1 Computer System

A computer system is a combination of all the components required to process and store data using a computer. Every computer system is composed of multiple pieces of hardware and software.

1.1 Hardware

The term “hardware” refers to all devices or equipment that make up a computer, such as the microprocessor (CPU), the memory, the hard disk, the keyboard, the mouse, the speaker , and the printer.. The basic hardware components of a typical computer system are discussed next.

1.1.1 Primary Storage Unit

The primary storage unit consists of read only memory (ROM) and random access memory (RAM).

1.1.1.a ROM

This type of computer memory contains non-volatile or permanent data that can only be read but not written to. ROM contains manufacturer’s programs that allow a computer to start up or regenerate each time it is turned on.

1.1.1.b RAM

Main memory, or also called read/Write memory is a volatile memory when the computer is turned off; everything stored in main memory is lost. Main memory is connected directly to the CPU; all programs must be loaded into main memory before they can be executed. Similarly, all data must be brought into main memory before a program can manipulate it. Main memory is an ordered sequence of cells, called memory cells. Each cell has a unique location in main memory, called the address of the cell. These addresses help you access the information stored in the

cell; the content of a cell can be either a programming instruction or data. However, main memory stores everything as sequences of 0s and 1s. The memory addresses are also expressed as sequences of 0s and 1s.

1.1.2 Secondary Storage Unit

Due to the limited capacity of primary storage and because programs and data must be stored in main memory before processing and because everything in main memory is lost when the computer is turned off, information stored in main memory must be transferred to some other device for permanent storage. The device that stores information permanently is called secondary storage. Examples of secondary storage are hard disks, flash drives, floppy disks, CD-ROMs, and tapes.

1.1.3 Input /Output Devices

For a computer to perform a useful task, it must be able to take in data and programs and display the results of calculations. The devices that feed data and programs into computers are called input devices. The keyboard, mouse, and secondary storage are examples of input devices. The devices that the computer uses to display results are called output devices. A monitor, printer, and secondary storage are examples of output devices.

1.1.4 Central Processing Unit (CPU)

The brain of any computer system is the CPU. It controls the functioning of the other units and processes the data; where it takes data and instructions from the storage unit and makes all sorts of calculations based on the instructions given and the type of data provided. It is then sent the results back to the storage unit. CPU includes Arithmetic logic unit (ALU) and control unit (CU).

1.1.4.a Arithmetic Logic Unit: All calculations and comparisons, based on the instructions provided, are carried out within the ALU. It performs arithmetic functions like addition, subtraction, multiplication, division and also logical operations like greater than, less than and equal to etc.

1.1.4.b Control Unit: Controls all computer system operations like input, processing and output; where it takes care of step by step processing of all operations inside the computer.

1.1.5 Computer Network

A computer network is a set of connected computers. The connection between computers can be done via cabling, most commonly the Ethernet cable, or wirelessly through radio waves. Connected computers can share resources, like access to the Internet, printers, file servers, and others.

1.2 Software

The computer hardware is not capable of doing anything on its own. It has to be provided a detailed set of instructions to perform a specific task in order to achieve a desired goal; this set of instructions which are written in a form that is understood by the computer is known as a computer program. The set of programs and other associated documentation which describes what the program does and how it is to be used is known as computer software. The software acts as an interface between the user and the computer. A number of software's can be run on the same hardware to perform different types of jobs. Software is mainly classified into Application Software and System Software.

1.2.1 Application software:

Application software comprises all the programs you apply to perform specific task, such as programming languages, word processing programs, payroll and inventory programs, and even games.

1.2.2 System Software:

System programs control the computer they acts as interface between the application programs and the computer. The system program that loads first when you turn on your PC is called the operating system. Without an operating system, the computer is useless. The operating system monitors the overall activity of the computer and provides services. Some of these services include memory management, input/output activities, and storage management. The operating system has a special program that organizes secondary storage so that you can conveniently access information. MS-DOS and Windows are examples of system software.

2 Programming Languages

Programming language is a coded syntax used by computer programmers to communicate with a computer. The language enables a computer user to dictate what commands the computer must perform to process data. These languages can be classified into machine language, assembly language, and high level language

2.1 Machine Language:

In this language the programs are written in binary code i.e. the instructions are made only by a combination of binary digits 0 and 1. Machine languages execute the fastest since they are immediately understood by the computer and no translation program is required. Also they make efficient use of primary memory. But it is very difficult to program in this binary or machine language because the programmer has to know details of hardware to write program.

2.2 Assembly Language:

The 0 s and 1 s of the machine language were substituted by letters and symbols in assembly languages. The language uses symbols instead of numbers to write

programs. A program written using such symbols in the assembly language is called the source program. The program written in assembly language has to be converted into machine language for use by the computer. This is achieved with the help of the assembler. The assembler is a system program which is supplied by the manufacturer. It converts the assembly program into a machine readable program and the resulting program is called the object program.

2.3 High Level Languages:

Higher level languages make use of English like words and statements and mathematical symbols for instructions. Higher level languages make programming easier, since they are relatively easy to learn. Less time is required to write programs in high level languages. The programmer is not required to know the detailed working of the computer system in order to program in a high level language. Many high-level languages have been created like COBOL (Common Business Oriented Language) which is designed for business applications; FORTRAN (Formula Translation) which is a language designed for programming complex mathematical programs; BASIC (Beginners All-purpose Symbolic Instruction Code) which is originally designed to be simple enough for beginners to learn; PASCAL is a structured, general-purpose language designed primarily for teaching programming; PYTHON is a general purpose language designed for both business and academic applications; VISUAL BASIC is a Microsoft programming language that allows programmers to quickly create Windows-based applications. JAVA is an object-oriented language used to develop programs that run over the internet in Web browser; C is a structured, general – purpose language; C++ is based on the C language but offers object-oriented features that is not found in C. Many people consider C and C++ to be high-level languages, but actually C and C++ are both somewhat of a bridge between the low-level languages and high-level languages. You might think of them as middle-level languages. The level of a

language, in this context, essentially refers to how far it is removed from actual machine language. However a high level language is not directly understood by the computer. It is required to be translated into machine language. Therefore they generally execute more slowly and require more memory than the same program written in assembly language. The programs which are used to translate programs written in high level language into machine language are known as translators. There are two types of translators which are compiler and interpreter.

2.2.1 Interpreter

An interpreter is a program that simultaneously translates and executes the statements written in a high-level language. As the interpreter reads each individual statement in the program, it translates it into a machine language code and then directly executes it. This process is repeated for every statement in the program.

2.2.2 Compiler

A compiler is a program that translates statements written in a high-level language into a separate machine language program. The machine language program can then be executed any time you wish. After the translation, the compiler is no longer required.