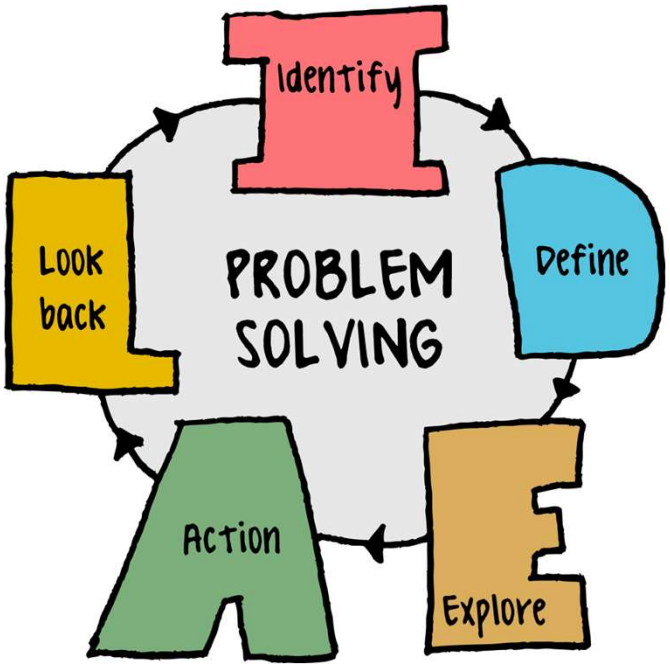
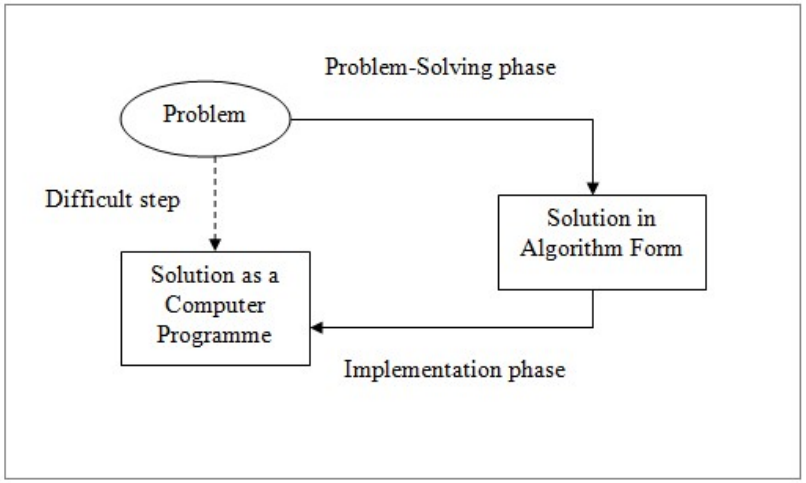
19CS101	PROGRAMMING FOR PROBLEM SOLVING (Common to All B.E. / B. Tech.)	L	T	P	J	C
		3	0	0	0	3

UNIT I	INTRODUCTION TO PROBLEM SOLVING TECHNIQUES	9
Fundamentals - Computer Hardware – Computer Software - Algorithms - Building blocks of algorithms (statements, state, control flow, functions) - Notation (pseudo code, flow chart, and programming language) -Problem formulation - Algorithmic problem solving - Simple strategies for developing algorithms (iteration, recursion). Illustrative problems.		
UNITII	**C PROGRAMMING BASICS**	**9**
Introduction to 'C' Programming –Fundamental rules – Structure of a 'C' program – Compilation and Linking processes –Constants, Variables, keywords, Identifier, Delimiters – Declaring and Initializing variables – Data Types – Operators and Expressions –Managing Input and Output operations – Decision Making and Branching –Looping statements –Illustrative programs.		
UNIT III	**ARRAYS AND STRINGS**	**10**
Arrays – Characteristics, Initialization – Declaration – One dimensional and two dimensional arrays - String-String operations – String Arrays. Simple programs-Sorting - Searching – Matrix operations (Addition, subtraction and Multiplication) –Illustrative programs.		
UNIT IV	**FUNCTIONS AND POINTERS**	**9**
Function – Definition of function – User-defined Functions - Declaration of function – Call by reference – Call by value – Recursion – Pointers - Definition – Initialization –Pointer arithmetic – Pointers and arrays – Illustrative programs.		
UNIT V	**STRUCTURES AND UNIONS**	**8**
Defining Structures and Unions – Structure declaration – Need for Structure data type - Structure within a structure - Union - Programs using structures and Unions - Pre-processor directives –Illustrative programs.		
L: 45 T:0 P:0 J:0 TOTAL:45 PERIODS		

Problem Solving Techniques





Problem Solving

Step 1	• Understand the problem • Identify program input and output
Step 2	• Design the solution (algorithm)
Step 3	• Writing a program in a programming language to match the algorithm steps

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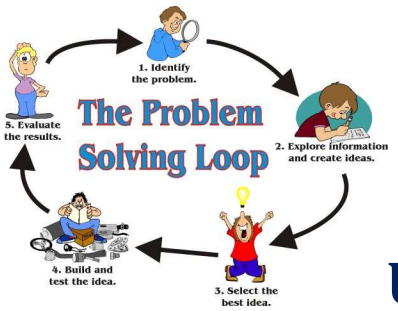


Department of Information Technology

19CS101 PROGRAMMING FOR PROBLEM SOLVING

I B.Tech. IT/ I SEMESTER

UNIT I : Introduction to Problem Solving Techniques

Topic 1 : Fundamentals

Fundamentals - Computer Hardware – Computer Software - Algorithms - Building blocks of algorithms (statements, state, control flow, functions) - Notation (pseudo code, flow chart, and programming language) -Problem formulation - Algorithmic problem solving - Simple strategies for developing algorithms (iteration, recursion). Illustrative problems.

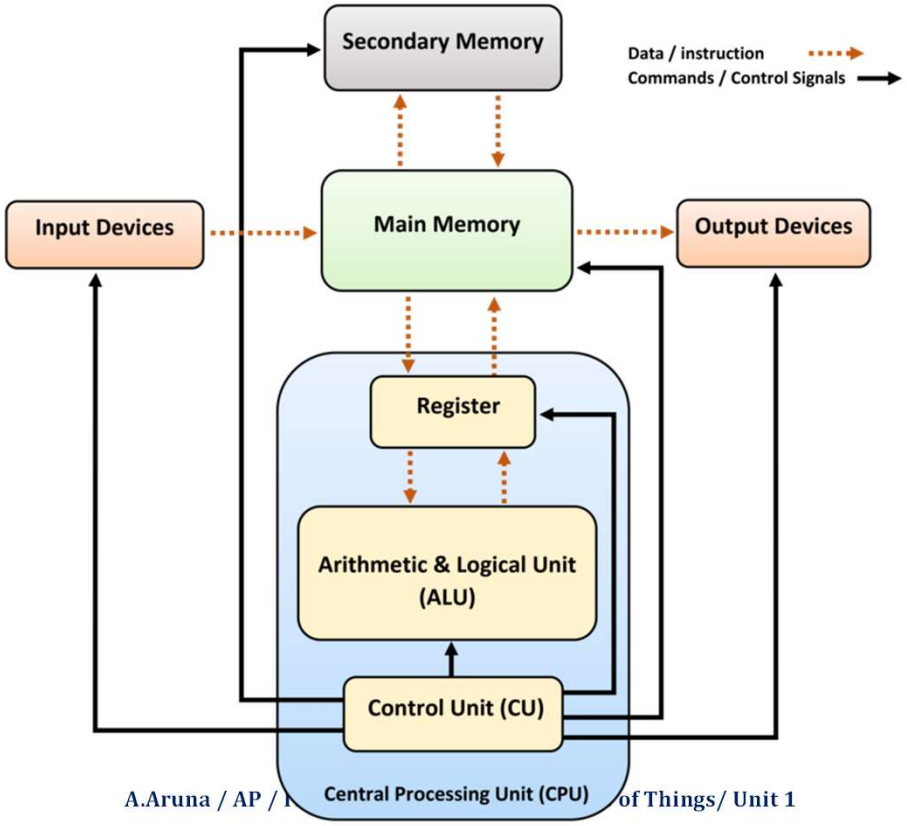
Fundamentals

BASIC OVERVIEW OF A COMPUTER

- Central Processing Unit (CPU)
- Memory Unit
- Input Devices
- Output Devices
- Secondary Storage Devices

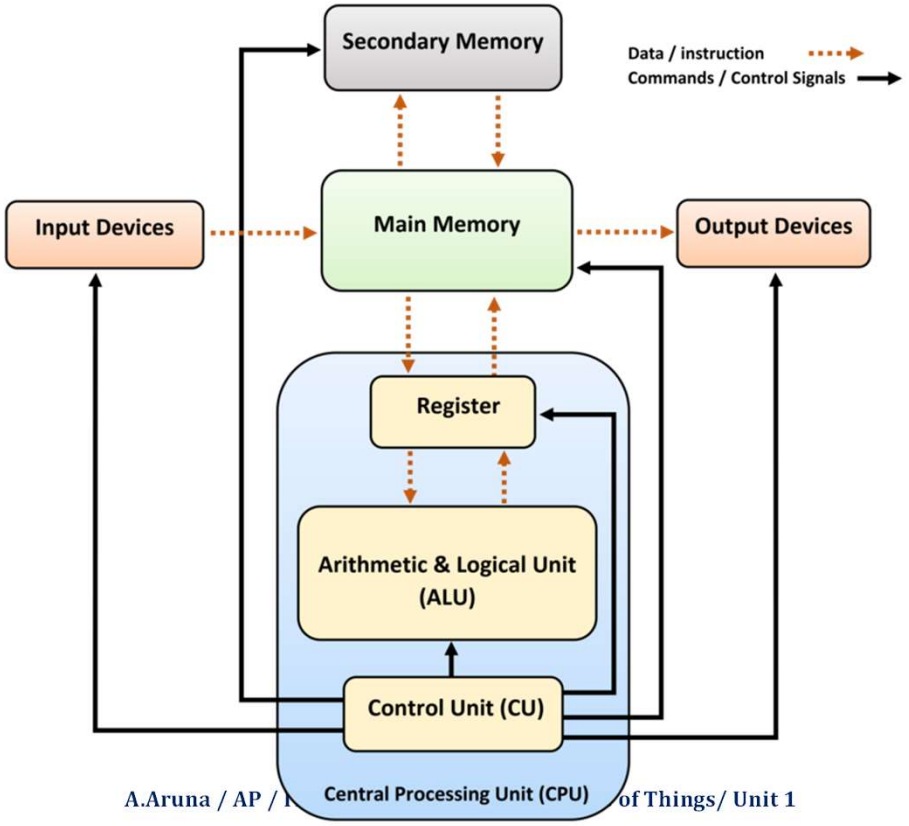
Fundamentals

Computer Block Diagram



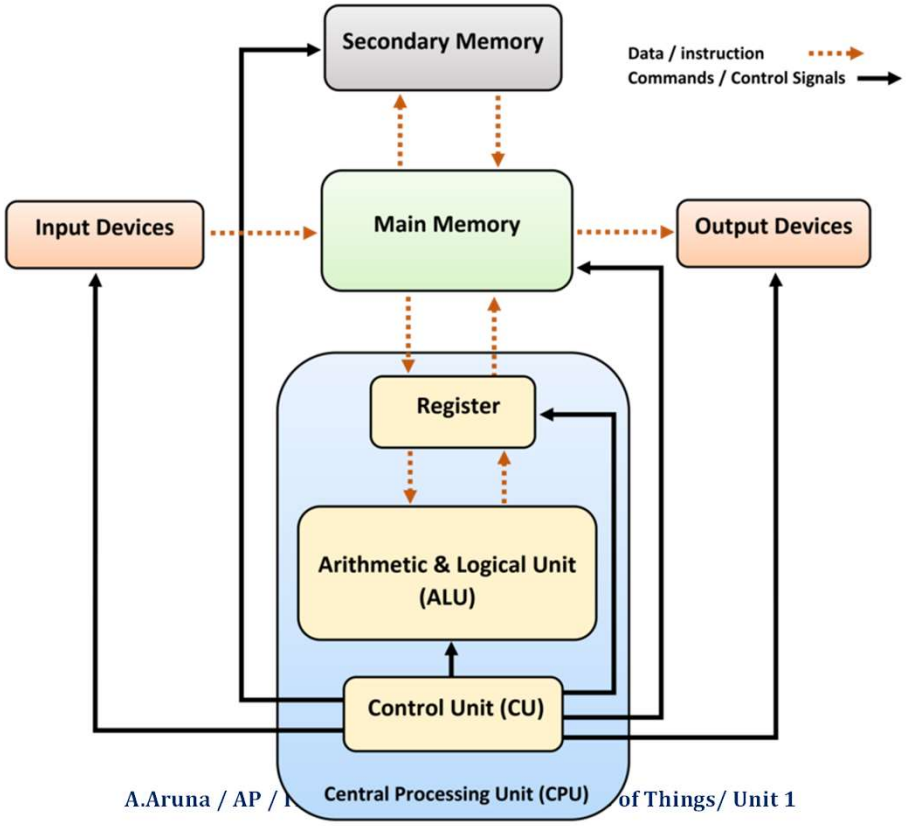
Fundamentals

Computer Block Diagram



Fundamentals

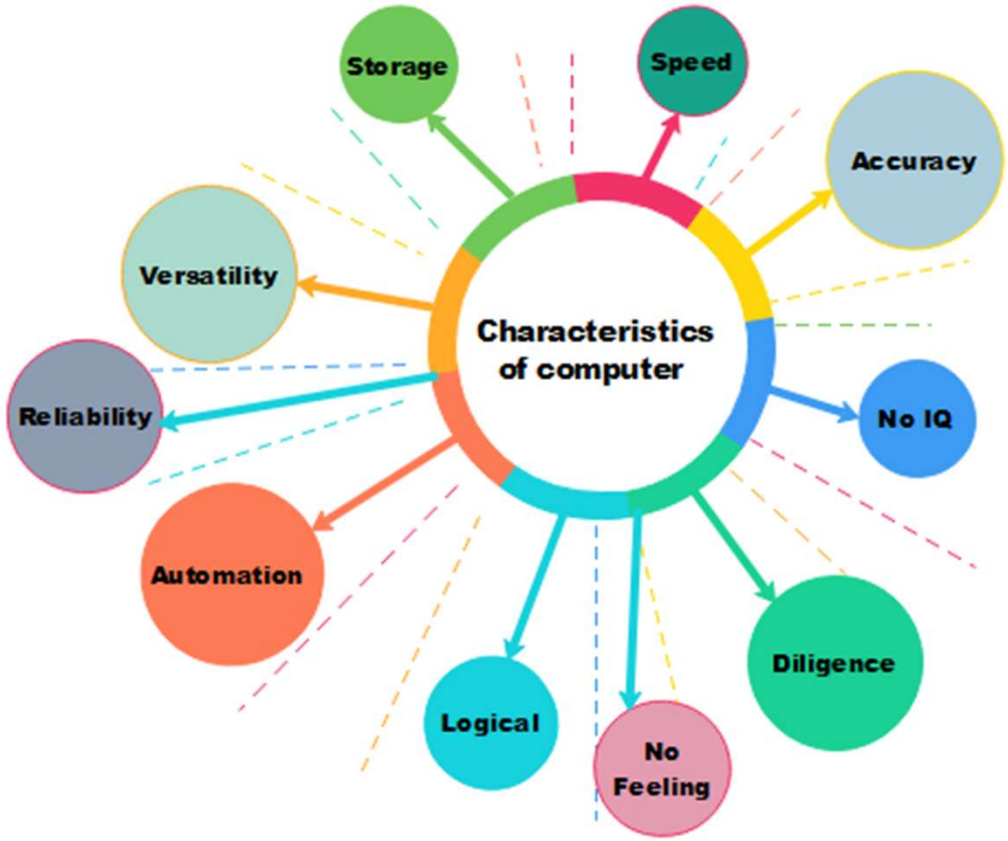
Computer Block Diagram

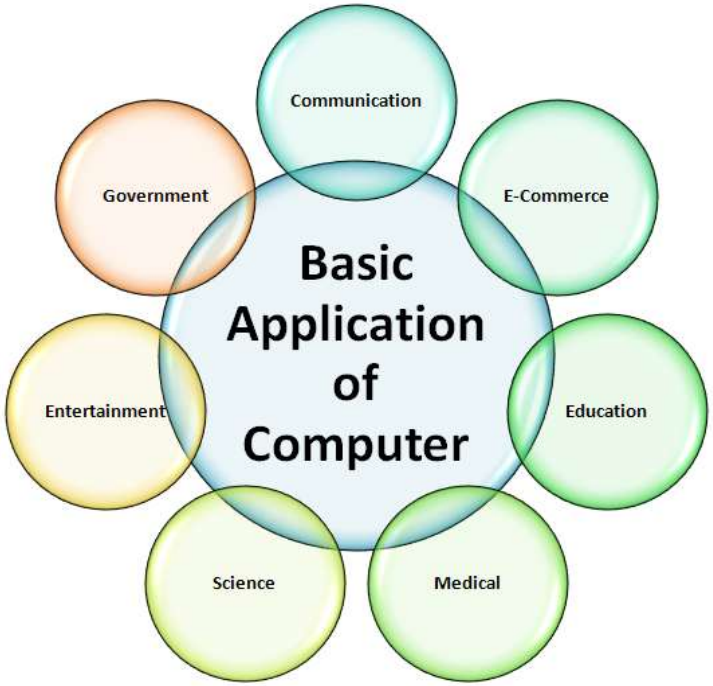


- Parts of the CPU

1. Buses
2. The Control Unit
3. The Arithmetic Logic Unit
4. Program counter
5. Instruction Register
6. Memory Data Register
7. Memory Address Register

Characteristics & Application of a Digital Computer





Characteristics of a Digital Computer

- **Speed:**
  A computer is a fast electronic device that can solve large and complex problems in few seconds. The speed of a computer generally depends upon its hardware configuration.
- **Storage capacity:**
  A computer can store huge amount of data in its different storage components in many different formats. The storage area of a computer system is generally divided into two categories, main memory and secondary storage.
- **Accuracy:**
  A computer carries out calculations with great accuracy. The accuracy achieved by a computer depends upon its hardware configuration and the instructions.
- **Reliability:**
  A computer produces results with no error. Most of the errors generated in the computer are human errors that are created by the user itself. Therefore, they are very trustworthy machines.
- **Versatility:**
  Computers are versatile machines. They can perform many different tasks and can be used for many different purposes.
- **Diligence:**
  Computers can perform repetitive calculations any number of times with the same accuracy. Computers do not suffer from human traits, such as tiredness, fatigue, lack of concentration, etc.

Application of Computer

- **Education:**
  Computers are used in schools and colleges to teach students in a better and easy way. The students can get more information about a specific topic or subject using the Internet.
- **Business:**
  Computers are used in different types of businesses to store a large amount of information in the form of a database.
- **Communication:**
  Computers, connected with each other through Internet can be used to transfer data to and from other computers. E-mail is one of the most common mediums that is used.
- **Science:**
  Computers are used by various scientists for the purpose of research and development. They generally make use of computer for research and analysis.
- **Engineering**:
  Computers are used by engineers for the creation of complex drawings and designs while working in different fields like automobiles and construction.
- **Entertainment:**
  Computers are used in the entertainment industry for creating graphics and animations.
- **Banking:**
  Computers are being increasingly used for online banking. Through online banking, the users or customers can transfer and receive money by using computers and Internet. Etc.

Evolution of Computers

Abacus
(3000 BC)

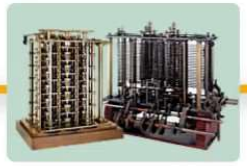
Napier Bones
(1617)

Pascaline
(1642)

Leibniz Wheel
(1685)

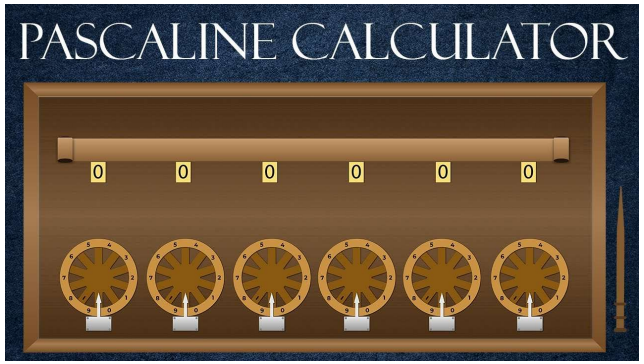
Mark I
(1944)

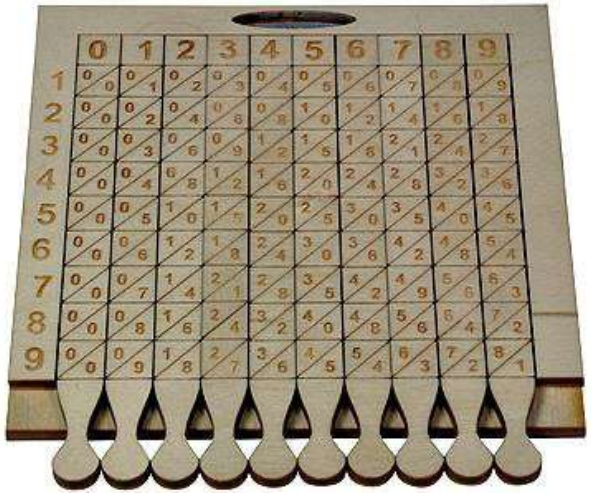
Census Machine
(1889)



Analytical Engine
(1833)

Jacquard Loom
(1804)





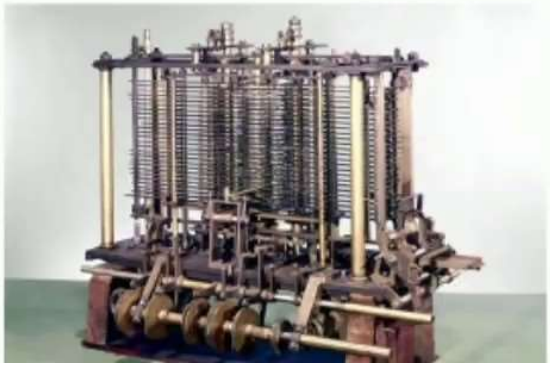
Evolution Of Computers And Computer Technology

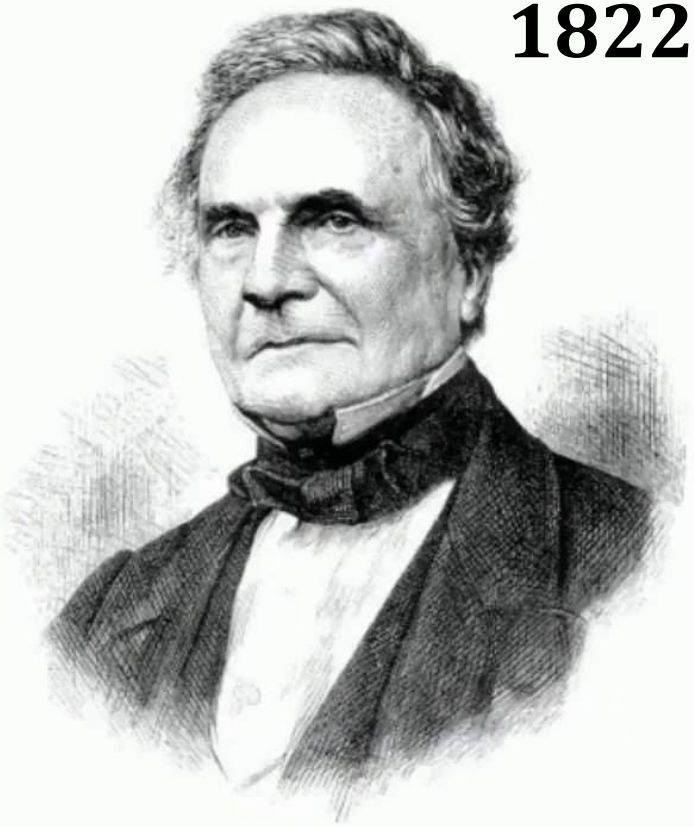
Charles Babbage

(December 26, 1791 – October 18, 1871)

1822

Inventor & Founder of Computers

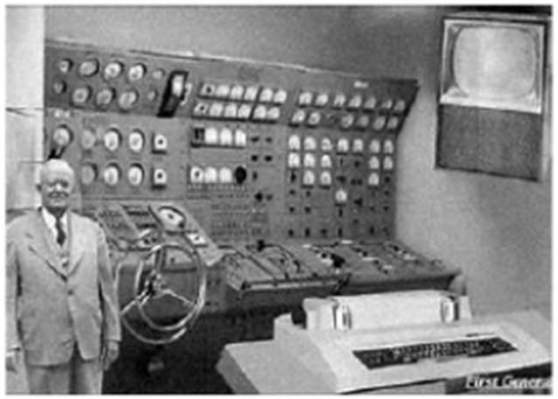




Generation of Computer

1st Generation Computer:

- Period- 1940-1956
- Circuitry- Vaccum tube
- Memory capacity- 20kB
- Processing Speed- 300 IPS inst.per sec.
- Programming Language- Assembly Languag
- Example of Computers- UNIVAC,EDVAC



2nd Generation Computer:

- Period- 1956-1963
- Circuitry- Transistor
- Memory capacity- 128kB
- Processing Speed- 300 IPS
- Programming Language- High Level Languag
- Example of Computers- IBM 1401,CDC 3600

3rd Generation Computer:

- Period- 1964-1971
- Circuitry- Integrated chips(IC)
- Memory capacity- 1MB
- Processing Speed- 1 MIPS
- Programming Language- C ,C++
- Example of Computers- IBM 360 series,
- 1900 series

Generation of Computer

4th Generation Computer:

- Period- 1971-present
- Circuitry- Microprocessor(VLSI)
- Memory capacity- semiconductor, high
- Processing Speed- Faster than 3rd gen.
- Programming Language- C , C++ , Java
- Example of Computers- Pontium Series, Multimedia,Stimulation.

5th Generation Computer:

- Period- present & beyond
- Circuitry- Ultra Large Scale integration
- Memory capacity- ULSI & VLSI
- Processing Speed- Very Fast.
- Programming Language- All languages
- Example of Computers- Artificial Intelligence, Robotics.

Computing System & Concepts

➢ **Hardware:**

- The physical devices that make up the computer are called Hardware.
- The hardware units are responsible for entering, storing and processing the given data and then displaying the output to the users.
- The basic hardware units of a general purpose computer are keyboard, mouse, memory, CPU, monitor and printer.

➢ **Software:**

- The term software refers to a set of programs and instructions that help the computers in carrying out their processing.
- Software is very necessary for the proper functioning of a computer.
- There are mainly two types of software, viz. Application Software and System Software

➢ **Data:**

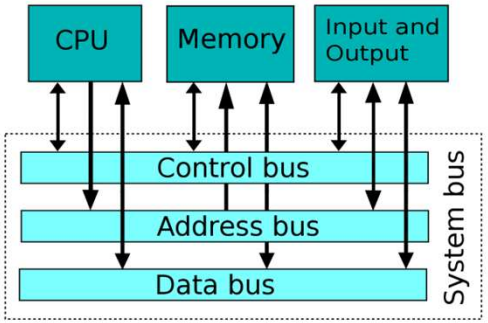
- Data refer to the raw facts and pieces of information that is usually entered into the computer system by the user, so as to generate the desired output and are of two types:
  - Qualitative data: The data, which are represented in words or text form
  - Quantitative data: The data, which are represented in numerical form

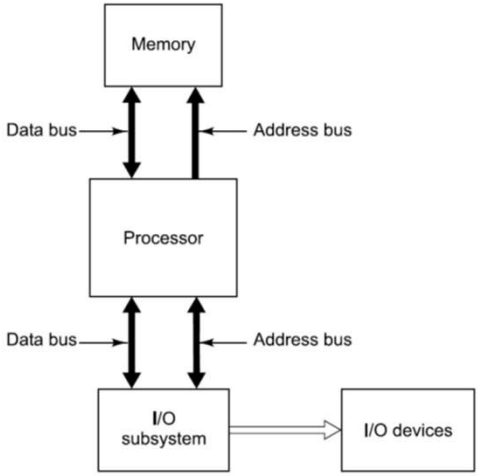
➢ **People**

- Computer systems are designed by the people, for the people.
- People, therefore, include the people who design and build hardware and software (known as systems people) and the people who actually use computer systems for their applications (known as users)

BUS

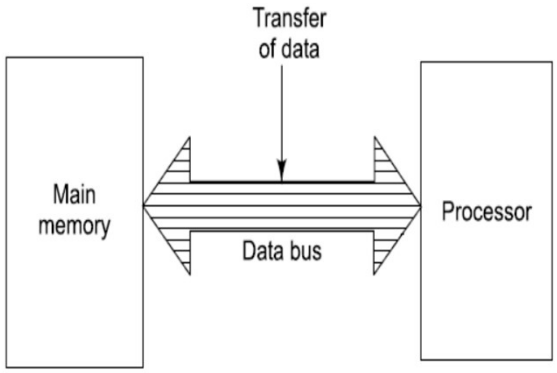
- A bus is a set of wires that is used to connect the different internal components of the computer system for the purpose of transferring data as well addresses amongst them.
- There may be several buses in a computer system.
- A bus can either be a serial bus or a parallel bus.
- In serial bus, only one bit of data is transferred at a time amongst the various hardware components.
- On the other hand, in parallel bus, several bits of data can be transferred at a time amongst the various hardware components.
- The speed of any type of bus is measured in terms of the number of bits transferred per second, between two components.
- Figure shows a bus system used in a computer system.
- The figure depicts the two different types of buses according to the type of operations performed by them.
- These buses are **data bus and the address bus**.
- Apart from data and address bus, a third type of bus known as control bus also exists in the computer system.
- The control bus manages the transfer of data and addresses among various components by transferring appropriate control signals.





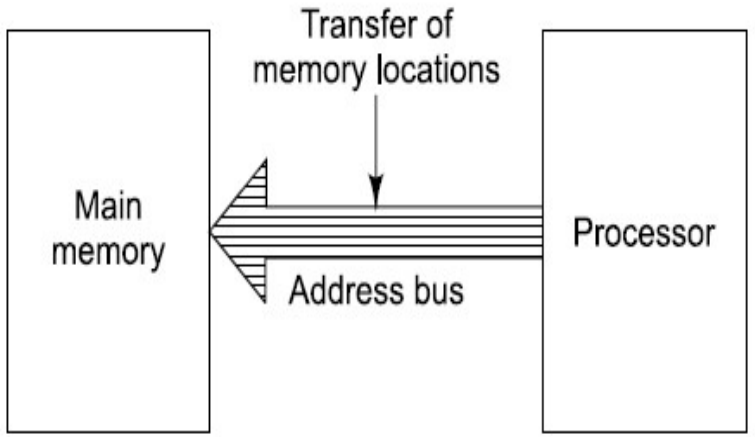
Data Bus

- Data bus in a computer system is used to transfer data amongst the different internal components.
- The speed of the data bus also affects the overall processing power of a computer system.
- Modern computer systems use 32-bit data buses for data transfer.
- This means that these buses are capable of transferring 32 bits of data at a time.
- Figure shows the data bus implemented between the main memory and the processor of a computer system.
- The figure shows that a bidirectional data bus is implemented between the main memory and the processor of the computer system.
- The bidirectional data bus allows the transfer of data in both the directions.
- The data bus is generally bidirectional in nature in most computer systems.



Address Bus

- The address bus is also known as memory bus.
- It transfers the memory addresses for read and write memory operations.
- It contains a number of address lines that determine the range of memory addresses that can be referenced using the address bus.
- For example, a 32-bit address bus can be used to reference 232 memory locations.
- Like data bus, the address bus can also be a serial or a parallel bus.
- Figure shows the address bus, used for transferring memory locations between processor and memory.
- The figure shows that the address bus between the main memory and the processor of a computer system is unidirectional.
- However, an address bus may also be bidirectional.
- For example, the address bus between the processor and the I/O system is bidirectional

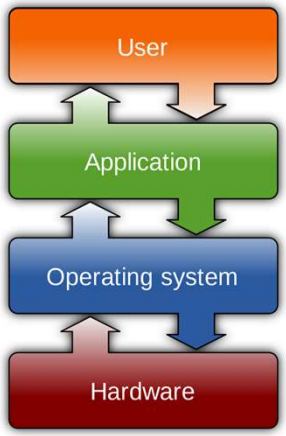


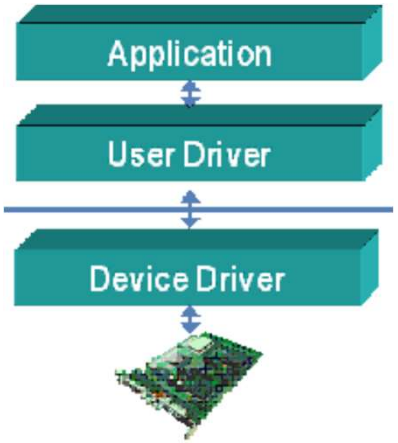
Computer Software

- Instructions that tell the computer how to process data into the form you want.
- Software and programs are interchangeable.
- Two major types:
  - System Software
  - Application Software

Functions of a system software

- Managing resources (memory, processing, storage, and devices like printer).
- Providing user interface
- Running applications

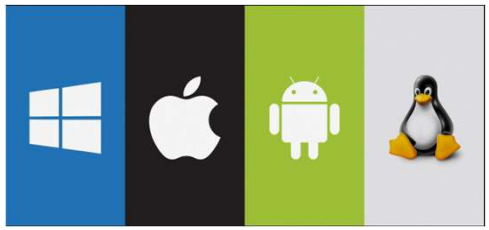


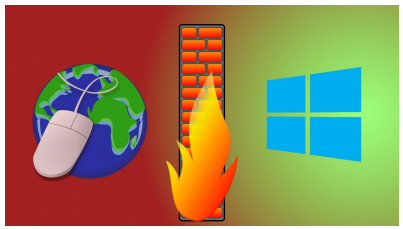


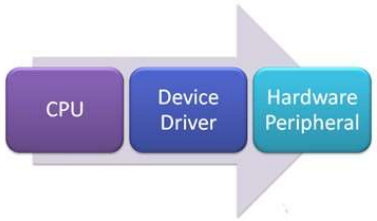
System Software

System Software enables the application software to interact with the computer hardware.

- Operating Systems are programs that coordinate computer resources, provide an interface between users and the computer; and run applications.
- Utilities perform specific tasks related to managing computer resources.
- Device drivers are specialized programs designed to allow particular input or output devices to communicate with the rest of the computer system.

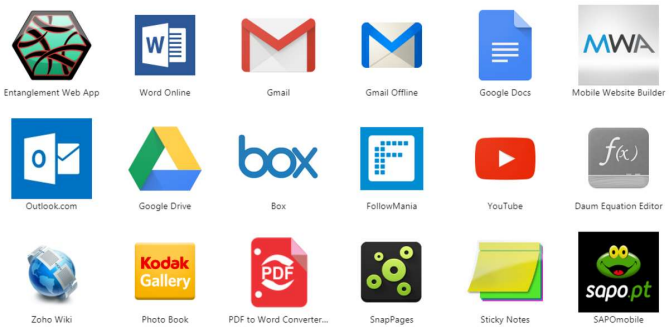






Application Software

- Applications Software provides the real functionality of a computer.
- Helps to use the computer to do specific types of work.
- Basic Applications, widely used in all career areas.
- Specialized Applications, more narrowly focused on specific disciplines and occupations.



DOS and GUI Operating System

- Disk Operating System
- DOS was the first widely installed operating system for personal computers.
- Command-driven
- MS-DOS Commands
- A COMMAND is the name of a special program that makes your computer carry out a task.

DOS and GUI Operating System

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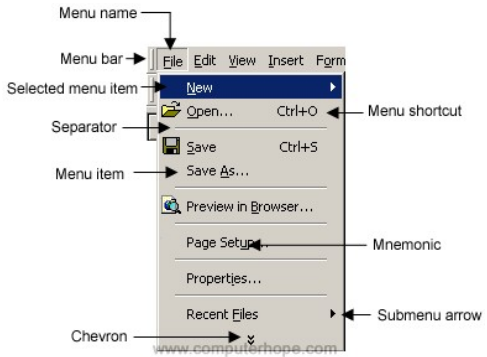
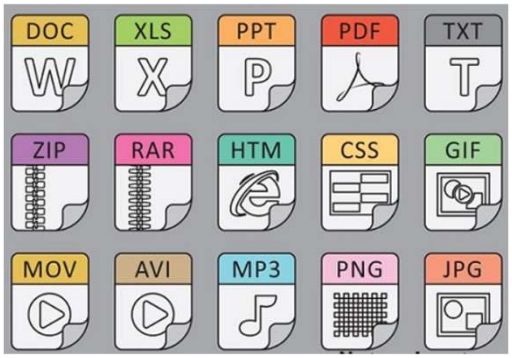


Files & Extensions

FILE is simply a collection of information that you store on a disk or diskette.

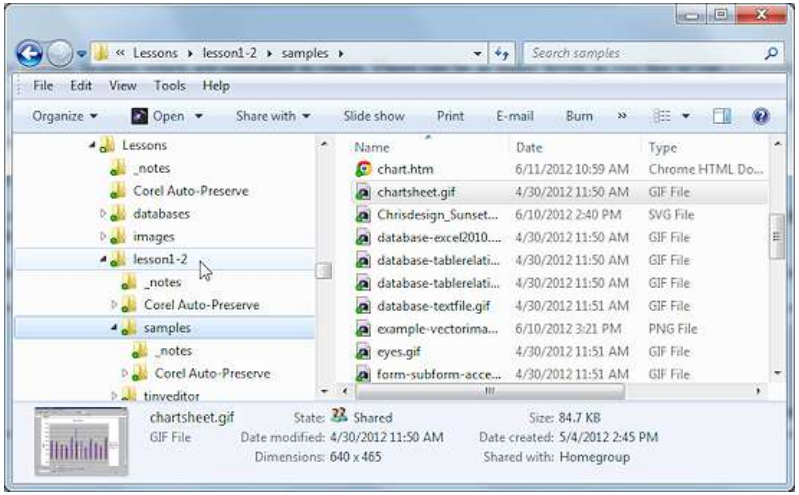
- Must have a unique name
- Two parts: the “filename” and “extension” separated by a period.
- Use extension to make filenames more descriptive.
    - .DOC – word documents
    - .XLS – excel documents
    - .PPT – powerpoint documents

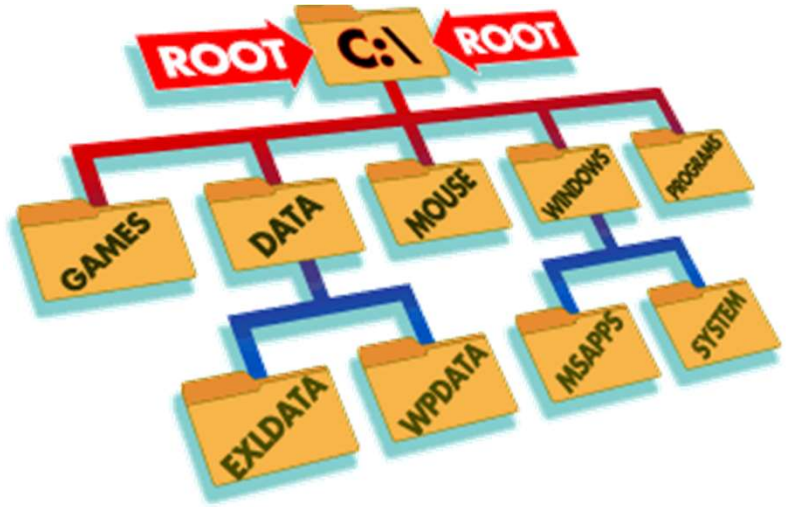


Directories

One way of organizing the files on the computer Hard Disk

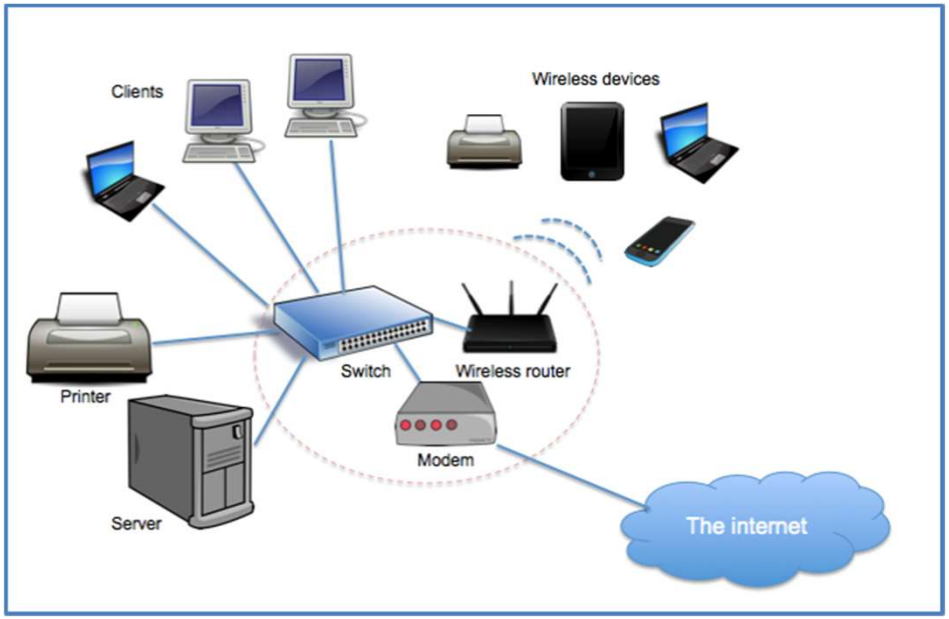
- ROOT – one basic directory
- Rest - Subdirectories

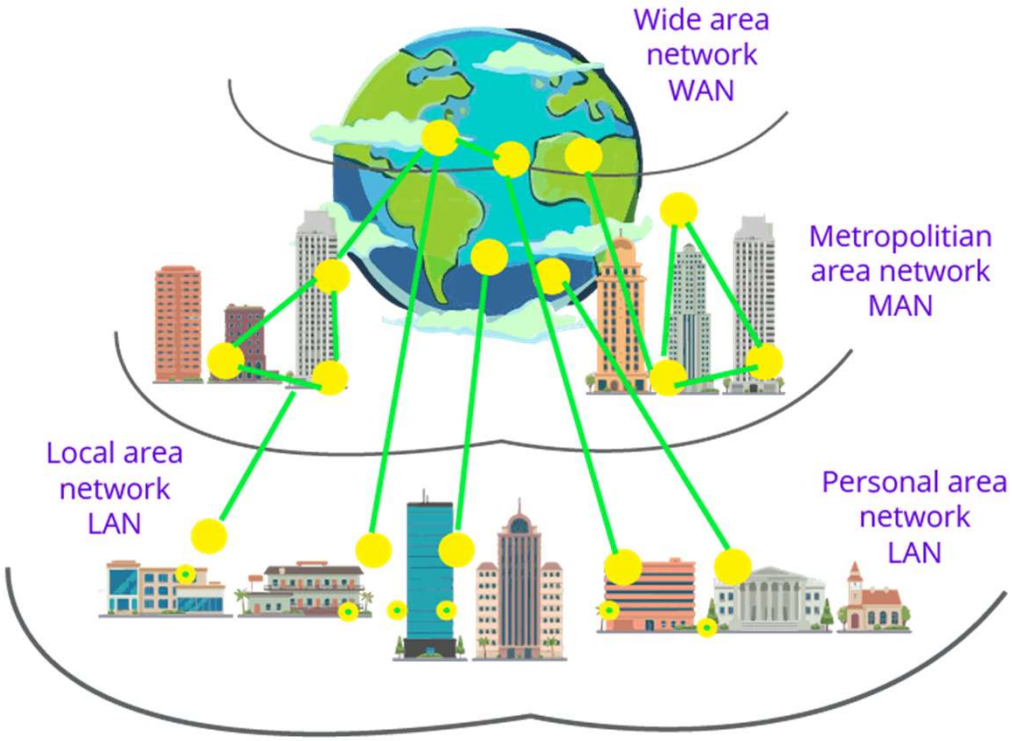


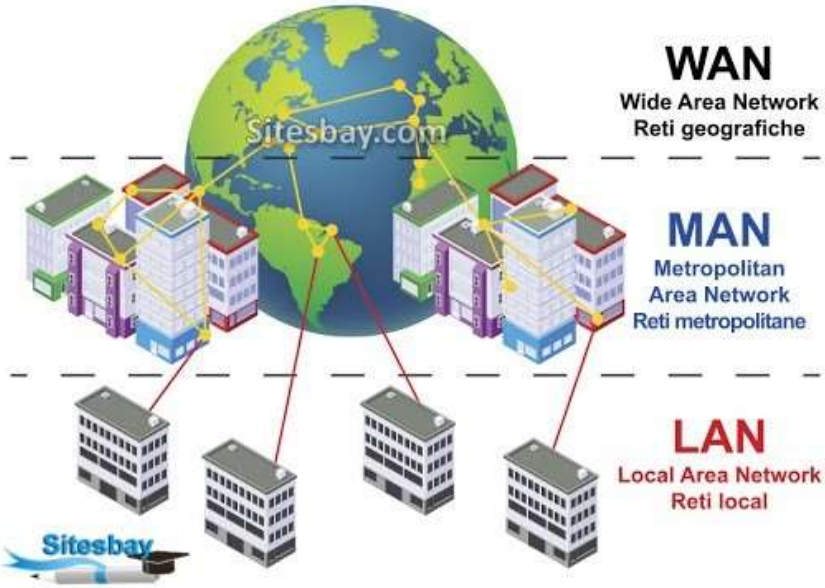


Computer Networks

- A computer network is a system for communicating between two or more computers and associated devices
- A popular example of a computer network is the internet, which allows millions of users to share information
- Computer networks can be classified according to their size:
  - Personal area network (PAN)
  - Local area network (LAN)
  - Metropolitan area network (MAN)
  - Wide area network (WAN)

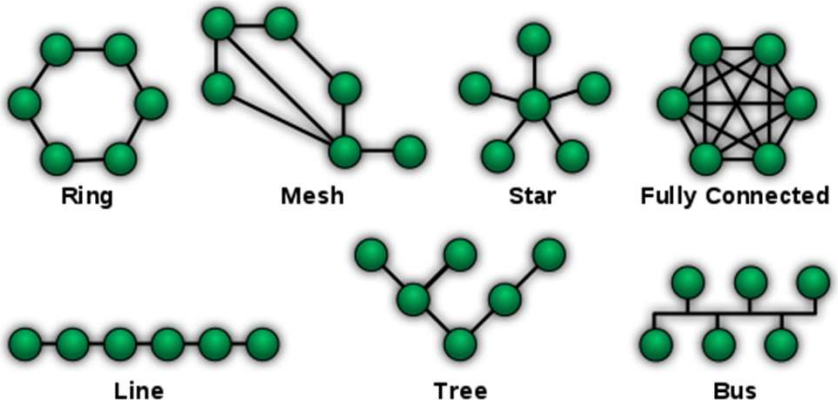



Wide area network WAN
Metropolitian area network MAN
Local area network LAN
Personal area network LAN


WAN
Wide Area Network
Reti geografiche
MAN
Metropolitan Area Network
Reti metropolitane
LAN
Local Area Network
Reti local
Sitesbay.com
Sitesbay

Network Topologies

- The network topology defines the way in which computers, printers, and other devices are connected.
- A network topology describes the layout of the wire and devices as well as the paths used by data transmissions



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- http://ecoursesonline.iasri.res.in/mod/resource/view.php?id=4311

Thank You!