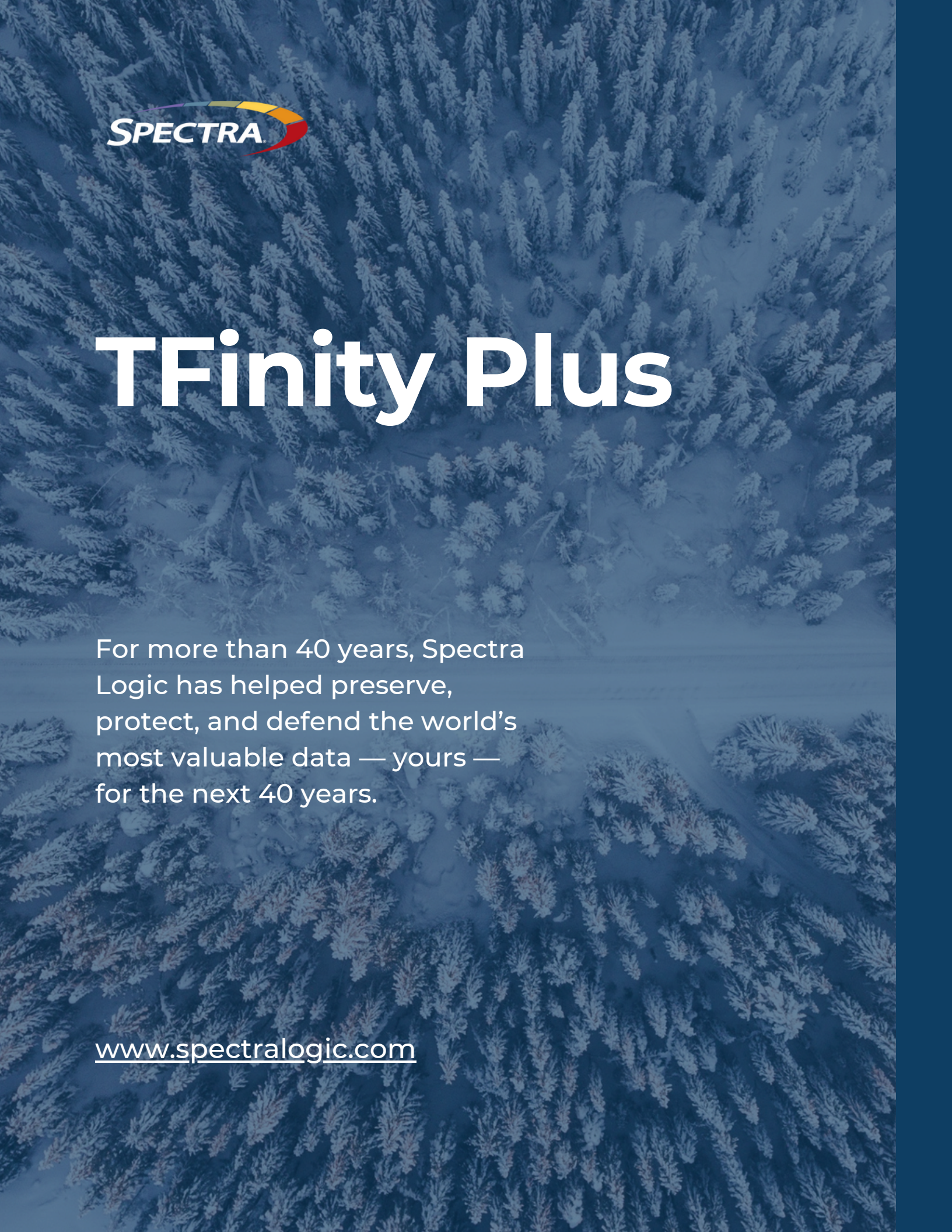


TFinity Plus

For more than 40 years, Spectra Logic has helped preserve, protect, and defend the world's most valuable data — yours — for the next 40 years.

www.spectralogic.com

Spectra TFinity Plus Library

The World’s Largest Storage System

The Spectra Logic TFinity® Plus is the world's largest, fastest, and feature-rich tape library. It includes: Media Lifecycle Management (MLM), Drive and Library Lifecycle Management (DLM, LLM), Data Integrity Verification (DIV), Integrated Encryption, Power Monitoring, Read/Write monitoring, ASM, and other features as inclusions or economically priced optional items — none of which require additional servers or support contracts to operate or manage.

Although it is the industry’s largest, and most richly featured library, the TFinity Plus continues to push the edges of tape storage. With a combination of redundant hardware and software features, Spectra® has created a tape library that delivers superior performance, reliability, and functionally. Doing so allows Spectra to extend its advantage relative to the competition while meeting any organization’s demands for a high performance, low cost, reliable, and scalable storage solution.

The Spectra Data Storage Story

Rethinking Storage

For over 40 years Spectra has focused on innovation in data storage and data management solutions. The leaders in data-intensive industries, government entities, and research rely on Spectra solutions that are optimized to support their specific workflows. In addition to our traditional disk and tape storage solutions, Spectra also offers a single converged object storage system — Spectra BlackPearl® — to bring all of these options together including public and private cloud, enabling customers to get the most out of every storage medium available today through a single interface.

TFinity Plus

CAPACITY

The TFinity Plus is the highest-capacity storage system in the world. The TFinity Plus has been engineered to offer more than six exabytes of compressed data storage in a single library.

PERFORMANCE

TFinity Plus is built with the highest performance we could achieve in automated tape technology. From robotics to drives to software to media, Spectra has included every one of our performance innovations in these libraries.

FLEXIBILITY

Our TFinity Plus can support three kinds of tape technology in the same library. Paired with our extensive software and hardware partners, organizations can develop customized workflows for every situation.

FEATURES

Data storage systems rely on carefully calibrated software, firmware, and hardware that harmoniously interact. The set of features contained in a TFinity Plus make it the industry leader in archive storage.

RELIABILITY

The TFinity Plus includes a redundant, dual-robotic infrastructure that not only provides for a failover solution, but also has twice the working ability. All of the parts and pieces have been carefully crafted and integrated for maximum reliability.

SUPPORT

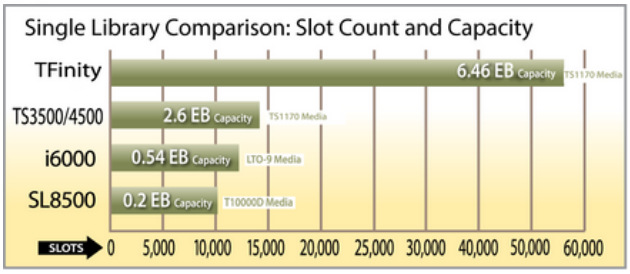
Spectra Logic delivers award-winning SpectraGuard Support for every TFinity Plus library. Spectra provides a superior level of service to help organizations achieve the least amount of downtime and avoid costly disruptions.

TFinity Plus

The World's Largest-Capacity Data Storage Library

Space-saving design, high-density architecture and seamless scalability combine to help the TFinity Plus achieve the status of the highest-capacity data storage system in the world.

World's Largest Single Library



Capacity with all three major media types

Drive Type	Configuration	Drives (max.)	Slots (max.)	Capacity Native	Throughput Native / Compressed per Hr†
IBM® TS1170 Technology	3-Frame Minimum	24	1,350	67.5 PB / 202.5 PB	34.56 TB / 77.6 TB
	45-Frame Library	168	42,930	2.15 PB / 6.45 EB	241.9 TB / 544.3 TB
LTO-10	3-Frame Minimum	24	1,800	54.0 PB / 135 PB	34.56 TB / 103.68 TB
	45-Frame Library	168	56,400	1.6 EB / 4.2 EB	241.9 TB / 725.8 TB
Tri-Media*	3-Frame Minimum	24	1400	39.1 PB	30.3 TB / 59.1 TB
	45-Frame Library	168	47,420	1.32 EB	212.1 TB / 524.18 TB

† Maximum Throughput Compression * Tri-Media = evenly distributed frames of LTO-10, IBM® TS1170, and Oracle® T10000D technologies

TeraPack: A Spectra Logic Invention

Spectra Logic created the TeraPack® magazine in 1999 and revolutionized how tape media could be handled and stored within its libraries. Our competitors continue to use the vertical tape stacking method which limits the amount of tapes within a library's walls. TeraPack magazines were designed to be placed into chambers and since each TeraPack can hold ten LTO tapes per chamber, the immediate result is a tripling of the quantity of tapes stored per square foot compared to other tape libraries. This unique invention of the TeraPack magazine also means that each individual TeraPack can be easily moved out of the library and conveyed to a geographically distant location for the ultimate in disaster recovery protection.

"For more than 40 years, Spectra has pushed the boundaries of data storage, including our latest achievement — the industry's first tape library to archive an exabyte of uncompressed data in a single footprint. Now, on to the next breakthrough ..."

Nathan Thompson,
Spectra Logic
Founder and CEO

Industry-Leading Density

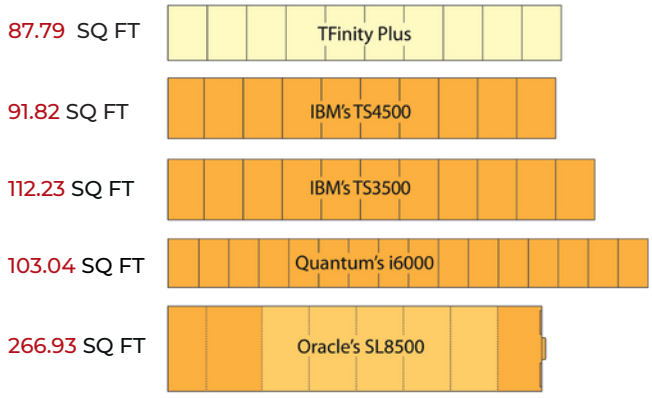
When data center real estate counts, TFinity Plus offers you unsurpassed storage density and the smallest footprint through a unique and highly efficient library design. Using TeraPack magazines instead of individual cartridges, the TFinity Plus delivers industry-best density and up to a 50% reduction in data center floor space versus competing offerings.

The highly compact library design is also built to fit into a standard rack-row layout, fitting colocated and standardized data center designs that don't easily accommodate non-standard equipment footprints. These significant space-saving benefits allow you to re-task floor space for operations other than storage.

Shrink Your Data Center Footprint

Enterprise Library Footprint Comparison

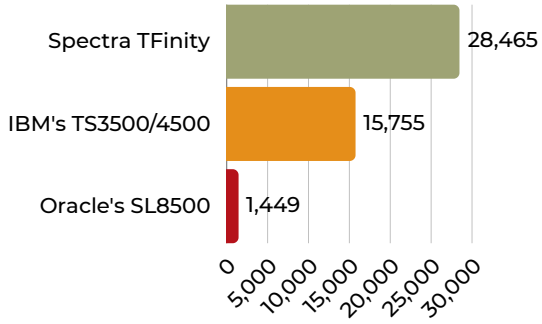
The floorspace comparison diagrams shown below are based on a tape slot count of 10,000 cartridges and 12 drives.



* *Single-Robot Library*

Compressed Terabytes per Square Foot

Based on 10,000 enterprise drive tape slots (IBM's RS1170 or Oracle's T10000D) and 12 enterprise drives

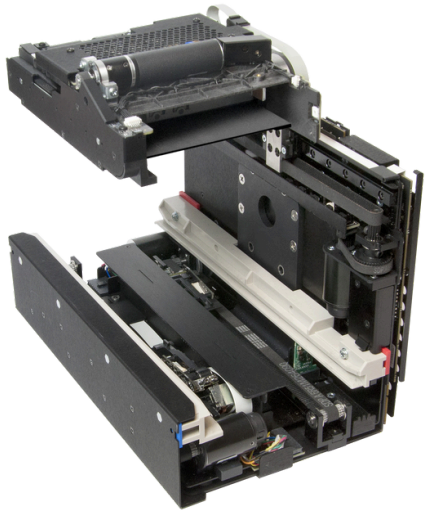


IBM's TS3500 Not Applicable above 15,000 slots

IBM® TS1170 Technology (150TB compressed at 3:1) in TFinity Plus and TS3500. Oracle® T10000D (20TB compressed at 2.5:1) in SL8500

The World's Fastest Library: TFinity Plus High-Performance Transporter

Spectra engineers generated a three-fold boost in performance

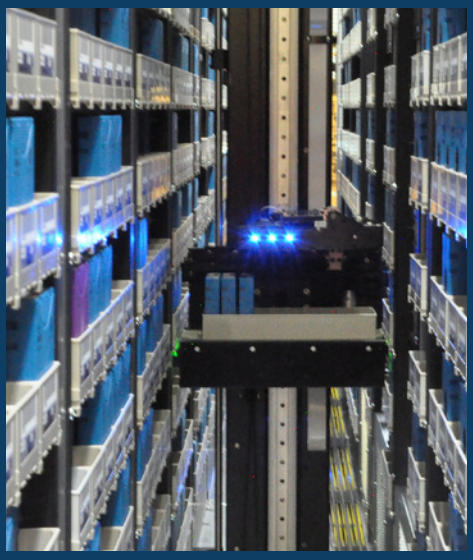


The High-Performance Transporter (HPT) is a "from the ground up" redesign of the robotic hand used to manipulate media. The transporter has been designed with four primary goals: better performance, better reliability, mixed media, and better sensing. The new HPT from Spectra accomplishes this and more by reduced cycle time or tape mount time (better performance) and increased mean time between failures (better reliability). HPT is the central improvement that provides organizations with the industry's fastest library on the market today. New sensors and features, including temperature and humidity readings, ensure increased reliability of the HPT. Coupled with the ability to support any current type of tape media, the HPT frees organizations from vendor lock-in and provides superior flexibility.

Spectra's patented TeraPorter also experienced major upgrades

The TeraPorter is the tall, vertical arm inside the Spectra Logic TFinity Plus library. It is used to position the HPT (robotic picker) at the chamber or the drive so that the transporter can handle each TeraPack.

One primary goal of the new TeraPorter is to increase the speed of the horizontal move performance of the arm. As a TFinity Plus grows longer, the horizontal performance can impact the overall response time of mount commands. The new TeraPorter will provide a top-end speed of (160 ips) or double that of the previous model. The acceleration rate will not change (50"/sec^2) in which case it will reach maximum speed in five to six frames.



Brushless motors and copper rails

Brushless DC motors deliver maximum torque when stationary, better operating performance, superior reliability, and less downtime over traditional brushed motors. Copper rails and carbon brushes provide higher reliability in power and signal delivery, while doing an excellent job of keeping debris out of the system.

Operational Moving Efficiency

Enhanced management controls for greater productivity

MEDIAIQ™

The Spectra Logic move queuing feature accepts Fibre Channel host "move" commands, then sorts and assigns them to movers based on their proximity between media and drives. This allows the library to assign the robot best positioned to service each particular request.

SLOTIQ™

A software "move" algorithm will virtualize the slot location inside the library and take advantage of the TeraPack's unique design. In doing so, it allows the robots to physically move less often or shorter distances as they take advantage of the available storage "holes" within a TeraPack as well as those closest to the drive bay, thereby improving cycle performance. This is a Spectra exclusive time-saving and production streamlining feature.

"Since our customers require the highest levels of performance, we work tirelessly to advance our tape libraries so they can be the fastest in the world."

Jon Benson, VP of Engineering and Emerging Technologies

Robotic Load Balancing

When using Robotic Load Balancing there is an approximate 20% improvement in the mount rate of a TFinity in a single exporter library with both TeraPorters processing moves in parallel. With Robotic Load Balancing enabled, moves are sent to the library by the software. After a quick verification of media availability, the library immediately sends a success message for the first move received; then processes the second move received using the second TeraPorter, thus allowing two moves in parallel.

Bulk Loading: Less Media Handling

All TFinity Plus libraries support BulkTAP end units as an optional hardware feature. Each BulkTAP allows 14 TeraPacks to be imported or exported in a single user operation.

TFinity Plus will additionally support the use of up to two BulkTAPs simultaneously for decreased loading-to-working time for organizations who eject/load large amounts of media from their library. While one set of robotics is working read/write operations, the other set of robotics can take in and distribute from one of the BulkTAPs. Then the robotics can switch jobs so the other BulkTAP media load can be taken in and distributed.

Best-In-Class Tape Technology

IBM TS1170 Technology Drives and Media with TFinity Plus

IBM® TS1170 Technology offers the most reliable tape technology ever developed. Designed to provide Enterprise-Class reliability with 24 x 7 usage. In addition to robust reliability and data integrity, the IBM TS1170 offers the largest capacity per tape of any tape technology available. This translates into fewer tapes needed to store the same amount of data, less labor and time to manage the tape inventory, as well as reduced library, application, and offsite slot costs. Superior performance provides customers with the ability to get the same amount of work done with fewer drives and reduced support costs.

Superior Data Integrity:
Spectra SKLM with AES-256 bit encryption and key management.

Fast Performance

Experience shorter backup windows and improved data access with the fastest tape drive on the market, delivering native data transfer rates of 400 MB/s and compressed data transfer rates of up to 900 MB/s.

Designed for Constant Use

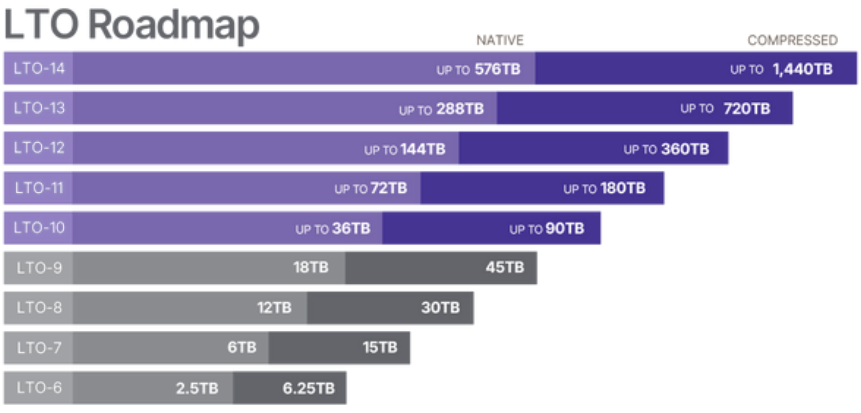
250,000 hour MTBF to meet demanding uptime requirements and ensure data is available when it's needed.

High Capacity

50TB native
(150 TB compressed at 3:1)

TFinity Plus Maximizes LTO Tape Technology

LTO (Linear Tape Open) is the only open format tape technology available, resulting from a cooperative development effort in the industry. LTO media is the low-cost, yet high performance storage standard. LTO-10 is the current generation and the LTO roadmap is planned to go out to generation 14 and beyond.



Note: Compressed capacities assume 2.5:1 compression (achieved with larger compression history buffer).
Source: The LTO Program. The LTO Ultrium roadmap is subject to change without notice and represents goals and objectives only.

- **LTO-10 Capacity:** Up to 75Tb compressed 2.5:1 (30TB native)
- **LTO-9 Capacity:** Up to 45TB compressed 2.5:1 (18TB native)
- **Data transfer rate:** Full-Height Drive – Up to 900 MB/s compressed (400 MB/s native)
- **Speed matching:** Capable **Data cartridge:** LTO-10 (rewritable) LTO-10 (WORM)
- **Cleaning cartridge:** LTO Universal Cleaning Cartridge (UCC)

- **LTO-8 Capacity:** Up to 30TB compressed 2.5:1 (12TB native)
- **LTO-7 Type M Capacity:** Up to 22.5TB compressed 2.5:1 (9TB native)
- **Data transfer rate:** Up to 750 MB/s compressed (360 MB/s native) **Speed matching:** 100-300 MB/s
- **Corrected Bit Error Rate:** LTO-8 = 1.0 x 10-19 **Data cartridge:** LTO-8 (rewritable) LTO-8 (WORM)
- **Cleaning cartridge:** LTO Universal Cleaning Cartridge (UCC)

Transforming Data Center Tape Storage Connectivity

Spectra OSW-2400 Optical SAS Switch

A Transformation for Tape Connectivity

The Spectra OSW-2400 Optical SAS Switch is the industry's first 24G SAS-4 switch utilizing active optical cables that extend connection distances up to 100 meters. This innovative solution reduces or eliminates the need for Fibre Channel HBAs, switches, and cables while enabling switched topologies within data center environments — all without requiring specialized storage networking skills. The OSW-2400 switch lowers per-port costs to 1/3 of Fibre Channel while maintaining performance, scalability, and security. This allows organizations to streamline tape connectivity, enhance operational flexibility, and minimize infrastructure costs.

How it Works

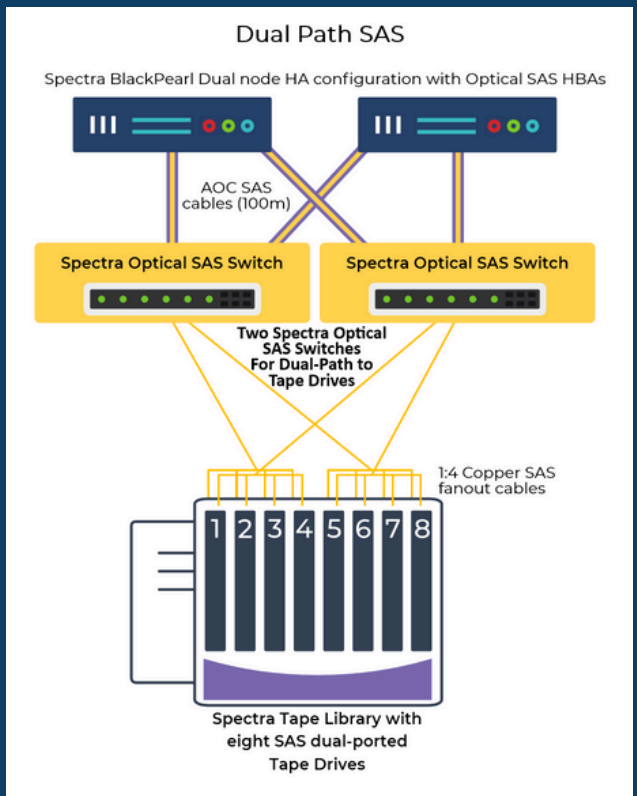
The OSW-2400 switch is ideal for organizations wanting to simplify and consolidate tape connectivity, extend connectivity from rack to data center distances, or reduce reliance on Fibre Channel.

- Connects 1 to 40 SAS tape drives per switch
- Aggregates bandwidth for 108 GB/s
- Covers up to 10,000 m2 data center floor space

Use Case: Spectra Optical SAS Switch High Availability

The Spectra OSW-2400 Optical SAS Switch can be configured for high availability using redundant connections and multipath I/O software to ensure uninterrupted access to tape drives. The following steps outline how this solution is implemented:

- Connect both ports of each tape drive to separate switch ports on the Spectra OSW-2400, creating redundant data paths
- Use dual SAS controllers on the host side, each connected to the switch, to establish multiple paths to each tape drive
- Implement host-based multipath I/O (MPIO) software to manage failover and load balancing across all available paths



It's a RoCE World Out There

Spectra has you covered with a modern approach to tape

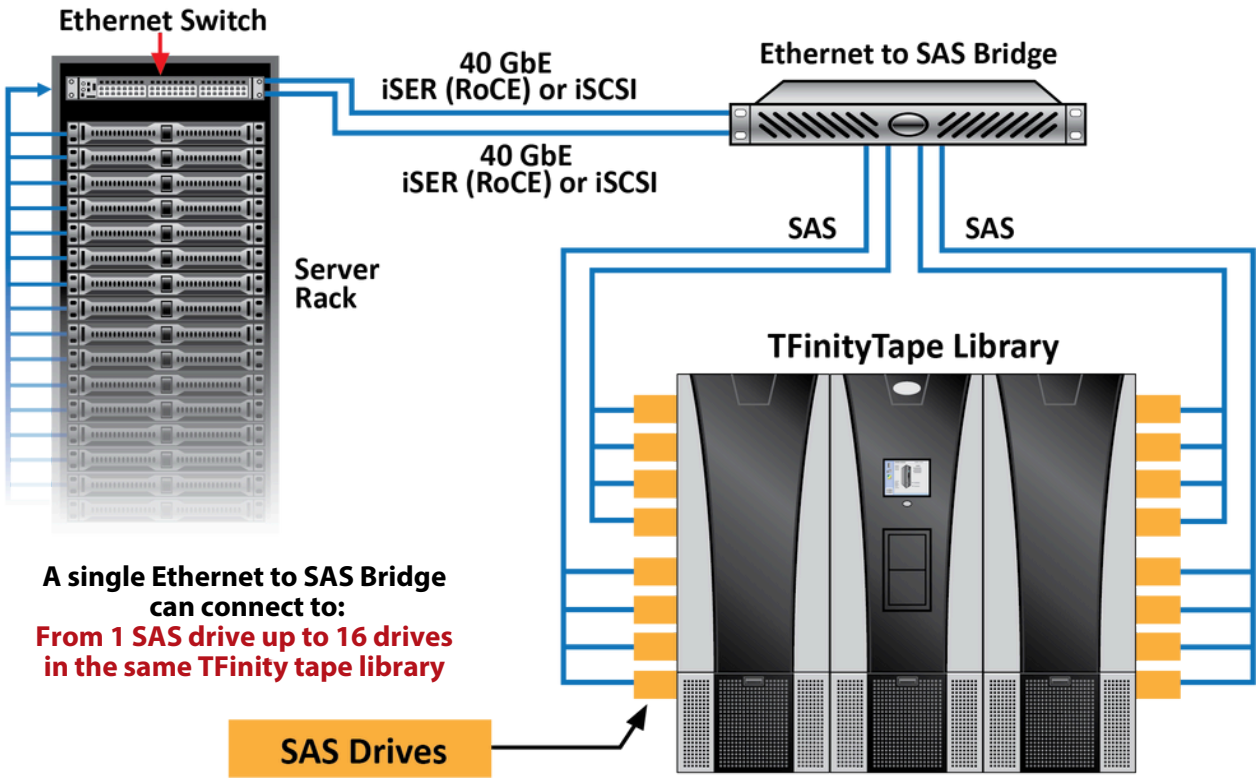
A large percentage of storage devices in a modern data center are attached via Ethernet for a number of different reasons, and one major reason is the cost savings using Ethernet over an older technology such as Fibre. Often the tape system is the last piece of equipment in a data center that is still using Fibre Channel, but new protocols like RoCE (Remote Direct Memory Access over Converged Ethernet) make it possible to utilize the full bandwidth of the latest generation of tape drives without the overhead of historical interfaces like iSCSI. Enter RDMA over Converged Ethernet a network protocol that allows remote direct memory access (RDMA) over an Ethernet network. This provides lower latency with higher bandwidth performance making your hardware work faster.

The cost per port for Ethernet is substantially lower than Fibre Channel, especially when it comes to comparing 50GbE or 100GbE to 32G or 64G Fibre Channel switches and HBAs. Paired with the reduced hardware cost of Ethernet, network engineers now have an easier job managing the system with the removal of Fibre Channel. Overall, data centers are progressing, and Spectra tape libraries are no different. Leveraging modern networking, Spectra libraries are positioned for the RoCE world ahead.

Ethernet to SAS Bridge

Ethernet to SAS Bridge is a 1U appliance that allows tape users with SAS tape drives to move away from either FC or direct-attach SAS tape drive architecture. An Ethernet to SAS bridge is at the core of the solution, providing two 40GbE inbound connections driving up to 16 channels of 12G SAS. SAS tape drives then provide the SAS connectivity on the tape library side. The bridge allows for connections using iSCSI or iSER via RoCE V2 (iSCSI Extensions for RDMA). After initial configuration and driver setup, the bridge is transparent to the host (regardless of iSCSI or iSER), and the host can read or write to the drives as if they were connected directly to the host system.

The controllers are optimized for high performance with multiple hardware acceleration engines which provide industry-leading performance to keep multiple tape drives streaming at maximum throughput. The solution enables a common set of services and features and is engineered with an open design that does not alter the data path.



Tri-Media Revolution

Three different tape technologies in the same library

Spectra pioneered the dual-tape technology of combining LTO with IBM® TS tape technology in the same library. Now we include Oracle® T10000 technology. The Spectra TFinity Plus Tri-Media feature allows you to preserve your investment by migrating or integrating your existing Oracle® media and drives — another Spectra exclusive.

Spectra eliminates Vendor Lock-In – Only Spectra offers support for all three major tape technologies: IBM® TS, LTO, and Oracle® T10000. We also support Object Storage with LTFS making your archives non-proprietary.

LTO

IBM TS11XX

Oracle® T10000

Configuration Options for Flexibility

Interchangeable parts allow for the fit that's right for you

Full-Isolation Service Bays

Allow a robot to automatically park itself where the repair can easily be done, while still allowing access to all of the TeraPacks within the library. The second robot in a TFinity is always active during these maintenance periods. This delivers a true, **high-availability** enterprise solution that is unmatched on the market today.

Non-Isolation Service Bays

The Spectra TFinity libraries have the option of being equipped with Non-Isolation service bays. In this configuration, when a robot has a failure it moves to the far right or left of the library. The other robot will take over any move operations requested by the host application. When it comes time to service the tape library, the power to the TFinity robots must be removed halting library robotic operations, but this can happen when it is convenient for the organization. This configuration is a **lower-cost** option for starting out in a TFinity which can be upgraded in the field to full-isolation service bays if needed.

Elastic Storage Slots / Frames

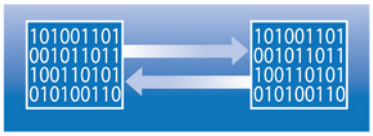
Another optional configuration is the ability to have elastic storage slots enabled. This is a configuration where service bays are not used. If a robot fails, the robot can be pushed to the end of the library, but it will block elastic storage slots. Once the robot is repaired, full operation and access to all slots is available.

Single Robot TFinity

The TFinity has the ability to be configured with a **single robot** for a lower-cost system. The single-robot model can be upgraded into a standard TFinity with a simple, easy addition of another robot. Start small and build as your demands increase.

TFinity Plus: Flexible Communication

Flexibility with multiple ways to interface with the TFinity



Spectra Logic API

The ReST API can be used to provide automated support for operating and monitoring the library. The LumOS ReST API which is based on the Open API specification, can be used for all TFinity Plus functionality. With this, normal library interactions can be automated without having to use the GUI for all functionality. The LumOS GUI can be used as well, both via the front touchscreen or remotely through the libray's IP address to control the TFinity Plus from anywhwere.

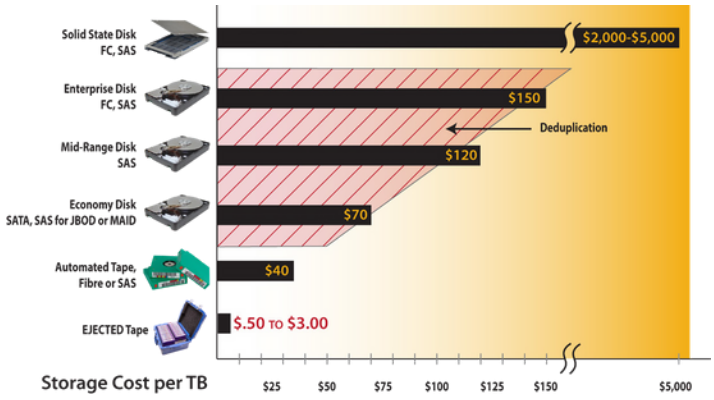
Data Path Failover

By using the Spectra Linux SCSI driver, the host system can lose a complete data path to the library... but as long as both ports on the back of the tape drive are connected through different data paths, the driver will automatically switch to the other path without any data loss or connectivity problems.

Cost Savings: Built into the TFinity Plus

Tape is the most cost-effective storage media available. The TFinity Plus leverages its lowest power consumption of any library per GB to deliver the world's fastest and highest-capacity single library. Able to expand from three frames to 45 frames and hold over six exabytes of compressed data, the flexibility of TFinity will always allow organizations to have a single tape library that meets all their needs.

The price of storage per terabyte on tape versus disk is so comparatively low, that every business enterprise should consider tape as a major part of their long-term storage and archive planning. David Reine of Clipper Group found that LTO tape costs up to 15x less than SATA disk for long-term archiving of large quantities of data.



"Our tape libraries form the backbone of IT infrastructures, so we ensure that they operate seamlessly with all leading technologies to create fully integrated solutions for our customers."

Matt Ninesling, Senior Director of Hardware Engineering

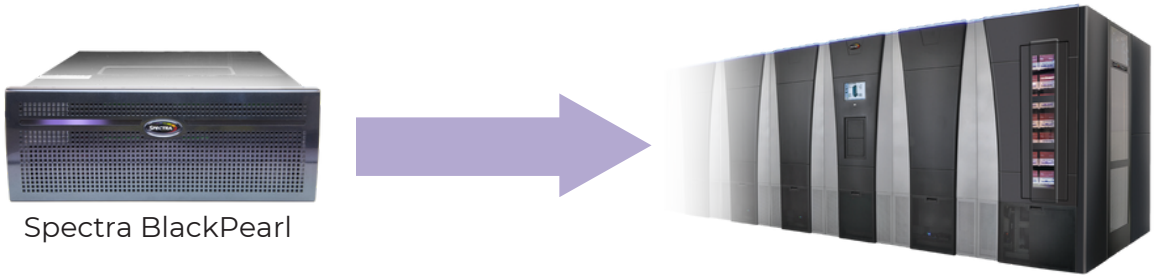
Industry-Leading Energy Savings

Highly Power Efficient

The TFinity Plus built-in, not bolted-on architecture provides the features you need and eliminates the requirement for multiple external servers to be purchased, powered, cooled, and serviced for the purpose of library management. In comprehensive testing and comparison, the TFinity power consumption is shown to be less than competing systems (in some cases, by a factor of 4x to 6x). Additionally, power consumption monitoring is an integral part of the LumOS feature set to help users keep track of their substantial energy cost savings.

Amazon S3-compatible Interfaces

Introducing the Industry-Changing Breakthrough in Massive Data Amazon S3-compatible and Amazon Glacier-compatible Interfaces for On-Premises Tape



Spectra BlackPearl

The most efficient, intelligent path to limitless storage in any TFinity Plus library.

The Spectra BlackPearl® platform solves the problem of costly and complex approaches to digital preservation by combining industry-standard object interfaces to flash, disk, and tape. Spectra BlackPearl interfaces with multiple storage targets into a simple and affordable solution. A TFinity library can now connect to Cloud Native applications such as Veeam, Cohesity, Network Appliance Storage Grid, iRODs, and a host of other storage apps.

A BlackPearl solution, combined with any online disk, nearline disk, tape, and cloud, provides organizations with complete control of their data. BlackPearl is built to support local copies, offsite copies, replication to anotherBlackPearl, and offsite public cloud storage. From the affordable entry-level BlackPearl H Series to the BlackPearl F Series that can transfer data at higher rates, there is a BlackPearl option perfectly sized for every organization. BlackPearl supports Amazon S3-compatible and DS3 for legacy applications.

BlackPearl Partner Developers

- Arcitecta
- Avid
- CatDV
- Cloudian
- Cyberduck
- Dalet
- Empress
- Globus
- Grass Valley
- Imagen
- IPV
- Karthavya
- Komprise
- Marquis
- StorCycle
- Tiger Technology
- Vidispine
- Network File Interface
- Rio Media Suite

BlackPearl Amazon S3-compatible Apps

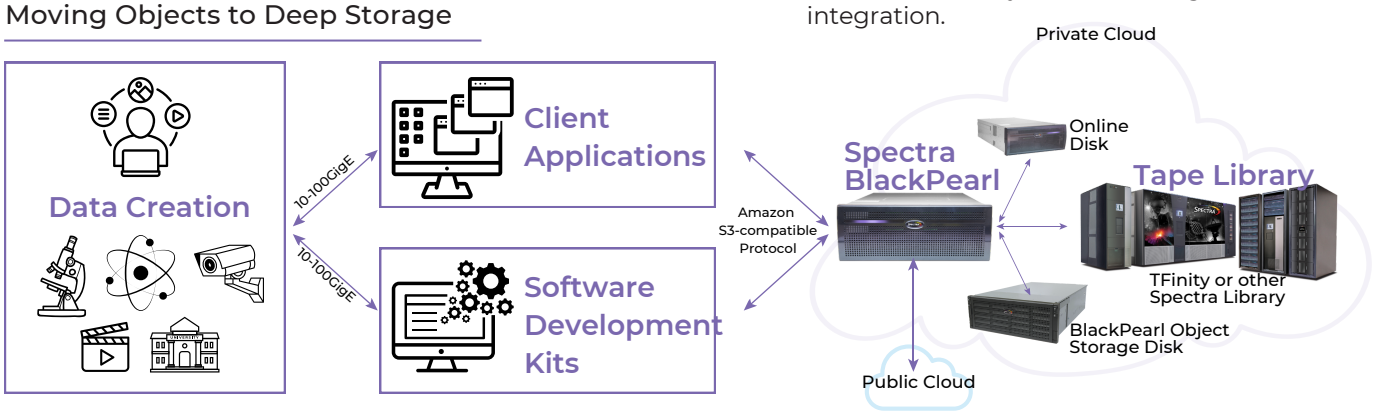
- Cohesity
- Veeam
- Netapp StorageGRID
- Backula
- StorCycle
- Rubrik NCD
- Rclone
- Rio Media Suite

Flexibility Makes It All Possible

Flexible storage is an underlying principle of BlackPearl and its advanced bucket management. Spectra policy-based data management software enables multiple copies. It is a storage networking method where data is stored on various types of media based on performance, availability, and recovery requirements.

Additional integration methods are available through SDK clients including Rio Media Suite, a rapid integration method to build your own storage integration.

Moving Objects to Deep Storage



TFinity Plus: Maximum Compatibility

Designed to work with the industry's cutting edge software

Spectra BlackPearl · Atempo · ARCITECTA OPERATING SYSTEMS FOR META+DATA · Spectra StorCycle

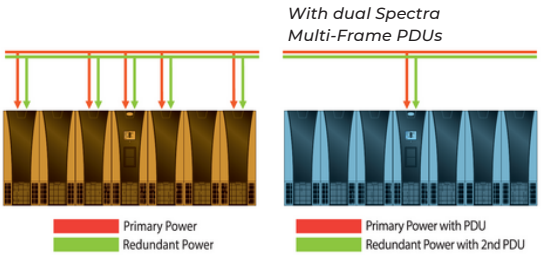
HPSS · globus · IBM · Versity · Hewlett Packard Enterprise · bareos · DELL EMC · COHESITY · VEEAM · VERITAS

Spectra tape libraries support nearly every software package written for open systems tape, in parallel with Spectra Shared Library Services (SLS), to deliver an application integration that maximizes the benefits of your storage, optimizes business results, and minimizes time-to-value. Combining Spectra storage systems and solutions with leading third-party applications can reduce risk, improve efficiency, and address data protection concerns while increasing flexibility through a more robust information infrastructure.

- **Archiware** – PreSTORE
- **Arcitecta** – Mediaflux
- **Atempo** – Digital Archive
- **Atempo** – Time Navigator
- **Bacula Systems** – Bacula Enterprise
- **Bareos** – Bareos GmbH & Co.KG
- **Cern Tape Archive** – CTA
- **CommVault** – Simpana and Galaxy
- **Computer Associates** – ARCserve Backup
- **DELL** – Avamar
- **DELL** – Networker
- **Enstore**
- **Globus** – with BlackPearl
- **GRAU Data** – AG
- **Hewlett Packard** – HP OpenView Data Protector
- **HPE** – Data Management Framework (DMF)
- **IBM** – High Performance Storage Systems (HPSS)
- **IBM** – Storage Protect (TSM, Spectrum Protect)
- **iRODs** – with BlackPearl
- **Masstech Group** – MassStore
- **NovaStor** – NovaNET, NovaXchange, and TapeCopy
- **Oracle HSM** (OHSM) – Oracle Secure Backup
- **Phobos** – Parallel Heterogeneous OBject Store
- **QStar Technologies** – HSM and Data Director
- **Quantum** – StorNext
- **Quest Software** – NetVault Backup
- **Roxio** – Retrospect (formerly EMC Retrospect)
- **Rubrik** – Cloud data management
- **SEP** – sesam
- **Seven10 Storage** – StorFirst
- **SGL** – FlashNet
- **StorageDNA**
- **Catalogic Software DPX** – Backup Express
- **Telestream** – Diva
- **Tolis Group** – BRU
- **Veeam** - Backup and Recovery
- **Veritas** – NetBackup
- **Veritas** – Backup Exec
- **Versity** – VSM
- **XenData** – Archive Series
- **Zmanda/Amanda** – Backup

Dual AC Power Design: No Phasing Required

The TFinity Plus has made improvements to its power subsystem over the TFinity library. In the previous TFinity, users were required to power each library mainframe, drive frame, and service bays with a separate power drop for each frame. With the implementation of a new power distribution unit, and dual AC power transfer switch, organizations can now utilize a single power input and run an entire library. If redundant power is needed, there are no longer any phasing requirements, enabling easy installation and configuration. Existing Spectra T950 and TFinity customers have the option to upgrade their existing library.



Snapshot of TFinity Plus Features

Feature	Summary
High-Performance Transporter	A) faster move performance B) multi-media capability C) enhanced reliability
New TeraPorter	Next-generation robotic transporter offering better performance and reliability
Custom Panels	Customer tailored artwork covers for front panels of TFinity Plus libraries
Tri-Media	Support for LTO, IBM® TS11XX, and Oracle® T10000 tape drives simultaneously
45-Frames	Expanding the maximum frame count from 40 frames to 45
SLOTIQ	Take advantage of empty spaces nearest tape drives to optimize performance
MEDIAIQ	Sorting move commands and optimizing move sequence based on robot location
Cold Storage	Segregation of tapes into a partition invisible to host applications to reduce cost
Dual Bulk TAP	Ability to simultaneously use 2x BulkTAPs for similar operations
BlackPearl Integration	Rack or other library top mounted gear to house BlackPearl appliance
Dual AC Power	No input power phasing requirement for N+1 power redundancy
TAOS	Time-Based Access Ordering System - Speeds up recall times by intelligently reordering recalls
Zoning	Allocates a library territory for each robot without using partitions, thus maximizing robotic performance

Spectra is proud to be a part of companies that engage in world-leading business and research

VIDEO SURVEILLANCE

Organizations in many industries use video surveillance to improve safety and security, protect business assets, meet legal requirements, and much more. To meet these demands, organizations are installing additional high-definition cameras and retaining video for longer periods.

HIGH-PERFORMANCE COMPUTING

High-Performance Computing (HPC) environments require storage of massive amounts of data forever, with the ability to quickly provide parallel access across the complete storage system to multiple users in any location, concurrently.

MEDIA & ENTERTAINMENT

With a focus on instant access of digital assets and monetization of content, one of the most critical needs in the Media and Entertainment industry is to have access to your content when you need it.

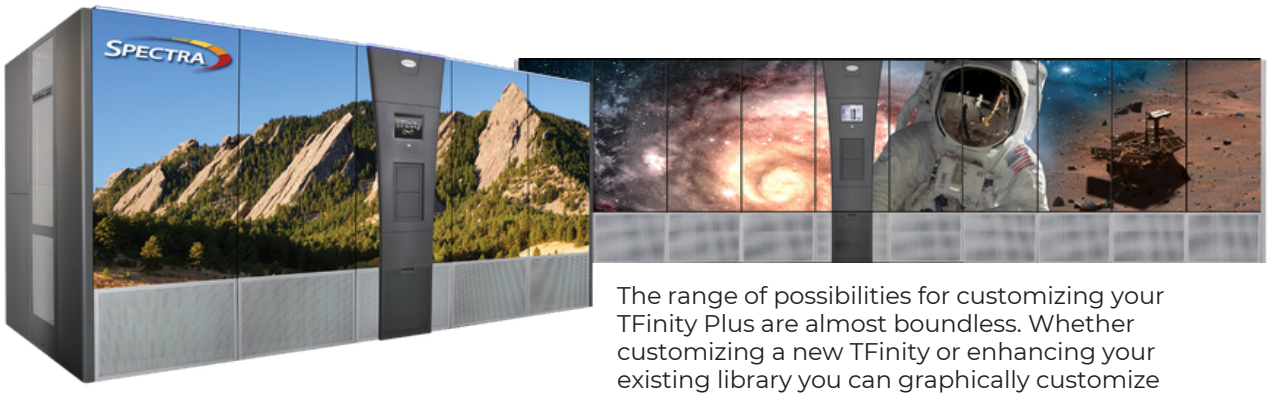
CLOUD STORAGE

Organizations must constantly reevaluate their unique mix of on-premises, private cloud, and public cloud environment to meet new business goals. Leveraging the Spectra hybrid storage eco-system, users can create a genetically diverse storage structure.

GENERAL IT

In an increasingly digital age, storage and sharing is more important than ever. Today's data backup, archive, and HSM storage solutions have evolved into much more feature-filled services that let you share and access your data easier and from pretty much anywhere — while still remaining affordable.

Industry-Unique Customized Graphics

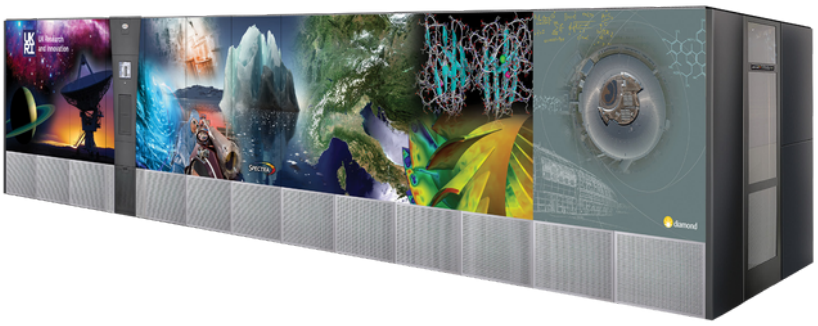


The range of possibilities for customizing your TFinity Plus are almost boundless. Whether customizing a new TFinity or enhancing your existing library you can graphically customize panels any way you would like.

Rutherford Appleton Laboratory in the UK

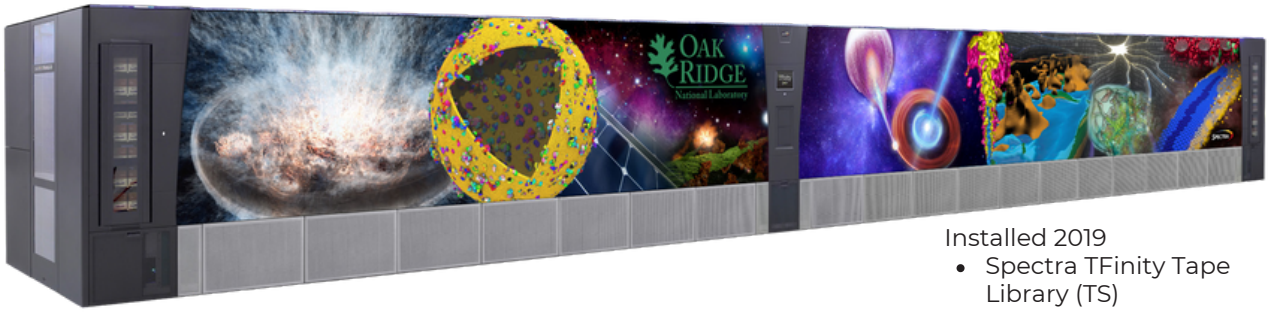
UKRI Science and Technology Facilities Council

Installed 2019
- Spectra TFinity Tape Library (LTO and TS)
- 7 frames initially
- 6 additional frames added in 2020



Oak Ridge National Laboratory

OAK RIDGE National Laboratory

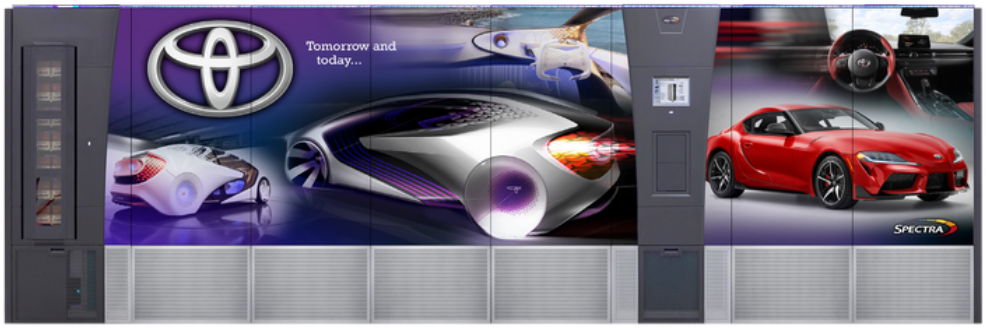


Installed 2019
- Spectra TFinity Tape Library (TS)
- 13 frames initially,
- 8 additional frames added

Toyota

TOYOTA

USA Corporate Headquarters in Plano, Texas
Installed in 2019
- Spectra TFinity Tape Library (LTO)
- 8 frames



LumOS Unified Management

Competing solutions typically require a variety of resources to manage a single tape library: as many as six interfaces; onsite interaction with the library; and remotely managed applications located on additional servers. A single LumOS, library management software, user interface manages an entire TFinity Plus library without any external servers. This consolidation eliminates your need for added equipment, software license charges, or increased power/cooling requirements of extra hardware. LumOS also offers you unparalleled operator efficiency, giving you the ability to manage your library, configurations, partitions, encryption key management, and all of your library/media/drive health monitoring through remote or local access with the Spectra Remote Library Controller.

Better Reliability Through Lifecycle Management

Media Lifecycle Management (MLM): To ensure the viability of your data, **MLM** tracks and reports on health and security related statistics for Spectra Certified Media. Detailed reporting allows you to move your data onto new tapes before degraded media affects your data.

MLM

Drive Lifecycle Management (DLM): DLM extends the same proactive approach to drives by integrating tape drive analysis and reporting within the library. Using easy-to-manage, color-coded icons, you can quickly identify the health status of a drive.

DLM

Lifecycle Management (LLM): Managing the health of your library's critical components is made easy with **LLM** — by delivering utilization metrics relative to the expected useful life of library robotics, filters and other critical components.

LLM

Data Integrity Verification

Spectra offers a sophisticated suite of standard features that allow you to actively check data already written to tape. **PreScan** checks each imported tape and verifies that the tape can be safely written to. **QuickScan** scans a tape uni-directionally to provide a rapid indicator of integrity of data written.

Tape Advantages Over Disk

Current spinning disk drives have reached maximum capacity providing 99 square inches of recordable space per drive. To achieve greater storage capacity, disk manufactures are forced to create new methods of recording (shingled, heat, helium filled) to gain additional capacity, but limitations are still a major hurdle. An LTO-10 tape cartridge has 18,898 square inches of recordable space with the ability to add additional tape for future technology. As each future generation of tape technology is released, expect continual storage capacity increases due to tape's ability to easily increase capacity.

- **Durability** - Tape-based storage offers superior durability over traditional disk-based storage
- **Longevity** - Modern tape media can last up to 30 years when stored properly
- **Portability** - Tape cartridges can be ejected and transported to any location in the world for safe keeping or disaster recovery
- **Linear Tape File System** - LTFS stored on tape can be accessed in the same way as data on disk and removable flash drives
- **Bit Error Rate vs. Disk** - To put into perspective how reliable tape is, it has a detected error rate of 1 x 1020 and an even more impressive undetected error rate of a single bit for every 1.6 x 1033 bits read. Compared to disk that has a detected error rate of 1 x 1016 , it becomes clear that tape provides the most reliable storage medium available.

VS.

Customers

"Tape libraries are highly expandable and easy to upgrade with denser media. This flexibility matches our current and future data storage needs exactly and makes the TFinity tape libraries an excellent solution for us."

Paul Newman,
HSM Storage Specialist

"Spectra's physically denser storage solution is much better for Livermore computing. The Spectra libraries take up significantly less floor space than our previous libraries, which allows us to be more efficient and agile as the big computers come and go."

Todd Heer,
Deputy Program Lead

"Our new Spectra tape library will allow the massive volumes of environmental data we collect to be made available to environmental scientists and support their research for many years to come."

Professor Bryan Lawrence,
JASMIN Principal Investigator

"The incorporation of Spectra Logic's active archive solution provides a platform for storage growth. It allows us to keep our primary data online and accessible to users, while also increasing the reliability of our stored data across physical sites."

Allan Williams,
Associate Director of Services & Technology

"We were happy to have a positive experience using Spectra Logic's technical support. Thanks to your speedy analysis and corrective actions/ suggestions, we managed to minimize the effect of one malfunctioning tape drive."

CSC - Espoo
TFinity Tape User

"As KAUST uses some of the most complex analytical tools in the industry and requires vast amounts of data storage, Spectra Logic's tape solution means that we are effectively able to manage our data safe in the knowledge that it is well protected and easy to retrieve."

Dr. Justin Mynar,
Director of Core Laboratories

"NCSA designed Blue Waters to be one of the largest, most powerful supercomputing ecosystems in the world. The Spectra Logic TFinity met our rigorous requirements."

Bill Kramer, Deputy Director of the Blue Waters Project

"The new library has just shy of 10,000 slots for tapes," Anderson said. "We'll be able to easily move all 70 petabytes of existing data into the new system and have plenty of room for at least a year or two before we have to start thinking about expanding."

Jason Anderson, HPC Linux Systems Engineer

"I have never had anything less than an excellent experience with Spectra Logic's technical support. Every single person has been knowledgeable and helpful throughout the ticketing process. Thanks for all the great work!"

University of Minnesota
Spectra Tape User

"Technical training seems to less important for big companies as the years go by. The T950 training that I received at "Spectra University" in 2014 was still the most thorough as compared to other organizations."

KTVT TV - Fort Worth
Spectra Tape User

"Spectra is an ideal partner due to its deep storage expertise. Spectra's BlackPearl product ecosystem, including their family of tape libraries and NAS disk products, will offer our customers an easy-to- deploy model, fast access to deep storage, and seamless scalability at a very attractive cost per terabyte."

Steve Tuecke
CEO

"Spectra Logic is a great company to work with, offering superior products and outstanding customer support. We are very pleased with the capacity, speed and reliability of our system, as well as its ability to integrate seamlessly into our existing production environment."

Andrew Proude, Sr. Systems and Broadcast Engineer

SpectraGuard® Support

Support offerings for Spectra TFinity Plus range from our standard worldwide next-business-day replacement to more advanced alternatives, including next day, same day, four-hour onsite service, and our exclusive Assisted Self-Maintenance option. Our support staff is cross-trained over the entire storage environment — not just hardware — so we can assist you with all aspects of any problem that should ever arise.

Next Business Day Service

- Next business day delivery of parts. Upon verification that the product has malfunctioned and a part replacement is required, the part will be shipped for delivery and customer installation the next business day.
- Remote troubleshooting between 8:00 a.m. and 5:00 p.m. during the standard business week, excluding nationally recognized holidays in the customer's location.
- 24 x 7 access to the Support Web Portal, knowledge base, and online documentation.

Next Business Day Onsite Service

- Access to a SpectraGuard Technical Support representative on any business day (not including evenings, weekends, or holidays) from 8 a.m. to 5 p.m.
- A service visit from a field service representative, upon verification, that the unit has malfunctioned and a part replacement is required. If Spectra Logic is notified by 5 p.m. a field service representative will be dispatched for arrival on the following business day between 8 a.m. and 5 p.m.
- Remote troubleshooting between 8 a.m. and 5 p.m. during the standard business week, excluding nationally recognized holidays in the customer's location.
- 24 x 7 access to the Support Web Portal, knowledge base and online documentation.

Four-Hour Onsite Service

- Telephone access to a Technical Support representative, 24 hours a day, 7 days a week, 365 days a year (including evenings, weekends, and holidays).
- Upon verification that the unit has malfunctioned and a part replacement is required, a service visit from a field service representative will be dispatched to arrive on-site within four hours, including evenings, weekends, and holidays. The customer may specify an arrival time after the four-hour window. The customer may be requested to replace the part if appropriate.
- Remote troubleshooting 24 hours a day, 7 days a week, 365 days a year.
- 24 x 7 access to the Support Web Portal, knowledge base and online documentation.

Self-Service Options

- In-depth training to allow fully self servicable options.
- Full training via web training and ability to visit Spectra's lab for full hands on training for every element of the tape library.
- 24 x 7 access to the Support Web Portal, knowledge base and online documentation.

"Along with delivering the industry's preeminent tape libraries, Spectra's world-class support sets us apart from our competitors – and we have the customer satisfaction scores to prove it."

Roberto Bigliani, Vice President of Worldwide Service Operations

Assisted Self-Maintenance (ASM)

Drive

Power Supply

Robotics

I/O Module

When a component does need replacement, Spectra gives you the option to do it yourself — without onsite support. ASM is an industry-first support option designed for customers that require minimal downtime for environments where normal support services are not feasible (e.g. high-security facilities, mobile sites such as ships). ASM stocks all customer replaceable parts at your site, giving you the ability to make immediate repairs and eliminate the delays that a site visit can involve.

Spectra Logic:
We Pledge to Keep Your Data Safe from Harm

As an archive specialist with decades of experience and thousands of installed solutions, we believe Spectra solutions deliver the greatest value available in the marketplace. Our comprehensive portfolio of hardware and software, application integrations, professional services, and customer support is second to none, backed always by our unwavering promise — we pledge to keep your data safe from harm.

About Spectra Logic Corporation

Spectra Logic modernizes IT infrastructures to preserve, protect and defend data, whether on-premises, in a single cloud, across multiple clouds or in all locations at once. Our cost-effective solutions help organizations efficiently manage, migrate and store long-term data, from terabytes to exabytes, with features that make it ransomware resilient.

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