



The Spectra® TFinity™ Library's High-Availability Features

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ABSTRACT

The speed of data creation dramatically increases the volume of data and the importance of protecting it. To that end, tape and its automation have maintained a significant presence in the data center and expanded in importance, especially in light of long-term storage requirements and the necessity of disaster recovery/continuity of operations. To meet the constant demands placed on data and its availability, the Spectra TFinity library has added multiple layers of system redundancy and failover.

INTRODUCTION

The Spectra TFinity library embodies a huge advancement in data protection, both through innate redundancy and through flexibility in configuration and ease of use. Building on the proven Spectra Tape Series family architecture, TFinity takes the T950's best features and builds on them. With a capacity exceeding 30,000 tapes and performance of up to 120 drives, TFinity can handle huge data storage, management and retrieval requirements, while sustaining an ease of use and availability, both unrivalled by any competing enterprise tape library.

ADDRESSING AREAS THAT GOVERN AVAILABILITY

To provide the highest possible availability and reliability, the Spectra TFinity library provides:

- Redundancy through stand-by components; for example, the global spare drive
- Redundancy through active failover-components; for example, redundant robotics
- Availability through constant monitoring; for example, drive, tape, and hardware health monitoring
- Availability through hot upgrades and hot-swap components; for example, multiple TFinity components including brushes and access ports
- Availability through components on-site, through TFinity maintenance options

The Spectra TFinity's serviceability is already proven through the modular design that has been field tested by the Tape Series library design. No competing library provides TFinity library's modularity, which permits and encourages rapid component addition and installation by customers.



SYSTEM-WIDE COMPONENT RELIABILITY

Virtually every complex system can be assessed at a sub-assembly level. High availability is ensured by measuring and improving the reliability of each component, and by providing redundant components wherever possible. Typically, library reliability has been measured in terms of the automation components—everything *but* the drives and the tape. However, library reliability is inextricably linked with tape and drive reliability.

The Spectra TFinity is the first library to provide drive redundancy and to increase the administrator's access to drive and tape health data. This greatly increases all-around availability and gives the library user insight into core availability issues that were never before easily accessible –or understandable.

These key factors, singular in ease of use and their comprehensive nature, support the TFinity library's extremely high availability and reliability:

- Increased drive availability through Global Spare drive and Drive Lifecycle Management (DLM)
- Increased library availability through hot firmware updates, and component-health tracking through Hardware Health Monitoring (HHM)
- Increased media reliability through Media Lifecycle Management (MLM) features

For the first time, drive availability is addressed through library design, significantly increasing real-world availability. Up until now, drive availability has been tallied separately—not included in assessing library availability. The distinction has made some sense, given that the drive and library manufacturers typically are separate companies (or separate divisions within a company). The goal in tracking library availability independent of drive availability is to permit library vendors to focus on high availability of library-specific features. As helpful as this is in assessing library availability, it is cold comfort in the data center for administrators dealing with drive failures.

TFinity library design addresses drive-availability issues, so this historical if somewhat artificial distinction is unnecessary. TFinity supports high drive-availability in two distinct ways: an installed spare drive, and instant insight into drive health. The first addresses specific failures, the second helps to prevent those failures altogether—identifying failing drives and removing them before they affect operation.

The Global Spare drive option provides stand-by redundancy. By installing a drive that is designated as available to one or more partitions, drive failures can be immediately addressed by simply bringing the stand-by drive online. Because the spare drive is virtualized, the switch to the spare is transparent to the application. The spare drive assumes the worldwide name (WWN) of the failed drive, permitting

the new drive to seamlessly continue operations—the environment doesn't have to be reconfigured, and the application doesn't need to be restarted.

Drive Lifecycle Management (DLM) adds another layer of protection against drive failure by reporting on drive health. The health of drives is indicated using icons that make it clear, at a glance, which drives may need attention:

-  The drive health is good. The drive is operating normally.
-  The drive requires some attention. Use the recorded and displayable drive error code to determine the action required.
-  The drive health is poor. The drive has experienced an unrecoverable error or problem. Replace the drive.



Figure 1: Screen indicators of tape health

Availability is also enhanced through the TFinity library's support of hot upgrades to library and drive firmware. No downtime is required, ensuring on-going availability. Further, library component health is tracked using HHM. This alerts you to potential component health issues, again permitting you to act before library operation is negatively affected.

REDUNDANCY

The TFinity library provides extensive system redundancy and fail-over, including:

- Dual robotics option
- Global Spare drive
- N+1/2N power supplies
- QIP failover
- Multiple access ports and touch-screen displays option
- Robotics/brushes
- Dual communications paths
- Dual robotics control paths



ASSESSING LIBRARY AVAILABILITY

Even without factoring in the tape and media availability features, the TFinity library is projected to provide greater than 0.99997 reliability, as calculated using the industry-standard statistical reliability model. The industry-standard model includes identifying key components and their failure rates as a foundation. Redundancy and other features that improve reliability are then assessed, as these features improve overall system availability. The industry model does not take into account issues relating to drive and media availability, so it is logical to assume that TFinity availability will be greater than the four nines specified above when factoring in the additional drive and media availability functionality.

CONCLUSION

The Spectra TFinity library has brought a new level of availability and reliability to data-intensive environments. The library combines component redundancy, media and drive health tracking, and a surprising array of integrated management features to increase availability, and to reduce complexity in the data center.

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