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## RE-EDUCO

### IO4 - ACTIVE LEARNING FOR DIGITAL INNOVATION MODULE 1A

# COMPUTER ESSENTIALS



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## 1. COMPUTERS AND DEVICES

### 1.1. HARDWARE

1.1.1. DEFINE THE TERM HARDWARE. IDENTIFY THE MAIN TYPES OF COMPUTERS LIKE DESKTOPS, LAPTOPS, TABLETS. IDENTIFY THE MAIN TYPES OF DEVICES LIKE SMARTPHONES, MEDIA PLAYERS, DIGITAL CAMERAS.



Monitor, CPU, keyboard, mouse, printer, sound system, RAM, hard drive, and other components of the computer system make up the hardware. Hardware is utilised to take user input, store it, display it, and execute orders. Simply put, computer hardware refers to the physical components required for a computer system to operate. The motherboard, graphics card, CPU (Central Processing Unit),

ventilation fans, webcam, power supply, and other circuit boards that operate within a PC or laptop are all included.

#### 1.1.1.1. MAIN TYPES OF COMPUTERS



**Desktop/Tower computers** - are designed for home or office use. These computers are used to run application programs such as word processors, spreadsheets, databases, presentation software etc. Desktop systems have units that are placed on a desk. Tower systems have units that can either be placed on or underneath the desk.

**Laptops** - are lightweight portable computers with a built-in (thin screen) monitor, keyboard, hard-disk drive, battery, and power supply adapter. Laptops can easily be transported and conveniently used in libraries, temporary offices and at meetings. Laptop computers typically cost more than desktop computers with the same capabilities.



**Tablets** - are small portable computers that use a touchscreen as their primary input device. Most tablets are slightly smaller and weigh less than the average laptop. Early tablet touchscreens were designed to work with light pens. Most modern tablets support human touch input. Tablets are generally seen as accessories to laptops and desktop computers rather than replacements.

### 1.1.1.2. MAIN TYPES OF DEVICES

**Smartphones** - are phones with advanced features like e-mail, Internet and e-book reader capabilities, and/or a built-in full keyboard or external USB keyboard.



**Multimedia players** - are electronic devices capable of storing and playing digital media. Music and videos are typically stored in internal disks or a small memory card that can be inserted in these handheld devices.

**Digital cameras** - are used to take digital photos which are then stored on a SD (Secure Digital) or CF (Compact Flash) card. Unwanted images can be deleted directly on the camera. Most digital cameras also include a small LCD screen that shows a live preview of the image, which makes it easier to capture pictures. Most digital cameras also include an option to record video.



The digital photos are transferred from the camera to a computer via a USB cable. The photos can be incorporated in word-processing documents, presentations, sent by email or posted on a web site. You can also edit them using photo editing software. If you want to print hard copies of your photos, you can use a home printer or an online printing service.

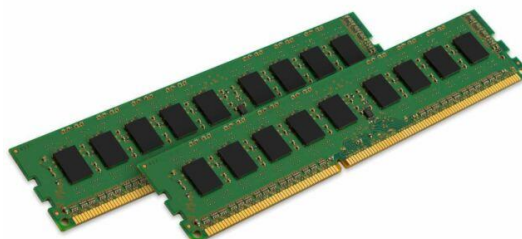
### 1.1.2. DEFINE THE TERMS PROCESSOR, RANDOM ACCESS MEMORY (RAM), STORAGE. UNDERSTAND THEIR IMPACT ON PERFORMANCE WHEN USING COMPUTERS AND DEVICES.

**The Processor** - Every computer has a processor inside it. The processor also known as the Central Processing Unit (CPU) is the 'brain' of the computer. It determines the speed at which program instructions are carried out by the computer.



The speed of the CPU is measured in gigahertz (GHz). 1GHz is equal to 1 billion cycles per second. Each computer instruction requires a fixed number of cycles, so the speed determines how many instructions per second the microprocessor can execute. When the CPU's GHz is higher, the computer will execute program instructions faster.

**Random Access Memory** - Memory is an important component of a computer since it stores and retrieves data. The most common type of computer memory is Random Access Memory (RAM). Because it loses its data when the computer's power is turned off, it's sometimes referred to as volatile memory. Dynamic RAM and static RAM are the two forms of RAM. Static RAM requires more electricity but saves data for extended periods of time, whereas dynamic RAM uses a tiny amount of electricity to store data. RAM



(or dynamic random access memory) is a type of memory that allows you to do things quickly (DRAM). Instructions and data can be temporarily stored in this form of memory.

The more RAM your computer has, the more data can be loaded from the hard drive into the RAM, which can effectively speed up your computer. In fact, adding RAM can be more beneficial to your computer's performance than upgrading the processor. Nowadays, 4GB RAM is a standard on all computers.

If the computer's power supply is cut off, the information held in the RAM is lost. For this reason, data stored in RAM, which is required for future use, has to be stored on secondary storage devices such as USB (Universal Serial Bus) flash drives and hard disks. USB flash drives are sometimes referred to as USB pen disks.

**Storage Devices** - As indicated in the previous section, the internal memory (RAM) is temporary, and therefore information has to be stored on permanent media (hard-disks or USB flash drives) referred to as secondary or backing storage.



Storage devices and media include internal hard disks, external hard disks, network drives, CDs, DVDs, Blu-Ray Discs, USB flash drives, memory cards and online file storage. To use any type of disk, the computer has to be equipped with the appropriate disk drives. More details about these storage devices and media are available in another section of this courseware.

### 1.1.3. IDENTIFY THE MAIN TYPES OF INTEGRATED AND EXTERNAL EQUIPMENT LIKE PRINTERS, SCREENS, SCANNERS, KEYBOARDS, MOUSE/TRACKPAD, WEBCAM, SPEAKERS, MICROPHONE, DOCKING STATION.

**Peripheral hardware** includes computer peripherals including mouse, printers, scanners, and speakers. Input and output devices are the two types of peripherals.

**Input Devices:** Input devices include the computer mouse and scanner. Input devices are used to send data to the computer, as their name suggests. A mouse is used to input cursor movements, whereas a scanner is utilized to digitize tangible media.

Computer output devices include things like printers and speakers. Printers convert digital data like text or image files to a physical medium like paper. Digital files' audio is converted into audible sound waves using speakers.

#### Printers

There are different categories of printers including inkjet and laser printers.



- **Inkjet printer** - sprays small droplets of ink at high speed onto the surface of paper. This process produces high quality print approaching that produced by laser printers. Inkjet printers are reliable, quiet and inexpensive. Colour inkjet printers provide an inexpensive way to print full colour documents.
- **Laser printer** - uses a technology similar to that used in a photocopying machine. It uses a laser beam to produce images with excellent letter and graphics quality. They are quiet and fast but somewhat expensive compared to dot matrix and inkjet printers. Laser printers are widely used in applications requiring high-quality output. Some printers, known as multifunction printers, have printing, scanning and photocopying features.



### Screens

Screens or monitors are also known as video displays or visual display units (VDU). Screens can have different screen sizes e.g., 14"-, 15"-, 17"-, 19"- and 21"-inch. There are two main categories of monitors:



- Cathode-ray tube (CRT) monitors - have a vacuum tube used as a display screen. This same kind of display technology is used for televisions and flight-information monitors at airports.

Thin Film Transistor Liquid Crystal Display (TFT-LCD) monitors - are made up of two plates of glass with a substance in between them in which light is manipulated. Molecules of liquid crystal line up in a way that alters their optical properties, creating images on the screen by transmitting or blocking out light.

Compared to CRT monitors, TFT-LCD monitors are much thinner, weigh less and consume less power. In recent years, touch screens became common. laptop computers. TFT-LCD monitors are also available for desktop computers - they take less desk space compared to CRT monitors. Some touchscreens require the use of special pens. Most modern touchscreens detect human touch. The mouse and keyboard are not required when using a touchscreen device. Tablets and smartphones use the touchscreen technology. Touchscreens are commonly used in computer kiosks by banks, airports etc.



### Scanners

The scanner is a device that transfers printed text and images to a computer. When a document is scanned, it is converted into a digital format. This creates an electronic version of the document that can be viewed and edited on a computer.





Most scanners are flatbed devices, which means they have a flat scanning surface. This is ideal for photographs, magazines, and various documents. Most flatbed scanners have a cover that lifts up so that books and other bulky objects can also be scanned. Another type of scanner is a sheet-fed scanner, which can only accept paper documents.

There are different types of scanners - the flatbed scanners being the most common. Sometimes

scanners form part of a multifunction printer. Such printers have printing, scanning and photocopying features.

Scanners arrive with:

- Driver software -the program that controls the operation of the scanner.
- Photo-editing software - the program used to manipulate scanned images.
- OCR (Optical Character Recognition) software - the program used to transfer printed text into a word-processor for editing and formatting

## Keyboards

The keyboard contains a set of typewriter like keys that enable you to enter data in the computer. The keys on computer keyboards are often classified as follows:



- Alphanumeric keys - letters and numbers.
- Punctuation keys - comma, period, semicolon etc.
- Special keys - function keys, control keys, arrow keys, Caps Lock key etc.

The standard keyboard layout that we use is known as a QWERTY keyboard because the first six keys on the top row of letters spell QWERTY. Local computer stores sell keyboards with the Maltese characters.

## Mouse

The Mouse is a device that controls the movement of the cursor or pointer on a display screen. The mouse may contain up to three push buttons each of which has a different function depending on the program being used have. Nowadays, mice may also include a scroll wheel for scrolling through long documents etc.



## Trackpad

The trackpad is a small, touch-sensitive pad used as a pointing device on most laptop computers. By moving a finger or other object along the pad, you can move the pointer on the display screen. Tapping the pad is equivalent to clicking the mouse.



## Webcam

The webcam or web camera is a small camera that either attaches to a user's monitor or sit on a desk. Most webcams connect to the computer via USB. Most laptops and tablets have in-built webcams.

The webcam is used to hold video communications over Internet. Typically, webcams are used with communication programs such as Skype, Google Hangouts etc. Through webcams users are able to see each other and movements in real time. Webcams can be used to record video files and to take still pictures



## Speakers

The speakers can be plugged into the back of computers carrying a sound card. The sound card is used to capture as well as play back recorded sounds. The speakers enhance the multimedia capabilities of computers. Laptops and tablets have in-built speakers.

## Microphone

The microphone is a device that allows sound signals to be converted into digital files that may be stored on the computer. Microphones can be stand-alone or incorporated with headphones or in-built in laptops.

Voice-recognition software uses a microphone to convert a person's speech into digital signals by comparing the electrical patterns produced by the speaker's voice with a set of pre-recorded patterns stored in the computer. Microphones are also used along with Internet telephony software to communicate with other people via Internet.



## Docking Station



The docking station also known as a universal port replicator is a hardware device that allows laptops to connect easily to a TFT screen, a keyboard, a printer etc. Docking stations enable users with a laptop computer to convert it into a desktop computer when at the office or at home. The laptop connects directly to the docking station without the need of using any additional cables. Docking stations vary depending on the laptop model.

### 1.1.4. IDENTIFY COMMON INPUT/OUTPUT PORTS LIKE: USB, HDMI.

A **Computer Port** is an interface or a point of connection between the computer and its peripheral devices. Some of the common peripherals are mouse, keyboard, monitor or display unit, printer, speaker, flash drive etc.

The main function of a computer port is to act as a point of attachment, where the cable from the peripheral can be plugged in and allows data to flow from and to the device.

- PS/2
- Serial Port
- DB-25
- DE-9 or RS-232 or COM Port
- Parallel Port or Centronics 36 Pin Port
- Audio Ports
- Surround Sound Connectors or 3.5 mm TRS Connector
- S/PDIF / TOSLINK
- Video Ports
- VGA Port
- Digital Video Interface (DVI)
- Mini-DVI
- Micro-DVI
- Display Port
- Mini DisplayPort
- RCA Connector
- Component Video
- S-Video
- HDMI
- Mini HDMI
- Micro HDMI



Typically, all computers will have these ports:

**USB (Universal Serial Bus) port** - is a slot in the computer that supports fast transfer data rates. USB flash disks, digital cameras, mice, keyboards etc. can be connected to the computer via the USB port.

**HDMI (High-Definition Multimedia Interface) port** - is a slot on the computer that supports the transfer of audio and video data through a single cable. A computer with an HDMI port can be connected to an external monitor or HDTV (High- Definition Television) with one cable, supporting high-definition video and audio.



Network port - is used to connect the computer to a network or a modem.

**FireWire port** - is a slot that connects digital video cameras to the computer. FireWire supports faster transfer data rates than USB ports



## 2. FILE MANAGEMENT

### 2.1. INTRODUCING FILES AND FOLDERS

#### 2.1.1. RECOGNISE GOOD PRACTICE IN FOLDER, FILE NAMING: USE MEANINGFUL NAMES FOR FOLDERS AND FILES TO HELP WITH SEARCHING AND ORGANISATION.

A computer program is made up of a collection of files. These files can be divided in two categories:



Program files / Instruction files - written by computer programmers i.e., manufacturers of software. Users are not really interested in the contents of these files.

Data files / User files - written by you (the user) i.e., letters, memos, faxes, databases, graphs etc.

Keep the names of your files and folders simple yet descriptive. In file names and file paths, avoid excessive duplication and redundant words. Words should be separated with capital letters rather than spaces. They ensure that the relevant item is retrieved and that no other papers are mixed up with it. The file name tells you what the document is about at a glance, making it easier to find what you're looking for. This is why naming standards for files are so crucial. It is a good practice to use meaningful names for folders and files to help with searching and organisation. A file naming convention is a method of naming files in a systematic way that makes it easier to find them later. Knowing the contents of a file without having to open it is possible given a consistent and descriptive protocol.

### 2.2. STORAGE AND COMPRESSION

#### 2.2.1. IDENTIFY FILE SIZE, FOLDER SIZE, STORAGE CAPACITY MEASUREMENTS LIKE: KB, MB, GB, TB.

Here are the most common ones. KB, MB, GB - A kilobyte (KB) is 1,024 bytes. A megabyte (MB) is 1,024 kilobytes. A gigabyte (GB) is 1,024 megabytes. A terabyte (TB) is 1,024 gigabytes. File sizes are always measured in bytes. A byte is a sequence of 8 bits (and remember, a bit is the smallest piece of digital information, 0 or 1). A single byte is enough bits to represent 256 numbers, because  $2^8 = 256$ . Start superscript, 8, end superscript, equals, 256.

**Bit** - short for Binary Digit, is the smallest unit of information on the computer. A single bit can hold only one of two values: 0 or 1. More meaningful information is obtained by combining consecutive bits into larger units. A group of eight bits (e.g., 1011 0010) make up one byte.

**Byte (B)** - is the amount of storage needed to store one character (e.g., a, c, +, =, %, 8). So, for instance, a computer with 32,000 bytes of memory can store up to 32,000 characters in its memory. Large amounts of memory are indicated in terms of kilobytes, megabytes and gigabytes.

**Kilobyte (KB)** - is equivalent to 1024 bytes.

**Megabyte (MB)** - is equivalent to 1024x1024 bytes (or 1,048,576B). Five hundred (500) pages of double-spaced text occupy about 1MB of space.

**Gigabytes (GB)** - is equivalent to 1024x1024x1024 bytes (or 1,073,741,824B). Hard-disks (discussed later) have storage capacities measured in terms of GB (200-320GB).

**Terabyte (TB)** - is equivalent to 1024x1024x1024x1024 bytes (or 1,099,511,627,776B).

Name	Equal To	Size (In Bytes)
Bit	1 Bit	1/8
Byte	8 Bits	1
Kilobyte	1024 Bytes	1024
Megabyte	1, 024 Kilobytes	1, 048, 576
Gigabyte	1, 024 Megabytes	1, 073, 741, 824
Terabyte	1, 024 Gigabytes	1, 099, 511, 627, 776

**Files** - are units that store collections of data. Almost all information stored in your computer must be in a file. Different types of files store different types of information. For example, program files store programs, text files store text; graphic files store images or pictures etc. Each file has a name referred to as a filename. Typically file sizes range from KB to MB.

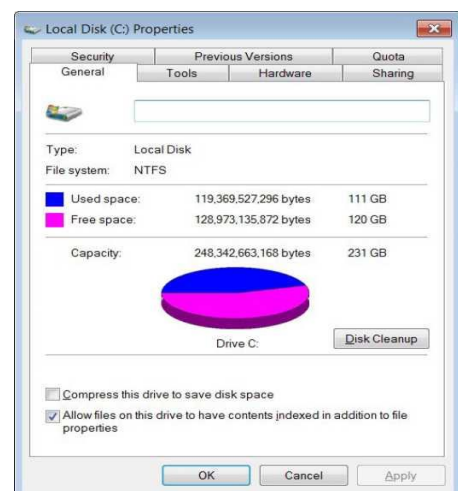
**Folders** - store collections of files. Typically, you organize your word-processing, spreadsheet and picture files (from your digital camera) in folders. Computer programs (e.g., MS Windows, MS Word, MS Excel etc.) are stored in separate folders. Folders may also contain other folders (sub-folders) in them. Folder sizes may range from KB to GB.

## 2.2.2. VIEW AVAILABLE SPACE ON A STORAGE DEVICE.

Select File Explorer from the taskbar, then This PC on the left to see how much space is left on your Windows 10 device. Under Devices and drives, you'll see how much space you have on your hard drive.

To view the available space on a USB flash disk, hard disk etc.:

1. Navigate to the USB flash disk or hard disk in Computer window.
2. Right-click the disk.
3. Click Properties. The Properties dialog box is displayed. Free space indicates the available space on the selected storage device.
4. Click OK button



### 2.2.3. UNDERSTAND THE PURPOSE OF FILE, FOLDER COMPRESSION.

A digital folder that has been compressed to a smaller size **to save disk space**. It can be used for backup or any purpose. Supported by the operating system, compressed folders offer the user a way to store larger files or a larger number of files without taking up as much space.

### 2.2.4. COMPRESS FILES, FOLDERS.



Press and hold (or right-click) the file or folder, select (or point to) Send to, and then select Compressed (zipped) folder. A new zipped folder with the same name is created in the same location.

File compression is the process of reducing the size of a data file to the smallest size possible. Compressed files take up less storage space and can be transferred to other computers more quickly than uncompressed files. You can work with compressed files and folders in the same way that you work with uncompressed files and folders. You can also combine several files into a single compressed folder. This makes it easier to share a group of files.

Typically, compressed files are organized in a folder ending with the extension .ZIP (MS Windows) or .SIT, or .HQX (Macintosh). A folder containing compressed files is also known as an archive folder.

To compress files in a folder on a drive:

1. Locate the file or folder that you want to compress.
2. Right-click the file or folder. A short-cut menu will be displayed.
3. Point to Send to.
4. Click Compressed (zipped) folder. A new compressed folder is created in the same location.

To rename it, right-click the folder, click Rename, and then type the new name.

Note that:

- Some types of files, like JPEG pictures, are already highly compressed. If you compress several JPEG pictures into a folder, the total size of the folder will be about the same as the original collection of pictures.
- If you have already created a compressed folder and you want to add a new file or folder to it, drag the files that you want to add to the compressed folder.

### 2.2.5. EXTRACT COMPRESSED FILES, FOLDERS TO A LOCATION ON A DRIVE

To unzip a single file or folder, open the zipped folder, then drag the file or folder from the zipped folder to a new location. To unzip all the contents of the zipped folder, press and hold (or right-click) the folder, select Extract All, and then follow the instructions.

To extract compressed files from a location on a drive:

1. Locate the compressed folder that you want to extract files or folders from.
2. Do one of the following:
  - To extract a single file or folder, double-click the compressed folder to open it. Then, drag the file or folder from the compressed folder to a new location.
  - To extract the entire contents of the compressed folder, right-click the folder, click Extract All, and then follow the instructions.

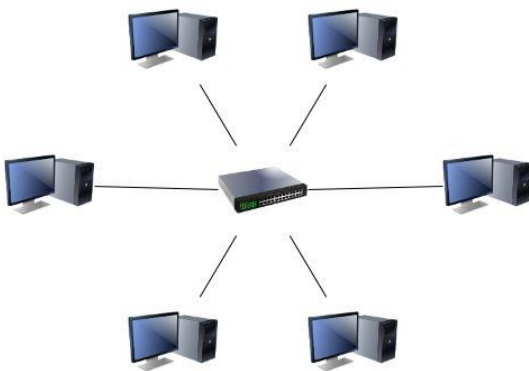


### 3. NETWORKS

Over the past years, millions of personal computers have been connected together to form computer networks. These networks facilitate the communication of data between different computers and sharing of resources.

#### 3.1. NETWORK CONCEPTS

##### 3.1.1. DEFINE THE TERM NETWORK. OUTLINE THE PURPOSE OF A NETWORK: TO SHARE, ACCESS DATA AND DEVICES SECURELY.



A computer network is made up of two or more computers that are linked together by wired or wireless connections for the purpose of transmitting, transferring, or sharing data and resources. At the same time or at various times, network sharing allows multiple people to access information through multiple devices. When a device is connected to a network, it allows other users/devices on the network to share and exchange data. Shared resources are another term for network sharing. A network is made up of two or more computers that are connected in order to share resources (such as printers and CDs), exchange files, and allow electronic communication. Cables, phone lines, radio waves, satellites, and infrared light beams can all be used to connect computers on a network.

In general, the purposes of network include:

- Sharing of data - Networking enables several computer users to share data. Thus, individual users can work on the same data at the same time. Depending on the configuration of the network, users work on real time updated data.
- Sharing of peripheral devices - Networking enables several computer users to share laser printers, scanners, modems etc. Typically, several computer users in the same office are served by a single printer. This is cost effective for organisations with many computer users.
- Sharing of programs - Networking enables several computer users to share the same programs. In most organisations, people make use of the same software. Rather than purchasing individual software packages for each computer user, organisations purchase network versions of the program.
- Efficient communication - Networking enables efficient exchange messages and documents between several computer users. Networking eliminates the typical delays encountered with standard inter-office mail delivery or telephone calls.

A client is a computer that requests data from another computer known as a server. Compared to the client computer, the server is a powerful computer in terms of processing speed and data storage.

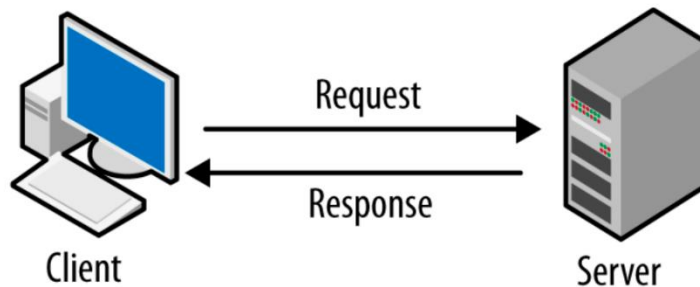
Different servers may be used to manage different tasks.

- A file server is a computer that acts like a disk drive, storing the programs and data files shared by client computers.



- A print server controls one or more printers and stores the print-image output from all computers on the system.
- Web servers contain Web pages that can be viewed using a browser.

**Mail servers** manage e-mail.



3.1.2. DEFINE THE TERM INTERNET. IDENTIFY SOME OF ITS MAIN USES LIKE: WORLD WIDE WEB (WWW), VOIP, E-MAIL, IM.



The Internet is a vast network that connects computers all over the world. Through the Internet, people can share information and communicate from anywhere with an Internet connection.

The Internet, short for 'International networking,' consists of thousands of computer networks that connect millions of computers around the world. The Internet is also referred to as the 'Net', 'Information Superhighway' and 'cyberspace'.

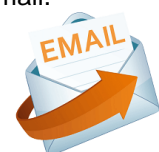
The Internet refers to the hardware and software that provides different communications services between computer networks. These services include:

- **World Wide Web (WWW, W3 or the 'Web')** - is the text and pictures that you view on your computer. It consists of all the Internet screens that appear on your computer. These screens, referred to as Web pages, contain text, pictures, sounds and video files.



- **Voice over Internet Protocol (VoIP)** - is an Internet service that enables you to communicate using voice with another person/s. The communication is real time. It is a telephone conversation over Internet. Sometimes this is referred to as Internet telephony or IP telephony. Many home users communicate with their friends and relatives through Internet telephony using a VoIP program, a microphone and speakers/headphones. There are no additional charges for these voice calls because these happen over the same Internet service used for Web browsing and e-mail.

- **Electronic Mail (e-mail)** - is the transmission of messages over computer networks. These messages can contain text, graphic images and sound files.



- Instant Messaging (IM) - is an Internet service that enables you to communicate using text with another person/s using an instant messaging program. The communication is real time - similar to a telephone conversation but using text instead of voice. A program known as instant messenger is used for text or chat communication. Typically, the instant messaging system alerts you whenever somebody on your private list is online. You can then initiate a chat session with that particular individual. You can also use an instant messaging program to send files such as documents and pictures. Nowadays, programs such as MS Windows Messenger, Skype and Google Chat are used as instant messengers and VoIP. Some users make use of web cam during IM or VoIP communications.



#### Top uses of the Internet:

- Electronic mail. At least 85% of the inhabitants of cyberspace send and receive e-mail. ...
- Research.
- Downloading files.
- Discussion groups. ...
- Interactive games. ...
- Education and self-improvement. ...
- Friendship and dating. ...
- Electronic newspapers and magazines.

#### 3.1.3. DEFINE THE TERMS INTRANET, VIRTUAL PRIVATE NETWORK (VPN) AND IDENTIFY THEIR MAIN USES.

An intranet is an organisation's private network that uses the infrastructure and standards of the Internet and World Wide Web. It is a website accessible only by the organisation's members, employees or other persons with authorisation.

When an organisation develops a public website on the Internet, it is making selected information available to the public. When it creates an intranet, it is making selected information available only to authorised personnel.



An intranet's Web site looks and acts just like any other Web sites, but the firewall surrounding an intranet prohibits unauthorized access. Intranets enable employees to have quicker access to internal information and to share knowledge so that they can do their jobs better.

The term "virtual private network" refers to the ability to create a secure network connection when using public networks.

VPNs encrypt your internet traffic and hide your real identity on the internet. Intranets are a form of network, whereas VPNs are a way of linking computers that are located in different locations.

A VPN is required to use a public network, whereas an Intranet is not.

Some intranets, but not all, can be deployed through a VPN. Virtual private networks (VPNs) based on networks are used to securely connect two networks via an insecure network. An IPsec-based WAN is one popular example, in which a company's entire offices link via IPsec tunnels over the internet. Network VPNs come in a variety of forms.

### 3.1.4. UNDERSTAND WHAT TRANSFER RATE MEANS. UNDERSTAND HOW IT IS MEASURED: BITS PER SECOND (BPS), KILOBITS PER SECOND (KBPS), MEGABITS PER SECOND (MBPS), AND GIGABITS PER SECOND (GBPS).

Your download speed, or bandwidth, is another term for it. There are metric prefixes for bits per second. One kilobit per second (kbps) equals 1,000 bits per second (bps), one megabit per second (Mbps) equals 1,000,000 bits per second (Mbps), and one gigabit per second (Gbps) equals 1,000,000,000 bits per second. The number of bits transported in a single second is a measure of data transmission rates. The most common unit of measurement is kbps (kilobits per second) (1000 bits per second). Bytes per second are expressed in kBps (capital B). For computer modems and transmission carriers, bits per second (bps or bit/sec) is a typical measure of data speed. The number of bits broadcast or received per second is expressed in bits per second, as the phrase implies.



The data transfer rate is commonly used to measure how fast data is transferred from one location to another.

Data is transmitted in characters or collections of bits. The transmission speed of data is measured in:

- **bps** - stands for bits per second. 8 bits = 1 character (Letter 'A' = 8 bits).
- **kbps** - stands for kilobits per second or 1000 bits per second. A 56.6K modem technically transmits 56,600 bits per second of data.
- **mbps** - stands for megabits per second or 1,000,000 bits per second.
- **gbps** - stands for gigabits per second. 1Gbps is equal to 1,000,000,000 bits per second.

### 3.1.5. UNDERSTAND THE CONCEPTS OF DOWNLOADING FROM, UPLOADING TO A NETWORK.

Putting online pages, photos, and files on a web server is known as uploading. Downloading is the process of acquiring web pages, pictures and data from a web server. You'll need to upload a file to make it available to everyone on the internet. The transmission of a file or data through a network from one computer to another, usually from a larger server to a user device, is known as downloading. The term "download" can apply to a broad data transfer or a specific file transfer. Download, DL, or D/L are other terms for it. Downloading data is a need of any internet usage.

Downloading refers to the transfer of data from a server to a local computer. For example, when you view a webpage, the source code of a webpage is copied to your browser from a server across the Internet. Another example is when you download a document from Internet to your computer. When downloading files, the larger the file, the more time it takes to complete the transfer.

Uploading refers to the transfer of data from a local computer to a server. For example, you can create a website and then upload this from your computer to your web server.

Computers can be connected in different ways to the Internet.

**Dialup connection** - is a form of Internet access that uses telephone lines. The computer uses a special device called a modem that dials a telephone number and connects to an Internet Service Provider (ISP). Once connected users can browse the web, access emails etc.

- Dial-up connections are inexpensive compared to broadband connections. However, data transfer over dial-up is slower compared to broadband connections. Another disadvantage of dial-up connections is that no voice calls can be made/received through the phone line when this is being used for Internet.  
Internet Service Providers (ISPs) are companies that sell the services of their Internet server to stand-alone computer users.
- **Broadband connection** - is a connection that enables fast data transfer rates between computers connected to Internet. A broadband connection is a permanent 'always-on' connection to Internet. Being an 'always-on' connection makes computers more prone to intruder (or hacker) attacks. Firewalls are installed to prevent such attacks. Typically, a user pays a flat-rate monthly fee when subscribing to a broadband connection.  
Broadband connections are available through a phone line (ADSL), a cable, Wi-Fi, WiMAX, a mobile phone and satellite.

**Asynchronous Digital Subscriber Line (ADSL) broadband** - is a broadband connection that uses a modem and the telephone line system to connect a computer to Internet. The ADSL modem is different from a dial-up modem. Through ADSL, a user can use the same phone line to connect to Internet and make a voice call at the same time. ADSL connections are faster compared to dial-up connections. Incoming data (downloading) is significantly faster than outgoing data (uploading). ADSL connections are expensive compared to a dial-up connection.

**Cable broadband** - is a broadband connection that uses a modem and the cabling infrastructure used for cable TV to connect a computer to Internet. The cable modem uses the same cabling infrastructure and connection to your home as cable TV. The cable modem connects to the computer via a local area network (LAN) card. Cable connections are faster compared to dial-up connections. Incoming data (downloading) is significantly faster than outgoing data (uploading). The cost of a cable connection is similar to an ADSL connection.

**Wi-Fi** - is a connection that uses radio transmitters and receivers to link computers. Many organisations and public areas provide wireless local area network hotspots known as Wi-Fi (Wireless Fidelity) hotspots. Users can subscribe to these connections. In some public areas such connections are provided at no charge. Nowadays many users have wireless Internet connectivity at home. Many smart phones support wireless connectivity.

**WiMAX** is a wireless communications standard similar to Wi-Fi but supports a far greater range of coverage. While a Wi-Fi signal can cover a radius of 30m, a fixed WiMAX station can cover a range of up to 50km. Mobile WiMAX stations can broadcast up to 16km.



**Mobile phone** - Telecommunication companies offer subscriptions that include Internet on smartphones. There are different mobile Internet technologies.

**Satellite broadband** - is an Internet connection that requires the installation of a special satellite dish.

## 4. SECURITY AND WELL-BEING

### 4.1. PROTECTING DATA AND DEVICES



Data security - is concerned with protecting software and data from unauthorized tampering or damage. IT departments often attach more importance to data protection rather than hardware protection. Recovery of lost data is often more expensive than replacing damaged hardware.

Sensitive data should be safeguarded against unauthorised access. In a network environment, the system administrator provides a unique user ID and a

password to each computer user. The user ID and password are needed to logon to the networked computer.

Home users are able to set up a start-up password through their operating system. You should also set a password to unlock your screen saver. You can also set password protection to data files.

#### 4.1.1. RECOGNISE GOOD PASSWORD POLICIES LIKE: CREATE WITH ADEQUATE LENGTH, ADEQUATE CHARACTER MIX, DO NOT SHARE, CHANGE REGULARLY.

The use of a strong password enhances the security of your computer system. Your password should be at least 8 characters long. It should consist of both upper- and lower-case letters and also one or more numbers. Your date of birth, phone number or any word that can be found in a dictionary do not constitute a strong password. Passwords should be changed regularly.



Never share or disclose your password to any other person including colleagues, family members etc. Do change your password if you suspect that somebody knows it.

#### 4.1.2. DEFINE THE TERM FIREWALL AND OUTLINE ITS PURPOSE.

**A firewall** is a type of computer network security device that controls internet traffic entering, leaving, and within a private network. This programme, sometimes known as a dedicated hardware-software unit, works by blocking or allowing data packets on a per-packet basis. A firewall is essentially a barrier between a private internal network and the public Internet at its most basic level. The basic goal of a firewall is to let safe traffic in while keeping harmful traffic out.

A firewall is a system designed to prevent unauthorised access to your computer system when connected to Internet. A firewall is simply a program or hardware device that filters information coming through the Internet connection into your private network or computer system. If an incoming packet of information is flagged by the filters, it is not allowed through. Many users having always-on connections (such as ADSL or cable) are encouraged to install personal firewalls (software) that protects their system from intruders.



#### 4.1.3. UNDERSTAND THE PURPOSE OF REGULARLY BACKING UP DATA TO A REMOTE LOCATION.



What are the benefits of having a backup of your data? The fundamental reason for a data backup is to keep a safe archive of your vital information, whether it's classified documents for your business or priceless family photos, so that you can quickly and effortlessly recover your device in the event of data loss. The backup's goal is to make a copy of the data that can be recovered if the

primary data fails. Primary data failures can occur due to hardware or software failure, data corruption, or a human-caused incident, such as a hostile attack (virus or malware) or data deletion by accident.

Backing up data is the copying of data files to a secondary storage medium (USB flash disk, CD/DVD or magnetic tape streamer) as a precaution in case the first medium fails.

Most users store large quantities of data on the hard disk without backing this on other storage media. It is of utmost importance to back up your data regularly. It is suggested that you make two backups of all your data files.

To be especially safe, you should keep one backup in a different location from the other - off-site storage. The latter protects data against theft and fire hazards.

You can back up files using operating system commands, or you can buy a special-purpose backup utility (program). Backup programs often compress the data so that backups require fewer disks.

#### 4.1.4. RECOGNISE THE IMPORTANCE OF REGULARLY UPDATING SOFTWARE LIKE: ANTI-VIRUS, APPLICATION, OPERATING SYSTEM SOFTWARE.

Updates are vital because they frequently contain critical security patches. Indeed, many of the more dangerous malware attacks we find use software flaws in mainstream applications like operating systems and browsers. Efficiency was improved. More than merely security upgrades, software updates frequently include new and improved functionality as well as performance improvements to improve the end-user experience. Developers are always looking for new methods to improve the programme so that users can be more productive. Antivirus software detects, prevents, and responds to dangerous software, such as viruses, on your computer. Antivirus software is a vital aspect of a strong security plan, even if you're careful with how you use your computer to avoid becoming infected with a virus.



We strongly recommend that you turn on Windows automatic updating so that Windows can install security and other important or recommended updates for your computer as they become available.

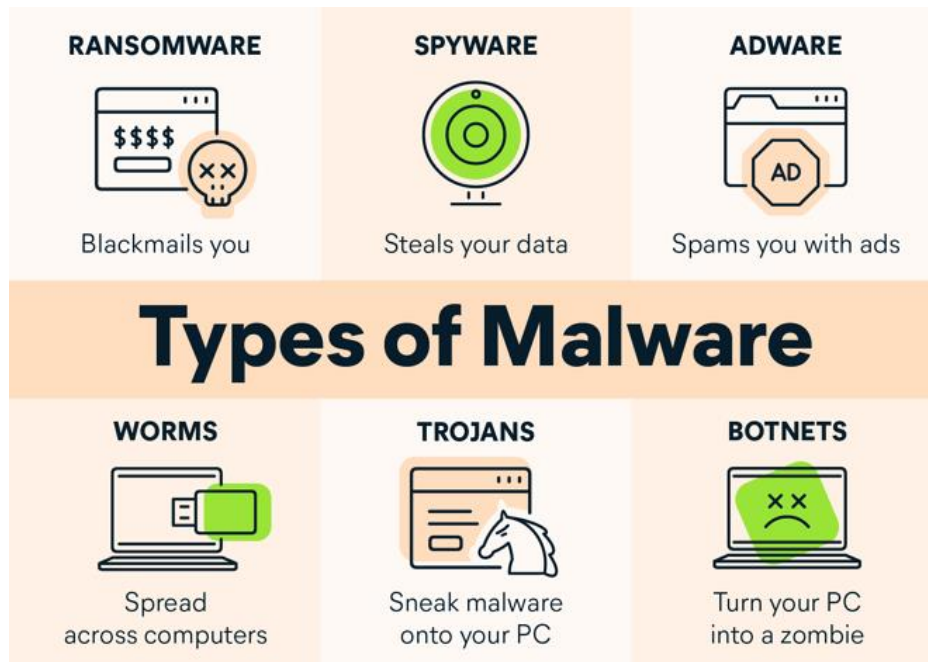
Computer programs such as operating systems, email clients, browsers, media players and desktop applications (e.g., word processors, spreadsheets, databases etc.) may have vulnerable defects through which intruders can gain access to your computer.

Software vendors usually release patches or hotfixes for their products when a security vulnerability is discovered. You must ensure that all programs on your computer are updated with the latest available patches. You should also check for any available updates when installing new software.

Software patches can often be downloaded for free from the vendor's website. Some programs (e.g., MS Windows) have utilities which automatically connect to the vendor's website and download any available patches. If there is no automatic update feature for any of your programs, visit the vendors' website regularly and download any available updates.

## 4.2. MALWARE

### 4.2.1. UNDERSTAND THE TERM MALWARE. IDENTIFY DIFFERENT TYPES OF MALWARE LIKE: VIRUS, WORM, TROJAN, SPYWARE.



Malware is a term that refers to viruses, spyware, worms, and other types of malicious software. Malware is software that is designed to harm a machine that is not connected to the internet. Whenever the phrase "malware" is used, it refers to a software that is intended to harm your computer, such as a virus, worm, or Trojan horse. Viruses, worms, Trojan horses, ransomware, spyware, and other dangerous programmes all fall under the category of malware. A virus is an executable file that contains malicious code. When an infected file is sent from one computer to another, the virus spreads. Viruses can be benign or malicious, altering or erasing data.



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#### 4.2.2. BE AWARE HOW MALWARE CAN INFECT A COMPUTER OR DEVICE.

To infect your computer, malware might take use of known software flaws. A vulnerability is a software flaw that allows malware to get access to your computer. When you visit a website, it may attempt to infect your PC with malware by exploiting weaknesses in your browser. When you open or download attachments or files, or when you visit a phishing website, malware can infect your device. Downloading free content, such as illicit downloads of popular movies, TV episodes, or games, could lead to malware infection on your device. using file-sharing sites to download material

Malware (malicious software) is a program designed to secretly enter and damage a computer system. Malware includes:

- **A computer virus** is a piece of program designed and written to make additional copies of itself and spread from location to location, typically without user knowledge or permission. Viruses are written by programmers with malicious intent to annoy computer users.
- **Worms** are similar to viruses in that they make copies of themselves but differ in that they need not attach to particular files or sectors at all. Once a worm is executed, it seeks other systems - rather than parts of systems - to infect, then copy its code to them. Typically worms slow down computer systems.
- **Trojan horses** secretly place illegal, destructive instructions in the middle of a computer program. Once the program is run, the Trojan horse becomes active. Trojans do not replicate themselves like other viruses.
- **Spyware** is a program that secretly installs itself on computers and collects information about users without their knowledge. Spyware programs can collect various types of personal information, such as Internet surfing habits and sites that have been visited. They can also interfere with user control of the computer in other ways, such as installing additional software and redirecting Web browser activity. Spyware is known to change computer settings, resulting in slow connection speeds, different home pages, and/or loss of Internet or functionality of other programs.
- **Two sources of viral infections are:**
  - Sharing infected files over the intranet i.e., the internal computer network of an organisation.
  - Downloading infected files from Internet sites.

You should be careful with program or file downloads from the Web. Files available on bulletin boards or public newsgroups may be infected. Software updates e.g., drivers, multimedia players, should be downloaded from the manufacturer's official website. It is important to update your anti-virus program to prevent against malware.

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#### 4.2.3. USE ANTI-VIRUS SOFTWARE TO SCAN A COMPUTER.

Antivirus software, often known as anti-malware software, is a computer application that prevents, detects, and removes malware. It is abbreviated as AV software. The name comes from the fact that antivirus software was created to identify and eradicate computer infections. To open the app, type Windows Security into the search bar and pick the top result. Virus and threat protection can be found by clicking on it. Scan choices can be found in the "Current threats" section. To scan the entire system for viruses and other malware, select the Full scan option. The Final Word on Malwarebytes in practically every way, Bitdefender outperforms Malwarebytes, including malware detection rates, extra

features, and cost. Bitdefender is an excellent choice if you want a high-quality, feature-rich antivirus at a low price (and don't mind a limited VPN).

Anti-virus software is a program, which protects the computer system against most viruses. Typically, such programs detect the presence of viruses in a computer and in most cases remove (or disinfect) any files infected by viruses.

Different users may have different anti-virus programs. You can follow these generic steps to scan specific drives, folders and files for viruses.

- Click **Start** button.
- Highlight **All Programs**.
- Highlight the antivirus program. A submenu will be displayed.
- Select the appropriate scanning option.
- Follow any other steps.

Unfortunately, new viruses are being developed all the time. Thus, if the anti-virus program is not updated on a regular basis, it will not be able to detect new virus types and variants. When you install an update, new entries are added to the software's virus definitions database so that suspect files can be recognized and dealt with. Most anti-virus programs are updated automatically when you connect your computer to Internet.