Fundamentals of IT Assignment

Submitted by

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Q 1. what is a basic computer?

A computer is basically an electronic device that can store, process, manipulate and retrieve data. A typical desktop computer is a machine equipped with a set of necessary hardware such as a CPU, GPU, monitor, keyboard and mouse. They work in coordination with the help of an operating system, generally with a Graphical User Interface.

2. what are the major functions of a computer system?

The major functions of a computer system is as follows:

* Data input: Data is input using input devices, storage media or network interfaces.
* Data processing and manipulation: Data processing and manipulation into meaningful information is done with the help of components such as CPU, GPU, RAM and other peripherals.
* Information Output: Processed data is disseminated using output peripherals such as a Monitor for visual output, speakers for sound, printed for hard copies etc.
* Data storage: The computer can store data of any type into its storage devices such as HDD, SSD or flash drives.

3. Difference between i3, i5 and i7 processors.

i3, i5 and i7 are different series of processors made by chip manufacturer Intel; the naming schemes indicate relative performance in ascending order provided the generation is constant; i.e. 11th Generation Intel i7 would generally be faster than 11th Generation i5 which itself would be faster than 11th generation Intel i3.

i3 11th Generation is a dual-core Processor with a maximum frequency of 4.1 GHz while i5 11th generation is a hexa-core Processor with a maximum frequency of 4.9 GHz and i7 11th generation is an octa-core Processor with a maximum frequency of 5 GHz.

4. How are ROM, RAM and CD-ROM different from each other? where are they located?

RAM (Random Access Memory) is a type of volatile memory that stores data that can be accessed randomly at any time, in any order and from any physical location, allowing quick access and manipulation. RAM is inserted into the RAM slots on the motherboard, generally adjacent to the CPU socket.

ROM (Read Only Memory) stores the program required to initially boot the computer, i.e. BIOS (Basic Input Output System). ROM is non-volatile and cannot be easily altered or reprogrammed. ROM is also located on the motherboard.

CD-ROM (Compact-Disk Read Only Memory) is a form of Read-Only (RO) Disk that from which data can only be read/executed by the computer. A CD-ROM Drive or optical drive is the device used to read them. CD-ROM drives are typically located on the CPU box as extensions with wires internally going to the motherboard.

1. What are the various computer generations? Tabulate it with its characteristics and applications.

Various Generations of Computers

|  |  |  |  |
| --- | --- | --- | --- |
| Generation | Hardware Components | Characteristics | Computers |
| First Generation  (1942-1959) | * Vacuum Tubes for memory and CPU circuitry. * Punch cards, paper tape and magnetic tape as peripherals. | * Programmed using Machine code (binary, e.g., in EDVAC) or decimals (e.g., in ENIAC). * Highly expensive * Huge and Non-portable * Slow input and output devices * Excessive heat generation * High electricity consumption * Vacuum tubes needed to be frequent replacement, resulting into huge maintenance cost. | * ENIAC * EDVAC * UNIVAC * EDSAC * IBM-701 * IBM-650 |
| Second Generation  (1959-1965) | * Transistors and magnetic core memory as circuitry * magnetic tape and magnetic disks as peripherals | * Programmed using FORTAN, COBOL and assembly language * Batch processing, multiprogramming OS * Still expensive * Smaller in size and offered better portability * Faster performance * Lesser heat generation * Lower electricity consumption | * IBM 1620, 7000 * ATLAS * NCR 304 * IBM 7094 * CDC 1604 * CDC 3600 * UNIVAC 1108 * HONEYWELL 400 |
| Third Generation  (1965-1975) | * Integrated Circuits * Keyboard and monitor as input and output devices * Rotating Hard drives with huge size were used as | * Programmed using BASIC, PASCAL, ALGOL-68, COBOL, FORTRAN – II was used in third generation computers * Remote Processing, Time Sharing, multiprogramming OS * Faster, compact, and cheaper | * IBM 360/370 * PDP 8 * CDC 6600 |
| Fourth Generation  (1975-1988) | * VLSI Microprocessor Circuits * Magnetic Disks with larger storage capacity | * Time-Sharing, Real-Time networks, distributed GUI OS * Faster Compact and Affordable * C, C++, DBASE | * DEC 10 * STAR 1000 * CRAY -I/II * Apple II * VAX 9000 |
| Fifth Generation  (1988-Present) | * ULSI Microprocessor Circuits * Floppies, Hard Disk Drives, Flash Drives and Solid-State Drives | * Parallel Processing and Artificial Intelligence Technology * C, C++, Java, .Net   ……. | * IBM * Pentium * Param   ….. |

6. what is nano technology?

Nanotechnology, in the context of computer science, is a type of engineering geared toward building electronic components and devices measured in nanometres, which are extremely tiny in size and structure.

7. Why should the width of the transistor be in nano meter?

Width of the transistor should be in nano meters since the smaller your transistors’ width, the more you can fit on a chip, and the faster and more efficient your processor could be.

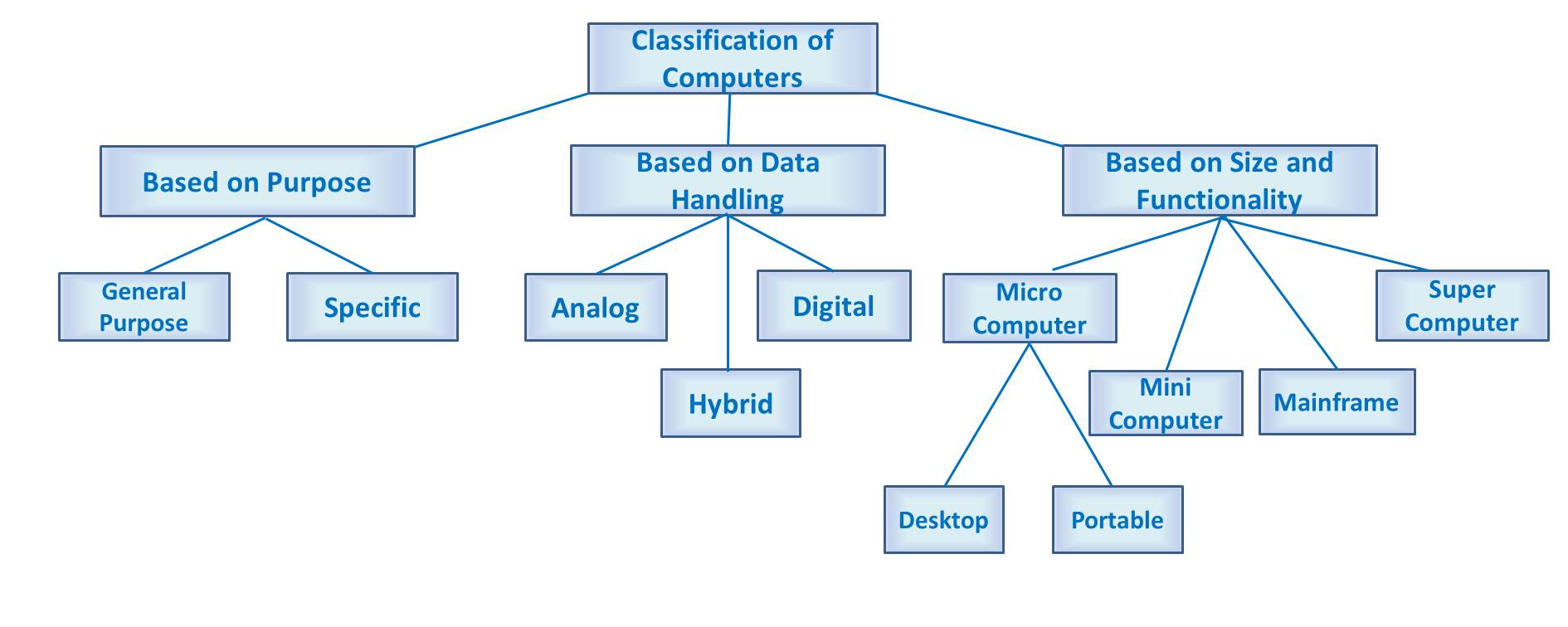
8. Why is the width of the transistor having higher significance than the length?

The width of the transistor is having higher significance than the length since transistors aren’t built on top of each other in a chip, rather they are fit side-by-side of each other.

9. Write down the difference between mainframe, mini, micro and supercomputers.

|  |  |  |
| --- | --- | --- |
| **Microcomputer** | **Minicomputer** | **Mainframe Computer** |
| Introduced in 1970 | Introduced in 1960 | Introduced in 1975 |
| Generally consists of one processor | Generally consists of two or more processors | Generally consists of multiple processors |
| Storage capacity capped in Gigabytes | Storage capacity capped in Terabytes | Storage capacity capped in Petabytes |
| Memory capacity in Megabytes | Memory capacity in Gigabytes | Memory capacity in Gigabytes |
| Single user operatable | Serves two to thousands of connected users at a time | Serves hundreds to thousands of connected users at a time |
| Very small in size | Bigger than Microcomputers | Bigger than both micro and minicomputers |
| Costs around $500-$5000 | Costs around $18k-$500k | Costs around $500k-5 Million |
| Used at home, offices, and educational institutes | Used by business institutes and departments | Used by large organisations like banks |
| e.g., IBM-PC and Apple Macintosh | e.g., VAX 8800 and MV-1500 | e.g., IBM-370 and NEC |

10. Draw a block diagram to show different classifications of computers.



1. What is the difference between CU and CPU

Central Processing Unit (CPU) consists of the following features −

* CPU is considered as the brain of the computer.
* CPU performs all types of data processing operations.
* It stores data, intermediate results, and instructions (program).
* It controls the operation of all parts of the computer.

CPU itself has the following three components.

* Memory or Storage Unit
* a control unit
* ALU(Arithmetic Logic Unit)
* Control unit

This unit controls the operations of all parts of the computer but does not carry out any actual data processing operations.

Functions of this unit are −

* It is responsible for controlling the transfer of data and instructions among other units of a computer.
* It manages and coordinates all the units of the computer.
* It obtains the instructions from the memory, interprets them, and directs the operation of the computer.
* It communicates with Input/output devices for transfer of data or results from storage.
* It does not process or store data.

1. What is the difference between main and primary memory?

They are the same

1. What is the difference between auxiliary and Secondary memory

They are the same

1. Draw the block diagram of computer and describe its various parts.

Diagram

Description automatically generated

An input device is a piece of equipment used to provide data and control signals to an information processing system, such as a computer or information appliance. Examples of input devices include keyboards, mouse, scanners, cameras, joysticks, and microphones

CPU: central processing unit (CPU), principal part of any digital computer system, generally composed of the main memory, control unit, and arithmetic-logic unit. It constitutes the physical heart of the entire computer system; to it is linked various peripheral equipment, including input/output devices and auxiliary storage units. In modern computers, the CPU is contained on an integrated circuit chip called a microprocessor

Control unit: The control unit is a component of a computer's central processing unit that directs the operation of the processor. A CU typically uses a binary decoder to convert coded instructions into timing and control signals that direct the operation of the other units. Most computer resources are managed by the CU.

In the computer system, ALU is a main component of the central processing unit, which stands for arithmetic logic unit and performs arithmetic and logic operations. It is also known as an integer unit (IU) that is an integrated circuit within a CPU or GPU, which is the last component to perform calculations in the processor. It has the ability to perform all processes related to arithmetic and logic operations such as addition, subtraction, and shifting operations, including Boolean comparisons (XOR, OR, AND, and NOT operations).

Main memory consists of RAM and ROM.

In computing, memory or RAM is a device or system that is used to store information for immediate use in a computer or related computer hardware and digital electronic devices.

Auxiliary storage is any storage that is made available to the system through input/output channels. This term refers to any addressable storage that is not within the system memory (RAM)

ROM is an acronym for Read-Only Memory. It refers to computer memory chips containing permanent or semi-permanent data. Unlike RAM, ROM is non-volatile; even after you turn off your computer, the contents of ROM will remain. Almost every computer comes with a small amount of ROM containing the boot firmware.

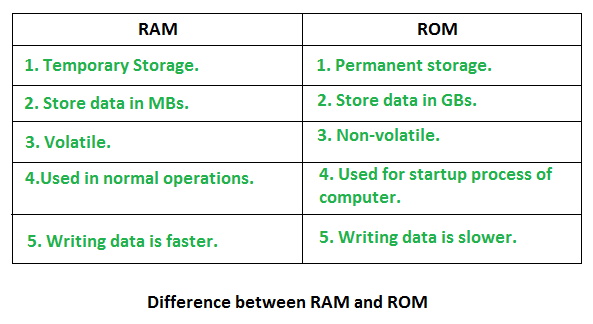
The output device displays the result of the processing of raw data that is entered in the computer through an input device. There are a number of output devices that display output in different ways such as text, images, hard copies, and audio or video. E.g., monitor, printer, etc.

1. what are the types of memories?

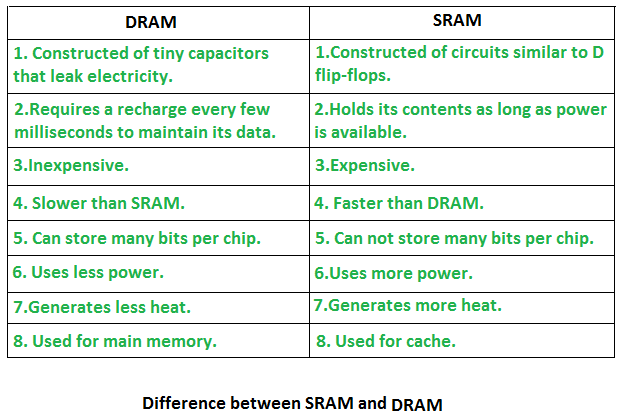
Computer memory is of two basic types – Primary memory (RAM and ROM) and Secondary memory (hard drive, CD, etc).

1. What is the difference between RAM and ROM?

Random Access Memory (RAM) is primary-volatile memory and Read-Only Memory (ROM) is primary-non-volatile memory.



1. What is the difference between SRAM and DRAM?



1. What are the various types of ROM?

There are 4 types of ROM-

* PROM (Programmable read-only memory) – It can be programmed by the user. Once programmed, the data and instructions in it cannot be changed.
* EPROM (Erasable Programmable read only memory) – It can be reprogrammed. To erase data from it, expose it to ultraviolet light. To reprogram it, erase all the previous data.
* EEPROM (Electrically erasable programmable read only memory) – The data can be erased by applying an electric field, with no need for ultraviolet light. We can erase only portions of the chip.
* MROM(Masked ROM) – The very first ROMs were hard-wired devices that contained a pre-programmed set of data or instructions. These kinds of ROMs are known as masked ROMs, which are inexpensive .

1. What is BIOS?

BIOS, or Basic Input/Output System, is the built-in core processor software responsible for booting up your system. Typically embedded into your computer as a motherboard chip, the BIOS functions as a catalyst for PC functionality action.

1. What is the need of Secondary memory?

Secondary storage is needed to keep programs and data long term. Secondary storage is non-volatile , long-term storage. Without secondary storage all programs and data would be lost the moment the computer is switched off

1. What is the difference between fixed and removable storage?

Fixed Storage media is an internal storage medium like a hard disk that is fixed inside the computer. A storage medium that is portable and can be taken outside the computer is termed removable storage media

1. What are the characteristics of Secondary Storage?

Characteristics of secondary storage are:

* It is non-volatile, which means it retains data when power is switched off.
* It allows for the storage of data ranging from a few megabytes to petabytes.
* It is cheaper as compared to primary memory.
* Secondary storage devices like CDs and flash drives can transfer the data from one device to another.

1. What is the difference between SSD &HDD in their working principle and structure?

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| **SSD** | **HDD** |
| SSD stands for Solid State Drive | HDD stands for Hard Disk Drive |
| SSD does not contain mechanical parts, only electrical parts like ICs, thus making it lightweight and ideal for portable devices. This ensures a longer lifespan without compromising on speed with the passage of time. It stores data on instantly accessible memory chips. | HDD contains mechanical rotating parts inside which makes it heavy and vulnerable to physical wear and tear more than an SSD. HDD gets slower with the passage of time. It uses mechanical platters and a moving read/write head to access data. |
| SSDs are at least two times costlier than HDDs for same amount of storage. | HDDs are comparatively cheaper in price. |

1. What are the various removable Storages? Describe with comparative table.

Different types of Removable Storages are:

* Optical discs (CDs, DVDs, Blu-ray discs)
* External HDDs and SSDs
* Pen drives and Flash drives
* Memory cards
* Floppy disks
* Magnetic tapes
* Paper storage (punched tapes, punched cards)

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| **Removable Storage Type** | **Technology** | **Storage Limit** |
| Optical Disks | Laser technology: digital data are recorded by burning a series of microscopic holes | * 700 MB- 8.5 GB * Up to 50 GB (Blu-ray disks) |
| External HDDs and SSDs | Electromechanical (HDDs) and Flash based (SSDs) | * 4 GB- 20 TB (HDDs) * 128 GB- 100 TB (SSDs) |
| Pen Drives and  Flash Drives | Flash based | * 1 GB- 2 TB |
| Memory Cards | Flash based | * 2 GB and under (SD) * 2GB - 32 GB (SDHC) * 32 GB – 2 TB (SDXC) * 1 TB – 128 TB (SDUC) |
| Floppy disks | Magnetic | * 800 KB- 2.8 MB |
| Magnetic tapes | Magnetic | * 1.1 MB – 15 TB |

1. What are the various types of optical disks?

Optical disc is divided into CD Drive and DVD Drive and Blue Ray Disk -

* CD Drive: CD stands for Compact Disk. CDs are circular disks that use optical rays, usually lasers, to read and write data. There are three types of CDs:

1. CD-ROM (Compact Disk - Read Only Memory): The manufacturer recorded the data on these CDs. Proprietary Software, audio or video are released on CD-ROMs.
2. CD-R (Compact Disk - Recordable): The user can write data once on the CD-R. It cannot be deleted or modified later.
3. CD-RW (Compact Disk - Rewritable): Data can repeatedly be written and deleted on these optical disks.

* DVD Drive: DVD stands for digital video display. A DVD is an optical device that can store 15 times the data held by CDs.
* Blu Ray Disk: Blu Ray Disk (BD) is an optical storage media that stores high definition (HD) video and other multimedia files.

1. Difference between primary & secondary memory.

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| Primary Memory | Secondary Memory |
| Primary memory (RAM and ROM) is directly accessed by the Central Processing Unit (CPU) | Secondary memory is not accessed directly by the Central Processing Unit (CPU). Instead, data accessed from a secondary memory is first loaded into Random Access Memory (RAM) and then sent to the Processing Unit |
| RAM provides a much faster accessing speed to data than secondary memory. Computers can quickly process data by loading software programs and required files into primary memory (RAM). ROM helps the computer to start up. | Secondary memory is slower in data accessing. Typically primary memory is six times faster than secondary memory. |
| RAM is volatile and gets completely erased when a computer is shut down. ROM stays non-volatile but is Read-only for the user. | Secondary memory provides a feature of being non-volatile, which means it can hold on to its data with or without an electrical power supply |

1. Difference between System Software and Application Software. Explain with examples.

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| System Software | Application software |
| System software is mainly designed for managing system resources. | Application software is designed to accomplish tasks for specific purposes. |
| Programming of system software is complex. | Programming of application software is comparatively easy. |
| A computer cannot run without system software. | A computer can easily run without application software. |
| System software does not depend on application software. | Application software depends on system software and cannot run without system software. |
| e.g., Windows, GNU/Linux distros, Mac OS | e.g., Office suites, VLC Media player, etc |

1. What are the language processor?

Language processors are those which convert human language to machine language. Eg- compiler and interpreter.

1. How assembler and compiler different from each other?

A compiler is used to convert high-level programming language code into machine language code. On the other hand, an assembler converts assembly level language code into machine language code. Both these terms are relevant in context to program execution.

1. How compiler and interpreter different from each other?

Compliers and interpreters are programs that help convert the high level language (Source Code) into machine codes to be understood by the computers.

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| **Interpreter** | **Compiler** |
| Interpreter translates just one statement of the program at a time into machine code. | Compiler scans the entire program and translates the whole of it into machine code at once. |
| An interpreter takes very less time to analyze the source code. However, the overall time to execute the process is much slower. | A compiler takes a lot of time to analyze the source code. However, the overall time taken to execute the process is much faster. |
| An interpreter does not generate an intermediary code. Hence, an interpreter is highly efficient in terms of its memory. | A compiler always generates an intermediary object code. It will need further linking. Hence more memory is needed. |
| Keeps translating the program continuously till the first error is confronted. If any error is spotted, it stops working and hence debugging becomes easy. | A compiler generates the error message only after it scans the complete program and hence debugging is relatively harder while working with a compiler. |
| Interpreters are used by programming languages like Ruby and Python for example. | Compliers are used by programming languages like C and C++ for example. |

1. Why compiler is more useful for security purpose?

Compiler is more useful for security purposes since the source code can’t be reverse engineered easily from the compiled binary whereas in case of interpreter, we need to disclose source code to be run.

1. Give some examples of language which can be compiled by the compiler.

C, C++, Go, and Rust

1. Give some examples of language which can is run by the interpreter.

Python, JavaScript, Ruby, and PHP

1. What is the purpose of linker?

Linker is a program in a system which helps to link a object modules of program into a single object file. It performs the process of linking. Linker are also called link editors. Linking is process of collecting and maintaining piece of code and data into a single file

1. What are the different types of linker/ difference between static and dynamic loader?

The main difference between static and dynamic linking is that static linking copies all library modules used in the program into the final executable file at the final step of the compilation while, in dynamic linking, the linking occurs at run time when both executable files and libraries are placed in the memory.

1. What are loaders?

In computer systems a loader is the part of an operating system that is responsible for loading programs and libraries. It is one of the essential stages in the process of starting a program, as it places programs into memory and prepares them for execution.

1. What are different types of loaders?

The different types of loaders are, absolute loader, bootstrap loader, relocating loader (relative loader), and, direct linking loader.

1. Difference between linker and loader?

Key Differences Between Linker and Loader

1. The key difference between linker and loader is that the linker generates the **executable** file of a program whereas, the loader loads the executable file obtained from the linker into **main memory for execution**.
2. The linker intakes the **object module** of a program generated by the assembler. However, the loader intakes the **executable module** generated by the linker.
3. The linker combines all object module of a program to generate **executable modules** it also links the **library function** in the object module to **built-in libraries** of the high-level programming language. On the other hands, loader **allocates space to an executable** module in main memory.
4. The linker can be classified as **linkage editor,**and**dynamic linker** whereas loader can be classified as **absolute loader, relocatable loader**and**dynamic run-time loader**.
5. What are the different types of charts in MS office and describe the function of each .

* Column Charts

One of the most common charts used in presentations and dashboards, column charts are meant to compare values to each other. Usually these are values that have been categorized in some way. The most common subset for a column chart is one set of data broken up into categories.

* Pie Charts

As the name implies, pie charts are shaped like a pie, and are best used when you need to show the amount of a much larger category that’s taken up by smaller sub-categories.

* Line Charts

Moving on to line charts requires a new set of data because line charts and other similar chart types tend to be time-dependent. This means, you are usually (but not always) charting a data point over the progression of time.

* Area Charts

Area charts are identical to line charts, but the area under the line is filled in. While the focus of the line chart is still the change in values over time, the focus of an area chart is to highlight the magnitude of values over time.

* Scatter (XY) Charts

A favourite among scientists and statisticians, scatter charts are plotted data points (usually a cluster of similarly measured data points), that are intended to show correlations or patterns in the data that aren’t obvious when you’re just looking at individual data points.

* Bubble Charts

This can also be represented (even better) in the form of a bubble chart. This is a fun visualization to create when you have three dimensions of data you can plot.

1. What is an OS? give some examples.

Operating System is system software. The communication between a user and a system takes place with the help of an operating system. Windows, GNU/Linux distros, and Android are examples of operating systems that enable the user to use programs like MS Office, Notepad, and games on the computer or mobile phone.

1. Write a brief history of OS with examples of market share.

Operating systems were first developed in the late 1950s to

manage tape storage

• The General Motors Research Lab implemented the first OS in

the early 1950s for their IBM 701

• In the mid-1960s, operating systems started to use disks

• In the late 1960s, the first version of the Unix OS was

developed

• The first OS built by Microsoft was DOS. It was built in 1981 by

purchasing the 86-DOS software from a Seattle company

• The present-day popular OS Windows first came to existence in

1985 when a GUI was created and paired with MS-DOS.

* GNU/Linux came to existence in 1991

Current OS Market Share

|  |  |
| --- | --- |
| Operating System Market Share Worldwide - January 2022 | |
| Android | 39.47% |
| Windows | 32.06% |
| iOS | 17.59% |
| OS X | 6.73% |
| Unknown  (Linux, BSD, etc) | 1.71% |
| Chrome OS | 1.09% |

1. What are the types of OS?

1. Batch Operating System –

This type of operating system does not interact with the computer directly. There is an operator which takes similar jobs having the same requirement and group them into batches. It is the responsibility of the operator to sort jobs with similar needs.

2. Time-Sharing Operating Systems –

Each task is given some time to execute so that all the tasks work smoothly. Each user gets the time of CPU as they use a single system. These systems are also known as Multitasking Systems. The task can be from a single user or different users also. The time that each task gets to execute is called quantum. After this time interval is over OS switches over to the next task.

3. Distributed Operating System –

These types of the operating system is a recent advancement in the world of computer technology and are being widely accepted all over the world and, that too, with a great pace. Various autonomous interconnected computers communicate with each other using a shared communication network. Independent systems possess their own memory unit and CPU. These are referred to as loosely coupled systems or distributed systems. These system’s processors differ in size and function. The major benefit of working with these types of the operating system is that it is always possible that one user can access the files or software which are not actually present on his system but some other system connected within this network i.e., remote access is enabled within the devices connected in that network.

4. Network Operating System –

These systems run on a server and provide the capability to manage data, users, groups, security, applications, and other networking functions. These types of operating systems allow shared access of files, printers, security, applications, and other networking functions over a small private network. One more important aspect of Network Operating Systems is that all the users are well aware of the underlying configuration, of all other users within the network, their individual connections, etc. and that’s why these computers are popularly known as tightly coupled systems.

5. Real-Time Operating System –

These types of OSs serve real-time systems. The time interval required to process and respond to inputs is very small. This time interval is called response time. Real-time systems are used when there are time requirements that are very strict like missile systems, air traffic control systems, robots, etc.

1. What are the various functions of OS?

Important functions of an operating System:

Security – The operating system uses password protection to protect user data and similar other techniques. it also prevents unauthorized access to programs and user data.

Control over system performance – Monitors overall system health to help improve performance. records the response time between service requests and system response to having a complete view of the system health. This can help improve performance by providing important information needed to troubleshoot problems.

Job accounting – Operating system Keeps track of time and resources used by various tasks and users, this information can be used to track resource usage for a particular user or group of users.

Error detecting aids – The operating system constantly monitors the system to detect errors and avoid the malfunctioning of a computer system.

Coordination between other software and users – Operating systems also coordinate and assign interpreters, compilers, assemblers, and other software to the various users of the computer systems.

Memory Management – The operating system manages the Primary Memory or Main Memory. Main memory is made up of a large array of bytes or words where each byte or word is assigned a certain address. Main memory is fast storage and it can be accessed directly by the CPU. For a program to be executed, it should be first loaded in the main memory. An Operating System performs the following activities for memory management:

It keeps track of primary memory, i.e., which bytes of memory are used by which user program. The memory addresses that have already been allocated and the memory addresses of the memory that has not yet been used. In multiprogramming, the OS decides the order in which processes are granted access to memory, and for how long. It Allocates the memory to a process when the process requests it and deallocates the memory when the process has terminated or is performing an I/O operation.

Processor Management – In a multi-programming environment, the OS decides the order in which processes have access to the processor, and how much processing time each process has. This function of OS is called process scheduling. An Operating System performs the following activities for processor management.

Keeps track of the status of processes. The program which performs this task is known as a traffic controller. Allocates the CPU that is a processor to a process. De-allocates processor when a process is no more required.

Device Management – An OS manages device communication via their respective drivers. It performs the following activities for device management. Keeps track of all devices connected to the system. designates a program responsible for every device known as the Input/Output controller. Decides which process gets access to a certain device and for how long. Allocates devices in an effective and efficient way. Deallocates devices when they are no longer required.

File Management – A file system is organized into directories for efficient or easy navigation and usage. These directories may contain other directories and other files. An Operating System carries out the following file management activities. It keeps track of where information is stored, user access settings and status of every file, and more… These facilities are collectively known as the file system.

1. What are the various features of OS?

Program Execution: The Operating System is responsible for the execution of all types of programs whether it be user programs or system programs. The Operating System utilizes various resources available for the efficient running of all types of functionalities.

Handling Input/Output Operations: The Operating System is responsible for handling all sorts of inputs, i.e, from the keyboard, mouse, desktop, etc. The Operating System does all interfacing in the most appropriate manner regarding all kinds of Inputs and Outputs.

For example, there is a difference in the nature of all types of peripheral devices such as mice or keyboards, the Operating System is responsible for handling data between them.

Manipulation of File System: The Operating System is responsible for making decisions regarding the storage of all types of data or files, i.e, floppy disk/hard disk/pen drive, etc. The Operating System decides how the data should be manipulated and stored.

Error Detection and Handling: The Operating System is responsible for the detection of any type of error or bugs that can occur while any task. The well-secured OS sometimes also acts as a countermeasure for preventing any sort of breach to the Computer System from any external source and probably handling them.

Resource Allocation: The Operating System ensures the proper use of all the resources available by deciding which resource to be used by whom for how much time. All the decisions are taken by the Operating System.

Accounting: The Operating System tracks an account of all the functionalities taking place in the computer system at a time. All the details such as the types of errors that occurred are recorded by the Operating System.

Information and Resource Protection: The Operating System is responsible for using all the information and resources available on the machine in the most protected way. The Operating System must foil an attempt from any external resource to hamper any sort of data or information.

1. Advantages and disadvantages of OS?

Advantages of Operating System :

* O/S gives the interface between the clients and equipment.
* O/S permits to User Friendly Graphic Interface for all clients since it gives different menus, catches, symbols, and more for simple route.
* No necessary any specialized aptitudes for working GUI O/S.
* financially savvy.
* It has answerable for controlling and control of all PC capacities.
* These stages are agreeable for all projects.
* It permits best highlights, for example, “Attachment and play”, implies no need any drivers for utilizing their gadgets like as mouse, console, and sky is limit from there.
* O/S utilizes various procedures, for example, memory division, paging, and trading. Working framework can deal with own memory with utilizing those methods.
* Working System gives help to dealing with all information and yield gadgets of PC framework.
* O/S helps change all projects into measure for executing directions, and it has answerable for synchronizing of all cycle.
* Working System can likewise deal with a wide range of interferes.
* O/S actualizes a wide range of booking strategies, for example, first start things out served, Round robin, Priority planning and briefest employment firs booking and so forth for planning the all cycle in CPU for execution.
* It assists with crushing outer discontinuity.
* O/S has answerable for circulating all information over whole framework.
* O/S gives the authorization for requesting paging just as preaging.
* It has no needed to fracture.
* It assists with planning all pages in powerful way.
* O/S permits imparting one bit of information to numerous clients.
* It additionally can share various assets like as Printer, Fax and so on.
* O/S can be refreshed time by time with no problem.
* It gives the adaptable interface to introducing a wide range of games and programming, and can run effectively them.
* Some O/S gives the insurance from perilous records and infection, for example, Windows safeguard in Window O/S.
* Various O/S are accessible in open source, for example, Unix/Linux. Working System can be run effectively on PC framework with no cost (Free).

Disadvantages of Operating System :

Here, we will spread the light on restriction (cons) of working frameworks.

* It has broadened memory access times, for example, page table query.
* Need improvement with utilizing TLB.
* Required protected page tables. Need more memory for memory board.
* Need inner fracture.
* Page Table Length Register (PTLR) needs to bound with virtual memory size.
* It required greater improvement in staggered page tables and variable page sizes.
* Obscure clients can be utilized your framework without your authorization.
* On the off chance that working framework get shortcoming, at that point your information can be obliterated from O/S.
* It is exceptionally troublesome assignment for giving whole assurance from all infections in light of fact that any danger can be embedded any time.

1. What is a Kernel in an operating system? Explain with diagram.

The kernel is the essential centre of a computer operating system (OS). It is the core that provides basic services for all other parts of the OS. It is the main layer between the OS and hardware, and it helps with process and memory management, file systems, device control and networking.

1. What are the types of Kernels?

The types of Kernels are:

* Monolithic kernel
* Micro kernel
* Hybrid kernel
* Exo kernel
* Nano kernel

1. Difference between Firmware and Operating system.

Firmware is usually fixed but the OS is often updated on a regular basis . firmware is low level operations like booting the computer into an OS whereas the OS is high level interfaces. Firmware is used for a single purpose, but the OS is used for general purposes which allow any kind of software to run on multiple types of hardware.

1. Difference between 32-Bit and 64-Bit OS.

* A 32-bit system can access 232 memory addresses, i.e., 4 GB of RAM or physical memory; ideally, it can also access more than 4 GB of RAM.
* A 64-bit system can access 264 memory addresses, i.e., actually 18-Quintillion bytes of RAM. In short, any amount of memory greater than 4 GB can be easily handled by it.

1. What are the basic elements of communication system? explain with block diagram

Information source (message signal), Transmitter, Channel, Receiver.

Diagram

Description automatically generated

Basic Elements of communication system

1. various types / modes of communication system.

Verbal Communication, On-Verbal Communication, Written Communication,

Listening, Visual Communication.

1. What are the various transmission modes? In communication system

There are three modes of transmission, namely: simplex, half-duplex, and full-duplex.

1. What are various types of guided media explain each with diagram?

Guided media, which are those that provide a conduit from one device to another, include twisted-pair cable, coaxial cable, and fiber-optic cable.

Guided Transmission Media uses a "cabling" system that guides the data signals along a specific path.

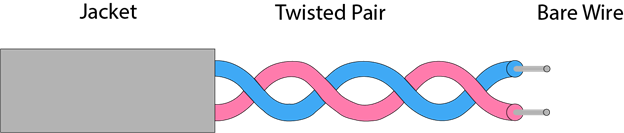
There four basic types of Guided Media:-

Open Wire→Open Wire is traditionally used to describe the electrical wire strung along a telephone pole.

A picture containing text, furniture

Description automatically generated

Twisted Pair→ Twisted pair is a physical media made up of a pair of cables twisted with each other. A twisted pair cable is cheap as compared to other transmission media. ... The frequency range for twisted pair cable is from 0 to 3.5KHz. A twisted pair consists of two insulated copper wires arranged in a regular spiral pattern.



Coaxial Cable→ Coaxial cable is very commonly used transmission media, for example, TV wire is usually a coaxial cable.

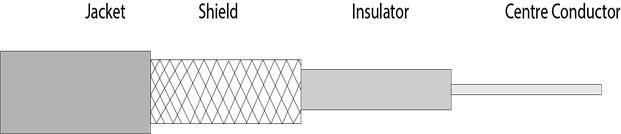
The name of the cable is coaxial as it contains two conductors parallel to each other.

It has a higher frequency as compared to Twisted pair cable.

The inner conductor of the coaxial cable is made up of copper, and the outer conductor is made up of copper mesh.

The middle core is made up of non-conductive cover that separates the inner conductor from the outer conductor.

The middle core is responsible for the data transferring whereas the copper mesh prevents from the EMI(Electromagnetic interference).



Optical Fiber→ Fibre optic cable is a cable that uses electrical signals for communication.

Fibre optic is a cable that holds the optical fibres coated in plastic that are used to send the data by pulses of light.

The plastic coating protects the optical fibres from heat, cold, electromagnetic interference from other types of wiring.

Fibre optics provide faster data transmission than copper wires.

A picture containing graphical user interface

Description automatically generated

1. What are various unguided media? Explain each of them with their ranges and application?

Unguided media transmits the electromagnetic waves without using any physical medium. Therefore it is also known as wireless transmission.

In unguided media, air is the media through which the electromagnetic energy can flow easily.

Radio waves

* Radio waves are the electromagnetic waves that are transmitted in all the directions of free space.Radio waves are omnidirectional, i.e., the signals are propagated in all the directions.
* The range in frequencies of radio waves is from 3Khz to 1 khz.
* In the case of radio waves, the sending and receiving antenna are not aligned, i.e., the wave sent by the sending antenna can be received by any receiving antenna.
* An example of the radio wave is FM radio.
* Application: FM Radio, Television, cordless phones

Microwaves

* Microwaves are the electromagnetic waves having the frequency in the range from 1GHz to 1000 GHz.
* Microwaves are unidirectional as the sending and receiving antenna is to be aligned, i.e., the waves sent by the sending antenna are narrowly focussed.
* Frequency range: The frequency range of terrestrial microwave is from 4-6 GHz to 21-23 GHz.
* Application: satellite communications, radar signals, phones, and navigational applications

Satellite Communication

* A satellite is a physical object that revolves around the earth at a known height.
* Satellite communication is more reliable nowadays as it offers more flexibility than cable and fibre optic systems.
* Frequency range: 1 GHz – 30 GHz
* Application: Weather forecast, live streaming media, etc

Infrared

* An infrared transmission is a wireless technology used for communication over short ranges.
* The frequency of the infrared in the range from 300 GHz to 400 THz.
* It is used for short-range communication such as data transfer between two cell phones, TV remote operation, data transfer between a computer and cell phone resides in the same closed area

1. What is client server model?

The Client-server model is a distributed application structure that partitions task or workload between the providers of a resource or service, called servers, and service requesters called clients. In the client-server architecture, when the client computer sends a request for data to the server through the internet, the server accepts the requested process and delivers the data packets requested back to the client. Clients do not share any of their resources. Examples of Client-Server Model are Email, World Wide Web, etc.

1. How does client server model work?

Clients are computers capable of receiving information or using a particular service from the service providers (Servers). Servers are remote computers which provides information or access to particular services to clients.

1. what are the advantages and disadvantages of client server model?

Advantages of Client-Server model:

* Centralized system with all data in a single place.
* Cost efficiency requires less maintenance cost and Data recovery is possible.
* The capacity of the Client and Servers can be changed separately.

Disadvantages of Client-Server model:

* Clients are prone to viruses, Trojans and worms if present in the Server or uploaded into the Server.
* Servers are prone to Denial of Service (DOS) attacks.
* Data packets may be spoofed or modified during transmission.
* Phishing or capturing login credentials or other useful information of the user are common and MITM (Man in the Middle) attacks are common.

1. What is the difference between LAN, MAN and WAN

A LAN (local area network) is a group of computers and network devices connected together, usually within the same building. By definition, the connections must be high speed and relatively inexpensive (e.g., token ring or Ethernet). Most University departments are on LANs to share resources.

A MAN (metropolitan area network) is a larger network that usually spans several buildings in the same city or town. The IUB network is an example of a MAN.

A WAN (wide area network), in comparison to a MAN, is not restricted to a geographical location, although it might be confined within the bounds of a state or country. A WAN connects several LANs, and may be limited to an enterprise (a corporation or an organization) or accessible to the public. The technology is high speed and relatively expensive. The Internet is an example of a worldwide public WAN.

1. What is VoIP? Why should we use VOIP?

Voice over Internet Protocol (VoIP), is a technology that allows you to make voice calls using a broadband Internet connection instead of a regular (or analog) phone line.

1. What are the features of VOIP?

* Advanced Call Management.
* Call Routing.
* Anonymous Call Rejection.
* Auto Attendant.
* Business Text Messaging.
* Call Analytics.
* Call Forwarding.
* Call Notify.

1. How does VoIP work?

Voice over IP converts your voice into a digital signal, compresses it, and sends it over the internet. A VoIP service provider sets up the call between all participants. On the receiving end, the digital data is then uncompressed into the sound that you hear through your handset or speakerphone.

1. What are the advantages and disadvantages of VoIP?

|  |  |
| --- | --- |
| Pros | Cons |
| Lower costs | Reliable internet connection required |
| Increased accessibility | Latency and jitter |
| Complete portability | No location tracking for emergency calls |

1. What are the various working networks?

● Repeater

● Hub

● Bridges

● Switch

● Router

● Modem

● Access point

● Gateway.

1. state on which network layer these devices work at.

* Repeater- Physical Layer
* Hub- Physical Layer
* Bridge- Data Link Layer
* Switch- Data Link Layer

1. what is the difference between switch and hub?

|  |  |
| --- | --- |
| Hub | Switch |
| Hub is a networking device which is used to transmit the signal to each port (except one port) to respond from which the signal was received. | Switch is a network device which is used to enable the connection establishment and connection termination on the basis of need. |
| Hub is operated on a Physical layer. In this, packet filtering is not available. | Switch is operated on the Data link layer. In this packet filtering is available. |
| It is of two types: Active Hub, Passive Hub. | It is a type of full duplex transmission mode and it is also called efficient bridge. |

1. what is OSI network model?

The OSI Model (Open Systems Interconnection Model) is a conceptual framework used to describe the functions of a networking system. The OSI model characterizes computing functions into a universal set of rules and requirements in order to support interoperability between different products and software

1. Write a short note on firewall history.

• Gen 1 Virus

Generation 1, Late 1980’s, virus attacks on stand-alone PC’s

affected all businesses and drove anti-virus products.

• Gen 2 Networks

Generation 2, Mid 1990’s, attacks from the internet affected all

business and drove creation of the firewall.

• Gen 3 Applications

Generation 3, Early 2000’s, exploiting vulnerabilities in

applications which affected most businesses and drove Intrusion

Prevention Systems Products (IPS).

• Gen 4 Payload

Generation 4, Approx. 2010, rise of targeted, unknown, evasive,

polymorphic attacks which affected most businesses and drove

anti-bot and sandboxing products.

• Gen 5 Mega

Generation 5, Approx. 2017, large scale, multi-vector, mega

attacks using advance attack tools and is driving advance threat

prevention solutions.

Back in 1993, Check Point CEO Gil Shwed introduced the first stateful

inspection firewall, FireWall-1. Fast forward twenty-seven years, and a firewall

is still an organization’s first line of defense against cyber attacks. Today’s

firewalls, including Next Generation Firewalls and Network Firewalls support a

wide variety of functions and capabilities with built-in features, including:

• Network Threat Prevention

• Application and Identity-Based Control

• Hybrid Cloud Support

• Scalable Performance

1. What are the types of firewalls?
   * Packet filtering

A small amount of data is analyzed and distributed according to the

filter’s standards.

* + Proxy service

Network security system that protects while filtering messages at the

application layer.

* + Stateful inspection

Dynamic packet filtering that monitors active connections to determine

which network packets to allow through the Firewall.

* + Next Generation Firewall (NGFW)

Deep packet inspection Firewall with application-level inspection.

1. Why do we need firewalls?

Firewalls provide protection against outside cyber attackers by shielding your computer or network from malicious or unnecessary network traffic. Firewalls can also prevent malicious software from accessing a computer or network via the internet.

1. Write a short note on Bluetooth technology

It is a Wireless Personal Area Network (WPAN) technology and is used for exchanging data over smaller distances. This technology was invented by Ericson in 1994. It operates in the unlicensed, industrial, scientific and medical (ISM) band at 2.4 GHz to 2.485 GHz. Maximum devices that can be connected at the same time are 7. Bluetooth ranges upto 10 meters. It provides data rates upto 1 Mbps or 3 Mbps depending upon the version. The spreading technique which it uses is FHSS (Frequency hopping spread spectrum). A Bluetooth network is called a piconet and a collection of interconnected piconets is called scatternet.

1. Difference between piconet and scatternets

| **Piconet** | **Scatternet** |
| --- | --- |
| Piconet is the type of connection formed between 2 or more Bluetooth enabled devices. | between 2 or more Bluetooth enabled devices. It is a type of ad-hoc computer network consisting of 2 or more piconets. |
| It supports maximum 8 nodes i.e,1 master & 7 slaves | It supports more than 8 nodes. |
| It Allows less efficient use of Bluetooth channel bandwidth. It is usually applied to Bluetooth devices. It is a smaller coverage area | It Allows more efficient use of Bluetooth channel bandwidth. It is applied to Bluetooth devices too. It is a larger coverage area. |

1. In which spectrum band does Bluetooth Technology operate? mention the range and data rates for different Bluetooth devices.

Bluetooth® technology uses the 2.4 GHz ISM spectrum band (2400 to 2483.5 MHz), which enables a good balance between range and throughput. In addition, the 2.4 GHz band is available worldwide, making it a true standard for low-power wireless connectivity.

|  |  |  |  |
| --- | --- | --- | --- |
| **Bluetooth**  **Technology** | **BLUETOOTH V2.1** | **BLUETOOTH 4.0 (LE)** | **BLUETOOTH 5 (LE)** |
| **Range** | Up to 100 m | Up to 100 m | Up to 400 m |
| **Max range** **(free field)** | Around 100 m (class 2 outdoors) | Around 100 m (outdoors) | Around 1,000m (outdoors) |
| **Frequency** | 2.402 – 2.481 GHz | 2.402 – 2.481 GHz | 2.402 - 2.481 GHz |
| **Max data rate** | 1- 3 Mbit/s | 1 Mbit/s | 2 Mbit/s |
| **Application** **Troughput** | 0.7-2.1 Mbit/s | Up to 305 kbit/s | Up to 1,360 kbit/s |
| **Topologies** | Point-to-point, scatternet | Point-to-point, mesh network | Point-to-point, mesh network |
| **Network** **Standard** | IEEE 802.15.1 | IEEE 802.15.1 | IEEE 802.15.1 |