UNIT 1 BASICS OF COMPUTER TECHNOLOGY

Structure

1.0 OBJECTIVES

After completing this Unit, you will be able to:

- describe the basic architecture of the computer;
- discuss the use of various hardware and peripheral devices;
- explain the functions of major hardware components; and
- understand the basic working of Ubuntu Linux operating system.

1.1 INTRODUCTION

The utilisation of computer technology is well recognised, in almost all fields of governance, businesses, libraries, education, etc. Today, computer technology has infused every sphere of common man. From banking to shopping, railway reservation to medical prescription. In this unit, we will introduce you to the basic computer technology and how it works? Knowing internal and external components of a computer system is important for a beginner of computer technology. This unit will provide you the basic knowledge about the devices associated with computer system particularly in the context of library systems. In addition we will also try to discuss some of the basic functions of an operating system, which actually creates an interface between the computer hardware and you. Please note that this unit covers only the basics of computer technology. For further details you may refer to suggested further readings given at the end of the unit.

1.2 OVERVIEW OF COMPUTER SYSTEM

Before starting an introduction about computer, let us understand the need and reason why computers are so much important for us. Generally computers help us in performing tasks that are repetitive, involve calculation or manipulation of data and perform tasks that involve storage of large quantities of information.

Computer can be defined as "An electronic machine that is capable of interpreting and executing stored program (sequence of instructions), input data, perform operation on data (calculation and logical operations), and output the results". The data which normally we deal with consists of numeric and characters such as decimal digits 0 to 9, alphabets A to S, operators (e.g. +, -, >, =, etc.) and many other special characters or images (e.g.; @, {,],etc.). However, computers cannot understand such form of data and hence it has to be transformed into binary-form (also known as machine language) by using two symbols 0 and 1, which are called binary digits or bits. For Example: If we want a computer to do ADD (2, 3); computer needs to map this particular instruction into a binary form. Lets assume the mapping is "01= ADD, 2=10, 3=11", for a computer this instruction will be "01 10 11". One of the key aspects in program execution is the execution of an instruction. The key questions that can be asked in this respect are:

a) How are the instructions supplied to the computer?

b) How are they interpreted and executed?

Most of today's computers look like what is illustrated in Figure 1.1. The designs are based on concepts developed by John Von Neumann referred to as the Von Neumann architecture (shown in Figure 1.2).

Fig. 1.1: A Modern Computer

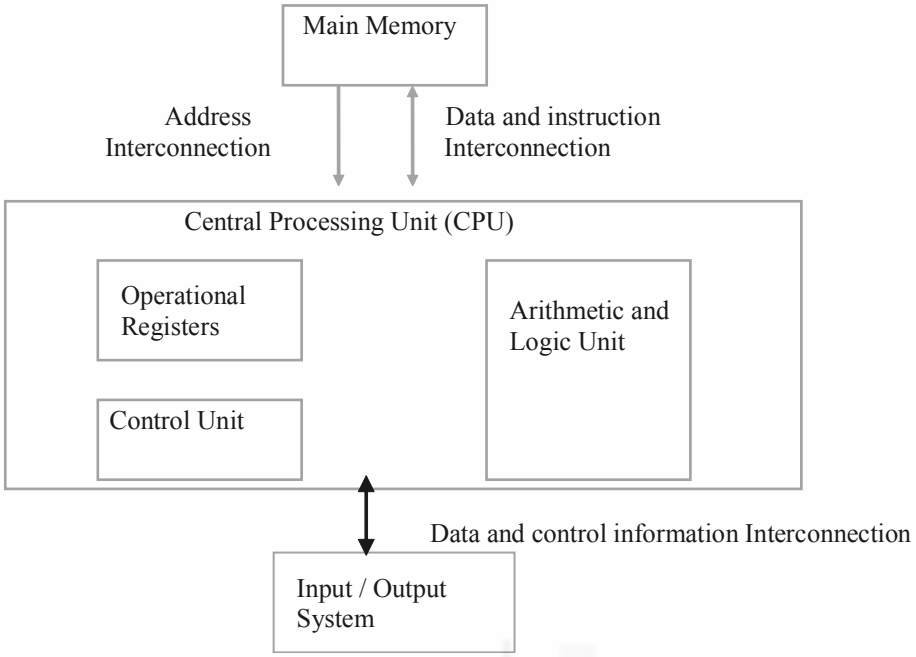

Fig. 1.2: Von Neumann Computer Architecture

Von-Neumann proposed that there should be a unit performing arithmetic and logical operation on the data. This unit is termed as Arithmetic Logic Unit (ALU). One of the ways to provide instruction to such computer will be by connecting various logic components in such a fashion, that they produce the desired output for a given set of inputs. The process of connecting various connections is termed as Hardwired. But this is a very inflexible process of programming. Let us have a general configuration for arithmetic and logical functions. In such a case there is a need of a control signal, which directs the ALU to perform a specific arithmetic or logic function on the data. Therefore, in such a system, by changing the control signal the desired function can be performed on data. Any operation, which needs to be performed on the data, can be obtained by providing a set of control signals. Thus, for a new operation one only needs to change the set of controls.

The Arithmetic Logic Unit (ALU) and the Control Unit (CU) together are termed as the Central Processing Unit (CPU). The CPU is the most important component of a computer's hardware. The ALU performs the arithmetic operations such as addition, subtraction, multiplication and division, and the logical operations such as:

- Is A = B? (where A and B are both numeric or alphanumeric data)
- Is a given character equal to M (for male) or F (for female)?

The control unit interprets instructions and produces the respective control signals. How can the instructions and data be put into the computers? The instruction and data needs to be supplied by external environment. For this an input module is needed. The main responsibility of input module is to put the data in the form of signals that can be recognised by the system. Similarly, we need another component, which will report the results in proper format and form. This component is called output module. These components are referred together as input/output (I/O) components.

The memory unit stores all the information in a group of memory cells, also called memory locations, as binary digits (bits). Each memory location has a unique address and can be addressed independently. The contents of the desired memory locations are

provided to the central processing unit by referring to the address of the memory location. The amount of information that can be held in the main memory is known as memory capacity. The capacity of the main memory is measured in Kilo Bytes (KB) or Mega Bytes (MB). One kilobyte stands for 2^{10} bytes which 1024 bytes (or approximately 1000 bytes). A mega byte stands for 2^{10} Kilobytes, which is approximately little over one million bytes.

Computers are therefore, made of four major components (parts):

1) **Input units:** Humans interface with the computer through devices like the mouse and keyboard.

2) **Central Processing Unit**: Referred as "Brain" of the computer that controls all computer operations, processes information and computes results. It is the logical component of a computer system that interprets and executes program instructions. This component comprises:

   - Control Unit- that interprets program instruction, directs the internal operation, and controls the flow of data in and out of primary memory.
   - Arithmetic and Logical Unit- that performs the arithmetic and logical operations.
   - Memory- also called primary memory holds the input/output data and program instructions. Memory is made of Integrated Circuits or Chips that are tiny silicon chips. In each chip thousands of electronic components are engraved.

3) **Secondary Storage** or Auxiliary Storage is a means for permanently storing data. Do not confuse it with the memory. Memory is a small size storage, which is used by CPU and operating system for its own use. Due to this reason it is sometimes not considered as major components of computer system, instead it is considered as an input/output Device.

4) **Output Units:** data is transferred from a computer to an output device like the printer and monitor where the results are displayed.

1.3 COMPUTER PERIPHERALS AND HARDWARE

There are two terms commonly used in computer world, computer hardware or simply hardware and peripherals. Let us discuss what we mean by these terms. As you know computer is an electronic device that has the ability to store, retrieve, and process data. The physical parts that make up a computer (the central processing unit, input, output, and memory) are called **hardware**. Any hardware device connected to a computer and any part of the computer outside the CPU and working memory is known as **Peripherals**. Some examples of peripherals are keyboards, mouse, monitors, printers, scanners, barcode reader, tape drives, microphones, speakers, joysticks, plotters, and cameras.

1.3.1 Computer Peripherals

When you look on a simple computer you can see Central Processing Unit (CPU) cabinet, Monitor, Keyboard and Mouse. Your computer and you interact through these peripherals. The keyboard and monitor are the minimum peripherals you should have with your computer. Your choice of peripherals depends on personal preference and the complexity of the interactions you intend to have with your computer.

Computer Monitors

The computer monitor is an output device that displays input on a screen and is very similar to a television monitor. When the computer wants to display something, it calculates how it needs to change the color and brightness of the different pixels, and changes the values in the video memory. The smaller the pixels, the clearer and sharper the picture appears on the monitor. Earlier CRT monitors were used as given below in the figure 1.3a. Nowadays the LCD monitors (as shown in figure 1.3b) are in common use these are thinner in size and uses lesser electricity.

Fig. 1.3a: CRT Monitors

Fig. 1.3b: LCD Monitors

Keyboard

The computer receives most of its input from the user via the keyboard that is very similar to the typewriter keyboard as shown in figure 1.4 given below. This input device is connected by a cable to the keyboard port on the back of the computer. There are extra keys on the computer's keyboard that are not found on a normal typewriter. The exact manner in which the keys function depends on the software program. We have different type of keyboards available nowadays which can support multimedia activities and Internet browsing.

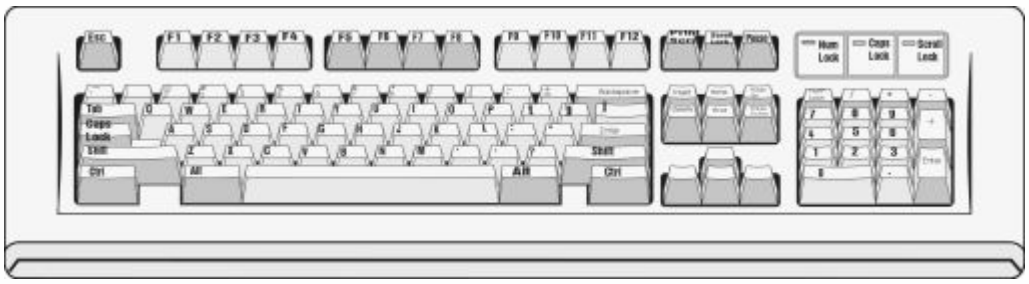

Fig. 1.4: A Computer Keyboard

As shown below in the figure 1.5, mouse is a pointing input device attached to the computer that controls the movement of the cursor on the screen. It allows the user to execute commands using point & click and click & drag techniques. As the user moves the mouse across the pad, the cursor moves across the screen. The mouse should always be used with a mouse pad to provide a smooth surface for mouse movement and to help keep the mouse from damage. If you "run out of room" on the pad, simply

pick up the mouse and move it to the opposite edge and continue movement. Generally, mouse has two buttons (left and right) and newer mice have a scroll wheel between the two. Mouse commands are executed by "clicking". The term "click" refers to the left mouse button.

Fig. 1.5: Mouse a Pointing Device Attached to the Computer

Printer

A printer is an output device to transfer images and text from a computer to a printed page as given below in figure 1.6. Printers take information from the CPU and transfer it to paper, provide a hard copy (permanent human-readable text and/or graphics) of documents stored in electronic form, usually on physical print media such as paper or transparencies. Many printers are primarily used as local peripherals, and are attached by a printer cable or, in most new printers, a USB cable to a computer, which serves as a document source. Some printers, commonly known as network printers, have built-in network interfaces (typically wireless or Ethernet), and can serve as a hardcopy device for any user on the network. Individual printers are often designed to support both local and network connected users at the same time.

There are a number of different printer technologies available: Dot Matrix, Ink Jet or Laser. Inkjet printers use small cartridges full of different colour inks. They squirt a tiny drop of ink onto the paper using a bubble or pressure to form a dot. All the dots are layered on top of each other to form the desired colour. Laser printers are more expensive to run but produce a crisper image.

Fig. 1.6: Laser Printer

Scanner

An input device that is becoming less used with the advent of digital cameras. A scanner (shown below in the figure 1.7) is an optional extra rather than a necessity peripheral device connected to the Personal Computer (PC) via the parallel port or USB port. It allows you to digitise a flat, paper image and transfer it to your computer where the image can be manipulated. For instance you may use it for digitizing old photographs that can be stored on the hard drive, repaired, enhanced and printed out on a printer.

Fig. 1.7: A Scanner

Barcode Readers

Barcode reader is an input device for reading printed barcodes. We can also say it's a special scanner for barcodes. You all must have seen barcodes, that are printed on most of the products we use in our daily life. It looks like thin and thick series of black lines as shown below in figure 1.8:

Fig. 1.8: Example of a Barcode

Barcode reader consists of a light source, a lens and a light sensor interpreting optical impulses into electrical signals. Furthermore, almost all barcode readers contain decoder circuitry analysing the barcode's image data provided by the sensor and sending the barcode's content to the scanner's output port.

The barcode reader types can be classified based on the scanning methods; some of these types are described below:

Pen Readers

It requires the operator to swipe the pen over the code. Pen type readers consist of a light source and a photodiode that are placed next to each other in the tip of a pen or wand. A pen reader is shown below in figure 1.9.

Fig. 1.9: Pen Type Barcode Readers

To read a barcode, the tip of the pen moves from corner to corner the bars in a stable shift. The photodiode measures the intensity of the light reflected back from the light source and produces a waveform that is used to measure the widths of the bars and white spaces in the bar code. Black bars in the bar code absorb light and white spaces reflect light so that the voltage waveform produced by the photo diode is a representation of the bar and space pattern in the bar code. Further, the scanner decodes this waveform.

Laser scanners

Laser scanners as shown below in figure 1.10, work similar like a pen readers except that they use a laser beam as the light source and normally utilise either a reciprocating mirror or a rotating prism to scan the laser beam back and forth across the barcode.

Fig. 1.10: Laser type Barcode Readers

CCD Readers

Charge Coupled Device readers also called as LED scanner, use an array of hundreds of tiny light sensors queued up in a row in the head of the reader, it is shown in figure 1.11. Every sensor measures the intensity of the light immediately in front of it.

Fig. 1.11: LED Barcode Readers

The important difference between a LED reader and a pen or laser scanner is that the LED reader is measuring emitted ambient light from the bar code whereas pen or laser scanners are measuring reflected light of a specific frequency originating from the scanner itself.

Camera-Based Readers

Two dimensional imaging scanners or camera based barcode readers are the newest types of barcode reader currently available. They use a small video camera to capture an image of a bar code as depicted in a figure 1.12. The reader then uses digital image processing techniques to decode the barcode.

Fig. 1.12: Camera based Barcode Readers

Speaker

Computer speakers shown in figure 1.13 or multimedia speakers, are external speakers, commonly equipped with a low-power internal amplifier.

Fig. 1.13: A Set of Computer Speaker

Modem

A modem enables a computer to transmit data over telephone or cable lines. Computer information is stored digitally, whereas information transmitted over telephone lines is transmitted in the form of analog waves. A modem converts between these two forms. Modems come in two forms: Internal and External; Internal modems are PCI cards that you can connect as shown in the figure 1.14a. In figure 1.14b External modem is shown, that are kept outside of your computer, connected either by a USB or Serial Port.

Fig. 1.14a: Internal Modem

Fig. 1.14b: External Modem

Radio-Frequency Identification (RFID)

RFID architecture works like a small area (generally in few meters) client-server network based on radio frequencies for communication between client and server. It has two component RFID Client Tag and RFID server or antenna or receiver. RFID tag is applied or incorporated into an object or a product for the purpose of identification and tracking using radio waves. RFID tag is an integrated circuit for storing and processing information, modulating and demodulating a radio-frequency (RF) signal, and other specialised functions. The receiver or antenna is for receiving and transmitting the signal. There are generally three types of RFID tags as shown below in the table 1.1:

Table 1.1: Classification of RFID tags

ACTIVE RFID TAGS	Contain a battery and can transmit signals autonomously.
PASSIVE RFID TAGS	Have no battery and require an external source to provoke signal transmission.
BATTERY ASSISTED PASSIVE (BAP)	Require an external source to wake up but have significant higher forward link capability providing great read range.

Among the many uses of RFID equipments, one is its implementation in libraries. This technology has gradually begun to replace the conventional barcodes on library items. The RFID tag can contain many identifying information, such as a book's title, author's name, publication year, publisher name, book type, etc. This information is read by an RFID reader, which replaces the standard barcode reader. The RFID tag used on products or library materials typically measures 50 mm X 50 mm. It may replace or be added to the barcode to provide an innovative and easier way for other inventory management also. It can also act as a security device, taking the place of the more traditional electromagnetic security strip and not only the books, but also the membership cards could be fitted with an RFID tag.

Self-Check Exercise

Note: i) Write your answers in the space given below.

ii) Check your answers with the answers given at the end of this Unit.

1) What is a significance of ALU in CPU?

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2) Calculate the number of bits in two-kilobytes.

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3) How inkjet printers work?

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4) Differentiate between LED and Pen type barcode readers.

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5) How RFID technology can be useful for library management?

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1.3.2 Computer Hardware

In general when we use the term hardware it refers to nuts and bolts available at the hardware shops. Similarly the nuts and bolts of a computer is called hardware, which is a physical, electrical, and mechanical parts of the computer. In the last decade or so, the hardware technologies have seen many changes and also have advanced remarkably. From few kilobytes of RAM (Random Access Memory), now the PCs have couple of Gigabytes of RAM, hard-disks have also improved from few Gigabytes to hundreds of Gigabytes memory space, and also other drives and monitor have also emerged with better performance and cost. In this section we will study about the different internal hardware components of a computer.

CPU (Central Processing Unit)

The CPU is the computer's control center, it appears as shown in figure 1.15. Think of it as the brain that does all the thinking (computation). It reads instructions from your software and tells your computer what to do. The actual CPU is about 1.5 inches square, yet it is the most critical part of the computer. The speed at which the CPU processes information internally is measured in Megahertz (MHz) and Gigahertz (GHz). 1 GHz is equal to 1,000 MHz. Generally; processors with higher MHz or GHz enhance your ability to run creative, entertainment, communication, and productivity applications.

Fig. 1.15: Central Processing Unit

Motherboard

Sometimes called the system board or main board, the motherboard is the main circuit board of a PC. The motherboard (shown in figure 1.16) is the central nervous system and circulatory system, plus much more, all rolled into one. The motherboard typically

contains the processor (or CPU), BIOS (basic input/output system), memory, mass storage interfaces, serial and parallel ports, expansion slots, and all the controllers required to communicate with standard peripheral devices, such as the display screen, mouse, keyboard and disk drive. Collectively, some of the chips, which reside on the motherboard are known as the motherboard's chipset.

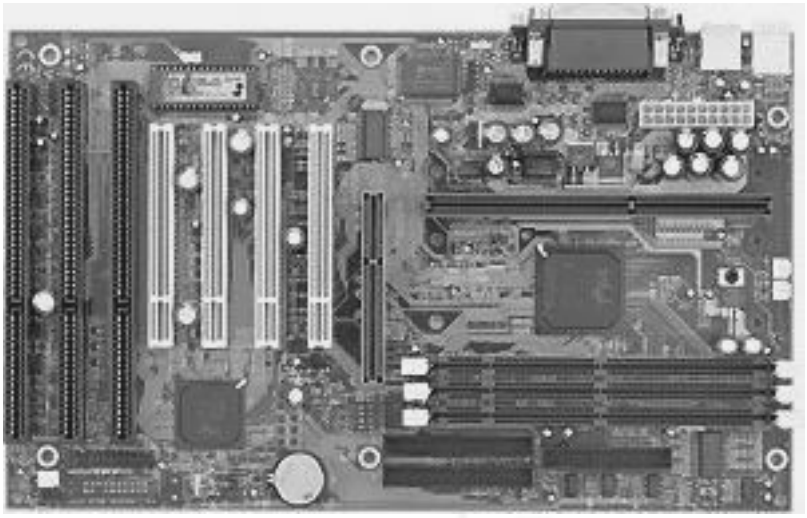

Fig. 1.16: The Motherboard

Power Supply Unit

The Power Supply Unit appears as shown in figure 1.17, is the most important component in a PC. This is the core of the system and is needed to supply power to the motherboard, which in turn, supplies power to all the other components inside and sometimes outside the computer case. Its fundamental function is to convert available power from the wall socket, to the type that a computer can use. It converts 230 volt current and splits it into useable +3.3v, +5v and +12v DC current.

Fig. 1.17: Power Supply Unit

ROM (Read Only Memory)

A type of memory chip which does not lose information even when the power is turned off. Once data is programmed into the ROM chip, its contents cannot be altered. For example, ROM BIOS chips are used to store information for starting up your computer.

RAM (Random Access Memory)

RAM as shown in figure 1.18 are chips that allow data to be written to, however unlike hard disks, the data is short term and is only used for the duration the PC is switched on. Data can be accessed very quickly using this method of temporary storage. Memory comes in many different types and sizes depending on the type of motherboard you have.

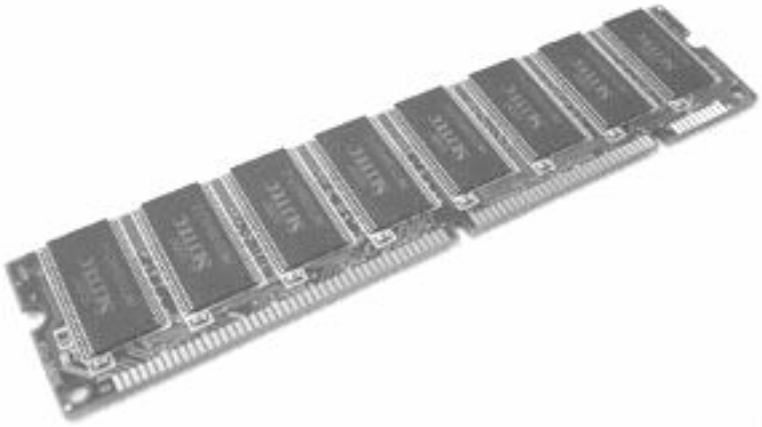

Fig. 1.18: Random Access Memory

Storage Devices

Computers are also known, as data processing machine, to store and process data computer must have memory. There are different kinds of memories like primary memory and secondary memory, primary memories like RAM (random access memory) and ROM (read only memory) is computer personal memory used to process its own data. However, the secondary memory is an off-line memory, which is used to store and carry the data like floppy disk, compact disk, hard disk etc.

Hard disk: It is normally large size memory that a computer uses to store information. Most computers come with one or two hard drives, situated inside the computer cabinet. The terms hard drive and hard disk are used interchangeably. Today's hard disks provide fast access and can hold several gigabytes of information as compared to megabytes on floppy disks. But hard disks are permanently fixed with screws in the computer cabinet; rarely we plug it out because detaching it frequently is not safe. Hence, to carry data we need some removable memory disk, further in this section we have listed some of these removable disks.

Floppy Disk: These are removable disk that stores information magnetically. You can use a floppy disk to read/write information between computers, or to make a backup of your files. Floppy disks are 3.5 inches in diameter and have a storage capacity of 1.44 MB. These are now obsolete.

Zip disks: This is also a removable disk, which can store 100 - 250 MB of data. A special 3.5" removable disk drive is needed to retrieve the information from the computer and write to the zip disk. An external zip drive can be moved from one computer to another.

Cartridge tapes: These are magnetic tapes similar to cassette tapes used for the purpose of storage and backup. Since the information is stored sequentially, in the cartridge tapes, backup and retrieval of stored information is slower. The advantage of tape is that they can be purchased with large storage capacities (1– 4 GB) allowing the entire contents of the hard drive to easily fit on one tape.

CD-ROMS: Compact disks can store approximately 650-800 MB of data or 74-80 minutes of music. These drives are read only and cannot be used for recording data.

Read/Write CD-ROMS: CD-ROM drives that write, rewrite and record data. Two types of CD-ROM disks are used: CD-Recordable (CD-R) and CD-Read/Write (CD-R/W). CD-R/W's can only be "read" by CD Read/Write drives, while CD-R disks can be read by most CD-ROM drives.

Digital Video Disc (DVD): A digital video disc (DVD) is a type of optical disc storage technology that looks like a CD-ROM disc, but can store greater amounts of data. DVDs are often used to store full-length movies and other multimedia content that requires large amounts of storage space. But to run the DVD we should have a DVD drive.

USB/Flash Drive: USB drives are very popular removable disks in current time. It is a plug-and-play portable storage device that uses flash memory and is lightweight enough to attach to a key chain. These drives can be used in place of a floppy disk, zip drive disk, or CD. When the user plugs the device into their USB port, the computer's operating system recognises the device as a removable drive. Unlike most removable drives, a USB drive does not require rebooting after it is attached, do not require batteries or an external power supply, and is platform independent. Several USB drive manufacturers offer additional features such as password protection, and downloadable drivers that allow the USB drive to be compatible with older systems that do not have USB ports. USB drives are available in capacities ranging from 1GB to 32 gigabytes GB.

Self-Check Exercise

Note: i) Write your answers in the space given below.

ii) Check your answers with the answers given at the end of this Unit.

6) What is BIOS?

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7) How DVDs are different from CDs?

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1.4 OPERATING SYSTEM

In contrast to the hardware, software are the non-physical components of the computer system. A set of instructions is known as programs and a set of programs, which gives a finite output, is called software. Operating system is the first software that you work on the first time or whenever you start your computer. Computers need something to manage all the hardware components and give an interactive interface to control these hardware devices, which are taken care by the computer operating system. There are different operating systems available like Microsoft Windows based operating systems like Windows 7 or UNIX or Linux variants etc. In this unit we will discuss Linux based operating system Ubuntu. Linux is a freely available, open source, Unix-like operating system. Written originally for the PC by Linus Torvalds, with the help of many other developers across the Internet, Linux now runs on multiple hardware platforms. Because of its speed, stability, and low cost, Linux became the fastest growing operating system

for servers. Today, Linux is widely used for both basic home and office uses. It is the main operating system used for high performance business and in web servers. Linux has made a huge impact in this world. Now days there are many Linux based operating systems available. Some of its most popular flavours are Red Hat Linux, Fedora and Ubuntu. Most of the Linux based operating system has the following given features, however these may vary from version to version:

- **Low Cost/Free:** Linux and much of its software come with the GNU General Public License and hence it is free and open source.
- **Stability:** Linux has high stability compared with other operating systems. There is no need to reboot the Linux system to maintain performance levels.
- **Performance:** Linux provides high performance on various networks. It has the ability to handle large number of users simultaneously.
- **Networking:** Linux provides a strong support for network functionality; client and server systems can be easily set up on any computer running Linux. It can perform tasks like network backup faster than other operating systems.
- **Flexibility:** Linux is very flexible and can be used for high performance server applications, desktop applications, and embedded systems. You can install only the needed components for a particular use. You can also restrict the use of specific computers.
- **Compatibility:** It runs all common Unix software packages and can process all common file formats.
- **Fast and Easy Installation:** Linux distributions come with user-friendly installation.
- **Better use of Hard Disk:** Linux uses its resources well enough even when the hard disk is almost full.
- **Multitasking:** Linux is a multitasking operating system. It can handle many things at the same time.
- **Open Source:** Linux is an Open source operating systems. You can easily get the source code for Linux and edit it to develop your personal operating system.

1.4.1 Ubuntu Operating System

Ubuntu is an operating system based on Linux that is also developed by a worldwide community of programmers. Ubuntu is based on the concept of free or open-source software, meaning that you do not pay any licensing fees for Ubuntu, and you can download, use, and share the operating system free of charge. Being a Linux-based operating system, Ubuntu has a well-deserved reputation for stability and security. Ubuntu is generally acknowledged to be the most widely used version of Linux available.

Comparing Ubuntu with Windows

Before starting with Ubuntu, it is very important for us to understand the differences between Windows and Ubuntu. The most noticeable way is licensing and distribution terms can be used to differentiate between Ubuntu operating systems and Microsoft Windows. Ubuntu is open software and it's completely "free software" free means the freedom to run, use, modify, redistribute copies, and release your improvements to the public. In addition to this it includes many of the software's used for everyday computing at no cost, unlike Windows. Some of these are given below:

Office Suite: A full office suite with a word processor, spreadsheet, and presentation software that can read and write in .doc, .xls, and .ppt formats and can also output to PDF.

Desktop Email Client: Evolution, an email program with a similar interface to Microsoft Outlook.

Web Browser: Firefox, the increasingly popular Web browser.

Others Software: Ubuntu's online Applications Guide lists some Ubuntu-compatible applications that allow you to edit images, listen to and manage music, edit and watch videos, read PDFs.

Updates and bug fixes: Frequent security updates and bug fixes for applications and the operating system are managed by Ubuntu which makes its working robust and bug free.

Start Linux Ubuntu

The following are few important steps and procedures will be helpful to install Ubuntu operating system, however it is important for you to check the minimum hardware requirements for Ubuntu installation as it may varies from version to version. As shown below in the figure 19 this screen appears as first boot screen, as you can see it has many options with an advice that for desktop or laptop installation default installation is suitable, however it can show some more option on press of F1 key.

Fig. 1.19: Ubuntu the First Boot Screen

As we are doing this installation for a desktop, let's prefer default option and press enter. We advise you not to go for server install unless you completely know about it. After you Press Enter, you may find a cluster of internal installation line scroll on the screen as shown below in figure 1.20, but it is normal processing so ignore it.

Fig. 1.20: Ubuntu Internal Installation Process on the Screen

After this Ubuntu will ask few questions to complete your personalised setting for language, time zone, username and password. In addition to these questions there are a few other questions that may cause some confusion. During installation it shows the status of the process being completed as shown below in figure 1.21.

Fig. 1.21: Status of the Process

When it will ask for Partitioning choose the Erase Entire Hard Drive option, if you are not installing Ubuntu with any other operating system on your computer. The boot loader determines which operating system the computer boots to. Hence, It is recommend to install Grub a boot loader to the MBR (Master Boot Record). Now you need to reboot your computer to install the other packages, if you are asked to drive out the installer disk, you can take it out as for further this disk is no more needed. If boot loader Grub is not installed in MBR as advised earlier you have to use boot-floppy or some other boot loader to finish the installation process. Once that finishes, you should get to a login screen as shown below in figure 1.22. Now you need to enter your recently created username and password during the installation process.

Fig. 1.22: Ubuntu Login Screen

1.4.2 Ubuntu File System

Before working on the operating system it is always important to understand the file system i.e. how files and folders or directories are organised in Linux.

Boot Directory: It has the boot information, including the Grub configuration file.

etc Directory: This has a lot of settings for software repositories you use and what other partitions or drives you have "mounted".

Home Directory: This is the only directory you will have access to without using your password to gain temporary administrator privileges. All of your files reside here, along with your settings and preferences, inside a folder called /home/username unless are not installed in a particular folder. So if your username is naveen, your files and settings will be in the /home/naveen folder.

Media Directory: or /mnt are where your media (CDs, DVDs, USB drives, etc.) and mounted partitions would go.

Root Directory: is the /home folder for root and has its own settings.

Usr Directory: is where a lot of stuff is stored that users will be using.

1.4.3 Common Commands and Utilities

The following are some of the basic commands you should know for working on any linux based operating system:

startx — If you happen to end up at a command-prompt without any graphics, you can log in and try typing this command to get back to the graphical (or "x") system.

xkill — Kills a misbehaving application. Once this command is run, the mouse cursor will become a skull and crossbones. Any window you click on after that will close immediately.

alias — Alias is used to substitute a small or more familiar name in place of a long string. It is commonly used for a long strings that are frequently used.

awk — awk utility is powerful data manipulation/scripting programming language (In fact based on the C programming Language). Use awk to handle complex task such as calculation, database handling, report creation etc.

cd — The cd sets the working directory of a process.

chmod — Chmod is a utility that changes the permission of a file.

chown — Chown is a utility that is also used to change file ownership.

cp — The cp command is used to copy files.

date — An essential command to set the date and time. Also a useful way to output current information when working in a script file.

df — The df command reports filesystem disk space usage. With no arguments, 'df' reports the space used and available on all currently mounted filesystems (of all types). Otherwise, 'df' reports on the filesystem containing each argument file.

pwd — To know the current working directory

ln — The ln command makes new, alternate file names for a file by hard linking, letting multiple users share one file. The ln command creates pseudonyms for files which allows them to be accessed by different names. These pseudonyms are called links. There are two different forms of the command and two different kinds of links that can be created.

ls — The ls command shows information about files. It lists the contents of a directory in order to determine when the configurations files were last edited.

man — Short for "manual," man displays information about commands and a keyword search mechanism for needed commands.

passwd A quick and easy way to change passwords on a system.

Shutdown Shutdown is a command that turns off the computer and can be combined with variables such as -h for halt or -r for reboot.

top Top provides an ongoing look at processor activity in real time. It displays a listing of the most CPU-intensive tasks on the system, and can provide an interactive interface for manipulating processes.

vmstat The vmstat command is used to get a snapshot of everything in a system, helping admins determine whether the bottleneck is CPU, memory or I/O. Run this command to get virtual memory statistics. vmstat reports information about processes, memory, paging, block IO, traps, and cpu activity.

Self-Check Exercise

Note: i) Write your answers in the space given below.

ii) Check your answers with the answers given at the end of this Unit.

8) What are various features of Linux based operating system? List them.

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9) How Ubuntu is different from Windows operating system?

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1.5 SUMMARY

ICT is changing all most all aspects of our daily life and lifestyle. If we just see lot of computation and communication is happening around us, either when we check the examinations result on mobile or when we withdraw money from the banks ATM. The influences of ICT revolution are also felt in our Library system. In this unit, we introduced you to the computer hardware technology, how it works and what it is. The peripherals devices like RFID and Barcode reader; those are particularly used in libraries are also discussed. In addition, the fundamentals of Ubuntu- Linux based operating systems have been covered. We have given few basic steps, which will be useful for a learner during the installation of Ubuntu operating system. Further this unit explained about the file system of Ubuntu and few commands and utilities, which will be useful for working on this operating system.

1.6 ANSWERS TO SELF CHECK EXERCISES

1) The Arithmetic Logic Unit (ALU) and the Control Unit (CU) together are termed as the Central Processing Unit (CPU). The CPU is the most important component

of a computer's hardware. The ALU performs the arithmetic operations such as addition, subtraction, multiplication and division, and the logical operations. The control unit interprets instructions and produces the respective control signals.

2) One kilobyte stands for 2^{10} bytes which 1024 bytes so 2 kilobytes will be 2048.

3) Inkjet printers use small cartridges full of different colour inks. They squirt a tiny drop of ink onto the paper using a bubble or pressure to form a dot. All the dots are layered on top of each other to form the desired colour.

4) The important difference between a LED reader and a pen or laser scanner is that the LED reader is measuring emitted ambient light from the bar code whereas pen or laser scanners are measuring reflected light of a specific frequency originating from the scanner itself.

5) RFID technology has gradually begun to replace the conventional barcodes on library items. The RFID tag can contain bibliographic data of a particular book, which replaces the standard barcode reader. It may be used to provide an innovative and easier way for inventory management as well. It can also act as a security device, taking the place of the more traditional electromagnetic security strip. Apart from the books, membership cards could be fitted with an RFID tag.

6) The Basic Input Output System (BIOS) is software stored on a small memory chip on the motherboard. BIOS instructs the computer on how to perform a number of basic functions such as booting and keyboard control. It is also used to identify and configure the hardware in a computer such as the hard drive, optical drive, CPU, memory, etc.

7) CDs and DVDs are optical discs that are used to store data. Both are similar in composition and usage, however DVDs offer more data storage capacity compared to CDs. CDs are commonly used for audio and program files, while DVDs are used for video and program files.

8) Most of the Linux based operating system has the following given features:

- **Low Cost/Free:** Linux and much of its software come with the GNU General Public License and hence it is free and open source.
- **Stability:** Linux has high stability compared with other operating systems. There is no need to reboot the Linux system to maintain performance levels.
- **Performance:** Linux provides high performance on various networks. It has the ability to handle large number of users simultaneously.
- **Networking:** Linux provides a strong support for network functionality; client and server systems can be easily set up on any computer running Linux. It can perform tasks like network backup faster than other operating systems.
- **Flexibility:** Linux is very flexible and can be used for high performance server applications, desktop applications, and embedded systems. You can install only the needed components for a particular use. You can also restrict the use of specific computers.
- **Compatibility:** It runs all common Unix software packages and can process all common file formats.

- **Fast and Easy Installation:** Linux distributions come with user-friendly installation.
- **Better use of Hard Disk:** Linux uses its resources well enough even when the hard disk is almost full.
- **Multitasking:** Linux is a multitasking operating system. It can handle many things at the same time.
- **Open Source:** Linux is an Open source operating systems. You can easily get the source code for Linux and edit it to develop your personal operating system.

9) The most noticeable difference is licensing and distribution terms of Ubuntu operating systems and Microsoft Windows. Ubuntu is open software and it's completely "free software" free means the freedom to run, use, modify, redistribute copies, and release your improvements to the public. In addition to this it includes many of the software's used for everyday computing at no cost, unlike Windows.

1.7 KEYWORDS

ALU : Abbreviation of **a**rithmetic **l**ogic **u**nit, is one component of the CPU (central processing unit) that performs all arithmetic computations, such as addition and multiplication, and all comparison operations.

Barcode : The machine-readable representation of the Universal Production Code (UPC). Bar codes are read by a scanner that passes over the code and registers the UPC. The width of each black line and the subsequent white space between each line coincides with the numbers of the UPC.

Bit : Short for **bi**nary digi**t**, the smallest unit of information on a machine. The term was first used in 1946 by John Tukey. A single bit can hold only one of two values: 0 or 1.

Byte : Abbreviation for binary term, a unit of storage capable of holding a single character. A byte is equal to 8 bits.

CPU : CPU is the abbreviation for **c**entral **p**rocessing **u**nit. Sometimes referred to as the central processor or simply processor, is the brains of the computer where most calculations take place. In terms of computing power, the CPU is the most important element of a computer system.

CU : Short for **c**ontrol **u**nit, it is a typical component of the CPU that implements the microprocessor instruction set. It extracts instructions from

memory and decodes and executes them, and sends the necessary signals to the ALU to perform the operation needed.

GRUB : Short for GNU GRand Unified Bootloader is a boot loader package from the GNU Project which provides a user the choice to boot one of multiple operating systems installed on a computer or select a specific kernel configuration available on a particular operating system's partitions.

RFID : Short for **r**adio **f**requency **id**entification, a technology similar in theory to bar code identification. An RFID system consists of an antenna and a transceiver, which read the radio frequency and transfer the information to a processing device, and a transponder, or tag, which is an integrated circuit containing the RF circuitry and information to be transmitted. RFID systems can be used where a unique identification system is needed.

1.8 REFERENCES AND FURTHER READING

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Websites:

http://www.ubuntuforums.org/

http://www.ubuntulinux.org/