Chameli Devi Group of Institutions, Indore
Department of ESH
BT205 Basic Computer Engineering
B. Tech, CSE and IT (II Semester)
Unit -1

……

Syllabus: Computer: Definition, Classification, Organization i.e., CPU, Register, Bus Architecture, Instruction Set, Memory & Storage Systems, I/O Devices and System & Application Software.
Computer Application: e-Business, Bio-Informatics, Health Care, Remote Sensing & GIS, Meteorology and Climatology, Computer Gaming, Multimedia and Animation etc.
Operating System: Definition, Function, Types, Management of File, Process & Memory.
MS Office: Introduction to MS word, MS Power-point, MS Excel

Unit Objective: To familiarize the students with basic computer knowledge, its applications with knowledge of operating system and MS office.

Unit Outcome: Students will be able to acquire knowledge of computer basics with its peripherals, its applications in various field, operating system and will be able to use MS office application

……..

Computer Definition

- A computer is a machine or device that performs processes, calculations and operations based on instructions provided by a software or hardware program. It has the ability to accept data (input), process it, and then produce outputs.
- A computer is a device that accepts information (in the form of digitalized data) and manipulates it for some result based on a program, software, or sequence of instructions on how the data is to be processed.
- Computer is digital electronic machine which takes input, process it and produce useful output. As an existence computer system is combination of interconnected hardware's and set of instructions called software.

Classification of Computer

<u>Classification based on Size:</u>
Super Computers: The super computers are the **highest performing system**. A supercomputer is a computer with a high level of performance compared to a general-purpose computer. All of the world's fastest 500 supercomputers run **Linux-based operating systems**.
Supercomputers actually play an important role in the field of computation, and are used for intensive computation tasks in various fields, including quantum mechanics, weather forecasting, climate research, oil and gas exploration, molecular modeling, and physical simulations and also throughout the history, supercomputers have been essential in the field of the cryptanalysis.
Example: PARAM, jaguar, roadrunner.

Mainframe Computers: These are commonly called as big iron, they are usually used by big organizations for bulk data processing such as statistics, census data processing and transaction processing. They are widely used as the servers as these systems has a higher processing capability as compared to the other classes of computers. Most of these mainframe architectures were established in 1960s, the research and development worked continuously over the years and the mainframes of today are far better than the earlier ones, in size, capacity and efficiency.
Example: IBM z Series, System z9 and System z10 servers.

Mini Computers: These computers came into the market in mid 1960s and were sold at a much cheaper price than the main frames. They were actually designed for control, instrumentation, human interaction, and communication switching as distinct from calculation and record keeping, later they became very popular for personal uses with evolution. In the 60s to describe the smaller computers that became possible with the use of transistors and core memory technologies, minimal instructions sets and less expensive peripherals such as the ubiquitous Teletype Model 33 ASR. They usually took up one or a few inch rack cabinets, compared with the large mainframes that could fill a room, there was a new term "MINICOMPUTERS" coined.
Example: Personal Laptop, PC etc.

Micro Computers: A microcomputer is a small, relatively inexpensive computer with a microprocessor as its CPU. It includes a microprocessor, memory, and minimal I/O circuitry mounted on a single printed circuit board. The previous to these computers, mainframes and minicomputers, were comparatively much larger, hard to maintain and more expensive. They actually formed the foundation for present day microcomputers and smart gadgets that we use in day-to-day life.
Example: Tablets, Smartwatches.

Classification based on Functionality:
Servers: Servers are dedicated computers which are set-up to offer some services to the clients. They are named depending on the type of service they offered.
Example: security server, database server.

Workstation: Those are the computers designed to primarily to be used by single user at a time. They run multi-user operating systems. They are the ones which we use for our day to day personal / commercial work.

Information Appliances: They are the portable devices which are designed to perform a limited set of tasks like basic calculations, playing multimedia, browsing internet etc. They are generally referred as the mobile devices. They have very limited memory and flexibility and generally run on "as-is" basis.

Embedded Computers: They are the computing devices which are used in other machines to serve limited set of requirements. They follow instructions from the non-volatile memory and they are not required to execute reboot or reset. The processing units used in such device work to those basic requirements only and are different from the ones that are used in personal computers- better known as workstations.

Classification based on Data Handling:
Analog: An analog computer is a form of computer that uses the continuously-changeable aspects of physical fact such as electrical, mechanical, or hydraulic quantities to model the problem being solved. Anything that is variable with respect to time and continuous can be claimed as analog just like an analog clock measures time by means of the distance traveled for the spokes of the clock around the circular dial.

Digital: A computer that performs calculations and logical operations with quantities represented as digits, usually in the binary number system of "0" and "1", "Computer capable of solving problems by processing information expressed in discrete form.
From manipulation of the combinations of the binary digits, it can perform mathematical calculations, organize and analyze data, control industrial and other processes, and simulate dynamic systems such as global weather patterns.

Hybrid: A computer that processes both analog and digital data, Hybrid computer is a digital computer that accepts analog signals, converts them to digital and processes them in digital form.

Block Diagram of Computer:

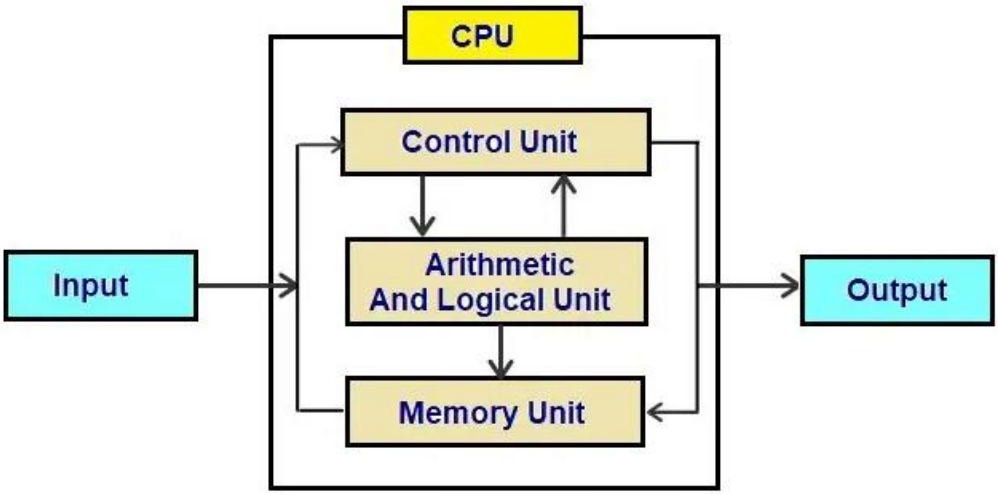

Figure 1.1: Computer Block Diagram

Input: All the data received by the computer goes through the input unit. The input unit comprises different devices like a mouse, keyboard, scanner, etc. Each of these devices acts as a mediator between the users and the computer. The data that is to be processed is put through the input unit. The computer accepts the raw data in binary form. It then processes the data and produces the desired output.

The 3 major functions of the input unit are:

- Take the data to be processed by the user.
- Convert the given data into machine-readable form.
- Then, transmit the converted data into the main memory of the computer.

The sole purpose is to connect the user and the computer.

CPU - Central Processing Unit: Central Processing Unit or the CPU, is the brain of the computer. It works the same way a human brain works. As the brain controls all human activities, similarly the CPU controls all the tasks. Moreover, the CPU conducts all the arithmetical and logical operations in the computer. Now the CPU comprises of two units, namely – **ALU (Arithmetic Logic Unit)** and **CU (Control Unit).**
Both of these units work in sync. The CPU processes the data as a whole.

ALU – Arithmetic Logic Unit: The Arithmetic Logic Unit is made of two terms, arithmetic and logic. There are two primary functions that this unit performs. Data is inserted through the input unit into the primary memory. Performs the basic arithmetical operation on it like addition, subtraction, multiplication, and division. It performs all sorts of calculations required on the data. Then sends back data to the storage.
The unit is also responsible for performing logical operations like AND, OR, Equal to, less than, etc.
In addition to this it conducts merging, sorting, and selection of the given data.

CU – Control Unit: The control unit as the name suggests is the controller of all the activities/tasks and operations. All this is performed inside the computer. The memory unit sends a set of instructions to the control unit. Then the control unit in turn converts those instructions. After that these instructions are converted to control signals. These control signals help in prioritizing and scheduling activities. Thus, the control unit coordinates the tasks inside the computer in sync with the input and output units.

Memory: All the data that has to be processed or has been processed is stored in the memory unit. The memory unit acts as a hub of all the data. It transmits it to the required part of the computer whenever necessary. The memory unit works in sync with the CPU. This helps in faster accessing and processing of the data. Thus, making tasks easier and quicker.

There are two types of computer memory:

Primary memory: This type of memory cannot store a vast amount of data. Therefore, it is only used to store recent data. The data stored in this is temporary. It can get erased once the power is switched off. Therefore, is also called temporary memory or main memory.

RAM stands for Random Access Memory. It is an example of primary memory. This memory is directly accessible by the CPU. It is used for reading and writing purposes. For data to be processed, it has to be first transferred to the RAM and then to the CPU.

Secondary memory: As the primary memory stores temporary data, thus it cannot be accessed in the future. For permanent storage purposes, secondary memory is used. It is also called permanent memory or auxiliary memory. The hard disk is an example of secondary memory. Even in a power failure data does not get erased easily.

Output:

There is nothing to be amazed by what the output unit is used for. All the information sent to the computer once processed is received by the user through the output unit. Devices like printers, monitors, projectors, etc. all come under the output unit. The output unit displays the data either in the form of a soft copy or a hard copy. The printer is for the hard copy. The monitor is for the display. The output unit accepts the data in binary form from the computer. It then converts it into a readable form for the user.

Computer Registers:

Registers are a type of computer memory used to quickly accept, store, and transfer data and instructions that are being used immediately by the CPU. The registers used by the CPU are often termed as Processor registers. A processor register may hold an instruction, a storage address, or any data (such as bit sequence or individual characters). The computer needs processor registers for manipulating data and a register for holding a memory address. The register holding the memory location is used to calculate the address of the next instruction after the execution of the current instruction is completed.

Register	Symbol	Number of bits	Function
Data register	DR	16	Holds memory operand
Address register	AR	12	Holds address for the memory
Accumulator	AC	16	Processor register
Instruction registers	IR	16	Holds instruction code
Program counter	PC	12	Holds address of the instruction
Temporary register	TR	16	Holds temporary data
Input register	INPR	8	Carries input character
Output register	OUTR	8	Carries output character

Table 1.1: Computer Registers

- The Memory unit has a capacity of 4096 words, and each word contains 16 bits.
- The Data Register (DR) contains 16 bits which hold the operand read from the memory location.
- The Memory Address Register (MAR) contains 12 bits which hold the address for the memory location.
- The Program Counter (PC) also contains 12 bits which hold the address of the next instruction to be read from memory after the current instruction is executed.
- The Accumulator (AC) register is a general-purpose processing register.

- The instruction read from memory is placed in the Instruction register (IR).
- The Temporary Register (TR) is used for holding the temporary data during the processing.
- The Input Registers (IR) holds the input characters given by the user.
- The Output Registers (OR) holds the output after processing the input data.

System Bus:

A bus is a set of electrical wires (lines) that connects the various hardware components of a computer system. It works as a communication pathway through which information flows from one hardware component to the other hardware component. A bus that connects major components (CPU, memory and I/O devices) of a computer system is called as a System Bus.

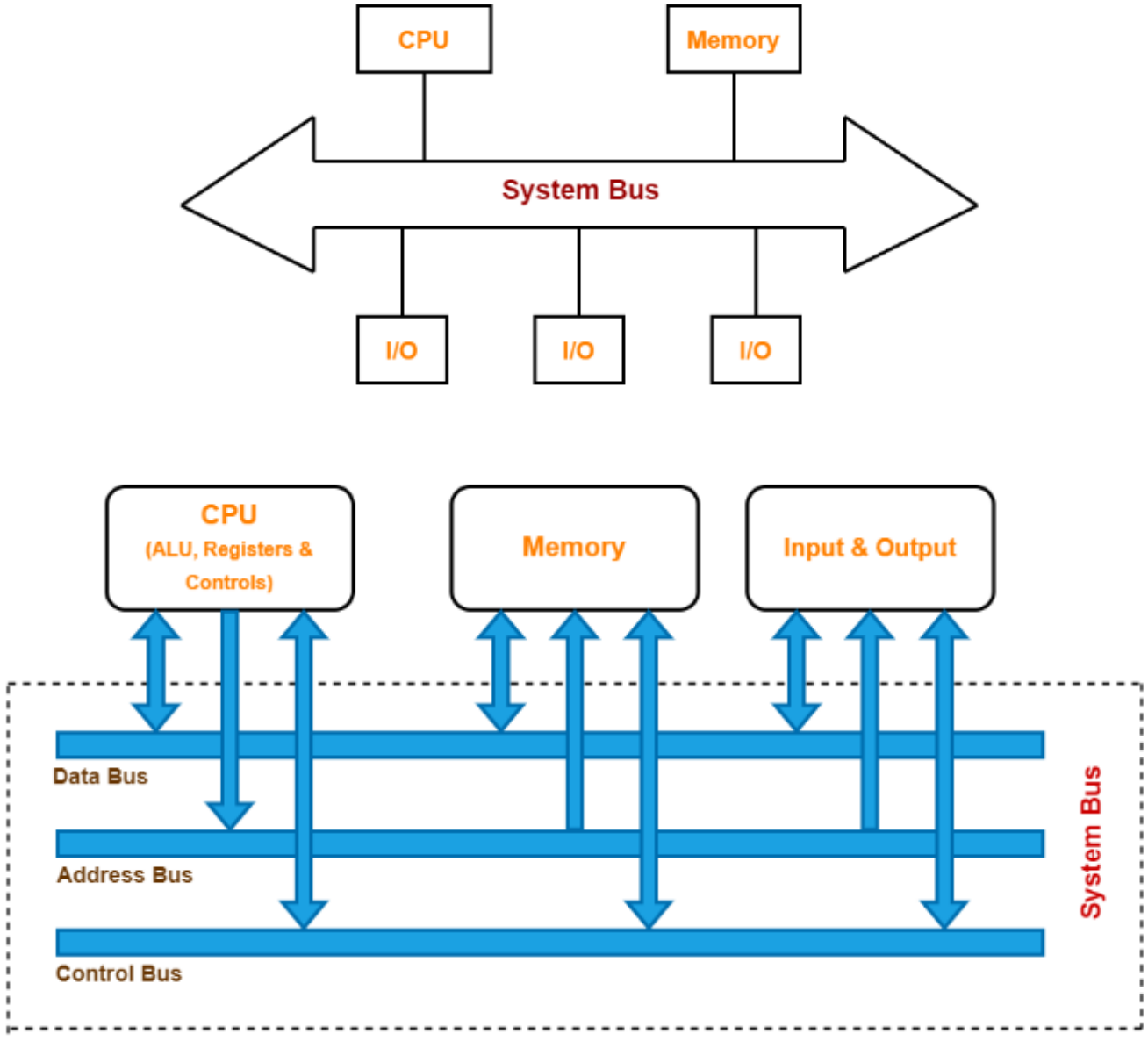

Figure 1.2: System Bus Architecture

Data Bus:

As the name suggests, data bus is used for transmitting the data / instruction from CPU to memory/IO and vice-versa. It is bi-directional. The width of a data bus refers to the number of bits (electrical wires) that the bus can carry at a time. Each line carries 1 bit at a time. So, the number of lines in data bus determine how many bits can be transferred parallelly. The width of data bus is an important parameter because it

determines how much data can be transmitted at one time. The wider the bus width, faster would be the data flow on the data bus and thus better would be the system performance.

Example:

A 32-bit bus has thirty-two (32) wires and thus can transmit 32 bits of data at a time.

A 64-bit bus has sixty-four (64) wires and thus can transmit 64 bits of data at a time.

Control Bus:

As the name suggests, control bus is used to transfer the control and timing signals from one component to the other component. The CPU uses control bus to communicate with the devices that are connected to the computer system. The CPU transmits different types of control signals to the system components.

It is bi-directional. Control signals are generated in the control unit of CPU. Timing signals are used to synchronize the memory and I/O operations with a CPU clock.

Typical control signals hold by control bus:

Memory read – Data from memory address location to be placed on data bus.

Memory write – Data from data bus to be placed on memory address location.

I/O Read – Data from I/O address location to be placed on data bus.

I/O Write – Data from data bus to be placed on I/O address location.

Other control signals hold by control bus are interrupt, interrupt acknowledge, bus request, bus grant and several others.

The type of action taking place on the system bus is indicated by these control signals.

Address Bus:

As the name suggests, address bus is used to carry address from CPU to memory/IO devices. It is used to identify the particular location in memory. It carries the source or destination address of data i.e. where to store or from where to retrieve the data. It is uni-directional. The width of address bus determines the amount of physical memory addressable by the processor. It determines the size of the memory that the computer can use. The wider is the address bus, the more memory a computer will be able to use. The addressing capacity of the system can be increased by adding more address lines.

Instruction Set:

Instruction: Instruction is machine language command used by processor to perform a specific task. Instruction has two parts known as opcode and operand.

Opcode: It specify operation to be performed.

Operand: Operand are data on which operation is performed. It also specifies the memory location or register where data is being stored or data to be fetched.

An instruction is a set of codes that the computer processor can understand. The code is usually in 1s and 0s, or machine language. It contains instructions or tasks that control the movement of bits and bytes within the processor.

Example of some instruction sets:

ADD − Add two numbers together.

JUMP − Jump to designated RAM address.

LOAD − Load information from RAM to the CPU.

Reduced Instruction set Computer (RISC)

A number of computer designers recommended that computers use fewer instructions with simple constructs so that they can be executed much faster within the CPU without having to use memory as often. This type of computer is called a Reduced Instruction Set Computer.

The concept of RISC involves an attempt to reduce execution time by simplifying the instruction set of computers. A characteristic of RISC processors' ability is to execute one instruction per clock cycle. This is done by overlapping the fetch, decode and execute phases of two or three instructions by using a procedure referred as pipelining.

The characteristics of RISC are as follows –

- Relatively few instructions.
- Relatively few addressing modes.
- Memory access limited to load and store instructions.
- All operations done within the register of the CPU.
- Single-cycle instruction execution.
- Fixed length, easily decoded instruction format.
- Hardwired rather than micro programmed control.

Complex Instruction Set Computer (CISC)

CISC is a computer where a single instruction can perform numerous low-level operations like a load from memory and a store from memory, etc.

The CISC attempts to minimize the number of instructions per program but at the cost of an increase in the number of cycles per instruction.

The design of an instruction set for a computer must take into consideration not only machine language constructs but also the requirements imposed on the use of high-level programming languages.

The goal of CISC is to attempt to provide a single machine instruction for each statement that is written in a high-level language.

The characteristics of CISC are as follows –

- A large number of instructions typically from 100 to 250 instructions.
- Some instructions that perform specialized tasks and are used infrequently.
- A large variety of addressing modes- typically from 5 to 20 different modes.
- Variable length instruction formats.
- Instructions that manipulate operands in memory.

Memory & Storage System:

The memory is made by using the registers. It is the most important component of a computer system. In technical terms, memory is known as RAM, which stands for Random Access Memory. It is volatile in nature because it lost the data when the system turns off.

Types: Primary Memory, Secondary Memory & Cache Memory

There are three major level of memory in the computer system, these three-level distinguished by response or access time is called Memory hierarchy.

Memory hierarchy can be represented by

Level 1: Processor Register and Cache memory - Fastest memory

Level 2: Main memory - Fast but slower than Level-1 memories

Level 3: Secondary memory – Slowest memories

Access time of different level of memories

CPU register and Cache < Primary memory < Secondary memory

Storage is a component in a computer system which allows systems to store the data and information on a long-term basis. In technical terms, it is known as a hard disk or SSD (Solid State Drive). The data and the information stored in the storage is permanent. It holds the high-capacity data which are not held in the computer memory. The data remains available in the storage device if the power of the device is off. So, it is also called as non-volatile memory. The CPU does not directly access it, so the processor transfers the data from storage to memory when the application needs the data. It also allows users to access and store their applications, files, and operating systems for an infinite time. HDD (High disk Drive); SD Cards; CD (Compact-Disk); DVD (Digital Versatile Disk); SDD (Solid State Drive).

Memory	Storage
It is usually referred to as Random Access Memory	It is usually referred to as Solid State Drive
It is an element which stores the data and information for a short-term basis.	It is an element which stores the data and information for a long-term basis.
It is a volatile memory.	It is a non-volatile memory.
It is faster than storage (SSD).	It is slower than the memory (RAM).
It is a component which accesses the data instantly.	It cannot modify or access the data as fast as memory.
When the system or device loses power, then the data or information is lost.	The data and information will remain even.
The modules of this component is expensive than the storage.	The cost of the storage device is less than the memory modules.
The size of memory devices is not large.	The size of storage devices is much larger than memory devices. And, the size goes up to terabytes.
This component is made up of registers.	This component is made up of magnetic parts or strips.

Table 1.2: Difference between Memory & Storage

System & Application Software:

Software is a set of programs, procedures, and routines that instructs a computer system what to do. It is mainly of two types named as, System Software and Application Software. Both the software helps the computer to perform specific tasks and allow the user to interact with the system. Some may consider the two to be the same with minor differences, but they are entirely different from each other. They can be prominently differentiated from each other based on their **functioning, purpose, and design.**

System Software:

System software is a set of computer programs, which is designed to manage system resources. It is a collection of such files and utility programs that are responsible for running and smooth functioning of your computer system with other hardware. It is solely responsible for running the operating system (OS) and managing the computer device entirely, and without it, the system cannot run. It is not used for a specific task and is hence known as general-purpose software. It acts as a platform for other software to work, such as antivirus software, OS, compiler, disk formatting software, etc. System software runs and functions internally with application software and hardware. Moreover, it works as a linking interface between a hardware device and the end-user.

Application Software:

Application Software is a type of software that is mainly developed to perform a specific task as per the user's request. It acts as an interface between the end-user and system software. Application software is not used to perform basic operations of a computer system like system software. Instead, they are installed on the computer system to function as a working tool for the end-user. Application software provides an interactive UI (user interface) for users to interact with it and work on it. This software is usually developed with the help of High-level languages, such as C, C++, Java, etc. Some examples of Application software are MS Office, Paint, Spreadsheet, Web-browser, etc. Although application software is designed to perform a specific task.

System Software	Application Software
System software is a set of computer programs that is designed to manage system resources.	Application Software is a type of software that is mainly developed to perform a specific task as per the user's request.
It acts as an interface between the Application Software and Computer hardware.	It acts as an interface between the end-user and System Software.
It is a general-purpose software.	It is a specific-purpose software.
System software is usually installed on the computer system at the time of OS installation.	Application Software is usually installed on the system as per the requirement of the user.
This software runs independently and works as a platform for working application software.	This software is not capable of running independently, which means they need system software to work on.
These are usually written in low-level languages such as Assembly language.	These are usually written in a high-level language such as C, C++, Java, etc.
System software work on the background, hence user don't directly interact with them.	Application software work on user-interface, hence user directly interact with them.
A system software starts running as we turn on our computer system and stops when the system is turned off.	Application software runs as per user request. It means when we launch them, then only they start and stop when we close them.
The development of System software is complicated and takes more time compared to application software, as they are built by considering the hardware compatibility.	Development of Application software is comparatively easier and takes less time than system software.
A computer system can't run without system software.	A computer system can always run without application software. However, for users, it is required to have some important application software to work on.
The working of system software is automated and starts functioning automatically after starting the computer system.	The working of application software is manual, which means the user needs to start using it.
Examples of System Software are Operating systems, Compiler, Assembler, Device drivers, etc.	Examples of Application Software are Web browsers, MS office, Graphic design software, etc.

Table 1.3: Difference between System & Application Software

Computer Applications in various fields:

e-Business: e-business is a term which is used for business or commercial transaction that includes sharing information across the internet using ICT and computers. E-business elements like Selling or buying of products, on-line banking, Payments by cards, on-line stock trading etc. become very handy due to computers.

Bio-Informatics: Field of Biology and Medicines together considered as Bio-informatics. Computer is playing very important role in this filed for statistical study on collection and storage of Biological and genetic data to arrive at require solution. DNA mapping, medicinal research, pattern recognitions are some areas of Bi-informatics where computer become very important tool.

Health Care: Various sophisticated medical equipment like Ultrasonography machine, CT scan, X-rays, Eye testing machine use computers for their smooth and accurate operations. Not only theses Doctors use computers to get suggestions on complicated case from their counterpart at abroad.

Remote Sensing and GIS: Remote sensing is a technique of acquiring information about an object or phenomenon without making physical contact with the it. Computer and its computation capabilities is

used in various field of remote sensing like geography, land surveying and Earth Science etc. in which computer collect, organized and analyzed data for further processing. Marine navigation and air traffic management are some are some examples where computers are used along with remote sensing mechanism. GIS (Geographical Information systems) in which computer gathers location specific data and present them in various meaningful form. GIS system fitted in Car is very useful in locating its real time position.

Meteorology and Climatology: Computers are very useful for collecting, storing and processing of atmospheric and weather-related data to forecasts atmosphere and weather conditions for short and long period. Computer displays results using graphics and animations for accurate forecasts.

Computer Gaming: Computer creates virtual environments with graphical and animation support for gaming. User can play game on stand along PC or Network connected PC on these virtual field, vehicle etc.

Multimedia and Animation: Computer support various Multimedia and animation elements for representation of music, video, sound, text, images etc.

Operating System:

An Operating System (OS) is an interface between a computer user and computer hardware. An operating system is a software which performs all the basic tasks like file management, memory management, process management, handling input and output, and controlling peripheral devices such as disk drives and printers. An operating system is software that enables applications to interact with a computer's hardware. The software that contains the core components of the operating system is called the kernel.

The primary purposes of an Operating System are to enable applications (software's) to interact with a computer's hardware and to manage a system's hardware and software resources.

Types of Operating Systems:

Batch Operating System: The users of a batch operating system do not interact with the computer directly. Each user prepares his job on an off-line device like punch cards and submits it to the computer operator.

To speed up processing, jobs with similar needs are batched together and run as a group. The programmers leave their programs with the operator and the operator then sorts the programs with similar requirements into batches.

Example: Payroll System, Bank Statements etc.

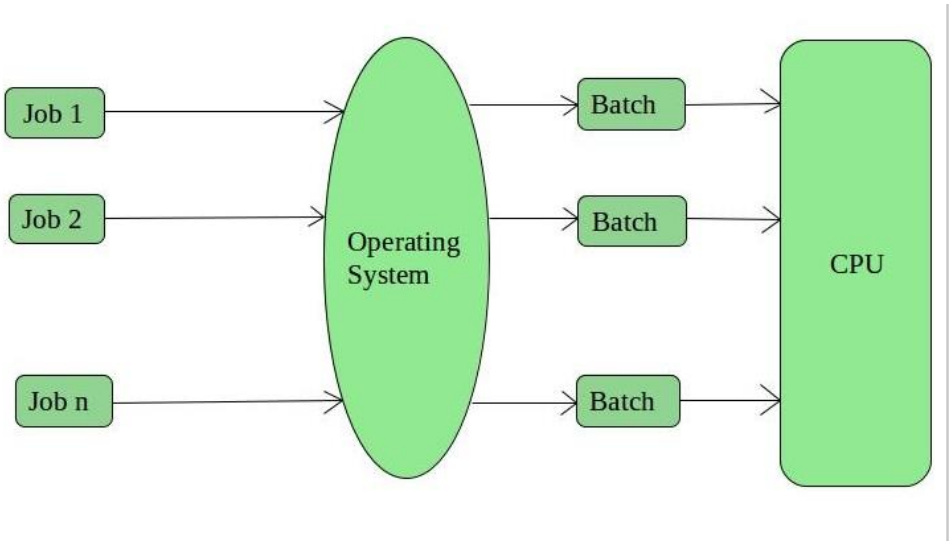

Figure 1.3: Batch Operating System

Time-sharing Operating System: Time-sharing is a technique which enables many people, located at various terminals, to use a particular computer system at the same time. Time-sharing or multitasking is a logical extension of multiprogramming.

Processor's time which is shared among multiple users simultaneously is termed as time-sharing. The main

difference between Multi-programmed Batch Systems and Time-Sharing Systems is that in case of multi-programmed batch systems, the objective is to maximize processor use, whereas in Time-Sharing Systems, the objective is to minimize response time.

Distributed Operating System: Distributed systems use multiple central processors to serve multiple real-time applications and multiple users. Data processing jobs are distributed among the processors accordingly. The processors communicate with one another through various communication lines (such as high-speed buses or telephone lines). These are referred as loosely coupled systems or distributed systems. Processors in a distributed system may vary in size and function. These processors are referred as sites, nodes, computers, and so on.
Example: AIX operating system for IBM RS/6000 computers.
Solaris operating system for SUN multiprocessor workstations.

Network Operating System: A Network Operating System runs on a server and provides the server the capability to manage data, users, groups, security, applications, and other networking functions. The primary purpose of the network operating system is to allow shared file and printer access among multiple computers in a network, typically a local area network (LAN), a private network or to other networks.
Example: Microsoft Windows Server, UNIX OS

Real Time Operating System: The term "real-time system" refers to any information processing system with hardware and software components that perform real-time application functions and can respond to events within predictable and specific time constraints.
A real-time system is defined as a data processing system in which the time interval required to process and respond to inputs is so small that it controls the environment. The time taken by the system to respond to an input and display of required updated information is termed as the response time.
A real-time operating system must have well-defined, fixed time constraints, otherwise the system will fail.
Example: air traffic control systems, process control systems, and autonomous driving systems.

There are two types of real-time operating systems
Hard real-time systems: Hard real-time systems guarantee that critical tasks complete on time. In hard real-time systems, secondary storage is limited or missing and the data is stored in ROM. In these systems, virtual memory is almost never found.
Soft real-time systems: Soft real-time systems are less restrictive. A critical real-time task gets priority over other tasks and retains the priority until it completes. Soft real-time systems have limited utility than hard real-time systems.

File management in OS:
A file system is a method an operating system uses to store, organize, and manage files and directories on a storage device.
The advantages of using a file system include the:
Organization: A file system allows files to be organized into directories and subdirectories, making it easier to manage and locate files.
Data protection: File systems often include features such as file and folder permissions, backup and restore, and error detection and correction, to protect data from loss or corruption.
Improved performance: A well-designed file system can improve the performance of reading and writing data by organizing it efficiently on disk.

Process Management in OS:
Process is the execution of a program that performs the actions specified in that program. It can be defined as an execution unit where a program runs. The OS helps to create, schedule, and terminates the processes which is used by CPU. A process created by the main process is called a child process. Process operations

can be easily controlled with the help of PCB (Process Control Block). It can be considered as the brain of the process, which contains all the crucial information related to processing like process id, priority, state, CPU registers, etc.

The operating system is responsible for the following activities in connection with Process Management:

Scheduling processes and threads on the CPUs.
Creating and deleting both user and system processes.
Suspending and resuming processes.
Providing mechanisms for process synchronization.
Providing mechanisms for process communication.

The Attributes of the process are used by the Operating System to create the process control block (PCB) for each of them. This is also called context of the process.

Process ID: When a process is created, a unique id is assigned to the process which is used for unique identification of the process in the system.

Program counter: A program counter stores the address of the last instruction of the process on which the process was suspended. The CPU uses this address when the execution of this process is resumed.

Process State: The Process, from its creation to the completion, goes through various states which are new, ready, running and waiting. We will discuss about them later in detail.

Priority: Every process has its own priority. The process with the highest priority among the processes gets the CPU first. This is also stored on the process control block.

General Purpose Registers: Every process has its own set of registers which are used to hold the data which is generated during the execution of the process.

List of open files: During the Execution, Every process uses some files which need to be present in the main memory. OS also maintains a list of open files in the PCB.

List of open devices: OS also maintain the list of all open devices which are used during the execution of the process.

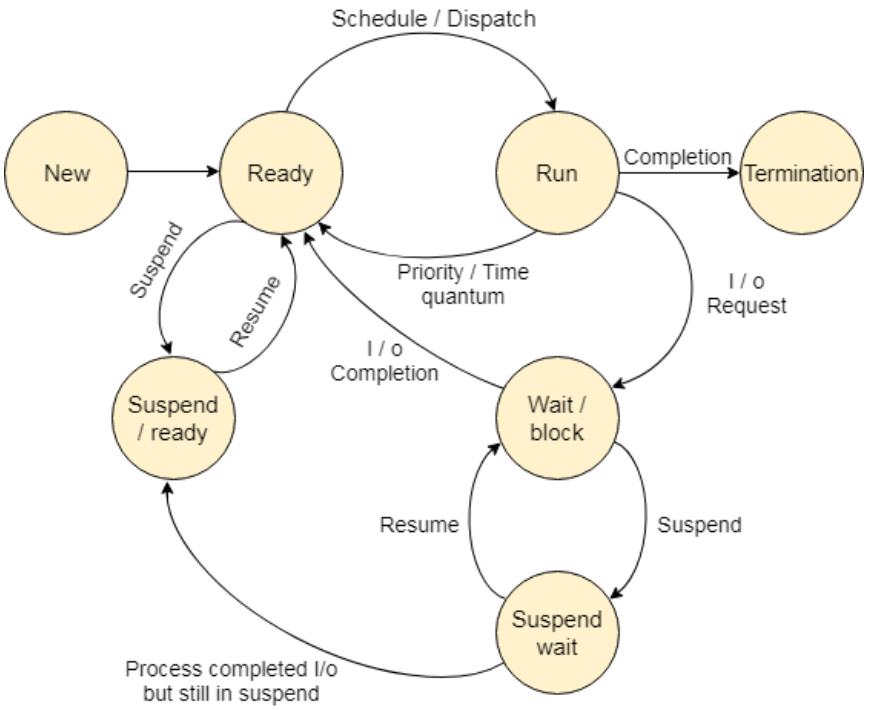

Figure 1.4: Process Life Cycle

New: The new process is created when a specific program calls from secondary memory/ hard disk to primary memory/ RAM a

Ready: In a ready state, the process should be loaded into the primary memory, which is ready for

execution.
Waiting: The process is waiting for the allocation of CPU time and other resources for execution.
Executing: The process is an execution state.
Blocked: It is a time interval when a process is waiting for an event like I/O operations to complete.
Suspended: Suspended state defines the time when a process is ready for execution but has not been placed in the ready queue by OS.
Terminated: Terminated state specifies the time when a process is terminated.

Memory Management in OS:
In a multiprogramming computer, the operating system resides in a part of memory and the rest is used by multiple processes. The task of subdividing the memory among different processes is called memory management.
Memory management is a method in the operating system to manage operations between main memory and disk during process execution. The main aim of memory management is to achieve efficient utilization of memory.
Why Memory Management is required:
Allocate and de-allocate memory before and after process execution.
To keep track of used memory space by processes.
To minimize fragmentation issues.
To proper utilization of main memory.
To maintain data integrity while executing of process.

Introduction to MS Office:
Microsoft Office is a software which was developed by Microsoft in 1988. This Office suite comprises various applications which form the core of computer usage in today's world.
The first version of Office contained Microsoft Word, Microsoft Excel, and Microsoft PowerPoint.
Microsoft Office is a suite of desktop productivity applications that is designed specifically to be used for office or business use.
It is a proprietary product of Microsoft Corporation and was first released in 1990. Microsoft Office is available in 35 different languages and is supported by Windows, Mac and most Linux variants.
It mainly consists of Word, Excel, PowerPoint, Access, OneNote, Outlook and Publisher applications.

MS Word:
Using word, a user can create the document and edit them later, as and when required, by adding more text, modifying the existing text, deleting/moving some part of it. Changing the size of the margins can reformat complete document or part of text. Font size and type of fonts can also be changed. Page numbers and Header and Footer can be included. Spelling can be checked and correction can be made automatically in the entire document. Word count and other statistics can be generated. Text can be formatted in columnar style as we see in the newspaper. Text boxes can be made.
Tables can be made and included in the text. Word also allows the user to mix the graphical pictures with the text. Word also has the facility of macros. Macros can be either attached to some function/special keys or to a tool bar or to a menu. It also provides online help of any option.

MS Excel:
AutoFormat - lets you to choose many preset table formatting options.
AutoSum - helps you to add the contents of a cluster of adjacent cells.
List AutoFill - automatically extends cell formatting when a new item is added to the end of a list.
AutoShapes toolbar- will allow you to draw a number of geometrical shapes, arrows, flowchart elements, stars and more. With these shapes you can draw your own graphs.
Drag and Drop - feature will help you to reposition the data and text by simply dragging the data with the help of mouse.

Charts - features will help you in presenting a graphical representation of your data in the form of Pie, Bar, Line charts and more.
PivotTable - flips and sums data in seconds and allows you to perform data analysis and generating reports like periodic financial statements, statistical reports, etc. You can also analyze complex data relationships graphically.
Shortcut Menus - commands that are appropriate to the task that you are doing appear by clicking the right mouse button.

MS Power Point:
Animations
Slide Transitions
Merge Shapes
Videos
Attractive smart arts
Notes for presentation
Charts
Exporting PPT to Video
Add audio narration
Add comment to slides