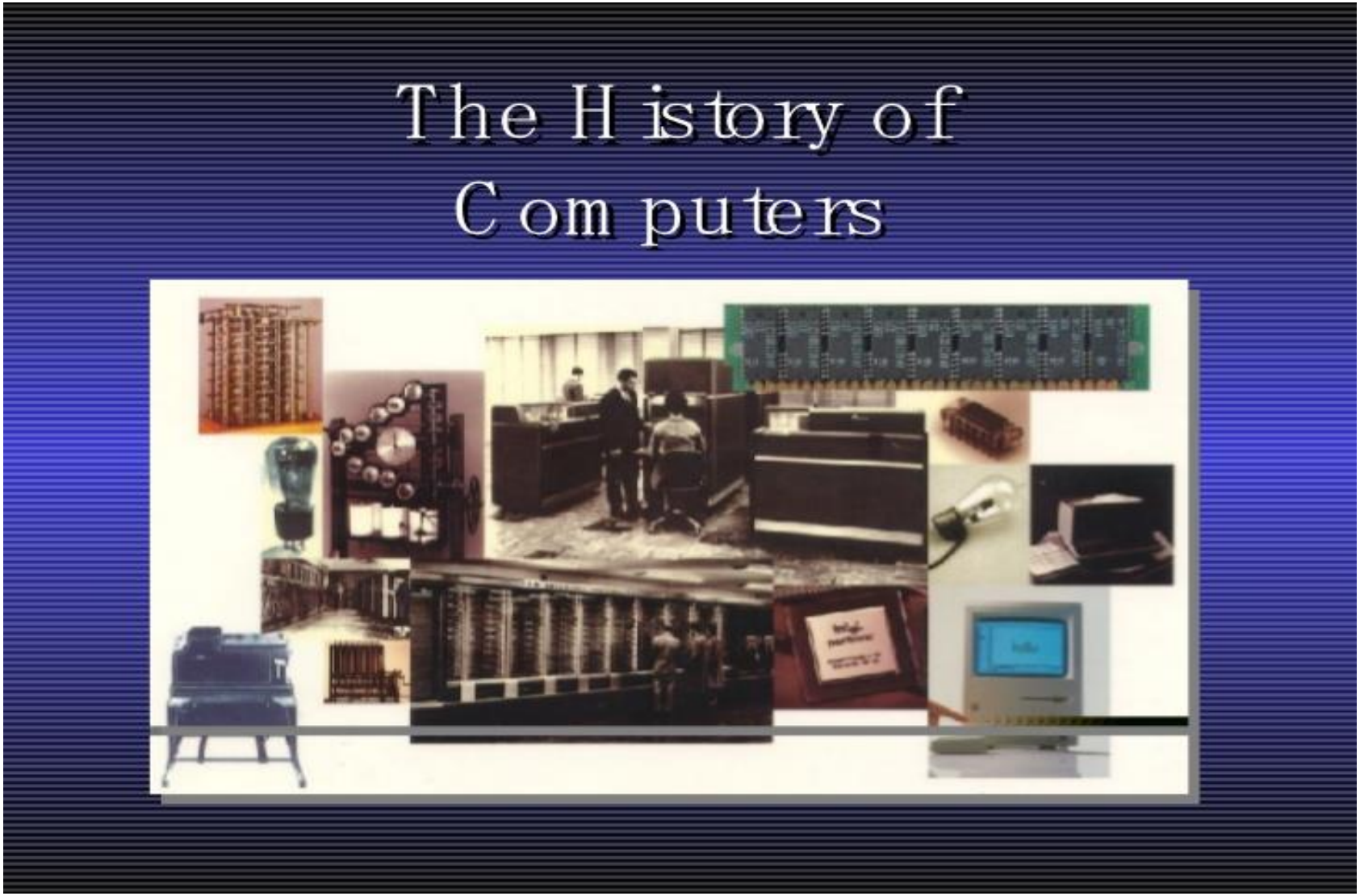
Fifth Generation Computers

Time Period : Future Technology
Technology : AI (Artificial Intelligence)

Fifth Generation Computer

AI (Artificial Intelligence)

History of Computer



History of Computer

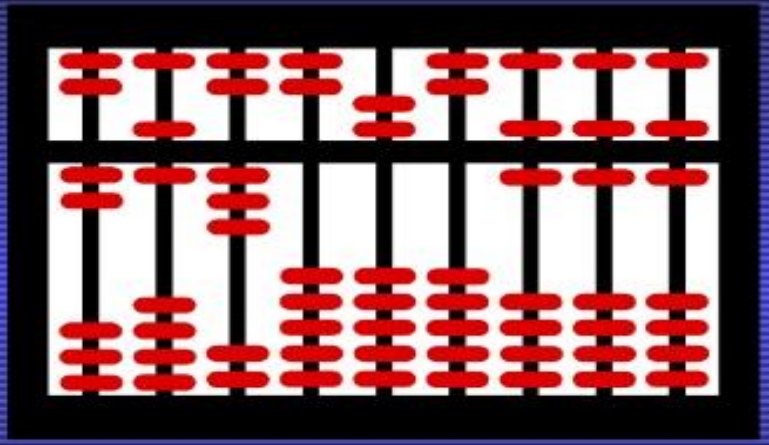
What is a computer?

A computer is an electronic machine that accepts information (Data), processes it according to specific instructions, and provides the results as new information.

History of Computer

I- Ancient Counting Machines

1- The Abacus (base 5)
(in ancient Babylon, China, Europe)



Ancient Time

2- The Roman Numerals

I II III IV V VI VII VIII IX X

3- The Arabic Numerals (base 10)

0 1 2 3 4 5 6 7 8 9 10

History of Computer

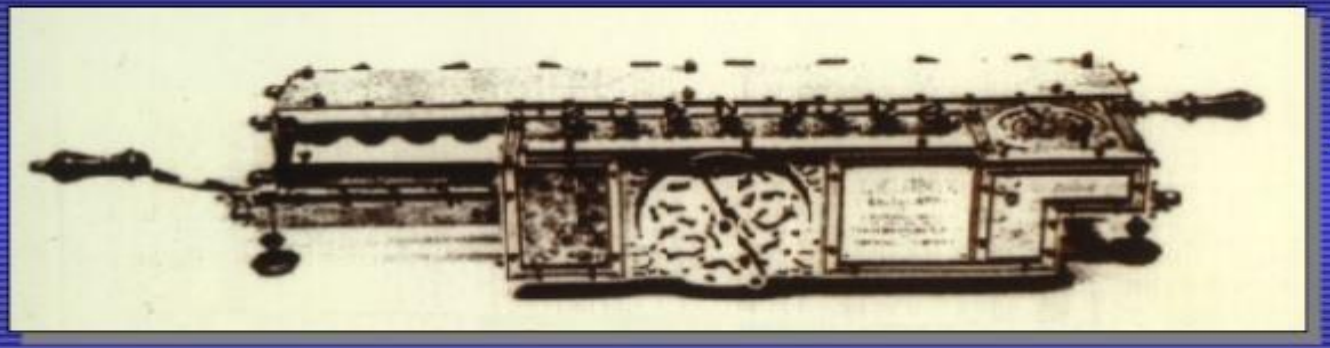
II- Mechanical Counting Machines

1642

4- The Pascaline is a mechanical calculating device invented by the French philosopher and mathematician Blaise Pascal in 1642. (+)

History of Computer

II- Mechanical Counting Machines



1673

5- The Leibniz Wheel was invented by the famous mathematician Leibniz in 1673.

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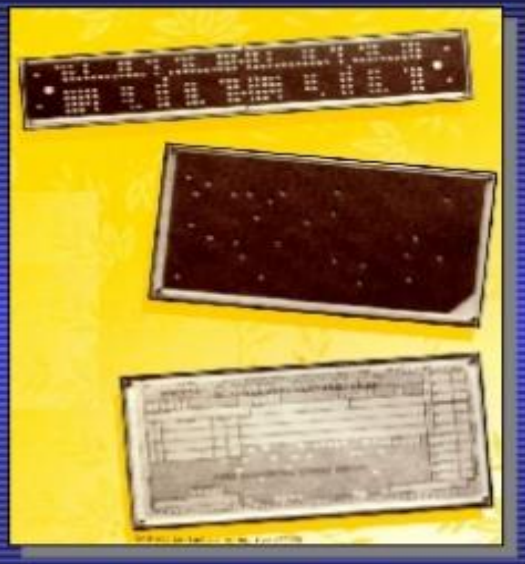
History of Computer

II- Mechanical Counting Machines



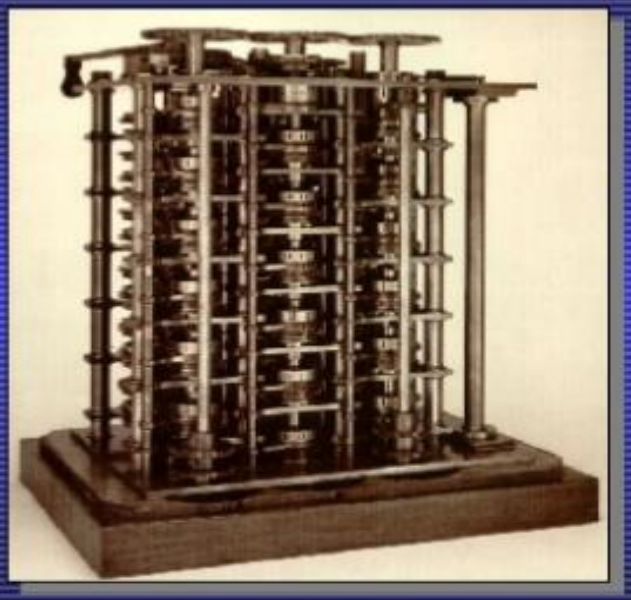
1810

6- Punched Cards were used by the French weaver Joseph Jacquard in 1810. The cards carried weaving instructions for the looms, later this idea offered a great use for storing info.

History of Computer

II- Mechanical Counting Machines

7- Babbage's Difference Engines were calculating machines made by Charles Babbage to produce tables of numbers that would be used by ship's navigators.



1832

1852

This device had mechanical problems similar to those that plagued Pascal and Leibniz.

History of Computer

The Invention of the Vacuum Tube

8- Initially discovered by Thomas Edison, the vacuum tube formed the building block for the entire electronics industry.

*Vacuum tubes were later used as electron valves in the 20th century to build the first electronic computers.

1883

History of Computer

III- Electrical Counting Machines

9- The US census of the 1880 took 9 years to compile and led to inaccurate figures. To solve the problem, Herman Hollerith invented a calculating machine that used electricity along with punched cards instead of mechanical gears.

1888

History of Computer

III- Electrical Counting Machines

- Hollerith's machine was immensely successful. The general count of the population, then 63 million, took only 6 weeks to calculate!

1888

- Based on the success of his invention, Herman Hollerith and some friends formed a company that sold his invention all over the world. The company eventually became known as:

International Business Machines IBM

History of Computer

II- Mechanical Counting Machines

10- A partial working model of Babbage's Analytical Engine was completed in 1910 by his son... used punched cards to store numbers. The design was no more successful than its predecessors.

1910

History of Computer

III- Electrical Counting Machines

1943

11- MARK I was built by a team from IBM and Harvard University. Mark I used mechanical telephone switches to store information. It accepted data on punched cards, processed it and then output the new data.

History of Computer

IV- Electronic Counting Machines

1946

12- The ENIAC was the first US-built all-electronic computer built to perform ballistics calculations. *(Away from IBM)*

History of Computer

IV- Electronic Counting Machines

1946

* It was 1000X faster than Mark I, but it drew a lot of power that dimmed the lights of Philadelphia when it was switched on due to the use of Vacuum Tubes.
* Mark I: 5 Additions / sec.
* ENIAC: 5,000 Additions / sec.
* ENIAC was made of 18,000 vacuum tubes.

History of Computer

IV- Electronic Counting Machines

ENIAC's Problems:

1- short life of vacuum tubes

2- It runs a single program, which means rewiring by a group of technicians is needed to change the program!!!

Solution: the same group of researchers worked on another version of ENIAC that can store programs on punched cards that are much easier to manage and they came up with: ➢

History of Computer

IV- Electronic Counting Machines

1946

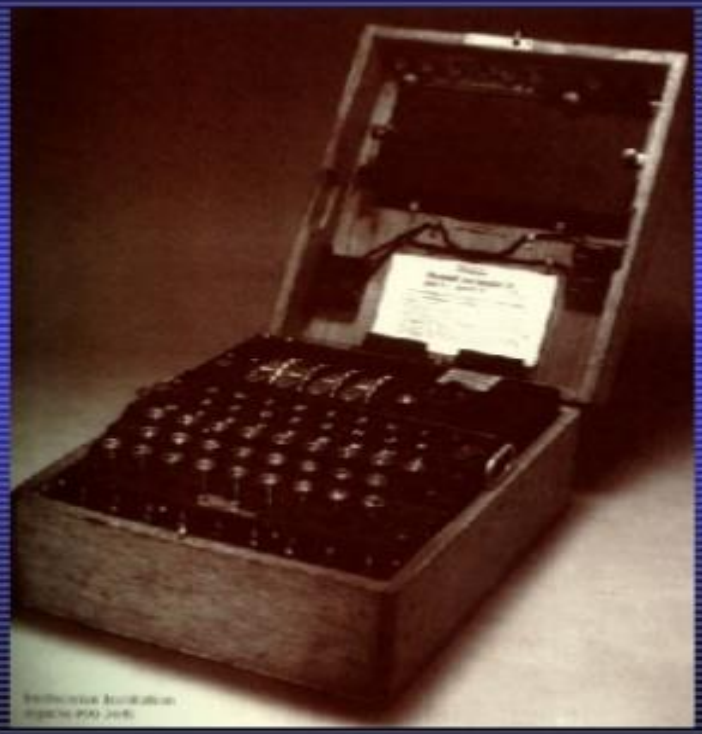
12- The ENIAC was the first US-built all-electronic computer built to perform ballistics calculations. *(Away from IBM)*

History of Computer

The Effect of World War II

Back in time to the days of war…

* During WWII, the German Navy developed a cipher machine named Enigma. The Enigma machine could automatically encode a message in such a way that only another Enigma machine could read decode it.



1938

History of Computer

The Effect of World War II

* In 1938 the Polish Secret Service managed to steal an Enigma machine that was smuggled to England.

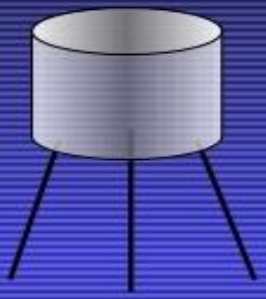
1938

* Secretly the British developed a computer named Colossus that could decipher as many as 2,000 messages per day. That computer used Vacuum tubes and was the world's first entirely digital computer. Surprisingly, though Colossus presented a similar technology to that of ENIAC, it had only 2,400 compared to 18,000 in ENIAC!!!

History of Computer

Two Inventions that changed the way computers are built!!

1- The Transistor



1946

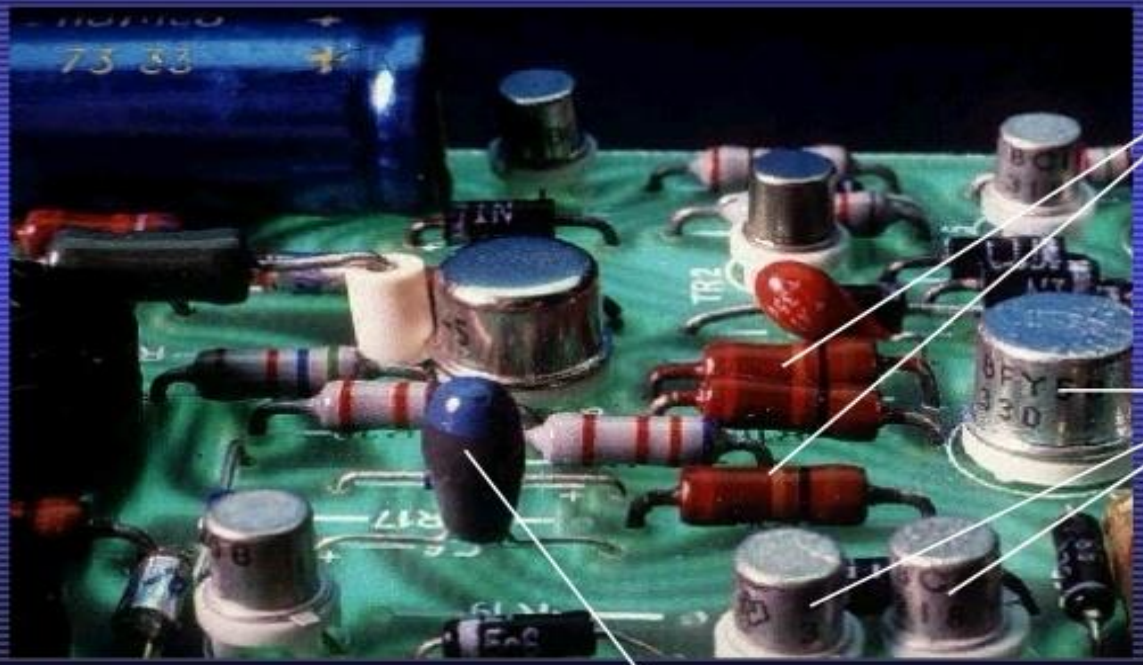
The most significant single invention of the modern era. It was invented by 3 scsientists at At&T's Bell Labs.

One of the first overseas companies was a Japanese company called Tokyo Telecommunications Laboratory. The company had troubles paying the license fee ($25,000) that company became in 1956 what's called now Sony! it replaced the Vacuum tube.

*** Transistors are smaller *(sometimes microscopic)***
*** Fast and don't need to warm up**

History of Computer

Transistors on a circuit board

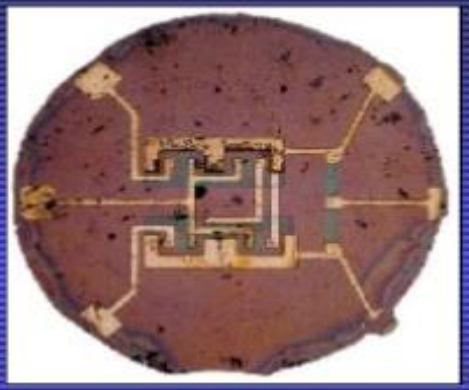


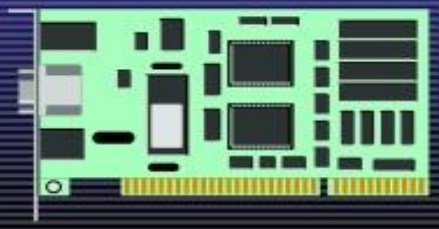
History of Computer

Two Inventions that changed the way computers are built!!

2- The (IC) Integrated Circuit

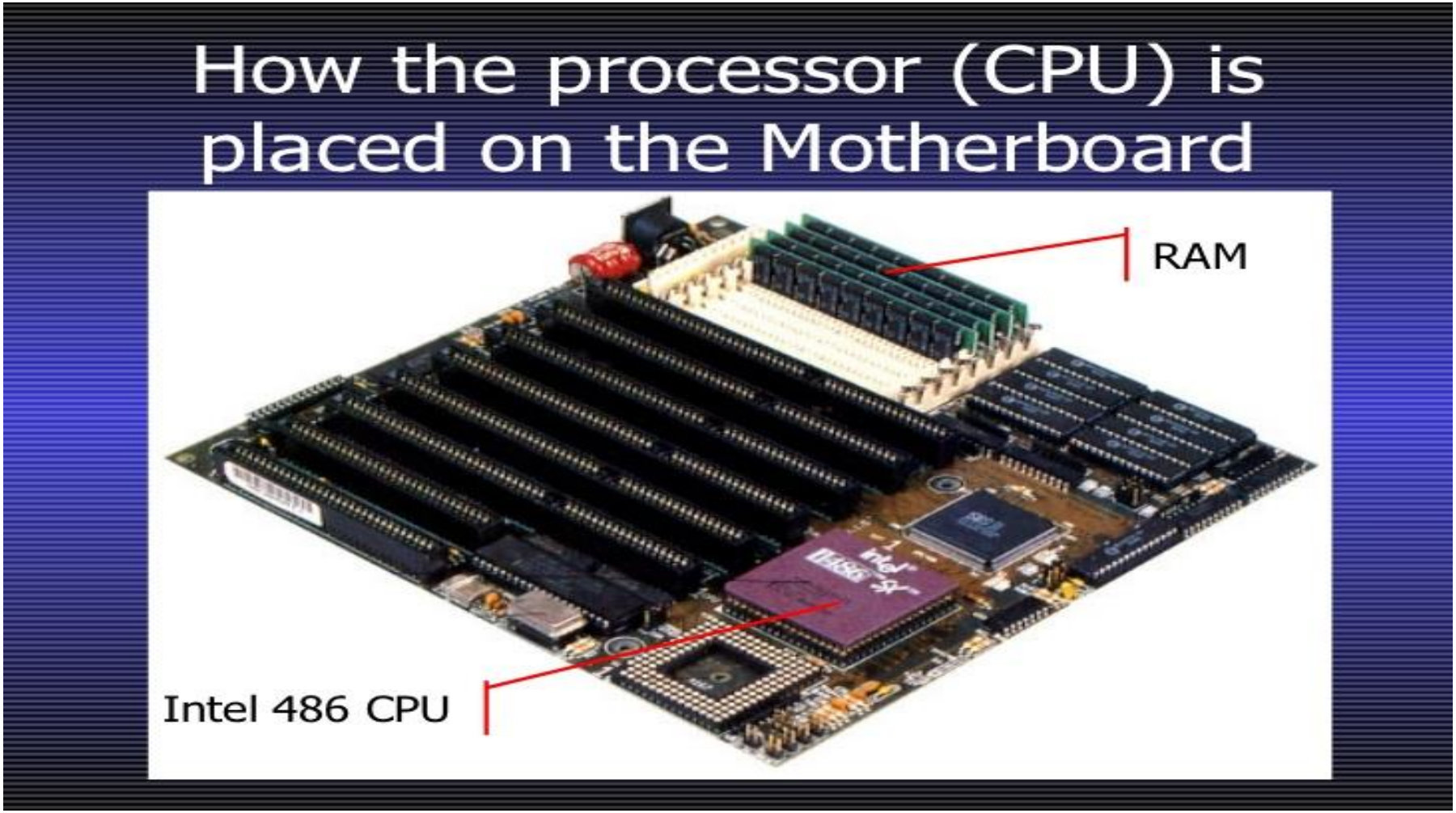
1961



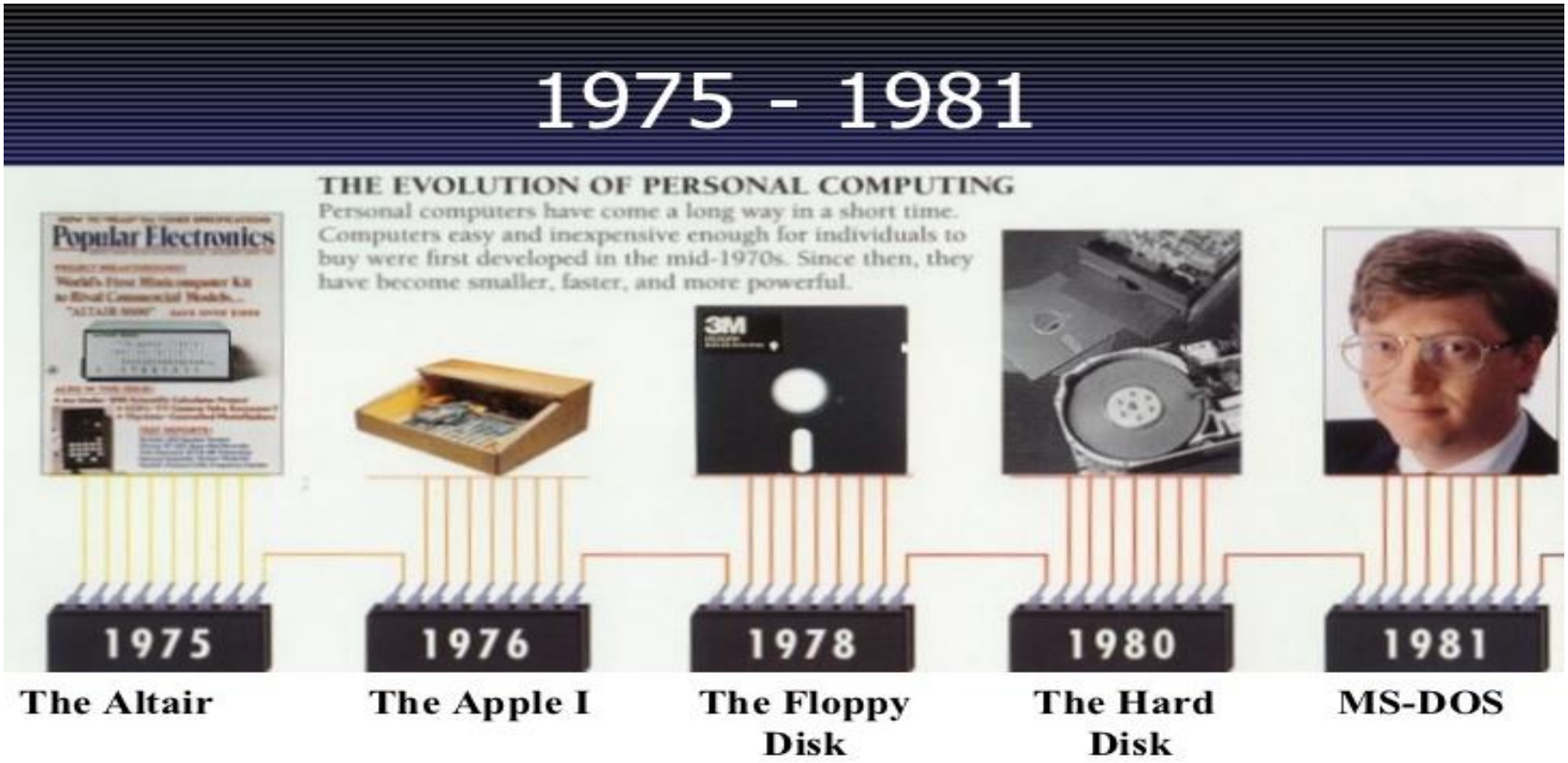


The IC revolutionized the entire electronic technology. Ex: The Pentium Processor contains 3.1 Million Transistors in 1.5 inch square!

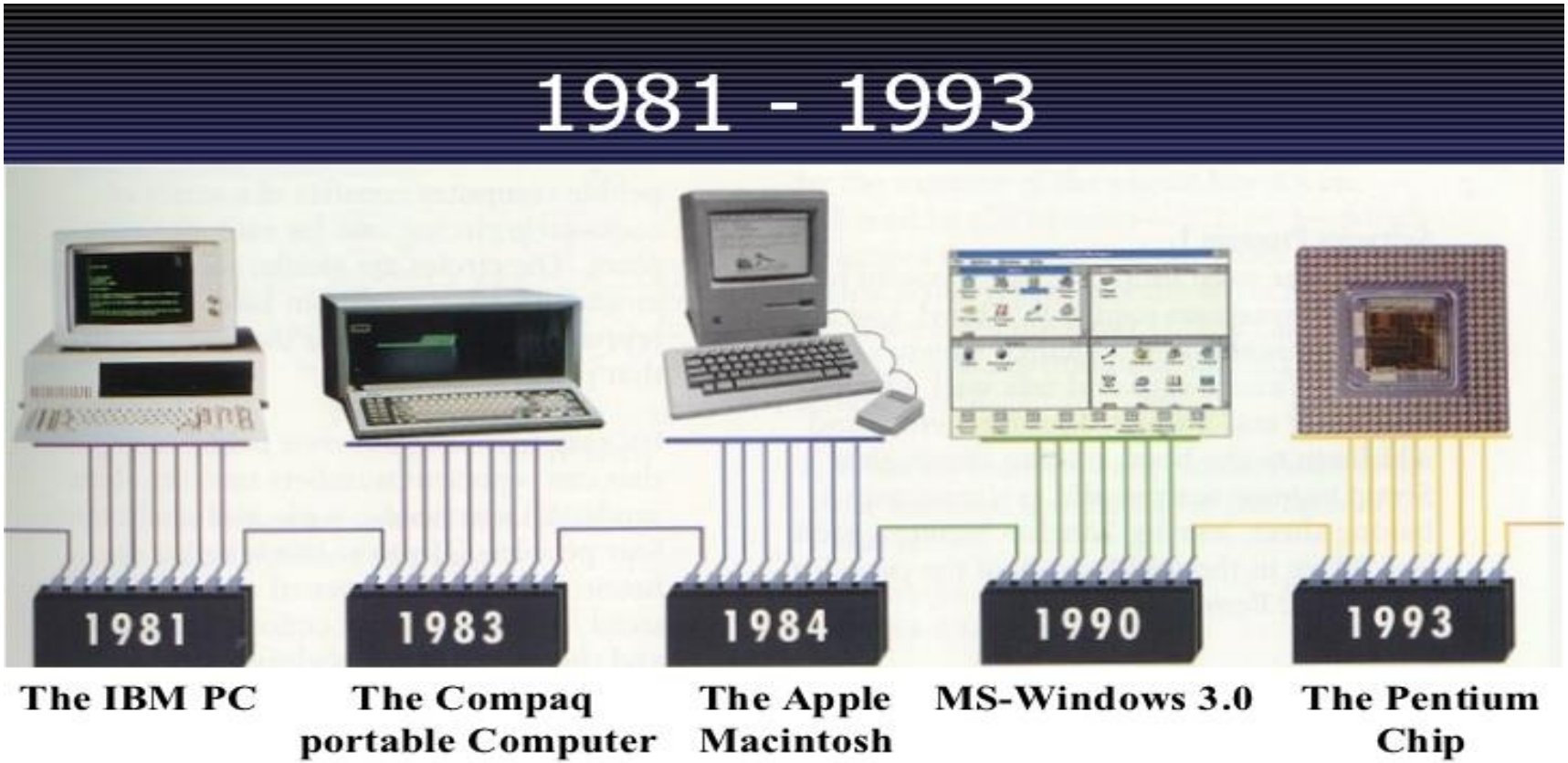
History of Computer



History of Computer

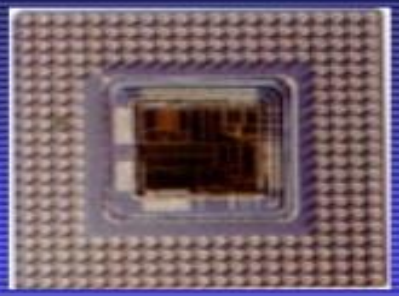


History of Computer

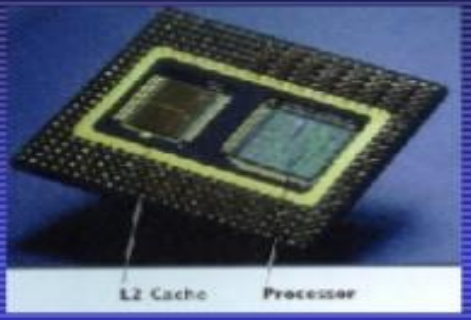


History of Computer

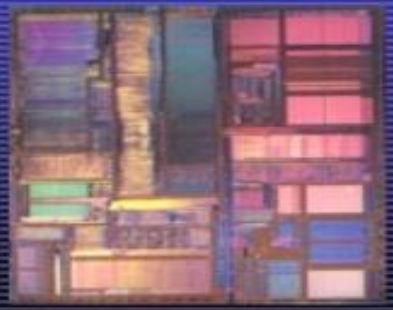
Intel Pentium Processors

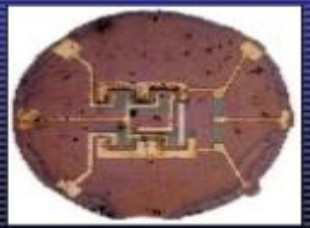


PENTIUM



PENTIUM Pro





PENTIUM II

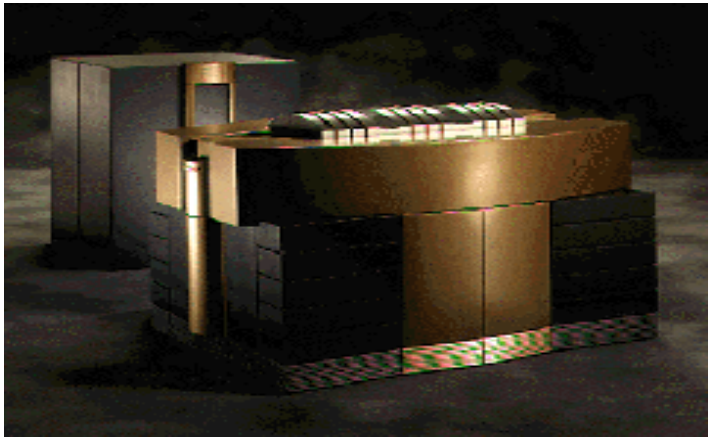
Classification of computer

- Computers are available in different shapes, sizes and weights, due to these different shapes and sizes they perform different sorts of jobs from one another.
- They can also be classified in different ways. All the computers are designed by the qualified computer architectures that design these machines as their requirements.
- A computer that is used in a home differs in size and shape from the computer being used in a hospital. Computers act as a server in large buildings, while the computer also differs in size and shape performing its job as a weather forecaster.
- A student carrying a laptop with him to his college is different in shape and size from all the computers mentioned above

Super computer

- The biggest in size, the most expensive in price than any other is classified and known as super computer. It can process trillions of instructions in seconds. This computer is not used as a PC in a home neither by a student in a college.
- Governments specially use this type of computer for their different calculations and heavy jobs. Different industries also use this huge computer for designing their products.

In most of the Hollywood's movies it is used for animation purposes. This kind of computer is also helpful for forecasting weather reports worldwide.



A CRAY T90 Series supercomputer

Mainframes

- Another giant in computers after the super computer is Mainframe, which can also process millions of instruction per second and capable of accessing billions of data.
- This computer is commonly used in big hospitals, air line reservations companies, and many other huge companies prefer mainframe because of its capability of retrieving data on a huge basis.
- This is normally too expensive and out of reach from a salary-based person who wants a computer for his home.

Minicomputer

- This computer is next in he line but less offers less than mainframe in work and performance.
- These are the computers, which are mostly preferred by the small type of business personals, colleges, etc.

Personal computers

- Almost all the computer users are familiar with the personal computers. They normally know what the personal computer is and what are its functions.
- This is the computer mostly preferred by the office / home users. These computers are lesser in cost than the computers given above and also, small in size; they are also called PCs in short for Personal computers.
- This computer is small in size and you can easily arrange it to fit in your home / office with its all accommodation. Today this is thought to be the most popular computer in all.

Notebook / Laptop

- Having a small size and low weight the notebook is easy to carry to anywhere. A student can take it with him/her to his/her school in his/her bag with his/her book.
- This is easy to carry around and preferred by students and business people to meet their assignments and other necessary tasks.
- The approach of this computer is also the same as the Personal computer.
- It can store the same amount of data and having a memory of the same size as that of a personal computer. One can say that it is the replacement of personal desktop computer.

Palmtop

- More commonly known as Personal Digital Assistants (PDAs), palmtops are tightly integrated computers that often use flash memory instead of a hard drive for storage.
- These computers usually do not have keyboards but rely on touchscreen technology for user input.
- Palmtops are typically smaller than a paperback novel, very lightweight with a reasonable battery life.
- A slightly larger and heavier version of the palmtop is the **handheld computer**.

Wearable Computers

- The latest trend in computing is wearable computers. Essentially, common computer applications (e-mail, database, multimedia, calendar/scheduler) are integrated into watches, cell phones, visors and even clothing!
- A wearable computer is a very personal computer. It should be worn like apiece of clothing, as unobtrusive as possible.
- A user should interact with the computer based upon context.
- It could be a communications device (immediate or store and forward), a recorder (visual, audio, other sensors) or a reference device (local or remote resources).

Comparisons between different types of computers:

Type	Components	Physical Size and Capacity	Cost	Usage
Microcomputer	All components in a single unit	Smallest	Cheapest	At homes, in schools and offices
Minicomputer	Several functional units	Small	Cheap	In universities, medium-sized companies, departments of large companies
Mainframe computer	Several separate units	Large	Expensive	In large organizations, universities, government
Supercomputer	Several separate units	Largest	Most expensive	In scientific research, weather forecasting, space exploration, military defense

What is Computer?

- The term computer is used to describe a device made up of a combination of electronic and electromechanical (part electronic and part mechanical) components.
- By itself, a computer has no intelligence and is referred to as hardware.
- It is an electronic device that have computation capacity.

Characteristics Of Computer

- Word Length
  - Number of bits processed at a go by a CPU
- Speed
  - Rate of processing of data
- Storage
  - Ability of storing data
- Accuracy
  - Accurate output as per given instruction
- Diligence
  - Able to perform a task repeatedly with same speed and accuracy.

Types of Computer

- Laptop
  - A portable and compact computer with a power of a battery.
- Desktop
  - A personal computer that is suitable to work at a ordinary desk. It is not a portable form of computer
- Palmtop
  - A small and light weight computer enough to held in one hand.

Use of Computer

- Education
- Health & Medicine
- Science and Engineering
- Aviation
- Business
- R & D
- Sports
- Recreation and Entertainment

Application of Computer

Computer in Banks

- Customer Information
- Products
- Reports and Profits
- Transactions and Goals
- Credit Applications
- Delinquency
- Miscellaneous

Application of Computer

Automatic Teller Machine

Using an ATM, customers can access their bank accounts in order to make cash withdrawals, credit card cash advances, and check their account balances as well as purchase prepaid cellphone credit. If the currency being withdrawn from the ATM is different from that which the bank account is denominated in (e.g.: Withdrawing Japanese Yen from a bank account containing US Dollars), the money will be converted at a wholesale exchange rate. Thus, ATMs often provide the best possible exchange rate for foreign travelers and are heavily used for this purpose as well.

Application of Computer

Computers In Engineering

The use of computer to engineering is by helping it to create some of the important factors or simply using a computer to create an image about their plan by means of using programming languages. To control their Machines and Many More.....

Application of Computer

Computers In The Government Offices



- Email Functions
- Distributing Payments
- Record Keeping
- Direct-Mail Promotions
- And Many More…….

Application of Computer

Computer In Business

- Accounting
- Customer Interaction
- Scheduling
- Communication
- Web site and Many More…….

Application of Computer

Computer In Hospitals



They are used for doctors orders, charting notes, documenting vital signs, So Many use……

Application of Computer

Computer @ Home




A great advantages of home computers is that they allow individuals and families to achieve a variety of tasks at home. Families can use word processing programs for homework, spreadsheets to manage bills, and the Internet for social networking and entertainment. While students can use computers at home, and adults at work, the convenience of being able use a computer at home is a great advantage in itself. Many businesses also allow their employees to work from home via computer, thus saving travel expenses to and from the office, as well as saving company resources.

Application of Computer

Computers In Manufacturing

Computer Integrated Manufacturing (CIM) ...
CAD techniques make use of group technology to create similar geometries for quick retrieval.
Electronic files and Many More……

Application of Computer

- Research
- Data Entry
- Intervention
- Virtual
- Teacher Resource
- Learning .....

THANK YOU!