

Introduction To Computers

Just, stay with me on this one

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What is a computer?

- It is a programmable electronic device or machine that can store, retrieve and process data. The instructions carried out usually build on simple arithmetic and logical operations to perform complex tasks
- The main component is a CPU – Central Processing Unit. It is made up of transistors that only understand binary i.e. 1's and 0's, Logic High's and Logic Low's
- Today's CPUs are an example of the [Turing Machine](#)
- Uses peripherals (mouse, touchpad, keypad) for interface

Computer Components - CPU

- The CPU is the main part of a computer. It's responsible for everything that happens from boot up to shut down. It runs all your programs and decodes all the series you binge. That's why the speed of it is important.
- CPU's are generally ranked by their speed measured (nowadays) in GHz i.e. the number of operations it can do in one second, for example:
 - 3GHz - 3×10^9 processor cycles per second
- Multi-core designs. A core, for simplicity, is another processor on the same chip.
- The average user runs different programs at the same time and these cores enable a processor to multitask.
- 'Hyper Threading' by Intel allows one core to runs two threads (loosely translated to programs) simultaneously. The only two processor manufacturers are Intel and AMD

Computer Components - CPU

- CPUs come in one of two architectures 32-bit (x86) or 64-bit. You'll rarely see 32-bit machines these days however
- 32-bit applications can work on 64-bit systems but 64-bit apps can't run on 32-bit platforms
- Architecture determines the amount of address lines to memory (RAM) and by extension how a program is written to use the address lines
- A 32 bit processor can only address $2^{32} = 4,294,967,296$ bits = 4,294,967,296 / 1024 bytes = ~4 Gigabytes of RAM
- A 64 bit processor can address $2^{64} = 18,446,744,073,709,551,616$ bits = 18,014,398,509,481,984 / 1024 bytes = ~18 Terabytes of RAM 🤖

Computer Components - GPU

- GPU – Graphics Processing Unit
- If the CPU is the brain and is so powerful, why do we need a GPU?
- CPUs are good at processing instructions in **sequence**. GPUs are good at processing instructions in **parallel**
- A GPU has to output one image (frame) to your screen at a point in time and every pixel of that image needs to be rendered (drawn, computed) at the same time
- Each GPU comes with a memory rating 1,2,4,6,8GB and the type of memory it uses GDDR4/5/6. So the higher both of those ratings are the better.

Computer Components – RAM

- RAM – Random Access Memory (referred to as memory from here)
- It's measured in GB (gigabytes) and its speed is measured in MHz (Megahertz)
- RAM keeps the instructions of the programs you're running at the ready for your beck and call. RAM is volatile, only keeps state if power is applied
- It needs to be fast and randomly accessible because there's no way to tell what a user is going to do or open.
- Today's consumer grade machines run on Double Data Rate v4 (DDR4) RAM and usually start out around 4GB of RAM and the highest speed is around 3200MHz

Computer Components – HDD, SSHD, SSD

- Okay, what? It seems like the people who design these things just like to make abbreviations no? In any case here's what each one means:
 - HDD – Hard Disk Drive
 - SSHD – Solid State Hybrid Drive
 - SSD – Solid State Drive
- That probably didn't do much in terms of clearing it up. Before we go deeper, let's explore what storage is and how it's measured.

Computer Components – HDD, SSHD, SSD

- The previous section mentioned RAM which is memory and this section talks about storage which essentially memory as well.
- Machines need long term, non-volatile (HDD, SSHD, SSD) and short term (RAM) memory. RAM only contains things when the machine is powered up and running or in sleep. Storage keeps things when you turn your system off.

Computer Components – HDD, SSHD, SSD

- Storage is measured in Gigabytes (GB) nowadays so the higher the number of GB the better. It should be noted that 1TB(Terabyte) = 1000GB.
- SSD is the fastest and HDD is the slowest.
- SSDs have no moving parts but HDDs do. Those moving parts introduce a considerable amount of time into reading and writing data.
- SSHDs have moving parts but they also have a bit of 'SSD or flash' memory in them hence the 'hybrid'.
- HDDs also come in speeds of 5400RPM and 7200RPM, the latter being the better

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Computer Components – I/O

- Input/Output
- This refers to the ability of your computer to interface with another components through standard interfaces like:
 - Ethernet
 - USB 3.x , 2.x and C
 - Thunderbolt
 - WiFi
 - Bluetooth

Operating Systems


- There a wide variety of OSs available:
 - *Windows 10, 8.1, 8, 7, Server, XP*
 - *MacOS Catalina, High Sierra*
 - *Ubuntu*
 - *Linux*
 - *And much more*

Operating Systems

- They all provide an interface, a layer of abstraction, between a specific machine and the software and firmware that's run on it
- Think about the millions of different computer hardware setups that exist, but most of the time if it runs an OS you're familiar with, you can use that hardware setup
- OSs handle everything on your computer, but even more important than that is your BIOS, which is, for further reading

Questions?

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 github.com/simeon9696/programmingworkshop