

Learning Objectives

In this chapter you will learn about:

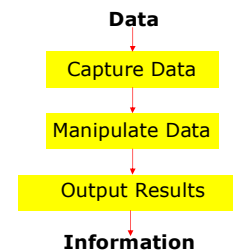
- Computer
- Data processing
- Characteristic features of computers
- Computers' evolution to their present form
- Computer generations
- Characteristic features of each computer generation

Computer

- The word computer comes from the word "compute", which means, "to calculate"
- Thereby, a computer is an electronic device that can perform arithmetic operations at high speed
- A computer is also called a *data processor* because it can store, process, and retrieve data whenever desired

Data Processing

The activity of processing data using a computer is called *data processing*



Data is raw material used as input and *information* is processed data obtained as output of data processing

Characteristics of Computers

- 1) **Automatic:** Given a job, computer can work on it automatically without human interventions
- 2) **Speed:** Computer can perform data processing jobs very fast, usually measured in **microseconds** (10^{-6}), **nanoseconds** (10^{-9}), and **picoseconds** (10^{-12})
- 3) **Accuracy:** Accuracy of a computer is consistently high and the degree of its accuracy depends upon its design. Computer errors caused due to incorrect input data or unreliable programs are often referred to as *Garbage-In-Garbage-Out* (GIGO)

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Characteristics of Computers

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- 4) **Diligence:** Computer is free from monotony, tiredness, and lack of concentration. It can continuously work for hours without creating any error and without grumbling
- 5) **Versatility:** Computer is capable of performing almost any task, if the task can be reduced to a finite series of logical steps
- 6) **Power of Remembering:** Computer can store and recall any amount of information because of its secondary storage capability. It forgets or loses certain information only when it is asked to do so

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Characteristics of Computers

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- 7) **No I.Q.:** A computer does only what it is programmed to do. It cannot take its own *decision* in this regard
- 8) **No Feelings:** Computers are devoid of emotions. Their judgement is based on the instructions given to them in the form of programs that are written by us (human beings)

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Evolution of Computers

- Blaise Pascal invented the first *mechanical adding machine* in 1642
- Baron Gottfried Wilhelm von Leibniz invented the first *calculator for multiplication* in 1671
- *Keyboard machines* originated in the United States around 1880
- Around 1880, Herman Hollerith came up with the concept of *punched cards* that were extensively used as input media until late 1970s

Evolution of Computers

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- *Charles Babbage* is considered to be the father of modern digital computers
 - He designed "Difference Engine" in 1822
 - He designed a *fully automatic analytical engine* in 1842 for performing basic arithmetic functions
 - His efforts established a number of principles that are fundamental to the design of any digital computer

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Some Well Known Early Computers

- The Mark I Computer (1937-44)
- The Atanasoff-Berry Computer (1939-42)
- The ENIAC (1943-46)
- The EDVAC (1946-52)
- The EDSAC (1947-49)
- Manchester Mark I (1948)
- The UNIVAC I (1951)

Computer Generations

- "Generation" in computer talk is a step in technology. It provides a framework for the growth of computer industry
- Originally it was used to distinguish between various hardware technologies, but now it has been extended to include both hardware and software
- Till today, there are five computer generations

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Computer Generations

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Generation (Period)	Key hardware technologies	Key software technologies	Key characteristics	Some representative systems
First (1942-1955)	<ul style="list-style-type: none"> • Vacuum tubes • Electromagnetic relay memory • Punched cards • Secondary storage 	<ul style="list-style-type: none"> • Machine and assembly languages • Stored program concept • Mostly scientific applications 	<ul style="list-style-type: none"> • Bulky in size • Highly unreliable • Limited commercial use and costly • Difficult commercial production • Difficult to use 	<ul style="list-style-type: none"> • ENIAC • EDVAC • EDSAC • UNIVAC I • IBM 701
Second (1955-1964)	<ul style="list-style-type: none"> • Transistors • Magnetic cores • Magnetic tapes • Disks for secondary storage 	<ul style="list-style-type: none"> • Batch operating system • High-level programming languages • Scientific and commercial applications 	<ul style="list-style-type: none"> • Faster, smaller, more reliable and easier to program than previous generation systems • Commercial production was still difficult and costly 	<ul style="list-style-type: none"> • Honeywell 400 • IBM 7030 • CDC 1604 • UNIVAC LARC

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Computer Generations

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Generation (Period)	Key hardware technologies	Key software technologies	Key characteristics	Some rep. systems
Third (1964-1975)	<ul style="list-style-type: none"> ICs with SSI and MSI technologies Larger magnetic cores memory Larger capacity disks and magnetic tapes secondary storage Minicomputers; upward compatible family of computers 	<ul style="list-style-type: none"> Timesharing operating system Standardization of high-level programming languages Unbundling of software from hardware 	<ul style="list-style-type: none"> Faster, smaller, more reliable, easier and cheaper to produce Commercially, easier to use, and easier to upgrade than previous generation systems Scientific, commercial and interactive on-line applications 	<ul style="list-style-type: none"> IBM 360/370 PDP-8 PDP-11 CDC 6600

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Computer Generations

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Generation (Period)	Key hardware Technologies	Key software technologies	Key characteristics	Some rep. systems
Fourth (1975-1989)	<ul style="list-style-type: none"> ICs with VLSI technology Microprocessors; semiconductor memory Larger capacity hard disks as in-built secondary storage Magnetic tapes and floppy disks as portable storage media Personal computers Supercomputers based on parallel vector and symmetric multiprocessing technologies Spread of high-speed computer networks 	<ul style="list-style-type: none"> Operating systems for PCs with GUI and multiple windows on a single terminal screen Multiprocessing OS with concurrent programming languages UNIX operating system with C programming language Object-oriented design and programming PC, Network-based, and supercomputing applications 	<ul style="list-style-type: none"> Small, affordable, reliable, and easy to use PCs More powerful and reliable mainframe systems and supercomputers Totally general purpose machines Easier to produce commercially Easier to upgrade Rapid software development possible 	<ul style="list-style-type: none"> IBM PC and its clones Apple II TRS-80 VAX 9000 CRAY-1 CRAY-2 CRAY-X/MP

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Computer Generations

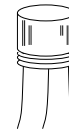
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Generation (Period)	Key hardware technologies	Key software technologies	Key characteristics	Some rep. systems
Fifth (1989-Present)	<ul style="list-style-type: none"> ICs with ULSI technology Larger capacity main memory, hard disks with RAID support Optical disks as portable read-only storage media Notebooks, powerful desktop PCs and workstations Powerful servers, supercomputers Internet Cluster computing 	<ul style="list-style-type: none"> Micro-kernel based, multithreading, distributed OS Parallel programming libraries like MPI & PVM JAVA World Wide Web Multimedia, Internet applications More complex supercomputing applications 	<ul style="list-style-type: none"> Portable computers Powerful, cheaper, reliable, and easier to use desktop machines Powerful supercomputers High uptime due to hot-pluggable components Totally general purpose machines Easier to produce commercially, easier to upgrade Rapid software development possible 	<ul style="list-style-type: none"> IBM notebooks Pentium PCs SUN Workstations IBM SP/2 SGI Origin 2000 PARAM 10000

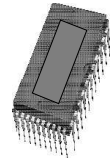
Electronic Devices Used in Computers of Different Generations



(a) A Vacuum Tube



(b) A Transistor



(c) An IC Chip

Key Words/Phrases

- Computer
- Computer generations
- Computer Supported Cooperative Working (CSCW)
- Data
- Data processing
- Data processor
- First-generation computers
- Fourth-generation computers
- Garbage-in-garbage-out (GIGO)
- Graphical User Interface (GUI)
- Groupware
- Information
- Integrated Circuit (IC)
- Large Scale Integration (VLSI)
- Medium Scale Integration (MSI)
- Microprocessor
- Personal Computer (PC)
- Second-generation computers
- Small Scale Integration (SSI)
- Stored program concept
- Third-generation computers
- Transistor
- Ultra Large Scale Integration (ULSI)
- Vacuum tubes