

## ***The Evolving Roles of Tape and Disk in the Energy Cost-Conscious Data Center***

By Bruce Master, Senior Program Manager, IBM (on behalf of the LTO Program)

Tape is: Low cost, off-line, portable, fast streaming, automated, low energy consuming, infinitely scalable (just add more cartridges) and tape offers WORM and Encryption! Tape is ideal for disaster recovery and long term data retention-archive.

Data has been growing exponentially amid a constantly-changing business environment. Data, or any information, is central to an organization's overall success, but it is at risk and must be protected.

The risk stems from a myriad of potential data destructors: things like system error, operator error, theft, hackers, viruses, sabotage and natural disaster.

IT storage managers are expected to manage and protect data with constrained resources and increasing expectations that come with tighter budgets, compliance regulations and security requirements, not to mention more attention to total cost of ownership and rising energy costs.

Data protection lessons are often learned the hard way. One provider of services to thousands of bloggers had their customers' data wiped out. The backup plan involved one disk drive replicating its data to another drive. Due to a system error the data was erased on one drive leading the other drive to erase the backup data as well. Unfortunately, there was no offline data to restore from.

In another scenario – again, with a disk-to-disk backup system – hackers were able to take out a flight simulation site's server as well as their backup server, rendering data culled from 13 years of hard work completely useless. The attack shocked the flight simulation community as the site had become a source of community-developed terrains, skins and mods – a contribution that had been considered immeasurable. Again, there was no offline data to provide recovery.

A data protection plan must incorporate an original copy of critical data that is stored offline and offsite to protect it from risks that can threaten online data. Offline data is inaccessible from system errors, hackers and viruses. The data should also be offsite. That way in the event of a site-wide disaster the offsite copy of data can be used to recover. The best form of offline and offsite data protection is tape storage today and for the foreseeable future.

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These are part of backup and data protection best practices which should include:

- **Multiple degrees of protection:** at least three copies of data in different locations, with one out of region for recovery in the event of a region-wide disaster. In these situations, tape is a cost-effective and easy solution.
- **Technology diversion:** it is important to have copies on different forms of media to avoid a media or system process disaster. In this case, a mixture of disk and tape – perhaps in a D2D2T environment – is ideal.
- **I/O system isolation:** at least one copy of data offline to avoid intentional or unintentional corruption. This could have prevented two of the examples noted earlier – and it could have been as simple as backing up the backup periodically with tape.
- **Protect access to data:** protection from data loss due to erroneous overwrite via WORM or from unintended access via encryption is essential for data at rest and in transit.

Companies that implement best practices can actually survive disasters – and disastrous effects – by setting up procedures that can cost exponentially less than the resulting costs of large-scale data loss. For example, take the experience of a large truck express service that stood in the path of Hurricane Gaston a few years ago. The good news: they had made a tape backup of their data the night before and had that tape stored remotely. They've since implemented a more robust procedure, and provides for no production system interruption and multiple tiers of protection with disk and LTO-5 tape libraries.

Tape storage is low cost. LTO-5 cartridge media is about 3 cents per GB compressed. Studies have shown tape solutions to be up to 20x less costly than disk storage solutions and to use nearly 300 times less energy. Tape is the green form of storage. Tape capacity is also highly scalable. You don't need to add more drives, simply add more cartridges to economically and efficiently grow capacity.

A blended tiered strategy of disk and tape can optimally address the varied objectives of the storage manager. Disk for high access backup and recalls and tape for low access backups, compliance, archive, cost control, energy efficiency and data protection. According to a University of California-Santa Cruz study, more than 90 percent of data stored to disk was never accessed again, and another 6.5 percent

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was only accessed once. This data should be stored on tape. It is perfect for this data as a less expensive and less energy-consuming storage medium, while disk can address the data that needs to be accessed quickly. Once that data becomes infrequently accessed it, too, should be moved to tape.

What does tape's future hold?

The LTO program has adopted as a standard the Linear Tape File System specification. This file system can allow tape to be used in a manner like disk or other removable storage media including directory tree access and drag and drop capability. This is important for cross platform sharing, ease of management and new use cases for a variety of industries including media and entertainment, digital video surveillance, medical imaging, legal documents, architectural drawings, government documents, cloud applications and many more.

The LTO roadmap extends to generation 8 with up to 12.8TB per cartridge. In 2010, IBM demonstrated a bit density achievement of 29.5B bits per square inch which could yield a 35TB tape and Maxell demonstrated the capability for a 50TB tape. Users can rest easy as tape's future is strong.