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Not Your Father's Drives: Data Doesn't Last Forever

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The data storage industry has been trending toward smaller, faster, and more rugged solid-state drive (SSD) technology. What is sacrificed to accommodate these features, and what risks do consumers take when purchasing SSDs? The focus of this paper is data storage technology, and in particular, the issues SSDs may create when powered off and archived.

SSD technology, contrary to popular belief, is nothing new; in fact, it has been around since the late 1970's. However, since SSD technology is only now gaining popularity, most consumers are unaware of the real differences between conventional hard drives and SSDs.

Traditional hard disk drives (HDD) store data on a series of spinning magnetic disks, called platters. These platters, which are found inside the hard drive, have billions of little areas that can either be magnetized or demagnetized. The data computers store is represented as ones and zeroes; ones are actually magnetized areas of the platter, while zeroes are demagnetized. The problem with this methodology is that the platters need to be moving in order to accomplish the reading and writing of the ones and zeroes. This is an issue because modern central processor units (CPU) are extremely fast and have the ability to process data in nanoseconds, while it can take a moving hard disk drive several milliseconds to find data on its magnetic surface. So, to allow CPUs to work at their full capacity, a quicker platform of reading and writing data was born. In the IT world this is sometimes referred to as "I/O" (Input/Output).

Fast-forward to modern SSDs, which primarily run on flash memory. This is a type of storage that does not utilize any moving parts and can be found in mobile devices and consumer SSDs, as well as in memory cards, BIOS chips, and other types of small media. Flash utilizes transistors and magnetization rather than platters in order to represent a value of either zero or one, thus eliminating the need for moving parts. This electronic (rather than motive) process allows flash memory to function at much higher speeds, compared to HDDs, which increases the efficiency of a CPU, which then leads to better computer performance. It's no wonder the industry has been shifting towards

SSDs – the technology is tried and true, and computers can now run at speeds which are significantly faster than what legacy HDDs could allow. So what's the catch?

In a nutshell, since SSDs employ electronic components and transistors, when powered off their volatility increases. The absence of electricity leads to issues with the way in which transistors read and write data. Additionally, the temperature at which SSDs are stored plays a big role in their stability - the higher the temperature, the quicker data retention dips. Studies have suggested that an SSD stored in the low 70s (F) will start losing retention after about two years. Increase that temperature to the mid-80s, and the timeline is cut to approximately one year.

Such studies aside, heat has long been a topic of friction within the technology sector. Certain vendors correlate heat with failure while others disregard heat altogether. Microsoft has said that heat may be strongly implicated in SSD failure, while Google disagrees. However, there is no research that unequivocally proves SSDs will *not* lose data when stored at elevated temperatures. Therefore, why risk losing critical evidence? When archiving data, HDDs are both safer and more cost effective. Considering that litigation can sometimes take years to conclude, and that important case data may rest inside a hot computer, or on a drive inside an unventilated file cabinet, the risk may already be high; archiving on a hard disk drive rather than a SSD may make all the difference.

Solid-state drives are great for increased speeds and increased storage capacity, but the current market value for SSDs is extremely high compared to HDDs. The bottom line is, why invest extra money in a technology whose benefits are only seen when it is actively being used? HDDs are clearly the better choice for long-term data storage – they're cheaper, they have fewer issues with data retention, and they have been used as an archive medium for decades.

The SSD market is still in its relative infancy, and until objective evidence shows that SSDs are a reliable archiving medium, the safest and most cost effective investment is in HDDs. Armed with an understanding of these factors, you can ensure that your case depends on your legal expertise, and not on the technological nuances of storage media.

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