



Computer Fundamentals





Agenda

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

Introduction



1

Were you able to finish
pre-class material?



USWAY[©]
CHOOSE YOURSELF

Students choose an option

Pear Deck Interactive Slide
Do not remove this bar

Introduction



How long did it take to finish it?



USWAY[©]
Students choose an option
IDENT YOURSELF

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What is Computer





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

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What is Computer

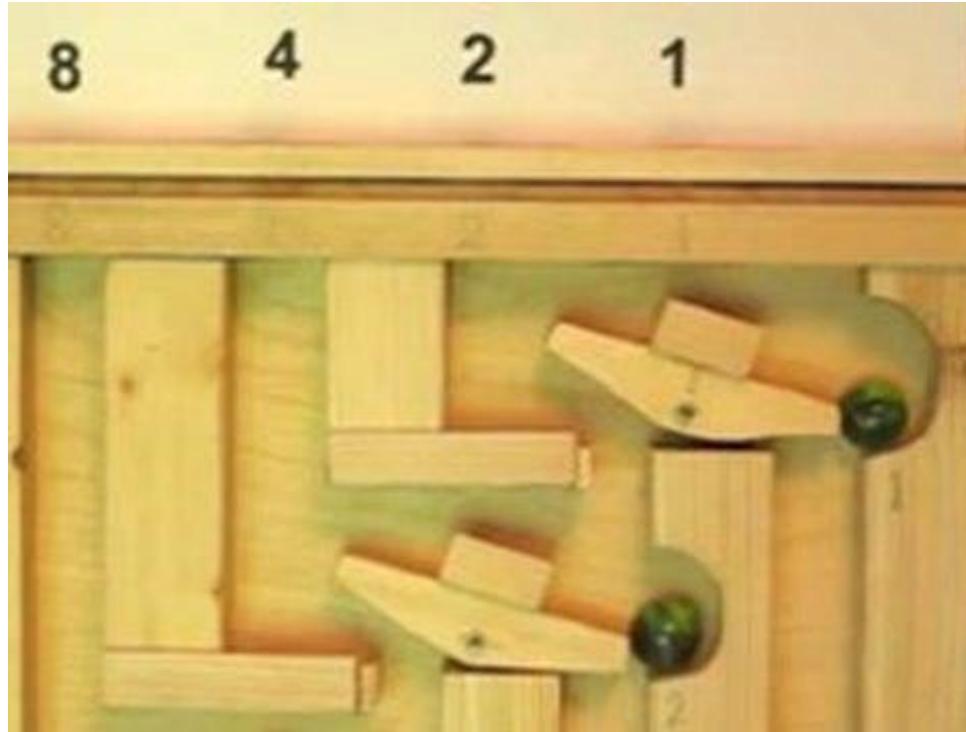


What is Computer



Students choose an option

What is Computer



USWAY[©]
INVENT YOURSELF

Students browse: www.youtube.com/embed/GcDshWmhF4A

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What is Computer

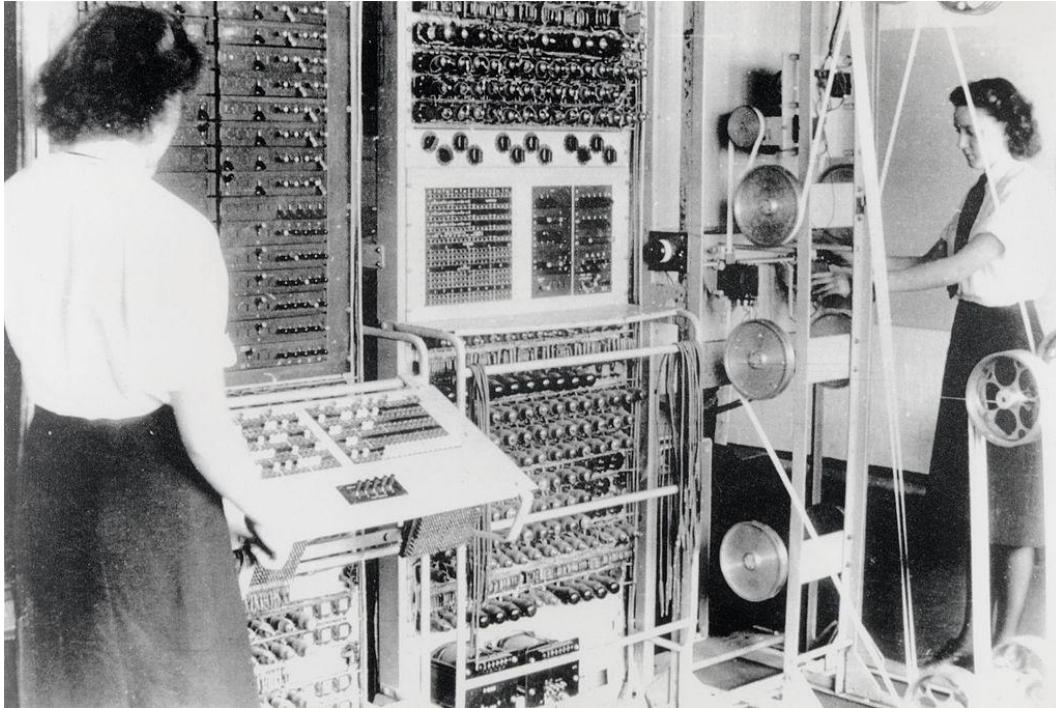


What is Computer

- 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**.



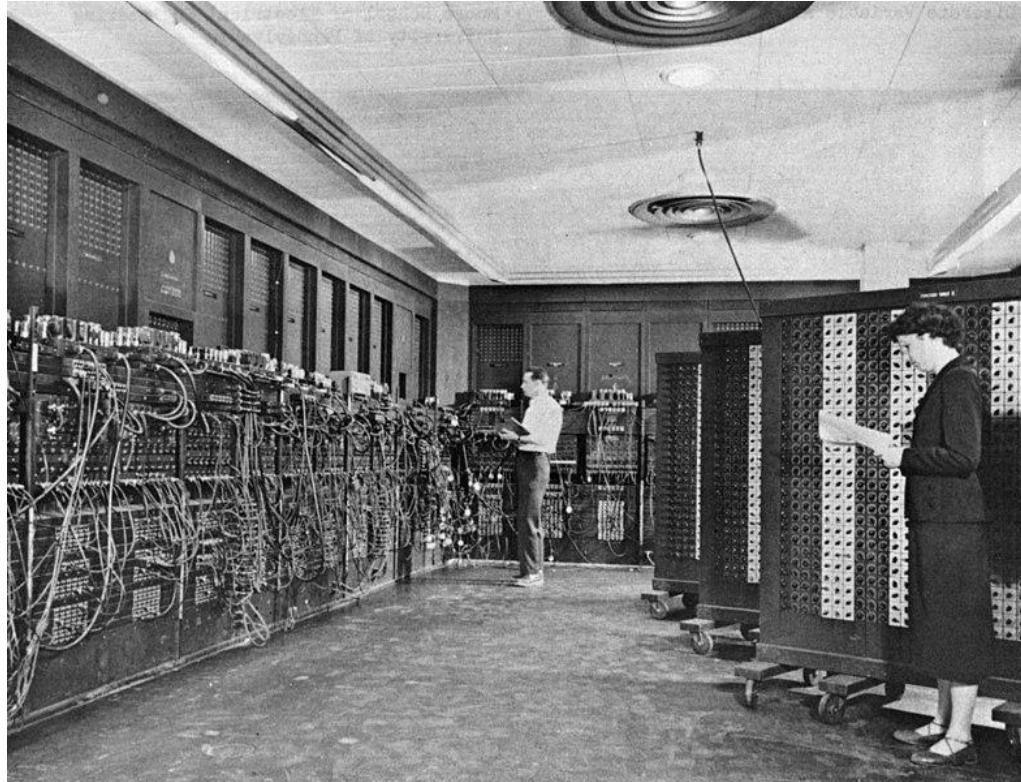
What is Computer



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

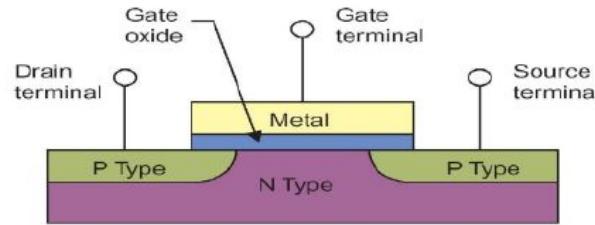
- So how does computers work?
- Let's shop on Apple.com



How Computers Work

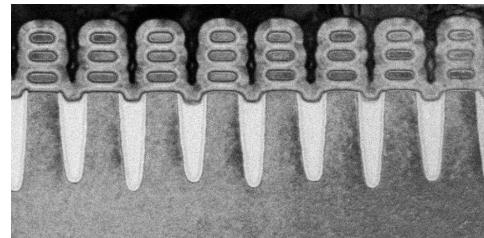


- **TRANSISTORS**



1956 Nobel Prize in Physics

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

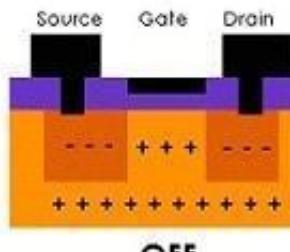
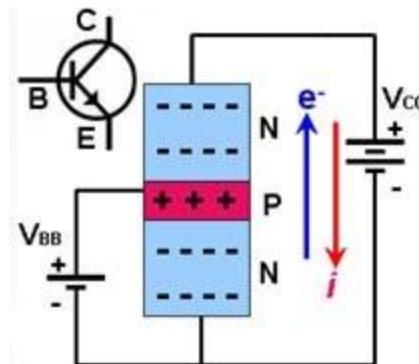


IBM's 5nm transistors

How Computers Work

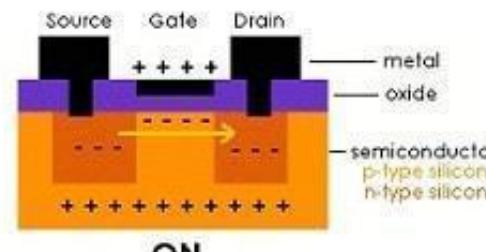


- **TRANSISTORS**



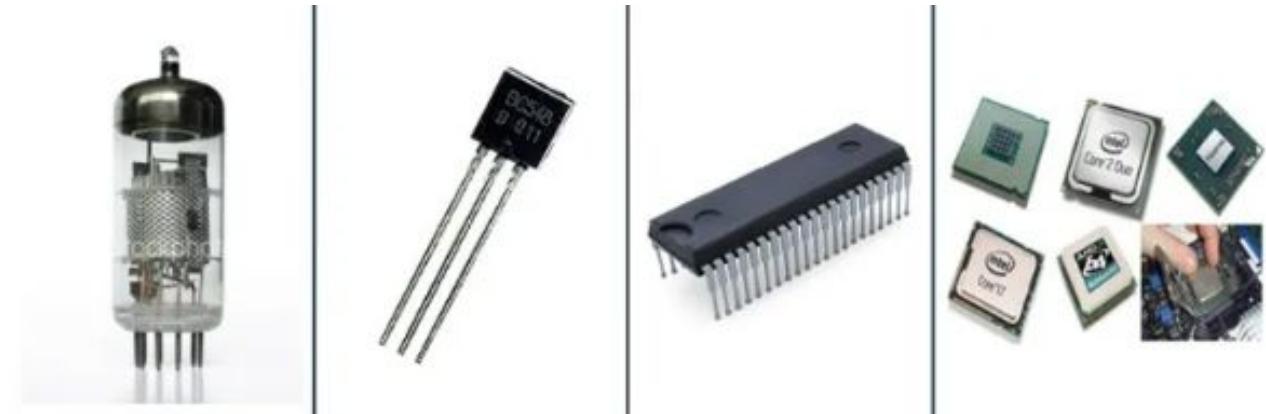
— metal
— oxide
— semiconductor
p-type silicon
n-type silicon

OFF



ON

How Computers Work



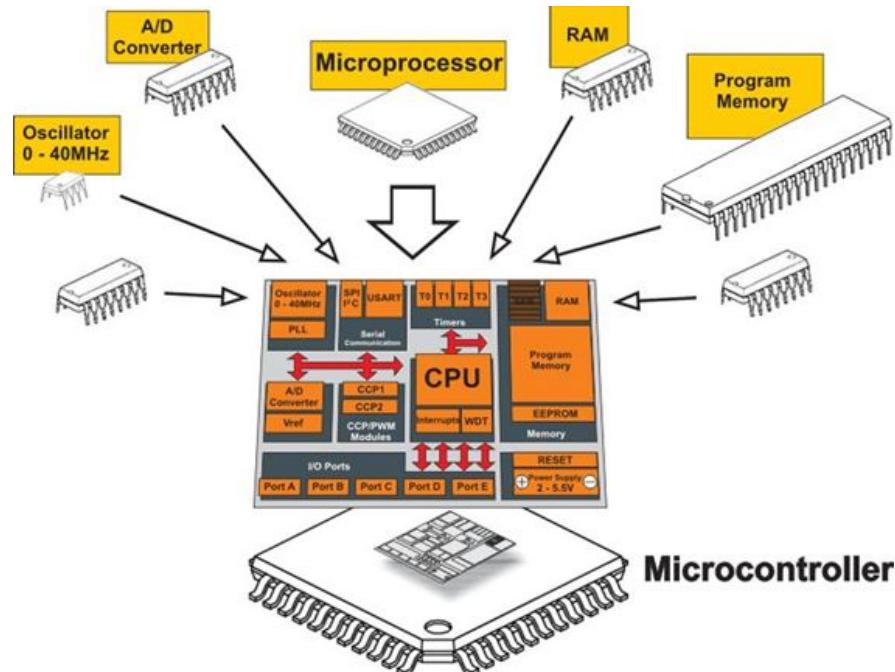
Vacuum Tube

Transistor

Integrated Circuits
(IC)

Micro Processor

How Computers Work





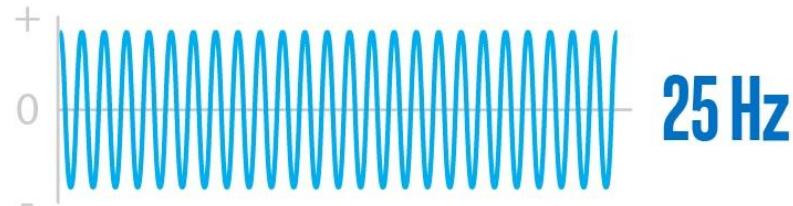
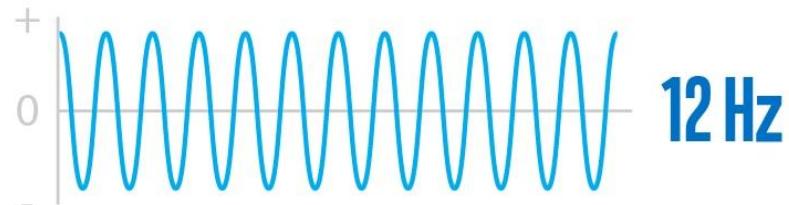
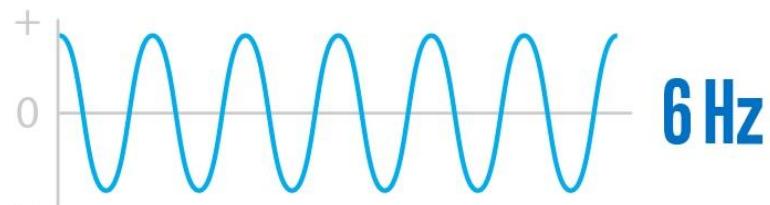
How Computers Work



**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

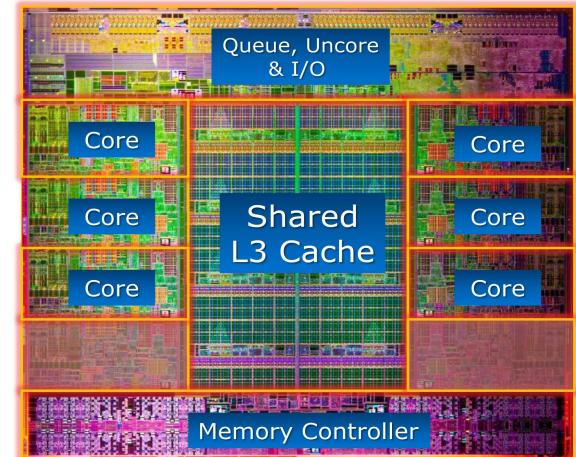
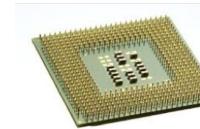
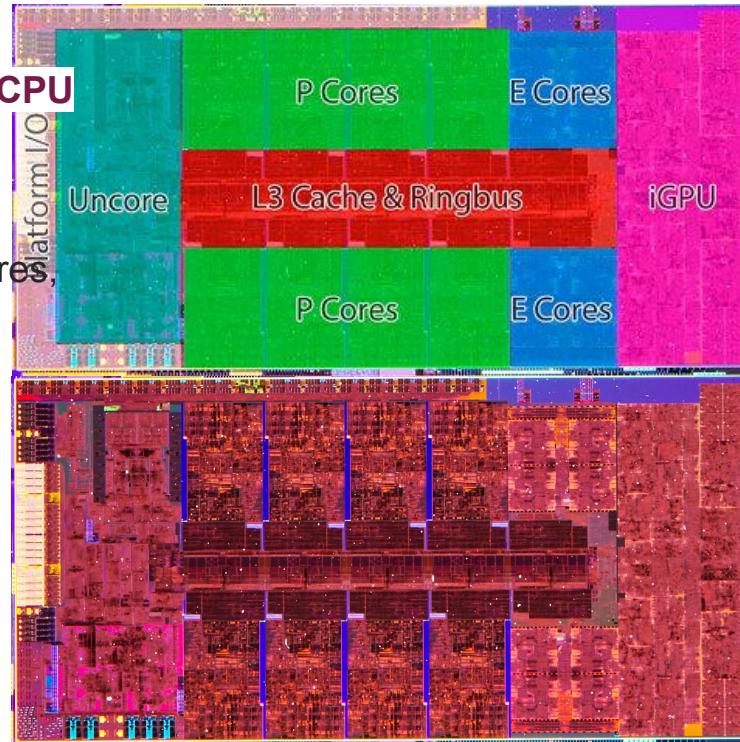


How Computers Work



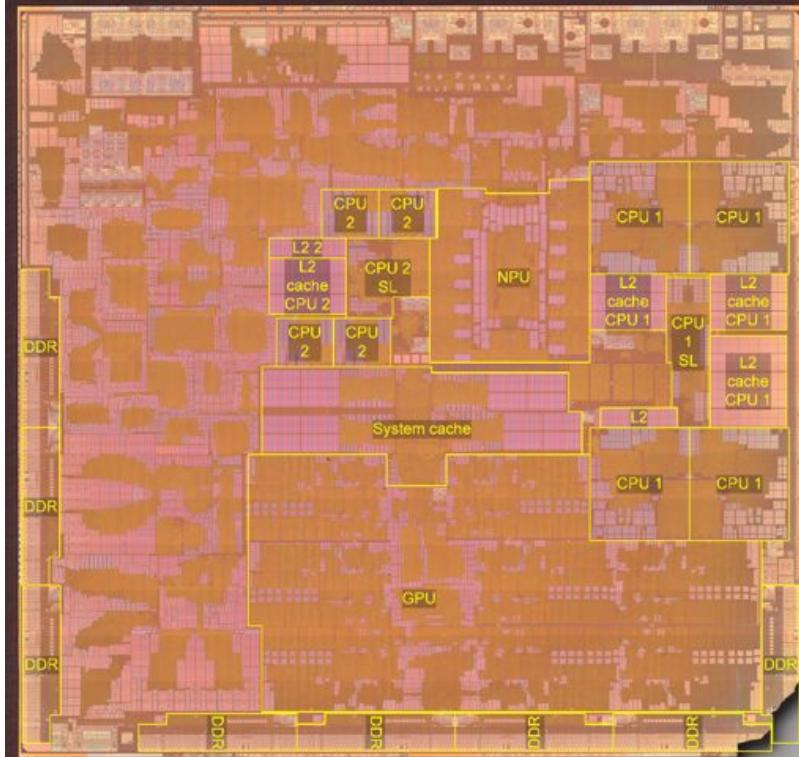
Intel i9-12900K CPU die photo

- 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





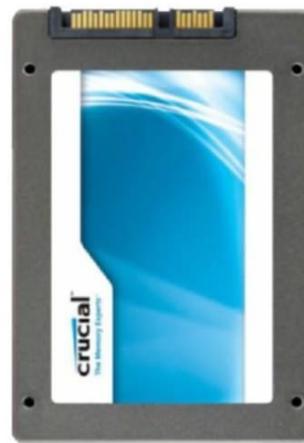
How Computers Work

Hard Disk Drive (HDD) vs SSD vs NVMe

Magnetic- SATA3



SSD - SATA3



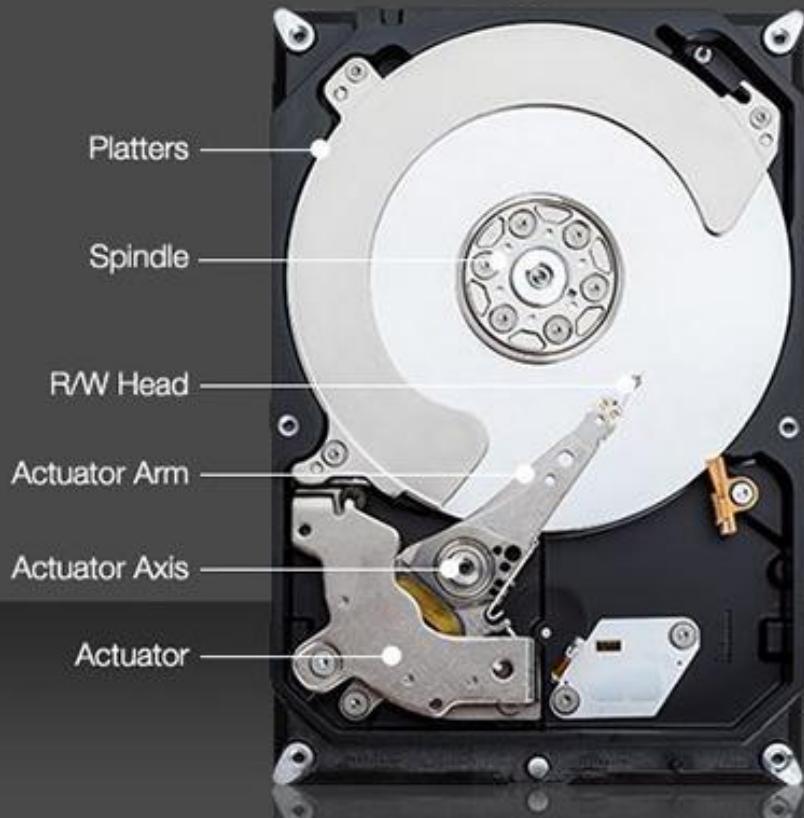
SSD - NVMe





HDD

3.5"

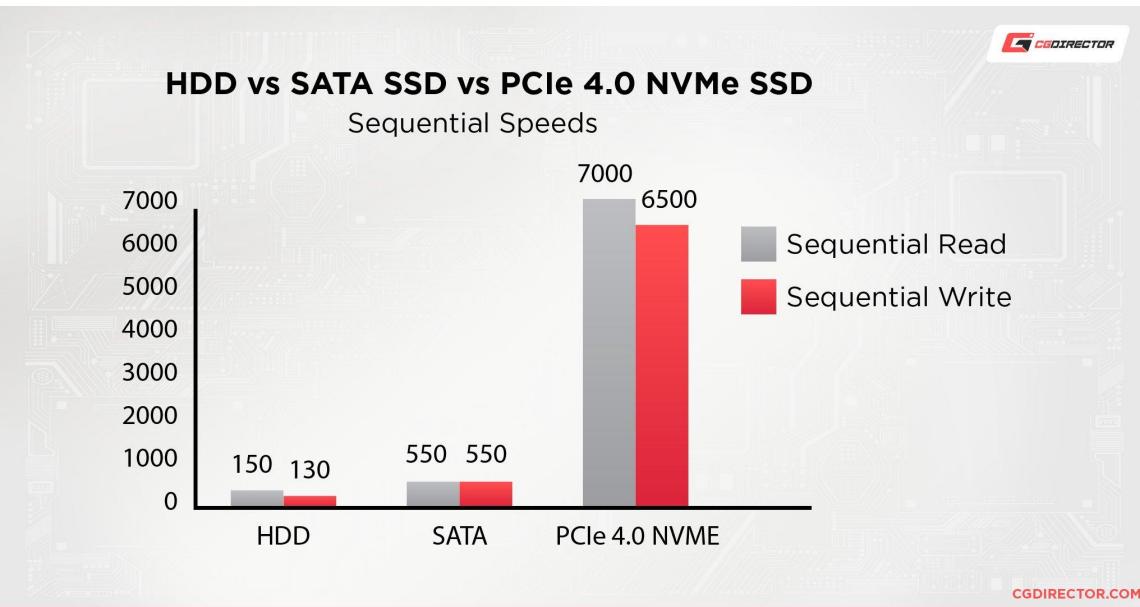


SSD

2.5"

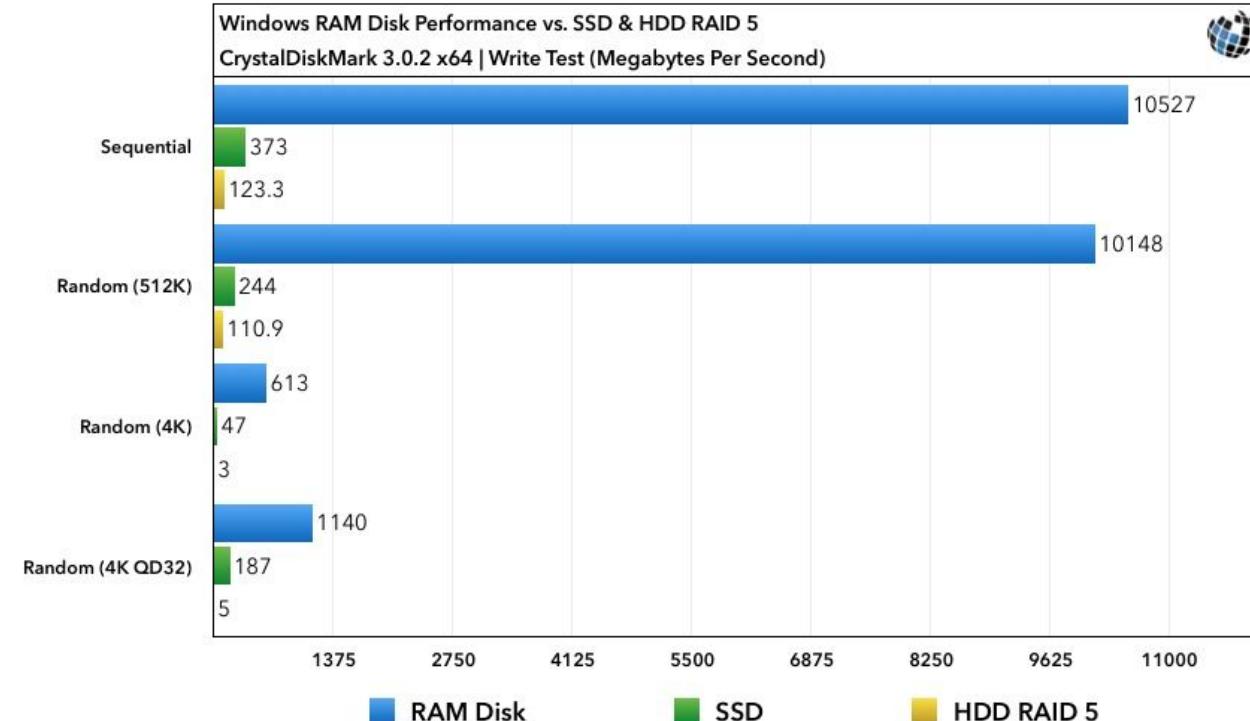


How Computers Work



CrystalDiskMark 5.1.2 x64	
File Settings Theme Help Language	
All	5 1GB F: 80% (1493/1863GB)
Seq Q32T1	102.9 96.08
4K Q32T1	1.896 2.053
Seq	101.7 96.26
4K	0.733 1.735
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	2591 1544
4K Q32T1	728.5 411.8
Seq	2353 1532
4K	56.13 195.0
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>

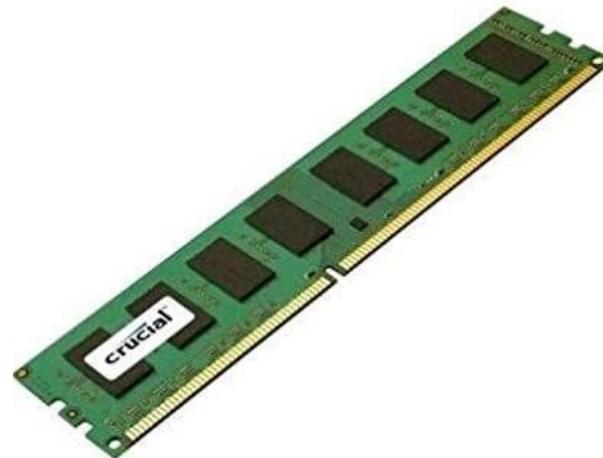
How Computers Work



Question: How about NVMe vs RAM?



VS





How Computers Work

Hard Drive vs RAM

Hard Drive



RAM



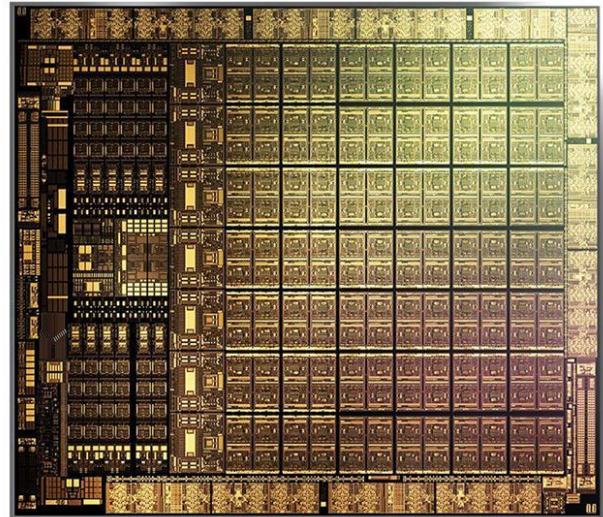
CPU



How Computers Work



GPU (Graphical Processing Unit)

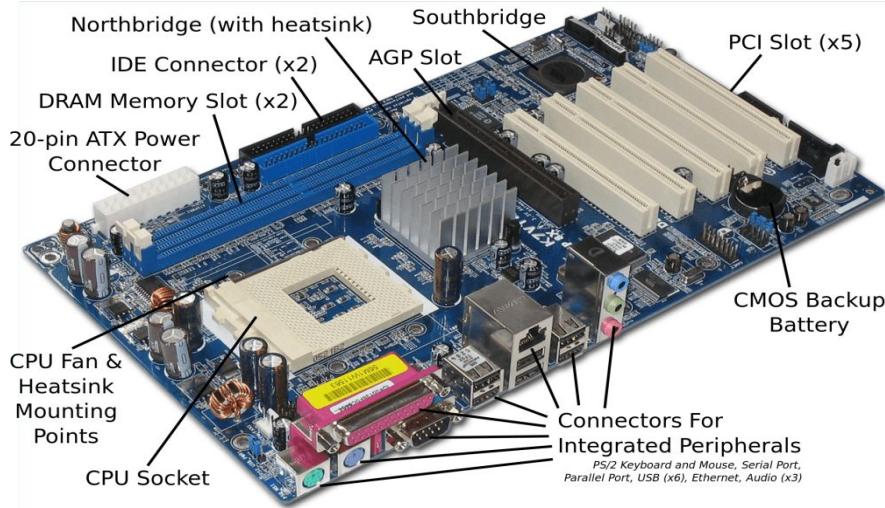


The GeForce RTX 3050's
GA106 GPU

How Computers Work



Mainboard or Logic Board



New Generation motherboard (Intel i9)



How Computers Work

Input and Output Devices



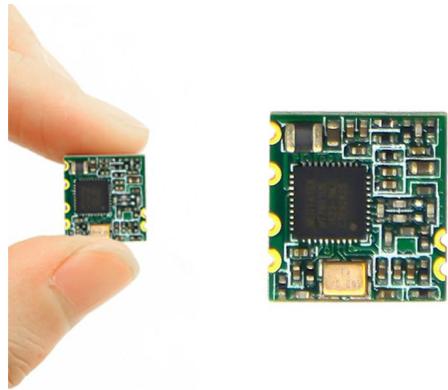
Students, write your response!

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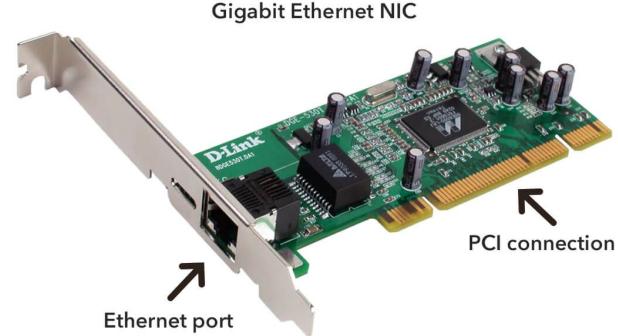
How Computers Work



- **Communication Devices**



Wireless Adapter



Network Interface Card

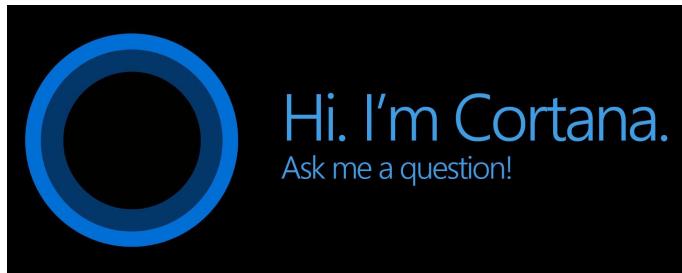
How Computers Work



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

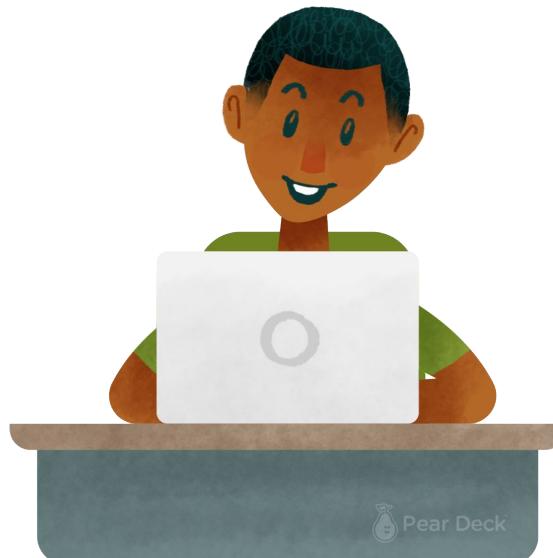


How Computers Work



???

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?



Students choose an option

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Do not remove this bar

Operating Systems



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

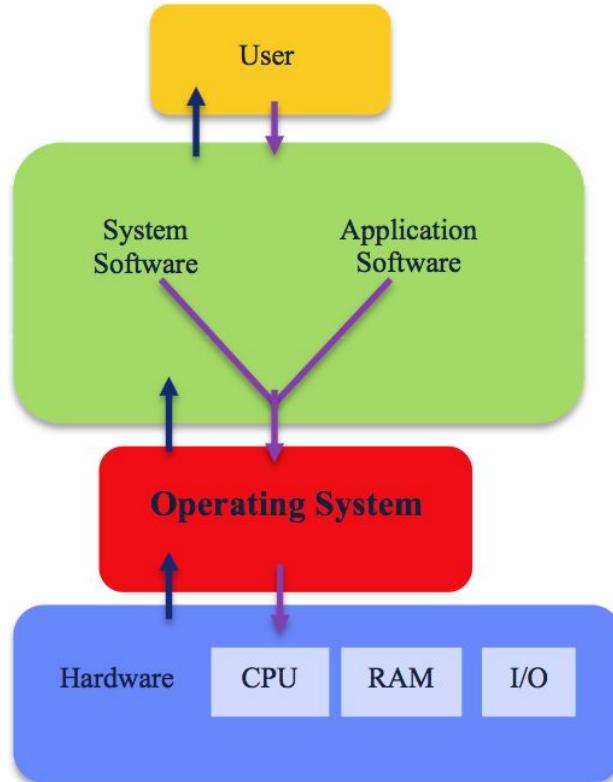
Operating Systems

- **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

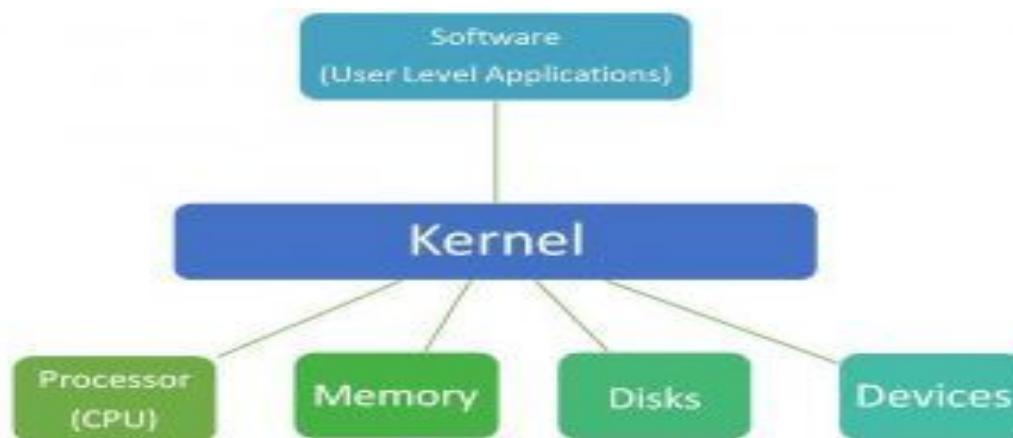




Operating Systems

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.

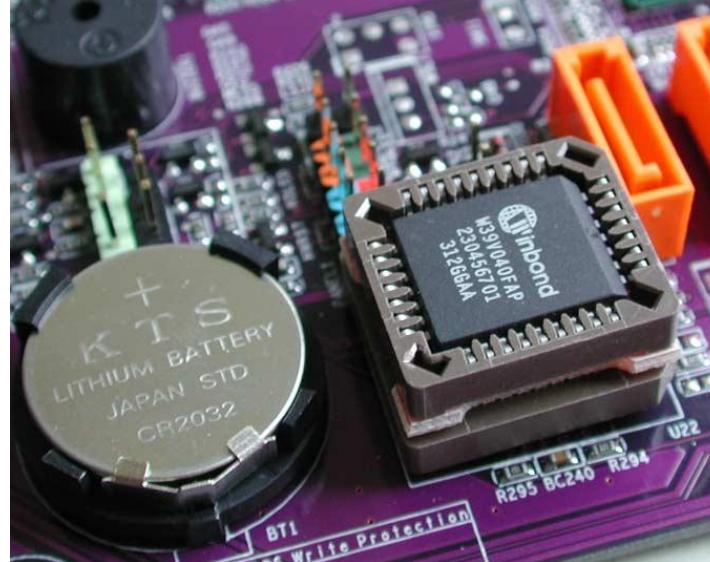
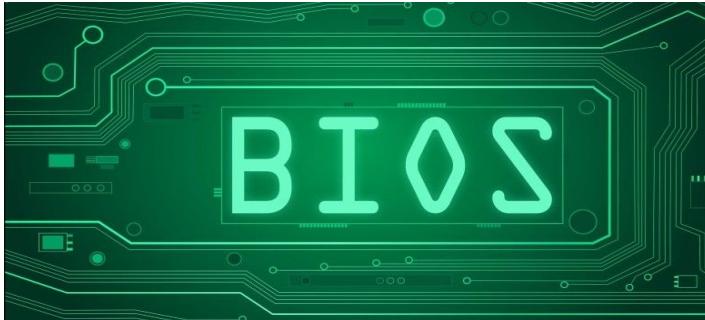


Operating Systems



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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Do not remove this bar

Operating Systems



MacTMOS



Linux



Operating Systems

Please write your computers and mobile phones operating system.



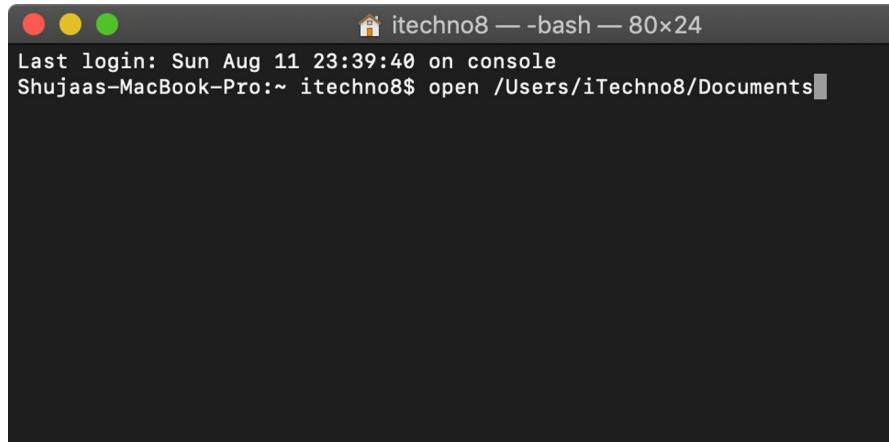
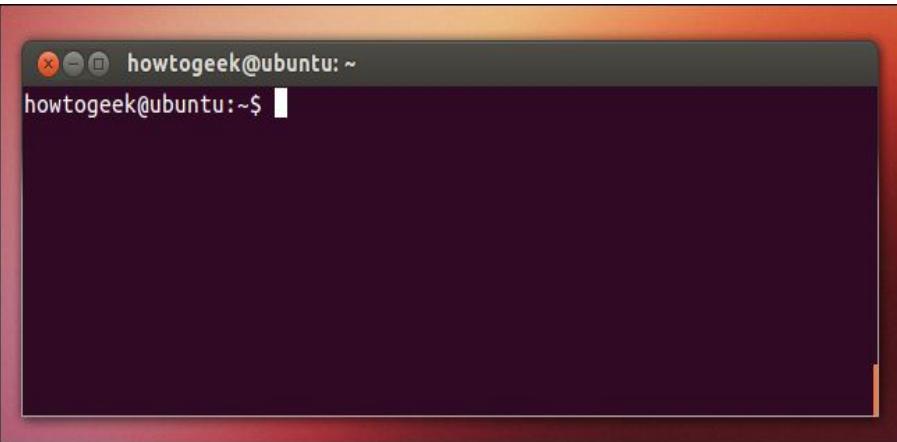
SWAY[©]
REINVENT YOURSELF

Students, write your response!

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Do not remove this bar

Operating Systems

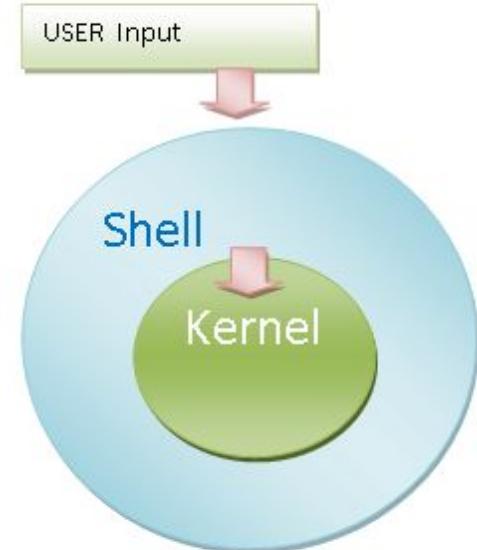
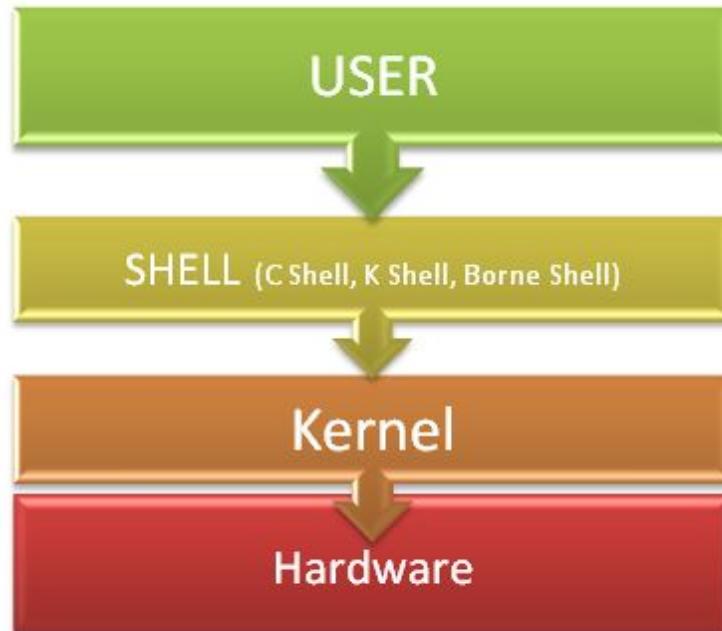
- **Terminal**





Operating Systems

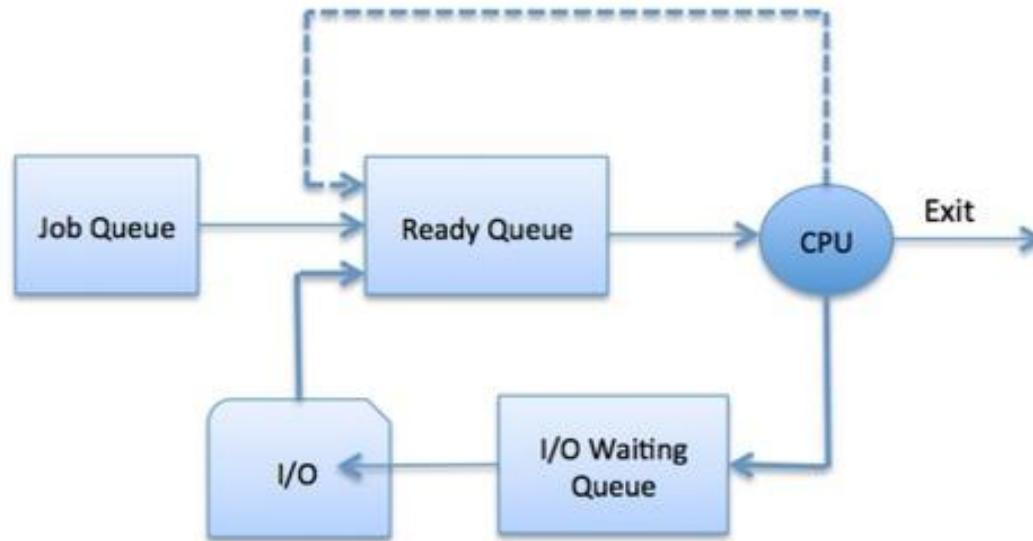
- **Shell**





Operating Systems

What do you know about scheduling?



Operating Systems



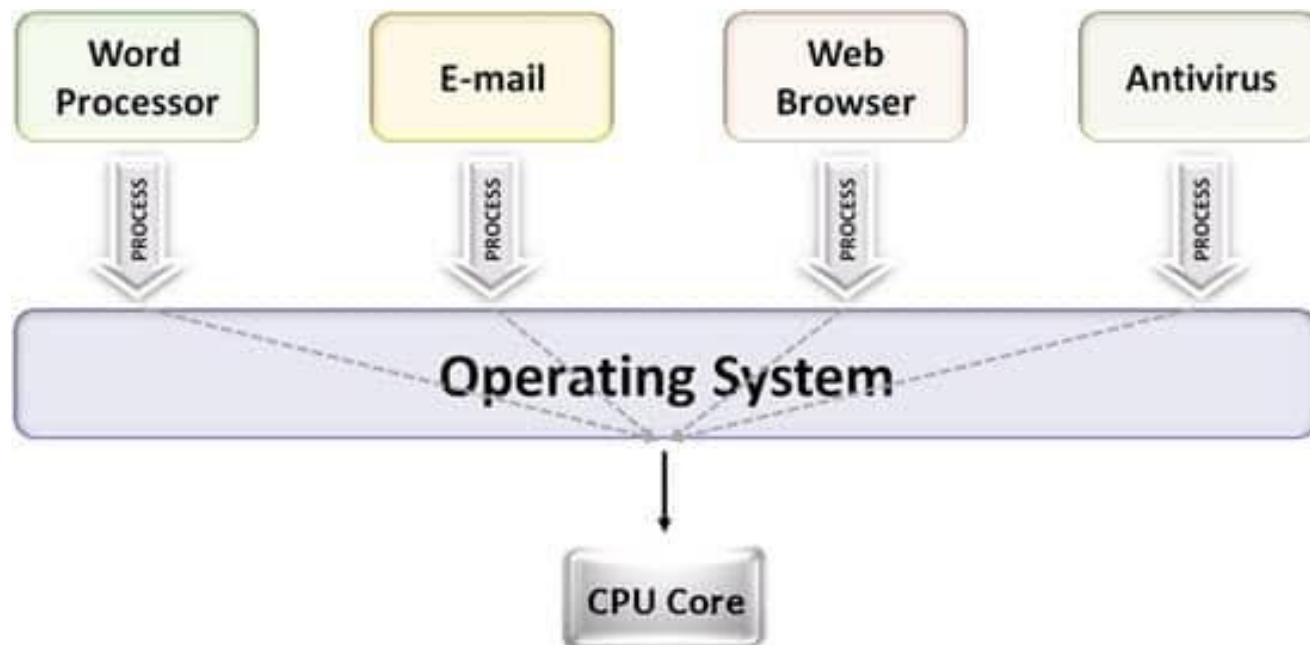
Scheduling

- Multiprogramming
- Multiprocessing
- Multithreading



Operating Systems

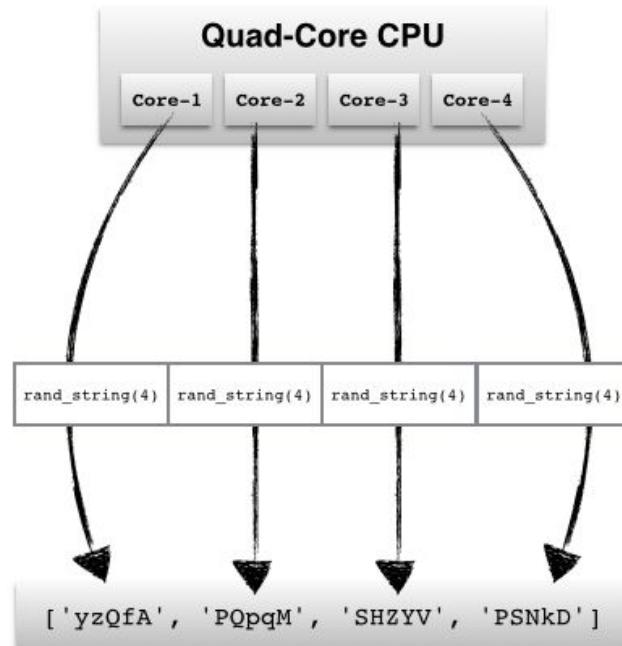
- Multiprogramming



Operating Systems



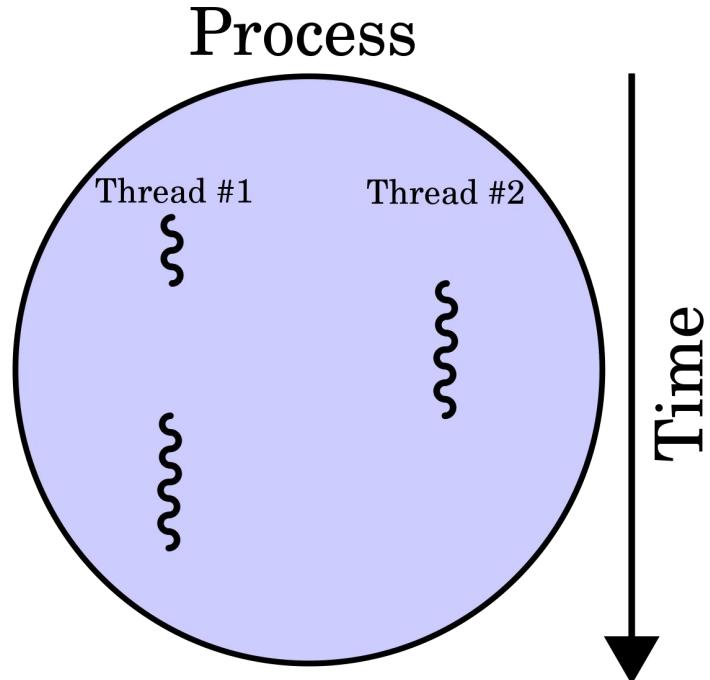
- Multiprocessing
[parallel processing]



Operating Systems



- Multithreading



Operating Systems



What is the difference between processes and threads?



SWAY[©]
REINVENT YOURSELF

Students, write your response!

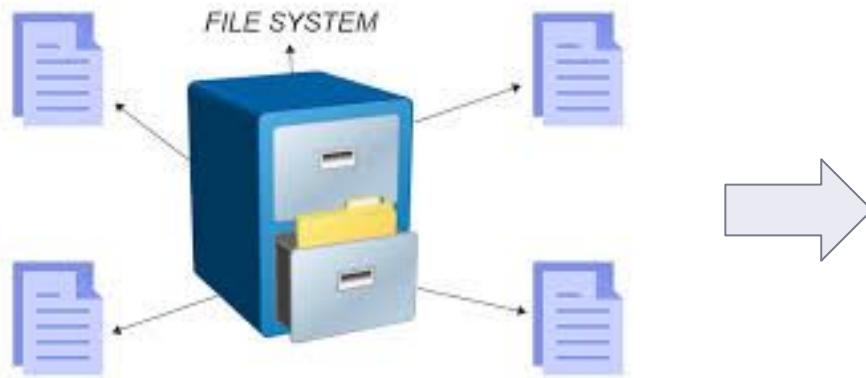
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Operating Systems



- **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

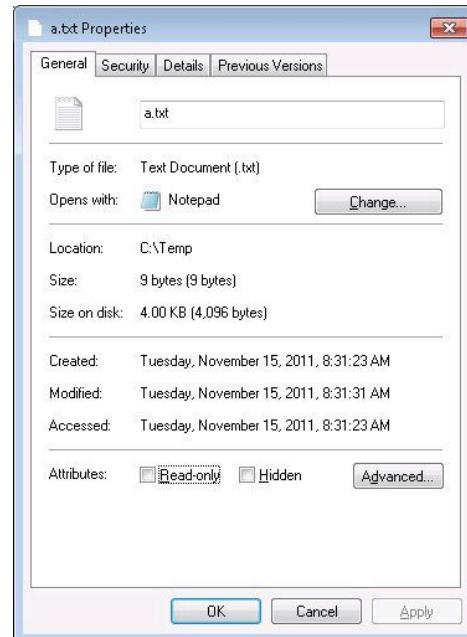
Elements **Values**

Operating Systems



- **File Attributes:**

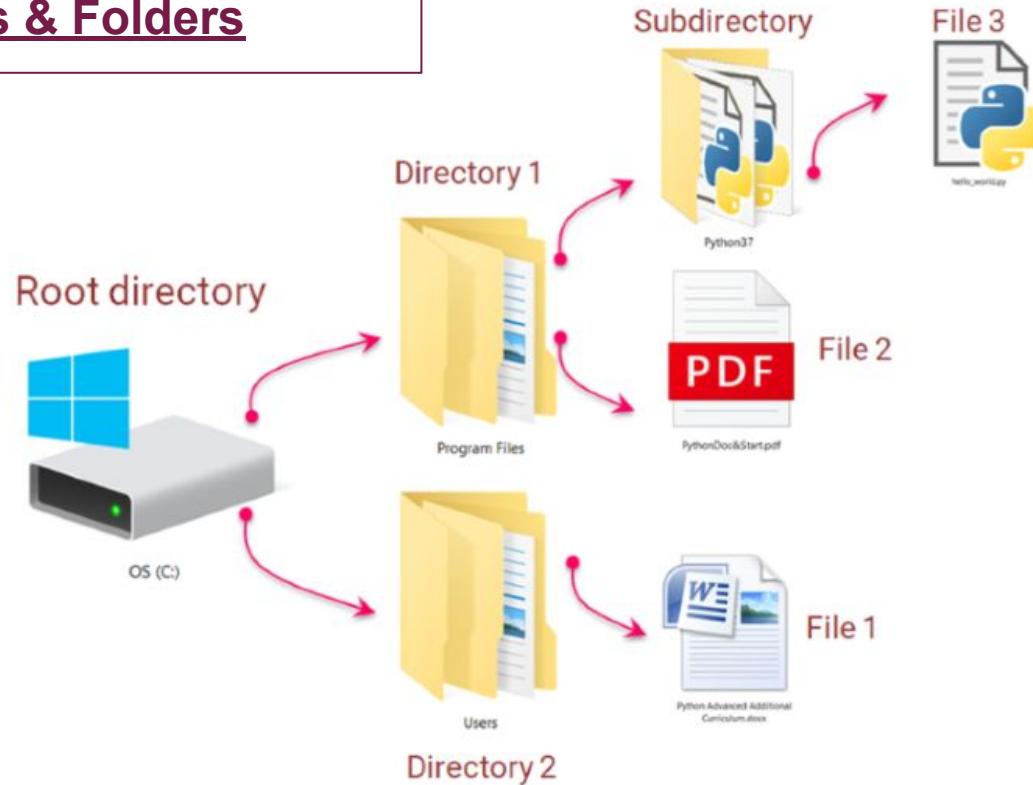
File attributes are metadata associated with computer files that define file system behavior.





Operating Systems

- **Directories & Folders**

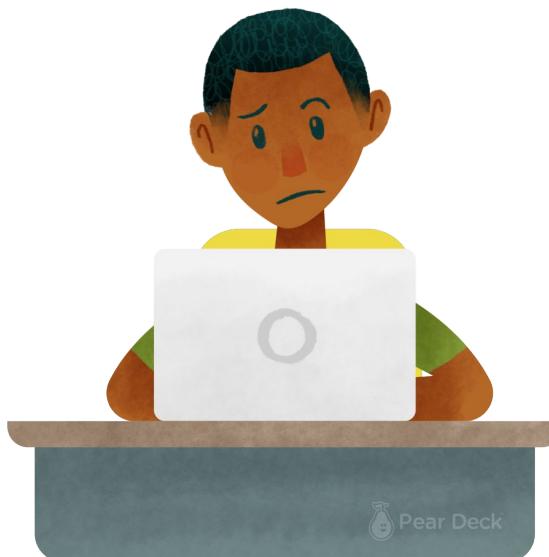




Drag your dot to how you are feeling:



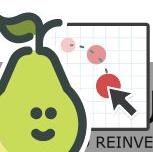
Keep going, I understand



I'm a little confused



Stop, I need help!



Students, drag the icon!

REINVENT YOURSELF



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Do not remove this bar

THANKS!

Any questions?

