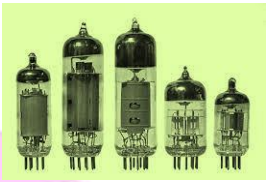
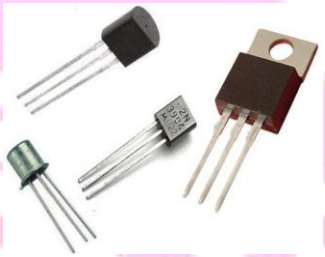
History of computer

First generation of computer:-



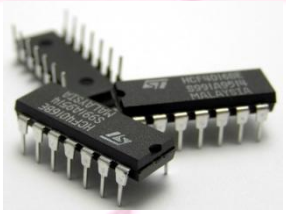
- Technology used:- vacuum tube
- Machine language used
- No permanent storage used
- Expensive and less reliable
- very slow and very large in size
- Punched cards and paper tape as I/O devices.
- Examples:- ENIAC, EDVAC, UNIVAC, IBM650, IBM 701, etc.

Second generation of computer:-



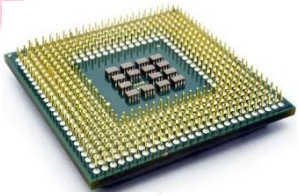
- Technology used: transistor
- magnetic core and magnetic tape / disk used as memory
- Assembly language used
- Low power consumption, generated less heat, and smaller in size.
- Improvement in speed and reliability
- punched cards and magnetic tape as I/O devices.
- Examples – IBM 1401, IBM 7090 and 7094, etc.

Third Generation of computer:-



- Technology used:- integrated circuits (ICs)
- magnetic core, magnetic tape/disk as memory
- High level language (FORTRAN, BASIC, Pascal, COBOL, C, etc.) used
- Smaller size, cheaper, and more efficient than second generation computers
- Improvement of speed and reliability
- Magnetic tape, keyboard, monitor, printer, etc as I/O devices
- Examples – IBM 360, IBM 370, PDP-11, UNIVAC 1108, etc.

Fourth Generation of computer



- Technology used– very large-scale integration (VLSI) and microprocessor.
- semiconductor memory (such as RAM, ROM, etc.) used.
- High level language (Python, C#, Java, JavaScript, Rust, Kotlin, etc.).
- Smaller, cheaper and more efficient
- Improvement of speed, accuracy, and reliability
- keyboard, pointing devices, optical scanning, monitor, printer, etc as I/O devices.
- Examples – IBM PC, STAR 1000, APPLE II, Apple Macintosh, etc.

Fifth Generation of computer:-

- Ultra Large-Scale Integration (ULSI) technology
- Understand natural language (human language), Parallel processing, AI, Machine learning etc.
- Example:- desktops, laptops, palmtop, tablets, smartphones, notebook, chromebook, etc.

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Generation of Microprocessor

Generation	Era	Chip type	Word size	Maximum memory size	Clock speed	Cores	Example
First	1971	LSI	4/8 bit	1 KB	108 KHz-200 KHz	single	4004, 8008
Second	1974	LSI	8 bit	1 MB	Upto 2 MHz	single	Motorola 6800 Intel 8085
Third	1979	VLSI	16 bit	16MB	4 MHz - 6 MHz	single	Intel 8086
Fourth	1981	VLSI	32bit	4GB	Upto 133 MHz	single	Intel 80386 Motorola 68030
Fifth	1995	SLSI	64bit	64GB	533 MHz - 34 GHz	Multicore	Pentium, Celeron, Xeon

Generation of Language

Generation	Characteristics	Examples
First (1GL)	Binary Code Binary	Machine code
Second(2GL)	Assembly Language	(e.g. x86 Assembly)
Third(3GL)	High Level language	Fortran, COBAL, C, BASIC, C++, JAVA, JS, Pascal
Fourth(4GL)	Domain Specific	SQL, MATLAB, Oracle Reports, SAS, PYTHON, Unix shell
Fifth(5GL)	AI/ real time processing	Based Prolog, LISP, Mercury

Types of computer

- **On the basis of data handling**
  - Analogue Computer
  - Digital Computer
  - Hybrid Computer
- **On the basis of size**
  - Super Computer
  - Mainframe Computer
  - Miniframe computer
  - Workstation
  - Micro Computer
- **On the basis of purpose**
  - General purpose
  - Special purpose

Analogue and Digital signal

SNo.	Analogue	Digital
1.	All natural signals (such as human voice, bird chirping or playing a musical instrument) are analogue signals.	Signals that are converted into a binary form(0,1)(such as CD,DVD,digital settop boxes) are called digital signals.
2.	Analogue signals are continuous electrical signals.	Digital signals are discrete (non-continuous) electrical signals.
3.	It varies with respect to time periodically or non-periodically.	it can only contain one value at a period of time.
4.	It is represented as sine waves.	It is represented as square waves.
5.	It uses low bandwidth i.e. real time processing can be done.	It uses relatively high bandwidth. i.e. real time processing may cause error.
6.	It has noise as they travel through the medium, these noises result in information loss in the signal.	The digital signals are more stable and less effected by noise. Therefore less information loss.
7.	It is less reliable	It is comparatively more reliable.
8.	It consumes more power for data transmission.	It consumes less power for data transmission.
9.	Major components of analogue circuits are resistors, capacitors, inductors, diodes etc.	Main components of digital circuit are transistors, logic gates, ICs, microcontroller etc.
10.	The result is not accurate.	It gives accurate results.
11.	Troubleshooting of analogue signals is difficult.	Troubleshooting of digital signals is easy.
12.	Parameters amplitude, frequency and phase are used to measure analogue signal.	Parameters bit rate and bit interval are used to measure digital signal.
13.	Analogue hardware is not flexible in implementation.	Digital hardware is flexible in implementation.
14.	It is suited for audio and video transmission.	It is suited for Computing and digital electronics.
15.	Analogue signals are less secure.	Digital signals are more secure (encryption).
16.	Example:- audio signals transmitted through wires, video signals broadcasted using antenna technology, radio signals, analog watches etc.	Example: - data store in a computer memory. Digital thermometer, digital watch, digital speedometer.
17.	It is used to measure temperature, current, voltage, distance, pressure, speed, etc.	In digital computer quantities are counted rather than measure.
18.	Transmission of digital data in the analogue channel is done by a process called modulation.	Transmission of analogue data in the digital channel is done by a process called demodulation.

On the basis of size

1. **Supercomputer:-**

- The most powerful and fastest computers,
- Capable of performing massive calculations and handling complex simulations.
- Consist of thousands to millions of processors working together in parallel to solve problems.
- Capable to handle trillions of instruction simultaneously.
- It is used in Scientific Research, pharmaceutical research, National Security and defence, Aerospace and Automotive Industry etc.

2. Mainframe:-

- Large, powerful, and high-performance computers.
- It can handle millions of instruction at a time.
- Extensive memory and storage capabilities.
- High-speed input/output channels.
- Example:- Enterprise Computing (dbms and ERP), Financial Services,Telecommunications, Airline Reservations and Travel, Education and Research:

3. Miniframe/Minicomputer:-

- Smaller and less expensive than mainframes but more powerful than microcomputers.
- It handles thousands of instruction simultaneously.
- Supported several input/output devices.
- They had moderate processing power and memory compared to mainframes.
- More affordable and easier to manage than mainframes.
- Examples:- Real-Time Control Systems, inventory, supermarkets etc.

4. Workstation:-

- Used to perform a specific task with great accuracy.
- Large storage capacity, better graphics, and a more powerful CPU as compared to a PC.
- Example:- video editing, gaming playstation, music creation and editing, CAD, data analysis etc.

5. Micro computer/Personal computer:-

- Designed for individual use.
- It has microprocessor as a central processing unit (CPU), memory, input and output unit.
- Personal Entertainment, Education and Learning, Multimedia and Content Creation, Internet Access, General Productivity etc.

Components of Computer

There are some following components of a computer:

1. Input devices
2. Output devices
3. Software
4. Hardware
5. Memory
6. CPU

Input devices

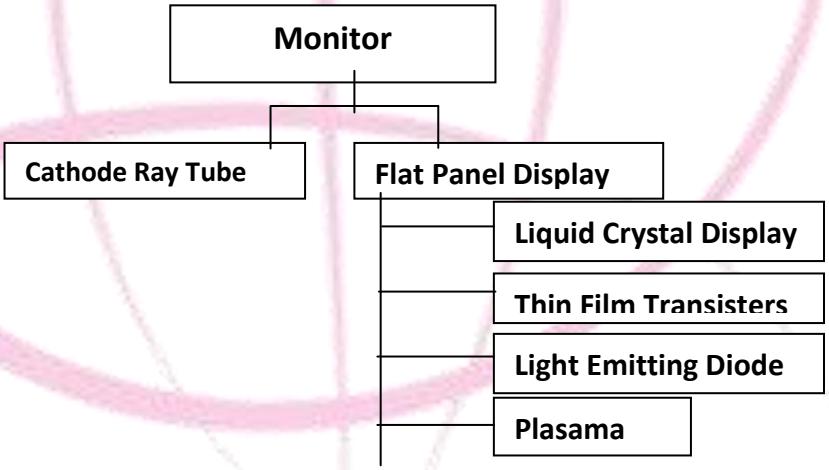
Input device are used to give instructions to the computer or system.

1. Keyboard
2. mouse
3. joystick
4. track ball
5. scanner
6. Digitizer (graphics tablet)
7. Optical Character Reader(OCR)
8. microphone
9. Bar code reader
10. Optical Mark Reader(OMR)
11. Camera
12. Magnetic Ink Character Reader (MICR)
13. touch pad
14. Light pen
15. Light gun
16. Stylus (digital pen)
17. Remote
18. Biometrics(Palm recognition facial expression, iris scan, retina scan thumb impression etc.)

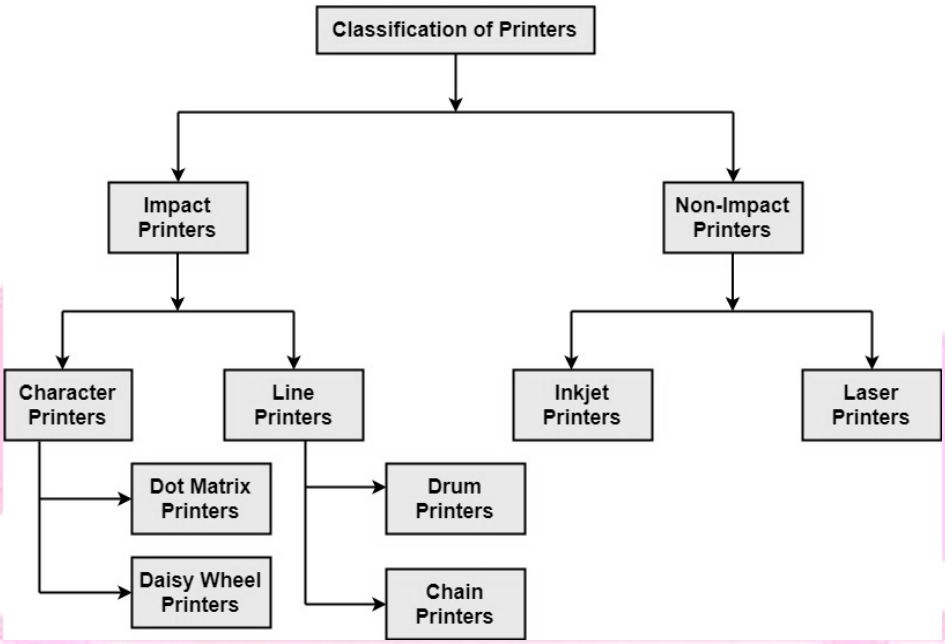
Output Devices

Output devices are used to give result of given instruction.

1. **Monitor** (Screen, display, VDU(Visual Display Unit/video display unit), VDD (Visual Display Device/ video Display Device))



2. **Printers**



3. **Plotter**
4. **Speakers**
5. **Projector**

Input & Output both

1. Headphone
2. Touch screen
3. Fax machine
4. Modem
5. Network card
6. Video/ sound card
7. Storage devices
8. Digital camera

Difference between input and output devices

SNo.	Input device	Output device
1.	It receives data from users.	It Provides data for users.
2.	It translates user instructions into a machine instructions	It translates the machine's instructions to user instructions.
3.	It can be commanded by the user.	Processor commands output device.
4.	It accepts user data and forwards it to the processor for further processing.	The output device provides the processed data from the processor.

Software

Software is a set of programs used to operate computers and execute specific tasks.
Program is a set of instruction.

Types of Software

- On the basis of development
  - Open Source Software
  - Closed Source Software
- On the basis of working mechanism
  - System Software
  - Application Software
  - Utilities

On the basis of development

SNo.	Open source Software	Closed source software
1.	It is also known as license free software	It is also called licensed or proprietary software.
2.	It provides access to its source code and detailed documentation of development.	It does not disclose the source code or SDLC.
3.	It allows any user or organization to view the source code.	Company or individual who has developed the software reserved all the rights of software code.
4.	Users or organization that has purchased or downloaded the software can modify and distribute the software.	No one can modify or distribute the CSS. Only developer company or person has this right.
5.	Price is comparatively less.	Price is high.
6.	Malware attack risk is minimum.	Malware attack is a challenge.
7.	Easy to fix errors in software.	Errors are fixed by developer company only.
8.	It can be installed in any system.	Installation requires license key which restrict the software usability. (piracy is punishable)
9.	It encourages collaboration among developers worldwide, as anyone can contribute improvements, report bugs, or suggest new features.	Limited collaboration to internal resources. Only feedback can be given about software. Development is done by the licensed organization only.
10.	Example:- Linux, Android, openoffice, mozila firefox, VLC media player, GIMP, python, php, apache server, moodle, MySql, Arogya setu app,Solaris, Ubantu etc.	Example:- windows OS, Google Earth, internet explorer, Skype, Adobe Flash, Adobe Reader, WinRAR, Microsoft Office, Mac OS,Unix etc.

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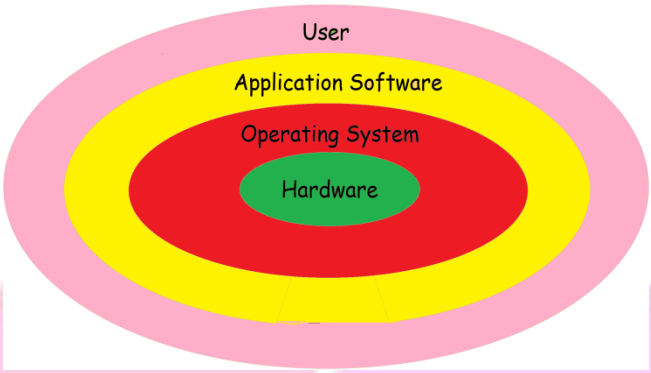

On the basis of working mechanism

SNo	System Software	Application Software	Utilities
1.	It directly interacts with and manages hardware resources.	It is installed on system software to interact with end users.	It can be system or application software.
2.	It performs system tasks like resource management, interrupt handling, error detection, hardware failure etc.	It is developed to perform some specific task (like gaming, reading, editing, listening music etc) at user ends.	It adds functionality to computer to perform better.
3.	It is written in low-level and high level languages.	It is written in high level language.	It helps computer by protecting optimizing and configuring.
4.	It is system-purpose software.	It is user-purpose software.	It may be used by both.
5.	A computer cannot run without system software.	Computer health has no issue without application software.	Depends upon the type of software.
6.	Essential System software runs when the system is switched on and stops when the system is switched off.	Application software runs as per the user's requirement.	It runs when it is required.
7.	Development is complex than application software.	Easy to develop comparatively.	Easy to develop and take less space.
8.	System software runs in backend to support system files.	Application software runs in front end to perform some tasks.	It can run in both end.
9.	It is soul of the system.	It is component of the system.	It improves the performance of soul and components.
10	It depends on the hardware.	It depends on the system software.	It depends upon the both.
11	Example:- Operating systems(windows, linux, unix, android), language translator, firmwares, device drivers etc.	Example:- web browsers, Microsoft office, gaming software, audio and video player, document reader etc.	Example:- Device drivers, antivirus, screen savers, disk cleaner, disk defragmentation etc.

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System Software

1) Operating System:

- An operating system is the system software that works as an interface to enable the user to communicate with the computer hardware.
- It manages and coordinates the functioning of hardware and software of the computer.
- Operating system is responsible for booting, Memory management, recourse management,,Data security, Loading and execution, Drive/disk management, CPU scheduling, Device management etc.
- **Examples:** Microsoft Windows, Android, ios, Bada, Symbian, Linux, Unix, Solaris, Ubantu, Net BSD, Free BSD and Apple Mac OS X.

2) Language translator: It is used to establishing communication between user and machine. It converts the low level or high level programming language into machine language.

Translator Type	Description
Assembler	Converts assembly language into machine language
Compiler	Translates high-level language into machine language in one go, creating an executable program
Interpreter	Translates high-level language code into machine code line-by-line
Just in time(JIT) compiler	Combines features of both compilers and interpreters by compiling code at runtime for improved performance

Device Drivers:- Device drivers are software that allow a computer's operating system to communicate with hardware devices, such as printers, graphics cards, keyboards, USB sticks etc. They act as a bridge between different computer components, allowing them to interact with each other and transmit data.

Some other softwares

1. Software as a service:-

- SaaS is also known as web-hosted software, on-demand software, or web-based software.
- SaaS is a cloud based software delivery model where software is hosted in the cloud and accessed via the internet.
- SaaS applications can be accessed from any compatible device over the internet without downloads.
- It may have dependency, security and latency issues as it is stored in cloud not deployed on system.
- **Example:-** Microsoft Office 365, google aaps, Github, gotomeeting, salesforce, zoom, slack etc.

2. Platform as a service:-

- Platform as a Service (PaaS) is a cloud computing model where a third party offers the necessary software and hardware resources that provides a complete cloud environment for developing, running, and managing applications.
- **Example:-** AWS Elastic Beanstalk, Heroku, Windows Azure, SharePoint etc.

3. Infrastructure as a service:-

- IaaS is a cloud computing model that provides on-demand access to computing resources such as servers, storage, networking, and virtualization.
- IaaS includes virtual servers and cloud storage, cloud security, and access to data center resources (managed by the IaaS provider).
- **Example:-** Amazon Web Services (AWS), Microsoft Azure, Google Cloud, DigitalOcean, and Linode.

4. **Shareware:-** It is a 'try before you buy' software.
   Example:- WinZip, Adobe Acrobat 8 Professional, Netflix, IDM, Antivirus etc.

5. **Public domain:-**
   - Software that is not protected by copyright, means anyone can use, modify, and distribute it freely without any restrictions.
   - **Example:-** SQLite, VLC media player, audacity, GIMP, Apache http server, liberoffice, filezilla etc.

6. **Freeware:-**
   - software that is distributed for free, allowing users to use, modify, and distribute it without payment. However, unlike open-source software, freeware may not necessarily provide access to its source code and documentation.
   - **Example:-** Adobe Acrobat Reader, CCleaner, bittorrent, chrome etc.

7. **Firmware:-** A specific type of software that is installed on hardware devices, such as computer peripherals, smartphones, routers, and embedded systems like microcontrollers and IoT devices.
   - **Example:-** BIOS/UEFI Firmware: Basic Input/Output System (BIOS) or Unified Extensible Firmware Interface (UEFI).

8. **Bloatware:-** Software that comes pre-installed on a device by the manufacturer, often taking up space and resources without providing significant value to the user.
   - **Example:-** trial versions of antivirus software, productivity suites, or games

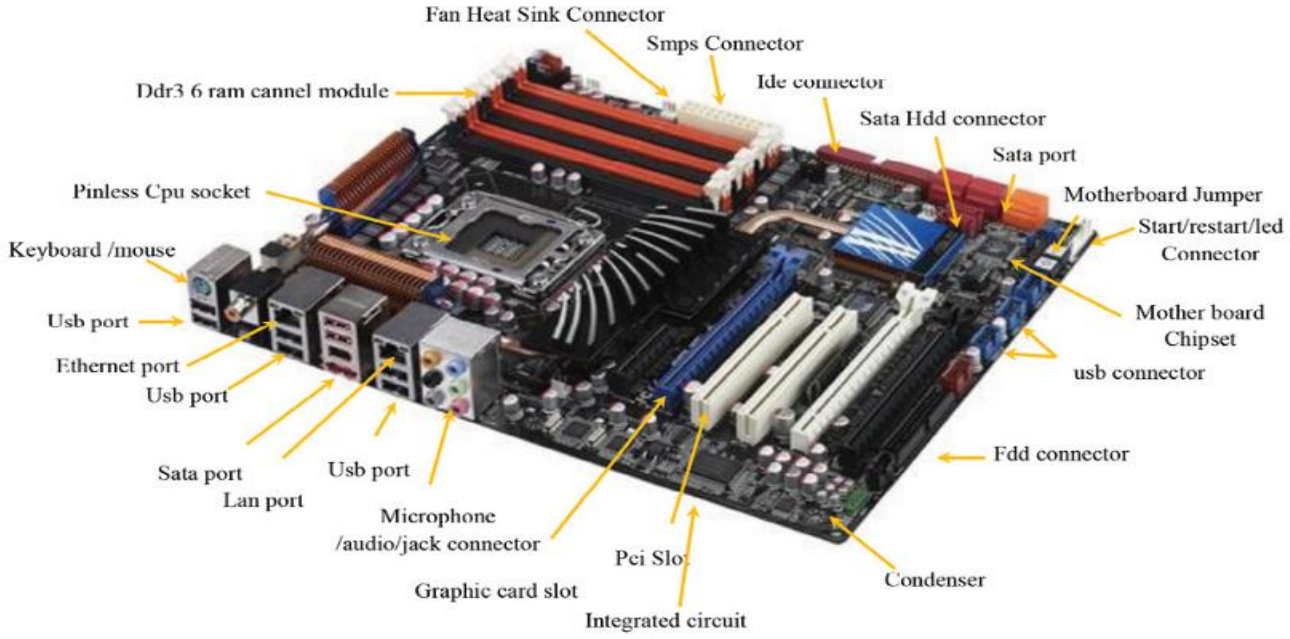
9. **Middleware:-** Software that acts as an intermediary between different applications, systems, or components, facilitating communication and data exchange between them.
   - **Example:-** Nginx or Apache HTTP Server, Apache Kafka etc.

10. **Malware:-** Software intentionally designed to cause damage to a computer, server, network, or user.
    - **Example:-** virus, worm, Trojan, botnets, rootkits etc.

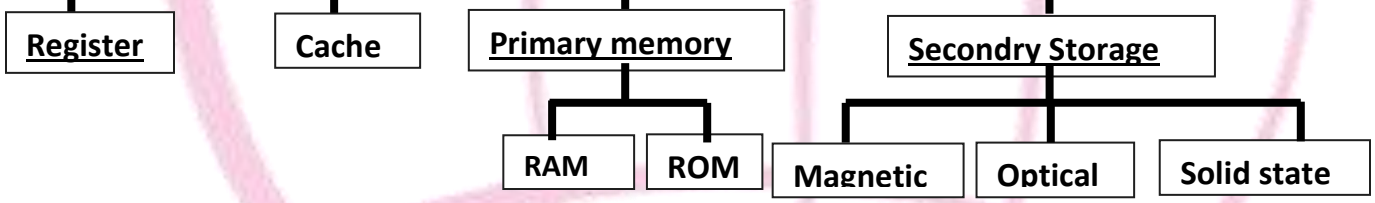
Hardware

Computer hardware includes the physical parts of a computer, such as central processing unit (CPU), RAM, ROM, monitor, mouse, keyboard, secondary storage, graphics card, sound card, speakers and motherboard.

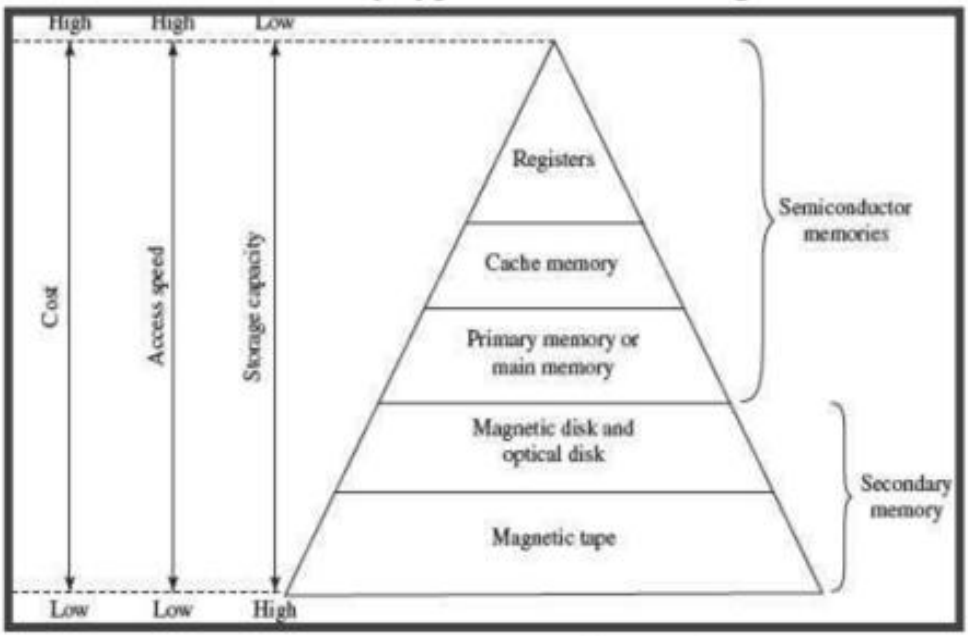
Motherboard



Memory



Memory Heirarchy



Register

- Registers are a vital component of a CPU's architecture, providing fast and efficient storage for data and instructions needed during program execution.
- It is volatile memory.
- It is Small, fast storage locations within the CPU that hold data and instructions temporarily.
- Limited storage capacity, typically ranging from 8 to 64 bits per register.

Types of Registers

Data Registers:

Accumulator (ACC): Holds intermediate results of arithmetic and logical operations.
General Purpose Registers (GPRs): Used for a wide variety of functions, can store data, addresses, or intermediate results. Examples include AX, BX, CX, and DX in x86 architecture.

Address Registers:

Index Registers: Used for modifying operand addresses during program execution (e.g., SI and DI in x86 architecture).
Segment Registers: Hold the addresses of segments in memory, facilitating segmented memory management (e.g., CS, DS, SS, and ES in x86 architecture).
Stack Pointer (SP): Points to the top of the current stack in memory, used for managing function calls and returns.
Base Pointer (BP): Points to the base of the stack, used for accessing parameters and local variables in the stack.

Special Purpose Registers:

Program Counter (PC) or Instruction Pointer (IP): Holds the address of the next instruction to be executed.
Instruction Register (IR): Holds the currently executing instruction.
Status Register or Flags Register: Contains flags that indicate the status of the processor (e.g., zero flag, carry flag, sign flag, overflow flag).
Control Registers: Used to control various aspects of the CPU's operation, such as enabling or disabling interrupts (e.g., CR0, CR2 in x86 architecture).

Cache

- Cache memory plays a critical role in bridging the speed gap between the CPU and main memory.
- It is a small, volatile, high-speed storage area located close to the CPU.
- More expensive per byte than main memory due to its higher speed.

Levels of Cache Memory

Parameters	L1 Cache (Level 1)	L2 Cache (Level 2)	L3 Cache (Level 3):
Location	Integrated directly into the CPU chip.	Either integrated into the CPU chip or located on a separate chip near the CPU.	Shared among multiple CPU cores and located on a separate chip or integrated into the CPU.
Speed	Fastest among all cache levels.	Slower than L1 but faster than L3.	Slower than L2 but faster than main memory.
Size	Smallest, typically ranging from 16 KB to 128 KB.	Larger than L1, typically ranging from 128 KB to 1 MB.	Largest among the cache levels, typically ranging from 1 MB to 32 MB.

Purpose	Stores the most frequently accessed data and instructions.	Serves as a secondary cache to store data and instructions not found in L1.	Enhances performance by storing data and instructions that are not found in L1 or L2.

RAM(Main Memory)

- The main storage area in a computer where data and instructions are stored for quick access by the CPU.
- Faster than secondary and tertiary memory but smaller in size.
- It is volatile memory as it requires power to maintain the stored information. Data is lost when the power is turned off or no need of that data .
- More expensive per byte than secondary storage due to its higher speed and performance.

Types of RAM

Parameters	DRAM (Dynamic RAM)	SRAM (Static RAM)
Structure	Uses capacitors and transistors to store each bit of data.	Uses flip-flops to store each bit of data.
Speed	Slower than SRAM but more common due to its cost-effectiveness.	Faster than DRAM but more expensive.
Usage	General-purpose memory used in most computing devices.	Often used in cache memory due to its speed.
Refresh Rate	Needs to be refreshed thousands of times per second to retain data.	Does not need to be refreshed, retains data as long as power is supplied.

Types of DRAM (Dynamic Random Access Memory)

SDRAM (Synchronous DRAM): it operates in synchronization with the system clock.

- Synchronization with the CPU clock improves efficiency.
- Supports burst mode, allowing faster data access in a sequence.
- Widely used in computer systems from the late 1990s to early 2000s.

DDR SDRAM (Double Data Rate SDRAM):- It transfers data on both the rising and falling edges of the clock signal.

- It is used in standard in modern PCs, laptops, and servers.
- DDR (DDR1): The first generation of DDR, doubling the data rate of SDRAM.
- DDR2: Improves speed and power efficiency over DDR1.
- DDR3: Further increases speed, reduces power consumption, and doubles the bandwidth of DDR2.
- DDR4: Enhances performance, power efficiency, and capacity compared to DDR3.
- DDR5: Offers higher speed, greater efficiency, and larger capacity than DDR4.

RDRAM (Rambus DRAM):- It is developed by Rambus Inc., it offers high-speed data transfer rates.

- Uses a high-speed data bus.
- High latency compared to DDR SDRAM.
- More expensive and complex.
- Briefly used in high-performance systems and gaming consoles but largely replaced by DDR SDRAM.

ROM (Read-Only Memory)

- It is a non-volatile memory used to store firmware.
- It is slower than RAM but retains data without power.
- Stores essential system instructions like BIOS/UEFI.

Types of ROM

1. Masked ROM
2. PROM (Programmable ROM)
3. EPROM (Erasable Programmable ROM)
4. EEPROM (Electrically Erasable Programmable ROM)
5. Flash Memory

Secondry Storage

- It is a non-volatile storage that retains data even when the power is turned off.
- It Provides high capacity than RAM and long-term data storage for files, applications, and the operating system.
- It is slower than primary memory
- It is cheaper per byte compared to primary memory.

Types Of Secondary Storage

- **Magnetic Storage:** Floppy disk, HDD, Magnetic tape, magnetic drum, cassettes, VCR etc.
- **Optical Storage:** CD, DVD and Blueray
- **Solid State Storage:** SSD, pendrive, memory card, sd card, micro sd card etc.

CPU (Central Processing Unit)

It is a primary component of a computer that performs most of the processing inside the system.
It executes instructions from programs, performs arithmetic and logic operations, and manages data flow to and from other parts of the computer.

It has 3 main parts

1. **Memory:-** Registers(we have discussed above)
2. **Arithmetic Logic Unit:-** It performs basic arithmetic and logical operations like addition, subtraction, multiplication, division, AND, OR, NOT, XOR, bitwise shifts etc.
3. **Control Unit:-** It directs processor operation by managing the execution of instructions.
   It mainly interprets program instructions and converts them into control signals that coordinate the activities of the CPU and other components of the computer system.

Types of Control Units

Parameters	Hardwired Control Unit	Microprogrammed Control Unit
Design	Uses fixed logic circuits to control signals.	Uses a set of instructions (microinstructions) stored in memory (control memory) to generate control signals.
Speed	Faster operation due to direct hardware implementation.	Slightly slower due to additional layer of instruction decoding.
Flexibility	Less flexible and harder to modify.	Easier to modify and update by changing the microprogram.
Complexity	Can be complex to design for instruction sets with many instructions.	Easier to design for complex instruction sets.

File Format

- A file format defines the structure and type of data stored in a file. The structure of a typical file may include a header, metadata, saved content, and an end-of-file (EOF) marker. The data stored in the file depends on the purpose of the file format.
- A file format is a standard way that information is encoded for storage in a computer file.
- file format is also called file extension.

Example:

abc.jpeg is an image file.
Xyz.flv is a video file.
pqr.wma is a audio file.

Text file format

TXT- text file
RTF – rich text format
CSV- comma separate value

Document File

DOC/ DOCX- document file/ document extension file
ODT – open document type
WPD- word

Image File Format:

JPEG, Exif, TIFF, GIF, BMP, PNG, PSD, RAW, INDD, EPS etc

Video File Format:

FLV, VOB, GIF, MPEG, AVI, MOV,RM, AMV, MP4, M4P, MPG, 3GP, VLC **etc**

Audio File format:

WAV, AIFF, AU, M4A, FLAC, MP3, AAC etc

Other File format

Pdf, exe, apk, zip, rar, dll, bat, ipa xls/xlsx, ppt/pptx,

Memory Unit

Memory unit is the amount of data that can be stored in the storage unit. This storage capacity is expressed in terms of Bytes.

1 bit = 0/1 (binary digit)
1 Nibble = 4 bit
1 Byte = 8 bit
1 KB = 1024 Byte (B)
1 MB = 1024 KiloByte(KB)
1 GB = 1024 MegaByte(MB)
1 TB = 1024 GigaByte(GB)
1 PB = 1024 TeraByte(TB)
1EB = 1024 PetaByte (PB)
1 ZB = 1024 ExaByte(EB)
1 YB = 1024 ZettaByte(ZB)
1 BB= 1024 yottaByte(YB)
1 GeopByte = 1BrontoByte

Computer Network

- A computer network is a system of interconnected computers and devices that can communicate with each other and share resources. Networks are essential for communication, data exchange, and resource sharing across different locations.
- Early research was performed by the US Department of Defense in 1962.
- This research group established ARPAnet (Advanced Research Project Agency) in order to connect the US Defense Department network.

Types of Computer Networks

Local Area Network (LAN)
Wide Area Network (WAN)
Metropolitan Area Network (MAN)
Personal Area Network (PAN)
Campus Area Network (CAN)

Internet

The Internet is a giant network of networks.
A network may include PCs, and other devices like servers or printers.

World Wide Web (WWW)

Tim Berners-Lee invented the World Wide Web in 1990.
The World Wide Web (WWW) is a system of interlinked hypertext documents and multimedia content accessible via the Internet. It allows users to browse and interact with websites through web browsers.

Web Browser

A web browser is a application software for accessing information on the World Wide Web. When a user requests a web page from a particular website, the web browser retrieves the necessary content from a web server and then displays the page on the user's device.
Example: Mozilla Firefox, Google Chrome, Apple Safari, Internet Explorer, Opera, UC browser, Microsoft edge, etc

URL (Uniform Resource Locator)

The address used to access a specific resource on the Internet, such as a webpage or file.

http:// or https://	www.example.com	/home.html	?id=123
Protocol	Domain Name	Path	Query Parameters

Cookies

Small text files stored on a user's device by a web browser, used to remember information about the user.
Session Cookies: Temporary, deleted when the browser is closed.
Persistent Cookies: Remain on the device until they expire or are deleted.
It is used to Store login information, tracking user behavior (e.g., for targeted ads), Remembering user preferences (e.g., language settings)

Session

A temporary and interactive information exchange between a user and a server, typically used to manage user states across multiple requests.
Session ID: A unique identifier assigned to each session, often stored in a cookie.
Duration: Sessions typically last as long as the user is active on the website; they expire after a period of inactivity.
It is used to track logged-in users, managing shopping carts in online stores, keeping track of user preferences during a visit

DNS (Domain Name System)

A system that translates human-readable domain names (e.g., www.example.com) into IP addresses (e.g., 172.123.16.1) that computers use to identify each other on the network.
DNS Server: A server that handles domain name queries and provides the corresponding IP address.
DNS Records: Information stored in DNS servers, including A records (address), MX records (mail exchange), and CNAME records (canonical name).

Website

- The definition of a website is a page or collection of pages on the World Wide Web that contains specific information which is provided by one person or entity and reterived by a Uniform Resource Locator (URL).
- Websites are typically dedicated to a particular topic or purpose, such as news, education, commerce, entertainment, or social networking, searching.

Types of Website

- **Blog:** A blog is a type of website where the content is presented in reverse chronological order (newer content appear first).
- **Informative website:** Website which are build to give information
  Example: Wikipedia, encylopedia
- **Social Networking Site:** A social networking service is an online platform which people use to build social networks or social relationships with other people who share similar personal or career interests, activities, backgrounds or real-life connections.
  Example: LinkedIn, twitter, Facebook, Tumblr, Flickr, Pinterest, Instagram etc
- **Commercial site:** An eCommerce website is a site that sells products and services through means of the data transfer and funds over the internet.
  Example: Snapdeal,Alibaba,Ebay India, Amazon,lenskart etc

Search Engine

A web search engine or Internet search engine is a software system or a web-based tool that is designed to search the World Wide Web in a systematic way for particular information specified in a textual web search query.
Example: Google,Yahoo, Bing, Baidu, AOL, Ask.com, Excite, DuckDuckGo, Chacha.com etc.

Malware

Malware also called malicious software is any software intentionally designed to cause damage to a computer, server, client, or computer network. It can take various forms and serve different malicious purposes, such as stealing data, disrupting operations, or gaining unauthorized access to systems.

Types of Malware

- **Viruses:-** A type of malware that copy itself and requires user interaction to activate or spread.
- **Worms:-** A standalone malware that replicates itself to spread to other computers on a network without needing a host file or user interaction.
- **Spyware:-** It secretly monitors user activity and collects personal information without consent. It can be an log keystrokes, capture screenshots, or harvest credentials; often bundled with legitimate software.
- **Adware:-** Software that automatically displays or downloads unwanted advertisements, often bundled with free software. It can be intrusive and slow down systems; some adware also tracks user behavior.
- **Trojan:-** A Trojan horse, or Trojan, is a type of malicious code or software that looks legitimate but can take control of your computer. A Trojan is designed to damage, disrupt, steal, or in general inflict some other harmful action on your data or network. A Trojan acts like a bona fide application or file to trick you.

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It does not replicate itself but can create backdoors, allowing unauthorized access to the infected system.

- **Ransomware:-** It encrypts the victim's data and demands a ransom to restore access. It often spreads through phishing emails or exploit kits; highly profitable for attackers.
- **Rootkits:-** It is designed to hide the existence of certain processes or programs from normal detection methods. It is often used to maintain persistent, unauthorized access to a system while avoiding detection.
- **Botnets:-** Networks of infected computers (bots) controlled by an attacker to perform coordinated tasks, such as launching distributed denial-of-service (DDoS) attacks. Infected computers often operate without the user's knowledge; can be rented out for malicious purposes.
- **Scareware:-** It tricks users into believing their computer is infected with a virus or other issues and prompts them to purchase fake software to fix it. It often involves pop-up messages or fake virus scans; profits by scamming users into buying useless or harmful software.
- **Logic Bomb:-** logic bomb, also known as a "slag code", is a malicious piece of code that is intentionally inserted into software to execute a malicious function when triggered by a specific event.
- **Spamming:-** Spamming is the use of messaging systems to send an unsolicited message to large numbers of recipients for the purpose of commercial advertising, for the purpose of non-commercial proselytizing, or for any prohibited purpose
- **Phishing:-** Phishing is the fraudulent attempt to obtain sensitive information or data, such as usernames, passwords and credit card details, by disguising oneself as a trustworthy entity in an electronic communication.
- **Denial of Service (DoS) Attack:-** A Denial of Service (DoS) attack is an attempt to make a computer, network, or service unavailable to its intended users by overwhelming it with a flood of illegitimate requests or data.
  The attacker sends a large volume of traffic to the target, often exploiting vulnerabilities to exhaust the target's resources, such as CPU, memory, or bandwidth.
  This can cause the targeted system to slow down significantly or become completely unresponsive.

Types of DoS Attacks:

Volume-Based Attacks: Overwhelm the network with excessive data.
Protocol Attacks: Exploit vulnerabilities in network protocols (e.g., SYN flood).
Application Layer Attacks: Target specific applications or services (e.g., HTTP flood).

- **Man-in-the-Middle (MitM) Attack:-** A Man-in-the-Middle (MitM) attack is a type of cyberattack where the attacker secretly intercepts and possibly alters the communication between two parties who believe they are directly communicating with each other.
  The attacker positions themselves between the victim and the intended recipient of their communications (e.g., between a user and a website).

Common MitM Techniques:

Session Hijacking: Stealing session cookies to take control of a user's session.
DNS Spoofing: Redirecting the victim to a fake website that looks like the legitimate one.
SSL Stripping: Downgrading a secure HTTPS connection to an unencrypted HTTP connection.

- **Multipartite Malware:-** It is a type of malware that spreads and infects a system in multiple ways, often through a combination of methods such as infecting both the boot sector and executable files.
  Multipartite malware typically starts by infecting one part of the system, such as the boot sector, and then spreads to other parts, like the file system.
  This makes it harder to detect and remove, as it can persist even if one part of the infection is eliminated.

Multiple Infection Vectors: Spreads through various means, such as infected files, email attachments, or malicious websites.
Resilience: Often designed to reinfect parts of the system that have been cleaned, making it more persistent.