

Is the future in flash, or is the hard drive here to stay?

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With data volumes continuing to increase at an unprecedented rate, capacity has become a critical criterion when it comes to selecting data storage solutions.

On the flip side, the need for increased speed and performance and 'instant on' solutions has driven a growing trend towards flash-based storage systems. With industry touting Solid State Drives (SSDs) and flash-based storage as the way of the future, and predicting the death of the hard drive as we know it, where exactly does the path lie? Is the future in flash, or is the humble hard drive here to stay?

Hard Disk Drives (HDDs) utilise spinning media technology, which, although it is prone to issues from being dropped or moved around too much, has been tried and tested over many decades and has seen significant enhancements to improve speed and storage capacity. On the other hand, SSDs - as well as thumb drives and memory cards - utilise flash, a newer technology that is faster and is not prone to such ill effects when dropped or handled roughly, as it does not require moving parts in the form of spinning platters. While flash-based storage is faster and it better able to handle mobility, several challenges remain with this new technology, which means that the predicted death of the HDD is vastly premature.

Far more cost effective

One of the biggest challenges currently is that HDDs are far more cost effective than SSDs. This is because, as an older technology, the cost of research and development, as well as manufacturing, around HDDs has already been absorbed. SSDs are still in the infancy stage, which means that R&D costs are high and economies of scale with regard to major manufacturing runs cannot yet be achieved. In addition, the available capacity of SSDs simply cannot cope with the storage volumes required today. While HDDs are available in capacities of up to 6TB, the maximum capacity of a SSD is only 1TB. The cost per GB of SSD remains unaffordable for the majority of applications and for many users.

Another issue with SSDs is that of reliability. While SSDs do not contain moving parts such as read/write arms and spinning platters, there is a common issue of the degeneration of cells, which can negatively affect the capacity of the drive over the years. Cell degeneration is unpredictable, and causes permanent data loss, which is problematic. SSD failure is permanent, whereas often data can be recovered from a damaged HDD, depending on the severity of the damage.

Less prone to damage

While SSD is less prone to damage from dropping or shocks, the spinning platter continues to have the advantage, not only in terms of cost per gigabyte, but also in terms of applications. The HDD is available in many platforms, such as the 3.5-inch architecture for desktop applications, 2.5-inch form factor for mobile applications, and 1.8-inch for automobiles and specialised applications.

The many applications for HDDs are evident in the fact that around 90% of the data stored around the world is stored on a hard drive, and approximately 90% of data storage manufactured today is still HDD. SSD is currently a technology that fits niche applications, such as smartphones, tablets, cameras and other applications that are not performance or storage intensive. In addition, SSDs are also used in high-end servers, which run mission-critical applications in which speed is critical. However, when it comes to capacity data storage, the trusted, cost-effective HDD is here to stay.

Within the flash memory space, there are also a host of new technologies being developed, such as Phase-Change Memory (PCM), Resistive Random-Access Memory (RRAM), and Magnetoresistive RAM (MRAM), which may show promise with faster speed and durability. However, while HDD is a tried-and-tested technology, it has by no means become static, and a similar evolution is taking place from a hard drive perspective. Perpendicular recording and Single Magnetic Recording (SMR) have enabled increased performance and capacity, and the next forthcoming technology centres around heat-assisted magnetic recording, which could further this technology, leading to hard drives with even higher capacities and greater performance.

Specific requirements

When it comes to choosing between HDD and SSD, users need to take into account specific requirements, preferences and budget. Each storage medium has its own pros and cons, and each is thus currently applicable in different devices and scenarios. This means that the two technologies will continue to co-exist for the foreseeable future, and we can safely say that the HDD is here to stay.

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