The Value of Tape and Tiered Adaptive Storage

SPECTRA

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Spectra Logic: Leading Storage Innovation Since 1979

- Proven Innovator and History of Success
  - Intelligent integration of complete data protection solutions
  - Founded in 1979, self-funded, profitable, debt-free growth
  - Continuous innovation
  - High customer satisfaction & support ratings

- Long-term Market Traction and Growth
  - Years of Yr/Yr growth in enterprise and mid-range tape libraries; media and support services
  - Leader in data intensive verticals: HPC, M&E, Federal
  - 380+ VARs and Resellers in North America and Europe
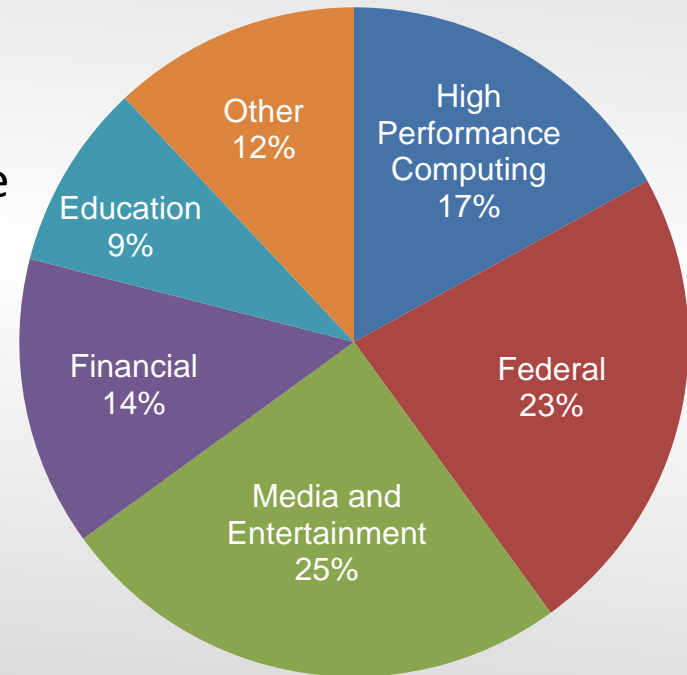
- OEM/PLP Partnership examples:

Worldwide Markets

- Leader in data intensive verticals:

    – Broadcast Archives & Playout

    – Post Production Backup and Archive

    – HPC Data Stores

    – Active Archive

    – Backup

Pie chart:
- High Performance Computing 17%
- Federal 23%
- Media and Entertainment 25%
- Financial 14%
- Education 9%
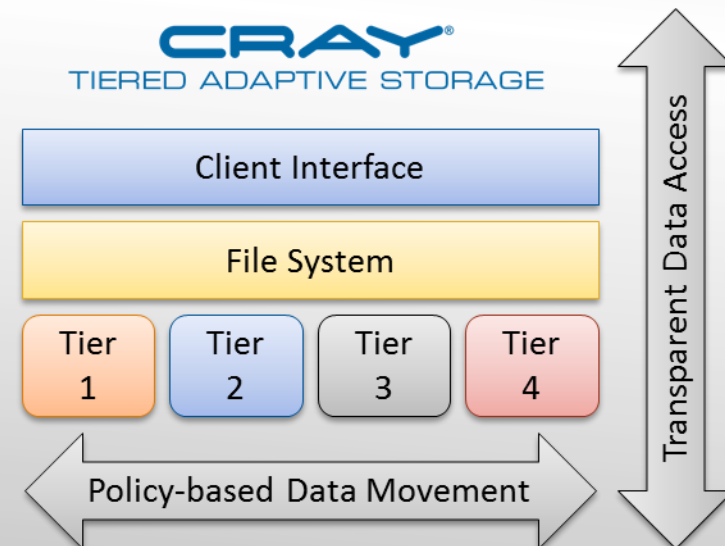- Other 12%

Cray and Spectra Logic

- Spectra Logic is Cray's preferred partner for all tape and library sales
- Current sites with Cray installed Spectra Logic libraries
  - Korea Meteorological Administration (KMA)
    - Spectra T-Finity tape library
  - CPTEC - Center for Weather Forecast and Climate Studies (Australia)
    - Spectra T950 tape library
  - EPCC – Archer (Edinburgh)
    - Spectra T380 tape library
- NCSA - Blue Waters
  - Spectra Logic T-Finity 380 PB

With Tiered Adaptive Storage (TAS) Cray expects to be the premiere archive solution provider for the world's largest systems

Tiered Adaptive Storage (TAS)

- Open, scalable tiered storage for HPC and Big Data

- Four physical tiers including primary:

  - **Tier 0** – Performance optimised for high I/O and throughput (disk or SSD)

  - **Tier 1** – Primary storage where live data resides (disk)

  - **Tier 2** – Capacity optimised nearline storage (disk or tape)

  - **Tier 3** – Extreme capacity, cost optimised for deep archives (tape)

- NFS, CIFS, VSM File System, Lustre HSM integration (2.5)

CRAY®
TIERED ADAPTIVE STORAGE

Client Interface

File System

| Tier 1 | Tier 2 | Tier 3 | Tier 4 |

Policy-based Data Movement

Transparent Data Access

Current Mid to Enterprise Tape Technologies

- LTO
  - Ultrium half inch open standard developed by IBM & HP with standard overseen by consortium of IBM, HP and Quantum. Automation from multiple vendors, very large scale from Spectra, IBM and Oracle, 5 media manufacturers.

- IBM TS1140
  - 4th generation 'Jaguar' drives, single vendor proprietary half inch format with underlying LTO technology. Drives from IBM, automation from IBM and Spectra, single source media.

- Oracle T10000D
  - 4th generation half inch format proprietary format drive. Single source only for drives, media and automation.

Tape Drive Technology In Use

Midrange Technology Shipments

Legend:
- AIT
- DLT
- EXB
- LTO Ultrium
- Mammoth
- SAIT
- SDLT
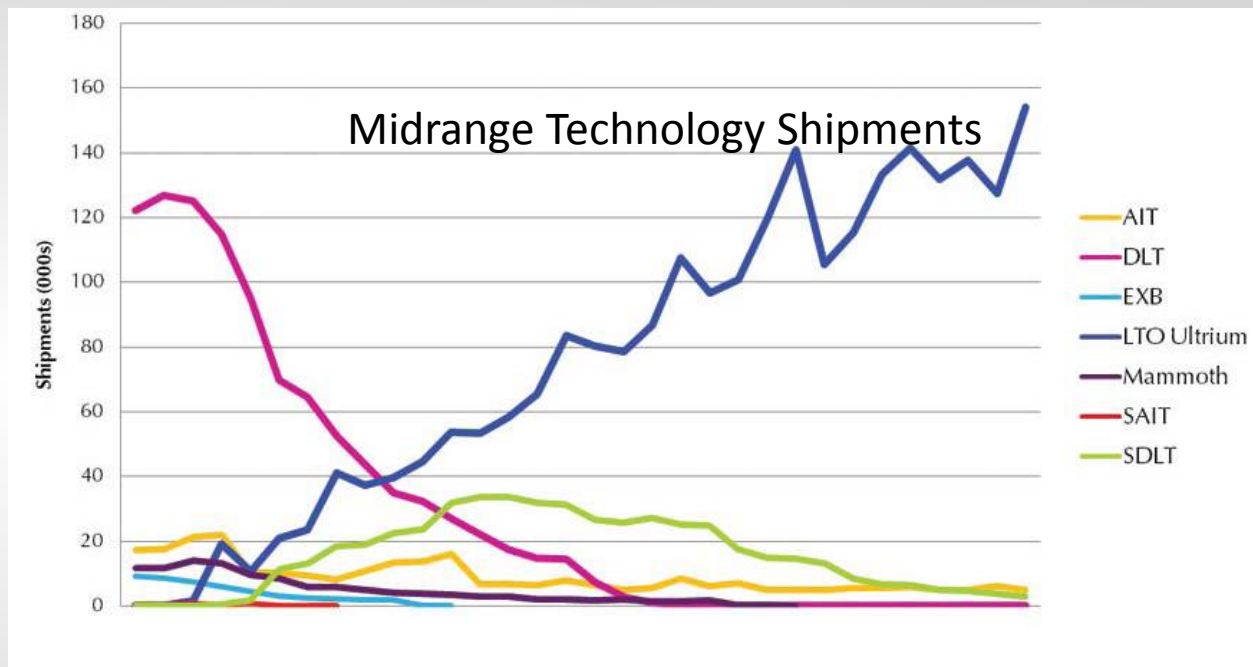
Market Share in units 2010:

LTO (all)   97%
TS1140   2%
T10000C   1%

- ≈75% of HPC Market Utilizes Open Tape Technology
- ≈25% of HPC Market Utilizes Proprietary Tape Technology

Tape Requirements for HPC environments

- Capacity – floor space occupied & library slot count
- Performance
  - Throughput
  - Connectivity bandwidth
  - Mount and file access times
  - Speed matching
- Reliability
  - Bit error rate
  - Drive MTBF
  - Drive media health reporting features
- Power consumption
- Drive and media cost (cost/TB)
- Number of sources, drives and media

IBM TS1140

Integration with TS1140 tape drives enhances reliability in T-Finity, T950, and T380 libraries

TS1140 Feature	Reliability Advantage
Load/Unload	Reduces failure in high workload environments
BER 10-21	Virtually no write errors, perfect data every time
Speed Matching	Less stop / start as data rates fluctuate = less wear, less failure
Virtual Backhitch	Less stop / start = less wear, less failure
32 heads	More data in fewer passes = less wear, less failure
Bigger motors	Easier to handle workload = less failure
Robust cartridge	Reduces cartridge damage in heavy duty use

Drive Comparison Chart

TS11x0	TS1120[2]	TS1130[2]	TS1140	Gen 5[1]	Gen 6[1]	
Native Capacity (TB)	0.7	1	4	8-10	14-20	
Compressed Capacity (TB) (2.5:1 Compression)	1.4	2	8	25	50	
Native / Compressed Throughput (MB/s)	104 / 208	160 / 320	250 / 650	Up to 360	Up to 540	

LTO	LTO4	LTO5	LTO6	LTO7[1]	LTO8[1]
Native Capacity (TB)	0.8	1.5	2.5	~6.4	12.8
Compressed Capacity (TB) (*2.5: 1 Compression)	1.6	3	6.25*	16*	32*
Native / Compressed Throughput (MB/s)	120 / 240	140 / 280	160 / 400	315 / 788	472 / 1180

T10K	T10K A	T10K B	T10K C	T10K D	T10K E[1]
Native Capacity (TB)	0.5	1	5	8.5	**10-12**
Compressed Capacity (TB)	1	2	10	20	?
Native / Compressed Throughput (MB/s)	120 / 240	120 / 240	240 / 360	252 / 800	?

[1] Projected Capacities and Performance [2] Not supported
LTO6 has larger ALDC core providing larger compression dictionary

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Spectra Confidential – NDA Required

Spectra T Series Libraries

- ## Reduce Storage Cost
  - Terapack density reduces floor space costs
  - Low power use drives down TCO
  - Scalability reduces growth costs
  - Simple media handling lowers administration costs
  - BlueScale minimizes application and hardware costs

- ## Improve Storage Reliability
  - Media Lifecycle Management reduces media failure
  - Library Lifecycle Management raises library availability
  - Drive Lifecycle Management improves drive reliability

- ## Ensure Data Integrity
  - Data Integrity Verification ensures data validity
  - BlueScale Encryption secures your data

TeraPack Density Reduces costs

- Industry leading density

- Industry's smallest footprint
  - Reduce expensive data center floor space requirements
  - Repurpose floor tiles to highest, best use
  - Reduce tape handling and associated costs
  - 10 LTO tapes or 9 TS1140 tapes per TeraPack

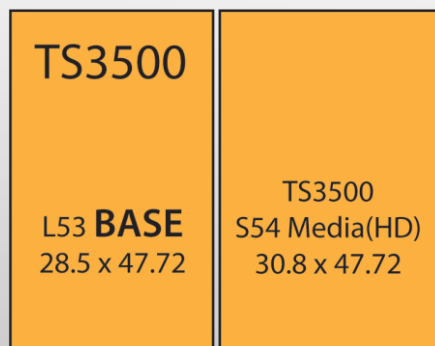- TeraPack design allows it to use as little as 20% to 50% of the floor space required by competitors.
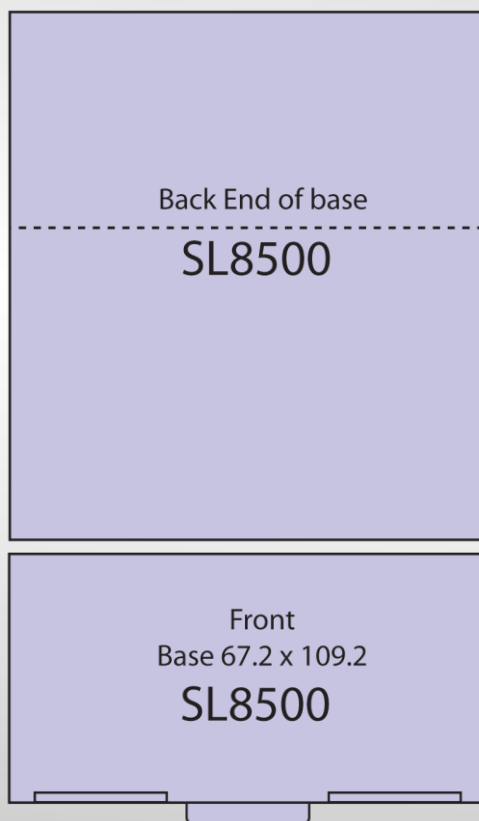
Saving Space Lowers Your Cost

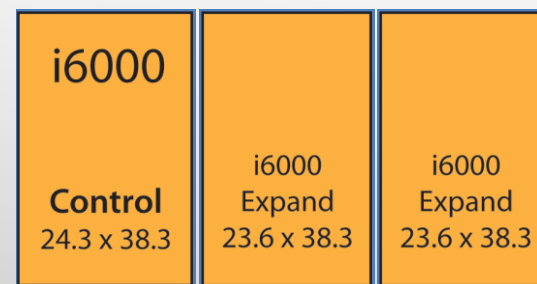## Footprint to hold 950 LTO tapes and 12 LTO tape drives

T950

BASE, Media
30.6 x 43.5

9.2 Sq. Ft.

TS3500

L53 **BASE**
28.5 x 47.72

TS3500
S54 Media(HD)
30.8 x 47.72

19.6 Sq. Ft.

Back End of base
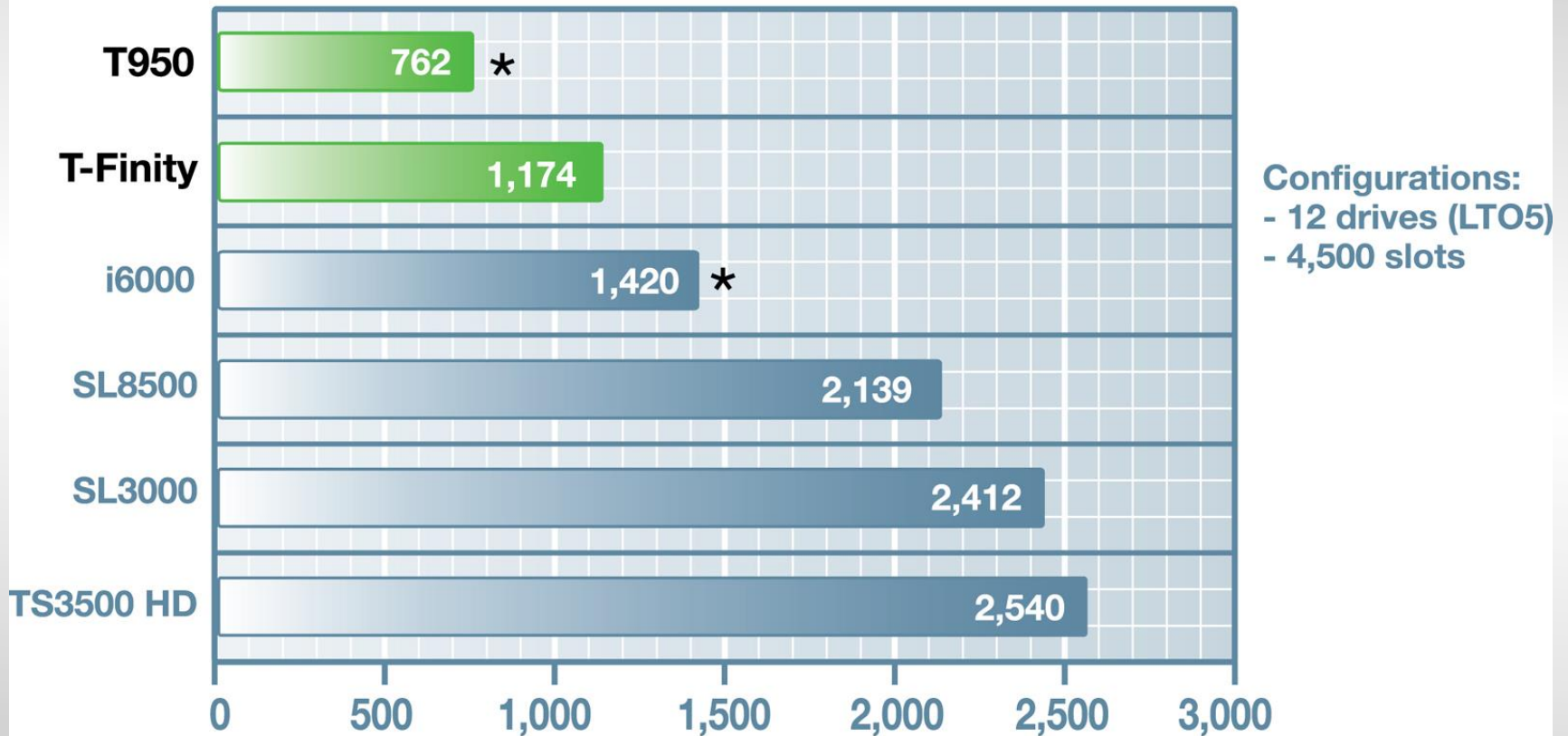**SL8500**

Front
Base 67.2 x 109.2
SL8500
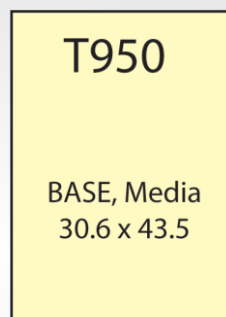
51 Sq. Ft.

To store as much as T950:

- IBM needs over 200% more space

- QTM needs over 200% more space

- Oracle needs over 500% more space!

i6000

Control
24.3 x 38.3

i6000
Expand
23.6 x 38.3

i6000
Expand
23.6 x 38.3

19 Sq. Ft.

Power Efficiency Reduces Your Cost

Enterprise Library Power Usage in Watts

Library	Watts
T950	762 *
T-Finity	1,174
i6000	1,420 *
SL8500	2,139
SL3000	2,412
TS3500 HD	2,540

Configurations:
- 12 drives (LTO5)
- 4,500 slots

*Single robot configuration. All others are multi-robot confugurations.

BlueScale 12 is Designed to

- Reduce storage costs

- Improve reliability

- Ensure data integrity

- Bring enterprise features to all T-Series libraries

POWERED BY BlueScale INTELLIGENCE

[Watch Demonstration of BlueScale on YouTube](#)

Universal Interface: Lower Cost

- Step-by-step screens guide you through the entire set-up process.

- Identical screens displayed when logged in on front panel touch screen or remotely reduces training costs.
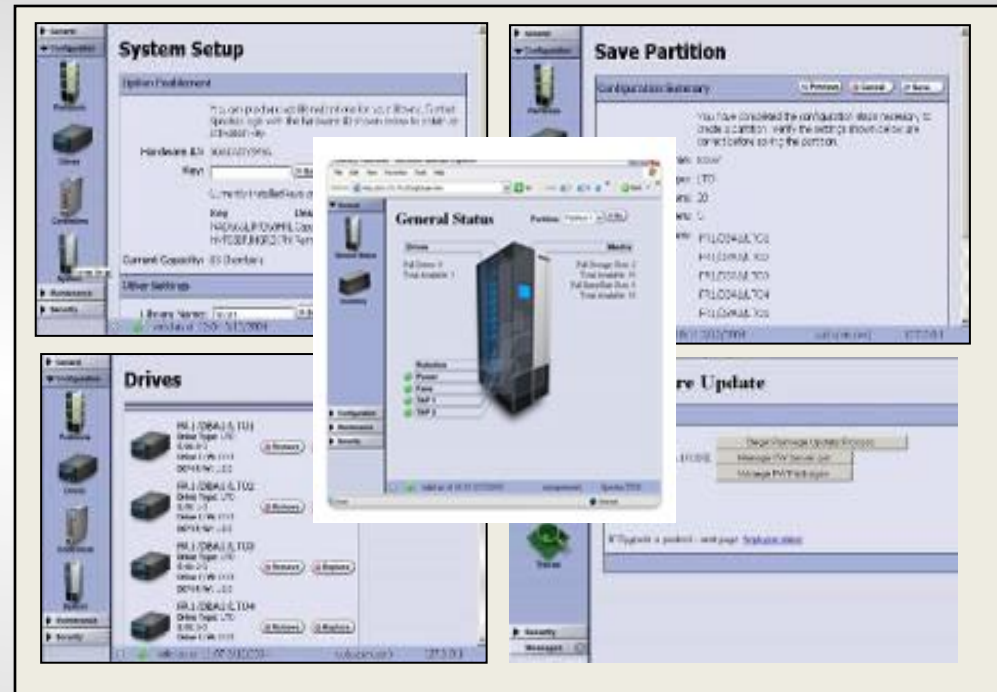
BlueScale Metrics: Reduce Cost

Patented Monitoring quickly lets you know:

- Drive Read and Write Performance
- Library Power Consumption
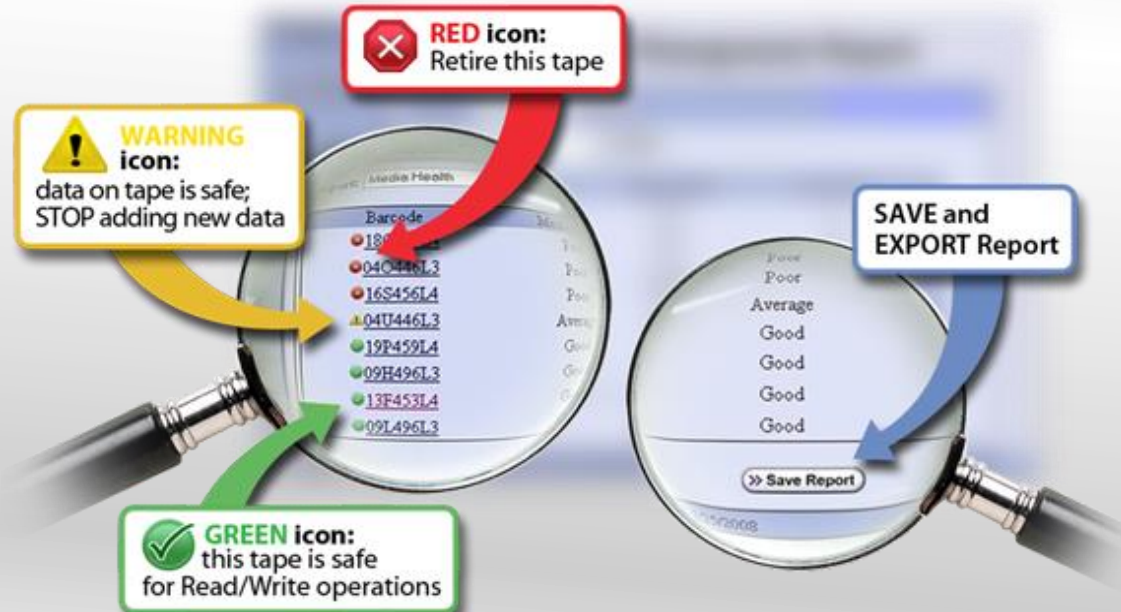- Graph over defined time interval or current performance
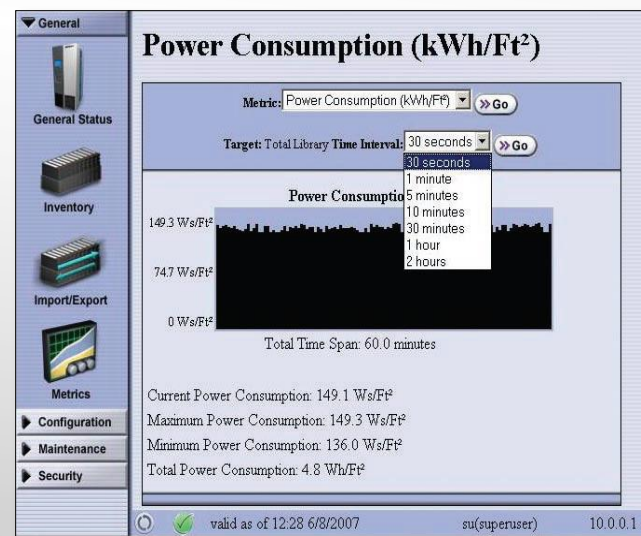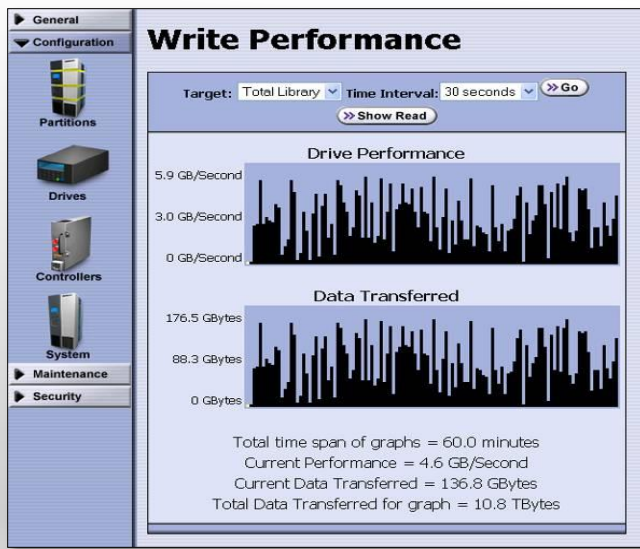
Media Lifecycle Management Improves Reliability

Alerts you before media goes bad

- Close to 40 data points tracked
- Advanced analytics determine health score
- Simple color coded reporting

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RED icon:
Retire this tape

WARNING icon:
data on tape is safe;
STOP adding new data

GREEN icon:
this tape is safe
for Read/Write operations

SAVE and
EXPORT Report

Spectra Certified Media

- 1. Media health
- 2. Barcode
- 3. Load count
- 4. Loaded
- 5. Born on date
- 6. Write protected
- 7. Encryption and moniker
- 8. Encryption key expiration
- **9. Media type**
- **10. Cleans remaining**
- **11. First write partition**
- **12. First write library**
- **13. Last write partition**
- **14. Last write library**
- **15. Remaining capacity**
- **16. Maximum capacity**
- **17. Soft write errors**
- **18. Soft read errors**
- **19. Remaining MAM capacity**
- **20. Current drive display**
- **21. Drive efficiency**
- **22. Media efficiency**
- **23. Drive status (last four)**

- **24. Last four load device s/n's**
- **25. Last four load device efficiency**
- **26. Media s/n**
- **27. Compression ratio**
- **28. Exported**
- **29. Export user**
- **30. Export time**
- **31. Current partition**
- **32. Manufacturer**
- **33. Manufacturer data**
- **34. Tape generation**
- **35. Number of cleans**
- **36. Date of first LTO**
- **37. Drive s/n of first LTO**
- **38. Temperature first LTO**
- **39. Humidity of first LTO**
- **40. Date of most recent LTO**
- **41. Drive s/n of most recent LTO**

Media Lifecycle Management monitors, tracks and reports on all facets of tape usage and health status to reduce tape-related errors, eliminate unscheduled downtime and increase the reliability of your backup and archive operations.

Data Integrity Verification Ensures Data Integrity

DIV ensures the data stored in your
T-Series library is what was written

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- PreScan

- PostScan

- QuickScan

PostScan™ Blackout Periods

Specified in hours of the day (to unset day, set both Start and Stop to 0)

Day		Start		Stop	
Sunday:	Start	0	Stop	0	
Monday:	Start	0	Stop	0	
Tuesday:	Start	0	Stop	0	
Wednesday:	Start	0	Stop	0	
Thursday:	Start	0	Stop	0	
Friday:	Start	0	Stop	0	
Saturday:	Start	0	Stop	0	

PreScan™: Performs a basic functionality test and health check on each imported cartridge

☐ Enable PreScan

PostScan™: Performs a readability verification test on each cartridge. To enable PostScan FullScan or QuickScan and select one or more triggers which specify when a PostScan sh...

○ **FullScan:** Uses Global Spare drives to perform verification tests. Moves to drives in a configured partition are not impacted.

○ **QuickScan:** Uses drives within the partition to perform verification tests. Normal moves will be delay up to 3 minutes when cartridges are being verified.

○ **QuickScan using Global Spares:** Uses Global Spare drives to perform quick cartridge verification Moves to drives in a configured partition are not impacted.

☐ Scan After Time [0] Days

☐ Scan After Write

☐ Scan After Read

PreScan™: Performs a basic functionality test and health check on each imported cartridge.

☑ Enable PreScan™

PostScan™: Uses a Global Spare drive to perform a readability verification test on each cartridge. Select one or more triggers to specify when a PostScan™ should occur:

☐ Scan After Time [180] Days
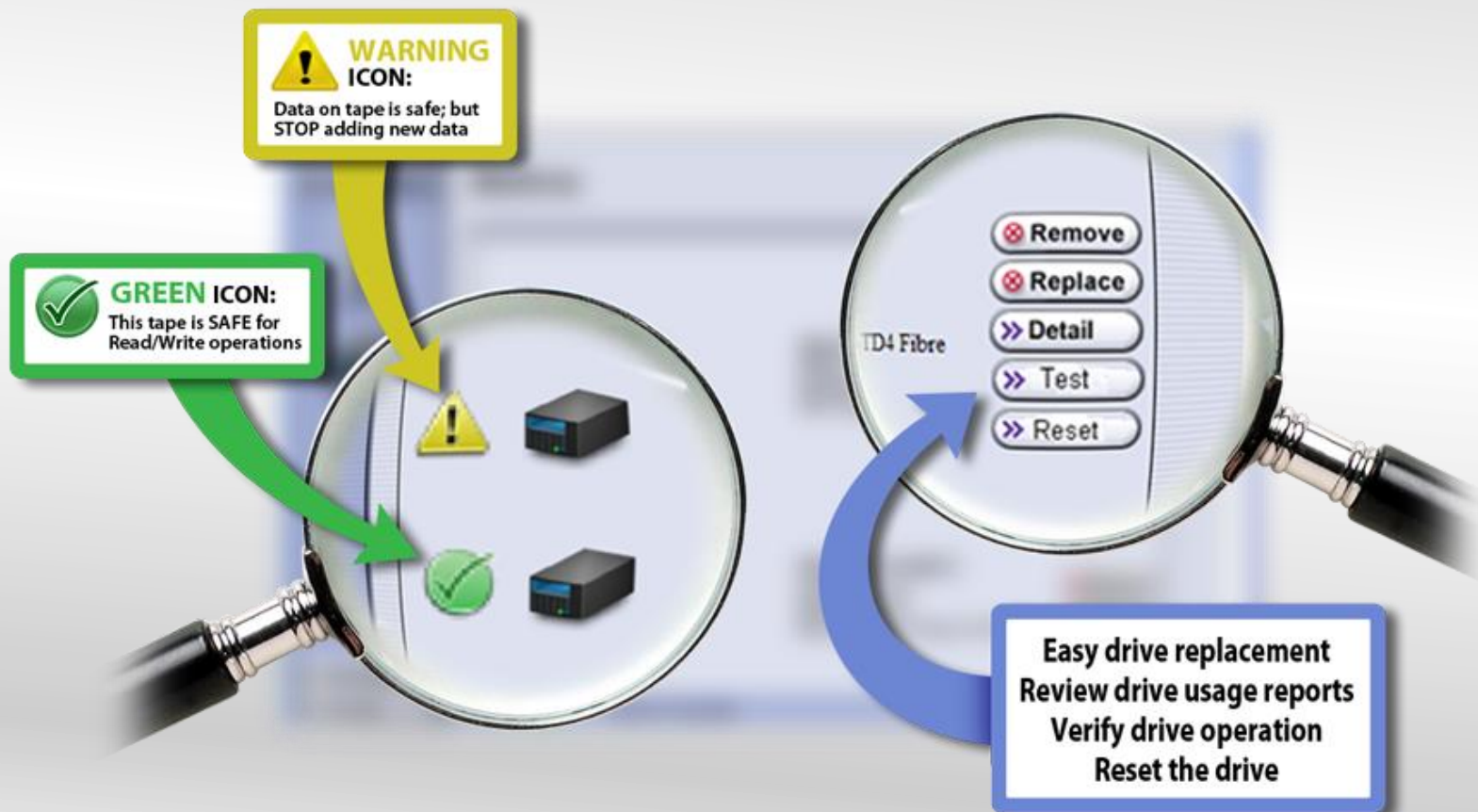
☐ Scan After Write

☐ Scan After Read

Drive Lifecycle Management Improves Reliability

Identifies drive issues before they become a problem

Thank You