From Basics to Brilliance: A Comprehensive Journey Through Computer Science

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Prerequisites

Curious about everything to do with computers

Learning Objectives

- A ‘Road Map’ of these sessions during phase one
- An understanding of the history and timeline of ‘Computing’
- The basic currency of computing
  - What ?
  - Why is it important to know ?
- Hardware
- Software

Road Map

- History
- Hardware
- Software
  - Firmware
  - Operating Systems
  - Applications
- Networks
- Internet / Intranet / Cloud computing
- **Software (application) Development**

Why is history important?

1885 Daimler Reitwagen

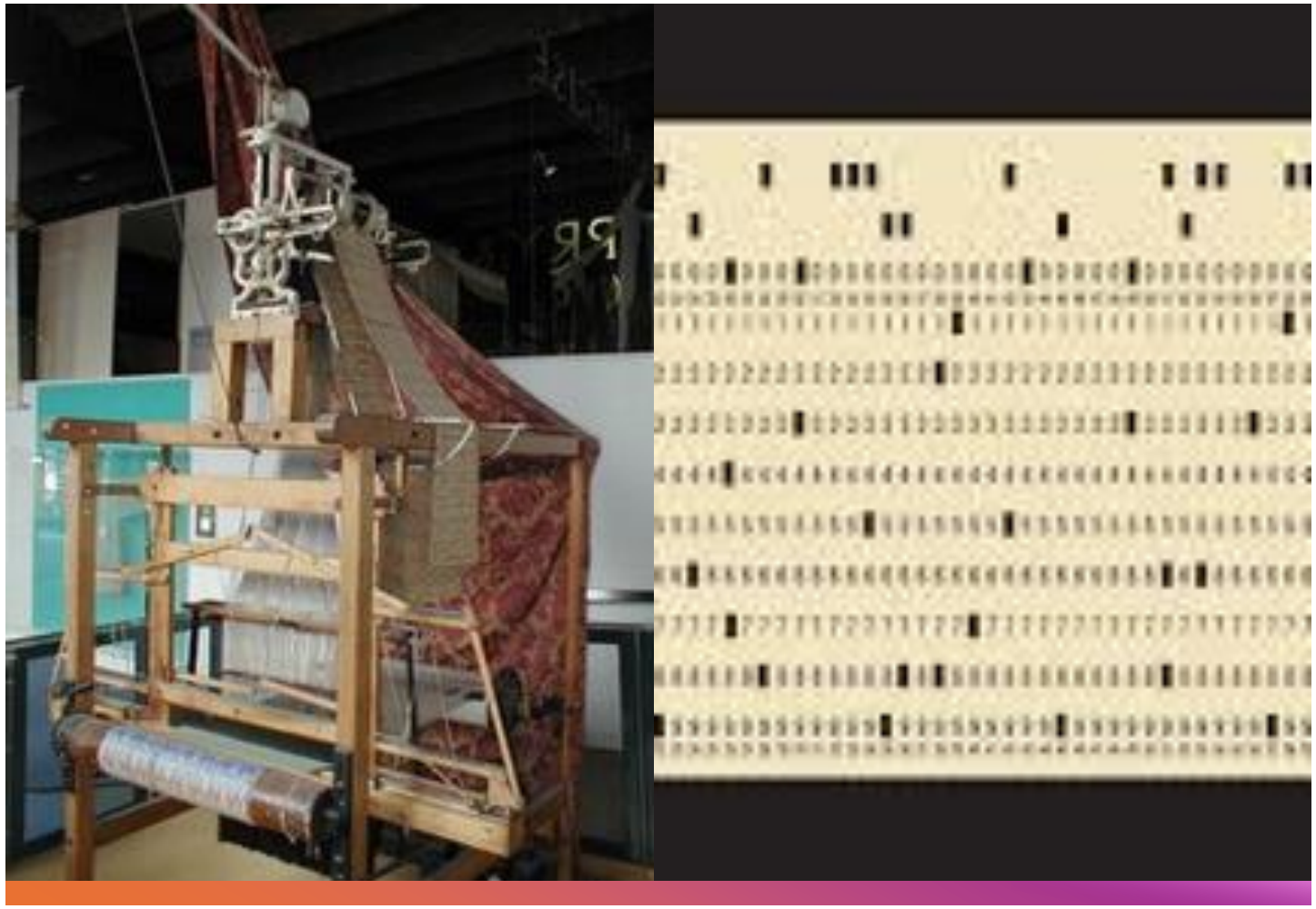
Computers

- What is a computer?

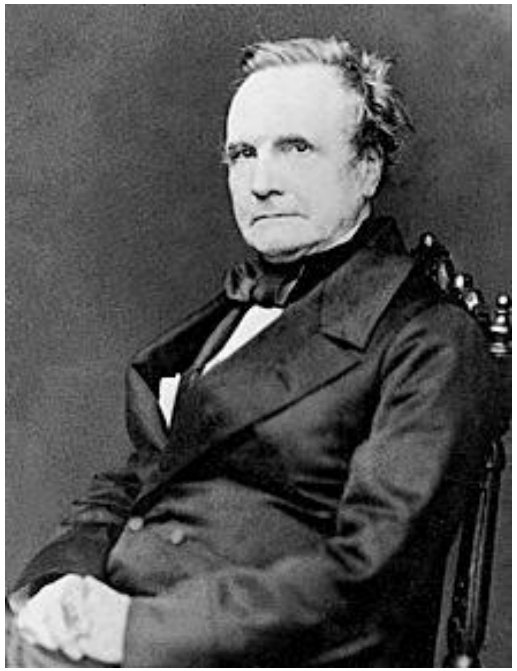
"A computer is a machine that can be programmed to automatically carry out sequences of arithmetic or logical operations."

Computers over the years ....

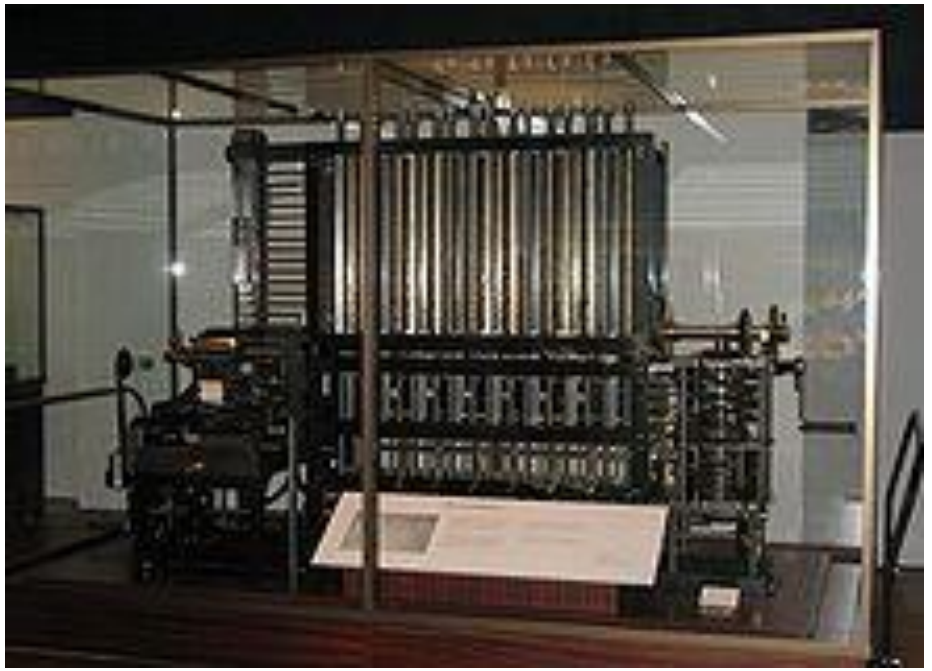
- **1801: Joseph Marie Jacquard,** a French merchant and inventor invents a loom that uses punched wooden cards to automatically weave fabric designs.



Computers over the years ....

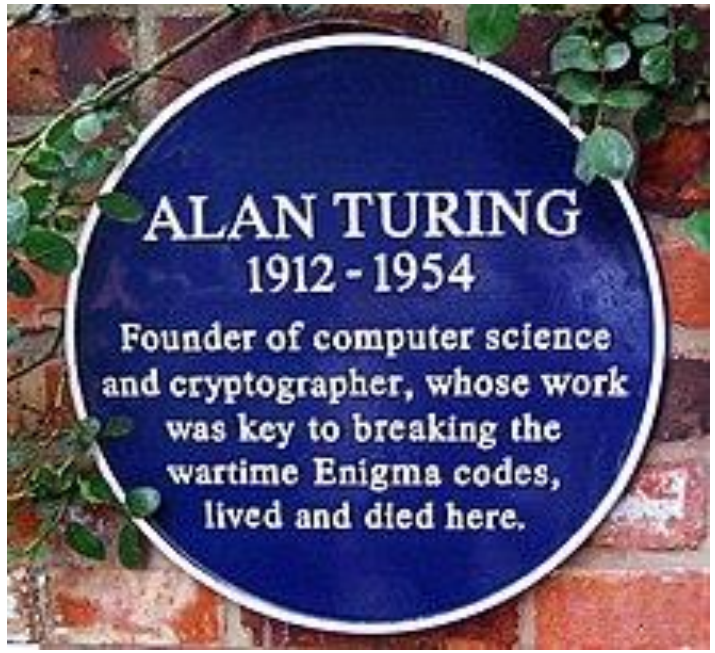


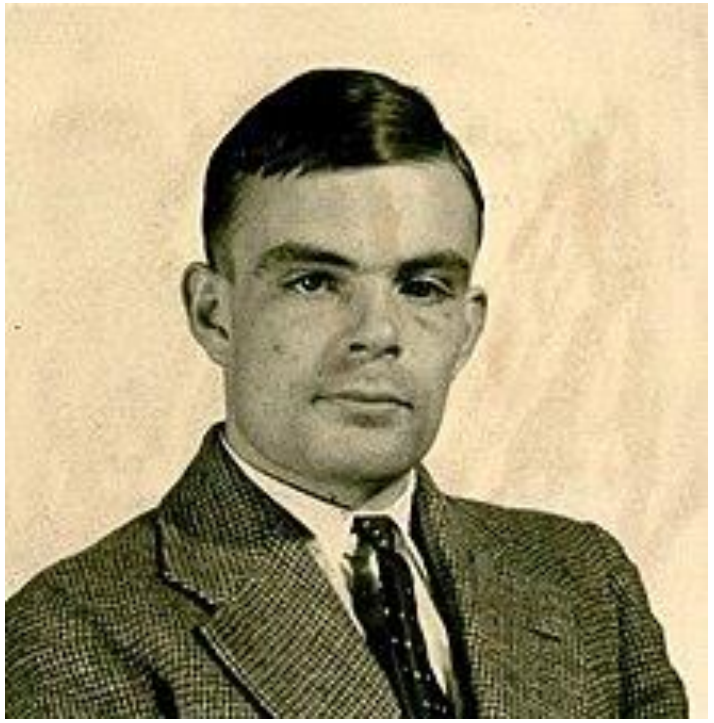
Charles Babbage



Difference engine – Mechanical calculator (1820s)

Computers over the years ....





The Turing Test (Imitation Game) is a deceptively simple method of determining whether a machine can demonstrate human intelligence: If a machine can engage in a conversation with a human without being detected as a machine, it has demonstrated human intelligence. - 1950

Enough about history for the moment ☺

Ports in Computers

- What do they do?

  A computer port is a connection point or interface between a computer and an external or internal device. Internal ports may connect such devices as hard drives and CD ROM or DVD drives; external ports may connect modems, printers, mice and other devices.

- How many ports can you have?

  There are 65,535 possible port numbers, although not all are in common use.

Phone / Computer Memory

- What memory sizes do you know ?
- What processors have you heard of ?
- What is a:
  - K
  - MB
  - GB

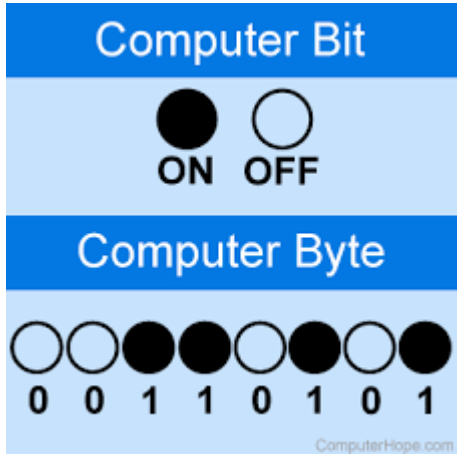
BIT – BInary Digit

Everything in a computer is 0's and 1's. The bit stores just a 0 or 1: it's the smallest building block of storage.

- a "bit" is atomic: the smallest unit of storage
- A bit stores just a 0 or 1
- "In the computer it's all 0's and 1's" ... bits
- Anything with two separate states can store 1 bit
- In a chip: electric charge = 0/1
- In a hard drive: spots of North/South magnetism = 0/1

Byte

- One byte = collection of 8 bits
- e.g. 0 1 0 1 1 0 1 0
- One byte can store one character, e.g. 'A' or 'x' or '$'



- **Kilobyte**, KB, about 1 thousand bytes
- **Megabyte**, MB, about 1 million bytes
- **Gigabyte**, GB, about 1 billion bytes
- **Terabyte**, TB, about 1 trillion bytes

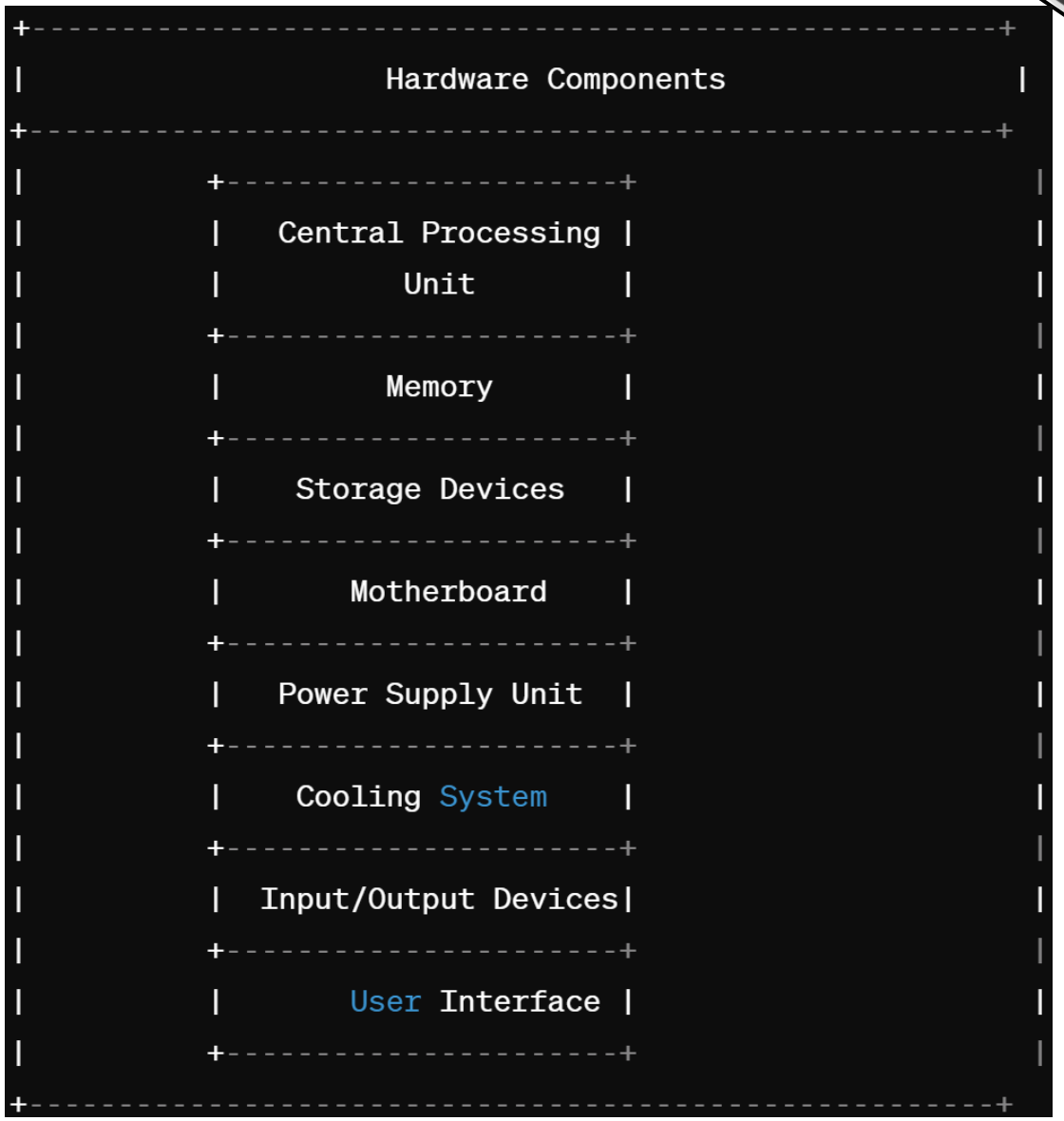
Binary numbering system

Decimal Number	Binary Number	Decimal Number	Binary Number
1	001	11	1011
2	010	12	1100
3	011	13	1101
4	100	14	1110
5	101	15	1111
6	110	16	10000
7	111	17	10001
8	1000	18	10010
9	1001	19	10011
10	1010	20	10100

How many bits to store this ?

There are 65,535 possible port numbers, although not all are in common use.

Hardware


Hardware Components
Central Processing Unit
Memory
Storage Devices
Motherboard
Power Supply Unit
Cooling System
Input/Output Devices
User Interface

Central Processing Unit (CPU)

Central Processing Unit (CPU): Executes instructions and performs calculations.

The performance of your CPU — the “brain” of your PC — has a major impact on the speed at which programs load and how smoothly they run. However, there are a few different ways to measure processor performance. Clock speed (also “clock rate” or “frequency”) is one of the most significant.

A CPU with a clock speed of 3.2 GHz executes 3.2 billion cycles per second.

Memory – Random Access Memory

RAM (random access memory) is a computer's short-term memory, where the data that the processor is currently using is stored.

RAM can be accessed much faster than data on a hard disk, SSD or other long-term storage device, which is why RAM capacity is critical for system performance.

Storage devices

- Hard Disk Drive (HDD) or Solid-State Drive (SSD): Stores data persistently.

- Optical Drive: Reads and writes data to optical discs (e.g., CDs, DVDs).

Motherboard

Connects and facilitates communication between CPU, memory, storage, and other components.

Do they have an impact on performance?

Power Supply and Cooling System

- Power Supply Unit - Converts AC power from the outlet to DC power for the computer's internal components.

- Cooling System - Maintains optimal operating temperatures for the CPU and other components.

Input / Output Devices

- List all the input / output devices

User Interface

- List the types of User Interfaces you are familiar with

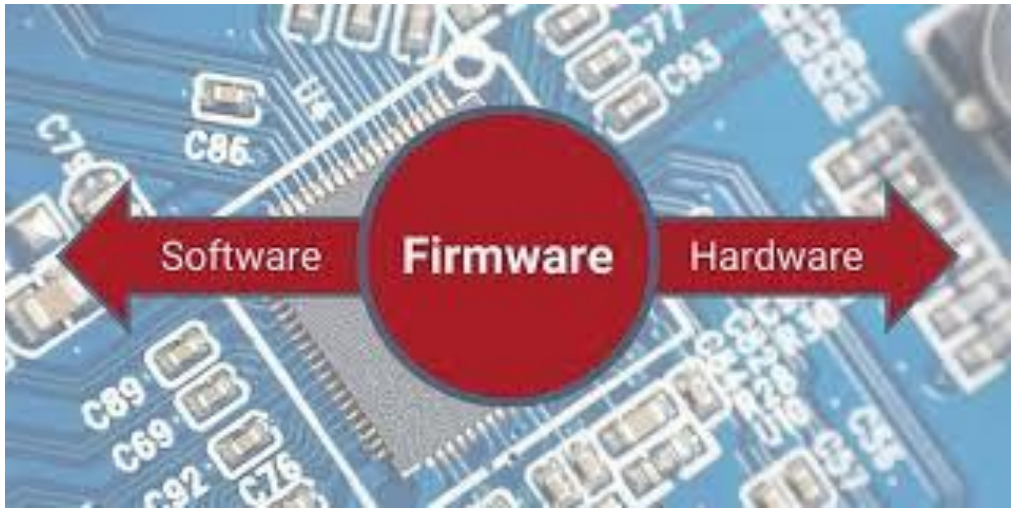
- Enables users to interact with the computer system.
- Can be graphical (GUI), text-based (CLI), or voice-based.

Software


Firmware
Operating System
Device Drivers
Application Software
Security Mechanisms

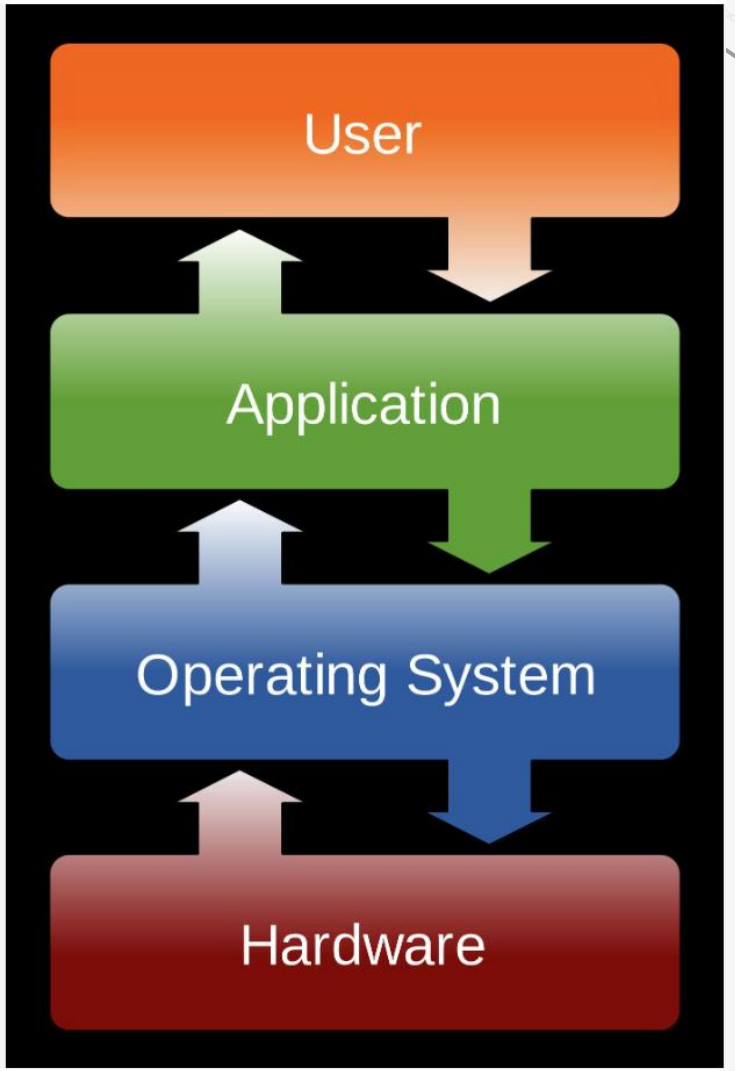
Firmware

- Firmware is a form of microcode or program embedded into hardware.
- Firmware provides instructions to help hardware start up, communicate with other devices, and perform basic input/output tasks.
- Firmware Updates ?



Operating Systems

- List the operating systems you know
- Windows, Linux, Android, Mac OS, Unix

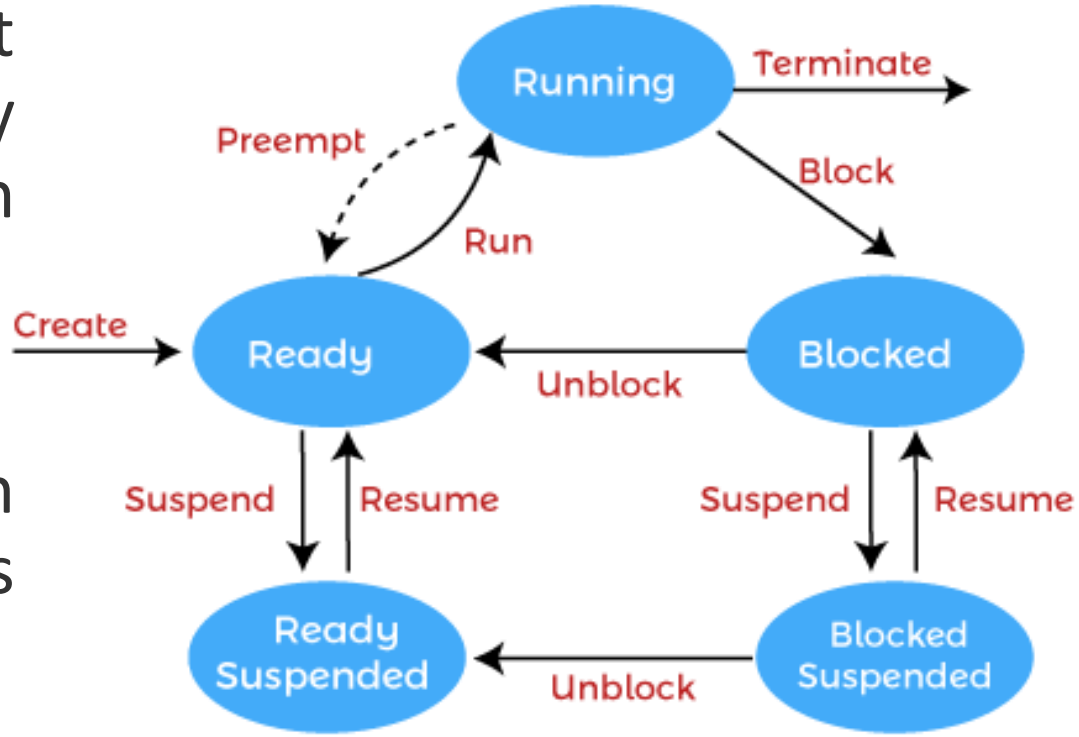



Process Management
File Management
Network Management
Main Memory Management
Secondary Storage Management
I/O Device Management
Security Management
Command Interpreter System
Operating System Components

OS – Process Management

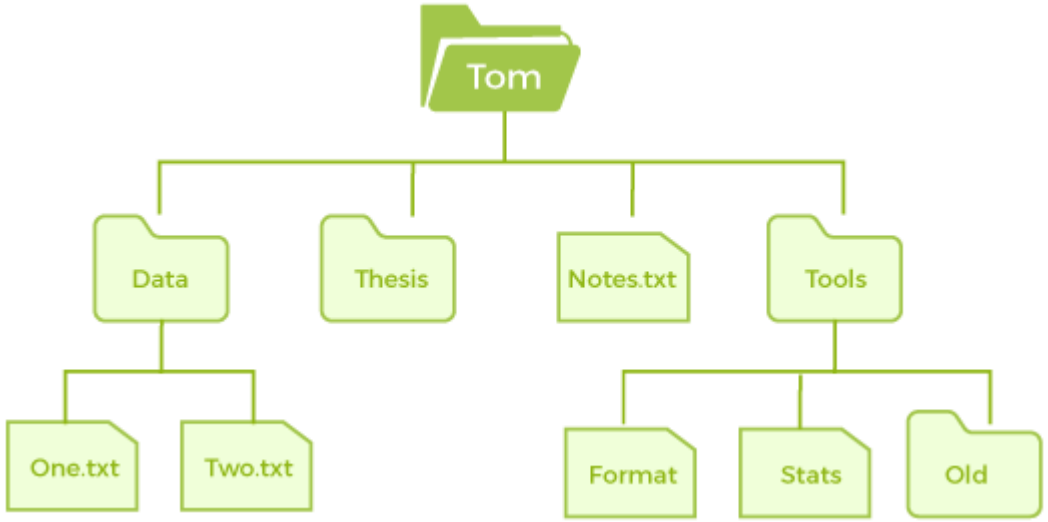
- The process management component is a procedure for managing many processes running simultaneously on the operating system.

- Every running software application program has one or more processes associated with them.

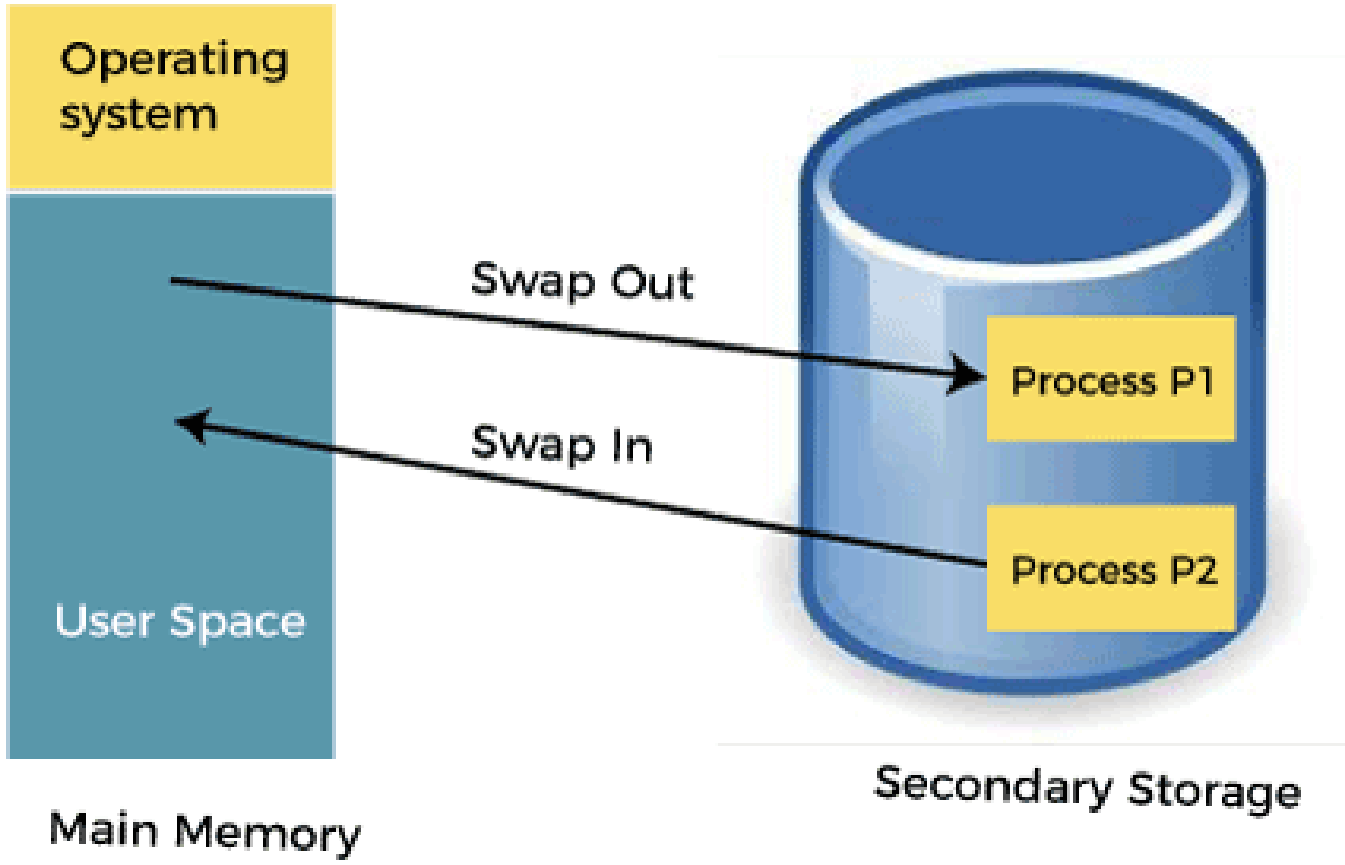


OS – File Management

- File and directory creation and deletion.
- For manipulating files and directories.
- Mapping files onto secondary storage.
- Backup files on stable storage media.

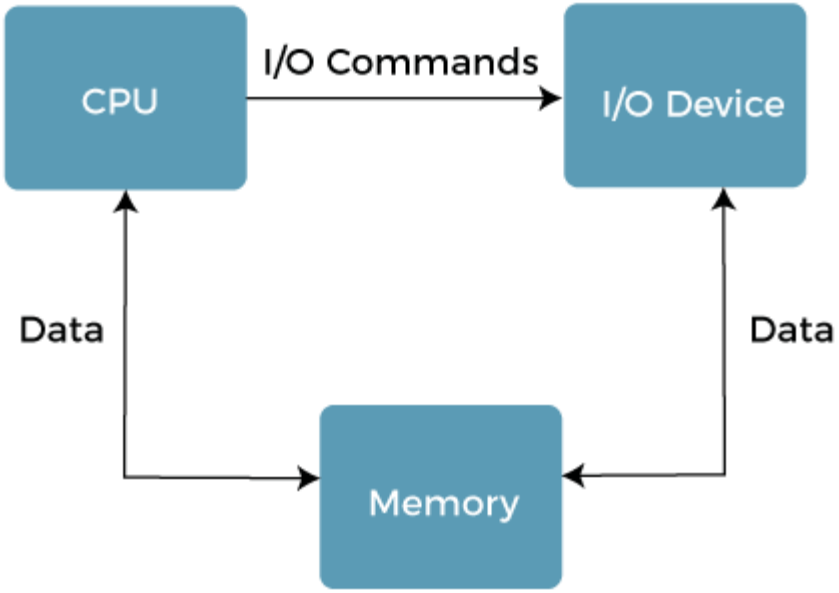


OS – Memory Management

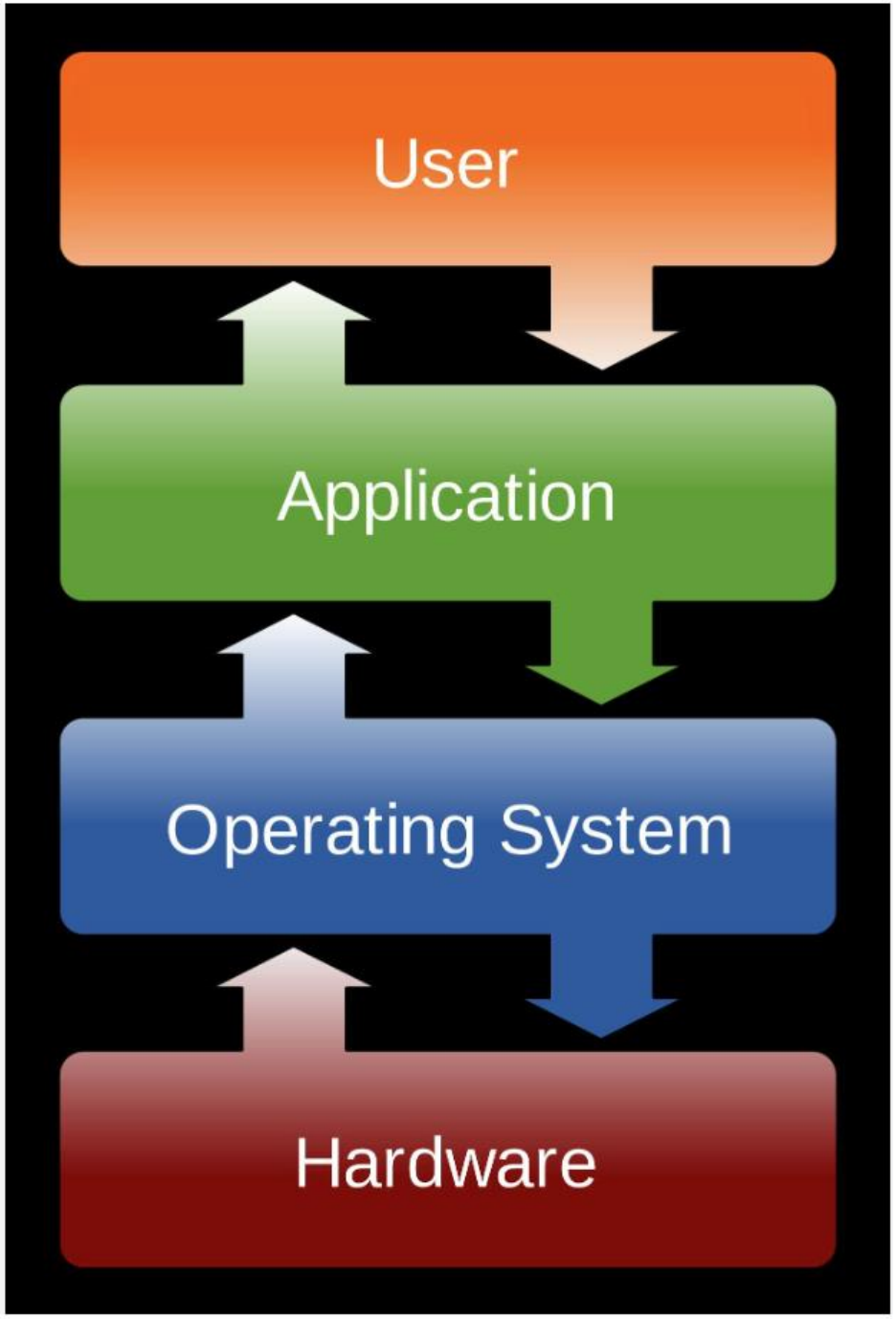


OS – Input / Output Device Management

- It offers a buffer caching system
- It provides general device driver code
- It provides drivers for particular hardware devices.
- I/O helps you to know the individualities of a specific device.



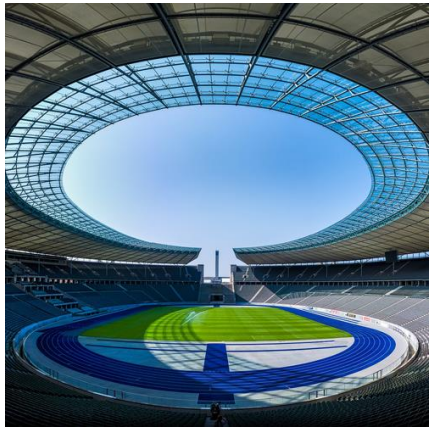
An operating system helps to hide the variations of specific hardware devices from the user.


User
Application
Operating System
Hardware

Applications

- List the applications you know


Time Management Application
Customer Relationship Management (CRM)
Business Process Management
Business Application
Project Management Application
Educational Software
Enterprise Resource Planning (ERP)
EDUCBA



Unicom family ....

Summary

- Road Map
  - History
  - Hardware
  - Software
    - Firmware
    - Operating Systems
    - Applications
  - Networks
  - Internet / Intranet / Cloud computing
  - Software (application) Development
- History
- Hardware
- Software

Learning Outcomes

- Do you have a clear idea of what will be covered in these sessions during phase 1 ?
- Do you have a reasonable understanding of the evolution of computers?
- Do you know the smallest ‘unit’ in computers and the significance of knowing it?
- Do you have a clear understanding of what is meant by hardware?
- Do you have clear understanding of the ‘three’ types of software and their functions?