



**Scaling the
PERFORMANCE
Wall**

*Spectra Raises the Tape
Performance Bar*

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Introduction

I attended the Spectra® Large Tape Conference (LTC) which was held May 3-4, 2018, in Broomfield, CO. bringing together users from the large-scale tape community for hands-on product demonstrations, in-depth technology discussions, and many networking opportunities. This year's LTC topic, "Scaling the Performance Wall," highlighted Spectra's emphasis on improving tape performance for large-scale storage environments and revealed an array of new tape library performance improvements.

Increasing tape cartridge capacity to lower the price per gigabyte has long been the primary focus of the tape industry. As native cartridge capacities have presently soared to 15TB, and with roadmaps pointing to capacities of hundreds of terabytes per cartridge in the not-too-distant future, both the number and size of files stored on a single tape cartridge will steadily increase. Thus, the probability for concurrent file accesses on the same cartridge will also increase signaling the need for faster tape file access to reduce contention.

Fortunately, in the past few years, the tape industry has stepped up its focus on improving performance by delivering new capabilities including the Active Archive, RAIT (Redundant Arrays of Independent Tape), and RAO (Recommended Access Order) while providing much faster data rates than any other storage products. With tape capacities projected to soar for the foreseeable future, it's time for the tape industry to increase its focus on initial access time (time to first byte), robotic access time (mount time), and overall throughput. Presentations at the LTC revealed that effort is well underway at Spectra.

Rational Robotics Improves ExaScale Library Performance

Spectra directly addressed tape library performance by introducing a series of improvements called Rational Robotics for the richly featured [TFinity® ExaScale](#) Tape Library which is currently the industry's highest capacity (up to 1.6EB compressed) library. Rational Robotics is a combination of intelligent

hardware and software tape library features that minimize the time required for a robotic library to locate a tape cartridge and access data on that cartridge while improving library and drive reliability.

Rational Robotics Software Optimizes Robotic Movement

Spectra has developed new software-enhanced management controls for greater productivity that helps the library's high-performance transporter (HPT) perform even faster with more efficient movements with Media IQ™ and Slot IQ™ (see below). The Media IQ software feature queues requests from all connected hosts and then assigns them to movers based on their optimal proximity between media and drives. This allows the library to assign the robot that is best positioned to service each particular request in the least amount of time, providing the most efficient robotic movement for reduced cartridge access times.

The Slot IQ software "move" algorithm will virtualize the slot locations or physical inventory inside the library and take advantage of the empty spaces (slots) nearest to tape drives. Slot IQ allows the robots to physically move shorter distances or less often as they take advantage of the available storage "holes" closest to the drive bay, eliminating unneeded robotic movement and improving performance. This reduces time when inserting new cartridges into the library. Media IQ and Slot IQ are Spectra-exclusive time-saving and intelligent streamlining features.

HPT (High Performance Transporter) Redesign

The TFinity ExaScale high-performance transporter is a redesign of the robotic hand used to manipulate media and represents the next step in library performance and reliability. The HPT uses new robotics and firmware and is designed with four goals: better performance, better reliability, mixed media support, and better sensing.



The new HPT reduces tape mount time (faster access time/performance) and has increased the MTBF (mean time between failure) for better reliability. New sensors and features, including temperature and humidity readings, provide additional reliability of Spectra's HPT. The HPT is the central technological improvement that now drives the industry's fastest library.

TAOS (Time-based Access Order System) Reduces File Access Time

In addition to several advanced robotic performance improvements for the TFinity ExaScale library, Spectra also addressed improving the file access time (time to first byte) with a new capability called TAOS. TAOS is a unique – and long overdue - advancement for LTO that provides up to a 4 times improvement in overall access speed on reads and up to a 13 times reduction in physical tape movement across the drive head. Less tape movement results in reduced tape media and drive wear providing the additional benefit of improving overall tape system reliability and reducing cost.