

# Using tape for a competitive advantage

How to bring value to your most important customer

# What is valuable to the archive customer

- Capacity
  - Massive amounts of data
- Mount performance
  - Get the tape to the drive every time, as fast as possible.
- Read / Write
  - Get the data onto tape as fast as possible.
  - Get the data off of the tape as fast as possible.
- Long term use
  - Support legacy tape system, LTO, TS and T10K.
  - Support the product for 10+ years
- Easy to service
- Cost



# Methods used for improving customer value

- Value innovation
  - Find the most valuable customer
  - Tune features to customers' attribute
- •Lean
  - 5 whys
- Direct customer feedback
  - Build what the customer wants











# **TFinity ExaScale**

- Up to 641 PB raw with LTO-8
- Flexible Configurations
  - 3 to 44 frames
  - 100 to 53,460 LTO / 40,680 TS slots
  - 2 to 144 tape drives
- LTO-6, LTO-7, LTO-8, TS1150, TS1155 Technology
- T10K legacy support for migration
- Dual robotics **for** availability and performance
- 24 x 7 x 365 operations

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• Upgrades in 9 or 10 slot increments





## **TFinity ExaScale**





Two ways to make things faster – move faster, do less. Lean principle



# **TFinity – High Performance Transporter**

- High Performance Transporter
  - Evolutionary Progression in performance, and reliability.
  - Completely new robotics and firmware.
  - Designed for 2,000,000 MCBF.



	First Generation Transporter	High Performance Transporter
TeraPack Drawer Pick/Put	7 seconds	< 1 second
Slot Pick	3 seconds	.5 seconds
Slot Put	3 seconds	. 5 seconds
Picker Head Rotation	1 second	.25 seconds





# Hardware / Software interface

# **TFinity Zoning Optimizations**

- The TFinity Bluescale software has been modified to include zoning information in the Read Element Status response.
- This allows the storage software to keep both robots working optimally in their zone without any robotic contention.

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# **TFinity TeraPack® Affinity**

- Do as many tape moves as possible from the same TeraPack to increase overall robotic performance.
- By giving the storage software the TeraPack barcode associated with each tape barcode the software can sort the internal move queue to consolidate all tape moves within a given TeraPack to happen in order.

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#### ISV + Spectra Logic Mount Rate percentage





# Media

Write performance

#### Value Innovation (Find the most important customer)



#### Move important features up, un-important down



#### **Reduced Error Rates and More Consistent Media**

- Rewrite Error Rate blocks that have to be rewritten
- More Rewrite Errors mean less capacity and loss of performance
- Users want consistency



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### TAOS<sup>™</sup> Read Performance

Time-based Access Order System (patent pending)





# Evolution of reading a disk drive

- Reads were done one cylinder at a time.
  - Usually one read per rotation
- Disk driver/OS Strategy Routine
  - Disk drivers began to understand the disk layout and optimize the order of the read.
  - Disk Driver Strategy Routine would re-orders read to optimizes heads/Sectors/Cylinders
- Strategy Routine moved into the disk drive
  - Chained commands given to drive
  - Drives buffers the data and does multiple reads per rotation
  - No knowledge of disk geometry





## Why block file locate is important

- ISV (HPSS/DMF) software see tape as one long sequences of blocks
- Modern tape uses wraps
  - Each tape generations changes number of wraps (Single Pass)
  - Track count per band also changes
- An LTO 8 tape is almost 200 km long when read from beginning to end
- TS has Recommend Access Order
  - Read in the best restore order is only available on Enterprise drives, Not on LTO



## **Example of 6 files recalled**



## Linear recalls are very inefficient





#### Ordered recalls based on LPOS much more efficient

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### **Crossing Bands Is Considered**







# Media and Drive Wear Reduction Testing with TAOS

- A test was performed with 100 files with a file size between 1-100MB:
- TAOS Meters of Tape Across the Drive Head: 2,470
- Unordered Meters of Tape Across the Drive Head: 31,878
- That's a ~13x reduction in meters of tape. Or 8.4% of the original meters of tape.
- Spectra currently estimates that TAOS will reduce tape and drive wear by ~10X on media read operations when used in conjunction with HPSS 7.5 or later
- Releasing with major archive packages





## **Other direct customer feedback**



#### **Tri-media - Three Different Tape Technologies in the same library**

- Spectra's ExaScale Edition tri-media feature now allows migrating or integrating your existing T10K media & drives.
- The ExaScale Edition TFinity supports mixed media environments with LTO, TS, and T10K.
- Spectra Logic offers a migration program where your existing T10K drives can be resledded into TFinity drive sleds and then used for recalling data from existing T10K media, reducing initial migration costs.

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#### **Custom Skins**















# Thank you