



Affordable, Efficient, Compliant Health Data Storage Through LTO with LTFS

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Healthcare organizations face a gauntlet of technology challenges these days: Healthcare data is being generated by an increasing number of devices like smartphones, tablets and RFID-based medical instruments, and the volume of health data is growing at an unprecedented rate. Electronic healthcare regulations such as those that are part of HIPAA and HITECH multiply every year, as do the costs and consequences of noncompliance. All the while, IT budgets are shrinking, and technology administrators are being asked to do more with less.

These unique challenges have healthcare practice managers scratching their heads: How can a healthcare organization store and manage an onslaught of patient data without adding staff headcount or massive infrastructure? How can it afford the technology required to stay compliant and provide good care to (and rigorous privacy for) its patients? There is an answer, and it may surprise you.

Healthcare IT Challenges

Storage requirements: One of the biggest challenges healthcare IT department face is growing storage requirements.

Standard medical records and images are being digitized, creating massive amounts of electronic data that must be stored. Compounding the problem is the fact that healthcare data is being generated by a whole new generation of medical and mobile devices. Storage predictions are staggering: A 2014 report stated that healthcare data storage volumes are on trend to soar into the yottabytes, or 10^{24} gigabytes.¹ In other words, if you think you have storage problems now, analysts predict it will get *50 times* worse in the next six years.

Complexity and expense: While there are a lot of storage management and data retrieval options in the market, most are complicated and expensive and threaten to put even more burden on already-strained IT resources. Consider this: Electronic data stored in any format (on tape or hard disk) has to be physically stored somewhere. Where and how it has to be stored can contribute to high total cost of ownership (TCO).

Data archived on hard disk has especially high TCO because hard disks require constant power and temperature control. Disks also fail and need to be replaced relatively often, as well as upgraded with newer, bigger capacities to cope with data increases. Even data “in the cloud” is stored on servers that consume massive amounts of energy.

Performance: Also, certain types of backup can cause performance delays for users during the backup window. In a healthcare setting, complicated storage and management procedures can negatively affect clinicians’ workflows. IT also has to make sure that patient data is retrievable—up to hundreds of years, in some cases. Of course, regulatory compliance is a major factor in healthcare IT infrastructure. Today, healthcare providers must comply with health IT



¹ “[Big Data Analytics in Healthcare: Promise and Potential](#),” *Health Information Science and Systems*, 2014



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legislation such as HIPAA, the HITECH Act, the Affordable Care Act and the FDA Safety and Innovation Act. These regulations require that storage is secure and data is accessible, and noncompliance fines can run into the thousands of dollars per incident: The fine for a HIPAA violation, even if it's not willful neglect, can cost up to \$50,000 per violation, with an annual maximum of \$1.5 million.

Affordability: Amid the growing storage requirements and IT regulations, healthcare organizations are on tight budgets. Post-recession budgets simply can't accommodate expensive data storage and retrieval infrastructure or additional IT staff just for data backup and management. Dedicated datacenters are also expensive, and disk has enormous energy consumption requirements. For healthcare providers especially, data storage and retrieval must be scalable to accommodate future growth without a whole-system overhaul.

Misinformation: Recently, there's been an onslaught of marketing misinformation that has healthcare administrators confused about their options. For example, sometime in 2006 a false Gartner statistic started popping up in disk storage whitepapers and marketing documents. Depending on which paper you read, the "statistic" reported that between 40% and 71% of tape backups fail. Gartner never said anything like that and has openly refuted the quote. Unfortunately, it's not an isolated incident, so IT managers have no idea which "study" to believe. The fact is, studies actually show that tape has an error rate that is at least two orders of magnitude better than disk.²

LTO with LTFS for Reliable, Affordable Long-Term Data Storage

The one thing we know for sure is that storage, management and retrieval systems must be affordable, secure, reliable, easy to use and manage, and scalable enough to accommodate future data growth. Linear Tape-Open (LTO) is magnetic tape data storage that can hold 2.5 terabytes of data in a small cartridge. This durable tape has been a trusted form of data backup and long-term retention for over a decade. Combined with Linear Tape File System (LTFS) technology, healthcare organizations can reliably and affordably store large volumes of data with easy access to data when needed.

Ease of Use

LTO with LTFS is particularly beneficial in healthcare settings where ease-of-use is paramount to streamlined workflow. For example, many healthcare applications are custom, and a common storage and retrieval approach is to write and integrate a custom tape interface dedicated to each application. However, this approach adds an unnecessary layer of complexity to an already complex infrastructure. LTO with LTFS simplifies the health data lifecycle by easily integrating with any custom or out-of-the-box applications used by departments across the practice. For hospitals, it makes sharing high-resolution medical images easy, regardless of platform in use, specialized equipment used to analyze images or storage infrastructure particular to the department.

LTO with LTFS allows clinicians and administrators to quickly retrieve and share EMR, PACS, DICOM and other medical data that is typically only stored for a short time. These records can be shared without workflow impact to any other department in the practice, and without conflict with any vendor-specific medical data and image software already in use. LTO with LTFS also simplifies the storage of large medical images that are not easily deduplicated. When it comes to transmitting large health data files such as x-rays, LTO with LTFS doesn't consume resources that affect users and individual files are readily accessible.

² ["DedupT: Deduplication for Tape Systems,"](#) IBM Research Division, Jan. 23, 2012



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How It Works

Using LTO with LTFS is as easy and intuitive as using a USB flash drive: An LTO tape drive attaches to the healthcare provider's computer systems, and the administrator only needs to download the LTFS software and format the LTO tape. The LTFS operating system extension leverages a graphical file manager and directory tree for easy, intuitive access to data on an LTO tape cartridge. It's as easy as dragging and dropping.

LTO tapes with LTFS have dual partitions: One partition holds the tape index, and the other holds the content. The tape becomes self-describing and enables easy viewing and access to tape files. Administrators can drag and drop files to and from tapes to browsers or directory trees. Files can be encrypted using an AES encryption algorithm with 256-bit keys in GCM mode (AES256-GCM) for security using an encryption key management. Data can be easily integrated with and centrally managed by healthcare independent software vendors (ISVs) or applications as sharable data and transactional data can be stored on disk or flash. As records age, the ISV or the system solution tiers the data for long-term storage on tape. The system can automatically create two copies on one disk as a primary copy, and another further two copies can be done on LTO tape with LTFS tape as secondary copies for long-term data retention and in case of a disaster recovery situation. LTFS format is an open standard making data on tape in LTFS format not proprietary.

Key Benefits

Scalable storage: Using LTO with LTFS is infinitely scalable by just adding more cartridges, with no surprises and no whole-system vendor lock-in. Plus, you can store lifetimes of data and scale as your practice grows. LTO-6 tape has an expansive storage capacity of 2.5 terabytes uncompressed and up to 6.25 terabytes compressed 2.5:1.

Easy management and retrieval: LTO with LTFS enables easy data access by allowing you to manage files directly on the tape, and even share them across platforms. It encrypts at the tape drive level and compresses before encryption, maximizing tape capacities and allowing high performance during backup. LTO with LTFS is so easy to use that it doesn't require additional IT staff headcount or DBAs and system administrators with specialized expertise. It doesn't affect clinicians' workflows, and instead allows staff to focus on good healthcare.

Helps you stay flexible and compliant: LTO with LTFS provides reduced complexity for better compliance. It addresses the unique needs of electronic medical records, digital imaging, picture archiving and communications systems, and regulatory compliance. Plus, tape is proven to be orders of magnitude more reliable than hard drives for long-term archives.³

Affordable: The fact is, LTO has the lowest-possible TCO⁴ of all the data storage options: TCO of equipment, media, maintenance, energy and floor space of the average disk-based solution costs 26 times the TCO of the average tape-based solution. The cost of energy alone for the average disk-based solution exceeds the entire TCO for the average tape-based solution. Consider that disk requires about four times the floor space of tape and tape can sit on the shelf for up to 30 years without the need to power anything up. For IT managers with mandates to green their data centers, tape is the most environmentally optimized solution.

³ ["The Tape Advantage: Benefits of Tape Over Disk in Storage Applications,"](#) Instrumental Inc., April 2008

⁴ ["Revisiting the Search for Long-Term Storage — A TCO Analysis of Tape and Disk,"](#) The Clipper Group, May 13, 2013



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About the LTO Program

The LTO Program was formed in 1997 and three companies—HP, IBM and Quantum—jointly oversee the development and roadmap of Linear Tape-Open (LTO) technology. Providing open format specifications to simplify the complex array of tape storage options, LTO technology allows users to have multiple sources of product and media. The “open” nature of LTO technology also provides a means of enabling compatibility between different vendors’ offerings.

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