

# Computer Fundamentals



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## Agenda

- ▶ Introduction
- ▶ What is Computer
- ▶ How computers work
- ▶ Operating Systems

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# Introduction

1

Were you able to finish  
pre-class material?



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# Introduction

How long did it take to finish  
it?



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# What is Computer



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# What is Computer



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# ► What is Computer



## Question:

Think outside of the box and tell me a computer not in traditional sense.



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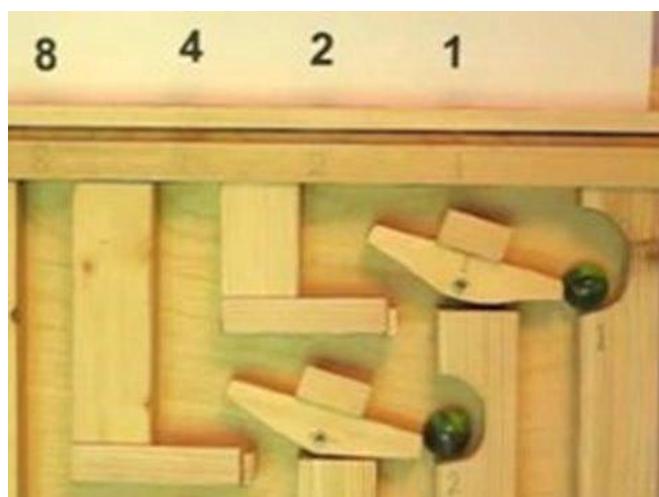
# ► What is Computer



# ► What is Computer



# ► What is Computer



# ► What is Computer



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# ► What is Computer

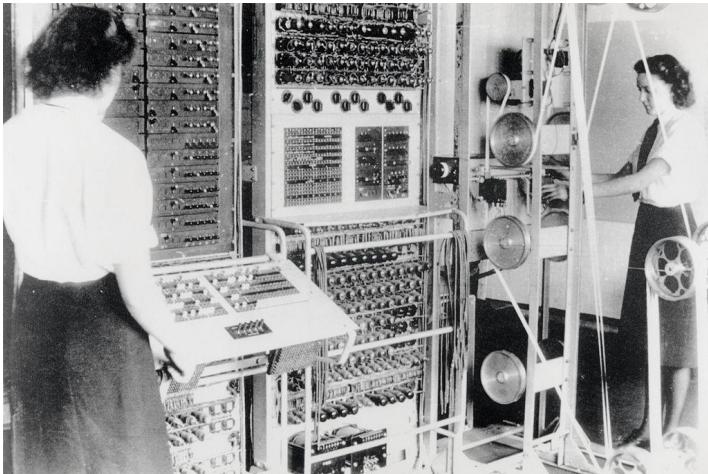
- A computer is...

a device that accepts data or **input** and **store** it to somewhere. Then **processes** this data in someway to automatically produce a **result or output**.



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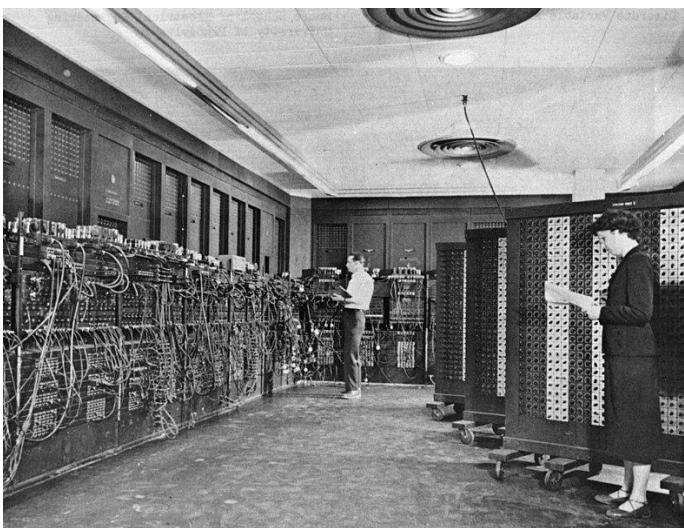
# ► What is Computer



Colossus computer

1943 - 1945

# ► What is Computer



[ENIAC](#) (Electronic Numerical Integrator And Computer)

1955

# ► What is Computer



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# ► What is Computer



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## How Computers Work

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## How Computers Work

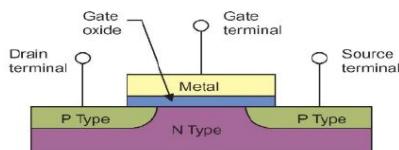
- So how does computers work?
- Let's shop on Apple.com



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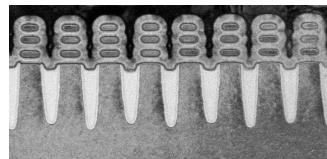
# ► How Computers Work

## • TRANSISTORS



### 1956 Nobel Prize in Physics

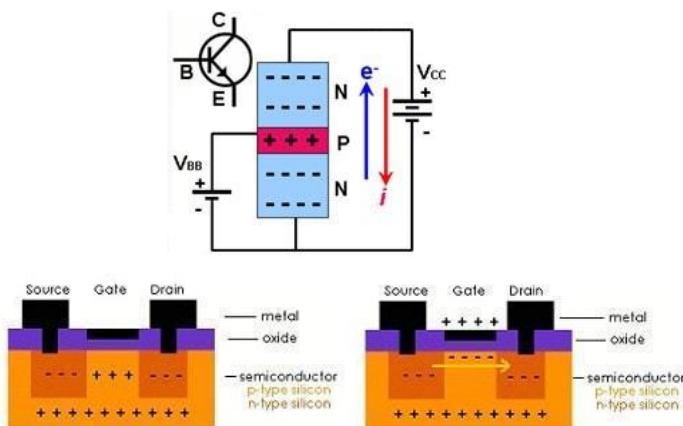
- Semi-conductor
- Cheap
- Small
- Very low energy consumption



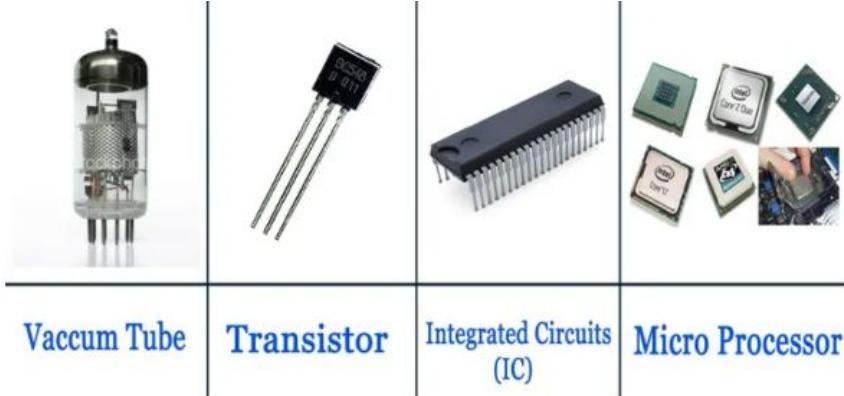
IBM's 5nm transistors

# ► How Computers Work

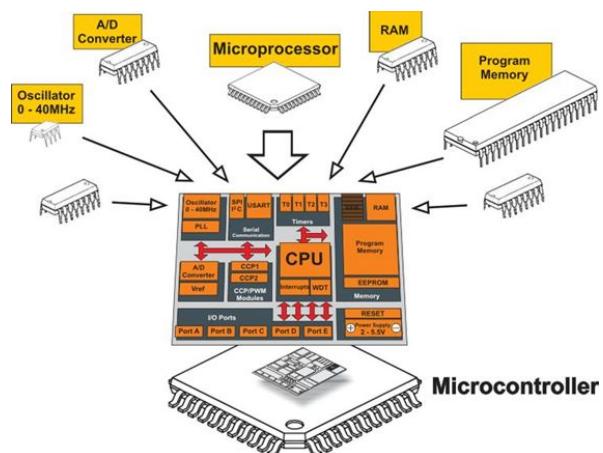
## • TRANSISTORS



# ► How Computers Work



# ► How Computers Work



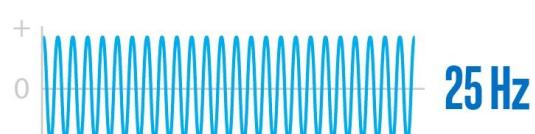
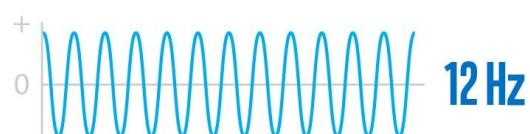
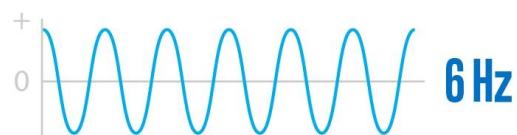
# ► How Computers Work



**Central Processing Unit  
(Brain of the Computer)**

**4.6 GHz = 4.6 Billion cycles  
per second**

# ► How Computers Work



# ► How Computers Work

DATE	CPU	# of transistors
1972	Intel 8008	3,500
1982	Intel 80286	134,000
1993	Pentium	3,100,000
2000	Pentium 4	42,000,000
2012	Quad-Core + GPU Core i7	1,400,000,000
2020	Apple M1 Chip	16,000,000,000
2022	Apple M2 Chip	20,000,000,000
2022	Apple M1 Ultra	114,000,000,000



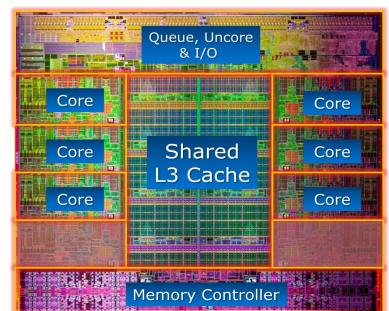
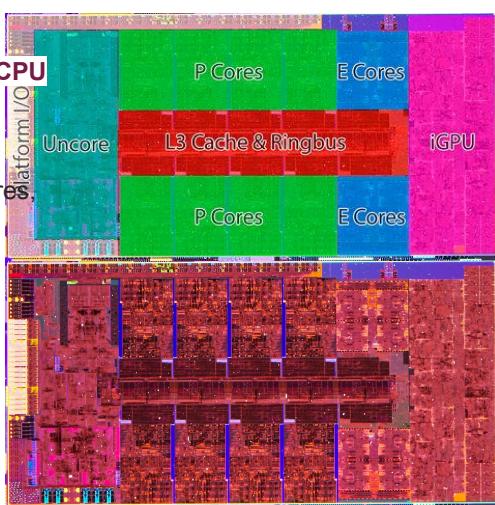
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# ► How Computers Work

Intel i9-12900K CPU die photo

Total Cores :16  
8 Performance-cores  
8 Efficient-cores  
Cache : 30 MB

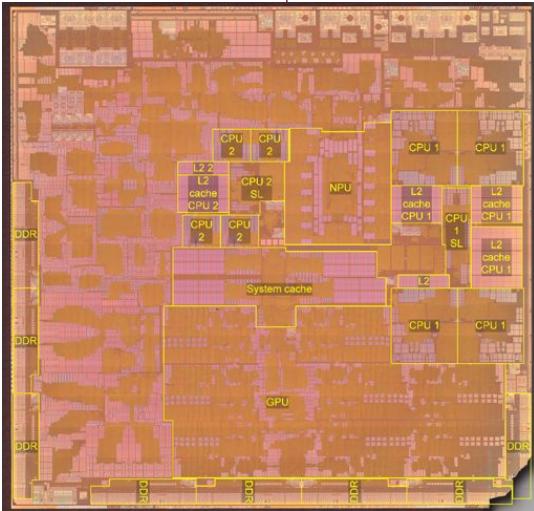


Intel i7-3960x CPU die

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# How Computers Work



Apple M1 die photo

- System on a chip (SoC)
- 5-nanometer process
- 16 billion transistors
- 8-core CPU
- 8-core GPU
- 16-core neural engine

# How Computers Work

## RAM (Random Access Memory)

- Temporary
- Fast
- Expensive



# ▶ How Computers Work

## Hard Drive

- Moving Parts
- Slow
- Cheap
- Vulnerable



# ▶ How Computers Work

Hard Disk Drive (HDD) vs SSD vs NVMe

### Magnetic- SATA3

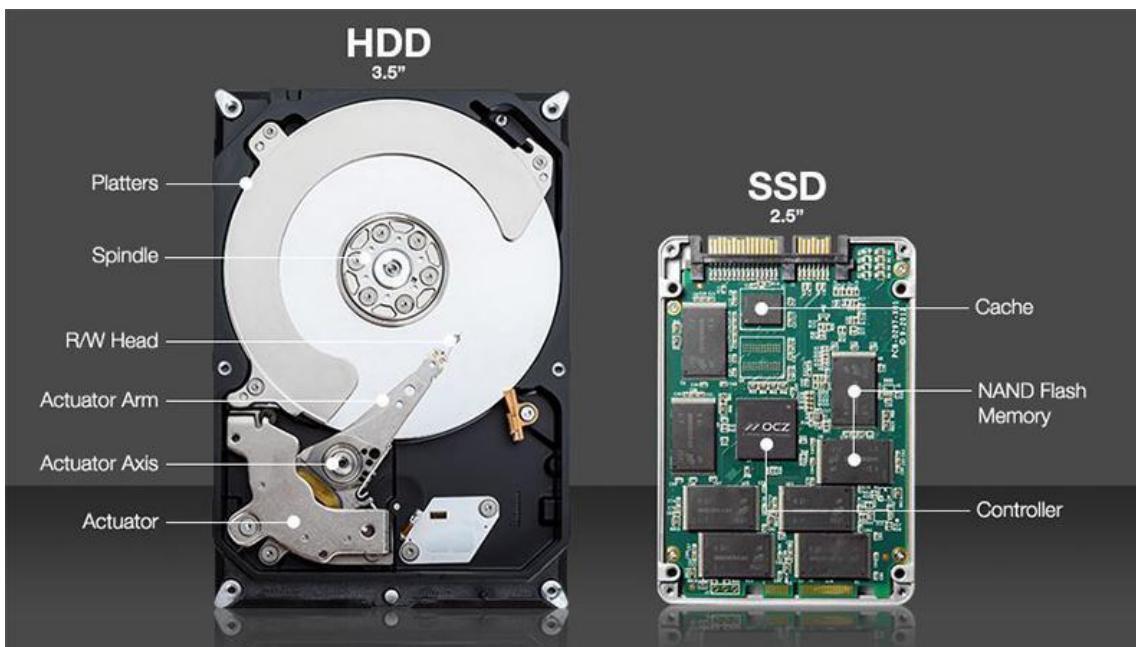


### SSD - SATA3



### SSD - NVMe

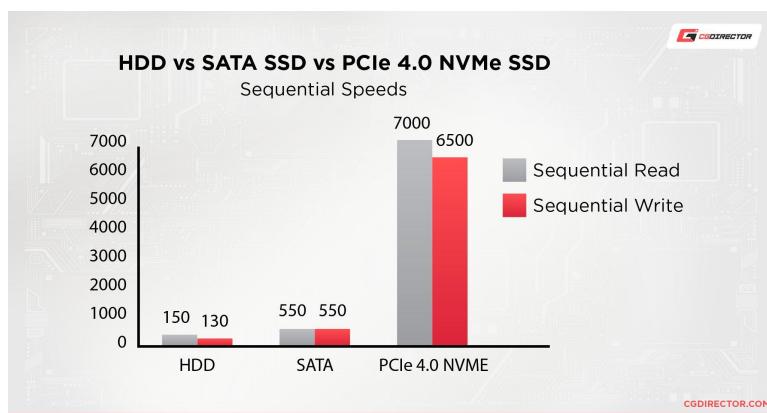




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## How Computers Work



Performance Summary:

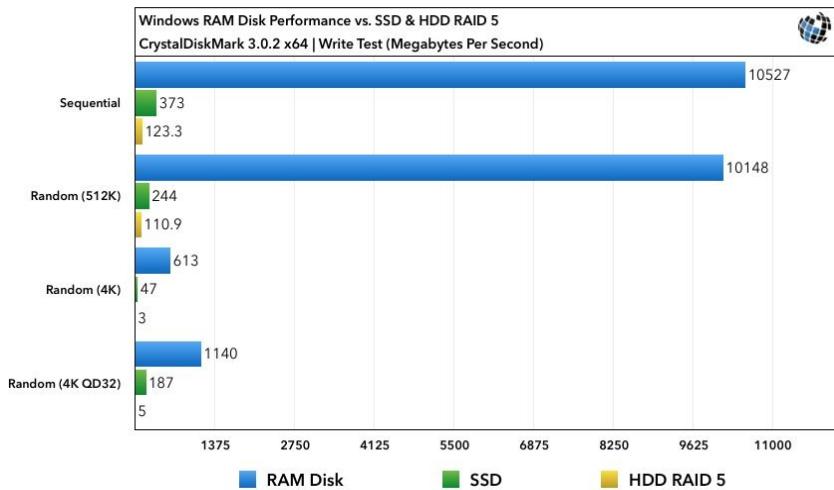
Drive Type	Read [MB/s]	Write [MB/s]
Western Digital 2TB 7200 RPM Hard Drive	102.9	96.08
Samsung 950 EVO 1 TB SSD Drive	557.5	531.9
Performance Summary:	395.2	355.0
Western Digital 2TB 7200 RPM Hard Drive	101.7	96.26
Samsung 950 EVO 1 TB SSD Drive	537.1	520.1
Performance Summary:	37.29	142.3
Western Digital 2TB 7200 RPM Hard Drive	1.896	2.053
Samsung 950 EVO 1 TB SSD Drive	0.733	1.735
Performance Summary:	2591	1544
Western Digital 2TB 7200 RPM Hard Drive	728.5	411.8
Samsung 950 Pro M.2 Flash Drive	2353	1532
Performance Summary:	56.13	195.0
Western Digital 2TB 7200 RPM Hard Drive	2353	1532
Samsung 950 Pro M.2 Flash Drive	56.13	195.0

In Read Performance:  
**SSD is 5x Faster than HDD**  
**M.2 is 5x Faster than SSD**  
**M.2 is 25x Faster than HDD**

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# How Computers Work



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Computer memory fundamentals  
<https://www.youtube.com/watch?v=p3q5zWCw8J4>

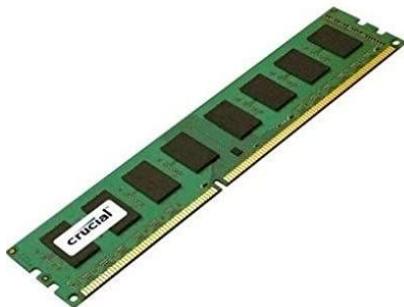
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# How Computers Work

Question: How about NVMe vs RAM?



VS



# ▶ How Computers Work

## Hard Drive vs RAM

Hard Drive



RAM



CPU

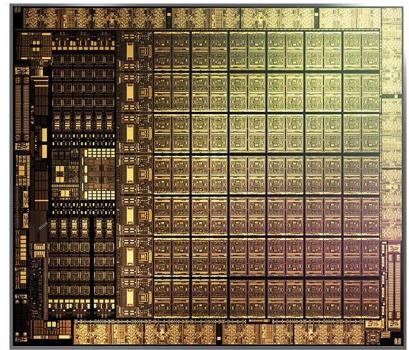


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# ▶ How Computers Work

GPU (Graphical Processing Unit)



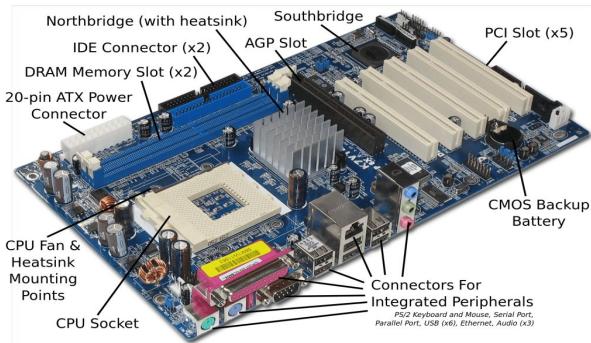
The GeForce RTX 3050's  
GA106 GPU

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# How Computers Work

## Mainboard or Logic Board



New Generation motherboard (Intel i9)

# How Computers Work

## Input and Output Devices



Students, write your response!

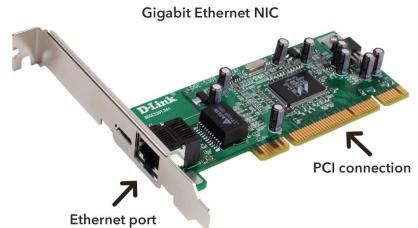
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# ► How Computers Work

- **Communication Devices**



**Wireless Adapter**



**Network Interface Card**

# ► How Computers Work

- **Virtual Reality / Augmented Reality / Mixed Reality**



# ► How Computers Work



???

Drag your dot to how you are feeling:



Keep going, I understand



I'm a little confused



Stop, I need help!



Students, drag the icon!



# ▶ How Computers Work



# ▶ Computer Fundamentals



# Agenda



## ► Operating Systems



## Introduction

Were you able to finish pre-class material?



# Introduction

How long did it take to finish it?



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Students choose an option

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## Operating Systems



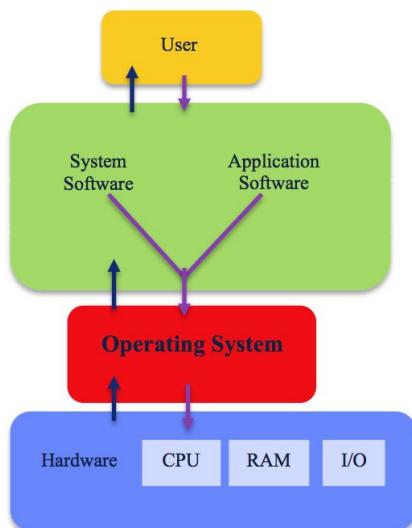
- Music
- Video
- Chat
- Shopping
- Coding
- Reading
- Gaming

# ► Operating Systems

- **OPERATING SYSTEMS:**  
**AN OPERATING SYSTEM (OS) IS SYSTEM SOFTWARE THAT MANAGES COMPUTER HARDWARE AND SOFTWARE RESOURCES AND PROVIDES COMMON SERVICES FOR COMPUTER PROGRAMS REQUIRE AN OPERATING SYSTEM TO FUNCTION.**



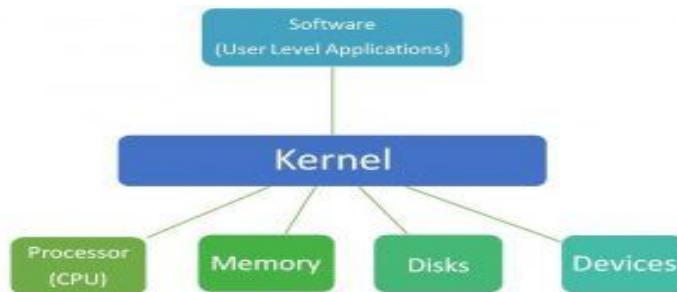
# ► Operating Systems



# ► Operating Systems

## **Kernel:**

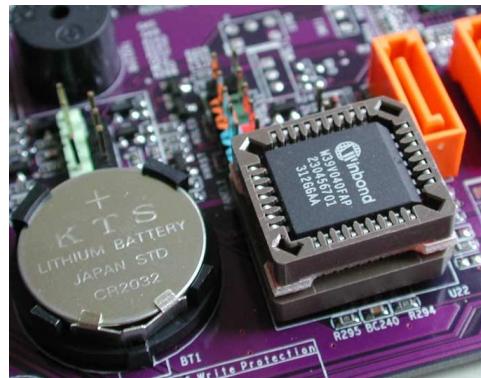
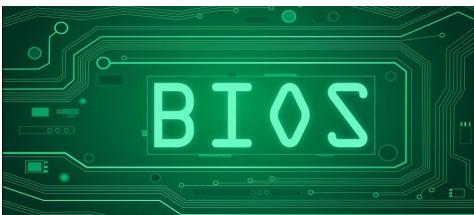
It connects applications to the actual processing of data. It also manages all communications between software and hardware components to ensure usability and reliability.



# ► Operating Systems

## **BIOS (Basic Input Output System):**

It is firmware used to perform hardware initialization during the booting process (power-on startup), and to provide runtime services for operating systems and programs.



# ► Operating Systems

**Question: What does OS manage?**



Students, write your response!

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# ► Operating Systems



**Linux**



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# ► Operating Systems

**Please write your computers and mobile phones operating system.**



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Students, write your response!

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# ► Operating Systems

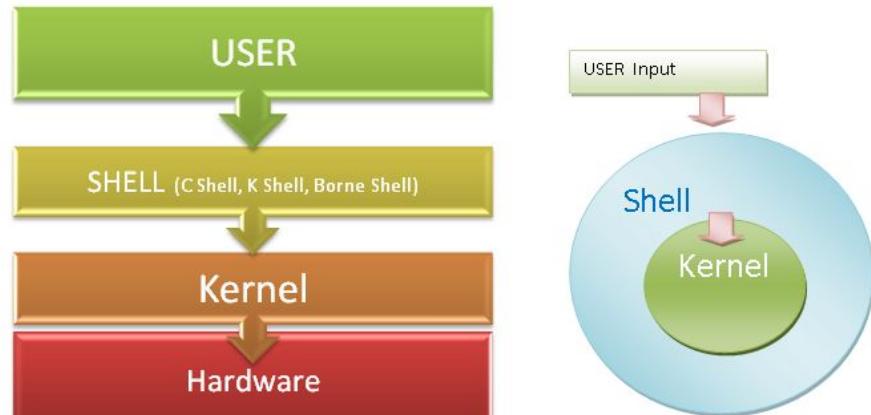
- Terminal

```
howto geek@ubuntu: ~
howto geek@ubuntu: ~$
```

```
iTechno8 — -bash — 80x24
Last login: Sun Aug 11 23:39:40 on console
Shujaas-MacBook-Pro:~ iTechno8$ open /Users/iTechno8/Documents
```

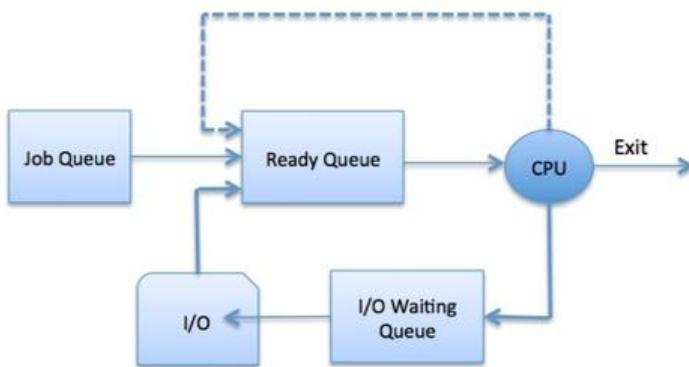
# Operating Systems

- Shell



# Operating Systems

**What do you know about scheduling?**



# ► Operating Systems



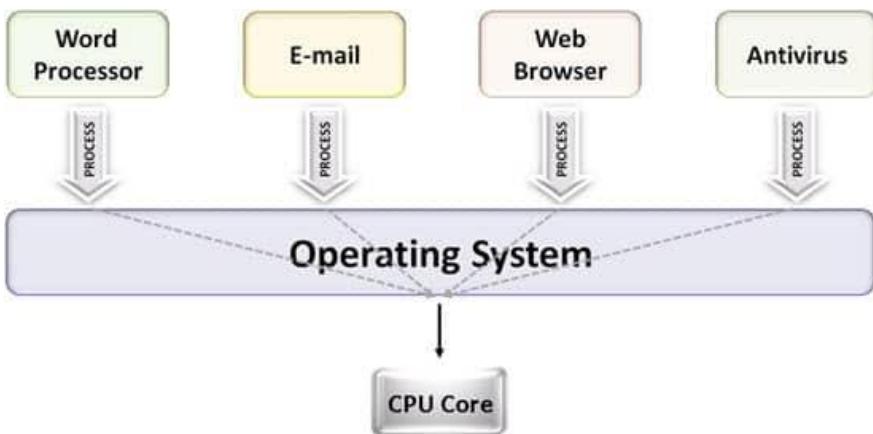
## Scheduling

- Multiprogramming
- Multiprocessing
- Multithreading

# ► Operating Systems

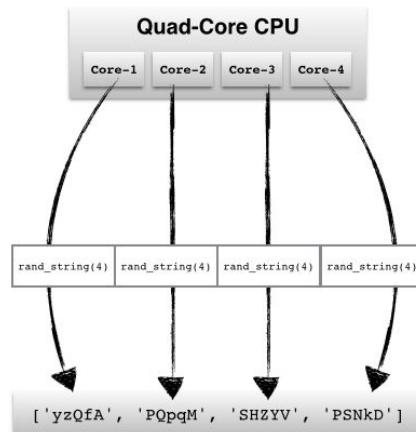


- Multiprogramming



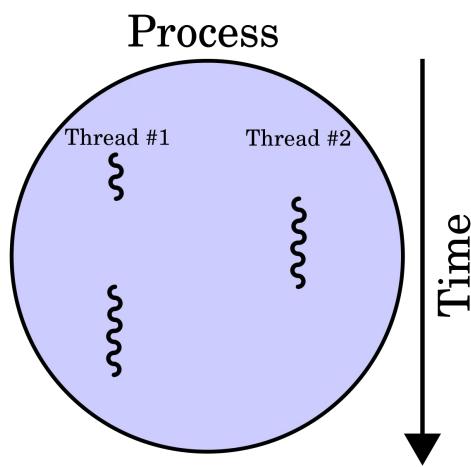
# ► Operating Systems

- Multiprocessing  
[parallel processing]



# ► Operating Systems

- Multithreading



# ► Operating Systems

## What is the difference between processes and threads?



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Students, write your response!

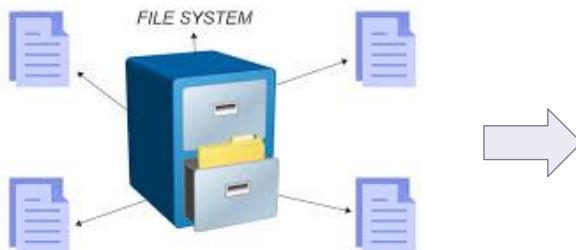
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# ► Operating Systems

- **Files:**

Files are spaces on your computer where data is stored.



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# ► Operating Systems

- **Metadata**



# ► Operating Systems

- **Metadata**

## Metadata example

Structural	Descriptive
Song Title:	Better Man
Artist Name:	Pearl Jam
Album Title:	Vitalogy
Genre:	Rock
Release Year:	1994
Track Number:	11 of 14
Composer:	Eddie Vedder
Copyright:	© Pearl Jam
Added By:	Robert Godino
Date Added:	26/11/2016 8:19 pm
Encoded With:	iTune v7.6.1
Media Kind:	MPEG audio file

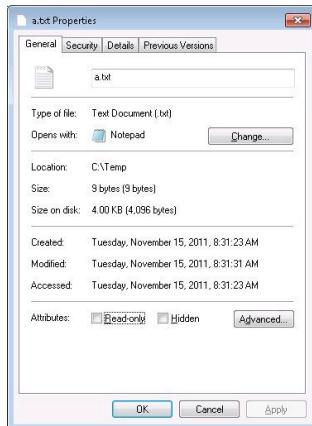
Elements

Values

# Operating Systems

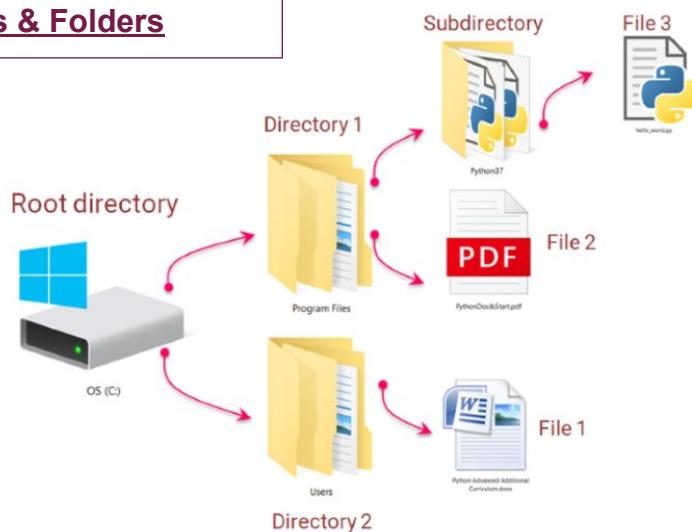
- **File Attributes:**

File attributes are metadata associated with computer files that define file system behavior.



# Operating Systems

- **Directories & Folders**





Drag your dot to how you are feeling:



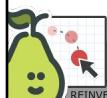
Keep going, I understand



I'm a little confused



Stop, I need help!



JSWAY®, drag the icon!

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THANKS!  
Any questions?

