

Research Assignment: Hard Drive Types

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In the digital age, data storage has become a critical aspect of computing. The ability to store and retrieve data efficiently and reliably is paramount for both personal and professional use. There are several types of data storage devices available, each with its unique characteristics and use cases. This paper will delve into three main types of storage devices: Hard Disk Drives (HDDs), Solid State Drives (SSDs), and Solid-State Hybrid Drives (SSHDs), exploring their structure, benefits, drawbacks, and ideal use cases.

Hard Drives:

What is a hard drive? A hard disk drive (HDD) is a data storage device that uses one or more rigid, rapidly rotating disks coated with magnetic materials to retrieve and store data. These types of drives allow computers to access the information of the drive even after the power goes out. HDDs use flash memory and spinning platters to access the information stored on it. According to (Brain, 2000, Para. 3), “The invention of the hard disk drive in 1956 marked a revolutionary leap in data storage technology. Developed by IBM engineer Reynold B. Johnson and his team ... this groundbreaking device used magnetic disks for data storage, allowing for rapid access to copious amounts of information compared to the sequential access of tape drives.” The invention of the HDD led to newer methods that the drive could use to store its data and access it. HDDs do hold several benefits, these include:

- **Capacity:** HDDs offer a wide range of storage capacities, from a few gigabytes to several terabytes for a reasonable price. They are built to meet the needs of specific users.

- **Build:** Built in memory that provides temporary storage to access data and enhanced its performance. HDDs usually have more storage space compared to their counterparts, SSDs. On top of that, HDDs are built to be robust and dependable.

HDDs do contain several advantages and disadvantages compared to their counterparts, according (Webster, 2019), HDDs are more affordable per gigabyte compared to SSDs and SSHDs. They are also ideal for mass storage needs. However, HDDs are slower than their counterparts, they are also more vulnerable to shocks. Finally, they are the noisiest type of storage, they generate noises and vibrations. Now what are the best use cases for HDDs? Generally, you would want to use HDDs for media storage like photos, videos, music, etc. Since HDDs offer cost-effective bulk storage for large media files.

Solid-State Drives:

What about solid-state drives? Solid-state drives (SSD) are another type of storage device that provides persistent data storage without any moving parts. SSDs use integrated circuits to store and retrieve data quickly and efficiently. Unlike its counterpart, HDDs. Each NAND flash chip contains blocks of memory, known as sectors. These sectors allow the SSD to store the information onto itself so that it could gather that information needed. According to (IBM Corporation, n.d.), SSDs try to mimic what the HDDs could do through nonvolatile solid-state memory. However, they are much faster than their HDD counterparts. What benefits do SSDs provide? Here are the benefits:

- **Build:** SSDs have no moving parts, unlike their HDD counterparts. Which makes them less prone to data loss from drops or shocks. They also provide faster boot times, quicker

data transfer, and much higher bandwidth. SSDs are also lightweight and portable, making them ideal for laptops tablets and other small devices.

- **Speed:** Usually, to get an SSD with lots of storage, it would cost more than HDD.

However, they do provide a speed unmatched by their counterparts HDD. Which means quicker operations of the machine.

SSDs do provide several advantages and disadvantages compared to their counterparts. The advantages SSDs include are faster speeds, they can perform the same tasks as HDDs and SSHDs but much faster. They are also more durable, since they contain no moving parts, they are more resistant to shocks and vibrations. Moreover, they are less power hungry than the HDDs. However, they tend to be the most expensive type of storage per gigabyte. Though improved, SSDs do have a finite number of write cycles. What are the best use cases for SSDs? SSDs are best used in situations where high-performance is needed. Since SSDs provide faster loading times than HDDs, they would be best used. Moreover, it is best to use SSDs to host the system's operating system, since it could benefit from the speeds. Lastly, it is best to use an SSD in portable machines since they are much lighter than their counterparts.

Solid-State Hybrid Drives:

Finally, what is SSDH? SSHD stands for solid-state hybrid drive. It is an HDD with a spinning hard disk, but with insignificant amounts of solid-state storage built in. A SSHD is an HDD and an SSD combined into one, reason for it being called a hybrid. The SSD is used as temporary storage and there to provide speed to speed things up, all the data is stored in the mechanical disks. According to (Martin, 2019), SSHD are slower than SATA SSDs. However, it still provides speed that an ordinary HDD. Now that the basics of an SSHD are given, time to explain the benefits, here are benefits:

- **Built:** SSHDs contain flash memory chips, like those found in SSDs, and a spinning magnetic disk, like HDDs. The flash memory stores frequently accessed data, while the magnetic disk manages less frequently accessed data. SSHD do provide quicker system operations faster than HDDs, but not as fast as SSDs.
- **Cost:** SSHDs do provide a balance between speed and affordability, they are generally a good option for users who need both.

SSHDs do also provide their own advantages and disadvantages compared to their counterparts. Since SSHDs are a combination of HDDs and SSDs, they have the combined advantages of both types. On top of that, since they do include both technologies, they have better performance than HDDs and lower costs than pure SSDs. However, since they are not pure SSDs, they do not have the speeds of a pure SSD. Also, they have limited SSD cache, so only a portion of the drive benefits from the SSD speeds. Now what are the best use cases for SSHDs? Since SSHDs are a balance between HDDs and SSDs, a hybrid approach would be the best. Since SSHDs have a balance of speed and costs, users could benefit from using this storage.

In conclusion, HDDs, SSDs, and SSHDs each offer unique advantages and have specific use cases where they shine. HDDs provide cost-effective bulk storage, making them ideal for storing large media files. SSDs, on the other hand, offer superior speed and durability, making them suitable for high-performance needs and hosting operating systems. SSHDs strike a balance between the two, offering a blend of speed and affordability. Understanding these differences can help users make informed decisions about the best storage solution for their specific needs. As technology continues to evolve, we can expect further advancements in data storage, potentially leading to new types of storage devices that offer even greater speed, capacity, and reliability.

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