

## Chapter- 4: Computer Software and its application

### 4.1 Introduction:

We know software is a set of instructions that are used to carry out a task. Software can be grouped into two categories namely application software and system software. The application software is one, which is application oriented, like our inventory program, payroll program are few. Similarly system software is used for system oriented tasks. Examples are compilers, assemblers, loaders. In this chapter, we discuss the computer language fundamentals, application software and system software.

### 4.2 Computer languages:

#### a) Machine language:

At the lowest level computer understands only 0 and 1. Programs expressed in terms of binary language are called **machine language**. A computer's programming language consists of strings of binary numbers (0's and 1's) and is the only one language computer can understand. This language is the lowest level of computer language recognized and used by the CPU. An instruction prepared in any machine language consists of 2 parts. The first part is the command or **opcode** or **operation code**. The second part of the instruction is the operand/s or data and it tells the processor where to find or store the data or other instructions that are manipulated. A short sample of machine language to perform addition in the storage location 0166 will look like this

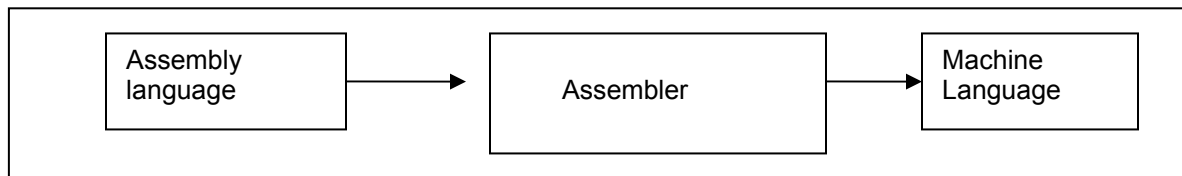
```
00010000 00000001 01100010
```

A machine language programmer has to know the binary code for each operation to be carried out. Machine language programmers must also be familiar with the internal organization of the computer. A machine language programmer must also keep track of all the addresser of main memory locations that are referred to in the program. The machine language format is slow and tedious. We the human beings work on natural language and not on binary language. Hence writing machine language program is difficult for the humans.

## b) Assembly Language and Assembler:

A low level first generation computer language, popular during early 1960s, which uses abbreviations or **mnemonic codes** (mnemonic means mind full) for operation codes and symbolic addresses. This symbolic instruction language is called Assembly language. One of the first step in improving the program preparation was to substitute mnemonics for operation codes. The mnemonics are different among makes and models of computer. Second step was symbolic addressing to express an address in terms of symbols convenient to the programmer. Another improvement was the programmer turned the work of assigning and keeping track of instruction addresses over to the computer. The programmer merely told the machine the storage address number of the first program instruction and the assembly language software the automatically stored all others in the sequence from that point.

The **mnemonics** are converted into binaries with the help of a translator known as Assembler.



The program written using mnemonics is called **Source program** or **assembly language program**, the binary form of the source program equivalent is called **Object Program**. Let us consider an assembly language program

```
LDA 9000
MOV B,A
MOV C,A
HLT
```

**Assembler** is used to convert assembly language into the machine language. For example object program or machine language equivalent for the above assembly language is

```
01110 0100001100
01110011101
```

0111110000

1011100000

Assembly language programs are commonly used to write programs for electronic controls using microprocessors e.g., compilers, operating systems, animation in computer graphics and so on.

Assembly language is relatively easy for the human beings compared to machine language. Programs writing are faster compared to machine language. Assembly language programmer should know details of the architecture of the machine. Assembly language programs are not portable.

### **c) Higher level languages and compiler:**

Instructions which are written using English language with symbols and digits are called **high level languages**. The high level language is closer to our natural language. The commonly used high level languages are FORTRAN, BASIC, COBOL, PASCAL, PROLOG, C, C++ etc. The complete instruction set written in one of these languages is called a high level language program or computer program or source program.

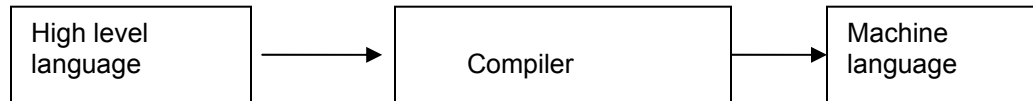
In order to execute the instructions, the source program is translated into binary form by a compiler or interpreter. A compiler is also used to translate source program into an object program. An interpreter is a program which takes the source program line by line and converts into machine code line by line. .

For example, C or C++ language uses a compiler as its translator to translate or compile the complete C program. It is also necessary to create an executable program to execute the instructions given in a source program by linking the input and output devices with your program. A linker (another program) is used to link library routing and generate an executable program from an object program. Compiler converts source program into object program in terms of stages called passes. Normally, most of the compilers use two passes to convert source program into the machine language program. Gwbasic is an interpreter used to convert basic program into object program.

### **d) Compiler:**

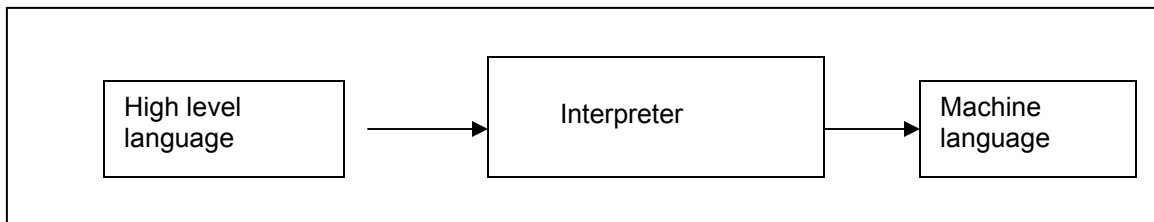
Compilers convert the program instructions from human understandable form to the machine understandable form and the translated program instruction is called object code. Compiler is nothing but a language translator used to translate the entire program of the high level language into machine language. Every programming language

requires its own compiler to translate the program. For example, the programming language PASCAL requires PASCAL compiler and C uses C compiler.



#### e) Interpreter:

**Interpreters** also convert the source program to machine language instruction but execute each line as it is entered. The translation of the source program takes place for every run and is slower than the compiled code. An interpreter must accompany the object code to run a program. Programming languages BASIC and LISP use interpreters.



#### f) Editor:

An editor is used to type the source program and store program in disk. C language uses one popular Borland's IDE (Integrated Development Environment) editor in MS-DOS system and in Vi editor in UNIX system. In DOS, we use popular Edit editor also. Editors are commonly used to type and edit documents and store them. Thus, they are also called text editors. In word processors we can perform the operation like setting up margins, spell check and so on. MS-WORD is one of the popular word processor.

### 4.3 System software:

System software is designed for a specific type of hardware. For example, the disk operating system (DOS) is used to co-ordinate the peripherals of a computer. The system software controls the activities of a computer, application programs, flow of data in and out of memory and disk storage. Our operating system, compilers, assemblers, linker and loaders are the example of system software.

System software also handles data in communication applications and within the computer systems in a computer network. The communication software transfers data from one computer to another. These programs also provide data security and error

checking along with the transfer of data between the computer systems.

#### **4.4 Application software:**

Application softwares are developed for application of the computer to common problems and tasks. They are available for business applications, science and engineering applications and so on. Personal productivity programs are categorized based on the nature of their use in word processing, generating spreadsheet, presenting graphics and maintaining databases. Application software is also available as packages and usually with a user manual.

Some of the application softwares are:

##### **a) Word processors:**

A word processor is used to prepare a report, a personal or business letter, in desktop publishing and so on. These offer formatting features such as using different character styles, line spacing, and page numbering and so on. Documents prepared using a word processor can be easily printed in any type of printer.

##### **b) Electronic spread sheets:**

Electronic spreadsheet software is used to prepare documents containing information or data in the form of numbers or characters. The information is arranged in rows and columns for further processing and analysis, preparing reports and generating charts. It is also capable of performing arithmetic operations and using functions.

##### **c) Database software :**

Databases are records related to a person or an organization. Database software have capability to edit and update data in a file. The data are processed to prepare and print salary details of employees, annual sales details and so on. One of the major applications of a computer is database management.

#### **4.5 Operating systems and its functions:**

We know operating system is a collection of programs and it is the interface between user and the computer. An operating system is a program which connects the user and the electronic hardware in a computer. It is a set of programs which supervise the

activities of a computer and activate the operations of the hardware components such as CPU, main memory, disk drives, keyboard, monitor and printer and so on. Some of the startup programs initially loaded to RAM are stored in ROM, mainly the BIOS programs which are recorded by the manufacturers of the computer system. Service programs available in operating system for operations like copying a file, deleting a file, formatting a disk, printing a file and so on are usually stored in the disk. Error messages are displayed on the screen if there is any malfunctioning of hardware. There are many operating system used in computers. Commonly used operating systems are MS-DOS (Microsoft Disk operating System), Windows 95/98/2000, Windows NT, UNIX and so on. Nowadays Windows XP, Windows-7 operating system is widely used in personal computers, and UNIX is used in Mainframes, Servers, Graphic Workstations and also personal computers. Linux is one of the most popular free operating system.

- Operating system will display instruction on the monitor screen and the user can interact with the computer.
- It loads the application programs such as MS Word, AutoCAD and so on from disk to the computer memory.
- It manages the information stored on disk and retrieves the same whenever required.
- It supervises and coordinates the activities of the hardware and peripherals such as CPU, keyboard, mouse, monitor, printer, RAM, disk drives and so on.
- It utilizes the power of the CPU for multitasking and timesharing.

In general operating systems performs many task which include Memory management, Process management, I/O management, Device management

**Multitasking:**

It is the ability of the computer to handle several application programs concurrently. Printing a document, executing a program and any other operation can be done simultaneously to reduce the idle time of the processor. The multi task capability of the operating system will utilize the processor efficiently, the reducing the user time. Another simple example is hearing audio songs and typing programs same time.

**Timesharing:**

It is the ability of the CPU to serve many users connected to it through a network. The

operating system will assign each user a slice of processor time or time quantum in a round-robin fashion. Since the CPU has high processing speed, it can process information of many users.

#### **4.6 Security Software:**

Information and computer systems are often critical assets that support the mission of an organization. Protecting them can be as critical as protecting other organizational resources, such as money, physical assets, or employees. The purpose of computer security is to protect an organization's valuable resources, such as information, hardware, and software. Through the selection and application of appropriate safeguards, security helps the organization's mission by protecting its physical and financial resources, reputation, legal position, employees, and other tangible and intangible assets. Unfortunately, security is sometimes viewed as thwarting the mission of the organization by imposing poorly selected, bothersome rules and procedures on users, managers, and systems. On the contrary, well-chosen security rules and procedures do not exist for their own sake they are put in place to protect important assets and thereby support the overall organizational mission.

##### **4.6.1 Threats of Computer Security:**

Computer systems are vulnerable to many threats that can inflict various types of damage resulting in significant losses. This damage can range from errors harming database integrity to fires destroying entire computer centers. Losses can stem, for example, from the actions of supposedly trusted employees defrauding a system, from outside hackers, or from careless data entry clerks. Precision in estimating computer security-related losses is not possible because many losses are never discovered, and others are "swept under the carpet" to avoid unfavorable publicity. The effect of various threats varies considerably some affect the confidentiality or integrity of data while others affect the availability of a system.

##### **a) Errors and Omissions**

Errors and omissions are an important threat to data and system integrity. These errors are caused not only by data entry clerks processing hundreds of transactions per day, but also by all types of users who create and edit data. Many programs, especially those

designed by users for personal computers, lack quality control measures. However, even the most sophisticated programs cannot detect all types of input errors or omissions. A sound awareness and training program can help an organization reduce the number and severity of errors and omissions.

Users, data entry clerks, system operators, and programmers frequently make errors that contribute directly or indirectly to security problems. In some cases, the error is the threat, such as a data entry error or a programming error that crashes a system. In other cases, the errors create vulnerabilities. Errors can occur during all phases of the systems life cycle.

#### **b) Fraud and Theft:**

Computer systems can be exploited for both fraud and theft both by "automating" traditional methods of fraud and by using new methods. For example, individuals may use a computer to skim small amounts of money from a large number of financial accounts, assuming that small discrepancies may not be investigated. Financial systems are not the only ones at risk. Systems that control access to any resource are targets (e.g., time and attendance systems, inventory systems, school grading systems, and long-distance telephone systems). Computer fraud and theft can be committed by insiders or outsiders. Insiders (i.e., authorized users of a system) are responsible for the majority of fraud.

Since insiders have both access to and familiarity with the victim computer system (including what resources it controls and its flaws), authorized system users are in a better position to commit crimes. Insiders can be both general users (such as clerks) or technical staff members. An organization's former employees, with their knowledge of an organization's operations, may also pose a threat, particularly if their access is not terminated promptly.

#### **c) Employee Sabotage:**

Employees are most familiar with their employer's computers and applications, including knowing what actions might cause the most damage, mischief, or sabotage. The downsizing of organizations in both the public and private sectors has created a group of individuals with organizational knowledge, who may retain potential system access (e.g.,



if system accounts are not deleted in a timely manner). The number of incidents of employee sabotage is believed to be much smaller than the instances of theft, but the cost of such incidents can be quite high.

#### **d) Malicious Hackers:**

The term malicious hackers, sometimes called crackers, refers to those who break into computers without authorization. They can include both outsiders and insiders. Much of the rise of hacker activity is often attributed to increases in connectivity in both government and industry. One 1992 study of a particular Internet site (i.e., one computer system) found that hackers attempted to break in at least once every other day. The hacker threat should be considered in terms of past and potential future damage. Although current losses due to hacker attacks are significantly smaller than losses due to insider theft and sabotage, the hacker problem is widespread and serious.

#### **e) Malicious Code:**

Malicious code refers to viruses, worms, Trojan horses, logic bombs, and other "uninvited" software. Sometimes mistakenly associated only with personal computers, malicious code can attack other platforms. Actual costs attributed to the presence of malicious code have resulted primarily from system outages and staff time involved in repairing the systems. Nonetheless, these costs can be significant.

#### **Malicious Software: A Few Key Terms**

**Virus:** A code segment that replicates by attaching copies of itself to existing executables. The new copy of the virus is executed when a user executes the new host program. The virus may include an additional "payload" that triggers when specific conditions are met. For example, some viruses display a text string on a particular date. There are many types of viruses, including variants, overwriting, resident, stealth, and polymorphic.

**Trojan Horse:** A program that performs a desired task, but that also includes unexpected (and undesirable) functions. Consider as an example an editing program for a multi-user system. This program could be modified to randomly delete one of the

users' files each time they perform a useful function (editing), but the deletions are unexpected and definitely undesired!

**Worm:** A self-replicating program that is self-contained and does not require a host program. The program creates a copy of itself and causes it to execute; no user intervention is required. Worms commonly use network services to propagate to other host systems.

**Spyware:** The term spyware refers to programs that surreptitiously monitor activity on a computer system and report that information to others without the user's consent.

**4.6.2 Antivirus software** is software used to prevent, detect and remove malware (of all descriptions), such as: computer viruses, adware, backdoors, malicious BHOs, dialers, fraudtools, hijackers, keyloggers, malicious LSPs, rootkits, spyware, trojan horses and worms. Antivirus softwares are programs which can detect, prevent and clean up computer viruses which may attempt to infect your computer system. It will scan downloaded files as well as your entire computer system in order to detect the presence of an infection.

**Internet security** is a branch of computer security specifically related to the Internet, often involving browser security but also network security on a more general level as it applies to other applications or operating systems on a whole. Its objective is to establish rules and measures to use against attacks over the Internet.<sup>[1]</sup> The Internet represents an insecure channel for exchanging information leading to a high risk of intrusion or fraud, such as phishing.

Some of the Antivirus and Internet Security Software

- AVG AntiVirus
- AVG Internet Security
- BitDefender AntiVirus
- F-Secure AntiVirus
- Kaspersky AntiVirus
- Kaspersky Internet Security
- McAfee AntiVirus
- Panda AntiVirus
- PC Tools Internet Security
- Symantec Norton Antivirus & Norton 360
- Trend Micro Internet Security
- Webroot AntiVirus

## Free Antivirus Software

- AVG AntiVirus Free Edition
- Microsoft Security Essentials
- Panda Cloud AntiVirus
- PC Tools AntiVirus Free Edition

### **4.13 Point to be Remember:**

- A computer's programming language consists of strings of binary numbers(0's and 1's) and is the only one language computer can understand
- This symbolic instruction language is called Assembly language.
- Compilers convert the program instructions from human understandable form to the machine understandable form.
- Interpreters also convert the source program to machine language instruction but execute each line as it is entered. The translation of the source program takes place for every run and is slower than the compiled code.
- System software is designed for a specific type of hardware.
- The system software controls the activities of a computer, application programs, flow of data in and out of memory and disk storage.
- Application softwares are developed for application of the computer to common problems and tasks. They are available for business applications, science and engineering applications and so on.
- An operating system is a program which connects the user and the electronic hardware in a computer.
- It is a set of programs which supervise the activities of a computer and activate the operations of the hardware components.