Introduction

What is a Computer?: **A Computer** is an electronic device that manipulates information, or "data." It has the ability to **store**, **retrieve**, and **process** data. You can use a computer to type documents, send email, and browse the internet. You can also use it to handle spreadsheets, accounting, database management, presentations, games, and more.

Computer system:

A system of interconnected computers that share a central storage system and various peripheral devices such as a printers, scanners, or routers. Each computer connected to the system can operate independently, but has the ability to communicate with other external devices and computers. All types of computers consist of two basic parts:

a) **Hardware** is any part of your computer that has a **physical structure**, such as the computer monitor or keyboard.

b) **Software** is any **set of instructions** that tells the hardware what to do. It is what guides the hardware and tells it how to accomplish each task. Some examples of software are web browsers, games, and word processors such as Microsoft Word.

c) **Others include:**

   - Liveware

   - Procedures

   - Data communication

Lexikon's History of Computing

Five Generations of Computers

In terms of technological developments over time, computers have been broadly classed into five generations.
The lines of distinction between each generation are not exact, and some overlap in technologies exists.
Although these designations are open to some controversy, as a general description of types of technology in use, the terms first, second, third, fourth and fifth generation are sometimes useful in providing a general perspective of some of the advancements in computing technology.

First Generation: 1944-1959

Characteristics:

(not all first generation computers had all these characteristics)

-vacuum tube based

-punched tape input or output

-about 1,000 circuits per cubic foot

Examples:

-Harvard Mark I (electromechanical)

-Whirlwind

-ENIAC

-EDSAC

-UNIVAC I, UNIVAC II, UNIVAC 1101

-RCA BIZMAC

-NCR CRC 102A, NCR CRC 102D

-Honeywell Datamatic 1000

-Burroughs E101, Burroughs 220

-IBM models 604, 650 (drum memory), 701, 702, 704, 705, 709

Second Generation: 1960-1964

Characteristics:

-used transistors

-about 100,000 circuits per foot

Examples:

-UNIVAC 1107, UNIVAC III

-RCA 501

-Philco Transact S-2000

-NCR 300 series

-IBM 7030 Stretch

-IBM 7070, 7080, 7090, 1400 series, 1600 series

-Honeywell 800, 400 series

-General Electric GE 635, 645, GE 200

-Control Data Corp. CDC 1604, 3600, 160A

-LARC

-Burroughs B5000, 200 series

Third Generation: 1964-1975

Characteristics:

-large scale integrated circuits

-10 million circuits per square foot

Examples:

-Burroughs 6700

-Control Data 3300, 6600, 7600

-Honeywell 200

-IBM System/360, System 3, System 7

-NCR Century Series

-RCA Spectra 70 series

-UNIVAC 9000 series

-General Electric GE 600 series, GE 235

Fourth Generation: 1975-Current

Characteristics:

-very large scale integration

-continued miniaturization

-billions of circuits per cubic foot

Examples:

-IBM System 3090, IBM RISC 6000, IBM RT

-ILLIAC IV

-Cray 2 XMP

-HP 9000

 Fifth Generation: Current and Future

Characteristics:

Combinations of some or all of the following technologies:

-extremely large scale integration

-parallel processing

-high speed logic and memory chips

-high performance, micro-miniaturization

-voice/data integration; knowledge-based platforms

-artificial intelligence, expert systems

-virtual reality generation

Evolution of Counting and Calculating Technologies

EARLY MANUAL METHODS

4,000 B.C. Early cuneiform; early hieroglyphics

3,000 B.C. Early abacus; early Egyptian papyrus writings

2,500 B.C. Babylonian numbering system

1,500 B.C. Ancient Semitic alphabet

1,500 B.C. Early Egyptian counting dots

485 B.C. Early Greek counting pebbles

300 B.C. Hindu numerals

105 A.D. Early block printing in China

800 A.D. Arabic numbering system

1045 A.D. Moveable clay type used in China

1423 A.D. Early block printing in Europe

1539 A.D. First printing press in western hemisphere

MECHANICAL METHODS

1620 Edmund Gunter invents his slide rule

1623 W. Schickard's calculator-clock adding machine

1632 William Oughtred invents slide rule & circular rule

1642 Blaise Pascal's mechanical adding machine

1671 Von Leibnitz invents Leibnitz Wheel calculator

1801 Jacquard's first punch card machine

1808 Early typewriter machine

1833 Charles Babbage's Difference Engine

1850 First key-driven adding machines

1867 First marketable manual typewriters

1879 First electric lights

1879 First mechanical cash register

1880 Tabulating & adding machines in widespread use

ELECTRICAL DEVICES

1904 Fleming Valve vacuum tube invented

1909 First combination typewriter and adding machines

1914 First electric typewriter

1918 First automatic playback typewriter, w/paper tape

1921 Printing-tabulating machines produced

1926 Electromechanical analog computer built by Dr. V. Bush

1928 CRTs

1928 Punch card machines attached to mech. calculators

1936 Konrad Zuse works on his "Z" machines

1939 Harvard Mark 1 calculator project begins

VACUUM TUBE ELECTRONICS

1942 Atanasoff's electronic digital computer

1943 Colossus digital computer (1,500 tubes)

1946 ENIAC (18,000 vacuum tubes)

1948 IBM 604 electronic calculator

1951 Univac I, first commercial computer

TRANSISTORIZED ELECTRONIC DEVICES

1947 Transistor invented at Bell Labs

1953 TX-0 transistorized computer at MIT

1954 IBM 608 transistorized calculator

1954 TRADIC (Transistorized Airborne Digital Computer)

1956 Leprechaun transistorized computer at Bell Labs

1958 CDC 1604 transistorized computer

1961 IBM Stretch Computer

INTEGRATED CIRCUITS AND MICROPROCESSORS

1961 Fairchild markets first integrated circuits

1961 Emergence of time-sharing systems

1964 Texas Instruments makes IC hearing aid

1965 DEC PDP-8 is first mass-produced mini-computer

1964 First digital computer launched into space

1974 First microcomputers

1976 Intel's 8748 "computer on a chip"

1995 Intel's 100 Mhz Pentium processor chip

Summary Generation of Computers

1. First Generation (1939-1954) – vacuum tube
2. Second Generation Computers (1954-1959) – transistor
3. Third Generation Computers (1959-1971) – IC
4. Fourth Generation (1971-1990) – microprocessor
5. Fifth Generation (from 1991)

Technical Evolution of Computers

- Increase in speed
- Increase in storage capacity
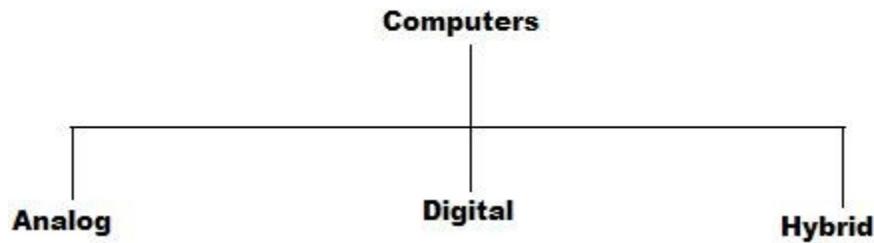- Increase in reliability
- Reduction in system cost

TYPES OF COMPUTERS

Computers can be classified based on their principles of operation or on their configuration. By configuration, we mean the size, speed of doing computation and storage capacity of a computer.

a) Types of Computers based on Principles of Operation

There are three different types of computers according to the principles of operation. Those three types of computers are

- Analog Computers
- Digital Computers
- Hybrid Computers

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                        Computers
                            |
       _____
      |                     |                      |
   Analog               Digital                Hybrid
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Analog Computers

Analog Computer is a computing device that works on continuous range of values. The results given by the analog computers will only be approximate since they deal with quantities that vary continuously. It generally deals with physical variables such as voltage, pressure, temperature, speed, etc.

Digital Computers

On the other hand a digital computer operates on digital data such as numbers. It uses binary number system in which there are only two digits 0 and 1. Each one is called a bit.

The digital computer is designed using digital circuits in which there are two levels for an input or output signal. These two levels are known as logic 0 and logic 1. Digital Computers can give more accurate and faster results.

Digital computer is well suited for solving complex problems in engineering and technology. Hence digital computers have an increasing use in the field of design, research and data processing.

b) Based on the purpose, Digital computers can be further classified as,

- General Purpose Computers
- Special Purpose Computers

Special purpose computer is one that is built for a specific application. General purpose computers are used for any type of applications. They can store different programs and do the jobs as per the instructions specified on those programs. Most of the computers that we see today, are general purpose computers.

Hybrid Computers

A hybrid computer combines the desirable features of analog and digital computers. It is mostly used for automatic operations of complicated physical processes and machines. Now-a-days analog-to-digital and digital-to-analog converters are used for transforming the data into suitable form for either type of computation.

For example, in hospital's ICU, analog devices might measure the patients temperature, blood pressure and other vital signs. These measurements which are in analog might then be converted into numbers and

supplied to digital components in the system. These components are used to monitor the patient's vital sign and send signals if any abnormal readings are detected. Hybrid computers are mainly used for specialized tasks.

c) Types of Computers based on Configuration

There are four different types of computers when we classify them based on their performance and capacity. The four types are

- Super Computers
- Mainframe Computers
- Mini Computers
- Micro Computers

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                        ┌─────────────────────┐
                        │  Digital Computers  │
                        └──────────┬──────────┘
            ┌──────────────┬───────┴──────┬──────────────┐
            ▼              ▼              ▼              ▼
    ┌──────────────┐ ┌──────────────────┐ ┌──────────────┐ ┌──────────────┐
    │Super Computers│ │Mainframe Computers│ │Mini Computers│ │Micro Computers│
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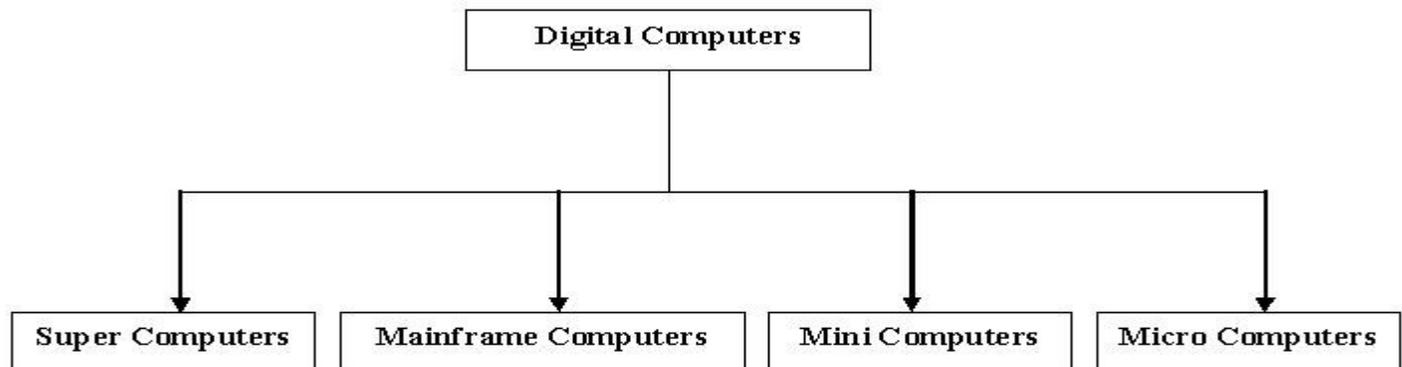
Super Computers

When we talk about types of computers, the first type that comes to our mind would be Super computers. They are the *best* in terms of processing capacity and also the *most expensive* ones. These computers can process billions of instructions per second. Normally, they will be used for applications which require intensive numerical computations such as stock analysis, weather forecasting etc. Other uses of supercomputers are scientific simulations, (animated) graphics, fluid dynamic calculations, nuclear energy research, electronic design, and analysis of geological data (e.g. in petrochemical prospecting). Perhaps the best known super computer manufacturer is Cray Research. Some of the *"traditional"* companies which produce super computers are Cray, IBM and Hewlett-Packard.

As of July 2009, the IBM Roadrunner, located at Los Alamos National Laboratory, is the fastest super computer in the world.

If you want to know more advanced details about super computers, refer to SuperComputers

Mainframe Computers

Mainframe computers can also process data at very high speeds vi.e., hundreds of million instructions per second and they are also quite expensive. Normally, they are used in banking, airlines and railways etc for their applications.

Mini Computers

Mini computers are lower to mainframe computers in terms of speed and storage capacity. They are also less expensive than mainframe computers. Some of the features of mainframes will not be available in mini computers. Hence, their performance also will be less than that of mainframes.

Micro Computers

The invention of microprocessor (single chip CPU) gave birth to the much cheaper micro computers. They are further classified into

- Desktop Computers
- Laptop Computers
- Handheld Computers(PDAs)

Desktop Computers

Today the Desktop computers are the most popular computer systems.These desktop computers are also known as personal computers or simply PCs. They are usually easier to use and more affordable. They are normally intended for individual users for their word processing and other small application requirements.

Laptop Computers

Laptop computers are portable computers. They are lightweight computers with a thin screen. They are also called as notebook computers because of their small size. They can operate on batteries and hence are very popular with travellers. The screen folds down onto the keyboard when not in use.

Handheld Computers

Handheld computers or Personal Digital Assistants (PDAs) are pen-based and also battery-powered. They are small and can be carried anywhere. They use a pen like stylus and accept handwritten input directly on the screen. They are not as powerful as desktops or laptops but they are used for scheduling appointments,storing addresses and playing games. They have touch screens which we use with a finger or a stylus.

More on Classification of Computers

a) According to size

• Supercomputers

   • Mainframe Computers

   • Minicomputers

   • Workstations

   • Microcomputers, or Personal Computers

Supercomputers : are widely used in scientific applications such as aerodynamic design simulation, processing of geological data.

   • Supercomputers are the most powerful computers. They are used for problems requiring complex calculations.

   • Because of their size and expense, supercomputers are relatively rare.

   • Supercomputers are used by universities, government   agencies, and large businesses.

Mainframe Computers: are usually slower, less powerful and less expensive than supercomputers. A technique that allows many people at terminals, to access the same computer at one time is called time sharing. Mainframes are used by banks and much business to update inventory etc.

• Mainframe computers can support hundreds or   thousands of users, handling massive amounts of input, output, and storage.

 • Mainframe computers are used in large organizations where many users need access to shared data and programs.

 • Mainframes are also used as e-commerce servers, handling transactions over the Internet.

Minicomputers: are smaller than mainframe, general   purpose computers, and give computing power without adding the prohibitive expenses associated with larger systems. It is generally easier to use.

   • Minicomputers usually have multiple terminals.

•   Minicomputers may be used as network servers and Internet servers.

Workstations

•   Workstations are powerful single-user computers.

•   Workstations are used for tasks that require a great deal of number-crunching power, such as product design and computer animation.

•   Workstations are often used as network and Internet servers.

Microcomputers, or Personal Computers : is the smallest, least expensive of all the computers. Micro computers have smallest memory and less power, are physically smaller and permit fewer peripherals to be attached.

- Microcomputers are more commonly known as personal computers. The term "PC" is applied to IBM-PCs or compatible computers.

- Desktop computers are the most common type of PC.

- Notebook (laptop) computers are used by people who need the power of a desktop system, but also portability.

- Handheld PCs (such as PDAs) lack the power of a desktop or notebook PC, but offer features for users who need limited functions and small size.

<p align="center">**Personal Computers (PC);** *Desk Top; Lap Top; Palm Top; PDA*</p>

b)   According to Technology

•   Analog Computers

•   Digital Computers

•   Hydride Computers

Analog Computers: - These computers recognize data as a continuous measurement of a physical property (voltage, pressure, speed and temperature).

      Example: Automobile speedometer

Digital Computers: - These are high speed programmable electronic devices that perform mathematical calculations, compare values and store results. They recognize data by counting discrete signal representing either a high or low voltage state of electricity.

Hybrid Computers:-A computer that processes both analog and digital data.

c)   According to Purpose

1.   General purpose Computers

2.   Special Computers

General purpose Computers

A 'General Purpose Computer' is a machine that is capable of carrying out some general data processing under program control.

Refers to computers that follow instructions, thus virtually all computers from micro to mainframe are general purpose. Even computers in toys, games and single-function devices follow instructions in their built-in program.

Special purpose Computers

A computer that is designed to operate on a restricted class of problems.

Use special purpose computer equipment to obtain patient diagnostic information.

Characteristics of Information

An item of information has following characteristics.

Accuracy

Information is true or false; accurate or inaccurate

Form

This is described in terms of qualitative and quantitative, numerical and graphic, summary and detailed.

Frequency

This is a measure of how often information is needed, collected or produced.

Breadth

This defines the scope of information

Origin

Information may origin from sources inside the organization or outside.

Time horizon

Information may be oriented toward the past, toward current event or toward future activities and events.

A set of information has following
characteristics

Relevance

Information is relevant if it is needed for a practical situation.

Completeness

Complete information provides the user with all that needs to be known about a particular situation.

Timeliness

Timely information is something that is available when it is needed. Further it has not become outdated through delay.

Characteristic of Computers

Speed

A computer can do mathematical operations move and copy documents at a speed in the order of million or billion instructions per second.

Reliability

Computer output is generally very reliable subject to the conditions that the input data is correct and the program instructions should be reliable and correct.

(Garbage In Garbage Out- GIGO)

Storage capability

As various computer media can store millions of characters of data in a condensed form, there is a tremendous saving in the storage area required to maintain the vital records necessary in a business environment.

Accuracy

Computers are very accurate. They can perform their millions of operations with great accuracy as their circuits have no mechanical parts to wear and malfunction.

Importance of ICT

ICT have many opportunities…

- Making learning more interesting especially for hard-to-understand issues
- Bridging distances – e.g using e-mails, phone, video conferencing etc.
- Breaking literacy barriers in communication – e.g using video and radio.
- Research and useful Information sharing – e.g using Internet
- Access information on jobs/internships
- Creation of new employment opportunities (via ICTs/with ICTs)
- Enhance interaction with peers over long distances
- Create entertainment opportunities (games, music,video)
- Provide more realistic information on life elsewhere
- Provide educational information (distance learning)
- Provide health information, including on sensitive issues

Function of a Computer

A Computer is a programmable, multipurpose Electronic machine that accepts data (e.g. raw data, facts & figures) and processes, or manipulates it into information we can use, such as summaries or totals

E.g. An automatic teller machine (ATM) computes the deposits and withdrawals to give you the total in your account.

Information processing

* *Data received* by a computer via its input devices

* *Stored in memory* prior to processing

* *Data get processed*

* *Results* sent to the output devices