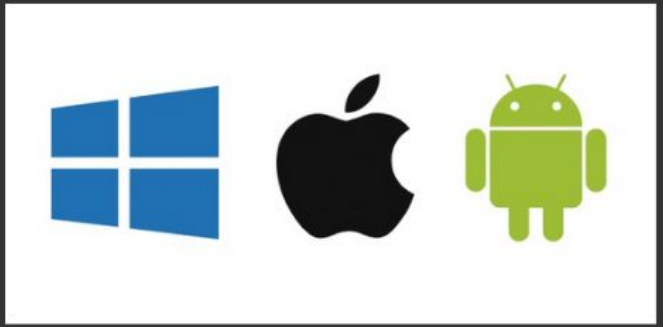
COMPUTER SYSTEM



CBSE
Crash Course

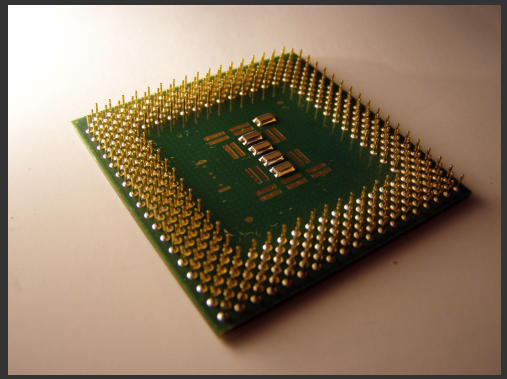
Components | Data and Information| Software | Operating System

What is a computer system?

- Computer System: A computer along with additional hardware and software together
- Components:
  1. CPU
  2. Input Devices
  3. Output Devices

Central Processing Unit (CPU)

- Processor
- Can be placed on one or more microchips
- Given instructions through a program
  - CPU fetches data through the memory and performs arithmetic and logic operations then stores back to memory
- Registers: A part of the CPU limited in size and number which is used to store data and instructions or intermediate results
- Arithmetic Logic Unit(ALU): Performs all the arithmetic and logic operations that need to be done as per instructions
- Control Unit(CU): Controls sequential instruction execution, interprets instructions and guides data flow through the memory
- CPU is also known as a microprocessor

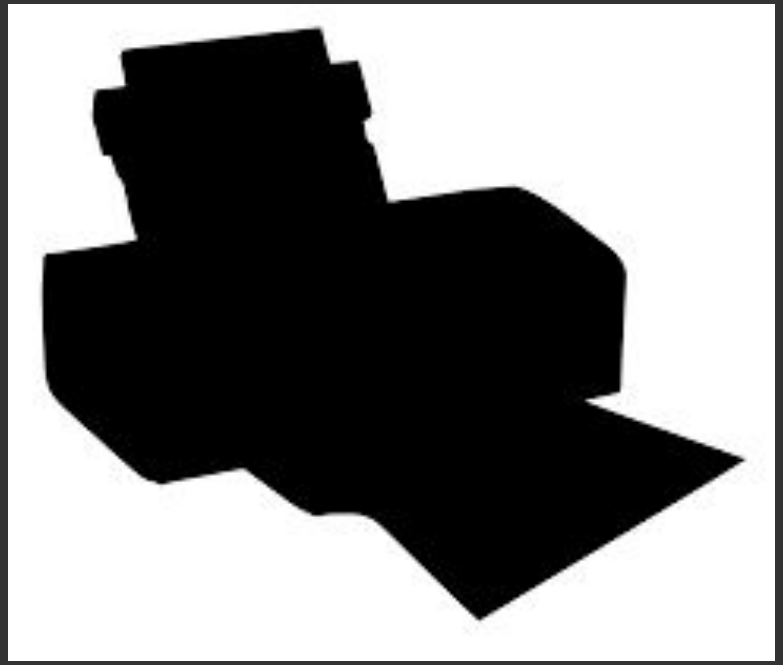


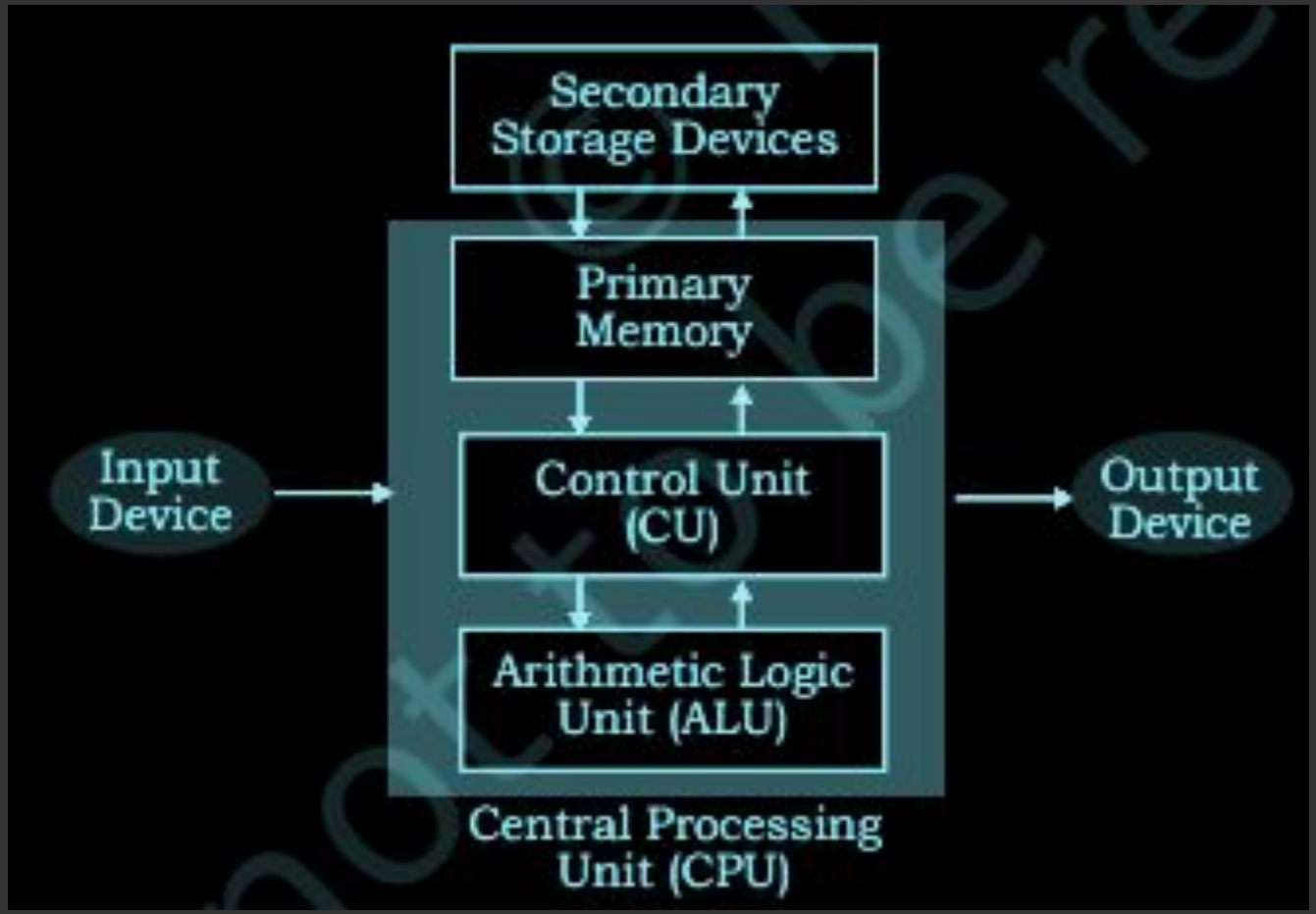
Input Devices

- The devices through which control signals are sent to a computer
- Convert input data to a digital form acceptable by the computer
- Data is temporarily stored in the main memory (RAM)
- For permanent storage and future use, data is stored in secondary memory
- Eg: keyboard, mouse

Output Devices

- The devices which receive data from a computer system for display, physical production, etc
- Eg: Printer, speakers, etc.





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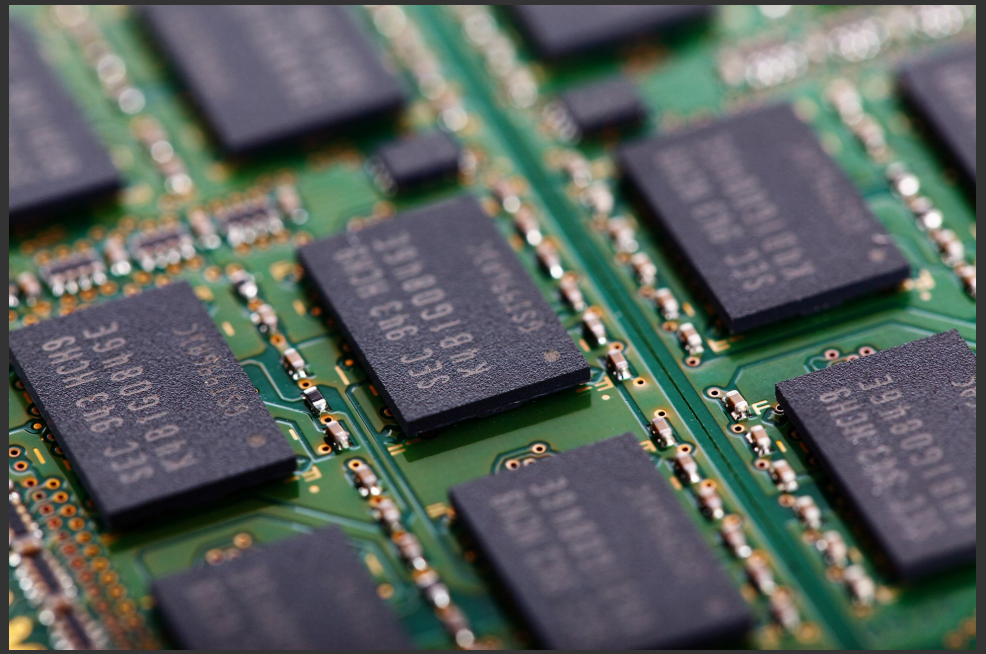
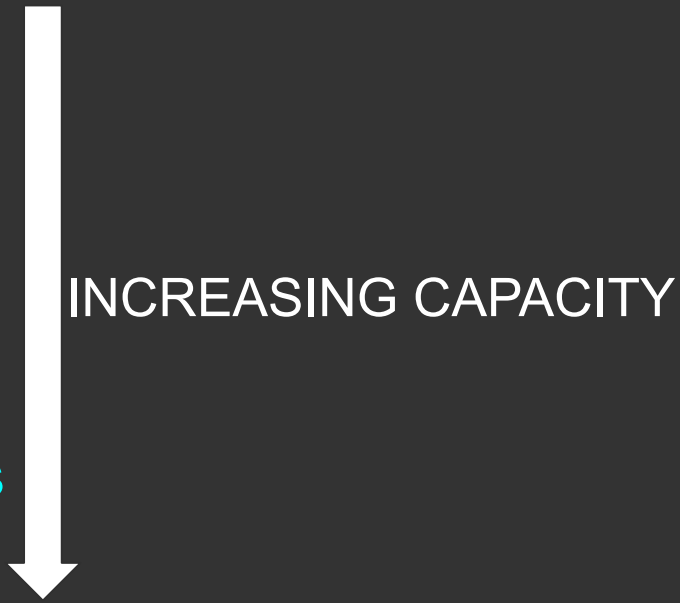
Computer Memory

- Units of data storage
- Types of memory:
  - Primary:
    - RAM
    - ROM
  - Cache
  - Secondary



Units of Data Storage

1. Bit: smallest unit - either 0 or 1
2. Nibble: 4 Bits
3. Byte: 8 Bits
4. Kilobyte: 2^{10} Bytes
5. Megabyte: 2^{20} Bytes= 2^{10} Kilobytes
6. Gigabyte: 2^{30} Bytes= 2^{10} Megabytes
7. Terabyte: 2^{40} Bytes= 2^{10} Gigabytes



Primary Memory

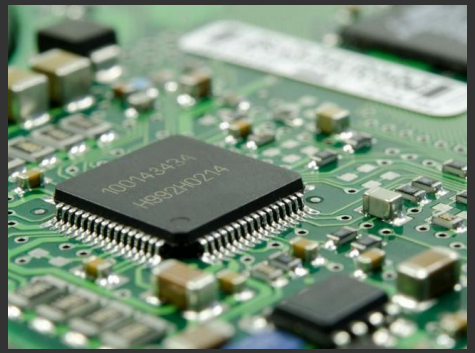
Loads program and data before processing

Types:

- Random Access Memory (RAM):
  - Volatile
  - Retains data as long as power is supplied
  - temporary storage
  - Faster than secondary memory or storage devices
- Read Only Memory (ROM):
  - Non-volatile
  - Small, faster permanent storage
  - Contents rarely changed

Cache Memory

- Since RAM is slower than CPU, cache is a high speed memory placed in between
- Stores the copies of data from frequently accessed locations and reduces time to retrieve data
- When a CPU needs some data it first examines the cache and if its not there, it accesses the primary memory



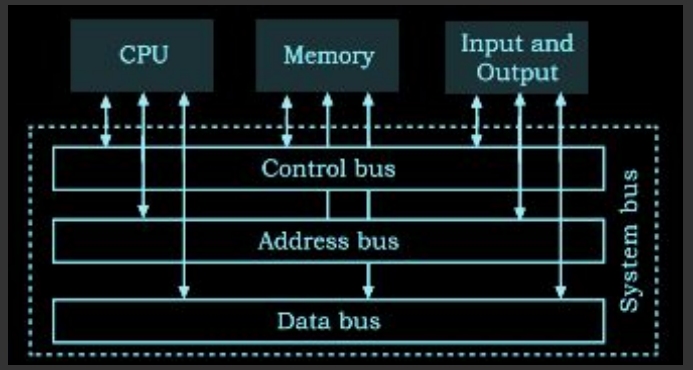
Secondary Memory

- Permanent
- Large storage capacity
- Slower and cheaper than main memory
- HDD,CD
- SSD

Data Transfer Between Memory and CPU

There are three kinds of “buses” for this purpose:

1. Data Bus: Transfers data between components. It is bidirectional
2. Address Bus: Transfers addresses of data between CPU and main memory. It is unidirectional
3. Control Bus: Communicates control signals between components. It is unidirectional



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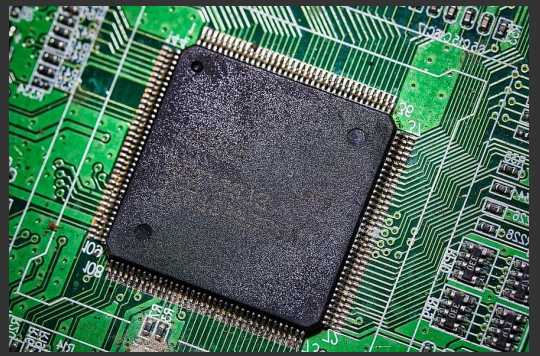
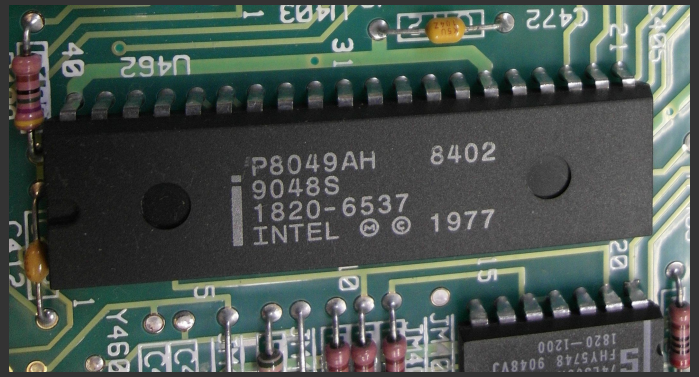
Microprocessor

1. Small sized electronic component which carreis out various tasks
2. Built over IC
3. Specifications:
   - Word Size: Maximum number of bits it can process (64 bit, 32 bit systems)
   - Memory Size: amount of RAM
   - Clock Speed: Number of pulses per second generated by the clock inside the computer.
   - Cores: The basic computation unit. Multicore processor allows more than one task



Microcontroller

1. A small computing device which has a fixed amount of RAM, ROM and other peripherals on a single chip.
2. Unlike CPU which only has microprocessor
3. EG: Mouse, washing machine
4. Embedded in another device to perform a particular function
5. Automates simple tasks



Data and Information

1. A computer considers everything as data
2. Raw and unorganised facts which can be processed for meaningful information
3. Types of Data:
   - Structured
     - Follows a strict structure
     - easy to comprehend
     - Organised into rows and columns

Roll No	Name	Month	Attendance (in %)
R1	Mohan	May	95
R2	Sohan	May	75
R3	Sheen	May	92
R4	Geet	May	82
R5	Anita	May	97
R1	Mohan	July	98
R2	Sohan	July	65
R3	Sheen	July	85
R4	Geet	July	94
R5	Anita	July	85

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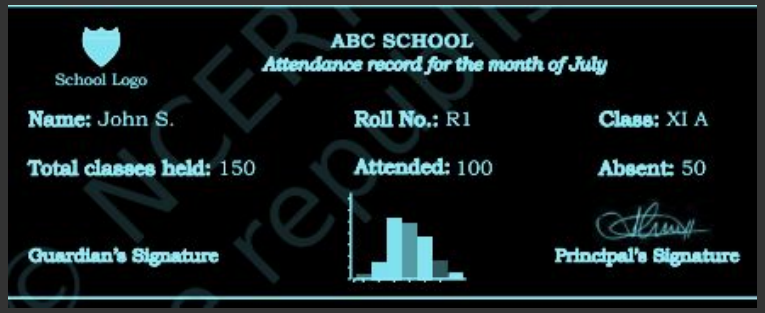
- Unstructured:
  - Data which is not organised in a pre-defined record format



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- Semi-structured:
  - No well-defined structure
  - Maintains internal markings to separate data elements
  - Eg: HTML page

Name: *Mohan*	Month: *July*	Class: *XI*	Attendance: *98*
Name: *Sohan*	Month: *July*	Class: *XI*	Attendance: *65*
Name: *Sheen*	Month: *July*	Class: *XI*	Attendance: *85*
Name: *Geet*	Month: *May*	Class: *XI*	Attendance: *82*
Name: *Geet*	Month: *July*	Class: *XI*	Attendance: *94*

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Data capturing, storage and retrieval

1. Data Capturing:
   - Gathering data from different sources in the digital form
   - Eg: barcode reader
2. Data Storage:
   - Process of storing captured data for future use
   - Server: Computers with larger and faster storage
3. Data Retrieval:
   - Fetching data from storage devices for using as per the user requirement
   - Minimising access time is crucial for faster processing
4. Data Deletion and Recovery
   - Storage can malfunction or crash
   - Users can accidentally erase data
   - Hackers can delete data
   - When data is deleted, its address is marked as free, doesnt completely remove
   - Recovery is possible if the contents of memory have not been overwritten

Software

1. The component of a computer system which we cannot touch or see physically
2. Comprises of instructions and data to be proccessed using the computer hardware
3. Eg: Word
4. Need:
   - To make the hardware useful and operational
   - Link between user and hardware
5. Types:
   - Operating System (OS):
     - Most basic system software without which other software cannot work
     - Manages other application programs and provides access and security to the users of the system
   - System Utilities:
     - Used for maintenance and configuration
     - Eg: disk defragmentation tool
   - Device Drivers:
     - Ensures proper working of devices
     - Controls the functioning of a particular device
     - Acts as an interface between the device and operating system

Programming tools

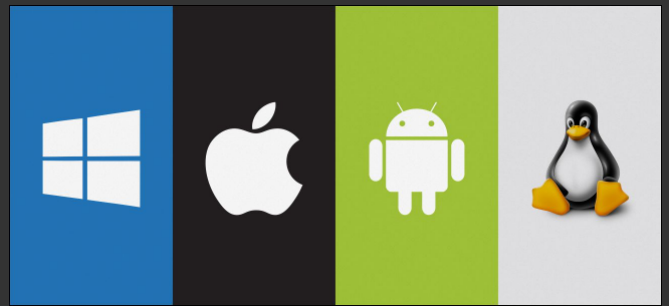
1. Types of languages:
   - Low Level(machine):
     - Machine dependent
     - Machine language (1s and 0s) and assembly language (englishilike words)
     - Assembly language is computer specific
   - High level:
     - Instructions written using english like sentences
     - machine independent
     - simpler
     - set of rules
     - similar to natural languages
     - EG: Java
1. Language Translators:
   - Translator: assembly/high level - machine
   - Assembler: assembly language to machine language
   - Compler: converts source code into machine code. It executes if all the rules of the language are followed
   - Interpreter: Translates line by line
2. Program Development Tools:
3. Text editor
4. Integrated Development Environment (IDE) - Text editor+building tools +debugger

Types of softwares

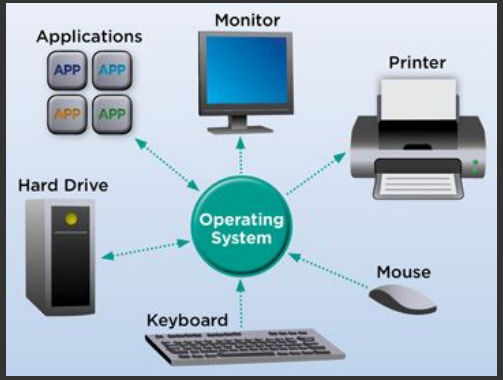
- Application Software: For specific requirements
  1. General Purpose:
     - Software made for general audience
     - Eg: LibreOffice,browser
  2. Customised: for specific requirements
     - Eg: websites
- Proprietary or Free and Open Source Software:
  1. Eg: Ubuntu
  2. Freeware: free software without source code
  3. Proprietary software: paid software like Windows

Operating system

1. Manages all the resources of the computer
2. Controls application software and device drivers
3. Manages system security
4. Objectives: to provide services for building and running applications, and provide the user with an interface with the compute
5. Interface:
    - Command based:
        - Requires user to enter specific commands
        - user has to remember the names of all commands
        - EG: MS DOS, Unix
        - Only one program at a time
    - Graphical User Interface:
        - Icons, menus visual options
        - Input devices like keyboard and mouse
        - EG: windows
    - Touch-based interface:
        - Smartphones and tablets
        - Touchscreen
        - ANDROID, Ios
    - Voice-based interface:
        - Helpful to disabled users
        - Eg Cortana, Siri
    - Gesture-based interface:
        - Some devices allow users to interact with gestures like waving and tilting



Functions of Operating System



- Functions of Operating Systems:
  1. Process Management:
     - Process: task in action
     - OS manages all the simultaneous processes
     - Allocates resource usage and exchange of information among processes
  2. Memory Management:
     - To manage memory used by running processes
     - Manage without interrupting these processes
  3. File Management:
     - The creation,updation,deletion and protection of files in secondary memory
     - Prevent different users from accessing other users' data
     - File Management
  4. Device Management:
     - The OS manages various devices through device drivers