**Storage Devices of a computer**

*Introduction and preface*

What is a storage device you may ask ? Well when I refer to something as a storage device in the interest of computers, I am referencing those devices that enable the digital( not tangible ) storage of information, e.g documents, programs( such as a web browser and Microsoft office for example ), etc. In other words they allow a computer to save things for future access.

There are two main types of devices that are used in laptops( sandwich like build ) and desktops( non-portable towers ), hard disk drives( HDD ) and solid state drives( SSD ). By the name of the first you would be right in thinking it contains some form of disk, however maybe the structure of the second is not immediately apparent, not to worry though I will explain both and compare them at the end.

*Hard Disk Drives( HDD )*

As mentioned before, a ‘HDD’ contains a disk, one that spins for that matter. It is this spinning disk which we call a platter( typically 3.5 inches in diameter )that is used to store information. I will now outline the functions/operations that a ‘HDD’ is used for:

- Writing information or in the case of computers, data

- Reading data that has already been written

- Deleting or overwriting previously written data

\*note: imagine that you are writing out a shopping list of which you will read from in the future when you need the information and can make changes to it using an eraser\*

“But how can you write all of my documents onto a simple disk?” You may ask, well its about time I get to that. The first thing you need to know is how a computer stores its data , that is using purely ‘ones’(on state) and ‘zeros’(off state), or a binary number system, as opposed to storing the literal letters of the alphabet or the decimal( 0-9 ) number system you are likely familiar with. There are a few main components that allow for this mechanism:

- The platters superficial magnetic media layer

- Read and write heads, which are placed just close enough to the platter

- The actuator, which is comprised of an arm attached to a motor which also holds the read and write heads at the end of it

- The spindle, which is an electrical motor that controls the speed of the platter

- The chassis or case that will enclose the circuits and keep it protected

“Wow that’s a lot of words”, you might be thinking. But don’ t worry I will try not to ramble on, essentially data is stored using magnetic fields. The write head converts electrical current from the power supply( what is plugged into the power outlet ) in your computer to a magnetic field which is then transferred onto the platters aforementioned magnetic media, the reverse of this is what the read head does. It is not to important to understand all that but I hope you can see how the two states, 1(on) and 0(off) are able to be stored across the entire disk when it is spun.( either way i have drawn a diagram to try and represent this )note : a strong magnetic field that is read represents 1 and a weak, 0

**10010011001111000000110101001110100000001101001110100001010110001101**

**101100000101011101101001111000111101011011010**

**100100110011110000001101010011101001110100001010110**

**11110000001101010011101001110100001010110**

To contextualize this for those who have ever opened a file on their computer, the HDD is instructed to move the actuator arm to a circle that holds the data of the file, which will be read and displayed to you in the case of a text file.

*Solid State Drives( SSD )*

To preface I will not go into all of the intricacies of SSDs, however it is useful to know about them- especially nowadays as they become a more popular choice for speed and reliability. Evident by the name, SSDs are solid state, in other words, have no moving parts.

So how do they operate to store data? - and more imperative, store data even when a power source is removed. Well, they store data in binary, like in HDDs. However unlike HDDs they use Flash Memory cells which use electrical devices called transistors to store electrons. Much like HDDs, SSDs can read, write and erase data. I wont go into how you can refer to the transistors voltage and switch between states by use of separate circuits, for a more detailed explanation I highly recommend this article( p.s it helped me a lot at understanding this fascinating technology ):

<https://www.sciencedirect.com/topics/computer-science/floating-gate-transistor>

For all intensive purposes you can think of them as a switch that has an on and off state.

You may wonder why I have even mentioned SSDs as they essentially fulfill the same purpose of HDDs, in a seemingly more complex manner. Well its important to mention them as they are often the better choice. See list below for the pros and cons of each.

**SSD**

*Pros*

-Fast( no moving parts ), especially with small read operations like booting or

opening programs

-Reliable and smart( they have a controller which allow fail resistant programs to

run )

-Power efficient( again no moving parts drawing a lot of power )

-Compact( when compared to HDDs, often the choice for smaller devices )

-Durable and shock resistant

*Cons*

-Only hold a limited amount of erase cycles( erasing data is taxing SSD’s

hardware )

-Typically more expensive when compared to HDDs( however becoming less of an

argument nowadays )

**HDD**

*Pros*

-Cheaper per bit( 1 or 0 value i.e lowest unit of storage ) when compared to SSDs

-Quite reliable

*Cons*

-Power hungry

-Very hard to fix( the platters require precise alignment on the spindle )

-Relatively slow when compared to SSDs

-NOISY!( my ears are better suited to silence )

That comparison can often be helpful in summarizing what I have discussed and I hope I did not bore you to death trying to explain how all this stuff works. \*See below for refs.\*

References ( placed chronologically by which the most of my information came from )

-<https://en.wikipedia.org/wiki/Hard_disk_drive_platter#References> ( link to references page on wiki article I read )

-Here is a link to a short article written by [Žarko Damjanović](https://www.linkedin.com/pub/%C5%BEarko-damjanovi%C4%87/83/180/677)

<https://hddsurgery.com/blog/hdd-actuator>

-<https://en.wikipedia.org/wiki/Solid-state_drive#References> (brings you to the article’s subsequent references, \*note that I mostly used the section labelled #Architecture\_and\_function )

-Previously referenced article, Jalil Boukhobza, Pierre Olivier( 2017 ) <https://www.sciencedirect.com/topics/computer-science/floating-gate-transistor>