Ninth Generation Cyber Resilient Tape Storage for your hybrid cloud

Highlights

- Store up to 1EB per 18-frame library with 2.5:1 compression
- Achieve 18TB capacity per cartridge, 50% better than LTO 8
- Execute faster restores with 400MB/s transfer rate, 11% better than LTO 8
- Retrieve data 73% faster with Open RAO IBM LTO 9 Tape Drive technology
- Get better protection with Physical Air Gap adding a barrier to hackers
- Avoid data corruption with Data immutability with WORM capabilities
- Prevent data visibility with AES-256-bit data encryption at rest
- Deploy tape in modern business use cases such as AI and cloud

IBM LTO Ultrium Gen 9 tape technologies bring a new level of storage cost-efficiency and modern data protection to 21st century business.

Two of the most powerful forces driving Information Technology (IT) today are the explosion of data volumes and the escalation of cyber security threats. Perhaps the fact that tape-based data storage solutions and technology have remained relevant and robust across the marketplace can be explained by how well tape addresses both of these critical issues.

LTO tape remains a leading solution in addressing modern data storage needs[1] supremely effective at helping enterprises of all types and sizes address their need for cost-efficient, high-volume data storage. And tape offers some of the best ways to mitigate and even thwart cyber threats. Perhaps just as important, innovation within the basic tape-based data storage platform has remained strong. IBM has never lost sight of the value and the promise of tape-based storage. Our on-going commitment to the venerable technology and the ever-expanding storage solutions it continues to provide has recently been reaffirmed with the release of new Linear Tape Open (LTO) Ultrium Generation 9 technologies and offerings. The new IBM LTO 9 drives and supporting systems increase tape's ability to provide cost-effective, secure storage solutions to meet the full range of rapidly evolving 21st century long term data storage requirements.

Ninth generation of innovation

Validated by the LTO program, tape remains a leading solution in addressing modern data storage needs.[2] Key to note that IBM is the leading tape storage vendor on the planet, with twice the market share of any other vendor.[3] This success is the result of a more than six decades-long commitment to the technology, and the adoption and execution of a product strategy based on innovation, continual improvement, constant communication with customers and business partners, and a focus on component quality.

IBM LTO Ultrium tape technology is designed for the heavy demands posed by the storage of less active data in modern use cases such as the Internet of Things (IoT), big data analytics, artificial intelligence (AI)-driven applications, media and entertainment, genomics, video streaming, and digital archiving. This proven tape technology has been enhanced in new IBM LTO Generation 9 tape solutions to provide increased capacity, performance, and reliability compared to LTO Generation 8.

The LTO Ultrium format is a powerful, scalable, adaptable open tape format developed and continuously enhanced by IBM and the other members of the LTO Program. The current LTO Ultrium roadmap has tape technology mapped out through twelve generations. This provides confidence to consumers and organizations in the storage market that tape will continue to be the most cost-effective storage medium for many years.

IBM LTO Ultrium 9 tape cartridges

LTO generation 9 specifications include previously introduced features, such as multi-layer security support via hardware-based encryption, WORM (Write-Once, Read-Many times)

functionality, and support for the Linear Tape File System (LTFS) protocol. Plus, the new LTO generation 9 specifications include full backward read and write compatibility with LTO generation 8 cartridges.

LTO media has doubled in capacity approximately every 2.3 years since the first generation was launched twenty years ago. For LTO generation 9, the LTO Program elected to balance the cost and benefit of technology within the specification, offering an 18TB tape cartridge – a 50% increase in storage density from the previous generation – to address the current market for storage capacity. A new roadmap has been established with the goal to double capacity in each generation moving forward.

Additional enhancements incorporated into the new IBM LTO Ultrium Gen 9 tape technologies include:

- A reduction of up to 39% Total Cost of Ownership of your tape library by replacing LTO8 technology[4]

- Up to 11% better data transfer rates from the previous tape generation, to 400 MB/s[5] for full high cartridges and 250-280 MB/s for half high cartridges

- LTO 9 tape drive support for the new IBM LTO Ultrium 9 data cartridges, with support for SAS 12 Gb and Fibre Channel (FC) 8 Gb interfaces

- IBM TS4500 tape library release with support for LTO 9 with SAS-12 Gb and FC-8 Gb interfaces

- Enhancements to IBM Spectrum Archive family support for Enterprise, Library and Single drive Editions.

A new technolog y is introduced to IBM LTO 9 tape drive technology, Open Recommended Access Order (oRAO), reduces tape data access times in LTO Ultrium Gen 9 tape technologies by up to 73%[6]. oRAO is a data retrieval accelerator that enables tape control applications to accelerate the retrieval of files from a single tape by reducing the seek time between files. It was developed from IBM file access acceleration technology. It can add cyber resilience by optimizing the access times to recovery data. oRAO is a native drive function that supports compressed and uncompressed data and is only available for LTO 9 generation technologies.

Up to 73% faster data access retrieval with IBM LTO 9 tape drive when working larger volumes of data
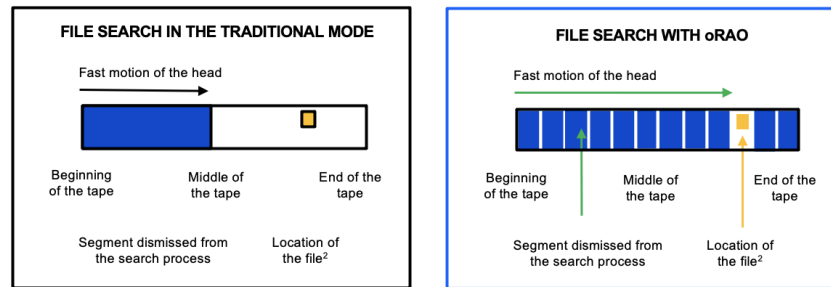
IBM LTO 9 Open Recomended Access Order

With IBM Spectrum Archive, accessing data stored on an IBM tape cartridge – instead of on disk – is transparent. IBM Spectrum Scale keeps a pointer to the data on tape and, if requested, retrieves the data without user or operator intervention. By leveraging the capabilities of IBM Spectrum Scale, IBM Spectrum Archive enables high performance and reliable access across the storage infrastructure. In turn, IBM Spectrum Archive enables IBM Spectrum Scale installations to add extensive capacity with lower media, floor space, and power costs. And with policy-based migration, archive capacity can be expanded without impacting data availability.

Innovations such as oRAO, as well as previously introduced features like data immutability with WORM and the physical air gap offered by tape, plus AES-256-bit encryption of data at rest, help LTO tape maintain its strong position as a preferred solution for cost-efficient, secure storage.

Advantages of IBM tape solutions

The amount of stored data is projected to reach 8.9 ZB worldwide by 2024. In addition, over 60% of all data is archival and it could reach 80% (~7.12 ZB) or more by 2024[7]. Far from being in decline, tape today provides data storage solutions to enterprises large and small in a wide range of industries around the planet. In fact, tape:

- Tape storage as a medium can be found both onsite and offsite in many organizations, it serves as the repository for 33% of the backup and archive data today on average.[8]

- Technology potential to meet robust capacity predictions over the next decade is superior to HDD technologies[9]

- Is 7 times less expensive than disk storage in a 10 year TCO comparative study and is 3 times cheaper than all cloud systems in a 10 year TCO comparative study[10]

- Is about two orders of magnitude more reliable than disk[11]

- Can be used in production IT environments to lower costs through new software-defined storage and flash-based architectures

For our business partners and tape storage customers alike, the IBM approach to tape technology development and innovation offers a number of advantages:

- *Component optimization*. Deeply integrating and optimizing all components in the tape systems results in lower risk of data loss, higher reliability, greater system stability, prolonged media life, and optimal performance.

- *One hand to shake*. Because IBM supplies the complete tape solution, including drives, automation, media, and software, customers benefit from a vendor that can work the solution end-to-end for faster problem resolution.

- *Stringent quality control*. Constant testing of media and other tape system components increases the reliability and durability of IBM tape products – only IBM brand tape media are tested against all IBM drive and library configurations.

- *Stronger product warranty*. IBM and our tape vendors guarantee that IBM tape products will be free from manufacturing and materials defects for the life of the cartridge.

- *Confidence*. The IBM history with tape spans nearly 65 years; our customers can have confidence in our experience and tape storage roadmap, while our knowledge base and media skills continue to grow.

Unique security of tape

Even though tape has been one of the cornerstones of effective data protection strategies over the years, IT architects and decision-makers recognize that tape cannot be a complete answer. But tape does offer powerful solutions for specific threats and use cases at a cost per gigabyte unmatched by other storage technologies.[12]

For example, ransomware attacks encrypt files, making them inaccessible, then attackers demand a ransom payment to decrypt them. These types of attacks embed time-delayed undetected malware into backup repositories. This makes file restoration pointless because as data is restored, the ransomware re-ignites and then re-encrypts the data all over again. But the air gap provided by tape can eliminate the ransomware cycle of infection and re-infection by creating a data copy essentially impossible for hackers to corrupt.

Many enterprises have considered eliminating tape from their data protection environments because tape cannot achieve established recovery point and recovery time (RPO/RTO)

objectives – too much time is lost loading tape cartridges and accessing their data. It's true that other data protection solutions such as snapshots and replication can offer better RPO/RTO – but they don't provide the protection against malware or other threats that tape air gaps do. Public cloud storage might seem to offer an effective alternative, because it can provide offsite storage options removed from the focus of a particular cyberattack. But moving large data volumes across the network can result in long recovery times – and expose valuable assets to new threats. Air gapping with tape technology should be a serious consideration for any company looking at best practices to ensure their company's data and their customers' privacy.[13]

IBM tape solutions have been engineered to mitigate the shortcomings of tape while maximizing its advantages. The latest IBM LTO Ultrium Gen 9 tape technologies offer significantly higher storage density than previous generations, helping to lower the cost of storing large data volumes. IBM tape drives and libraries provide multiple layers of data protection. And IBM Spectrum Archive, a member of the industry recognized[14] IBM Spectrum Storage family of software-defined solutions, offers solutions that can make access to data on tape as easy and fast as disk.

Next generation use cases

Tape storage solutions have always enjoyed strong deployment rates in traditional business and data center use cases such as backup and long-term archiving. The reality is that tapes move down in the data storage hierarchy moving from a backup media many years ago to a deep archive play[15].

In addition to its data integrity and cost benefits, tape also offers the advantage of portability, which allows for an "air gap" between data and online hackers, providing a uniquely effective safeguard against cyberattacks.

But the extremely positive data economics and security of tape storage play well in less traditional use cases as well. Consider cloud data storage. As much as 80 percent or more of the data enterprises generate will never be accessed after 90 days. If you are providing flexible, pay-as-you-go cloud IT services to internal company customers, you'll certainly deal with this fact. If you move inactive data to tape storage, costs will dive but system performance will not. If you are a provider of public cloud services, implementing tape storage at a cost of less than .1 cent per GB per month, exactly 0.59¢/GB, in other words, $5.89 / TB[16] which will give you significant competitive advantage. Remember tape technology does not add extra charges to retrieve your data. Leveraging the benefits of IBM tape solutions, cloud services should considered tape a complementary technology to cloud storage while offering a lower TCO that SSD/HDD cannot match[17].

And now, innovations in software-defined storage (SDS) technologies such as IBM Spectrum Scale and IBM Spectrum Archive, as well as on-going advances in tape technology itself, are

making tape more attractive than ever for addressing the storage requirements of a much broader and more modern range of use cases, such as artificial intelligence (AI). Autonomous driving (AD) initiatives offer a good example of the convergence of a traditional technology – tape – with the technological driver of the future.

The one thing AD initiatives all have in common is data—miles and miles of data. Sources include sensor data, weather data, satellite data, behavioral and other personal data, diagnostic data, and more. Each connected car generates data—from a few megabytes to sometimes gigabytes per day. When the car is a test vehicle used to train AI/AD models, data volumes can reach terabytes per car per day and hundreds of exabytes across entire AD initiatives.[18]

IBM Spectrum Archive dramatically increases the cost-efficiency of retaining the large amounts of data generated by smart cars. It provides an easy way to move data from test vehicles to less expensive IBM tape drives and libraries within a tiered storage infrastructure. By using tape libraries instead of disks for less active data storage, AD development infrastructure can improve efficiency and reduce costs. IBM Spectrum Archive seamlessly integrates with the scalability, manageability, and performance of IBM Spectrum Scale to offer an ideal AD development infrastructure storage solution. Using the IBM Linear Tape File System (LTFS) format, IBM Spectrum Archive provides direct, intuitive, and graphical access to data stored in IBM tape drives and libraries using the new LTO Ultrium Gen 9 and previous generation tape cartridges, drives, and libraries. It eliminates the need for additional tape management and software to access data. IBM Spectrum Archive enables organizations to improve the cost-efficiency of their cloud and analytics infrastructure by enabling:

- Operational storage tiers with tape, rather than storing cold data on costly disk storage.

- Storage of digital assets for the long term, so assets can be referenced and monetized for years to come.

- Creation of copies of data on operational storage, improving the efficiency and cost effectiveness of a tiered storage infrastructure.

Next generation of success

This is the future of tape. IBM LTO Ultrium Gen 9 continues tape's innovation toward faster access, lower cost, greater security, longer life, and more functionality. Complementary technologies such as IBM software-defined storage solutions constantly increase their compatibility, integration, and capabilities with tape. And even more industries, business use cases, and leading enterprises find that tape isn't living in the past; it's innovating toward the future – just like they are.

[1] LTO Consortium, 2019 LTO tape shipment report reveals record breaking tape capacity shipments, July 2020

[2] LTO Consortium, 2019 LTO tape shipment report reveals record breaking tape capacity shipments, July 2020, businesswire

[3] IDC Customed Branded Tape Report 2H 2020IBM Systems White Paper: *Defining the future of tape*, July 2017 (TSW03548-USEN-00)

[4] IBM analysis comparing 3-year TCO of new 200PB library with 18 LTO 8 drives against new 200PB library with 18 LTO 9 drives

[5] IBM, Miyamura et al., IBM LTO 9 Tape Drive Full Height Model Performance White Paper, October 2020

[6] Based on IBM internal testing of like User Data Sets, not all users will see these levels of performance improvements as optimization varies according to the number of segments retrieved. Source: Tsuyoshi Miyamura and Osamu Matsumiya, IBM LTO 9 Tape Drive RAO Performance Position Paper, May 2021.

[7] Horizon Information Strategies, Understanding the value of data life cycle, February 2021

[8] ESG, Christophe Bertrand, 2020 Tape Landscape, October 2020
https://www.lto.org/esg2020/

[9] LTO Program, INSIC Tape Technology update and Linear Tape-Open (LTO) White paper, September 2019

[10] ESG, Alex Arcilla, Quantifying the Economic Benefits of LTO-8 Technology, August 2018

[11] INSIC, INSIC Technology ROADMAP 2019, July 2019,
https://www.insic.org/wp-content/uploads/2019/07/INSIC-Technology-Roadmap-2019.pdf

[12] IDC White Paper: Using Tape to Optimize Data Protection Costs and Mitigate the Risk of Ransomware for Data-Centric Organizations, April 2018 IDC #US43710518

[13] LTO Program, LTO Tape Shipment Report Reveals Record Breaking Tape Capacity Shipments, July 8, 2020

[14] The Storries, Storage Awards, 2019 Winner: Software-Defined Storage Vendor of the Year, June 2019 and CRN 2020, 40 Coolest Software-Defined Storage Vendors, April 2020

[15] Horison Information Strategies, by Philippe Nicolas, Tape still alive for hyperscaledata centers, November 5, 2019

[16] 2021 IBM analysis for 1 EB tape storage with 96 Drives with LTO 8 technology at 2:1 Compression, not inclusive of spectrum archive or Black Pearl. Values expressed in US currency.

[17] IDC White paper, Phill Goodwin, Tape and Cloud: Solving Storage Problems in the Zettabyte Era of Data, June 2019

[18] IBM Solution Brief*: IBM Storage solutions for advanced driver assistance systems and autonomous driving,* October 2018   https://www.ibm.com/downloads/cas/O9WYG2BK

Why IBM?

The capacity, speed and reliability of your backup and archiving solutions are critical to your enterprise, along with the performance of your storage infrastructure as a whole. IBM offers market-leading experience to help you handle the storage challenges that your network or company faces with a broad portfolio of proven software, hardware and solutions offerings. Innovative technology in tune with recent innovations, a commitment to open standards and high performance—all backed by IBM with its recognized expertise—are just a few of the reasons why you should consider IBM storage offerings.

For more information

For more information about IBM LTO 9 tape systems, please visit our solutions page, or contact your IBM representative or IBM Business Partner. If you don't yet have an IBM representative or business partner, you can fill out this form to schedule a consult with our storage experts."

IBM®, Spectrum Archive™, IBM Linear Tape File System™, IBM Spectrum Protect™

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