Introduction to IT Systems

Chapter-1

Internet Skills and Computer Basics

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UNIT OUTCOMES

- **U1-O1**: Identify & connect different peripheral devices (printers, scanners, etc.) to a computer.
- **U1-O2**: Use different types of browsers and their key features (bookmarking, private browsing, tabbed browsing & synchronization, etc.)
- **U1-O3**: Write efficient search queries for precise information retrieval from the web.
- **U1-O4**: Browse various digital India portals, state portals & college portals and analyze various available services.

Contents

- Basic Internet Skills
  - What is internet
  - Applications of internet
  - Understanding Browser (Features and constituent)
  - Efficient use of Search Engine
  - Awareness about Digital India portals
- Introduction to Computer
  - Hardware, Software (Input/output devices)
  - Working principle of CPU
  - Memory (Primary & Secondary)
  - Monitor (CRT, LCD, LED)
  - Peripheral Devices

BASIC INTERNET SKILLS

- Globe is on your finger tip
  - Access the digital information & services
  - using the devices like computers, mobiles and such other gadgets and network device.
- Skills required to access various application of the internet are commonly termed as “Internet Skill”.

What is Internet?

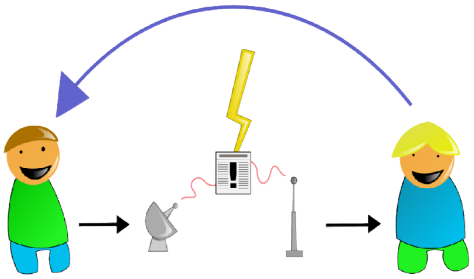
- Internet is a collection of
  - various interconnected networks
  - of heterogeneous types
  - across the globe.
- Comprising of
  - different kinds of devices, specifications for h/w & s/w to be connected in a global n/w and a variety of protocols
  - with a common understanding between various countries, universities, companies and global agencies.
- It is also referred as a “Network of Networks”.
- Purpose: Share resources over global network.
- It is a global networking over physical cables like traditional POTS (plain old telephone system), TV cables, fiber optic cables and even wireless medium like Wi-fi, 3G/4G or satellite communication.

Common Application of the Internet

- Communication
  - VoIP : Voice over the Internet Protocol
- E-Commerce
- Storage and file Transfer
- Live streaming and podcasts
- News, Entertainment
- Collaborative Tasks
- Research and Learning activities
- Interactive gamming
- Social Networking
- Job hunting
- Navigation & Tracking

Communication

- Elements of Communication
  - Sender
  - Receiver
  - Channel/Media
  - Message
  - Protocol



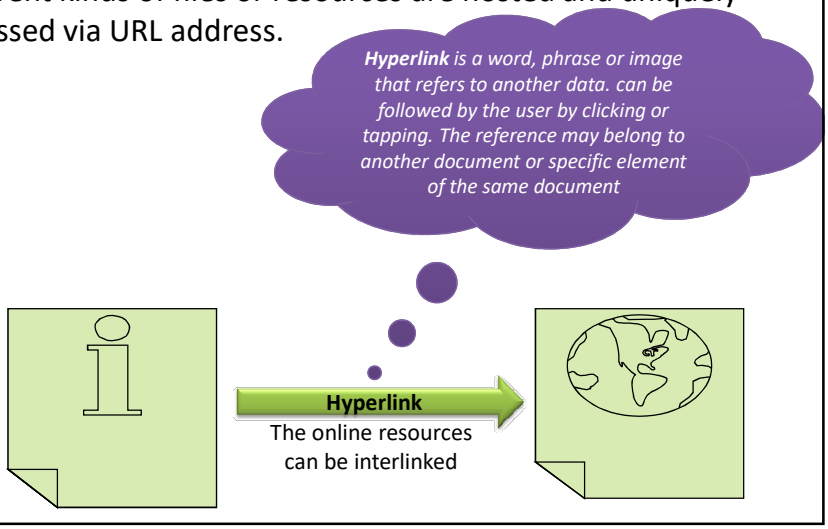
Few Commonly used terms for internet basics

- **Protocol :** Protocol is the set of rules that govern data communication.
  - HTTP, FTP, TCP, IP etc.
- **HTTP:** Hypertext Transfer Protocol defines the way *how data transfer over the web*. It is used to access website.
- **FTP:** File Transfer Protocol defines the way *how files (often large) transfer from one host to another* over the network.
- **TCP/IP**: Transmission Control Protocol and Internet Protocol are set of rules that govern the *linking of a computer system to the internet* and similar computer networks.

HTTPS is the secure version of HTTP using SSL (secure socket layer) encryption.

Few Commonly used terms for internet basics

- **WWW**: (World Wide Web) It is an information system where different kinds of files or resources are hosted and uniquely accessed via URL address.

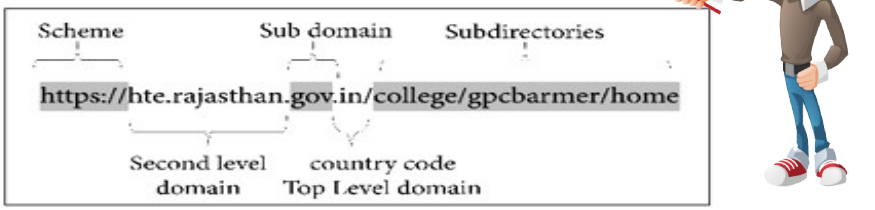


Few Commonly used terms for internet basics

- **Domain Name**: It is a human understandable unique name on the internet to identify a computer system resources.
  - Ex: .com, .org, .gov
- **DNS:** The domain name system translates human understandable domain name (for example, www. ncs.gov.in) to machine readable IP address (for example, 203.129.202.69)
- **ISP**: An Internet Service Provider is a company that provides internet access to other companies or individuals.

Few Commonly used terms for internet basics

- **URL** (uniform resource Locator) or web address :
  - It is a unique identifier of a web resource.
  - with specification of *how to access* and *where to access*.



Few Commonly used terms for internet basics

- **Email:** Electronic Mail is a method of exchanging digital messages from one electronic device to another device or to many recipients via a network.
- **Podcas**t: It is a web resource available on the internet that contains audio information.
- **Filetype**: Every information available on the internet have a certain format and type which is understood by their file type. Information can be in form of documents, audio, video, etc.

Few Commonly used terms for internet basics

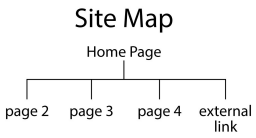
- **Download:** It is the process of copying data over the internet from one device to another in direction of a server to a client machine.
- **Upload:** It is also the process of transferring data from one device to another on the internet but from client to server-side.

Few Commonly used terms for internet basics

- **Modem:** It is the short name for hardware device modulator-demodulator. It is responsible to convert the digital data of a computer system to an analog signal which can travel over telephone lines (modulator) and vice-versa.
- **Network equipment**: These are networking hardware required for the interconnection and communication in a computer network e.g., bridge, repeater, hub, switch, router, modem, etc.
- **Cloud Computing**: It provides computer resources over the internet as per the demand of the user. Resources can be computer infrastructure, computing power or data storage, etc.

Few Commonly used terms for internet basics

- **Browser:** It is an application program with a user interface to display and navigate webpages over WWW.
- **Search Engine**: It is a web-based complex software that provides information searching services to its users. The search engine uses various algorithms to search its huge database and produce appropriate search results taking minimal time.
- **Webpage:** It is a hypertext document designed to view on the web browser (*A single page of the website*).
- **Website:** It is a collection of web pages and related resources that is identified by a common domain name and hosted (published) on a web server.



Browser

- A browser is
  - a client-side application program
  - to search and retrieve information from the web, available in the form of web pages and
  - display it on the client's machine.
  - It is also termed as "web browser" or "user agent".

UNDERSTANDING A BROWSER

- Services & information provided by the internet follows the client-server model.
- When a client machine seeks some service,
  - it forms a request message (HTTP Request) and sends it via a client-side program to network towards the server machine.
  - On the other side, when a request approaches the server machine it grants or denies the requested service in form of the response message (HTTP Response).

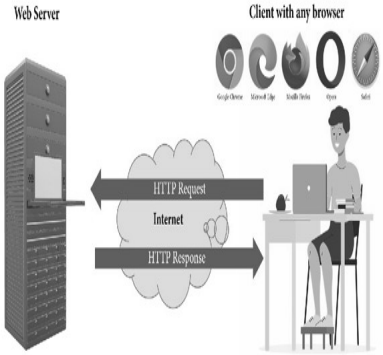


Fig.1.2: HTTP Request and Response

Google Chrome

- It is the most widely used web browser developed by Google.
- It is cross-platform web browser that was first released in 2008 for the windows operating system of Microsoft.
- This browser in now proprietary freeware based on Google's free and open source software project "chromium".
- It is widely used due to its speed & security capabilities.
- It is constantly updating and keeps us safe from phishing and malware scams.
- Web store keeps chrome customizable via its various themes, extension and web apps.
- It can translate a website in different language.

Microsoft Edge

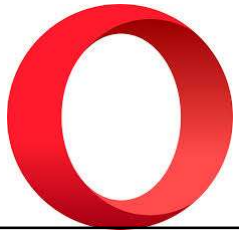
- It is developed by Microsoft and was firstly released in 2015 for its proprietary operating system windows 10.
- It is the successor of the Internet explorer web browser of the Microsoft family.
- It is also integrated with Microsoft's online platforms for providing voice control, searching functionality and dynamic content related to search inside the address bar.

Mozilla Firefox

- It is free and open-source browser developed by Mozilla Foundation and its subsidiary Mozilla corporation. It was initially released in September 2002 .
- In comparison to other browsers, Firefox provides an extensive library of extension & add-ons to its users for customizing their browser experiences & functionality.

Opera

- It is a multi-platform browser developed by Opera software.
- It was initially released in April 1995. it is also available for mobile devices and these mobile versions are known as opera mini 7 opera mobile.
- With its artificial Intelligence (AI) based platform opera browser supports a personalized news feed at the start page.
- It also supports sharing files, links and notes between user's different devices with the opera flow feature.



Safari

- This browser was developed by Apple Inc. and it is not a complete open-source browser.
- It was initially released on January 2003 as a part of MAC operating system.
- It is considered as faster browser with considerable high privacy features.
- Safari also implemented feature of cross site tracking.
- It natively supports web page translation and picture in picture functionality.

Market Share of Trending web browser

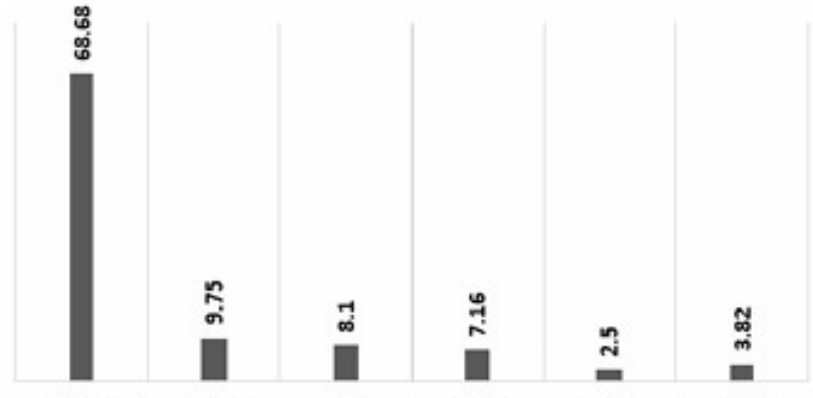


Fig. 1.3: Web Browser Market Share Percentage

Elements of a Chrome Browser Window

- Just click on the icon available at your desktop home screen or on to bottom bar (Taskbar) of your screen: launch the web browser.
- Input the URL on the address bar. Ex: https://uidai.gov.in/en/
- Title of the web page is displayed on the title bar.
- Navigation buttons include, back, forward and refresh button.
- Chrome web browser's address bar area is utilized for entering URL, search items, bookmarking, browsing history and site information (paddle lock, security status etc.) thus known as OmniBox.

Elements of Chrome

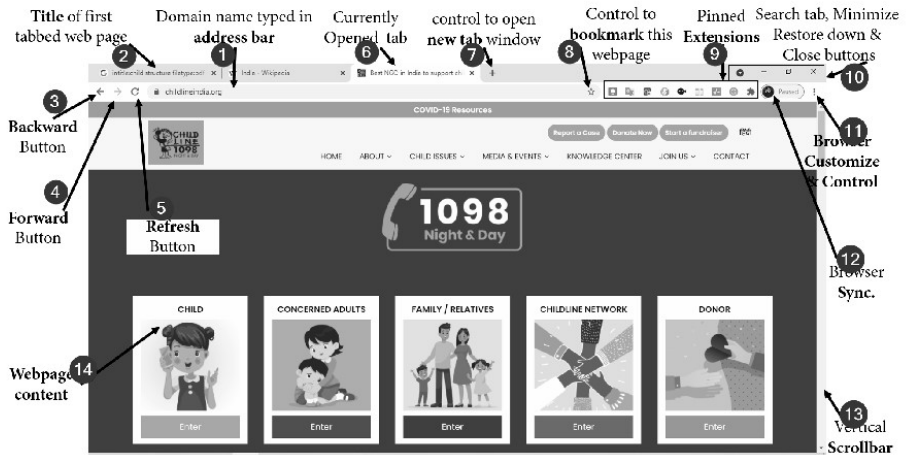


Fig. 1.4: Elements of Chrome Web Browser

Elements of Chrome

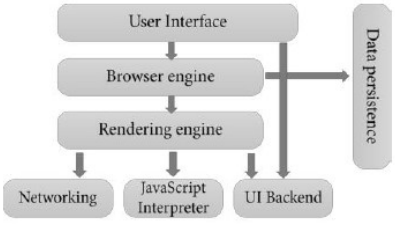
- Hyperlinks on same tab or new tab.
- Tabbed browsing : use + button
- Bookmarking
- Extensions and add-ons
- Minimize, maximize (restore) and close tabs.
- Synchronize different user settings across devices.
- Browser customize and control (three dots).
- Right click on the web page to get many other functionalities.
- QR code generation by right click.

Common Browser Features

- Bookmarking
- Download management
- Password Management
- Tabbed Browsing
- Browser history
- Form Management
- Spell Checking
- Privacy Mode
- Auto update
- Ad Blocking
- Incremental Search
- Page zooming

Constituent of web browser

- User Interface
- Browser Engine
- Rendering Engine
- Networking
- JS Interpreter
- UI Backend
- Data Storage and Persistence



Some Popular Search Engine

Search Engine

Google
- developed by Larry page and Sergey Brin in 1996.
- Initially known as BackRub
- Written in C, C++, Python

Microsoft Bing
- Owned and Maintained by Microsoft and Launched in 2009
- Successor of previous search engines of Microsoft e.g., MSN Search & Windows Live Search
- Written in ASP.NET

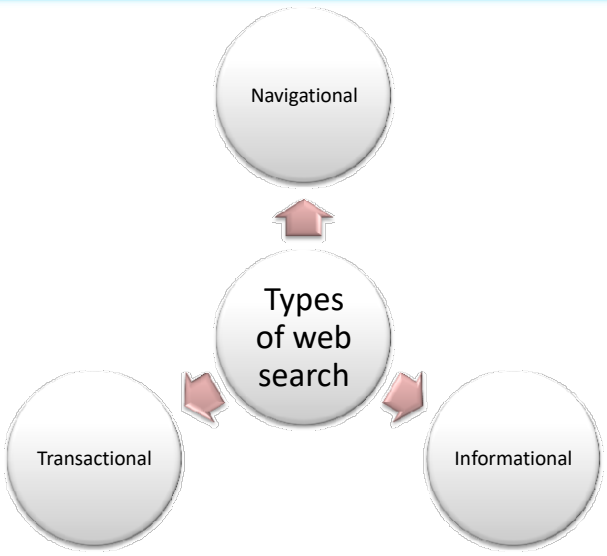
Yahoo
- Oldest search engine.
- Found by Jerry Yang and David Filo in Jan-94 as "Jerry and David's guide to the World Wide Web"
- Written in PHP

Baidu
- It is among the top performer in market share. Holds 72% of the Chinese search Engine Market as of June 2021.
- Owned by Chinese Company Baidu. Inc., one of the largest AI & internet company.
- Incorporated in Jan 2000 by Robin Li & Eric Xu.

Yandex
- Prevalently used in Russia and was launched in Sep 1997.
- Owned by Yandex N.V., a Russian-Dutch domiciled multinational.

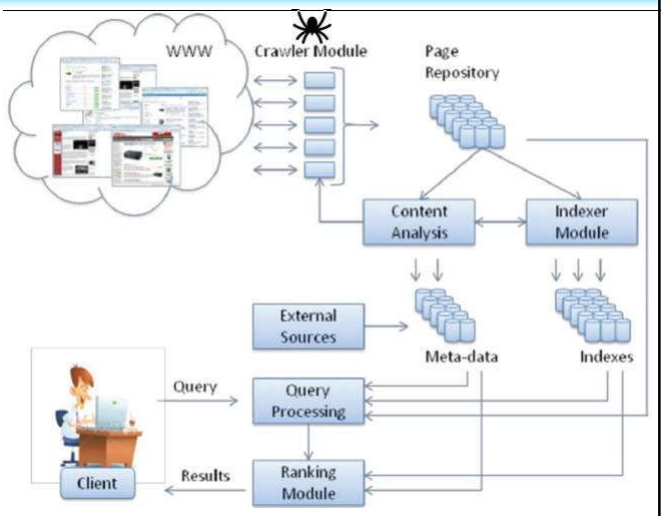
DuckDuckGo (ddg)
- Created by Gabriel Weinberg and owned by Duck Duck Go Inc. Launched in Sep 2008 and written in Perl, Java Script and Python.
- It respect the privacy of the users and displays the same search results to its all users for a given search query. It is against the online tracking of user's data.

Types of Web Search



How do search engine work

- Crawling
- Indexing
- Ranking



Google Search Symbols, Operators & Commands

Operator	Description	Example
	Informational Search Queries	
define	Returns a definition of the given term.	define tolerance
time	Returns the current time at a particular location.	time Australia
to	Convert measurements from one unit to another.	12 inches to feet
in	Convert measurements from one unit to another.	650 EURO in INR
translate	Translates the queried terms into another specified language.	translate hello world german
map	Returns map result by giving map followed by location.	map andhrapradesh
stocks	Returns stock information of given company name.	stock wipro
weather	Returns the weather forecast for the given location or ZIP code.	weather bodhgaya or 824231

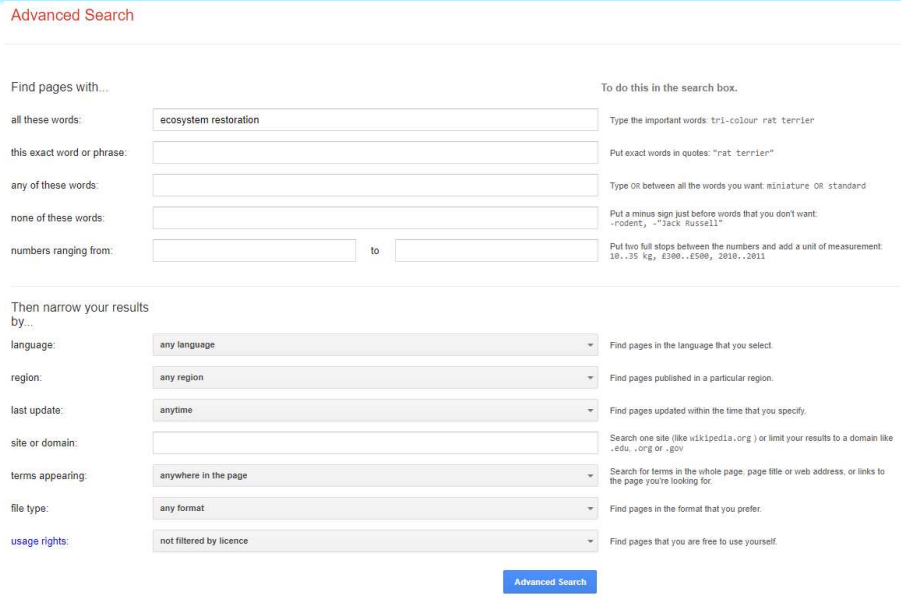
Google Search Symbols, Operators & Commands

Basic Search Symbols		
-	Excludes search results that include this term.	best tablets -drawing
|	Returns search results that match terms on either side of the pipe. The same as writing "OR" between search terms.	computer | tablet
@	Returns search results that match a particular social media site.	aicte @facebook
#	Returns search results that include a specific hashtag.	#largestvaccinedrive
""	Returns search results that include all terms within quotes in the **exact** given order.	"Gods own country"
*	Returns search results where **any** words can be matched in place of the asterisk.	best * in Haryana
..	When placed between two numbers, returns search results that match within the number **range**.	computer 30k..40k inr
()	Used to **group search** terms and control the search logic of the query.	(lata | mukesh) songs lyrics

Google Search Symbols, Operators & Commands

Most Popular Search Operators		
cache:	Show Google's cached version of a specific page.	cache:makeuseof.com
filetype:	Returns only search results that match a particular file extension.	"ITSystems"filetype:ppt
related:	Returns other websites that are similar to the queried website.	related:nytimes.com
site:	Returns only search results from a particular website.	Parenting site:https://www.unicef.org/india/
Other Search Operators		
inanchor:	Returns pages that are linked to using anchor text matching the search query.	inanchor:mental wellbeing
allinanchor:	Same as inanchor, but matching every term that appears after allinanchor.	inanchor:mental wellbeinghindi
intext:	Returns only search results that match in the page's body.	intext:no tobacco day
intitle:	Returns only search results that match in the page's title.	intitle:india tourism
inurl:	Returns only search results that match in the page's URL.	inurl:indiaculture

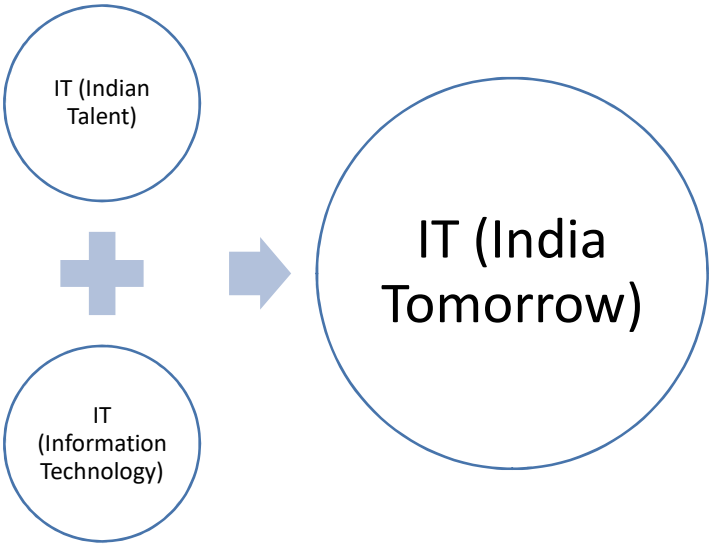
Google Advanced Search



Awareness about Digital India portals

- GoI has developed many portals and IT based infra. to empower its Citizens.
- Those portals in which services and information are presented and updated by the Central Govt. and whose aim is nationwide are called National Portals. E.g., *india.gov.in* or *mygov.in*.
- The portals to support and implement the digital India program are known as Digital India portal.

Digital India Portal



Pillars of Digital India Program

Digital India Portals (Infra)

Digital India Initiative		Website	Description
AADHAAR	AADHAAR	https://uidai.gov.in	The largest biometrics based identification system in the world for effective service delivery to citizens.
	COE-IT	http://www.coe-iot.in	Center for excellence for Internet of Things to build industry capable talent, start-up community and an entrepreneurial ecosystem for IOT
certin	CERT-IN	http://www.cert-in.org.in	Computer emergency response team-India
CSC	CSCS	https://csc.gov.in/	Common service centers portal
साइबर स्वच्छता केन्द्र	CYBER SWACHHTA KENDRA	http://www.cyberswachhtakendra.gov.in/	India initiative to create a secure cyber space by detecting botnet infections
DigiLocker	DIGILOCKER	https://digilocker.gov.in/	It's a secure cloud based platform for issuance, sharing and verification of critical lifelong documents.

Digital India Portals (Infra)

	(DISHA)	http://www.ndlm.in/	Digital Saksharta Abhiyan or National Digital Literacy Mission to impart IT training
Digitize India Platform	DIGITIZE INDIA PLATFORM	https://digitizeindia.gov.in/	Programme to provide digitization services for scanned document images
	DBT	https://dbtbharat.gov.in/	Direct benefit transfer aim to reform government delivery system
eSign	ESIGN	http://cca.gov.in/	An online electronic signature service
ESSO	ESSO-INCOIS	http://www.incois.gov.in/portal/index.jsp	to provide the best possible ocean information and advisory services
GeM	GOVT. E-MARKETPLACE	https://gem.gov.in/	It is single window solution for online procurement of common use Goods & Services required by various Government Departments / Organizations / PSUs
	IRCTC CONNECT	https://www.irctc.co.in/	Next generation e-ticketing system to facilitates search and book train tickets, check reservations or cancel them, and get upcoming journey alerts

Digital India Portals (Infra)

	JEEVAN PRAMAAN	https://jeevanpramaan.gov.in/	A biometric enabled digital service for pensioners to streamline the process of issuing life certificate
	MEGHRAJ	https://cloud.gov.in/index.php	Cloud Computing initiative to accelerate delivery of e-services in the country
	MOBILE SEVA APP STORE	https://apps.mgov.gov.in	To facilitate the process of development and deployment of suitable mobile applications
	NSM	https://nsmindia.in	National Super Computing Mission to empower the national academic and R&D institutions, spread across the country
	OPEN DATA	https://data.gov.in/	To publish datasets, documents, services, tools and applications for public use
	RAS	http://ras.gov.in/	Rapid Assessment System for continuous feedback for e-services delivered by Government of India and State Governments
	SWIFT	https://www.icegate.gov.in/SWIFT/	Single window interface for trade- a Project to facilitate the Trading Across Borders in India

Digital India Portals (Service Based)

Digital India Initiative		Website	Description
	SUGAMYA BHARATI ABHIYAAN & Mob App	http://accessibleindia.gov.in/content/	A crowd sourcing platform to comprehensively obtain information on inaccessible places across the country
	BHIM	http://www.bhimupi.org.in/ or App from google play store	An app that makes payment transactions simple, easy and quick using Unified Payments Interface (UPI)
	DIGITAL AIIMS	http://ehospital.nic.in/ehospital/	The Unique Health Identification Number gave every Patient visiting AIIMS a Digital Identity
	E-PANCHAYAT	http://epanchayat.in/	To provide comprehensive software solution attempting automation of Gram Panchayat functions

Digital India Portals (Service Based)

	EGREETINGS	https://egreetings.gov.in/	Aims to promote a contemporary and eco-friendly method of sharing greetings
	E-HOSPITAL	http://ehospital.nic.in/ehospital/	A Hospital Management Information System (HMIS) for internal workflows and processes of hospitals
	ENAM	http://www.enam.gov.in/NAM/home/index.html	A pan-India electronic trading portal to create a unified national market for agricultural commodities
	E-PATHSHALA	http://epathshala.nic.in/	Provide e-resources including textbooks, audio, video, periodicals and a variety of other print and non-print materials through website and mobile app
	ESAMPARK	https://sampark.gov.in	A mechanism to connect the government directly with citizens across India by running mailer, outbound dialing and SMS campaigns
	GSTN	http://www.gstn.org/index.php	Goods and service tax network is a uniform interface for the tax payer and a common and shared IT infrastructure between the Centre and States
	KHOYA PAYA	http://khoyapaya.gov.in/mpp/home	A citizen-based website to exchange information on missing and found children

Digital India Portals (Service Based)

	KISAN SUVIDHA	http://www.kisaansuvidha.com/	An mobile app developed to help farmers get relevant information instantly
	MRAKTKOSH	http://www.eraktkosh.in/	The web-based mechanism interconnects all the Blood Banks of the State into a single network
	NCS	https://www.ncs.gov.in/	National Career Service portal facilitates registration of job seekers, job providers, skill providers, career counsellors,, etc.
	NVSP	http://www.nvsp.in/	Services such as access the electoral list, apply for voter id card, apply online for corrections in voter's card, view details of Polling booth, Booth Level officer, Electoral Registration Officer, etc.

Digital India Portals (Service Based)

	PASSPORT SEVA PROJECT	http://www.passportindia.gov.in/	Enables simple, efficient and transparent processes for delivery of passport and related services
	SHAALA DARPAN	https://darpan.kvs.gov.in/shaala darpan/	An e-Governance platform for all Kendriya Vidyalayas in the country
	SOIL HEALTH CARD	http://www.soilhealth.dac.gov.in/	Aims at promoting Integrated Nutrient Management
	SWAYAM	https://swayam.gov.in	Aim to achieve access, equity and quality for education by best teaching learning resources and online MOOCS courses to all.
	UMANG	https://umang.gov.in App from google play store	Unified Mobile Application for New-Age Governance- a mobile app to facilitate a single point of access to all government services
	UTS APP	https://www.utsonmobile.indianrail.gov.in/RDS/	Enables booking unreserved paperless journey ticket, issue/renew season ticket and platform ticket

Digital India Portals (Empowerment)

Digital India Initiative		Website	Description
	AEPS	https://www.npci.org.in/	It is a payment service empowering a bank customer to use Aadhaar as his/her identity.
	BPO SCHEME	https://ibps.stpi.in/	Seeks to incentivize establishment of 48,300 seats in respect of BPO/ITES operations across the country.
	MYGOV	https://mygov.in	A unique first-of-its-kind participatory governance initiative involving the common citizen at large.
	NMEICT	http://www.nmeict.ac.in	Scheme to leverage the potential of ICT, in teaching and learning process for the benefit of all the learners in Higher Education Institutions

Digital India Portals (Empowerment)

	PMGDISHA	https://www.pmgdisha.in/	Scheme to make six crore persons in rural areas, across States/uts, digitally literate, by covering one member from every eligible household
	PMKVY	http://www.pmkvyofficial.org/	To enable a large number of Indian youth to take up industry-relevant skill training that will help them in securing a better livelihood
	SMART CITIES	http://smartcities.gov.in/content/	Provide updated information about smart cities projects and related processes.

Interesting Facts

- Aadhar Enabled Banking Transactions are growing continuously. In May 2021, Approx. 24,197 Crore Rupees transaction took place. New India is going digitally.
- As of July 2021, DIGILocker has 66.87 Million registered users and issued 4.32 Billion authenticated documents.

State Portal

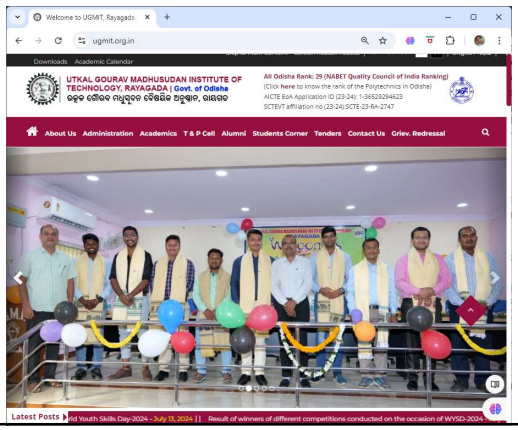
- The State Govt. performs tasks like dissemination of information, applications for various Govt. schemes & displaying their current status, feedback & disposal of grievances of departments etc.
- State portal is the nodal source of information of a particular state.

Features of State Portals

- Useful to provide single point information access to schemes and services of concerned departments like health, agriculture etc. of the particular state.
- Maintain transparency of information to reduce corruption.
- Part of e-Governance & reduces paperwork and time to disseminate information.
- Make Govt. departments more accountable as they know they are continuously monitored.

College Portal

- Open any web browser
  - Enter URL : www.ugmit.org.in or
  - Open any search engine and search 'UGMIT, Rayagada'



How to navigate any portal?

- If URL is known,
  - Open any web browser and enter its URL on the address bar.
- If the URL is unknown,
  - then open any web browser, open a search engine, then enter the search term.
  - Follow the desired hyperlink.

Introduction to Computer

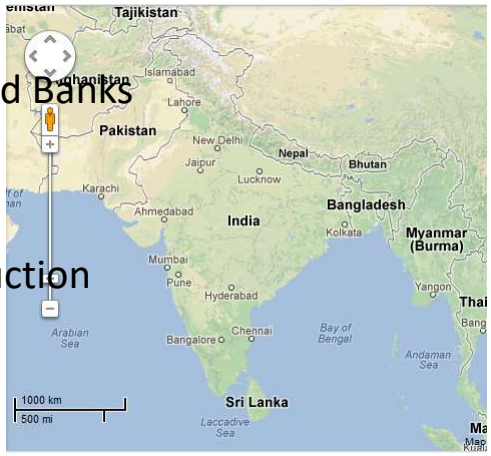
- **Definition**: Computer is an electronic data processing device which is used to read and write, compute and compare, store and process, large amount of data with high speed, accuracy and reliability.

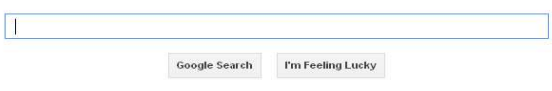
Data Processing

- The activity of processing data using a computer is called *data processing*
- *Data: raw material used as input*
- *Information:* processed data obtained as output.

Need

- Education
- Commercial Offices and Banks
- Scientific Researches
- Military Services
- Engineering and Production
- Publication
- Hospitals





Characteristics

- High Speed: Computer can perform data processing jobs very fast, usually measured in **microseconds (10^{-6}), nanoseconds (10^{-9}), and picoseconds (10^{-12})**
- Accuracy: Accuracy of a computer is consistently high and the degree of its accuracy depends upon its design. Computer errors caused due to incorrect input data or unreliable programs are often referred to as *Garbage- In-Garbage-Out (GIGO)*

Characteristics

- Storage Capability: Computer can store and recall any amount of information because of its secondary storage capability. It forgets or looses certain information only when it is asked to do so.
- Diligence: Computer is free from monotony, tiredness, and lack of concentration. It can continuously work for hours without creating any error and without grumbling
- Versatility: Computer is capable of performing almost any task, if the task can be reduced to a finite series of logical steps

Characteristics

- Reliability
- Automation
- Reduction in Paper Work
- Reduction in Cost

Disadvantages

- No I.Q. : A computer does only what it is programmed to do. It cannot take its own *decision in this regard*
- No Feeling : Computers are devoid of emotions. Their judgement is based on the instructions given to them in the form of programs that are written by us (human beings)
- Dependency
- Environment

Evolution of Computers

- Blaise Pascal invented the first *mechanical adding machine in 1642*
- Baron Gottfried Wilhelm von Leibniz invented the first *calculator for multiplication in 1671*
- *Keyboard machines originated in the United States* around 1880
- Around 1880, Herman Hollerith came up with the concept of *punched cards that were extensively used as input* media until late 1970s

Evolution of Computer

- Charles Babbage:
  - father of modern digital computers
  - He designed "Difference Engine" in 1822
  - He designed a *fully automatic analytical engine in* 1842 for performing basic arithmetic functions
  - His efforts established a number of principles that are fundamental to the design of any digital computer

Evolution of Computer

- COBOL: The first known computer language (1953)
- Jack Kilby and Robert Noyce: IC (1958), Noble Prize in Physics (2000)

Some well known early computers

- The Mark I Computer (1937-44)
- The Atanasoff-Berry Computer (1939-42)
- The ENIAC (1943-46) : (Electronic Numerical Integrator and Calculator): Grand father of digital computers
- The EDVAC (1946-52)
- The EDSAC (1947-49)
- Manchester Mark I (1948)
- The UNIVAC I (1951) : The first commercial computer for business and govt.

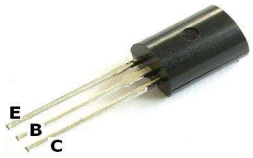
Generation of Computers

- The history of computer development is often referred to in reference to the different generations of computers.
- Each generation of computer is characterized by a major technological development that fundamentally changed the way computers operate.

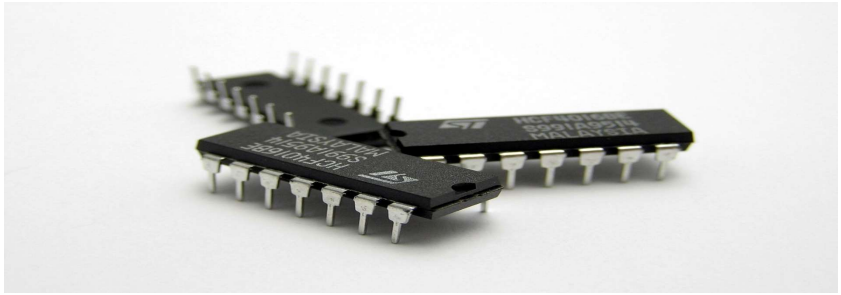
First Generation	
Vacuum Tubes	Bulky in size
Second Generation	
Transistors	High Power consumption
Third Generation	
ICs	SSI & MSI Technology
Fourth Generation	
ICs	VLSI Technology
Fifth Generation	
AI & ULSI Technology	Continuing

Components Used

(Vacuum tube)



(Transistor)



(ICs)

Computer Generations

Generation (Period)	Key hardware technologies	Key software technologies	Key characteristics	Some representative systems
First (1942-1955)	▪ Vacuum tubes ▪ Electromagnetic relay memory ▪ Punched cards secondary storage	▪ Machine and assembly languages ▪ Stored program concept ▪ Mostly scientific applications	▪ Bulky in size ▪ Highly unreliable ▪ Limited commercial use and costly ▪ Difficult commercial production ▪ Difficult to use	▪ ENIAC ▪ EDVAC ▪ EDSAC ▪ UNIVAC I ▪ IBM 701
Second (1955-1964)	▪ Transistors ▪ Magnetic cores memory ▪ Magnetic tapes ▪ Disks for secondary storage	▪ Batch operating system ▪ High-level programming languages ▪ Scientific and commercial applications	▪ Faster, smaller, more reliable and easier to program than previous generation systems ▪ Commercial production was still difficult and costly	▪ Honeywell 400 ▪ IBM 7030 ▪ CDC 1604 ▪ UNIVAC LARC

Computer Generations

Generation (Period)	Key hardware technologies	Key software technologies	Key characteristics	Some rep. systems
Third (1964-1975)	▪ ICs with SSI and MSI technologies ▪ Larger magnetic cores memory ▪ Larger capacity disks and magnetic tapes secondary storage ▪ Minicomputers; upward compatible family of computers	▪ Timesharing operating system ▪ Standardization of high-level programming languages ▪ Unbundling of software from hardware	▪ Faster, smaller, more reliable, easier and cheaper to produce ▪ Commercially, easier to use, and easier to upgrade than previous generation systems ▪ Scientific, commercial and interactive on-line applications	▪ IBM 360/370 ▪ PDP-8 ▪ PDP-11 ▪ CDC 6600

Computer Generations

Generation (Period)	Key hardware Technologies	Key software technologies	Key characteristics	Some rep. systems
Fourth (1975-1989)	▪ ICs with VLSI technology ▪ Microprocessors; semiconductor memory ▪ Larger capacity hard disks as in-built secondary storage ▪ Magnetic tapes and floppy disks as portable storage media ▪ Personal computers ▪ Supercomputers based on parallel vector processing and symmetric multiprocessing technologies ▪ Spread of high-speed computer networks	▪ Operating systems for PCs with GUI and multiple windows on a single terminal screen ▪ Multiprocessing OS with concurrent programming languages ▪ UNIX operating system with C programming language ▪ Object-oriented design and programming ▪ PC, Network-based, and supercomputing applications	▪ Small, affordable, reliable, and easy to use PCs ▪ More powerful and reliable mainframe systems and supercomputers ▪ Totally general purpose machines ▪ Easier to produce commercially ▪ Easier to upgrade ▪ Rapid software development possible	▪ IBM PC and its clones ▪ Apple II ▪ TRS-80 ▪ VAX 9000 ▪ CRAY-1 ▪ CRAY-2 ▪ CRAY-X/MP

Computer Generations

Generation (Period)	Key hardware technologies	Key software technologies	Key characteristics	Some rep. systems
Fifth (1989-Present)	▪ ICs with ULSI technology ▪ Larger capacity main memory, hard disks with RAID support ▪ Optical disks as portable read-only storage media ▪ Notebooks, powerful desktop PCs and workstations ▪ Powerful servers, supercomputers ▪ Internet ▪ Cluster computing	▪ Micro-kernel based, multithreading, distributed OS ▪ Parallel programming libraries like MPI & PVM ▪ JAVA ▪ World Wide Web ▪ Multimedia, Internet applications ▪ More complex supercomputing applications	▪ Portable computers ▪ Powerful, cheaper, reliable, and easier to use desktop machines ▪ Powerful supercomputers ▪ High uptime due to hot-pluggable components ▪ Totally general purpose machines ▪ Easier to produce commercially, easier to upgrade ▪ Rapid software development possible	▪ IBM notebooks ▪ Pentium PCs ▪ SUN Workstations ▪ IBM SP/2 ▪ SGI Origin 2000 ▪ PARAM 10000

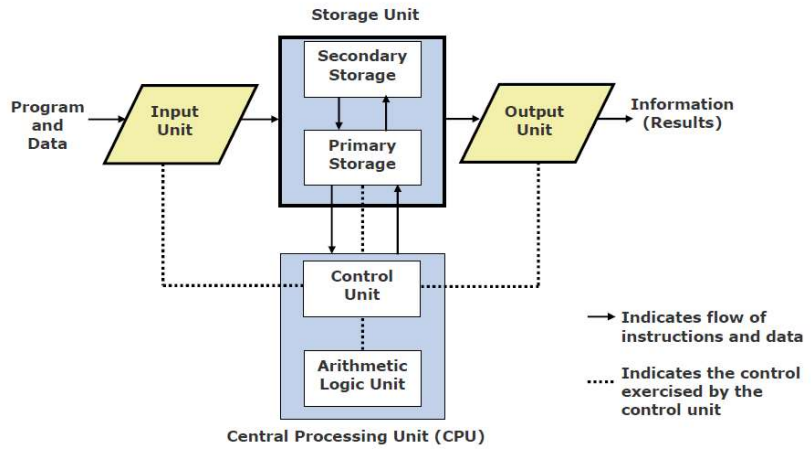
Basic Operations of a Computer

- **Inputting. The process of entering data and instructions** into the computer system
- **Storing. Saving data and instructions to make them** readily available for initial or additional processing whenever required
- **Processing. Performing arithmetic operations (add,** subtract, multiply, divide, etc.) or logical operations (comparisons like equal to, less than, greater than, etc.) on data to convert them into useful information

Basic Operations of a Computer

- **Outputting. The process of producing useful information** or results for the user such as a printed report or visual display
- **Controlling. Directing the manner and sequence in which** all of the above operations are performed

Basic Organisation of Computer (Functional Block diagram)



Input Unit

- Helps to accept data & read instructions from outside world.
- Input interface converts the user language to computer understandable form.

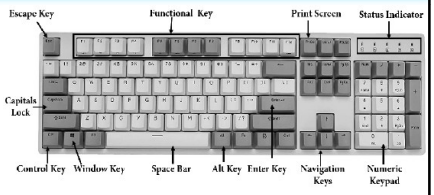
Input Devices

- Scanner
- Bar Code Reader
- Webcam
- Microphone
- Digital Camera
- Light Pen :
  - Light Sensitive device, made up of photocells and an optical system in a small tube.
  - It is mainly used to select items on the computer screen, for drawing pictures and writing directly on the computer screen.
- Joystick
- Graphic Tablet
- Stylus
- Touch Screen

Keyboards

- Primary input device.
- Wired/wireless.
- Types
  - QWERTY KB : for general purpose
  - Gaming KB : for game lovers
  - Virtual KB : for software inputting
  - Ergonomic KB : for physiological consideration
  - Multimedia KB : for convenient web surfing and music play

Keyboard (Cont…)



- Function Keys : F1 to F12
- Character Keys
  - A to Z
  - a to z
  - 0 to 9
  - Tabs, Caps etc.
- Modifier Keys : alt, shift, ctrl etc.
- Navigation Keys : ←, → , ↑,↓
- Numeric Keypad : 0 to 9, Num Lock, +, - etc.
- System Command Keys: PrtSc, Break/Pause, Esc, Enter, Windows, Space Bar, Backspace etc.

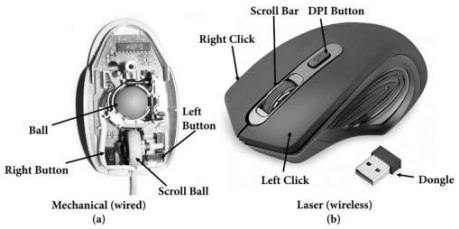
On most widely used QWERTY keyboard, the word 'Typewriter' is the longest word which can be typed by pressing letters of same row i.e., top row.

Mouse

- Handheld input device.
- Controls the pointer in GUI.
- Most widely used pointing device, and can move and select text, icons, files and folders.
- In a desktop computer the mouse is placed on a flat surface like mouse pad or desk.
- When we move the mouse with our palm in any direction, mouse will convert the palm's movement into an equivalent digital signal.
- The digital signal is used for moving the pointer on the computer screen.

Mouse (Cont…)

- Basic Operations.
  - Point
  - Click (Right Click, Left Click, Double Click)
  - Drag & Drop
  - Scroll
- Types
  - Mechanical mouse
  - Optical & Laser mouse



The first computer Mouse which was constructed in the year 1964 was made out of **wood and developed by** Doug Engelbart.

Output Unit

- Helps to accept the processed data from the system.
- Output interface converts the machine language to user understandable form.

Output Devices

- Projector
- Printer
- Speaker
- Braille Reader
- Plotter

Display

- CRT (Cathode Ray Tube)
- LCD (Liquid Crystal Display)
- LED (Light Emitting Diode)
- DLP (Digital Light Processing)
- Plasma Monitor
- Touch Screen Monitors

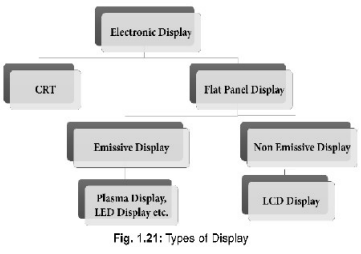
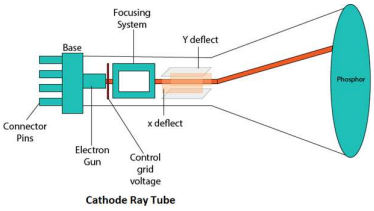
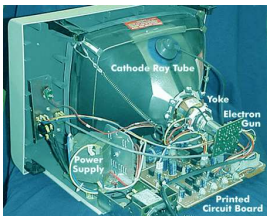


Fig. 1.21: Types of Display

CRT

- Oldest monitors using cathode ray tube.
- Employs CRT technology common for TV screens.
- CRT is a vacuum tube containing an electron gun at one end and a fluorescent screen at another end.
- Heavy and take large desk space.





LCD

- Flat screen display.
- Light weight, electricity savior, occupy less space
- Composed of two pieces of glasses with a thin layer of liquid crystals in between.
- When a voltage is applied, the orientation of liquid crystals will be changed, which is called polarization. This in turn make either dark or light area, creating a character or image.
- TFT monitor uses thin film transistor technology in an LCD. It is a variant of LCD monitors and is dominantly being used in current monitors.

LED

- LED monitors are flat panel display that make use of light emitting diodes for back lighting instead of cold cathode fluorescent (CCF), used in LCDs.
- Higher contrast, less negative environmental impact when disposed of.
- Mobile, TVs, monitors etc use LED.

DLP (Digital Light Processing) Monitors

- Developed by Texas Instruments.
- Used for presentations by projecting images from a monitor onto a big screen.
- It gives better quality pictures that can also be visible in a lit room normally.

Plasma Monitors

- It has a flat screen, and it has small fluorescent lights with color that are lit up to form images on the screen.
- They have very wide screen using very thin materials.

OLED (Organic Light Emitting Diode)

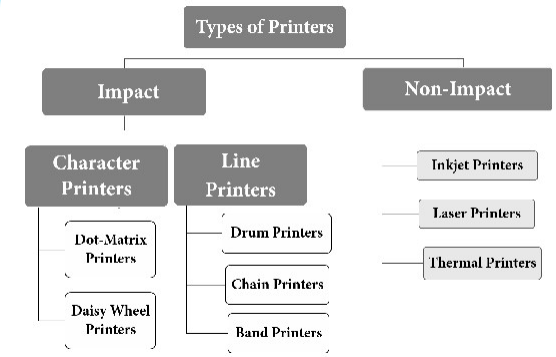
- Thinner and Lighter.
- Offers incredible contrast and color.
- It works without a backlight as it transmits visible light.
- Flexible and transparent displays are also possible using OLED.

Touch Screen Monitors

- These monitors perform both input and output functions.
- It enables the user to interact with the computer by using a finger or stylus instead of using a mouse or keyboard.
- When the user touch the screen, it occurs an event and forwards it to the controller for processing.
- It takes input from the user by touching menus or icons presented on the screen.

Printer

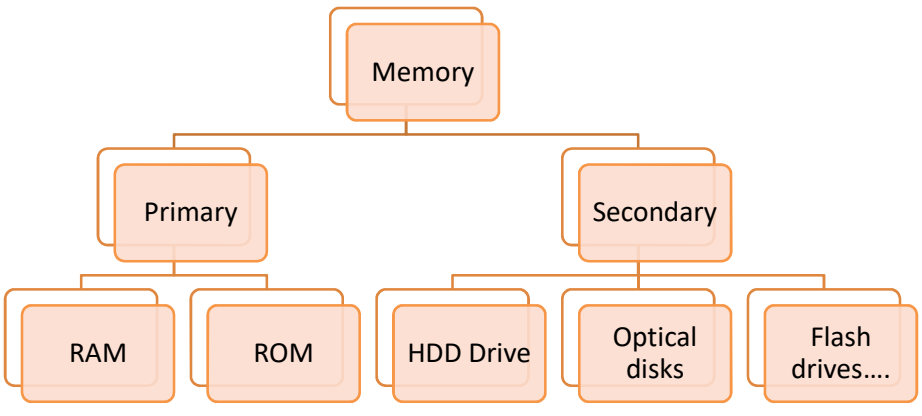
- Types
  - Impact
  - Non Impact



Storage Unit

- **The storage unit of a computer system holds (or stores) the following**
  - Data and instructions required for processing (received from input devices)
  - Intermediate results of processing
  - Final results of processing, before they are released to an output device

Classification of Memory

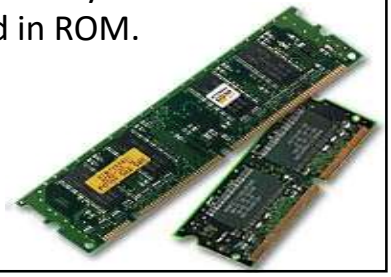


Two types of Memory

- Primary
  - Used to hold running program instructions
  - Used to hold data, intermediate results, and
  - results of ongoing processing of job(s)
  - Fast in operation
  - Small Capacity
  - Expensive
  - Volatile (looses data on power dissipation)
- Secondary
  - Used to hold stored program instructions
  - Used to hold data and information of stored jobs
  - Slower than primary storage
  - Large Capacity
  - Lot cheaper that primary storage
  - Retains data even without power

Primary Memory

- RAM (Random Access Memory)
  - Volatile Memory
  - Contents will be erased when the power is OFF.
- ROM (Read Only Memory)
  - Not a Volatile Memory
  - The System start-up programs and System date and time information will be stored in ROM.



Memory Capacity

- Memory capacity of a computer is equal to the number of bytes that can be stored in its primary storage
- Its units are:
  - Kilobytes (KB) : 1024 (2^{10}) bytes
  - Megabytes (MB) : 1,048,576 (2^{20}) bytes
  - Gigabytes (GB) : 1,073,741824 (2^{30}) bytes

Random Access Memory (RAM)

- Primary storage of a computer is often referred to as RAM because of its random access capability
- RAM chips are volatile memory
- A computer's motherboard is designed in a manner that the memory capacity can be enhanced by adding more memory chips
- The additional RAM chips, which plug into special sockets on the motherboard, are known as *single-in-line memory modules (SIMMs)*

Main Memory

- Every computer has a temporary storage built into the computer hardware
- It stores instructions and data of a program mainly when the program is being executed by the CPU.
- This temporary storage is known as main memory, primary storage, or simply *memory.*
- Physically, it consists of some chips either on the motherboard or on a small circuit board attached to the motherboard of a computer
- It has random access property.
- It is volatile.

Read Only Memory (ROM)

- ROM a non-volatile memory chip
- Data stored in a ROM can only be read and used
  - they cannot be changed
- ROMs are mainly used to store programs and data, which do not change and are frequently used. For example, system boot program

Types of ROMs

Type	Usage
Programmable ROM (PROM)	The user can load and store “read-only” programs and data in it
Erasable PROM (EPROM)	The user can erase information stored in it and the chip can be reprogrammed to store new Information
Ultra Violet EPROM (UVEPROM)	A type of EPROM chip in which the stored information is erased by exposing the chip for some time to ultra-violet light
Electrically EPROM (EEPROM) or Flash memory	A type of EPROM chip in which the stored information is erased by using high voltage electric pulses

Cache Memory

- It is commonly used for minimizing the memory processor speed mismatch.
- It is an extremely fast, small memory between CPU and main memory whose access time is closer to the processing speed of the CPU.
- It is used to temporarily store very active data and instructions during processing.
- *Cache is pronounced as “cash”*

Secondary Memory

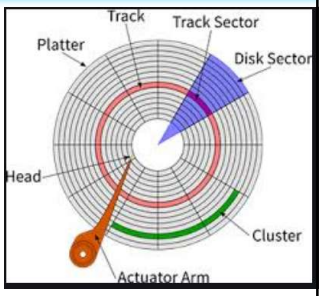
- Permanent Memory
- Contents will remain constant even though the power is OFF.

Hard Disk Drive (HDD)

- Secondary Memory
- Uses a disk and magnets to write data on the disk.
- Data can be read and write in random access manner.
  - User can store and retrieve data in any order.
- Cost per bit stored on the HDD is very less.
- Capable of storing more data than any other drive.
- Older HDD have some 100MB to GB, but newer HDD have GBs to TBs.

Components of HDD

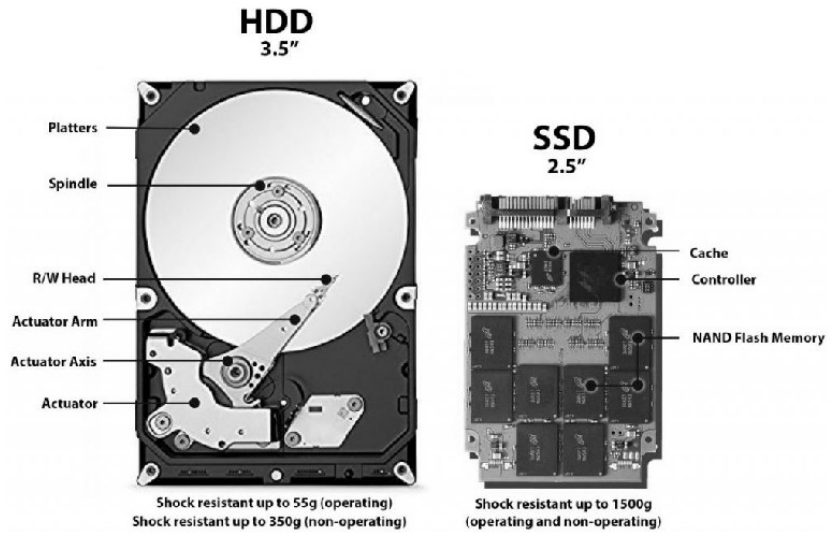
- Hard Disk
  - Platter :
    - Circular disks.
    - Store data in the form of 0s & 1s.
    - To increase the capacity, several Platter can be used .
    - Speed correlate with R/W rate.
  - R/W arm
    - Controls the R/W head.
    - Converts the magnetic surface into electric current.
  - Spindle motor
    - Place the platter in position and rotate as it requires.
  - Actuator
    - Control the movement of the R/W arm.
    - Transfer data to/from the platter.
    - Responsible for ensuring the exact position of the R/W arm.



SSD (Solid State Drive)

- SSDs are replacing HDDs now.
- SSDs are now configured as master drive for installing the OS and other software on it. HDDs are placed as secondary storage to store other files and folders.

Comparison Between HDD & SSD



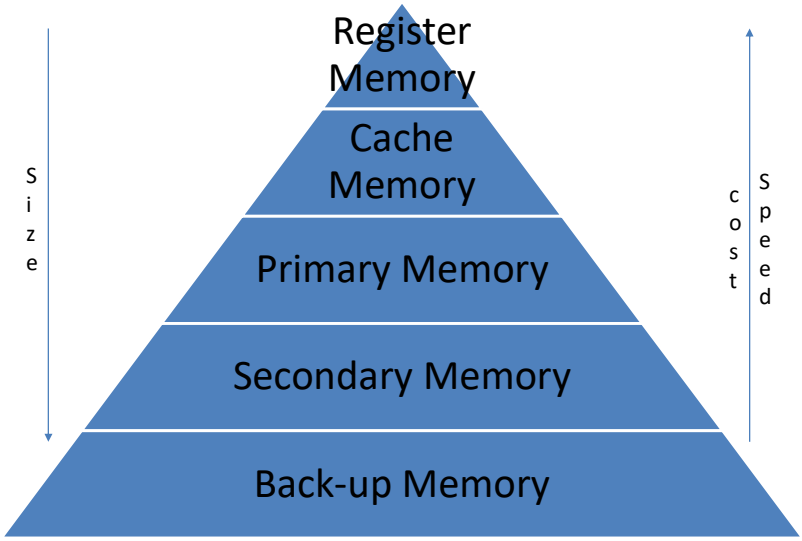
Comparison Between HDD & SSD

- Both are Hard Disk Drive
- SSD has high r/w performance for random and sequential data retrieve as compared to HDD.
- SSD are now popular in desktop and laptops as compared to HDD.
- SSD uses tacking chips in a grid whereas HDD uses magnetic properties to R/w data. HDD has a frequent mechanical breakdown as compared to SSD.
- SSD generate little to no noise as compared to HDD.

Some other terms used in Memory

- **Virtual Memory** : A part of Secondary storage used as temporary storage, when the main memory is not sufficient enough to hold the current program in execution.
- **Buffer**: It is the temporary memory in the input or output device which holds small amount of data (some KB) for small time interval.
- **Cache**: It is the memory available in CPU(processor) to load the program and execute in a faster manner.

Memory Hierarchy



Central Processing Unit

- ALU + CU = CPU
- It is the brain of a computer system.
- Performs all major calculations and comparisons
- It is responsible for activating and controlling the operations of all other units of a computer system.
- No other single component of a computer determines
- its overall performance as much as the CPU
- ALU: Arithmetic Logic Unit of a computer system is the place where the actual executions of instructions takes place during processing operation.
- CU: Control Unit of a computer system manages and coordinates the operations of all other components of the computer system.

Control Unit

- One of the two basic components of CPU
- Acts as the central nervous system of a computer system
- Selects and interprets program instructions, and coordinates execution
- Has some special purpose registers and a decoder to perform these activities

Arithmetic Logic Unit

- One of the two basic components of CPU.
- Actual execution of instructions takes place in ALU
- Has some special purpose registers
- Has necessary circuitry to carry out all the arithmetic and logic operations included in the CPU instruction set

Expansion Card

- Graphics Card
- Sound Card