SSD vs. HDD – The Missing Considerations
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Recently there has been a lot written about Solid State Drives (SSDs) and their role in enterprise storage. These articles include several comparisons of solid state drives and mechanical drives in RAID arrays for enterprise applications. While most of these articles address several very key areas of comparison (cost, performance, capacity, power, cooling, reliability), they often neglect to consider data recovery and data destruction/asset disposal. In the first part of this three-part series, I will examine data loss and recovery. In the second part, I will examine asset disposal, and in the third article, I will discuss steps that can be taken to minimize the risks.

Let’s tackle data recovery first. To understand how your choice of storage can affect the recoverability of data in the event something happens to your storage (and your backups), we need to take a closer look at how the data from a RAID array is written to the media.

With solid state disks, the data passes through the RAID controller to the individual SSDs that make up the array. As the data reaches the individual drives, it is passed to another specialized controller called a wear-leveling controller. The wear-leveling controller then determines to which NAND chip and block inside that chip the data is electronically written. The location of the data on the NAND chips changes constantly to help protect the NAND chips from wearing out.

With mechanical disks, the data is passed from the RAID controller to the individual disks. The data is then magnetically written by the read/write head to the platters in the drives as bits. It is important to note that the data is written in a very specific pattern on the platters. Specific bits of data are stored in consistent locations. As an example, when block 10 is written to the platter, barring any defects, the block stays in the same location on the disk platters. The data can then be read from the platter by going back to the same location on the platter and reading the magnetic orientation of the bit stored there. When changes are made to the data, the orientation of the bit may change, but its location on the platter does not change.

In short, the major differences between the media types are:

- Electronic vs. magnetic writes
- Static vs. dynamic storage locations

Most established data recovery specialists have had years to perfect their data recovery techniques for mechanical drives and some have very sophisticated methods for dealing with RAID controllers. Parts can be replaced and media damage can be overcome to get access to the raw data (basically creating an image of the data on the physical disk). Once the raw data is recovered, software can be used to virtualize the RAID controller. The data recovery specialist can virtually reassemble the array, then the logical volume can be rebuilt, errors can be corrected and the data can be recovered. Another difference to note is that individual disk failures on mechanical drives are often predictable and data loss can be prevented or minimized.

SSD is a newer technology and very few data recovery specialists have the ability to handle the RAID and the SSD layers in order to put the data together in the event of a failure. In some cases, parts can be replaced to overcome failures. To overcome media damage, however, the NAND chips often need to be removed and imaged independently. This requires specialized tools and software and usually a significant investment in R&D, as data is stored in a different way on each drive. The raw data bits then need to be reassembled into a usable format, which is much more challenging than simply imaging the disk by overcoming physical/electrical issues or media corruption like you would find in mechanical drives. Once that is complete, the RAID is then reassembled, the logical volume is
rebuilt, any damage is repaired and then the data is recovered. Individual disk failures are often unpredictable and special care needs to be taken to prevent data loss.

In conclusion, when evaluating solid state against traditional hard disks, make sure to take into consideration the possibility of data loss and the need for data recovery. It could mean the difference between meeting the requirements for enterprise applications and disaster. For recovery information about specific RAID controllers or specific drives and their recoverability before you purchase them, contact your local data recovery specialist.