MODULE

Information Communication Technology Skills

AEU 07104

Institute of Adult Education
Adult and Continuing Education Studies Department
Bachelor of Adult and Continuing Education – Through ODL

Copyright

Institute of Adult Education

Bachelor of Adult and Continuing Education – Through ODL

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Acknowledgements

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Director

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Contents

About this module

This module has been produced by the Institute of Adult Education. All modules are structured in the same way, as outlined below.

How this module is structured

The module overview:

Dear learner, the module overview gives you a general introduction to the module. Information contained in the module overview will help you determine:

- If the module is suitable for you
- What you will need to know
- What you can expect from the module
- How much time you will need to invest to complete the module.

The overview also provides guidance on:

- Study skills
- Where to get help
- Unit assignments and assessments
- Activity icons
- Units

We strongly recommend that you read the overview *carefully* before starting your learning

The module content:

The module is broken down into units. Each unit comprises:

- An introduction to the unit content
- Terminologies
- Core content of the unit with a variety of learning activities

- Unit reflection
- Unit assignments

Resources:

For those interested in learning more on this subject, we provide you with a list of additional resources at the end of this module.

Your comments:

Dear learner, after completing this module, we would appreciate it if you would take a few moments to give us your feedback on any aspect of this module. Your feedback might include comments on:

- Module content and structure
- Module reading materials and resources
- Unit assignments
- Module assessments
- Module duration
- Module support (assigned tutors, technical help, etc.)

Your feedback will help us to improve this module.

Module overview

Welcome to this module

Dear learner, as a prospective adult education facilitator or expert, you will learn Information and Communication Technology (ICT). This module comprises four units. The first unit introduces you to the fundamental concepts, terms, and theories of ICT. The second unit covers the fundamentals of computers systems, terms, components, and applications. The third unit presents data communication devices, networks, the internet, and a website. We hope you will enjoy studying this module. Welcome!

General competence

Dear learner, upon completion of this module, you should be able to gain knowledge, analytical skills, and an understanding of the various applications of ICT tools. It will also help you understand the fundamentals of computer systems, computer components, computer networks, the internet, and websites. This module will enable you to fulfil your duties and responsibilities as a learner and future adult education facilitator.

Study skills

Essentially, you will be taking control of your learning environment. As a result, you will need to consider performance issues related to time management, goal setting, stress management, etc. Perhaps you will also need to acquaint yourself with areas such as essay planning, coping with exams, and using the web as a learning resource.

Your most significant considerations will be time and space, i.e., the time you dedicate to your learning and the environment in which you engage in that learning.

Need help?

Dear learner, in the course of your study, you may need help with various issues such as the location of and how to get support from resource centres, clarification of various issues pertaining to your study materials, i.e., modules, and so on. If this happens, you are advised to ask for help from your centre coordinator or facilitator. You can also visit the website of the Institute of Adult Education, which is www.iae.ac.tz, or call +255 22 2150838 and ask for help.

Module assessment

After each unit, you will be required to attempt a one-unit assignment. This is not meant for submission, rather, for reflection on what you have learned in the whole module. You will also do tests and assignments for submission as guided by your module facilitator. Finally, you will sit for semester examinations to accomplish your assessment.

Getting around this module

Margin icons

While working through this MODULE, you will notice the frequent use of margin icons. These icons serve to "signpost" a particular piece of text, a new task or change in activity. They have been included to help you to find your way around the MODULE.

A complete icon set is shown below. We suggest that you familiarize yourself with them and their meaning before starting your study.

 Reflection	 Assessment	 Assignment	 Help
 Learning Outcomes	 Module Outcome	 Help	 Reflection

Unit 1

Fundamental Concepts, Terms and Theories in Information Communication Technology

Introduction

Dear learner, welcome to the first unit of this module. Unit one will introduce you to fundamental concepts, terms, and theories in ICT. Welcome.

Learning Outcomes

Dear learner, upon completion of this unit, you should be able to:

- explain the key concepts of ICT and the related terms;
- describe the distinct roles and impacts of ICT; and
- explain the various applications of ICT tools.

Information and Communication Technology

Dear leaner, why is ICT literacy vital to success in today's world?

In modern times, the entire world is dependent on ICT, as the entire system of daily life tasks is totally based on the extensive usage of ICT tools. This shows that ICT has become an incredible part of human life and will continue to dominate a major part of the daily lives of humans. Figures 1.1 and 1.2 highlight these concepts.

Figure 1.1: ICT infrastructure

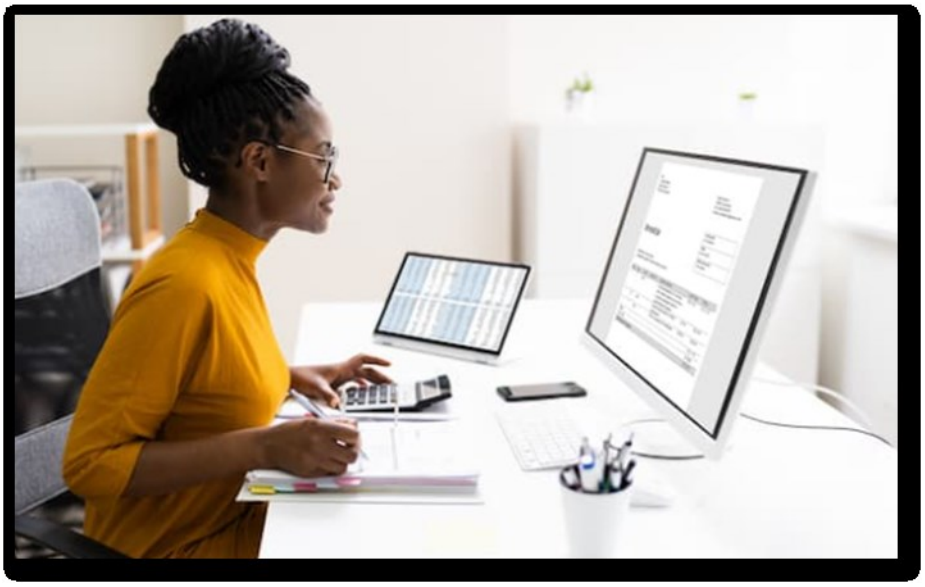


Figure 1.2: ICT tools in the working environment

Dear leaner, ICT tools are regarded as having great potential to promote development in key social and economic areas where a shortage of knowledge and local capacity obstructs development.

In the years between the 1980s and 1990s, much of the ICT focus was on how to reengineer the likes of financial institutions, manufacturing, retail, service, and government. These technology deployments were largely pursued and justified on the grounds of reducing costs and enhancing competitiveness by speeding communications.

Dear leaner, in recent years, the word information communication technology has been used so often and applied to so many situations. ICT has served a critical role in shaping society and culture, as well as sectors such as education, health, business, economics, etc., so it is important to examine ICT from the broadest perspective possible to truly appreciate the depth and complexity of this field and thereby understand the opportunities. Despite the importance and opportunities offered by ICT, its definition remains elusive.

Dear Learner, let us start with the background related to ICT. The term ICT originated from the word **telecommunications**, which has its roots in Greek: **tele** means "over a distance or far," and **communicara** means "the ability to share." Hence, telecommunications literally mean "the sharing of information over a distance.

Therefore, the term ICT can be defined **as** the capability (knowledge, skills, and aptitude) of a person to identify, search effectively for, and present specific information using the various computerized electronic devices in order to build knowledge and develop critical and creative thinking relevant to a field of study. This computer-based information communication environment supports the creation, sharing, and distribution of information. The solutions that address business needs, reduce costs, or enhance operations by speeding business processes and aiding communications using ICT are called ICT tools. Not surprisingly, some of the industries that are being most radically revolutionized by ICT tools are those that deal with the human senses, including health care, education, engineering, marketing, entertainment, etc. The best way to learn ICT is to quickly examine how it is changing education systems and lifestyles.

Role and impact of ICT

The integration of ICT tools brought revolution and significant changes in all fields. ICT is changing the way you live, work, play, socialize, entertain, serve, study, teach, rest, see a doctor, get a date, protect, shop for various products, and stay in touch, creating significant changes in how you use your time and money. In fact, ICT affects what, where, and how you do everything.

The success of South Korea and Taiwan, for example, heavily lies in their supply of ICT products and components to the world market, while that of Hong Kong and Singapore is in ICT-related trading and manufacturing. Subsequently, Malaysia, Thailand, and most recently China have all followed suit in ICT-related manufacturing and packaging. India has emerged as a world leader in software development since the mid-1990s.

impact of ICT

ICT has potential impact in various sectors. Flexible automation technologies and organizational innovations are being combined into new best-practice manufacturing systems and service providers. hardware production, particularly personal computers (PCs), as well as software development and services. These potential contributions could directly increase economic growth

and indirectly influence price and income structures.

Adoption of ICT in various service sectors has major implications. This is due to their impact on fundamental processes and organizational changes in different sectors, including product distribution, financial services, engineering, insurance, marketing, transportation, etc. This impact is, however, not restricted only to economies; it certainly has spill over effects on education, consumer behaviour, and quality of life.

Countries that have a relatively large pool of skilled or semiskilled labour with some knowledge of ICT are found to excel in ICT-enabled service activities. The impact of ICT includes various types of services, such as:

- handling of large volumes of marketing and post-sale service-related telephone communications with existing or potential customers (call centres);
- Data entry,
- Digitalization,
- insurance claim processing
- Design and maintenance of web sites, etc.

Application of ICT

Dear Learner, the coming section will talk in detail about the application of ICT. There are large economic incentives (huge cost savings) due to the use of ICT tools, with which the user is able to access, transmit, store, and manipulate information.

Here are some examples of the use of ICT tools:

a) Telephony, e-mail, and information services permit contact between friends and families and offer convenience to people in their day-to-day lives. Thus, they have major economic and social implications.

b) In the business arena, ICT offers business efficiency and enables the creation of new business activities. Thus, they have major employment and economic implications.

c) Multimedia and the Internet offer new audio, video, and data services that affect entertainment.

d) In education, ICT offers a lot in the teaching and learning process. These new services are overlapping with traditional

radio and television broadcasting, and major cultural implications are emerging.

e) Government applications of ICT affect the efficiency of government. Defense, national security, and crime-fighting applications are bringing with them major implications. News delivery influences people's perceptions of governments and their own wellbeing, thereby influencing voter attitudes.

Unit Reflection

Dear learner after the completion of this unit, it would be better if you could reflect on the following: What is this unit? The ICT-related theories, ICT definitions and terms, roles, impact, and application of ICT in human development.

Unit Assignment

Attempt the following questions:

1. Asks the questions related to ICT concepts and the related terms.

2. List down at least five applications of ICT in relation to your visit.

3. What is the impact of using the ICT facility you visited in relation to human daily activities?

Unit 2

Fundamental of Computer System, Terms, Components and Its Applications

Dear learner, this unit elaborates on the computer systems in the most detailed and easily comprehensible way. As a learner, you will be able to get a deep insight into computer systems. The unit starts by introducing computer systems. It defines some computer terms and classifies computers according to their design and purpose.

The unit will also introduce you to various computer system components, including its hardware and software, which are major components of computer systems. The unit also establishes relationships between the hardware and software. It also informs the learner about the various computer components across various verticals of the computer system.

Learning Outcomes

Upon completion of this unit, you should be able to:

- define computer systems and terms (hardware, software;
- explain the fundamentals of computer systems;
- explain the types of computers;
- describe computer components (including input and output devices);
- describe the different functions of input devices, system units, and storage devices;
- understand the relationship between hardware and software; and
- explain the different applications of computer systems.

Why Computer?

Dear learner, do you know that nowadays the entire world is dependent on the technology of the computer? If you know this, congratulations! But if you are still in doubt, relax! as this unit will inform you about computer technology.

Dear leaner, the computer has become an incredible part of human life and will continue to dominate a major part of the current world of digitization. The computer itself holds paramount importance in different activities (such as education, industries, health, business, etc.). All sectors now are digitized in some way or another, and many people rely on technologies and computer systems for their professions. Computer systems have become the soul of every operation in different fields. Dear Learner, let us now explore the computer system in the next unit.

Fundamentals of a Computer System

Dear leaner, do you know what a computer system is?

Generally, the term is used to describe a collection of devices that function together as a system. The entire system of the computer is made of different components. These components were used to convert data into meaningful information. These components act together in the direction of producing, distributing, and/or processing information.

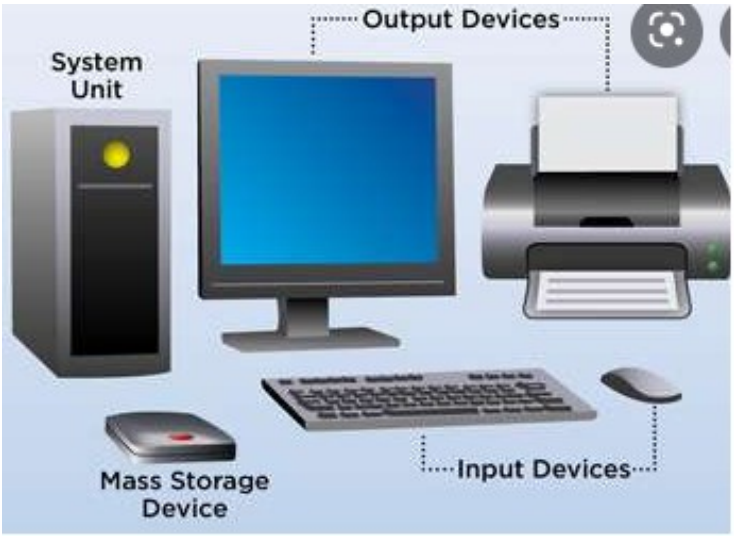
The major components are the hardware and software. These are the interconnected electronic components, mainly in the main cabinet. Apart from the major components, there are several peripheral or auxiliary devices that are connected to form the computer system and play a significant role in the operation of the computer.

The modern computer is not only considered a numeric calculator; it is also a kind of multimedia device that displays images, video, and sound through operating systems along with the applications that actually provide unique control over the relevant information to the user.

A computer system can be defined as a machine that can solve any problem by accepting data, performing certain operations on that data, and then presenting the results of those operations. Another acceptable definition of a computer system is one that is able to take a set of inputs, process them, and create a set of outputs while operating under the control of instructions stored in its own memory.

One of the important factors of a computer-based system is its

exactness or accuracy. This factor may not apply to other kinds of systems. Basically, a computer system is made up of five components. These components are hardware components, software, data, the network, and the user. These five components function together to perform input, processing, output, feedback, and control.



Source 2.1: https://www.gettyimages.com/photos.

Types of computers by Design

Depending on the logic it uses, a computer is generally thought to be designed in two types, either analogue or digital.

Analogue Computers

These are the computers that perform arithmetic operation and logical comparisons by measuring changes in physical magnitude e.g., Electronic voltage, pressure changes, temperature changes etc. These physical variations are analogous to the represented numerical values of the data being processed.

The application of analogue computers is confined to specialized scientific or engineering experiments, manufacturing process etc., temperature variations in chemical process are converted into electronic voltage for analogue computer`s mathematical analysis. Good examples of analogue device include slide rule, car speedometer, thermometer, etc.

Analog computer has the ability to accept inputs, which vary with time and intensity during the computing operation. The output from the analogue computer system may be in the form of graph. The

output signals can be used directly to control the operation of some other machine or process.

Digital computers

These are the most commonly used type of computers. The arithmetic operation and logical operation are based on digits (1s and 0s). These computers can process both numeric and alphanumeric or alphanumeric data. These types of computers are used in wider cross section of application areas such as scientific, industrial and most of the other based data processing applications.

The digital computer also has a unique ability and that is storing large quantities of data. Unlike analogue computers, the digital versions have comprehensive, logical facilities afforded by specialized programming. For stance, the memory storage devices in a digital computer are such as to enable the entire works to e recorded and stored on magnetic/ optical storage devices.

Classification of computers based on size/shapes

Generally, computers are recognized by their power and size. The common categories of the computer system consist of supercomputers, mainframes, and microcomputers. Traditionally, the term “size” refers to the physical mass of a computer. On the other hand, the term “power” refers to the speed as well as complexity of calculations that the computer carries out. In reality, the mainframe computers were much larger than the desktop microcomputers physically. The feature of size is not that significant these days as microelectronics can package powerful systems in very small spaces.

Supercomputers

Supercomputers are known as the most powerful, advanced, and expensive computers of the present era. They are usually characterized as comprising the fastest speeds of processing and doing the complex calculations. At present, those speeds can attain quadrillions of calculations per second. It is projected that the speed will be much faster in upcoming days. For example, in the field of film industry, supercomputers are mainly used to perform rendering operations that eventually transform the digital animations into three-dimensional magical world.

Figure 2.2: NASA Super computers. (Source: https://www.gettyimages.com/photos/super-computer-concept)

Mainframe Computer

Mainframe computer is known as an advanced multiuser device, which is typically used for managing the databases such as financial transactions and communications of major organizations like insurance companies, banks, government offices, hospitals, retail stores, and various other sectors also. As these applications do not need the computational complexity of supercomputers, mainframe computers are still very potent. These computers can easily process billions of commands or instructions per second, provide support to almost hundreds of users, and store trillions of bytes of data. They are quite expensive computers and necessitate the support from the staff to maintain its daily operations. These computers are very dynamic to the performance of various tasks of daily life.

Dear leaner, but it was only the personal computer, which actually transformed the way of thinking and working.

Figure 2.3: Mainframe computer concept. (Source : https://www.gettyimages.com/photos/mainframe-computer-concept)

Personal Computer

Personal computer is a kind of system that utilizes a microprocessor device in order to provide computing to a single specific user. Personal computers include various distinct names as well as configurations comprising microcomputer, desktop, laptop, and tablet. The computing enthusiast who desired his or her own computer systems instead of sharing a big centralized mainframe developed the first personal computer in the year of 1975.

Their efforts were greatly energized in the year 1971 when Intel initially introduced the microprocessor. A microprocessor is defined as the single silicon chip that includes all the elements of a central processing unit (CPU). This mini CPU was not as prevailing as a mini-frame computer, but it was much cheaper and smaller.

It was good for a single user who desired computing ability on the desktop. Altair was the very first microcomputer, which was appeared in the year 1975. It launched the microcomputer revolution. In the year 1977, Commodore Pet and Apple II followed. After that, in year 1981, the IBM PC was appeared. IBM utilized the Intel microprocessor to make office computers for processing of word, databases, and spreadsheets. These applications actually focused on the text-based data so as to

improve the productivity. Microcomputer is a small, relatively inexpensive computer with a microprocessor as its central processing unit (CPU).

Figure 2.4: A micro computer. (Source : https://www.gettyimages.com/photos)

On 24th century, 1984, Apple introduced a distinct kind of microcomputer, which depends on the images as well as sound to interact with the user. Stephen Wozniak and Steve Jobs caught the visions of Bush, Engelbart, and Kay when they transported the first commercial multimedia computer. The Macintosh utilized an operating system with a graphical interface that looked like a standard desktop with folders and a trash can. It was based upon a mouse to change or manipulate the programs and data. It comprised the sound capabilities and introduced itself at the January 1984 debut, dramatically. Right from that day, developments in the hardware technology supported the creation of multimedia computing. At present, a microcomputer is a multimedia machine in every aspect.

Components of a computer system (Hardware and software)

Dear leaner, for the formation of the successfully working computer system, it is very important to have all the essential components assembled with the correct amount of the interconnections between them. Therefore, along with the computer systems, it is very important that the computer systems should include the hardware and software components of the computer. The choice of the hardware and software components that are to be used in the computer system have to be done carefully so as the hardware components work well together along with the software components or programs. It is very important that there is a profound coordination between both the hardware components and

the software components so that the functionality of the computer should not be hampered

Hardware

Computer hardware comprised of input/output device, primary storage (Memory) and secondary, storage, processor, and media devices. Generally, hardware is about all the physical components of computer system. Computer hardware can be defined as the collection of physical elements that comprises a computer system. It refers to the physical components of a computer such as the monitor, keyboard, mouse, computer data storage, system unit, hard drive (HD) disk, etc. all of which are known as the physical objects of a computer system. Computer system is a set of integrated devices that input, output, process, and store data and information.

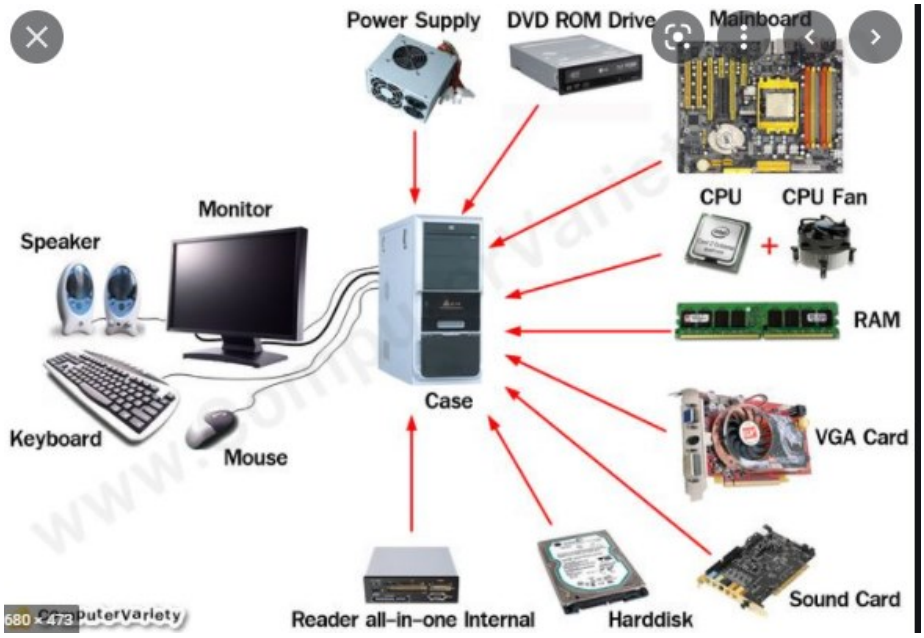


Figure 2.5: Overview of PC hardware. (https://www.gettyimages.com/photos)

(Source):https://www.google.com/search?q=images+of+computer+hardware

Dear learner is my hope that you clearly understand the Concept of hardware. Let us now explore all components of the Computer system (Input, Process and output)

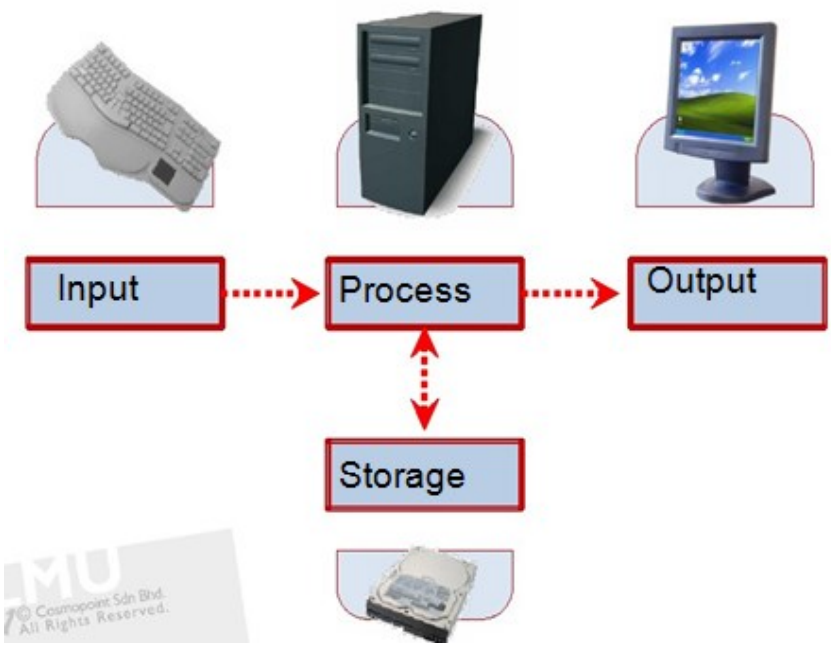


Figure 2.6 (https://www.gettyimages.com/photos)

Input Devices

Input devices are peripheral parts of the computer hardware equipment. These devices are used to provide data as well as control signals to an information processing system like a computer or any other information appliance. They translate data from the data that human understands to the one that computer can work with.

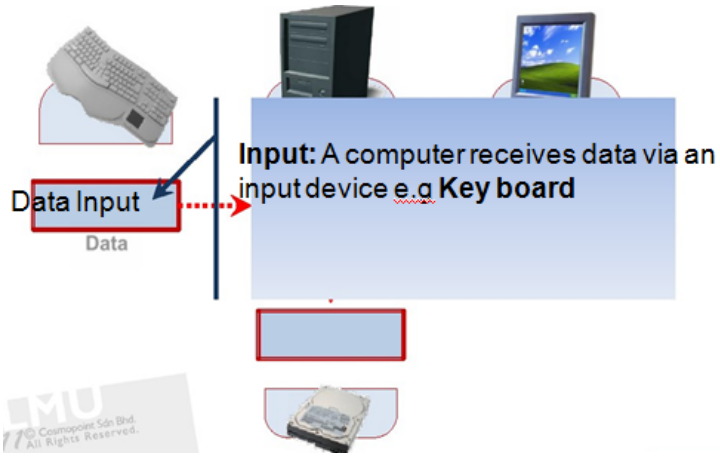


Figure 2.7 (https://www.gettyimages.com/photos)

Example of Input Devices: are Barcode reader, Cameras, Digital camera, Electronic whiteboard, Gamepad, Graphics tablets, Joystick, Keyboard, Microphone; Microphone; MIDI keyboard;

another input Devices are Mouse (pointing device), Pen input, Scanner, Touch screen, Video capture hardware, Webcam. Few of these input devices are briefly described:

A Mouse:

Most of the computer systems come along a mouse. A mouse is known as a pointing device, which is used for selecting the items available on the screen. The designs of some mouse are different, comprising the mouse having a small wheel on the body surface with which people can do additional tricks.

Figure 2.8: Mouse. (https://www.gettyimages.com/photos)

Optical mouse is another advanced pointing device that uses a light emitting component instead of the mouse ball. Mouse cannot be used for entering the data. It is only useful to select the options on the screen. Trackball is a substitute to the mouse. It is a kind of stationary cradle, which has a ball, which can be rolled with fingertips. Laptops provide another alternate way of pointing, the touchpad. It is defined as a pressure sensitive surface, which is built into the keyboard console. It let the movement of cursor by tracing the finger on the touchpad itself.

Keyboards

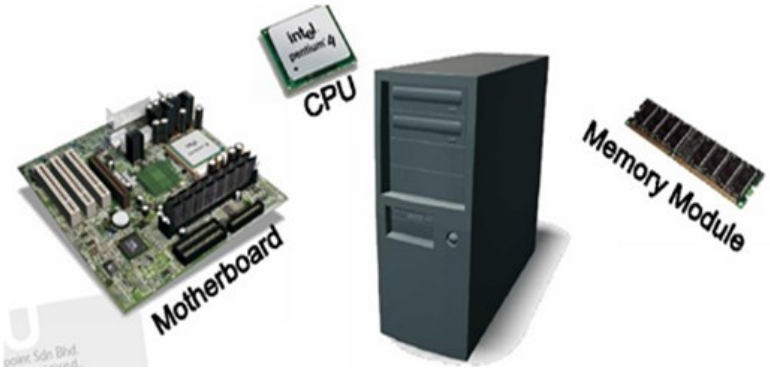
The keyboard is one of the basic ways of entering the information into the computer. Most of the computers have certain types of handheld devices. If a person has used a typewriter, he or she can easily use the keyboard. The keyboard comes in a different variety of styles. Microsoft keyboard has an ergonomic design, which decreases the muscle and tendon strain in the arms, wrists, and elbows.

Figure 2.9 Standard Computer Key Board. (Source: https://www.gettyimages.com/photos)

There are different types of keys on the **keyboard.** e.g. Alphanumeric keys, including letters & numbers. Punctuation keys, such as colon (:), semicolon (;) Question mark (?), Single & double quotes (‘,”) there are also special keys such as arrow keys, control keys, function keys (F1 to F12), HOME, END etc.

A system unit

A system unit is a personal computer component that houses other devices necessary for the computer to function. Inside the System Unit there are several hardware parts, such as Motherboard, CPU, memory modules, power supply, fan, wires, data bus, etc



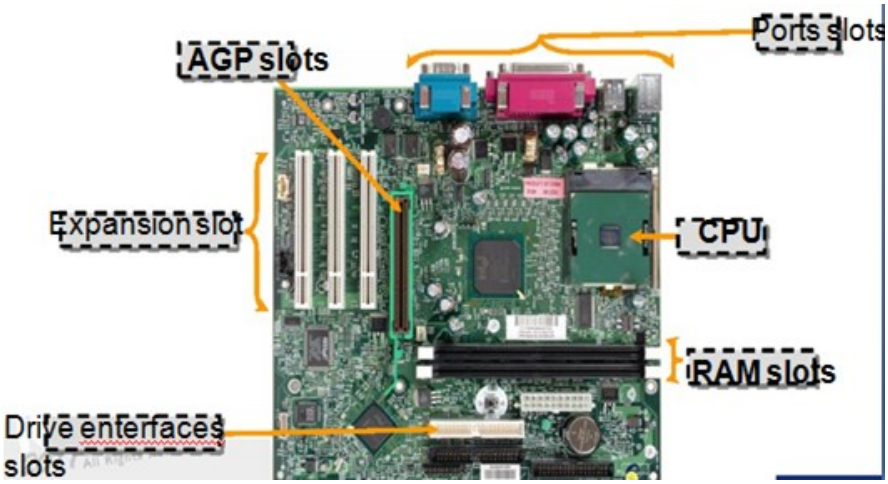


Figure 2.10 (Source: https://www.gettyimages.com/photos)

Central Processing Unit (CPU)

CPU is the unit that reads and executes program instructions. It is mainly responsible for all processes and functions. In context to the computing power. A CPU is known as the brain of a computer. Is the most crucial element of a computer system. The CPU includes three major components:

i. Arithmetic Logic Unit (ALU):

ALU: It performs all logical and arithmetic operations. Logical operations are letters, computer numbers, or special characters. Arithmetic calculations are addition, subtraction, multiplication, and division.

ii. Control Unit (CU): It controls as well as coordinates the components of computer. The following are the functions of the CU.

1. it read out the code for the next instruction to be implemented.
2. Increase the program counter, so it points to the next instruction.
3. Read the data the instruction needs from cells in memory.
4. Provide the required data to an ALU.
5. If the instruction needs an ALU to complete and instruct the hardware to do the desired operations.

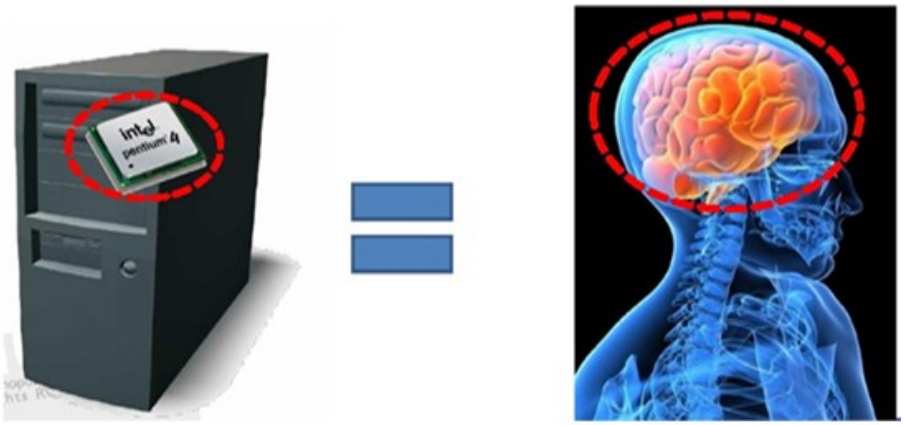


Figure 2.11 (Source : https://www.gettyimages.com/photos)

iii. Computer Memory

Dear leaner, do you know what is a computer Memory?

A memory is an area within a computer system that holds data waiting to be processed. It is the working memory of a computer system. Memory capacity is one of the important components of a computer. The computer stores a character in the storage cells with binary (0,1) mechanism. Thus, the basic unit of memory is a BIT (Binary digit – 0,1). To store a character, a computer requires **8 bits or 1 Byte**. This is called the "word length" of the storage unit. Hence the storage capacity of the computer is measured in the number of words it can store and is expressed in terms of Bytes.

Thus, different of unit measurements are

- 8 bits=1 Byte
- 1024 Byte is referred as 1 Kilo byte (KB)
- 1,000,000 Bytes = 1 Mega Byte (MB)
- 1,000,000,000 Bytes = 1 Giga Byte (GB)
- 1,000,000,000,000 Bytes=1 TB Tera Byte (TB)

The re two types of Computer memory namely Primary memory and Secondary memory. The primary memory is further classified into two types: Random Access Memory **(RAM)** and Read- Only Memory **(ROM) Primary Memory**: The stored data can be recalled instantly and correctly whenever desired. This memory is directly and quickly accessed by the CPU for reading or storing information.

Random Access Memory (RAM): It is a memory scheme inside the computer system, which is mainly responsible for storing or

keeping the data on a temporary basis, so that the processor whenever required can access it quickly. The more RAM you have installed in your computer the better. Because the size of the RAM is increasing all the time. The information in RAM can be “read” and altered at random by the computer.

The more RAM there is, the more programs that can be open simultaneously, and also they run faster. RAM requires a constant supply of electric power, so any information in RAM is lost when the computer is switched off. In nature, it is volatile, which means that the data will be deleted once supply to the storage device is turned off. The main function of RAM is to store data randomly, while the processor accesses the stored data from the RAM storage randomly. RAM is actually considered as ‘random access’ as any memory cell can be accessed directly if the row and column that actually intersect at that cell is known.

Read Only Memory (ROM): ROM It is called Read-only memory as information can only be read from and not written or changed onto ROM. It is the ‘built-in’ memory of a computer. It stores some basic input – output instructions put by the manufacturer to operate the computer. A good example is the ROM-BIOS chip, which contains ‘read-only’ software. Often network cards and video cards, also contain ROM chips.

The contents of ROM are permanently fixed when the chip is made. The information in ROM remains intact even when the computer is switched off. The computer can only “read” what is in ROM, it cannot change or alter it.

ROM does not depend on the power supply. The storage of data and instructions in ROM is permanent i.e., it is non-volatile memory is defined as a permanent form of storage. This means that ROM stays active irrespective of whether the power supply to it is on or off. ROM devices do not allow data stored on them to be modified.

Figure 2.12: ROM. (Source: https://www.gettyimages.com/photos)

Secondary Memory: It is used to store the data, and the data can be retained after the power is turned on again.

1**. Hard Drive (HD):** It is a kind of hard disk, which is a part of a unit, generally known as "Hard Disk Drive," "HDD,". Disk storage is a general category of storage mechanisms where data is recorded by various electronic, magnetic, optical, or mechanical changes to a surface layer of one or more rotating disks.

Figure 2.13 (https://www.gettyimages.com/photos)

They are used to store the data and relatively provide quick access to a huge amount of data on a Processor. A processor is the logic circuitry that responds to and processes the basic instructions that drive a computer. Dear leaner, if a computer was a human, then CPU would be the brain.

Computer software

Dear Learner, in order to grasp the concept of software and understand the different types of software available we first need to cover some basic definitions.

Software is a general term for the various kinds of programs used by a computer. These include several numbers of instructions and procedures which tells the computer how to do things, are also called as programs. Are the kind of program that performs different commands or instructions that are provided by the user?

It is to be noted that the software is an integral part of hardware, and it controls the series of operations. The computer hardware components can only work if the software components are added to the computer system. Else, the hardware components cannot function.

Dear learner, also it can be said that, computer software is a collection of the computer programs as well as relevant data that eventually provides the crucial instructions for telling a computer system what to do and how to do. Software is any set of instructions that escorts the hardware and tells it how to complete each task. Specifically, they are categorized into two classes namely **Systems software** and **Application software.**

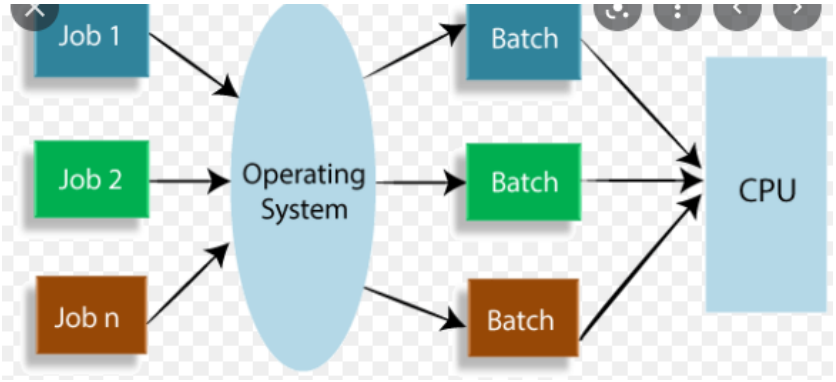


Figure 2:14: Types of software. (Source) https://www.google.com/search?q=computer+software

(i) System Software

Dear learner, as a matter of fact, every computer system will function only with the proper operating system. It is very important

for a computer system to have an operating system installed, and all the hardware components should be compatible with that operating system.

Computer system software is computer software, designed to control the computer hardware to provide fundamental functionality as well as a platform for running application software. Within System software, a main component is the operating system or OS. The Operating System is a collection of software that manages computer hardware resources and provides common services for computer programs.

Figure 2.15: Concept of OS. (Source : https://www.gettyimages.com/photos)

Essentially, the OS acts as an intermediary between programs and the computer hardware. Among many other things, the OS interacts with the RAM or Random-Access Memory and the CPU or Central Processing Unit. It includes all of the utility programs that are used to manage the computer resources at very low level.

The basic input/output system, which is abbreviated as BIOS, gets the computer system started after it is turned on and then manages the flow of data between the operating system and linked devices such as the hard disk, keyboard, mouse, video adapter and printer. The boot program is used to load the operating system into the main or RAM of the computer. System software further consists of the system utilities like the disk defragmenter and System Restore.

(ii) Application Software

Application software are the programs, designed for end users. It allows end users to complete one or more specific tasks that are not related to the computer System software which is designed to run a computer's hardware and application programs.

Application software is the software designed for a specific purpose. It allows users to do things like create text documents, assist in healthcare e.g. patient diagnostic, Industrial design, used in education, play games, listen to music, or surf the web, etc.

Application software needs an Operating System for it to function. Examples of Computer Application Software are not limited to the following: Word processor, spreadsheet, Database management system (DBMS). Desktop publisher, graphics editor, Presentation software, Web browser, etc.

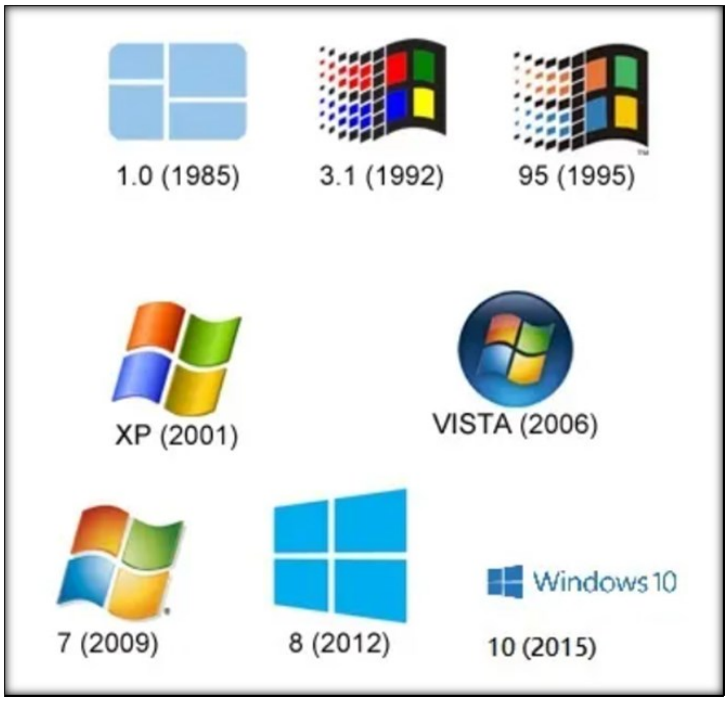


Figure 2:16 : Computer software. (Source)
https://www.google.com/search?q=computer+software

Storage Devices: in computer systems

What is a storage device?

- Hard Disk Drive (HDD);

- Solid State Drive;
- Random Access Memory (RAM);
- CD, DVD and Blu-Ray Discs;
- DVD-RAM and ROM; and
- USB Flash Memory.

A storage device is a piece of hardware that is primarily used for storing data. The purpose of storage devices is to store data and software for later use.

Dear learner, every desktop computer, laptop, tablet, and smart phone will have some kind of storage device within it. There are also standalone, external storage drives that you can use across devices.

Storage is not only necessary for saving files, but also for running tasks and applications. Any file you create or save on your computer saves to your computer's storage device. This storage device also stores any applications and your computer operating system.

As technology has advanced over time, data storage devices have also evolved in a major way. Nowadays, storage devices come in many shapes and sizes, and there are a few different types of storage device that cater to different devices and functions.

A storage device is also known as a storage medium or storage media. Digital storage is measured in megabytes (MB), gigabytes (GB), and, these days, terabytes (TB).

Some computer storage devices are able to hold information permanently while others can only hold information temporarily. Every computer has both **primary and secondary storage,** Primary storage devices are main computers storage devices while secondary devices are one where you can also store files but is not a main storage you use. with primary storage acting as a computer's short-term memory, and secondary as a computer's long-term memory.

Primary Storage: Random Access Memory (RAM) and ROM

Random Access Memory, or RAM, is the primary storage of a computer. When you're working on a file on your computer, it will temporarily store data in your RAM. RAM allows you to perform everyday tasks like opening applications, loading webpages,

editing a document or playing games. It also allows you to jump from one task to another without losing your progress. In essence, the larger the RAM of your computer, the smoother and quicker it is for you to multitask.

RAM is a volatile memory, meaning it cannot hold onto information once the system turns off. For example, if you copy a block of text, restart your computer, and then attempt to paste that block of text into a document, you'll find that your computer has forgotten the copied text. This is because it was only stored temporarily in your RAM. RAM makes it possible for a computer to access data in a random order, and thus reads and writes much faster than a computer's secondary storage.

Secondary Storage: Hard Disk Drives (HDD) & Solid-State Drives (SSD)

In addition to RAM, every computer also has another storage drive that's used for storing information on a long-term basis. This is secondary storage. Any file you create or download saves to the computer's secondary storage. There are two types of storage device used as secondary storage in computers: HDD and SSD. While HDDs are the more traditional of the two, SSDs are fast overtaking HDD as the preferred tech for secondary storage.

Secondary storage devices are often removable, so you can replace or upgrade your computer's storage, or move your storage drive to a different computer. There are notable exceptions, like MacBooks, which don't offer removable storage.

Hard Disk Drives (HDD)

The hard disk drive (HDD) is the original hard drive. These are magnetic storage devices that have been around since the 1950s, though they've evolved over time.

A hard disk drive is comprised of a stack of spinning metal disks known as platters. Each spinning disk has trillions of tiny fragments that can be magnetized in order to represent bits (1s and 0s in binary code). An actuator arm with a read/write head scans the spinning platters and magnetizes fragments in order to write

digital information onto the HDD, or detects magnetic charges to read information from it.

HDDs are used for TV recorders, servers, and laptop and PC storage.

Solid-State Drives (SSD)

Solid-state drives emerged far more recently, in the '90s. SSDs don't rely on magnets and disks, instead they use a type of flash memory called NAND. In an SSD, semiconductors store information by changing the electrical current of circuits contained within the drive. This means that unlike HDDs, SSDs don't require moving parts to operate.

Because of this, SSDs not only work faster and smoother than HDDs (HDDs take longer to gather information due to the mechanical nature of their platters and heads), they also generally last longer than HDDs (with so many intricate moving parts, HDDs are vulnerable to damage and wear). Outside of newer PCs and high-end laptops, you can find SSDs in smartphones, tablets, and sometimes video cameras.

The best way to store large amounts of data

If you're running out of space on your devices, it's time to look into an alternative storage device. Even external storage devices such as flash drives can run out of space, break, or get lost. That's why the best way to store all your files is in the cloud. It's safer, faster, and easier to access.

Cloud storage

Storage capacity is no longer dependent on the physical capacity of your computer. Many options exist to hold your files while saving storage space on your computer, phone, or tablet. If your devices are slow and running out of space, you can offload files onto a physical storage device. Or better yet, use the best storage technology and save your files to the cloud.

While not exactly a device per se Cloud storage is the newest and most versatile type of storage for computers. "The cloud" is not one place or object, but rather a huge collection of servers housed in data centres around the world. When you save a document to the

cloud, you're storing it on these servers. Because cloud storage stores everything online, it doesn't use any of your computer's secondary storage, allowing you to save space in your computing device. The cloud storage on the other hand, can go with you anywhere without taking up any physical space, and without the physical vulnerabilities of an external drive.

If you forget to bring a hard drive containing important documents to a meeting, there's not much you can do other than go back and grab it. If you break or lose a hard drive altogether, it's unlikely you'll ever get that data back. These risks don't exist for cloud storage—your data is backed up and accessible whenever and wherever you are so long as you have access to the internet.

External storage devices

Dear learner, in addition to storage media contained within a computer, there are also digital storage devices that are external from computers. These are commonly used to expand storage capacity on a computer runs low on space, allow more portability, or provide easy file transfers from one device to another.

External HDDs and SSDs

You can get both HDD and SSD devices as external drives. These generally offer the largest storage capacity among external options, with external HDDs offering up to 20 TB of storage and (reasonably-priced) external SSDs offering up to 8 TB of storage. External HDDs and SSDs work in the exact same way that their internal counterparts do. Most external drives can connect to any computer; they're not tied to one device, so they're a decent solution for transferring files across devices.

Flash memory devices

We mentioned flash memory earlier when discussing SSDs. A flash memory device contains trillions of interconnected flash memory cells that store data. These cells hold millions of transistors that when switched on or off represent 1s and 0s in binary code, allowing a computer to read and write information. One of the most

recognizable types of flash memory device is the USB flash drive. Also known as a memory stick, these small, portable storage devices have long been a popular choice for extra computer storage.

Before it was quick and easy to share files online, USB-flash drives were essential for easily moving files from one device to another. However, they can only be used on devices with a USB port.

Older computers have a USB port, but newer ones may require an adapter. These days, a USB flash drive can hold up to 2 TB of storage. They're more expensive per gigabyte than an external hard drive, but they have prevailed as a simple, convenient solution for storing and transferring smaller files. Aside from USB drives, flash memory devices also include SD and memory cards, which you'll recognize as the storage medium used in digital cameras.

Optical Storage Devices

CDs, DVDs, and Blu-Ray discs are used for a lot more than playing music and videos—they also act as storage devices. Collectively they're known as optical storage devices or optical media.

A DVD has a tighter spiral track than a CD, allowing it to store more data despite being the same size, and a finer red laser is used in DVD drives than CD drives. DVDs also allow dual layering to increase their capacity further. Blu-Ray took things to another level, storing data on multiple layers with even smaller bumps that require an even finer blue laser to read them.

CD-ROM, DVD-ROM, and BD-ROM refer to read-only optical storage disks. The data written on them is permanent and cannot be removed or overwritten. This is why they can't be used as a personal storage. Instead, they are typically used for software installation programs.

CD-R, DVD-R, and BD-R format disks are recordable, but cannot be overwritten. Whatever data you save on a blank recordable disk will then be permanently stored on that disk. So, they can store data, but they're not quite as flexible as other storage devices.

CD-RW, DVD-RW, and BD-RE: Are re-writable. This allows you to write new data on them and erase unwanted data from them as much as you want. They've been overtaken by newer technology like flash memory, but CD-RWs were once the top choice for

external storage. Most desktop computers and many laptops have a CD or DVD drive.

CD can store up to 700 MB of data, DVD-DL can store up to 8.5 GB, and Blu-Ray can store between 25 and 128 GB of data.

Floppy Disks

While they may be obsolete at this point, we can't discuss storage devices without at least mentioning the humble floppy disk, **aka** diskette. Floppy disks were the first widely-available portable, removable storage devices. This is why most "Save" icons look the way they do; they're modelled after the floppy disk. They work in the same way as hard disk drives, although at a much smaller scale.

The storage capacity of floppy disks never exceeded 200 MB before CD-RW and flash drives became the favoured storage media. The iMac was the first personal computer released without a floppy disk drive in 1998. From here, the over 30-years, the floppy disk very quickly declined.

Optical Disc

It is an optical disk drive that utilizes a laser light as a crucial part of the process of writing or reading data to or from optical discs. Some drives can only read from discs. Few recent drives are normally readers as well as recorders that are also known as burners or writers. 3. DVDs, Blu-Ray Discs, and Compact Discs: They are known as the common types of the optical media that can be read and recorded by such drives in a convenient way.

Optical drive is a generic name. The drives are generally described as "CD" "DVD," or "Blu-ray," followed by "writer," "drive," etc. There are three major kinds of optical media, DVD, CD, and Blu-ray discs. DVDs can store around 8.4 GB of data, CDs can store around 700 MB, and Blu-ray discs can store around 50 GB of data. This capacity of storage is a clear benefit over the floppy disk storage media, which has a capacity of 1.44 MB only. 4.

Flash Disk: It is a storage module, which is made up of flash memory chips. A flash disk has no access arms or mechanical

platters, but the term disc is used as the data are accessed as if they were on a HD. The structure of disk storage is emulated.

Output Devices

An output device is a part of computer hardware equipment, which is used to communicate the outcomes of data processing done by an information processing system, which transforms the electronically produced information into human-readable form. Technically output devices **can be defined as the device which convert machine-readable information into people readable form**. (i.e. it converts data from an electronic form inside the computer to a form that can be used outside)

Figure 2:17: Examples of Output Devices. (Source : https://www.gettyimages.com/photos)

Most output can be divided into two categories namely **Soft Copy and Hard Copy.** Soft copy includes output from monitors and from audio devices while Hard copy output includes output from printers, plotters, and microfilm. Examples of computer output atr microfilm (COM), LCD, Monitor, Plotters, Printers (all types), Projection panels, Projector, Speaker(s), etc.

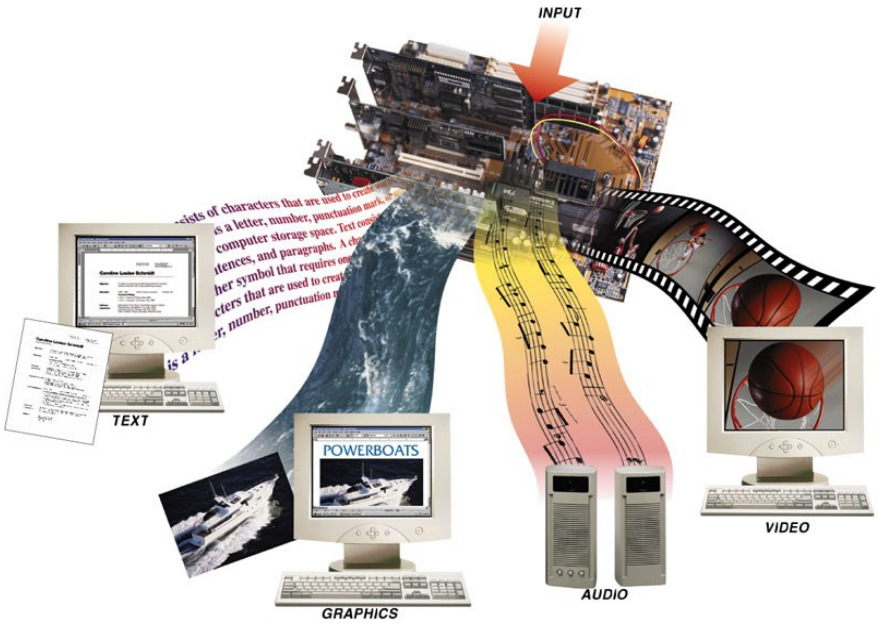


Figure 2:18 Depicts the Output Devices. (Source: https://www.gettyimages.com/photos)

Monitors

These are a major need; hence, they are generally comprised of standard equipment. At present, monitors are available in every range of prices. Various people assume that the big the monitor is, the better it fits with the budget range. The bigger size of monitor is more expensive as compared to the smaller ones. A 17-inch screen monitor does not cost extreme as compared to a 15-inch monitor. The difference is quite more than worth it.

More the screen space is available, the easier it is to do the work on the computer system. However, remember that the bigger is the display, the larger is the tube. A larger tube hence will take up more space on the desk. Various manufacturers of the computer system provide monitors with short tube that do not consume a lot of desktop real estate.

Dear learner, the peripheral devices are also very necessary to make the computer system to function properly. In a computer system there are various peripheral devices, such as printers, scanners, or routers, which can be used by each and every computer that is a member of the interconnected system. The choice of the hardware components that are to be used in the computer system have to be done carefully so as the hardware

components work well together along with the software components or programs.

It is very important that there is a profound coordination between both the hardware components and the software components so that the functionality of the computer should not be hampered.

Data Vs Information Communication

Data communication

ICT involves sending messages (data/information) for the purpose of communication. As it said before ICT is a general term for a vast array of technologies that send information over distances. Mobile phones, land lines, satellite phones and voice over Internet protocol (VoIP) are all telephony technologies -- just one field of ICT. Radio, television and networks are a few more examples of ICT.

Data

Data is all about idea or facts. It is unprocessed information. Data is fed in the computer by using input devices e.g. Key board, microphone, scanner etc. Information is the processed data, is used to facilitate decision making. In a computer system, a processed information can be available at the output stages, e.g. Printer, speakers, VDU etc.

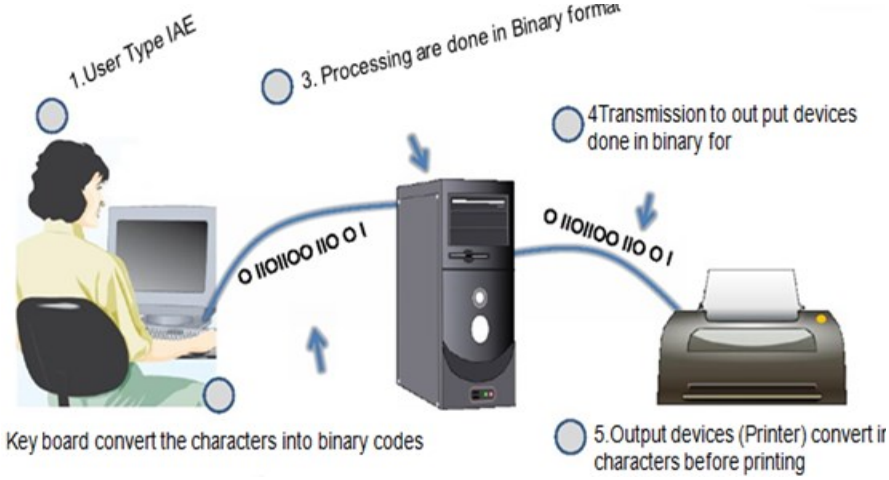


Figure 2 :18 (Source : https://www.gettyimages.com/photos)

Application software in office techniques

Dear learner in this section you will lean and apply some of the application software, features, and usages of Windows Office products such as Microsoft Word 2013 and Microsoft Excel 2013.

Word Microsoft Word is a word-processing program designed to help you create professional-quality documents by helping you organize and write your documents more efficiently. Some uses for World include, Memos, Newsletters, Reports, Resume, Brochure etc.

Write and Modify Text When writing a document, one of the most important things you can do is format your document. Formatting is all about adding visual touches to a document. Formatting makes reading a document easier, in addition to that formatting makes documents look more appealing.

Microsoft word allows you to simply edit text by adding text to the middle of existing paragraph, replacing text with other text, Undo and Redo Actions Using a word program, you can also add a header to your document, footer, and adjust the margins of your text.

Tools and Features: The insert tab provides tools such as SmartArt graphics, tables, and text boxes Powerful editing and peer reviewing tools help you work with others to make your documents perfect. One of the main features of word is the ability to create new documents using a template. The word templates come ready to use with various themes and styles depending on what you are writing.

Read Documents is another interesting feature is Read Mode Open your document in Read Mode to hide most of the buttons and tools so you can get enjoy the document without distractions. to view in read mode click view and then select read mode. It allows for multiple people to edit a document. To track changes, click review then Track Changes It tracks all of the additions, Deletions, Moves, etc. Formatting changes: This is one of the most important tools is the multiple paste option, paste with style from source, paste with style of destination, Paste without formatting.

Excel: Is another powerful application program that allows us to get meaning out of a lot of data. Excel is also a program that allows us track any kind of information as well as performs simple calculations. It depends on how you use it and to what extent. Excel is made up of a grid of cells. The cells can contain numbers, text, and formulas. Cells are referenced by their location in the row and

column on the sheet, so cell A1 is in the first row of column A.

Putting data in the cells and grouping them by rows and columns allows you to: Add the data, sort it, Filer it, put it in tables, build charts on a blank grid you can begin to work by immediately inserting data. For example, in cell A1, insert the number 2. You have officially added data to your excel sheet.

Creating Formulas and inserting Functions in a Worksheet: When you've entered numbers in your sheet, you might want to add them up. A fast way to do that is by using the AutoSum button. Before you use the AutoSum, you have to first select the cell to the right or below the numbers you want to add so that Excel knows what to add and where to put the result.

Creating a simple formula

(1) Insert an equal sign in the cell (=). This tells Excel that this cell will contain a formula.

(2) Type a combination of numbers and calculation operators, like the plus sign (+) for addition, the minus sign (-) for subtraction, the asterisk (*) for multiplication, or the forward slash (/) for division. Then Press enter to run the calculation, for example, enter =2+4, =4-2, =2*4, or =4/2.

Formulas can also be created for specific cells rather than numbers, for example =A5+A7 =A5/A7 =A5*A7 Functions are calculation designed to work within formulas. =SUM =AVERAGE =MAX =MIN =COUNT 5.2.2 Manipulating Data

In Excel data can be manipulated and formatted to distinguish different types of data. Do this by clicking the arrow next to general in-home tab. Manipulate data by putting them in a table this lets you quickly filter your data. Excel has many different tools and options to manipulate the data, if learning Excel it is encouraged to play around with some of these options. For example, options such as Total can be added to your data and used for Total Sum, Total Average, Total Percent, etc.

The relationship between hardware and software

Dear leaner, hardware, as well as software, is interdependent on each other. Both should work along so as to help computer to produce a desired output. The software cannot be utilized if the

hardware devices do not provide any support for example, Web browser is a software program that allows a user to locate, access, and display web pages.

In a similar way, if there is no proper instruction given to the system, the hardware component is useless, as it cannot be used. To get a desired job completed on the computer system, the precise software package has to be loaded into the software. Hardware could be a prior expenditure Development of software is extremely expensive. It is also better to note that different types of software packages can be loaded on the hardware to operate different tasks.

Dear Leaner, is my hope that you now understand that the software eventually acts as a linked interface between the user and hardware. It can be concluded that the hardware and software are the heart and soul of a computer system.

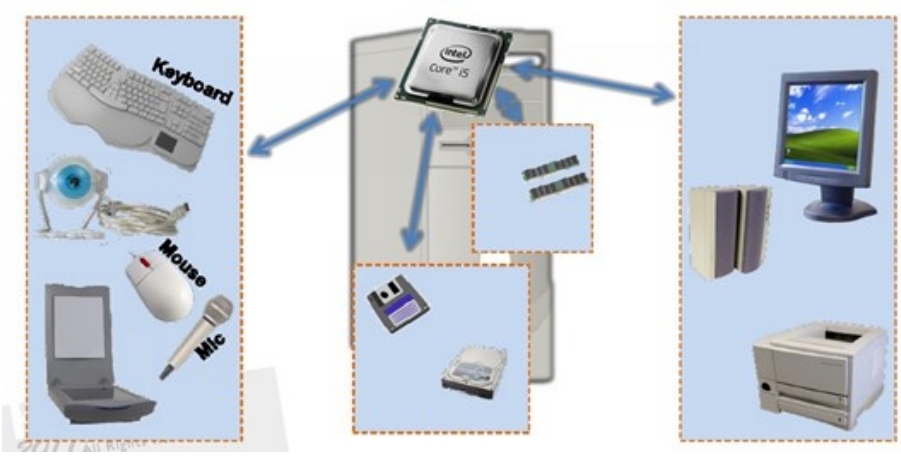


Figure 2:19 https://www.gettyimages.com/photos

Table 2.1: Comparison between Hardware and software

	Hardware	**Software**
Definition	They are needed to store and run the software.	It is a program which enables a system to execute a specific task
Type	Input, processing, storage, control, and output devices	Programming software, system software, and application software
Nature	Physical in nature	Logical in nature

Examples	Monitor, printer, scanners, CDROM, etc	Adobe Acrobat, Microsoft Office, Google Chrome, etc.

Source: ***https://www.diffen.com/difference/Hardware_vs_Software***

Hardware and Software working Together

Hardware is usually managed by the operating system. An operating system is defined as software whose main function is to control the computer. It is used to manage the hardware and applications, gives an interface for the users and stores, recovers, and manipulates the file. Generally, an operating system functions as the intermediary between hardware and application. Various applications can be installed on a computer system to meet the needs or requirements of the user.

These days, the most popular operating systems for the personal computers are Microsoft Windows XP, Windows 2000, and Windows 98/Me. Numerous other Microsoft operating systems for personal computers that are outdated are Windows NT, Windows 95, and DOS. There are several other operating systems that are not made by the Microsoft, including the Mac OS and Linux. It is important to get knowledge of the installation of an operating system and its application in the troubleshooting of a failed device.

An operating system is mainly responsible for the interacting with the hardware, but its DOS is a platform independent acronym for Disk Operating System, which was initially introduced by IBM for the System/360 mainframe and later became common shorthand for the popular family of disk-based operating systems for x86-based IBM PC compatibles. OS does not necessarily relate directly to hardware. Instead, the operating system uses the drivers of device or the BIOS to interface with the hardware.

Device drivers are known as the small programs that are stored on the HD that instruct the computer about how to communicate with the hardware device like modem, printer, network card, etc. The BIOS on the motherboard is a permanently coded or hard-coded into the chip of a computer known as the ROM BIOS chip or firmware chip.

Software policy

Software piracy can be defined as the unauthorized copying of the software. It refers to different ways by which the software is

obtained without even asking the holder. Some common kinds of software piracy are: Counterfeit software, OEM unbundling, Soft-lifting, Hard disk loading, and Internet software piracy.

Counterfeit Software (software piracy)

It is a type of piracy, which takes place when the fake copies of the software are made by using a CD burner to copy the specific software. It is generally sold at the prices less than the retail price of the authentic software.

OEM Unbundling

Original equipment manufacturer (OEM) unbundling is a type of software piracy, which takes place when OEM-packaged software is alienated from the hardware it originally came, hustled with, at the OEM or the retail level of sale.

Soft-Lifting

It is a kind of software piracy, which takes place when the users share the software with any other users who are not approved to have the right to use by the End-User License Agreement (EULA). The most general type of soft-lifting takes place when a person does legitimately purchase the required software but installs it onto several computers, this is considered as a destruction of the licensing agreement.

Hard Disk Loading

It is a kind of software piracy that actually occurs when the hardware dealers set up an illegal copy of the commercial software onto the computer system. In various cases, users will not get any original CD of the software, but the dealer of hardware may charge for the unauthorized software in the total pricing of system purchase

Licensing agreement is a legal contract between two parties, known as the licensor and the licensee.

Internet Software Piracy: It is defined as the system piracy in

which the software is illegally obtained from the internet channels, mainly by peer-to-peer file sharing systems and downloaded from the pirated websites.

Activity

1. Under lesson in unit two, you will need to complete the definitions task.

You should include at least 5 examples

2. You will need to download and complete the input, storage and output devices. You will need to think of some extra examples by yourself

Review Questions

1. Explain the fundamental components of a computer system.
2. Give some examples of input and output devices.
3. Describe three segments of central processing units.
4. Define Random Access Memory and Read Only Memory.
5. What are the major categories of software?
7. What is the relationship between software and hardware?
8. How software helps in managing the hardware?
9. Describe the term “BIOS”.
10. Define “Spreadsheet.”

Unit Reflection

Using your Smartphone, or school camera you will need to find 5 different examples of input and output devices around your town area. Use your imagination and think of examples of other than found in Computer laboratory,

For each image you will need to explain where it is found and what its purpose is.

Unit Assignment

Attempt the following questions:

1. Define computer system and terms (hardware, software).
2. Identify types of computers.
3. Discuss different functions of input devices, system unit and storage devices.
4. Describe relationship between hardware and software.

Unit 3

Data Communication Devices, Networks, Internet and Website

Introduction

Dear learner, before we get into the technical details of the Networking technologies it's important to understand the driving forces behind computer Networking and communications. Networking has allowed a virtual world to emerge one in which time and distance no longer represents a barrier to doing business or communicating. One of the most significant evolutions occurring in computing and communications is the computer Networking.

Learning Outcomes

Dear learner, after completion of this unit you should be able to:

- Define computer networks terms;
- Describe data communication devices in computer network;
- Describe types of Network design;
- Explain Different types of networking communication devices;
- Describe Internets, and website; and
- Apply various ICT technologies that are already in use.

This section described here are ultimately very important to how computer networking will evolve and to where the growth areas will be.

Data Communication Devices and Computer Networks

Data communication is the exchange of data between two devices through a form of transmission medium such as a wire cable. Businesses rely on the networks to function properly every day. In order communication to occur, the communication devices have to be part of a system made up of hardware and software. The effectiveness of a data communication system is rated on four characteristics.

1. Delivery – The system must deliver data to the correct destination. This means that only the intended device or user and only that device or user must receive data. Dear learner can you imagine sending an e-mail to a specific person, and instead everyone in your neighbourhood receives it?

2. Accuracy – The system must deliver the data accurately. What this means is that in the process of being sent, data should not be altered, or destroyed. Sometimes these situations do occur, but it is up to a good system to detect an error in transmission and correct or retransmit the data.

3. Timeliness – The data must be delivered within a reasonable amount of time. In a world where we are used to nearly everything being instant, it is crucial that messages arrive quickly. If we send a message informing that we are running 10 minutes late it should not arrive 30 minutes later.

This however, does not only apply to text. When transmitting data such as video and audio, timing is everything especially with real-time transmission. Real time transmission is the delivering of data as they are produced, in the same order that they are produced, and without significant delay. In real time transmission, a lot of delay can equal lag in a video.

4. Jitter – the amount of jitter should be minimal. If packets of video are sent every 30ms and sometimes a lot of packets are sent with 40ms the delay will give you an uneven quality in the video result. Another term exchangeable with this is lag. In online games lag occurs when the latency of a motion performed is observed at a later time.

Data Communication System Components

Data communication systems have 5 components.

1. **Message** – the data to be communicated. Data includes • Text • Numbers • Pictures • Audio • Video

2. **Sender** – the device that sends the original message. Senders include • Computer • Workstation • Telephone • Video Camera

3. **Receiver** – The device that receives the message. Receiver examples are the same as those of the sender

4. **Medium** – The medium refers the transmission medium or the

physical path that the message travels through. Mediums include • Coaxial Cable • Fibre Optic Cable • Radio Waves • Twisted-pair wire.

5. **Protocol** – the last component is the protocol. A protocol is a set of rules that govern the communication of data. Protocols are the agreement between two devices. It is easy to understand protocols this way.

A person that only speaks French cannot communicate with a person that only speaks Spanish.

However, if a person that speaks French and a person that speaks Spanish both also speak English than they can communicate. In this example, English is the protocol that allows for the communication between devices.

For example, in a radio broadcasting station the station's large power amplifier is the transmitter; and the broadcasting antenna is the interface between the power amplifier and the "free space channel". The free space channel is the transmission medium; and the receiver's antenna is the interface between the free space channel and the receiver. Next, the radio receiver is the destination of the radio signal, and this is where it is converted from electricity to sound for people to listen

Computer Networking

Dear leaner, do you know what Computer Networking is? Before describing computer, network let us understand first the standalone computer.

Standalone computer is a single computer not attached to a network

Figure 3.1: Standalone computer. (Source: https://www.diffen.com/difference/Hardware_vs_Software)

While in computer networks, networked computing devices pass data to each other along data connections. Network computer devices that originate, route and terminate the data are called **network nodes**. Nodes can include hosts such as personal computers, phones, servers as well as networking hardware. Two such devices are said to be networked together when one device is able to exchange information with the other device, whether or not they have a direct connection to each other.

Figure 3 :2 Source : https://www.google.com/search?q=free+images+networking

Generally, a computer network consists of several computers that are connected to one another using devices that allow them to communicate. By definition A computer network can be described as a group of computers that are connected to one another that are connected using devices that allow them to form a link between them so that they can communicate. Without the engineering principle that connected multiple computers over an extended distance, communication using ICT tools would be improbable, and in some cases impossible.

The link between these nodes or computers can be formed by joining them with cables. These cables are commonly known as Ethernet cables. The computers can also be connected without the help of wires or cables. Network may also be wireless and connected using wireless routers. If your computer network is wireless, it would not require that they be connected using hardware. When the computers are connected via a computer network, they are able to transmit files from one computer to another. These computers are also able to connect to the internet using one connection.

Computers are very often connected to networks using wireless links such as **Communications satellites**. Satellites communicate

via microwave radio waves, which are not deflected by the Earth's atmosphere. The satellites are stationed in space, typically in geosynchronous orbit 35,400 km (22,000 mi) above the equator. These Earth-orbiting systems are capable of receiving and relaying voice, data, and TV signals also the terrestrial microwave is another example of wireless. **Terrestrial microwave communication** uses Earth-based transmitters and receivers resembling satellite dishes. Terrestrial microwaves are in the low-gigahertz range, which limits all communications to line-of-sight. Relay stations are spaced approximately 48 km (30 mi) apart.

So, it can be said that, computers are connected to each other and have the benefit of sharing different resources among them. These resources may be anything among internet, printers, and servers for sharing files or any other suited resource. The network can be referred to as a connection that can serve more than one purpose and hence, enable a single computer to do more tasks than it alone can.

The main component that defines the proper functionality of a network is the operating system in itself. The operating system or the software is the main aspect of the network that controls, manages, and renders the required services so that the other programs that are required to be executed in the computer run without any kind of obstacle.

Types of Computer Network design

Peer to Peer (P2P) Net work

In this design of network, Peers with no centralized control over shared resources it can share resources with any other computer on network. In this kind of Network, no computer has higher access priority and there is no computer has more responsibility to provide or shared resources.

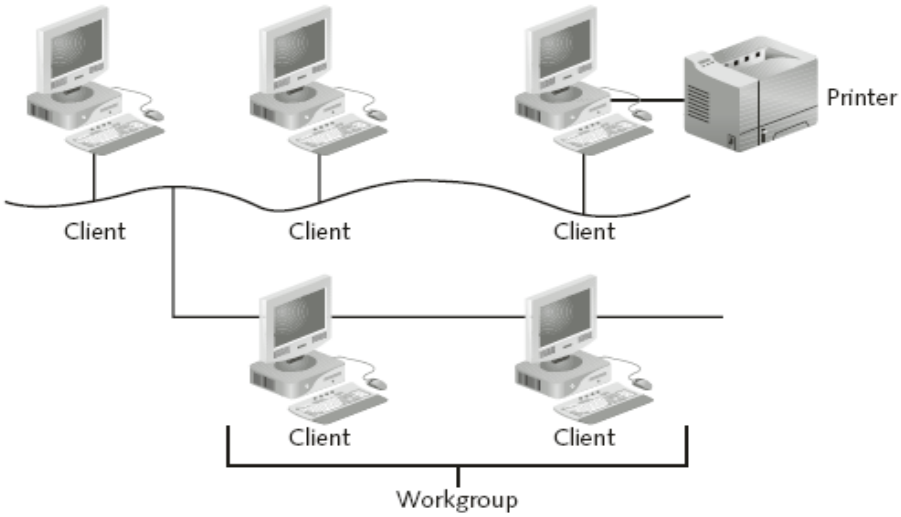


Figure 3.3: P2P network. (Source: (https://www.gettyimages.com/photos)

Advantages of P2P network

The following is not limited to the advantages of P2P network

- Easy to install and configure, no dedicated server, Users control own shared resources, Inexpensive to purchase and operate. No additional equipment or software. No dedicated administrators and works best with 10 or fewer users

Disadvantages of P2P Network

Dear leaner, there are also disadvantages of P2P. The following are the said disadvantages of P2P

- Security applies to single resource at a time, Users may have many different passwords, must back up each machine individually, Machine sharing resources may suffers reduced performance, no centralized organization scheme to locate or control access to data and P2P does not usually work well with more than 10 users.

Server based Network

Dear leaner, the word 'server' refers to a specialized computer or hardware on which the server software works and provides services to other computers or clients. A server has many functions, and they come in different types to facilitate different uses. Let's have a brief idea on what is a server before getting to know about the different types of servers

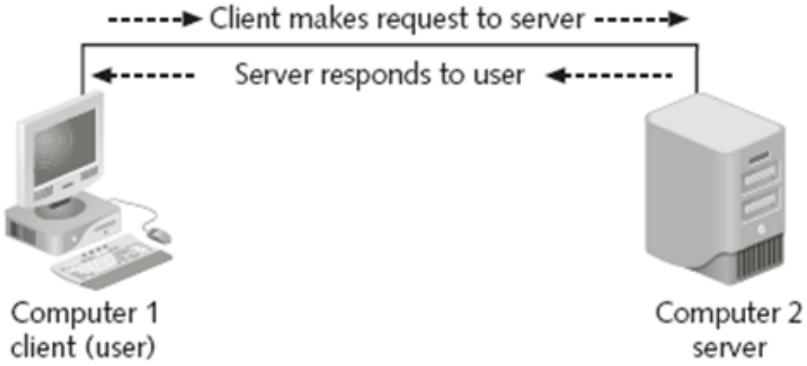
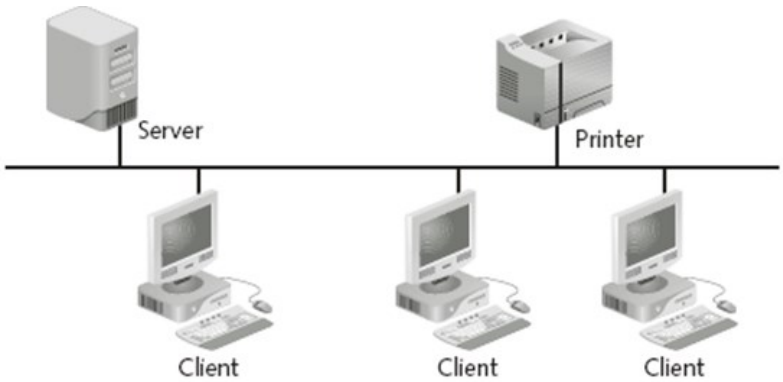


Figure 3 :4 Source : (https://www.gettyimages.com/photos

Dear learner, do you what is a server?

A server is a device with a particular set of programs or protocols that provide various services, which other machines (computers) or clients request, to perform certain tasks. Together, a server and its clients form a client/server network, which provides routing systems and centralized access to information, resources, stored data, etc. At the most ground level, one can consider it as a technology solution that serves files, data, print, fax resources and multiple computers.

The advanced server versions, like Business Servers enable the user to handle the accounts and passwords, allow or limit the access to shared resources, automatically support the data and access the business information remotely. For example, a file server is a machine that maintains files and allows clients or users to upload and download files from it.



Similarly, a web server hosts website and allows users to access these websites. Clients mainly include computers, printers, faxes or

other devices that can be connected to the server. By using a server, one can securely share files and resources like fax machines and printers. Hence, with a server network, employees can access the Internet or company e-mail simultaneously.

Types of Computer Network connections

Dear leaner, there are several types of network connections, such as LAN (local area network), CAN (Campus area network), MAN (Metropolitan Area Network), WAN Backbone and a VPN (virtual private network.

LAN: is a network that connects computers and devices in a limited geographical area such as a home, school, office building, or closely positioned group of buildings. Each computer or device on the network is a node. Wired LANs are most likely based on Ethernet technology.

The defining characteristics of a LAN, in contrast to a wide area network (WAN), include higher data transfer rates, limited geographic range, and lack of reliance on leased lines to provide connectivity. LAN technologies operate at data transfer rates up to 10 Gbit/s. A LAN can be connected to a WAN using a router.

A CAN network: Is a computer network that is made up of an interconnection of LANs within a limited geographical area. This type of network is used on college campuses. The networking equipment (switches, routers) and transmission media (optical fibre, copper plant, Cat5 cabling, etc.) are almost entirely owned by the campus tenant / owner (an enterprise, university, government, etc.). For example, a university campus network is likely to link a variety of campus buildings to connect academic colleges or departments, the library, and student residence halls.

Metropolitan area network (MAN): Is a computer network made up of several CAN computer networks. MAN is a large computer network that usually spans a city or a large campus. This type of network would use routers and hubs to connect it.

Wide area network (WAN) is a computer network that covers a large geographic area such as a city, country, or spans even intercontinental distances. A WAN uses a communications channel that combines many types of media such as telephone lines, cables, and air waves. A WAN often makes use of transmission facilities provided by common carriers, such as telephone companies. WAN

technologies generally function at the lower three layers of the OSI reference model: the physical layer, the data link layer, and the network layer.

Backbone network: A backbone network is part of a computer network infrastructure that provides a path for the exchange of information between different LANs or sub-networks. A backbone can tie together diverse networks within the same building, across different buildings, or over a wide area. For example, a large company might implement a backbone network to connect departments that are located around the world. The equipment that ties together the departmental networks constitutes the network backbone.

When designing a network backbone, network performance and network congestion are critical factors to consider. Normally, the backbone network's capacity is greater than that of the individual networks connected to it. Another example of a backbone network is the Internet backbone, which is the set of wide area networks (WANs) and core routers that tie together all networks connected to the Internet.

Virtual private network (VPN)

A VPN is network which does not use wires or cable to connect it. This type of connection is also secure and is mainly used in larger environments**.**

Personal Area Network (PAN) is a computer network used for communication among computer and different information technological devices close to one person. Some examples of devices that are used in a PAN are personal computers, printers, fax machines, telephones, PDAs, scanners, and even video game consoles. A PAN may include wired and wireless devices. The reach of a PAN typically extends to 10 meters. A wired PAN is usually constructed with USB and FireWire connections while technologies such as Bluetooth and infrared communication typically form a wireless PAN.

Home Area Network (HAN) is a residential LAN used for communication between digital devices typically deployed in the home, usually a small number of personal computers and

accessories, such as printers and mobile computing devices. An important function is the sharing of Internet access, often a broadband service through a cable TV or digital subscriber line (DSL) provider.

Communication Devices

Communication device it can be described as any kind of hardware device that has the ability to transmit a required amount of data or information or any set of commands between the device that is sending the communication and the one receiving it. There are several kinds of communication devices that are present in the computer world. The act of sending and receiving the information or set of commands is done by a kind of connecting device that forms as a medium for communications and is known by modem.

Computers read and interpret data in the form of digital signals. The data and information along with the chain of commands traces its path in the communication channel in one of the ways from analogous and digital forms which relies on the kind of communication channel that the data is traveling in.

The analogous form of signal is made of an electrical wave that is continuous in nature. Whereas, a digital kind of signal is made up of singular pulses that are further made up of a number of bits that come together to form bytes (Refer to the course of NTA L5). The modem works for those communication channels that exchange data and information through digital signals, for example, the cable lines for television, and transmits the signals in digital form between the channel for **communication and computer.** However, if the signals are in the form of analogue form, for example, the lines for telephone, the modem converts the signals from analogue form to digital form and then transmits it further.

Hubs: The hubs are the basic blocks in the networking pyramid that lie right at the bottom of it. The hubs are utilized in those networks that make use of cables that are twisted and paired together to form connection between the devices. These hubs can be combined with each other to form networks that are larger in size.

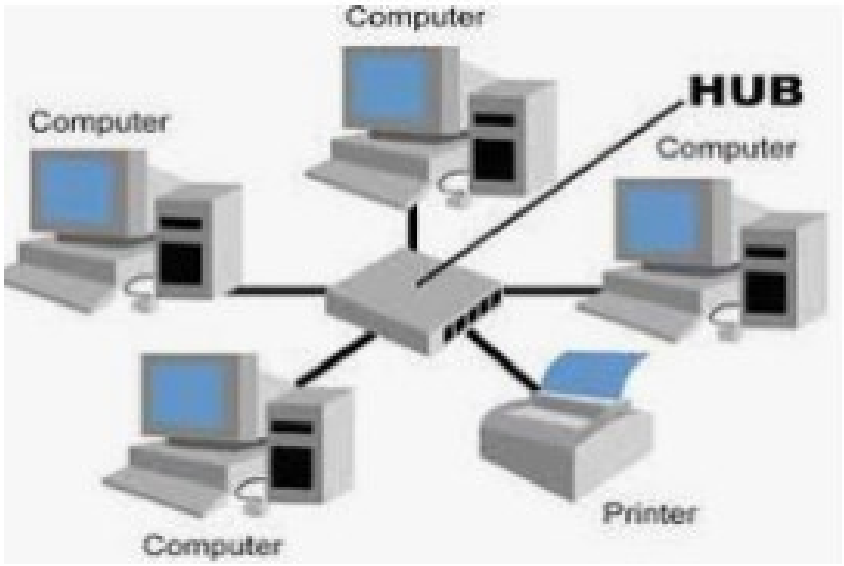


Figure 3.5: Source: https://www.google.com/search?q=hub+images

They are quite simple in nature and are used to transmit data packets to the devices that are connected to them. Though, they do not judge on the fact that whether the packets of data are meant to be delivered to the device or not. This lack of judgment on their part renders them inefficient. This efficiency may lead them to form a blockage that brings down the performances in a business or a network that is involved in too much of work

The Basic Function of the Hub

It involves making way for the transmission of the electrical signals to travel and reach their destinations. The device that performs such functions is known as passive hub. The other kinds of hubs that are more common and in greater use currently are active hubs.

Figure 3.6: Source: https://www.google.com/search?q=hub

These hubs regenerate the signals before the signals are transmitted to the devices connected to the hubs for communication and data reception, and then provides the path for transmission. The function of the hub does not involve any kind of interpretation or action on the data that it transmits.

The hubs may be found in a wide range of sizes and shapes. The hubs that are small in size and serve device between five and eight in number through the ports for connection they have are generally known as workgroup hubs. However, there are bigger hubs that can have up to thirty-two connections in them. These bigger hubs are generally known as high-density devices.

Switches: In a manner similar to hubs, the switches form as points of connection for the Ethernet network. The devices into which the data is to be transmitted and the ones acting as the source connect to the switches with the help of twisted cables paired up together, so that they can serve each device. The main point of difference between the hubs and switches is based on the way they deal with the data that is provided to them by the source to be taken to the receiver.

Figure 3 :6 (Source:)
https://www.google.com/search?q=free+images+networking

The hub does not judge the data and its receiver and transmits data regardless of the supposed destination. On the other hand, the switch transmits the data to the destination after gauging what kind of data is to be transmitted to which kind of destination device. The switch performs this task.

Modem: The modem is an abbreviation for the combination of words modulation and demodulation. It is the work of a modem to modulate the signals received and change them from either digital to analogue or from analogue to digital. The modem makes use of the telephone lines to transmit the data by receiving and directing it from one device to another. It is important that both the device that is sending the signals and the one receiving them, are equipped with a modem each.

The process of modulation involves changing the signals that are in digital form to the analogue forms. All the data is saved by the computer in digital forms. Hence, when the computer needs to transmit the data to some other device, and it is to be done through the telephone lines, the signals are first converted to analogue form, as that is the form that telephone lines can transmit the signals in.

The process of demodulation involves converting the signals from their analogue form to the digital form. After the signals have been received by the computer through telephone lines in analogue form, it needs to be converted to its digital form to be read by the computer. Here is where demodulation comes into play.

Features of Modem

Some important features of modem are as follows:

Speed: The time at which the modem can send data in bps. The speed of modem is normally from 300 bps to 56 kbps.

Self-Testing: Modem also examines the digital connection with the computer. It also checks analogue connection with the remote modem.

Voice Over Data: When data is being transmitted modem also offers the service of a voice conversation. This attribute must exist in both the source and destination modems.

Error Control: For the purpose to control errors for transmitted data, modems use various techniques.

Network Medium Carries Network Messages

Computers share access to common network medium that carries signals from one computer to another

Medium may be physical cable, such as twisted pair, coaxial, or fiber-optic (Guided medium). Medium may be wireless (unguided medium).

Network cards

A network card is a connector card, computer Card, Express Card module, USB network connector, or flash card that empowers a computer or gadget that does not have networking capabilities to get to a network and work on it. The network card organizes the transmission and receipt of information, guidelines, and data to and from the computer or gadget that holds the network card. Network cards are accessible in a wide range of styles. A network card for a computer on work station is a connector card that has a port to which a cable is inserted.

Network cards that give wireless information transmission additionally are accessible. This kind of card sometimes referred to as a wireless network card, frequently has an antenna for reception of signals. A network card pursues the rules of a specific system communications standard, for example, Ethernet or token ring. An Ethernet card is the most widely recognized kind of network card.

Wireless Access Points: A wireless access point is a focal communication device that permits computers and gadgets to exchange information wirelessly among them or to exchange

information wirelessly to a wired system. Wireless access points have great reception antennas for ideal signals.

Figure 3 :7 Source: https://www.google.com/search?q=wireless+access+point

Wireless access point can be depicted by the symbol as shown in the figure 3….

Figure 3 :18 Source: https://www.google.com/search?q=wireless+access+point

Routers: Router is a networking device that forwards data packets between computer networks and transmits information to its right destination on the system. A router can be utilized on any size of system. On the biggest scale, routers along the Internet backbone forward information parcels to their destination utilizing the quickest accessible way. For smaller business and home systems, a switch enables different computers to share a solitary rapid Internet association, for example, a cable modem or DSL modem. These routers interface from 2 to 250 computers.

Firewall

A firewall is a systems administration gadget, either equipment or programming based, that controls access to your association's

system. This controlled access is intended to shield information and assets from an outside risk.

To do this, firewalls are normally put at section/leave purposes of a system—for instance, setting a firewall between an interior system and the Internet. Once there, it can control access all through that point. In spite of the fact that firewalls regularly shield interior systems from open systems, they are additionally used to control access between explicit system portions inside a system—for instance, setting a firewall between the Accounts and the Sales divisions. The firewall is arranged on the server to permit or allow specific kinds of system traffic. In little workplaces and for standard home use, a firewall is regularly installed on the nearby system and arranged to control traffic.

Application of networks

Computer networks support applications such as access to the World Wide Web, shared use of application and storage servers, printers, and fax machines, and use of email and instant messaging applications. Generally, it can be said that Network services are used to provide some functionality for members or users of the network, such as to:

- Facilitate communication via email, video conferencing, instant messaging, etc;
- Enable multiple users to share a single hardware device like a printer or scanner;
- Enable file sharing across the network;
- Allow for the sharing of software or operating programs on remote systems; and
- Make information easier to access and maintain among network users.

Advantages and Disadvantages of Computer Networks

Dear learner, Computing is not about computers any more. As it defined before a computer network is a set of electronically connected computers which can share information and resources among themselves. Like every other technological prospect, computer networks come with its set of advantages and disadvantages.

Advantages of Networks

File Sharing

The major advantage of a computer network is that is allows file sharing and remote file access. A person sitting at one workstation that is connected to a network can easily see files present on another workstation, provided he/she is authorized to do so.

This saves him/her the hassle of carrying a storage device every time data needs to be transported from one system to another. Further, a central database means that anyone on that network can access a file and/or update it. If files are stored on a server and all of its clients share that storage capacity, then it becomes easier to make a file available to multiple users.

Resource Sharing

Resource sharing is another important benefit of a computer network. For example, if there are twelve employees in an organization, each having their own computer, they will require twelve modems and twelve printers if they want to use the resources at the same time. A computer network, on the other hand, provides a cheaper alternative by the provision of resource sharing. All the computers can be interconnected using a network, and just one modem and printer can efficiently provide the services to all twelve users.

Inexpensive Set-Up

Shared resources mean reduction in hardware costs. Shared files mean reduction in memory requirement, which indirectly means reduction in file storage expenses. A particular software can be installed only once on the server and made available across all connected computers at once. This saves the expense of buying and installing the same software as many times for as many users.

Flexible Handling

A user can log on to a computer anywhere on the network and access his files. This offers flexibility to the user as to where he should be during the course of his routine. A network also allows the network administrator to choose which user on the network has what specific permissions to handle a file. For example, the network administrator can allot different permissions to User Y and

User X for File ABC. According to these permissions, User Y can read and modify File ABC, but User X cannot modify the file. The permission set for User X is read-only. This offers immense flexibility against unwarranted access to important data.

Increased Storage Capacity

Since there is more than one computer on a network which can easily share files, the issue of storage capacity gets resolved to a great extent. A standalone computer might fall short of storage memory, but when many computers are on a network, the memory of different computers can be used in such a case. One can also design a storage server on the network in order to have a huge storage capacity.

End to end encryption (E2EE)

End-to-end encryption (E2EE) is a digital communications paradigm of uninterrupted protection of data traveling between two communicating parties. It involves the originating party encrypting data so only the intended recipient can decrypt it, with no dependency on third parties. End-to-end encryption prevents intermediaries, such as Internet providers or application service providers, from discovering or tampering with communications. End-to-end encryption generally protects both confidentiality and integrity.

Typical server-based communications systems do not include end-to-end encryption.

These systems can only guarantee protection of communications between clients and servers, not between the communicating parties themselves. Examples of non-E2EE systems are Google Talk, Yahoo Messenger, Facebook, and Dropbox.

Some systems that normally offer end-to-end encryption have turned out to contain a back door that subverts negotiation of the encryption key between the communicating parties, for example Skype.

The end-to-end encryption paradigm does not directly address risks at the communications endpoints themselves, such as the technical exploitation of clients, poor quality random number generators, or key escrow. E2EE also does not address traffic analysis, which relates to things such as the identities of the end points and the times and quantities of messages that are sent.

Disadvantages of Networks

Security Concerns

One of the major drawbacks of computer networks is the security issues that are involved. If a computer is a standalone computer, physical access becomes necessary for any kind of data theft. However, if a computer is on a network, a hacker can get unauthorized access by using different tools. In case of big organizations, various network security software needs to be used to prevent theft of any confidential and classified data.

Virus and Malware

If even one computer on a network gets affected by a virus, there is a possible threat for the other systems getting affected too. Viruses can spread on a network easily, because of the inter-connectivity of workstations. Moreover, multiple systems with common resources are the perfect breeding ground for viruses that multiply. Similarly, if malware gets accidentally installed on the central server, all clients' computers in the network that are connected to that server will get affected automatically.

Lack of Robustness

If the main file server of a computer network breaks down, the entire system becomes useless. If there is a central linking server or a bridging device in the network, and it fails, the entire network will come to a standstill. In case of big networks, the file server should be a powerful computer, which often makes setting up and maintaining the system doubly expensive.

Needs a highly skilled expert

The technical skills and know-how required to operate and administer a computer network is considerably high. Any user with just the basic skills cannot do this job. Also, the responsibility that comes with such a job is high, since allotting username-passwords and permissions to users in the network are also the network administrator's duties. Similarly, network connection and configuration is also a tedious task, and cannot be done by an average user who does not have advanced knowledge of computers and/or networking skills.

Lack of Independence

Since most networks have a centralized server and dependent clients, the client users lack any freedom whatsoever. Centralized decision making can sometimes hinder how a client user wants to use his/her own computer. Computer networks have had a profound effect on the way we communicate with each other today, and have made our life easier.

From the World Wide Web to your local office LAN, computers have become indispensable in daily life, and networks have become a norm in most businesses. If networks are designed and configured keeping in mind its pros and cons, they are the best piece of facility you could ever have.

Most Common Computer Network Problems

Dear leaner, whether you are a system administrator in an organization or someone who has a networked setup in your home, troubleshooting networking glitches is an inseparable part of your life. For a person, who ensures the smooth functioning of networked computers, frantic calls of help are the norm rather than the exception.

In other hand disasters do happen, most of the calls demanding assistance are a result of some very basic troubles; troubles that do not require a lot of skill, but just a little patience.

Dear leaner, in this section we going to learn on how to fix the most common networking and Internet problems right here.

Common Network Problems

IP Address and Network Card Issues

Sometimes, two computers are assigned the same IP address erroneously; and because the IP address is the identifying feature of a computer, it leads to obvious connectivity issues. On the other hand, network cards enable computers to link, and faults in the network cards obviously disrupt connectivity.

Fix it: Simply enough, changing the IP address on one computer will fix this problem in no time. To resolve the network card issue, pinging another computer is how you test the network card's functioning, which should tell you if it needs to be fixed.

Network Related Problems

Problems related to connectivity plague us perpetually, and more often than not, the solution lies in checking your physical connections and connection devices. Even with Wi-Fi network, there could be some unreachable areas where radio signals simply refuse to venture; and with a multiple client **WLAN**, you must choose a central location to install the router or **WAP.**

The Solution: A quick inspection of your router or hub will tell you if some machine is disconnected, or if there is a faulty cable.

Absence of Connectivity

Certain computers remain undetectable even after the naming rules for computers and domains have been followed. If you aren't using TCP/IP already (especially with home setups), it is recommended you do so as the functionality it offers is unmatched.

Fix it: Ensure all the computers are within the same subnet with individual IP addresses. This is elementary; but, just check if the file and printer sharing option is installed and functioning, and also define network shares on each computer.

Slow-moving Connectivity

Slow connectivity is the mark of a haphazardly planned network, leading to extra collisions, which the network is incapable of handling. Heavy file transfers bring down the speed tremendously. At times, the network card, which is actually in charge, may also be overtaxed.

The Solution: Users must be told to zip bulky files while transferring, which lowers the pressure on the network. Also, check if the network card is not suspended in the transmit mode, which indicates that the card is working overtime. All you need to do in such cases is, to replace the faulty components; having done that, never forget to test the functionality.

Drop in Internet Connections

Troubleshooting Internet connection drops should begin with an examination of the router and a check for any configuration

problems. Before you do that, just confirm if your signal strength is fine, and if it is, the problem is obviously internal.

Fix it: In case you have a wired setup, examine the network cables, as you're likely to notice that the source of the problem is a faulty cable. With wireless setups, it gets a little difficult to identify the source of the problem. However, in most cases, as mentioned before, the rogue computer could just be placed in a network unfriendly zone.

Problems Caused by Firewall Status

Along with providing the necessary security, Firewall settings can interfere with file sharing on connected computers. It is true that disabling security features can make your system vulnerable to attacks, but lowering security levels should not cause too much trouble.

The Solution: Rigid Firewall settings need to be adjusted to allow networked computers to share data. You may consider disabling the security settings temporarily, after having thoroughly considered all security related threats.

Review questions

1. Define computer networks.
2. Define communication devices in computers.
3. What are the hubs? Explain.
4. How are switches differs from hubs?
5. What is a modem?

The Internet

The Internet is a global system of interconnected governmental, academic, corporate, public, and private computer networks. It is composed of millions of networks. It is truly a global infrastructure and one of the first infrastructures to grow so rapidly. It is the successor of the Advanced Research Projects Agency Network (ARPANET) developed by DARPA of the United States Department of Defence.

Generally, there are two main types of internets namely **Intranet** and **Extranet.**

Intranets

An intranet is a set of networks that are under the control of a single administrative entity. This means that the administrative entity limits the use of the intranet to its authorized users. Most commonly, an intranet is the internal LAN of an organization. A large intranet typically has at least one web server to provide users with organizational information.

Extranet

An extranet is a network that is also under the administrative control of a single organization, but supports a limited connection to a specific external network. For example, an organization may provide access to some aspects of its intranet to share data with its business partners or customers. These other entities are not necessarily trusted from a security standpoint. Network connection to an extranet is often, but not always, implemented via WAN technology.

Over the Internet, there can be business-to-business (B2B), business-to-consumer (B2C) and consumer-to-consumer (C2C) communications. Intranets and extranets can be securely superimposed onto the Internet, without any access by general Internet users and administrators, using secure Virtual Private Network (VPN) technology.

Internet Origin

Internet first came into existence in the year 1969. The Internet was restricted to use by universities, government agencies, and researchers for several numbers of the years. In the mid-1960s, mainframe computers in research organizations were stand-alone devices. Computers from different manufacturers were unable to communicate with one another.

The department of defence had a section called Advanced Research Projects Agency (ARPA) was interested in finding a way to connect computers so that researches could share their findings, and eliminate costs and duplication of effort. Thus, ARPANET was created in 1969. In the year 1970, the first e-mail messages on the Internet were sent. In 1972, two ARPANET project members collaborated to attempt to link multiple networks to each other.

The University of California at Los Angeles, the Stanford Research Institute and the University of Utah were connected as part of the Advanced Research Projects Agency Network (ARPANET) project. It is this network that evolved to become what we now call the Internet.

In 1973, they created TCP/IP a list of protocols to connect different networks. The companies who wanted to enlarge their LAN-based e-mail began to hook up to the Internet in the 1980s. Companies started linking their internal networks to the Internet. The companies were doing this in order to permit the communication between their employees and employees at other companies.

By 1991, as time went on and more developments were made, IBM, Merit, and Verizon created an organization to build a high-speed Internet backbone of multiple super computers spread throughout the United States. It was because of these early Internet connections that the computer really began to progress from a computational device to a communications device In the 1990s, the Internet expanded and grew exponentially bigger when Tim Berners-Lee invented the World Wide Web (WWW)

Internet Social impact

Dear leaner, internet has played a significant role in social relationships. Nevertheless, devices like the telephone system were originally advertised with an emphasis on the practical dimensions of the device (such as the ability to conduct business or order home services) as opposed to the social dimensions.

In recent years, the popularity of social networking sites has increased dramatically. These sites allow users to communicate with each other as well as post photographs, events and profiles for others to see. The profiles can list a person's age, interests, sexual preference and relationship status. In this way, these sites can play important role in everything from organizing social engagements to courtship.

Prior to social networking sites, technologies like short message service (SMS) and the telephone also had a significant impact on social interactions. In cultural terms, internet has increased the public's ability to access music and film. With television, people can watch films they have not seen before in their own home without having to travel to the video store or cinema. With radio

and the Internet, people can listen to music they have not heard before without having to travel to the music store.

The World Wide Web

The World Wide Web is a system of interlinked hypertext documents accessed via the Internet using a web. The WWW is made up of **millions of pages of information** held on computers called Web Servers. These pages can contain text, images, and videos. You can navigate through these web pages through hyperlinks. Every link you click on a webpage is a hyperlink.

Browser

Web browsers are software designed to retrieve, and present pages on the World Wide Web. A web address is the informal name of the URL or uniform resource locator Each page has a specific URL and the browser locates a web page based on the URL**.**

Some common web browsers include, Firefox, Internet Explorer, Google Chrome, Safari etc. Browsers usually offer similar features such as back and forward buttons, Refresh button and Stop button, Address bar for the UR, A search engine, Status Bar and Find options.

Domain and sub Domain names (DNS)

Most Internet hosts or servers have a Domain Name System. It is a unique address (uses words) which assigned to a computer in order to identify business on the internet. It is a hierarchical naming system for any resource connected to the Internet or a private

network. It identifies the type of institution that owns the computer. Sometimes called an **'Internet's Phonebook'.**

The name is combined with a generic top-level domain (TLD) such as com or org. For example, an Internet server owned by TIGO (for example) might have the domain name Tigo.com The domain name must be registered before using it. Or when you type 'http://www.saris.iae.ac.tz in a Web Browser a DNS server translates that to the IP address of IAE Saris.

Sub domain names

Sub domains are created to organize and navigate to different sections of users website, for example this www.iae.ac.tz website, the www is the sub domain name. for more understanding, the figure…. bellow shows more details.

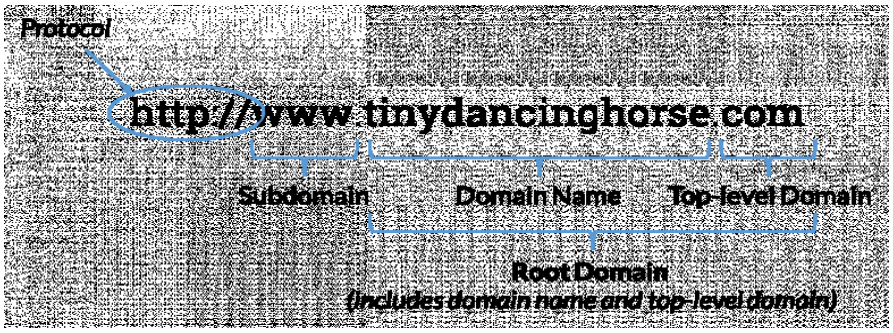


Figure 3:9: Root Domain name, TLD and Sub domain

Examples of top-level domains names are

- gov- (government agencies), mil- (military), edu/.ac (education institution), .org (organization non-profit), com (commercial business). net (network organization), ca – Canada. .th – Thailand, tz – Tanzania, .ke – Kenya.

Website

Website is a door through which the customer can enter the virtual company. It is a part of internet for all practical purpose. Is the combination of the home collection of documents that span many internet servers?

Website are like books and web pages are particular pages in the book. Web pages contain news, images, movies, sound, 3D woeds animation etc.

Internet Search engines

Within the search engine you enter a key word or phrase and it will retrieve documents from the Internet based on the information you typed in. To search the Internet, you use what are called Internet Search Engines. These are easily accessed via your Internet browser (i.e. Microsoft Internet Explorer, Google chrome or Netscape Navigator/Communicator, altvista, yahoo, Amazon, Cnn).

Unit Reflection

A small, independent, business/home/life insurance company consisting of an owner, a business manager, an administrator, and four agents decides to implement a network. The company occupies half of a small building in an office park. Their volume of business had been stable for the past three years, but recently it has been increasing. To handle the increased business volume, two new agents will be hired. *Your task is to design a suitable type of network to be implemented for this company.*

Unit Assignment

Every teacher in the School has a computer, but the headmaster/teacher has the only printer. These computers are not connected by any form of networking. When teachers need to print a document, they must first copy the file to a floppy disk, then carry it to the headmaster's computer, where they are finally able to print it. Similarly, when staff members want to share data, the only means available is to copy the data on one computer to a hardware storage device and insert the it in another computer.

Recently, problems have arisen. The Headmaster/teacher is spending too much time printing other people's documents; and it is frequently unclear which copy of a given document is the current and authoritative version.

Your task is:

1. How to solve the printing problem which is existing n this school?

2. to recommend Which type of network would you suggest for this School where the users are more about 150?

Unit 4

Introduction to Multimedia

Introduction

Dear leaner, the multimedia has become important in human development and will continue to dominate the major part of the current world. Multimedia holds a paramount importance in the different activities (such as entertainments, mass education, health, business marketing, etc.). Many people rely on the multimedia technology in different fields.

Learning Outcomes

Dear learner, after the completion of this unit you should be able to:

- define terms related to multimedia;
- describe multimedia tools;
- explain multimedia coding standards; and
- apply some multimedia systems.

What is Multimedia?

Multimedia Is the field concerned with the computer-controlled integration of texts, graphics, drawings, animation, audio, still and moving images. In multimedia, information can be represented, stored, transmitted and processed digitally.

In other words, Multimedia is any combination of text, graphic, sound, animation and video that is delivered by computer. When you allow the user to control what and when these elements are delivered, it is *interactive multimedia*.

Multimedia System

Multimedia System is a system that is capable of processing multimedia data and applications. A Multimedia System is characterized by the processing, storage, generation and manipulation of Multimedia information.

Multimedia system has hardware Peripherals such as: Input devices, Output devices, Storage devices, Communication devices, Modems and Network Interfaces.

Characteristics of multimedia system

A Multimedia system has four basic characteristics these are:

Multimedia systems must be computer controlled.

Multimedia systems are integrated.

The information they handle must be represented digitally.

The interface to the final presentation of media is usually interactive.

Components of Multimedia system

In order to form the Multimedia system, it needs components such as:

Capture devices: These includes Video Camera, Video Recorder, Audio Microphone, Keyboards, mice, graphics tablets, input devices (2D and 3D) Digitizing Hardware.

Storage Devices: these are Hard disks, CD-ROMs, DVD-ROM, etc.

Communication Networks: Local Networks, Intranets, or other special high-speed networks.

Computer Systems: Multimedia Desktop machines, Workstations, MPEG/VIDEO/DSP Hardware

Display Devices: Projectors, CD-quality speakers, HDTV, SVGA, Monitors, Colour printers etc.

Multimedia Input Devices

Multimedia input devices are not limited to the following,

Keyboards, Microphone, Digital camera, Scanners, Touch screen, Digital pen, trackball, etc.

PEN input

The PEN is one of the input devices for multimedia. It is a fast and efficient way to capture handwritten information and store it on your computer. usually comes with a USB cradle to upload information to the computer.

It captures and saves as written on digital paper, which has small dots on it that allow the pen to see what has been written. As you write, the pen captures the movement along the paper, and the movement is stored as a series of coordinates.

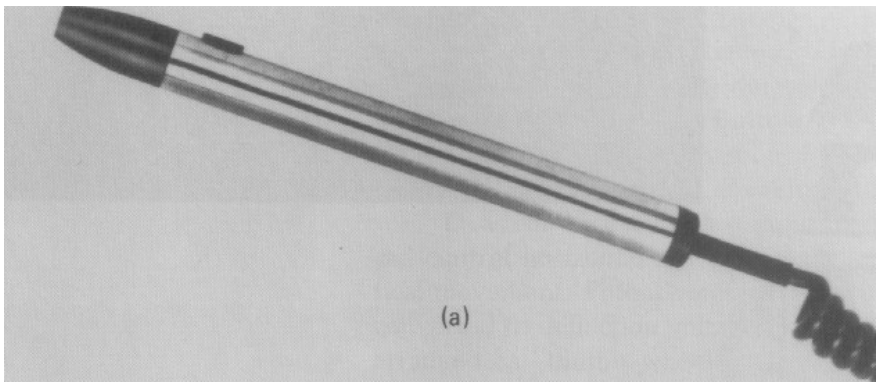


Figure 4:1 Working of the Digital Pen

When the pen is brought into contact with the screen, the digitizer generates the input as the pen is moved. Interrupts appear to the pen driver as messages. Then Driver builds pen packet containing x and y it Coordinates and the status of the pen. If the pen is moved on the screen, packets are sent to the display driver to draw the pen movements.

Multimedia Coding Standards

The following are the coddling standard used in multimedia

a) Still Picture Coding: JPEG 2000
b) Video Coding: MPEG-4
c) Multimedia Content Description Interface: MPEG-7
d) Speech Coding Standards: ITU G.729
e) Audio Coding Standards: MPEG-4
f) Text compression standards.

Video and Display systems

Most application are windows based with menu picks, bar graphs, pie charts,3D drawings ,3D spreadsheets. Video bring animation and live pictures into application. Therefore, the display system is an architectural component in multimedia system.

Display Systems Performance Issues:

This determines how the user perceives the performance and multimedia application. Main factors include:

a) Bandwidth;
b) Decoding;
c) Display technology
d) Some standards are
e) MDA- monochrome display adapter
f) EGA-Extended Graphics Adapter
g) PGA-Professional Graphics Adapter
h) VGA-Video Graphics Adapter
i) SVGA-Super Vidéo Graphics Adapter
j) Multimedia Digital V/ s Analog devices

Data captured in the analogue form should be converted to digital form. Therefore, Hardware and Software programs required to perform this conversion is called codecs, processing, etc.

Resolution and bandwidth issues:

Every object has some measure of quality for example,

Images quality- is measured in terms of pixels/inch.

Sound quality – sampling rate and no of bits required to represent amplitude.

Video quality- no of bits used for colour representation, no of frames per second.

Multimedia Output Devices

Monitors

Monitors contain a Cathode Ray Tube. Electron beams are projected from the back end of this tube towards the screen. This activates three different types of phosphors (chemicals) on the screen to glow. The combination of the glowing phosphors creates the colours and images that are viewable on the screen. The rate at which the phosphors are activated is called the refresh rate and is measured in hertz (Hz).

The screen of the monitor is made up of individual picture elements called pixels. These pixels are made up of many dots of phosphors grouped together. Each pixel is encoded and displayed separately from the others. The higher the number of pixels per inch, the higher the quality of the monitor.

Flat screens and lap top screens obviously have no space for a Cathode Ray Tube. Flat devices use liquid crystals that allow a certain amount of light to pass through them. These displays are called Liquid Crystal Displays (LCDs

Generally, there are three types of Monitors display system namely:

CRT Display systems

A CRT monitor contains millions of tiny red, green, and blue phosphor dots that glow when struck by an electron beam that travels across the screen to create a visible image. In a CRT monitor tube, the cathode is a heated filament. The heated filament is in a vacuum created inside a glass tube. The electrons are negative and the screen gives a positive charge so the screen glows.

Generates the visual output of text, graphics and video. A monitor's screen consists of scanlines-made of pixel array. Pixel made of Red, Green, Blue phosphors arranged in a triad.

Disadvantages of CRT

a) They have a big back and take up space on desk.

b) The electromagnetic fields emitted by CRT monitors constitute a health hazard to the functioning of living cells.

c) CRTs emit a small amount of X-ray band radiation which can result in a health hazard.

d) Constant refreshing of CRT monitors can result in headache.

e) CRTs operate at very high voltage which can overheat system or result in an implosion.

f) Within a CRT a strong vacuum exists in it and can also result in a implosion.

g) They are heavy to pick up and carry around.

Advantages of CRT

a) The cathode rayed tube can easily increase the monitor's brightness by reflecting the light.

b) They produce more colours

c) The Cathode Ray Tube monitors have lower price rate than the LCD display or Plasma display.

d) The quality of the image displayed on a Cathode Ray Tube is superior to the LCD and Plasma monitors.

e) The contrast features of the cathode ray tube monitor are considered highly excellent.

FLAT Panel Display systems

Video displays that are lighter and much thinner than CRT`s displays. These are:

- Plasma displays
- LCD's (Liquid Crystal Display)

Plasma Screen:

The television lights up thousands of tiny dots with a high-energy beam of electrons. In most systems, there are three-pixel colours -- Red, Green and Blue which are evenly distributed on the screen. By combining these colours in different proportions, the television can produce the entire colour spectrum. The phosphors on the screen of the plasma enhances the viewing pleasure.

Disadvantages of PLASMA Screens

Plasma display unit has a very short life span the manufactures estimate the life span to be around 20,000 hours to 30,000 hours (at a rate of 4 hours of TV a day that gives only 13.7 years). As your plasma display unit gets older its brightness gets dimmer. More expensive than cathode ray tube monitors. Plasma display units must be handled carefully because they are a very fragile display unit.

Advantages of PLASMA Screens

a) Larger viewing angle, 160º compared to LCD 40º & rear projection 120º. (Allows a larger audience to be able to view the image reproduction).

b) No projection throws distance limitations.

c) Plasma display units are considerably thinner in width than the CRT monitors.

d) Plasma display units are either free standing or can be mounted on a ceiling or wall.

e) Has a clearer image, brighter viewing angle, better colour quality and higher contrast ratio than the CRT and LCD display units.

Liquid Crystal Display (LCD)

Liquid crystal displays work by the tiny pixels on the screen showing more than 20,000,000 colours an LCD screen is a multi-layered, sideways sandwich.

A fluorescent light source, known as the backlight. This light passes through the first of two polarizing filters. The polarized light then passes through a layer that contains thousands of liquid crystal pixels arrayed in tiny containers called cells.

The cells are, in turn, arrayed in rows across the screen; one or more cells make up one pixel. Electric leads around the edge of the LCD create an electric field that twists the crystal molecule, which lines the light up with the second polarizing filter and allows it to pass through it.

Disadvantages of LCD Screens

a) After a while the LCD displays, then some of the pixels will die, you will see a discoloured spot on a black spot on the display.

b) LCD is considerably at a high price.

c) The LCD display will have slow response times.

d) The LCD display has a fixed resolution display and cannot be changed.

e) LCDs uses analogue interface making careful adjustment of pixel tracking/phase in order to reduce or eliminate digital noise in the image.

f) The viewing angle of LCD display is very limited due to the Automatic pixel tracking/phase controls.

g) The sharpness of a LCD display is at maximum weakness.

Advantages of LCD

a) Zero geometric distortion at the native resolution of the panel.

b) High peak intensity produces very bright images environments.

c) Screens are perfectly flat.

d) Consume little electricity and produce little heat

e) Very light and can be put anywhere or moved anywhere in the house.

f) Lack of flicker and low glare reduce eyestrain.

Bandwidth issues

is the capacity of a wired or wireless network communications link to transmit the maximum amount of data from one point to another over a computer network or internet connection in a given amount of time?

How bandwidth works

The more bandwidth a data connection has, the more data it can send and receive at one time. Bandwidth can be compared to the amount of water that can flow through a water pipe. The bigger the pipe, the more water can flow through it at one time. Bandwidth works on the same principle. So, the higher the capacity of the communication link, or pipe, the more data can flow through it per second.

How to measure bandwidth

While bandwidth is traditionally expressed in bits per second (bps). Modern network links have greater capacity, which is typically measured in Millions of bits per second (megabits per second, or Mbps) Or Billions of bits per second (gigabits per second, or Gbps).

Printing Technologies

Laser and print requirements

A laser printer needs to have all information about a page before it prints. How the image is communicated from the PC's memory to the printer depends on the type of printer used. The image to be printed, is communicated to the Printer. The printer converts the instructions into a bit map, by the printer's internal processor and result is an image of which every dot will be placed on the paper.

Basic components of laser technology-

Paper feed mechanism, paper guide, laser assembly, Fuser, toner cartridge.

Higher resolutions- 600 to 1200 dpi specialized multiplications;

Print server topologies-can be attached to workstations, workgroup LAN's; and

Form of speed, resolution, colour printing.

Image Scanners

A device which analyses a physical image or an object and converts it into a digital image. A scanner is used to take a print image and put it into a computer. It captures images from photographic prints, posters, magazine pages etc.

Types of scanner

Flatbed Scanner and Film Scanner

Flatbed Scanner

Film Scanner

Specifications of Scanners

Size of Scanner (width, A4),

Type of original (B/W, grayscale or colour)

Speed (cm/s)

Resolution (SPI, samples per inch)

Connectivity (Parallel port (slow), SCSI (faster), USB 1 (relatively slow), USB 2(fast)...

Driver software (Included software/ plug and play)

Output formats

Price.

Digital Cameras

Digital cameras capture an image that already exists. The resulting image files are essentially the same for both. A digital camera records and stores photographic images in digital format.

Once a picture is taken, it is stored in the digital camera's buffer and is compressed into JPEG format. The compressed image is transferred to the memory card. The images can be fed to a computer for further processing.

Cameras- (Availability)

Range from affordable to very expensive. Only professional photographers need to pay a lot of money for cameras! Simple digital cameras are available and usually affordable, though some budgeting may be necessary.

Recording Medium

At first, the recording medium was film, photosensitive paper

Now, most cameras use electronic photo sensors.

DV Camcorder

A DV Camcorder, or called a Digital Video Camera, captures full-motion images and sound into digital data. The CCD (Charged Coupling Device) in a DV camcorder is used to capture video. The quality of video a digital video camera (resolution) can produce depends on the amount of detail the CCD can detect.

Measured in pixels (in terms of Mega pixels (e.g. 1488 times 1728).

The captured video is exported to the video editing software for further processing.

Hard Drive Camcorders

In this type of camera, there is No tapes, no discs, it stores video and images (photos) on an internal hard disk drive. The video file can be transferred to a PC. 30GB can store up to 7 hours of DVD quality video.

Web Camera

A Web camera is a device that allows you to send real time video over the Internet. You can also use a Web camera to record videos that you can save on your computer. The quality of the images produced by a Web camera is determined by its resolution and speed.

Web cameras can commonly transfer video a speed of 15 frames per second and a resolution of 640 x 480 pixels or a speed of 30 frames per second at a resolution of 352 x 288 pixels. Web camera are often used for videoconferencing. Videoconferencing allows you to have face-to-face conversations with people on the Internet or other networks.

Things to Think about when taking Photos

- **Light**

How much light is allowed to fall on the recording medium and for how long is called exposure.

- **Long Exposure Vs Short Exposure**

Long exposure times=lots of light falling on the camera for a long time, makes images blurry while Short exposure, good for capturing fast movement, sports, waterfalls.

Taking good Photos

Keep background free of clutter and distracting details.

Notice how the busier background on the photo at left distracts you from the subject. The photo at right has a much cleaner background.

How much of your image is in good focus (controlled by the aperture)?

a) Do everything for a reason
b) Think about what your photo is showing
c) Remember, you can never represent the world quite as you see it, so make good choices about your photo shows
d) Think about what you want your viewer to see and feel
e) You have a lot of options for how to take a photograph
f) These options can be used to create different moods or concepts for your photo

Unit Reflection

After learning this last unit of this module, try to write a reflective essay on data multimedia system.

Unit Assignment

Attempt the following questions:

1. Define multimedia.
2. Describe multimedia coding standards.
3. Apply multimedia systems.

Unit 5

Preventive Maintenance of ICT Tools

Introduction

Dear leaner, we must take measures when using computing facilities not only to keep our files, and identity safe and secure, but also our equipment and instruments. Much like a car, taking the proper measures to protect computing tools will ensure it will run as designed and not break down on us.

Learning Outcomes

Dear learner, after completion of this unit you should be able to:

- Define computer security terms;
- Understand on how to Protect your ICT equipment/ Instruments;
- Apply techniques on how to Protect your files;
- Protecting your identity;
- Securing your computer when on the web; and
- Apply Protection Methods.

Protecting Your Equipment

Dear leaner, in computing and any other ICT tools needs to be protected so that it can perform well as intended. For example, If the processor and other components of a computer system overheat, the system will get unstable and components will begin to fail and become damaged. Damaged computer parts are expensive and it is essential both for private users and corporations to keep their machines cool.

For example, the maximum heat of a computer should be 185 degrees. A properly cooled system should maintain a temperature of 90 – 110 degrees.

Devices used to cool a system include:

k) CPU and case fans – case fans draw hot air out of the case to prevent overheating.

l) Coolers – sit on top of processor. Contains fan and heat sink. The heat sink draws heat away from processor and the fan blows away the drawn heat.

m) Dust-preventing tools – such as those discussed in lesson 2

When protecting your ICT equipment and instruments, the most basic protection begins with combating **surges** and **spikes.** In this make sure that you equip your computing facilities with this device.

Surge protectors: are inexpensive devices that filter electrical power to eliminate surges and spikes before they get to your equipment. Surge protectors are very inexpensive, starting at around Tshs. 5000 for a 4-outlet protector.

When purchasing a surge protector, the lower the let-through voltage, the better your equipment will be protected.

Protecting Your Files

System failure, virus, file corruption, or some other problems can cause data loss. One of the best methods of protecting your data is by backing them up. Never trust important data to only one media and that is why we should always have multiple copies and store them on different devices. Note that after you backup, you should delete a file and attempt to recover it to ensure that the backup process has worked fine.

How to protect your files

Dear leaner, Antivirus software is one of the best lines of defense. Antivirus is computer software used to prevent, detect and remove malicious computer viruses. Antivirus software can protect you from virus, Spyware and other malicious software **(Malware),** Antivirus software also allows us to search web sites and be alerted prior to accessing a harmful site by scanning sites in the search results and based on prior information known about a website. While Firewall Protection Secure Online Shopping & Banking Privacy Protection, Prevents spying, Data Theft and Phishing scams.

Protecting Your Identity

Aside from protecting your files it is crucial that you protect yourself. Your identity is very vulnerable online and you must take steps that your personal information is not stolen.

Ways to protect your identity

In order to protect your identity use antivirus software, anti-spyware software and a firewall. Also create strong passwords and keep computer operating system, browser, and security up to date.

You have to create strong passwords that mix 10 or more letters, numbers and special characters. Don't use the same password for more than one account. A tip is to set your computer's operating system, web browser, and security system to update automatically.

When you send sensitive information over the Internet ONLY do so if a "lock" icon on your browser's status bar is present. This means your information will be safe when it's transmitted. If the bar has a lock and is green that means a stronger encryption is being used and the website is even safer than usual.

If a website does not pass sensitive information there will not be any locks but the website is still okay to use. A popular example of such a website is youtube.com.

Don't always trust free Wi-Fi

Before you use a public Wi-Fi network, see if your information will be protected. If you use an encrypted website, it protects only the information you send to and from that site. If you use a secure wireless network, all the information you send on that network is protected.

Identity thieves rely on people making purchases and connecting to bank accounts through these unsecure Wi-Fi networks for them to steal credit card numbers and other important information.

These unsecure networks are a result of being set up by a person that is not as knowledgeable in the security sector. It is up to the consumer to always be aware and knowledgeable.

Many big companies have been attacked via unsecured Wi-Fi over the years and it has resulted in hundreds of thousands of compromised accounts.

Securing Your Computer When on the Web

A lot of vulnerabilities exist when surfing the web and you have probably heard of them all but what do they actually mean and how do they work? In this lesson we will be covering everything you need to know about viruses and the different kinds that exist.

Firewalls

A firewall is a network device for controlling network security and access rules. Firewalls are typically configured to reject access requests from unrecognized sources while allowing actions from recognized ones. The vital role firewalls play in network security grows in parallel with the constant increase in cyber-attacks.

Malware concepts

Malware – short for malicious software is any software used to disrupt, destroy and gain access to sensitive information.

Malware encompasses different types of virus including worms and Trojans as well as ransomware, spyware, adware, and scareware.

Spyware – type of malware installed on a computer that collects information on the user without their knowledge.

Adware – malware that automatically plays, or downloads advertisements

Scam ware - this includes fake popups on your computer claiming you have a virus. This is the actual virus however, and they want you to buy their “antivirus” to clean your system. In reality, your card just got stolen by the antivirus virus.

Ransomware – this malware encrypts your files and threatens to delete it within a certain amount of time unless you pay. Essentially you are held ransom.

How to know if your computer has a virus

- Antivirus lets you know
- Strange messages appear
- Computer crashes frequently
- Strange files you do not know appear
- Computer slows down and hard drive space is reduced
- Program not working like it used to

Virus Types and the related terms

Dear Learnerdo you What is a computer virus?

A computer virus refers to a program, which damages computer systems and destroys or erases data files.

Payload: is the part of the malware that actually performs the damaging action.

Types of Viruses

Time Bomb – performs an activity on a specific date while **Logical Bomb** performs when a certain action is performed

Worm – fills a computer with self-replicating information without the need of human interaction, slows your system. Spread through the Internet and local area networks, can spread through e-mails, messages and chats. Uses a lot of your network resources slowing down your connection

Boot Sector Virus – infects boot sector of computers. When the system boots, the virus is loaded into memory and destroys data in hard disk. Macro Virus – attach through word or excel and when opened is loaded into main memory. Macros are normally mini-programs that make tedious task simple and easy to do with a single action.

Trojan Horse – Destructive program that pretends to be software, or game that you want and can seriously harm the computer by causing data loss and theft. Do not replicate

Keylogger – associated with Trojans gather computers keystrokes to potentially determine passwords, usernames, social security numbers, and any other critical information that may have been typed in. Modern government websites require you to click rather than type sensitive information.

Some viruses do not steal information but are still an intrusion and can show messages on your screen such as the **Happy99 worm**. Other than forcing this to open, and allowing itself to be spread to other computers this worm does no other damage, and its payload is the mere message and fireworks that appear.

Ways a Virus Can Spread

1. E-mail attachments: Shared USB, Shared files like word that contain macros, direct download from the Web.

2. Phishing

Phishing is a deception designed to steal valuable personal information. Thieves send millions of fraud e-mail messages that appear to be from trusted web sites such as your bank or credit card company, the message attempts to get you to provide personal information. Just like fishing scammers use the emails as bait to lure you in.

Phishing scams include official-looking logos from real organization, and other information taken from the legitimate web site to make their fraudulent emails appear to be more realistic.

The emails contain threats to terminate your account if you do not reply, alert you of false intrusion, or even attempt to reward you or give you exclusive offers.

The links to phishing scams might also resemble that of the real one to trick a distracted eye. For example, Microsoft.com could be changed to micosoft.com or mircosoft.com if you do not notice the subtle change, you could believe you are on the actual website.

Phishing has become increasingly popular because the technical resources needed to execute phishing attacks can be readily acquired through public and private sources. In other words, Phishing has been streamlined and automated to allow use for non-technical criminals.

Most phishing scams rely on deceiving a user into visiting a malicious web site. Just as a fish is unaware that they are in danger of being caught, people are unaware that they are being targeted and might not even be aware of the types of scams that exist.

For phishing scams to work, a person must be unaware of these policies so that they are likely to be more susceptible to scams.

Your technical knowledge is irrelevant in phishing scams.

To protect yourself from phishing, be aware of the organizational policies and procedures for contacting customers, particularly for issues relating to account maintenance and fraud investigation.

Netflix scam

1. In this scam, an e-mail is sent to the Netflix customer and warns them that they have detected unusual activity on their account and have been forced to suspend it.

2. The email if properly formatted might even look like one from Netflix. In addition to the message, the e-mail provides a phone number, and request that you call it for customer assistance.

3. When you are connected to the fake Netflix account representative, the person tells you that a hacker has infiltrated your computer, and "forwards" your call to a Microsoft Technician.

4. This fake technician then pretends to rid your system of the intrusion while actually downloading any important files from your computer.

5. They then bill you for their services and ask that you to take a photo of your ID and credit card for "credential proof" and put it onto your computer. The reason this works on people is that the scammers follow a script just as a real technician would. If a person is not computer savvy, they will think that this person is really helping, and that the way they are doing things is standard procedure.

Facebook scam

1. In the Facebook scams, compromised accounts send messages to people's message box pretending to be a friend of the recipient. The message claims that the sender's house is on fire and burning to the ground. There is a link in the message so that the person can see footage of the fire.

2. The message comes from a hijacked Facebook account. Those who click the link will be taken to a fake Facebook login page designed to steal their real Facebook login details.

3. If you do login on the fake page, you will then be redirected to another page that claims you need download a YouTube Player update in order to view the fire video.

4. Clicking the "update" link will install a Trojan on the computer. The Trojan will collect information from your computer and allow criminals to control the computer remotely.

Protection Methods

1. Use antivirus software

The software examines each and every file in a computer and examines its content with the virus definitions stored in its virus dictionary. The dictionary is a file that belongs to the antivirus software that contains the code identified as a virus.

Antivirus software also constantly monitors the activity of all the programs. If any program tries to write data on an executable file, the antivirus flags that program and investigates it, this method helps with unknown viruses, however, it can also create a false alert and spend resources investigating non-threats.

2. Do not open email attachments you were not expecting Guard against spam, you should be cautious of emails that ask you to confirm personal or financial information over the Internet, or make urgent requests for this information by providing you with frightening information and be cautious of the sender.

3. Never enter personal information in a pop-up screen or click on unknown links; you ever know where it is really going to take you.

4. Scan downloaded files before opening them 5. Disable Macros on Word or Excel

Unit Reflection

Dear learner learning preventive maintenance of ICT tools, try think how you can protect your ICT equipment'/facilities.

Unit Assignment

Attempt the following questions:

1. Define computer security terms.
2. Describe how some can protect his/her computer.
3. Use protection methods.

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