



# Computer Fundamentals





# Agenda

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

# Introduction



1

Were you able to finish  
pre-class material?



USWAY<sup>©</sup>  
CHOOSE YOURSELF

Students choose an option

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# Introduction



How long did it take to finish it?



USWAY<sup>©</sup>  
ENT YOURSELF

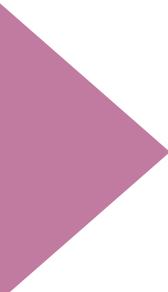
Students choose an option

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# What is Computer

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# What is Computer



# What is Computer



## Question:

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



Students, write your response!

REINVENT YOURSELF

Pear Deck Interactive Slide  
Do not remove this bar



# What is Computer

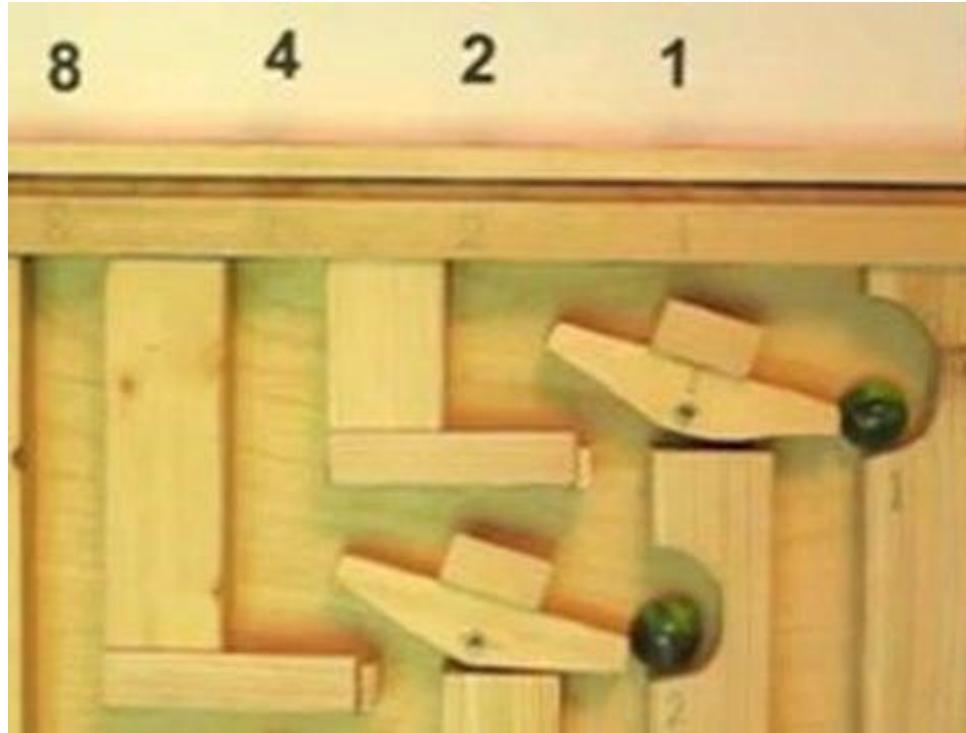


# What is Computer



USWAY<sup>©</sup>  
Students choose an option  
MENT YOURSELF

# What is Computer



USWAY<sup>©</sup>  
INVENT YOURSELF

Students browse: [www.youtube.com/embed/GcDshWmhF4A](https://www.youtube.com/embed/GcDshWmhF4A)

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# What is Computer

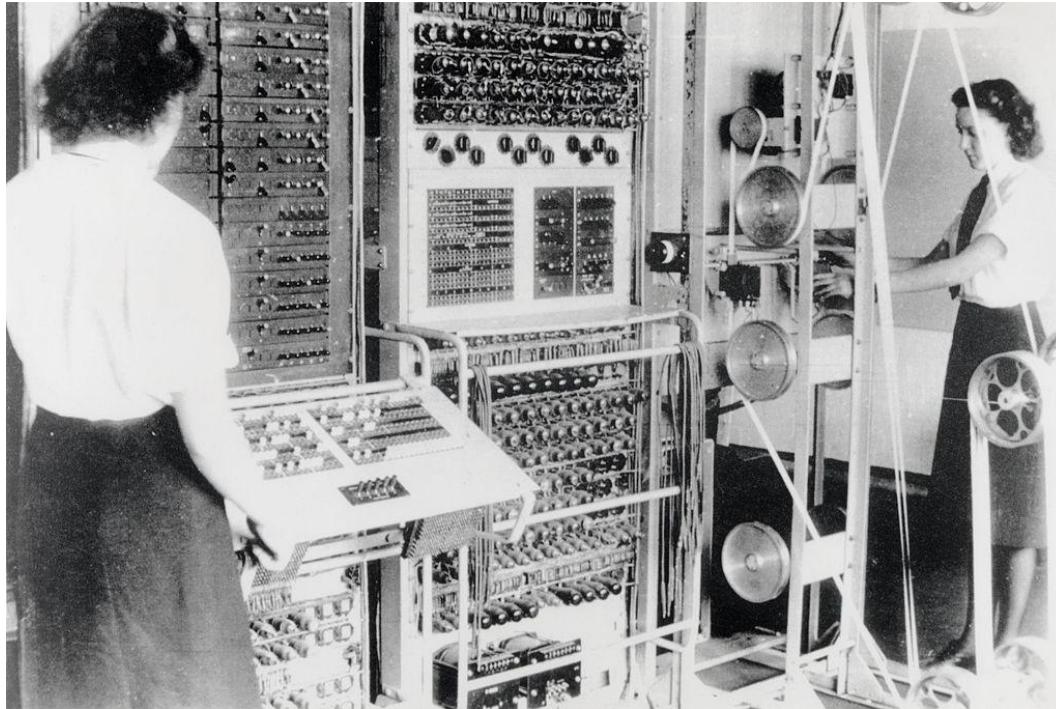


# What is Computer

- 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**.



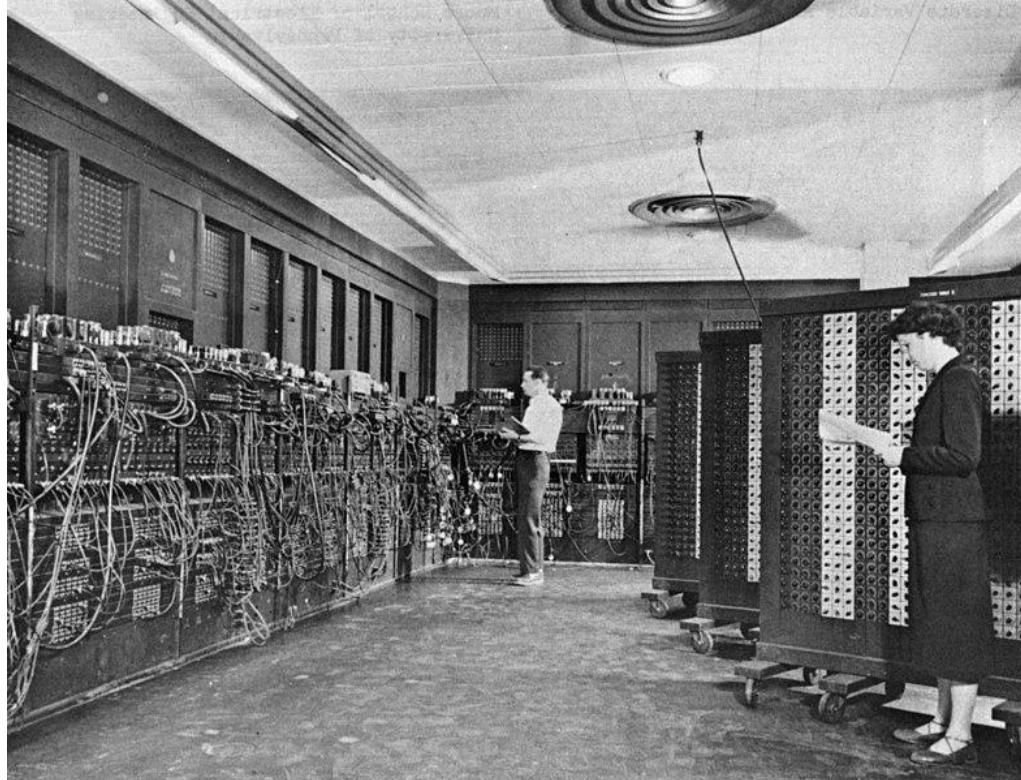
# What is Computer



Colossus computer

1943 - 1945

# What is Computer



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

1955



# What is Computer



# What is Computer





2

# How Computers Work

# How Computers Work

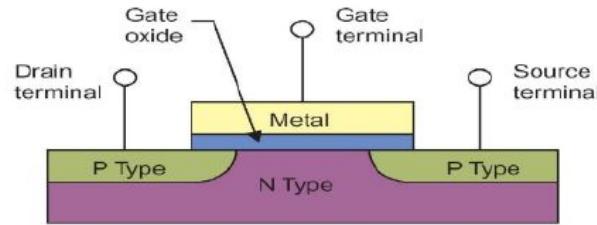
- So how does computers work?
- Let's shop on Apple.com



# How Computers Work

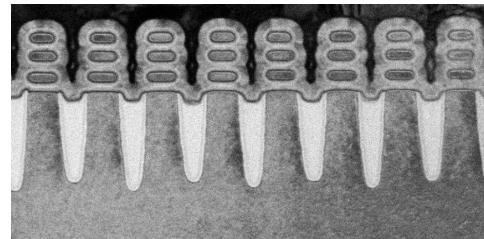


- **TRANSISTORS**



## 1956 Nobel Prize in Physics

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

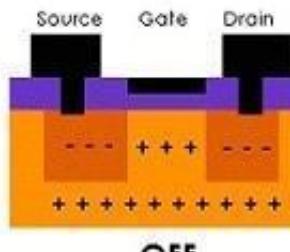
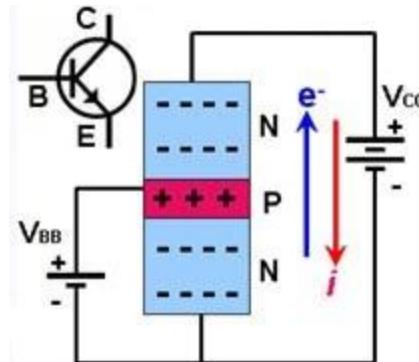


IBM's 5nm transistors

# How Computers Work

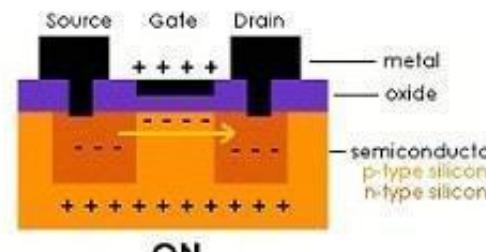


- **TRANSISTORS**



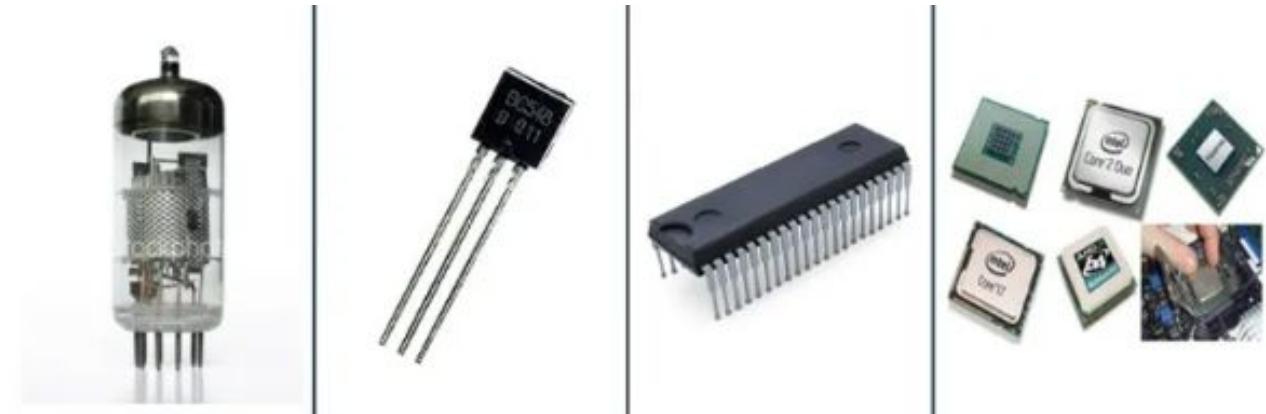
— metal  
— oxide  
— semiconductor  
p-type silicon  
n-type silicon

OFF



ON

# How Computers Work



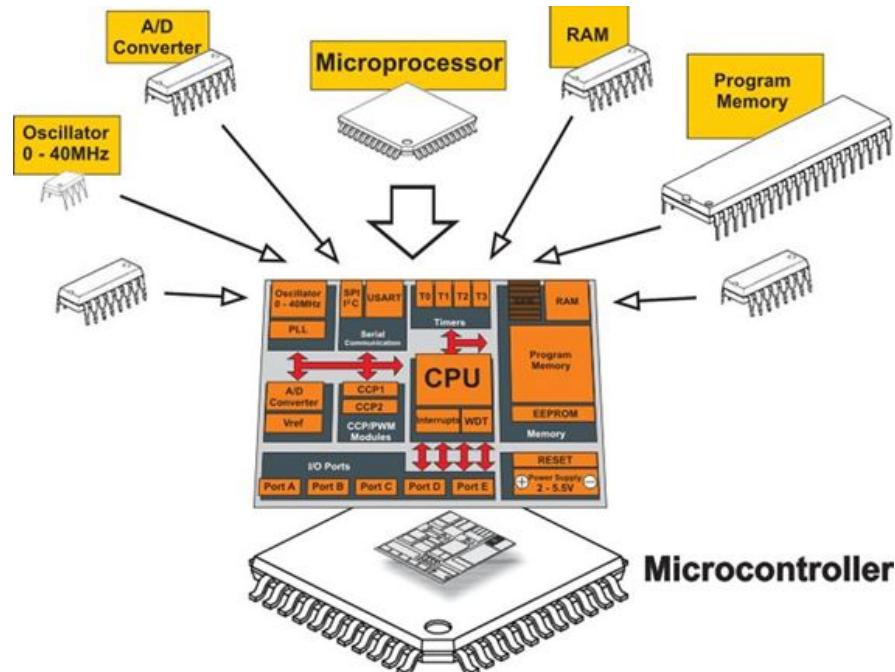
Vacuum Tube

Transistor

Integrated Circuits  
(IC)

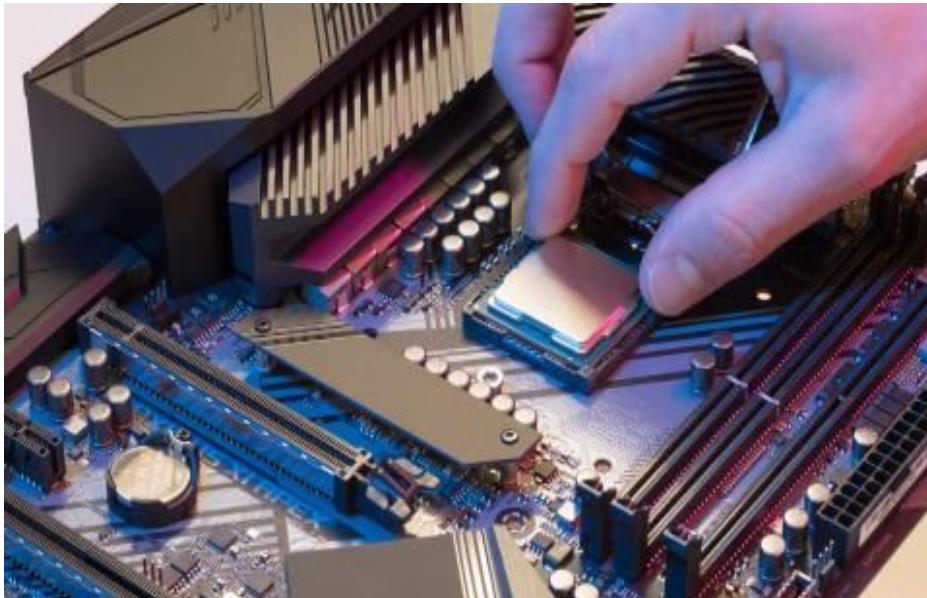
Micro Processor

# How Computers Work





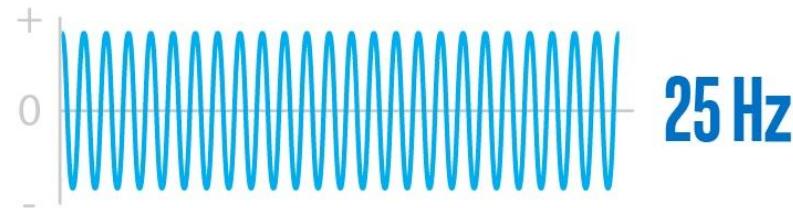
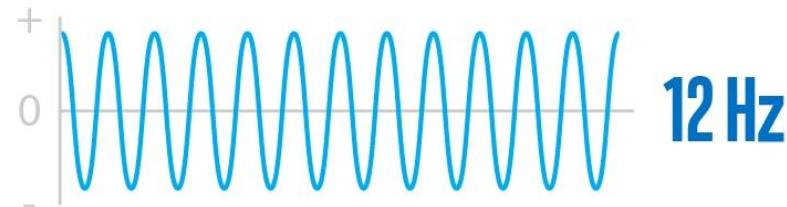
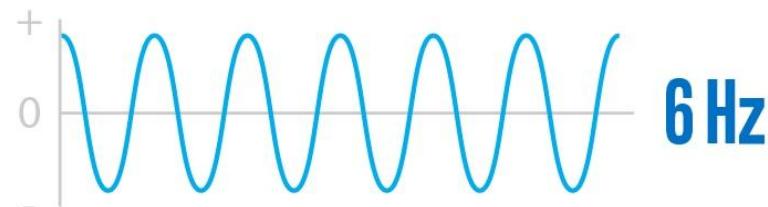
# How Computers Work



**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

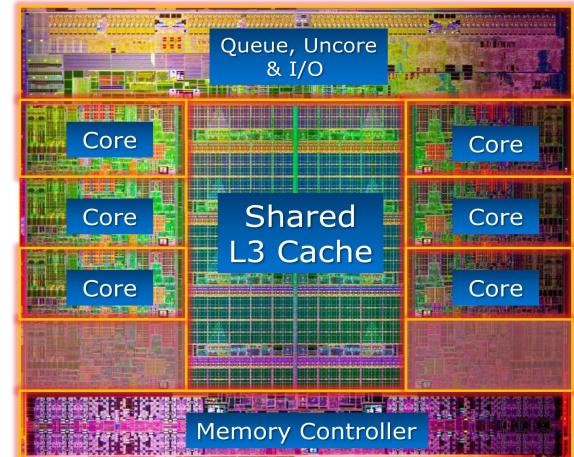
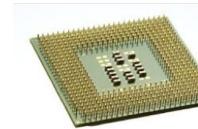
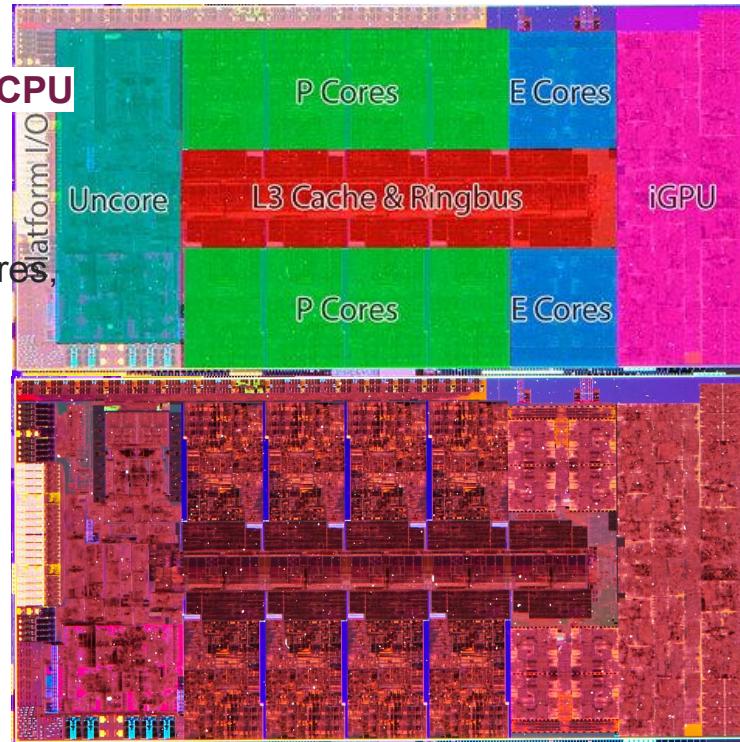


# How Computers Work



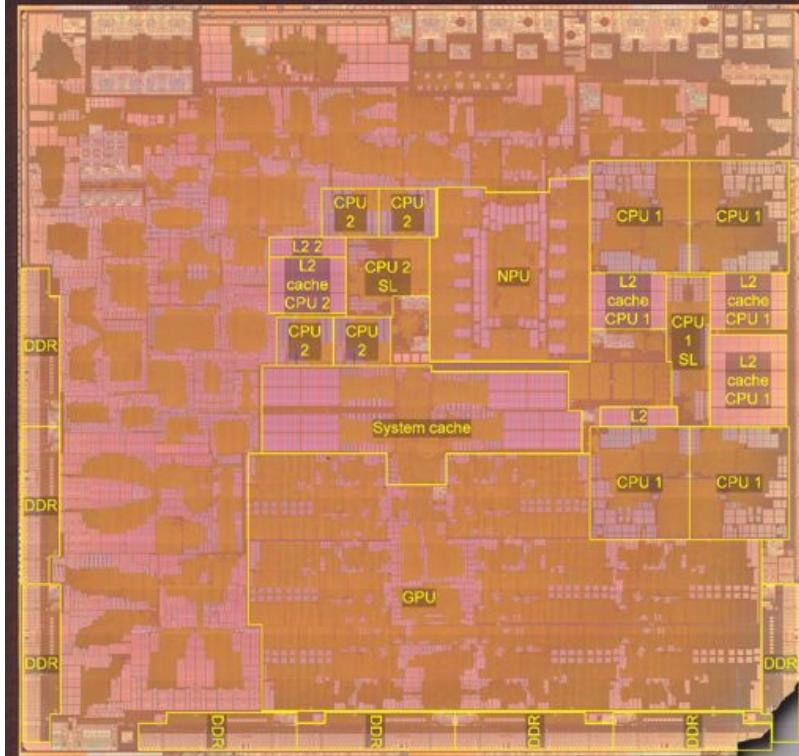
**Intel i9-12900K CPU die photo**

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



**Intel i7-3960x CPU die**

# 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





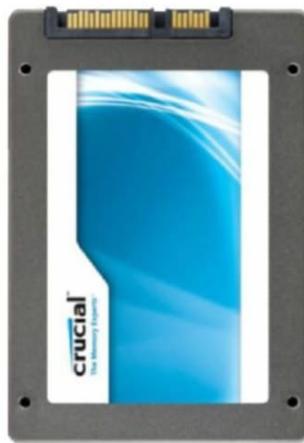
# How Computers Work

## Hard Disk Drive (HDD) vs SSD vs NVMe

**Magnetic- SATA3**



**SSD - SATA3**



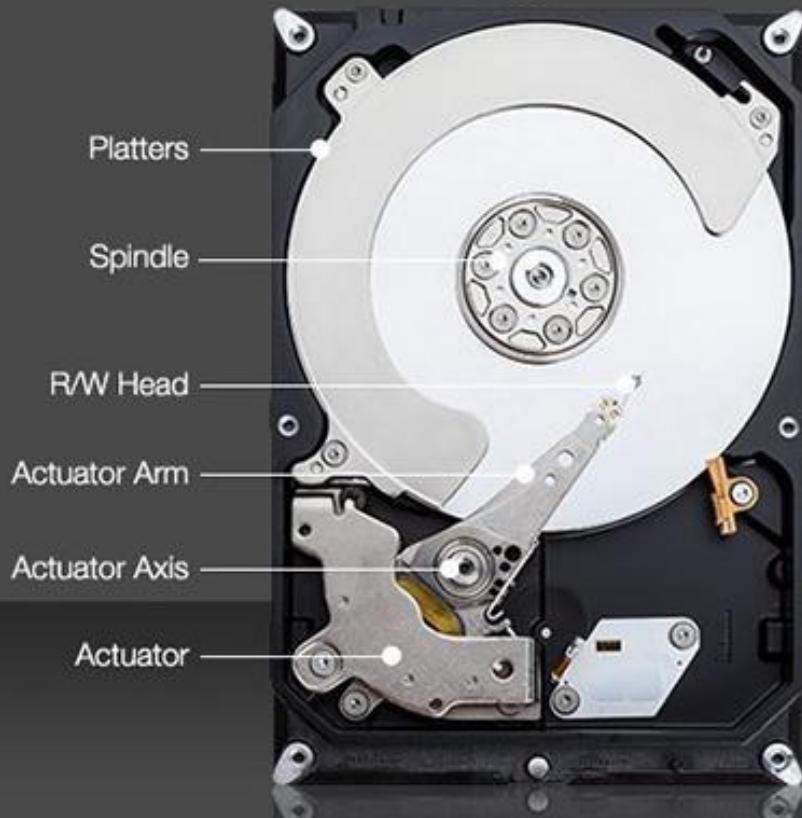
**SSD - NVMe**





## HDD

3.5"

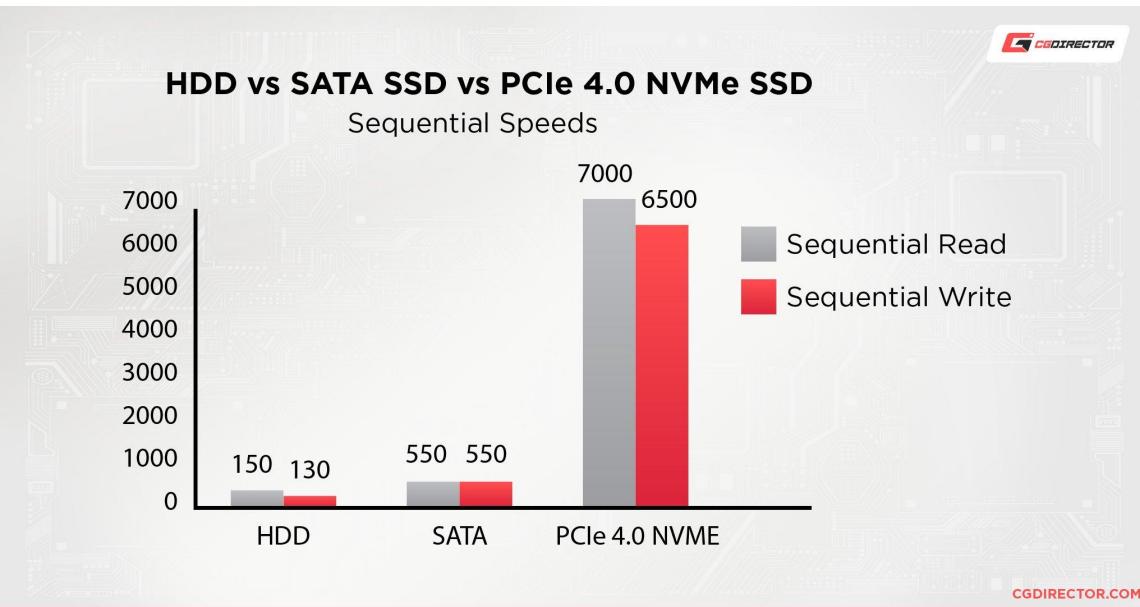


## SSD

2.5"

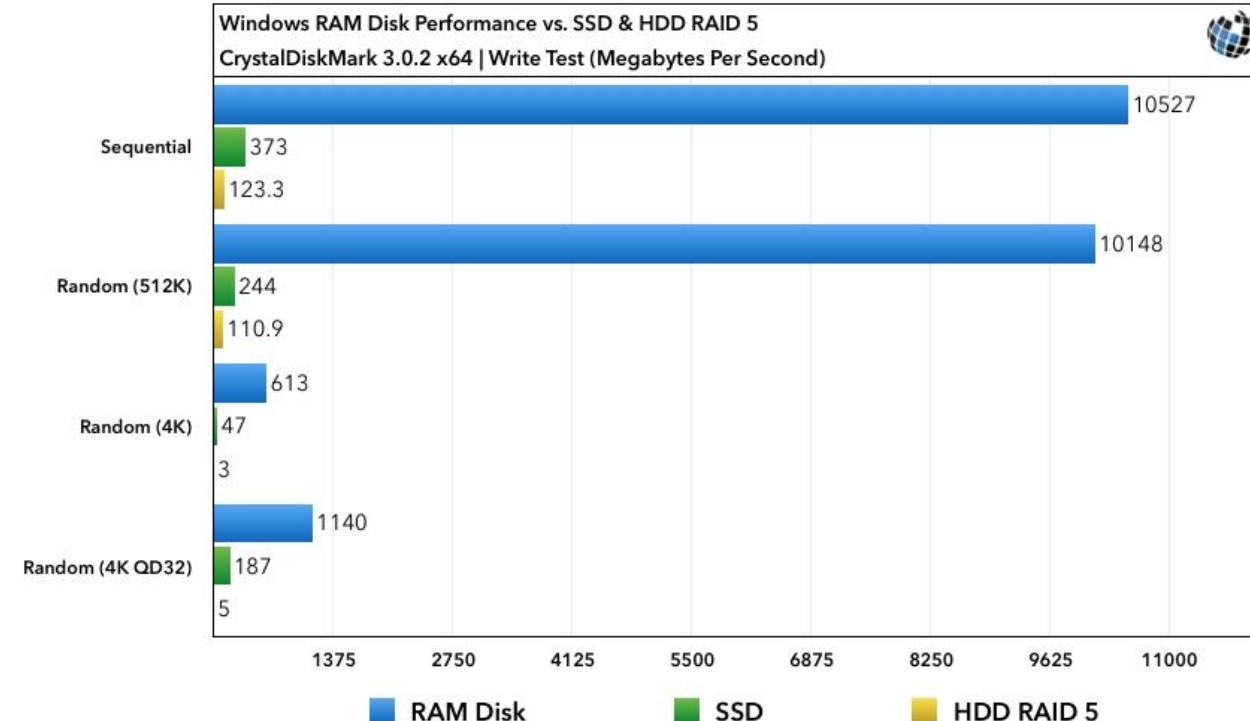


# How Computers Work



CrystalDiskMark 5.1.2 x64	
File Settings Theme Help Language	
All	5 1GB F: 80% (1493/1863GB)
Seq Q32T1	<b>102.9</b> <b>96.08</b>
4K Q32T1	<b>1.896</b> <b>2.053</b>
Seq	<b>101.7</b> <b>96.26</b>
4K	<b>0.733</b> <b>1.735</b>
Western Digital 2TB 7200 RPM Hard Drive	
CrystalDiskMark 5.1.2 x64	
File Settings Theme Help Language	
All	5 1GB C: 44% (189/429GB)
Seq Q32T1	<b>2591</b> <b>1544</b>
4K Q32T1	<b>728.5</b> <b>411.8</b>
Seq	<b>2353</b> <b>1532</b>
4K	<b>56.13</b> <b>195.0</b>
Samsung 950 EVO 1 TB SSD Drive	
Performance Summary:	
Hard Drive: 103 MB/sec read, 96 MB/sec write speed	
SSD Drive: 558 MB/sec read, 532 MB/sec write speed	
M.2 Drive: 2591 MB/sec read, 1544 MB/sec write speed	
In Read Performance:	
SSD is 5x Faster than HDD	
M.2 is 5x Faster than SSD	
M.2 is 25x Faster than HDD	

# How Computers Work



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

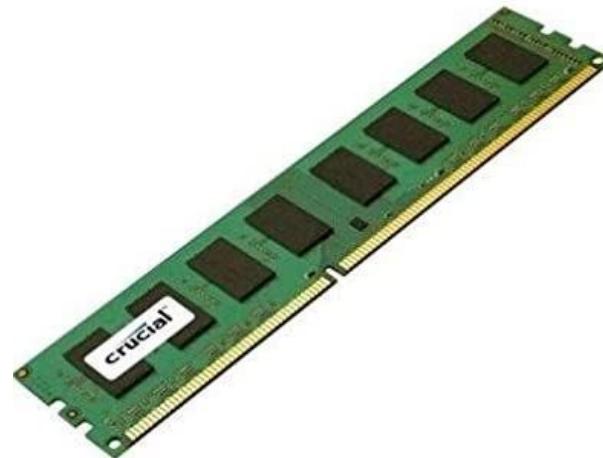
# How Computers Work



Question: How about NVMe vs RAM?



VS





# How Computers Work

## Hard Drive vs RAM

**Hard Drive**



**RAM**



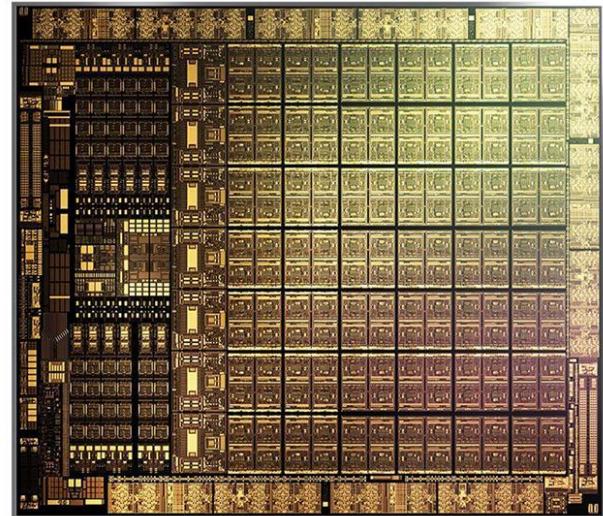
**CPU**



# How Computers Work



## GPU (Graphical Processing Unit)

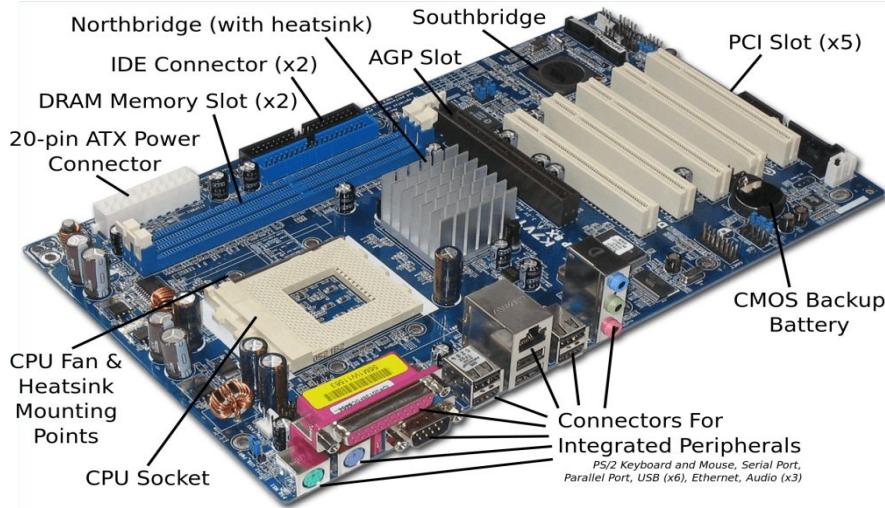


The GeForce RTX 3050's  
GA106 GPU

# How Computers Work



## Mainboard or Logic Board



New Generation motherboard (Intel i9)



# How Computers Work

## Input and Output Devices



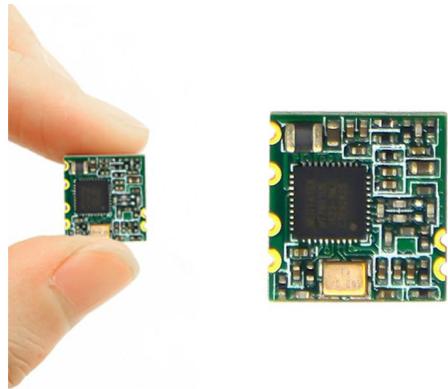
Students, write your response!

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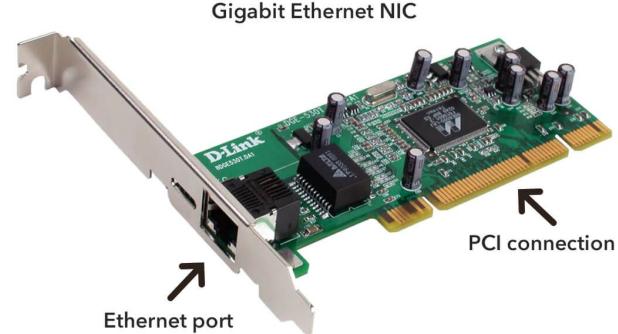
# How Computers Work



- **Communication Devices**



**Wireless Adapter**



**Network Interface Card**

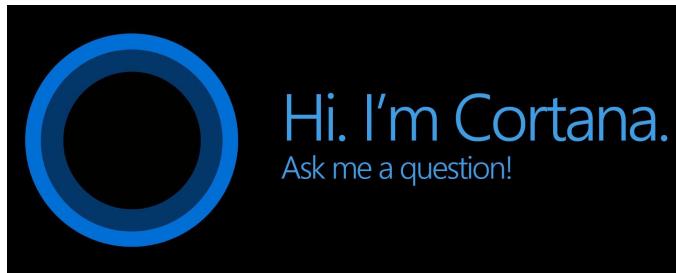
# How Computers Work



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

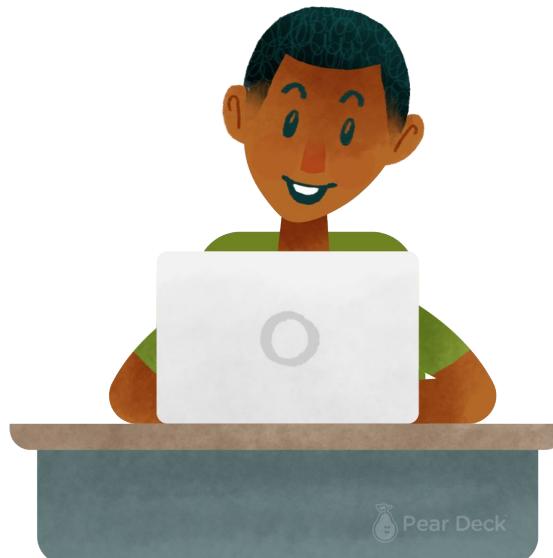


# How Computers Work



???

# 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?



4

5

6

7

8

9

10

USWAY<sup>©</sup>  
Students choose an option

ENT YOURSELF

# Operating Systems



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

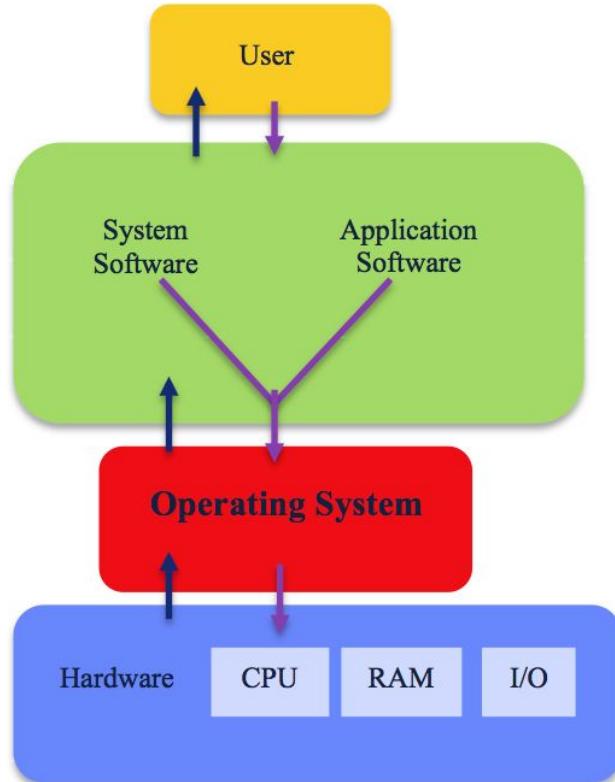
# Operating Systems

- **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

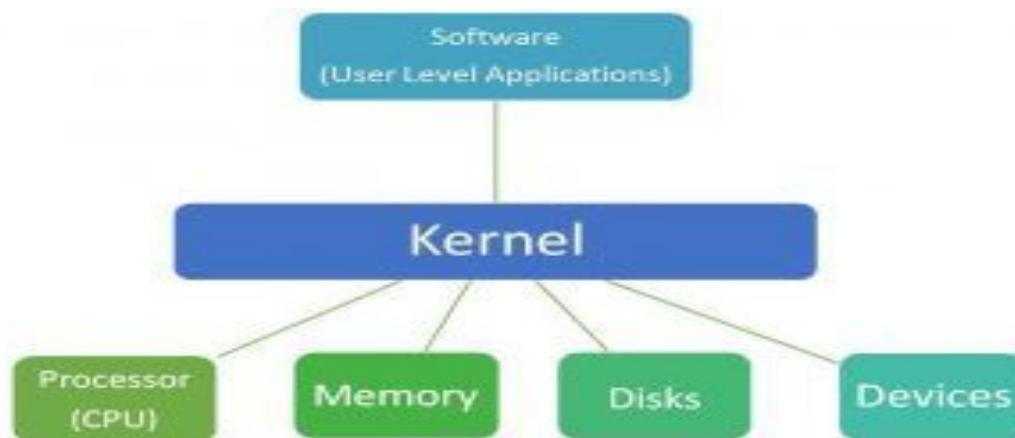




# Operating Systems

## 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.

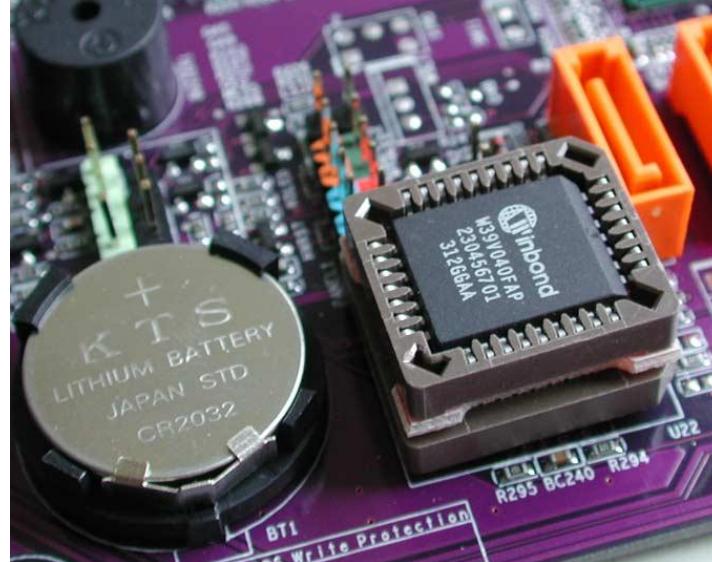
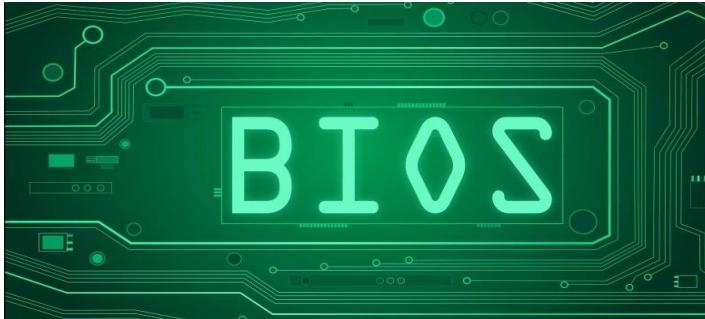


# Operating Systems



## **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!

Pear Deck Interactive Slide  
Do not remove this bar

# Operating Systems



Linux



# Operating Systems

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



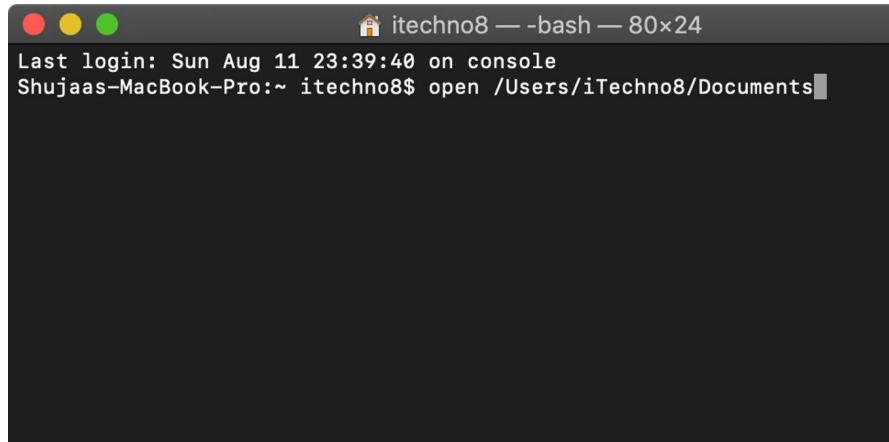
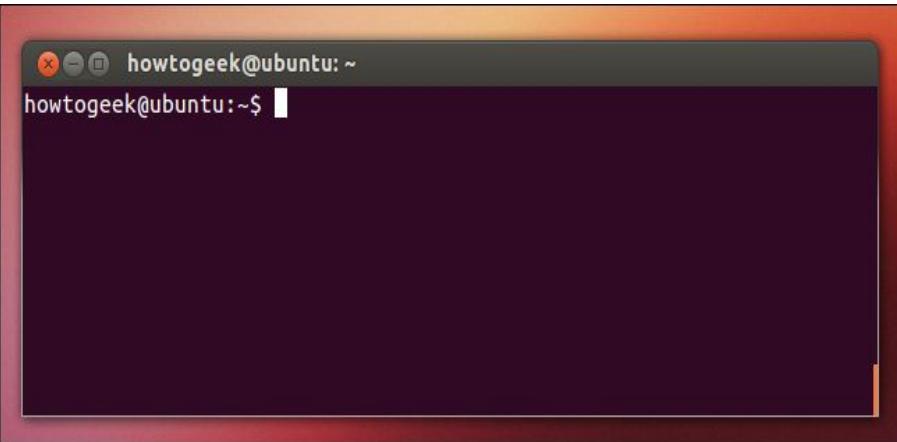
SWAY<sup>©</sup>  
REINVENT YOURSELF

Students, write your response!

Pear Deck Interactive Slide  
Do not remove this bar

# Operating Systems

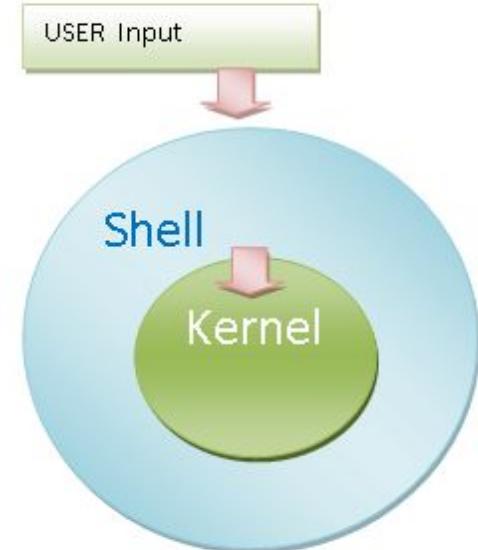
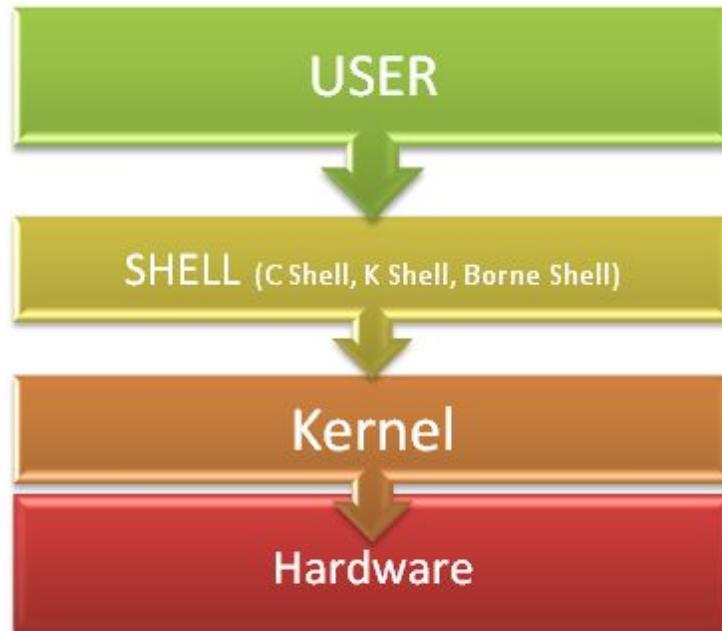
- **Terminal**





# Operating Systems

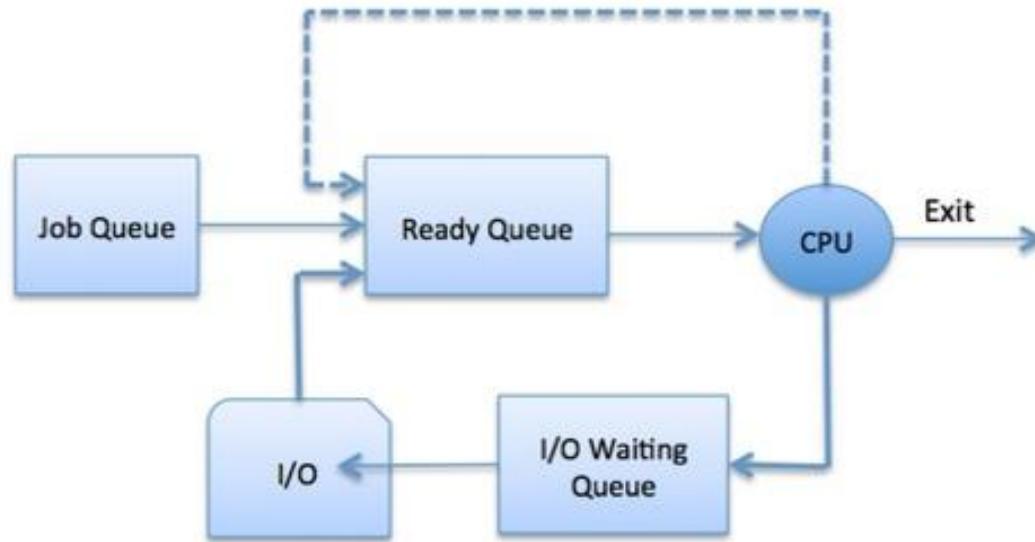
- **Shell**





# Operating Systems

## What do you know about scheduling?



# Operating Systems



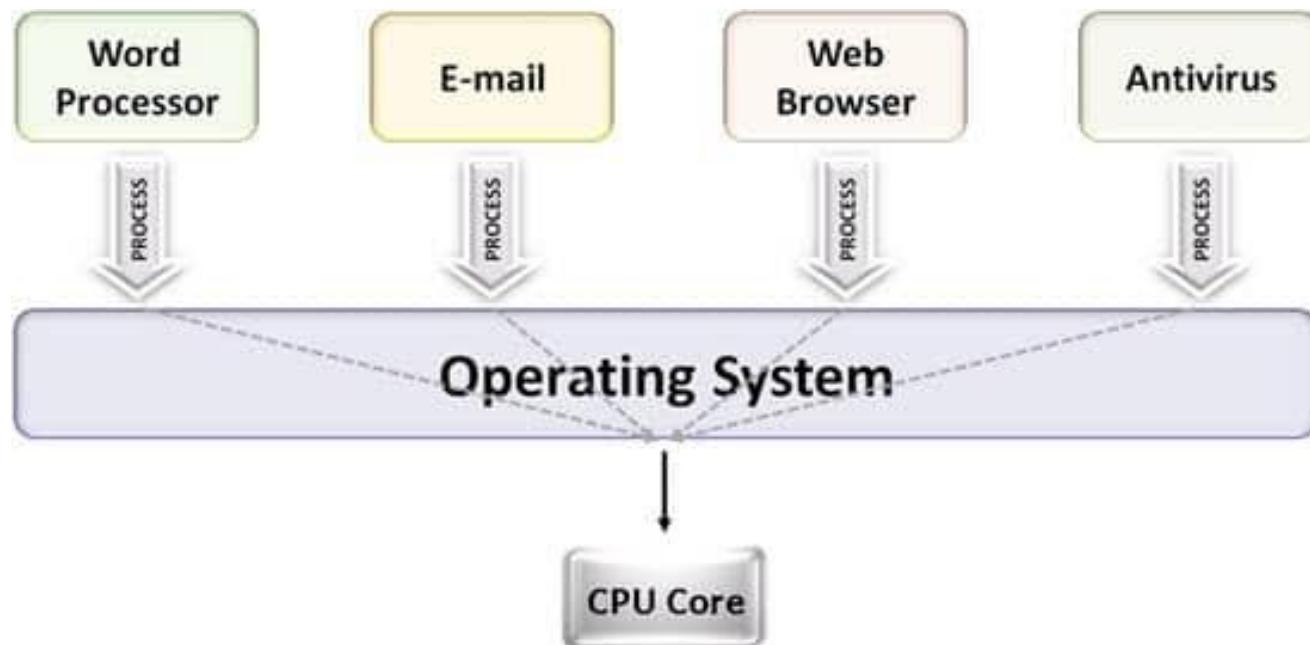
## Scheduling

- Multiprogramming
- Multiprocessing
- Multithreading



# Operating Systems

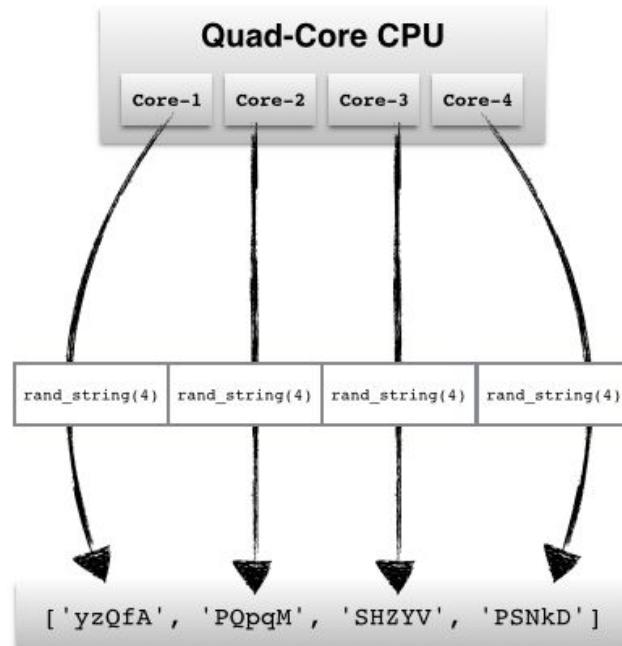
- Multiprogramming



# Operating Systems



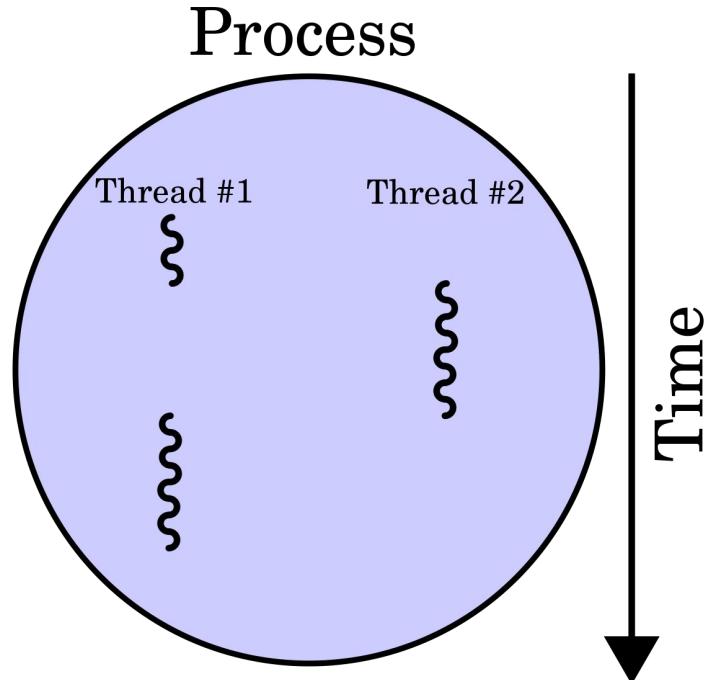
- Multiprocessing  
[parallel processing]



# Operating Systems



- Multithreading



# Operating Systems



**What is the difference between processes and threads?**



SWAY<sup>©</sup>  
REINVENT YOURSELF

Students, write your response!

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Do not remove this bar

# Operating Systems



- **Files:**

Files are spaces on your computer where data is stored.





# 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
Administrative	
Added By:	Robert Godino
Date Added:	26/11/2016 8:19 pm
Encoded With:	iTune v7.6.1
Media Kind:	MPEG audio file

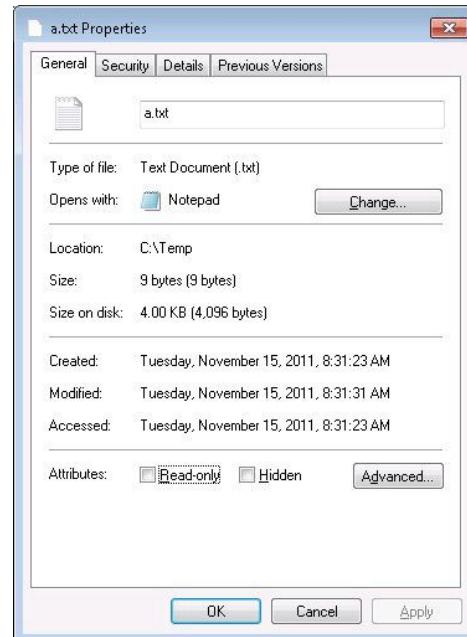
**Elements**      **Values**

# Operating Systems



- **File Attributes:**

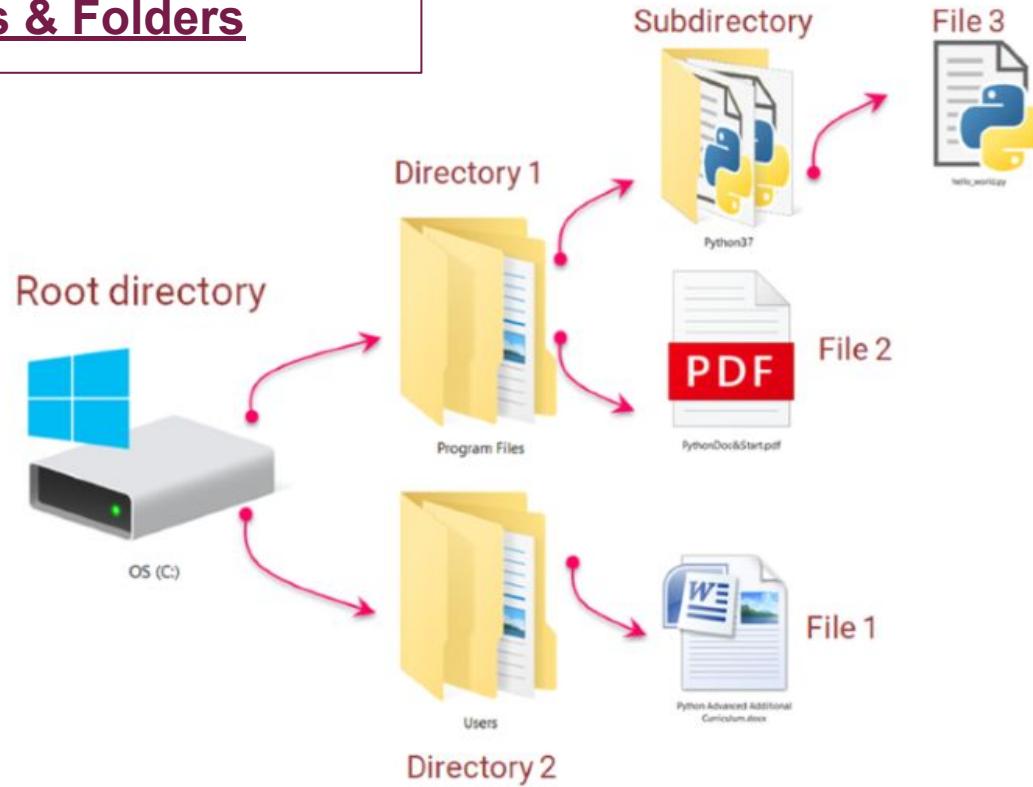
File attributes are metadata associated with computer files that define file system behavior.





# Operating Systems

- **Directories & Folders**

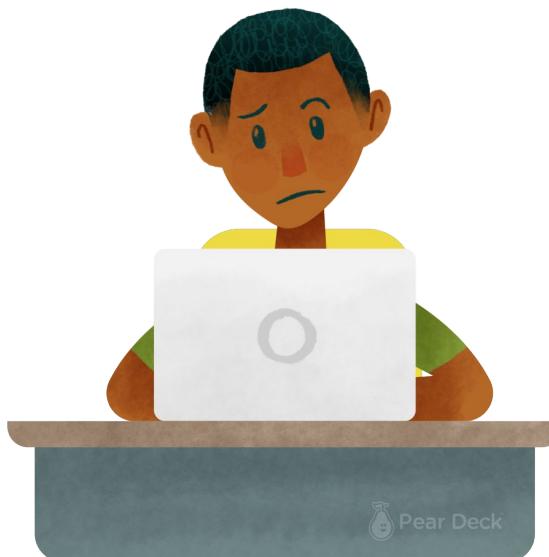




# Drag your dot to how you are feeling:



Keep going, I understand



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Stop, I need help!



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REINVENT YOURSELF



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# THANKS!

## Any questions?

