



**Driving Innovation
Through the Information
Infrastructure**

SPRING 2011



Backup & Archiving Tape Libraries

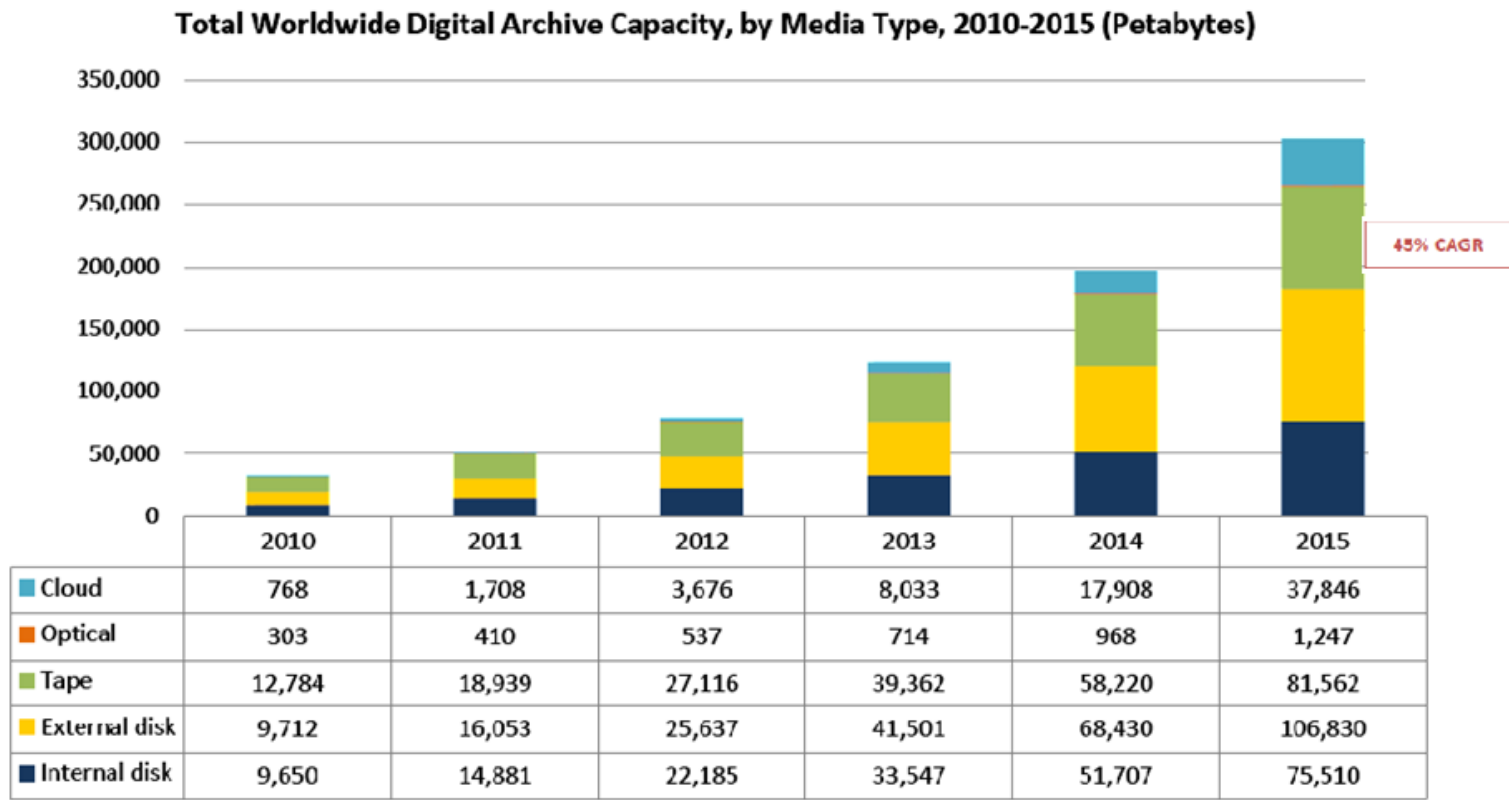
Molly Rector

VP of Product Management & Marketing

Spectra Logic

The Digital Universe

Figure 5. Total Worldwide Digital Archive Capacity, by Media Type, 2010-2015



Source: Enterprise Strategy Group, 2010.

Future of Tape Capability Secured

- January 22, 2010
 - *“The scientists at IBM Research – Zurich, in cooperation with the FUJIFILM Corporation of Japan, recorded data onto an advanced prototype tape, at a density of 29.5 billion bits per square inch — about 39 times the areal data density of today's most popular industry-standard magnetic tape product*.*
 - *“These new technologies are estimated to enable cartridge capacities that could hold up to 35 trillion bytes (terabytes) of uncompressed data*.*

* <http://www.zurich.ibm.com/news/10/storage.html>

Published LTO Tape Roadmap Today

ULTRIUM LTO
Eight-Generation Roadmap



	Generation 1	Generation 2	Generation 3	Generation 4	Generation 5	Generation 6	Generation 7	Generation 8
Compressed Capacity	200 GB	400 GB	800 GB	1.6 TB	3 TB	8 TB	16 TB	32 TB
Native Capacity	100 GB	200 GB	400 GB	800 GB	1.5 TB	3.2 TB	6.4 TB	12.8 TB
Compressed Data Rate	up to 40 MB/s	up to 80 MB/s	up to 160 MB/s	up to 240 MB/s	up to 280 MB/s	up to 525 MB/s	up to 788 MB/s	up to 1180 MB/s
Native Data Rate	up to 20 MB/s	up to 40 MB/s	up to 80 MB/s	up to 120 MB/s	up to 140 MB/s	up to 210 MB/s	up to 315 MB/s	up to 472 MB/s

2010

Note: Compressed capacities for generations 1-5 assume 2:1 compression. Compressed capacities for generations 6-8 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.
 Linear Tape-Open, LTO, the LTO logo, Ultrium, and the Ultrium logo are registered trademarks of HP, IBM and Quantum in the US and other countries.

<http://ultrium.com/technology/roadmap.html>
 Announced April 14, 2010

Active Archive Alliance

- Founded in April 27, 2010
 - Education
 - Best practices
 - Intercompatibility



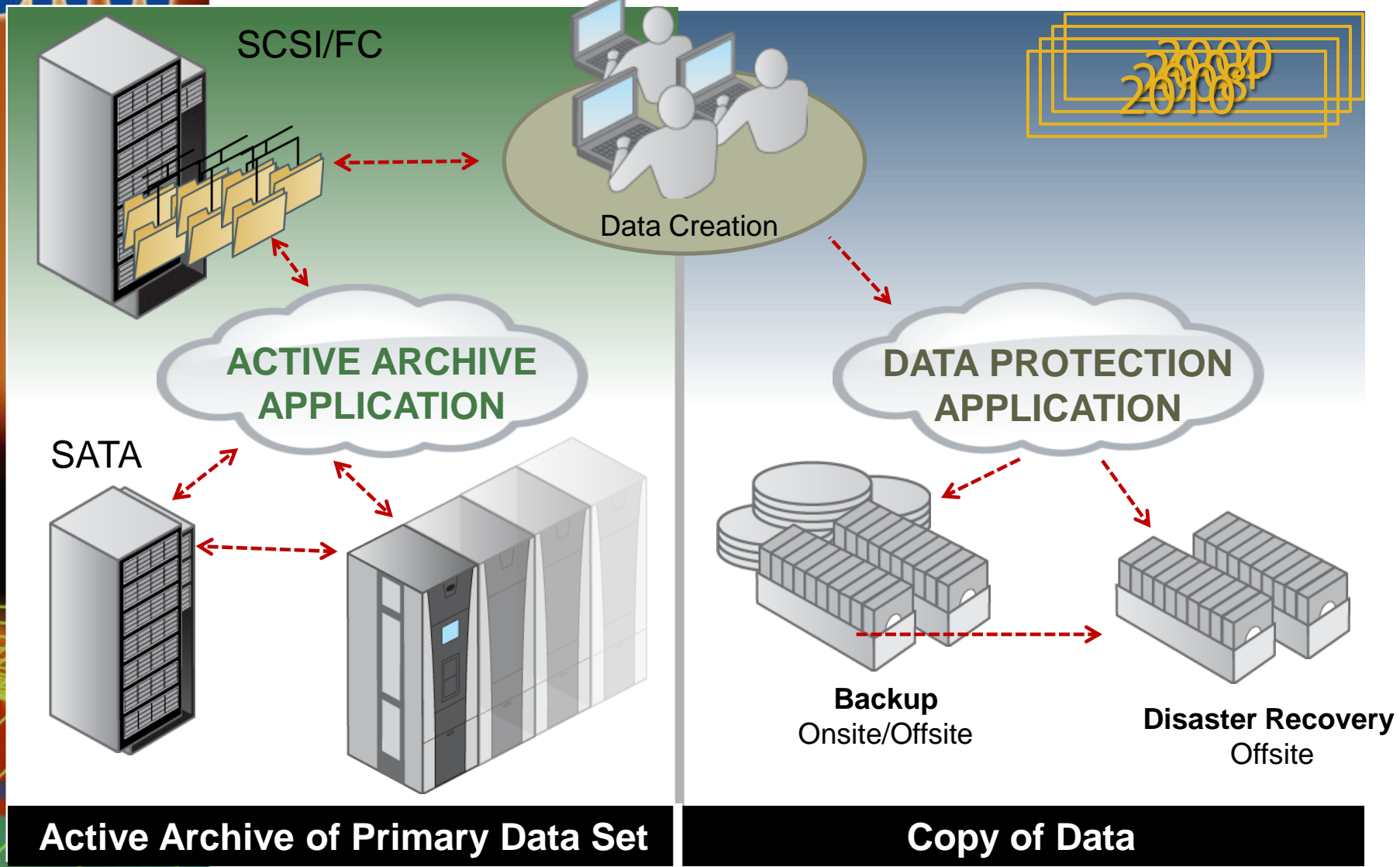
National Energy Research Scientific Computing Center... A fit for tape

At NERSC :

- There are 13PB of data on tape
- 30 – 40% of its tape's activity are reads
- It has a measured and proven reliability of 99.945%
- The tape cost is around 5% of that of its disk storage

This is *Primary* data with no secondary Copy!

The Evolution of the Data Center





Two Big Changes in the World of Tape

#1. Evolution of Software Capabilities with Tape:

- ✓ Extending file system storage to tape
- ✓ Metadata search
- ✓ Data integrity
- ✓ Backup
- ✓ Encryption
- ✓ Compliance
- ✓ ... More to come



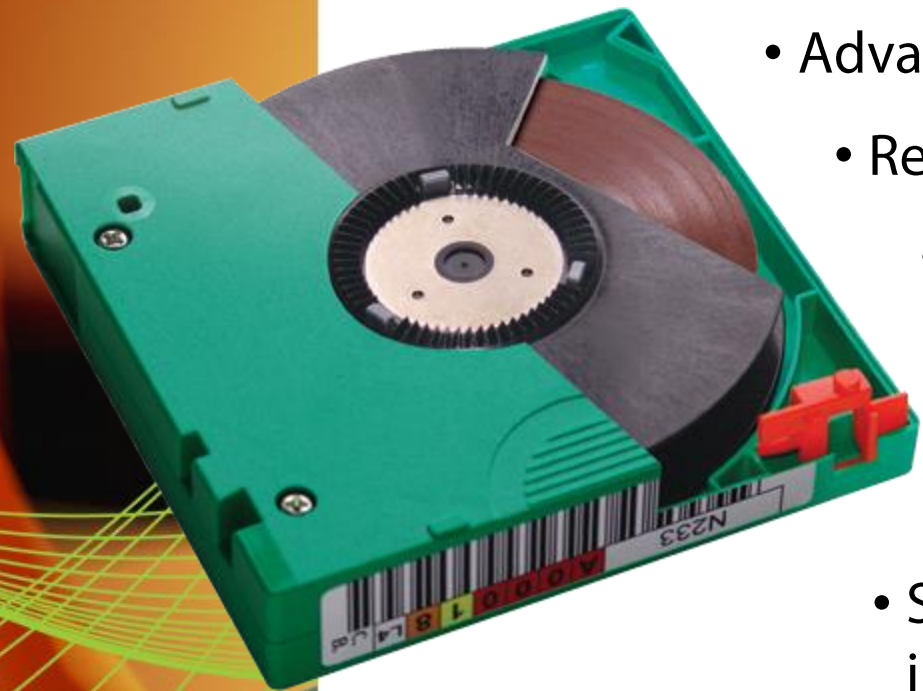
Two Big Changes in the World of Tape

#2. Evolution of Tape Hardware:

- ✓ Greater Reliability
- ✓ Greater Data integrity
- ✓ Greater Speed
- ✓ Greater Density
- ✓ Greater Power Efficiency
- ✓ Working as Primary Storage
- ✓ ... More to come

Tape technologies are reliable...

Reliability has increased 700% over the technology available a decade earlier



- Advances in the coating of tape film
- Read-after-write data verification
- Error correction codes
- Drive technology features simplified tape paths and servo tracking systems
- Spectra tape libraries offer data integrity verification

Beech, Debbie. "Best Practices for backup and long-term data retention"
Sylvatica Whitepaper. The evolving role of disk and tape in the data center.



New Highs in Data Integrity and Verification

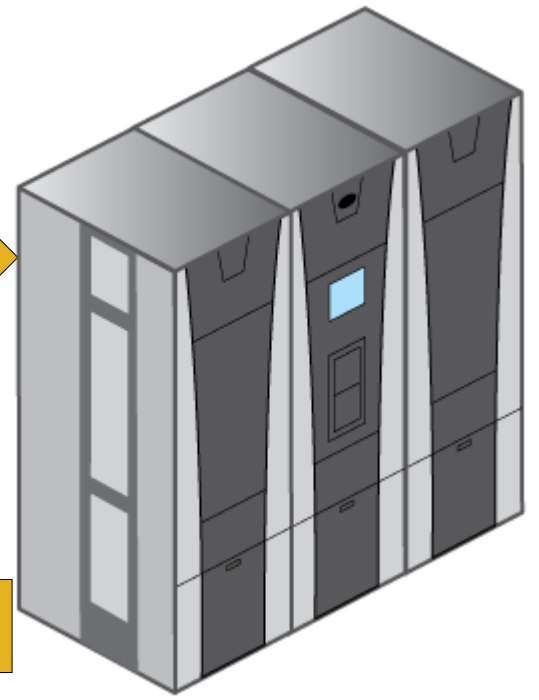
- Media health verification
- Proactive hardware health monitoring
- Starting to have data integrity verification capabilities

Tape Libraries are Fast...

...really fast!



Write to tape: 120 TB/hr compressed



Access from tape: 65-75 seconds avg**

* Based on benchmark 120 LTO5 tape drives in an Enterprise automated tape library

** Assumes 2:1 data compression

*** Times vary based on library and tape drive in use



High Density Implementations with Tape

High Density Tape Library Implementations:

- Enable storing more data in the library
- Highly efficient use of data center space
- Optimizes

Tape Offers the Best Power Efficiency*



Tape Library

SATA Disk System

* Clipper Group

University Case Study

- Pain Points
 - Store large quantities of data for multiple initiatives
 - 200 TB to grow to >1 PB in 3 years
 - Seeking file-based active archive to tape
- Goals
 - High density, speed and superior scalability
 - Ability to verify data integrity
 - Backup and archive data for NIH project
 - Partition storage to manage the backup data for nearly 9,000 research accounts

The Results

- Higher archive data retrieval speeds
- Supports 200 TB of data today, capable of growing to over 1 PB within three years
- Data managed in a single, partitioned library, supporting both backup and archive operations
- Data integrity verification for the backup and the archive environment

Architecting the Modern Data Center

