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TAPE MEDIA RELIABILITY
IEEE MSST CONFERENCE

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Contributors

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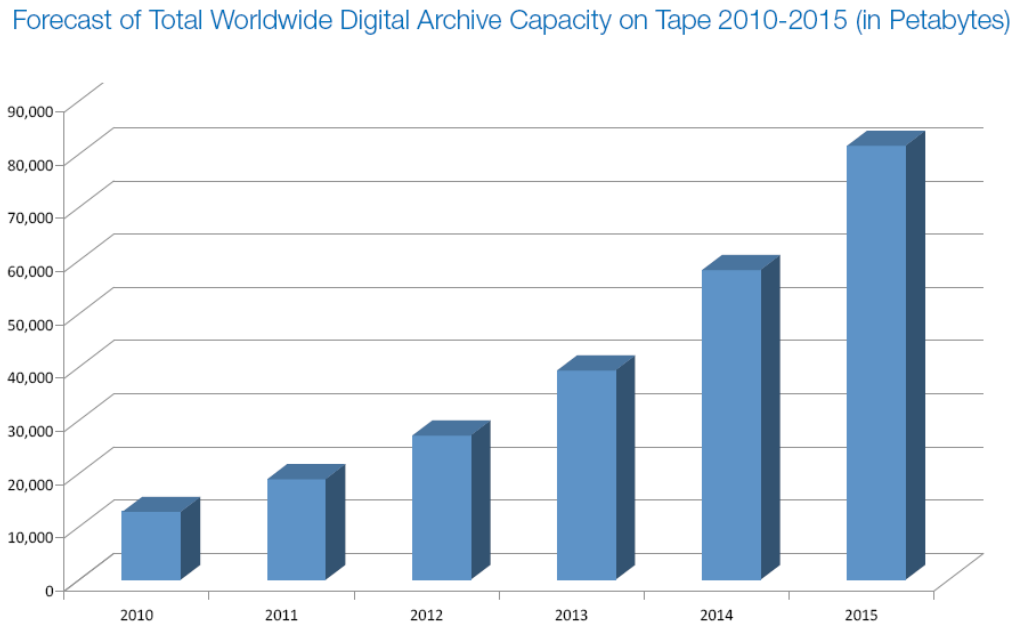
Tape is not Dead

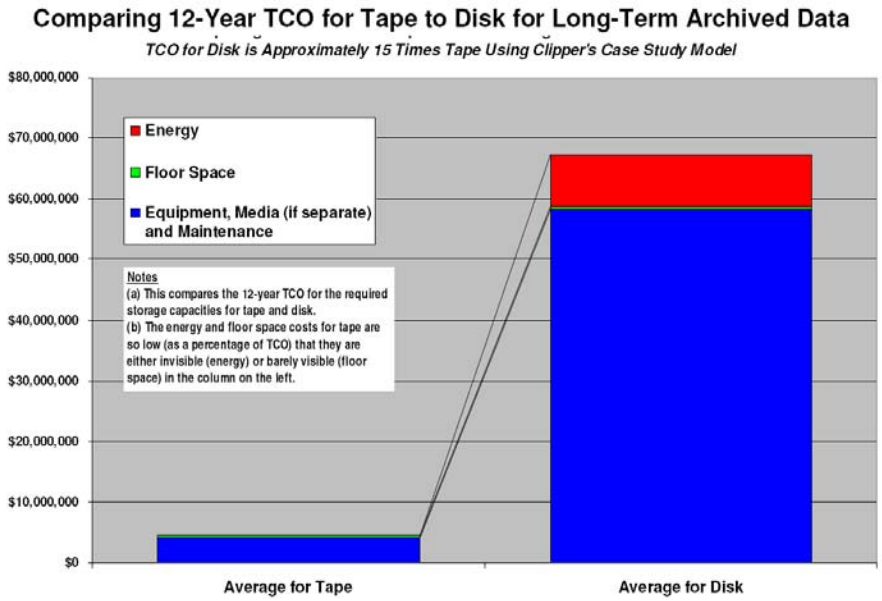
- Forecasts that the total worldwide cumulative digital archive capacity will grow to 300,000 Petabytes by 2015. (1)
- Tape currently holds 38% share of the overall digital archive volumes and is set to experience a six fold increase in digital archive petabytes stored from 2010 through to 2015. (2)
- After 59 years, tape still serves an important role in data archival.



(1) ESG Research Report, Digital Archive Market Forecast 2010-2015, July 2010
(2) http://www.enterprisestrategygroup.com/2010/12/nersc-proving-tape-as-cost-effective-and-reliable-primary-data-storage

We've heard why…

- Proven archivability (successful transcriptions after 30 years)
- Lower total cost of ownership compared to disc (1)
- Higher MTBF compared to disc (2), 290,000 hrs at 100% duty cycle
- Low bit error rates, 10^{-17} (3)
- Sustainable streaming data rates up to 210MB/s

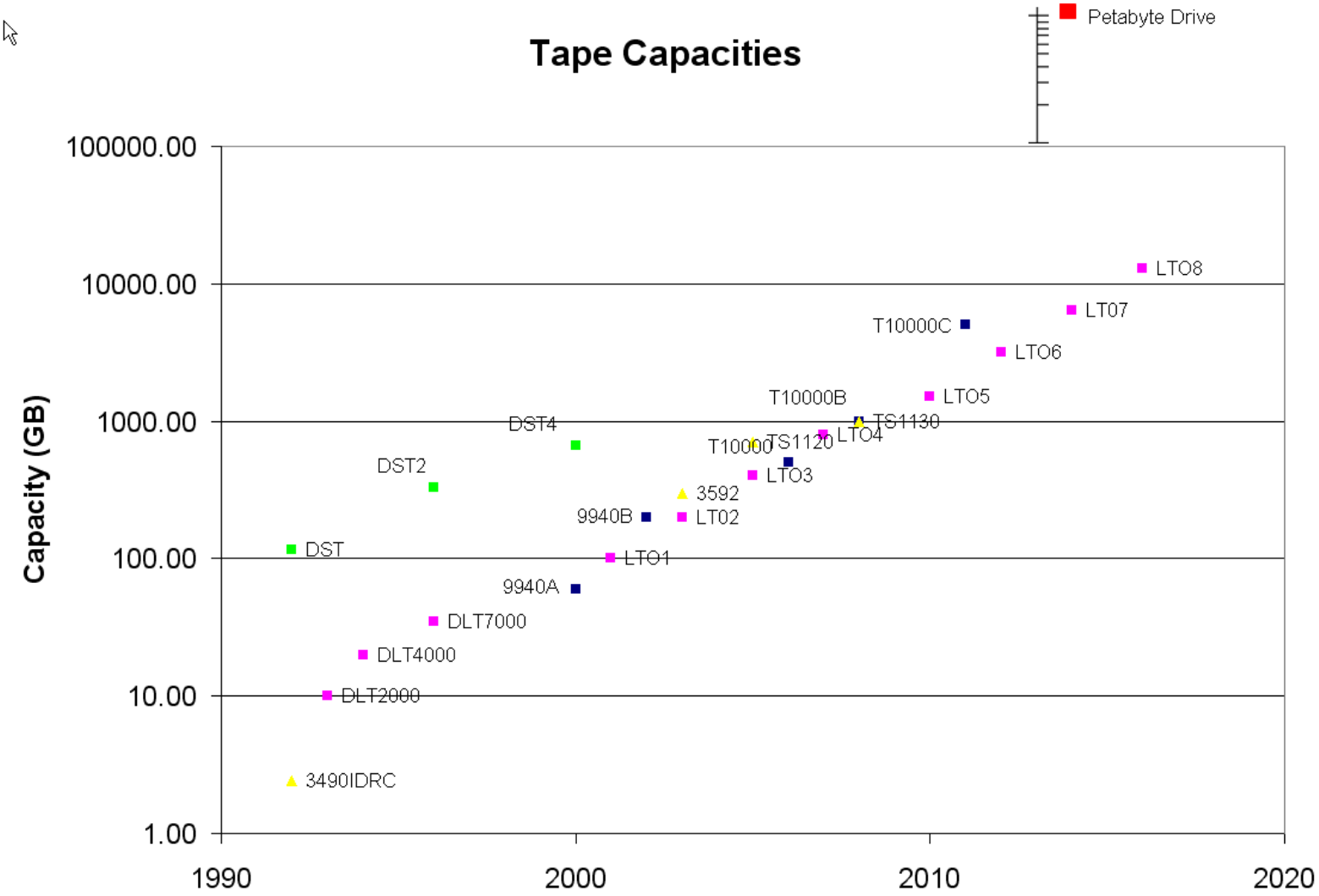


(1) The Clipper Group. "In Search of the Long-Term Archiving Solution – Tape Delivers Significant TCO Advantage over Disk" 12/23/2010

(2) T10KB manufacturer spec at a specified duty cycle meeting environmental specifications.

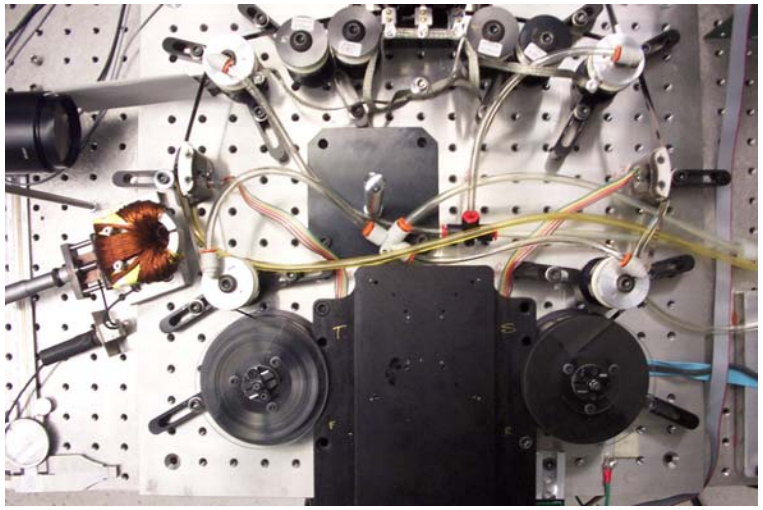
(3) Newman, Henry, "Why Enterprise Tape Can't Get No Respect", Enterprise Storage Forum, June 17, 2010

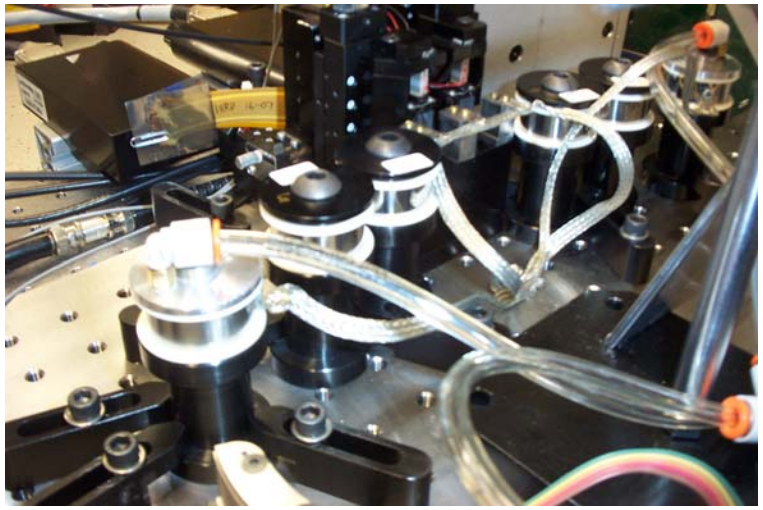
Healthy roadmap



Tape R&D still alive

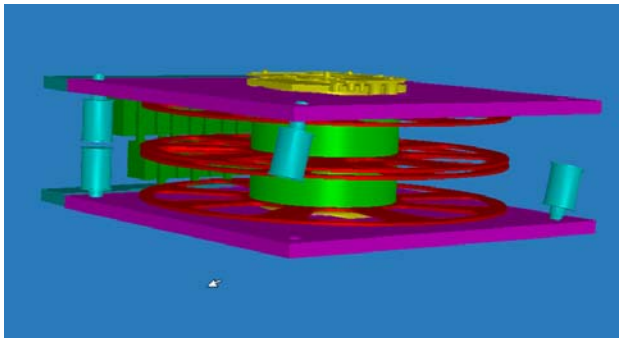
30TB Systems

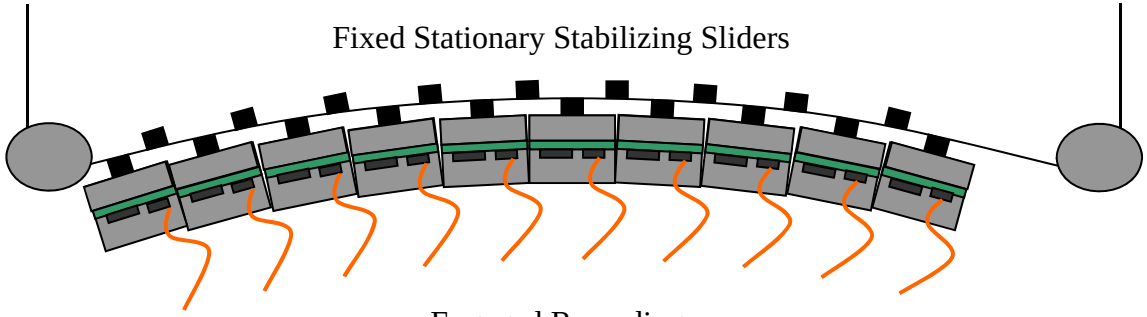




Petabyte Suitcase

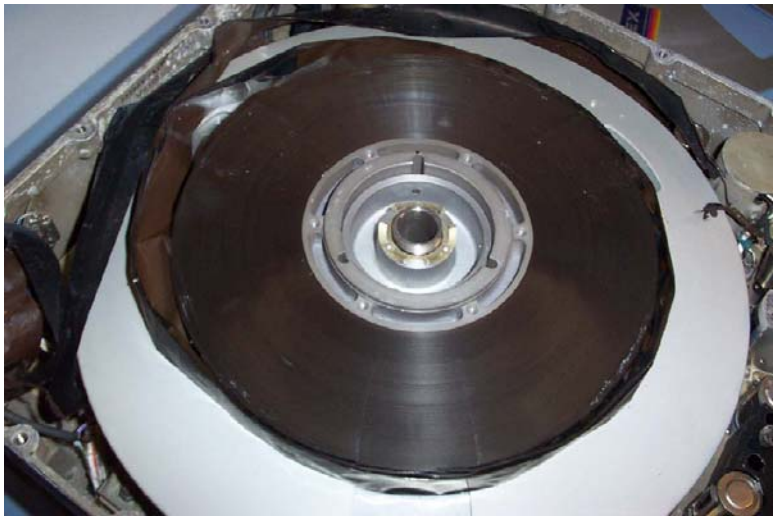
1000TB Systems





Tape can survive…

- Columbia Disaster 2/1/2003
- OEX data recorder and tape survived Mach18 collision with tree in Texas.
- Tightly wound tape pack is much like a giant hockey puck.
- Tape survived, same might not be said about the tree.
- Successful data transcription off all data to within 2 seconds of destruction.



Lessons Learned

- Advanced guiding systems, head designs, and servo electronics makes dealing with old systems easier.
- Troublesome “old school” components can be replaced with newer parts and materials to improve reliability of transcription.
- Fast processors make sampling of analog signal much easier, allowing single pass transcription down tapes.
- Large analog processing boards can be replaced with much smaller, quieter systems.
- 30 years from now, current high tech drives will look old school to the new transcribers.

Archival Guidelines

- Properly stored at 70’F 30% R.H. a Metal Particle or Gamma Ferric Oxide tape should last 30 years.
- Archive in protective cases and seal in desiccated environment.
- Tapes should be marked with a migration date, Backup software used, Operating System information, and drive information.
- Migration strategy should address translation of data at regular intervals. Never destroying original.
- Baking may be required to reverse effects of hydrolysis.

What can go wrong

- Polyester Polyurethane Hydrolysis
- Sticky tape phenomenon
- Debris/ Head Clogs
- Lubricant Loss
- Remember, tell them… Bake first, run soon.

Archive Retrieval Challenges

- Restoring 30 year old drives a challenge
- Documentation is hard to find on internet
- PCB rework as capacitors pop on first power-up
- Mechanical components need a lot of TLC
- Portions of system might be upgradable to newer technology to improve migration quality.
- Media needs reconditioning.

Don’t Destroy the original

- After a successful migration, save the original for a possible future migration with better resolution.
- More powerful compute hardware in the future might offer better analysis of data set.
- Like negatives, photos, and books, the archival media might outlive the migrating media.

Before you retire…

- Save paper copy of all manuals – might not be able to find the pdf's
- Document Hardware, OS, Patches, Software
- Leave a maintenance notebook for the drive
- Save a few drives for parts
- Save maintenance kits
- Save cleaning carts, calibration carts
- Save some cartridges for parts
- Shrink wrap the collection to prevent looters

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Archiving HDD

HDD Archival

- Some customers opt to archive their Hard Disk Drives to shelves.
- Cost compared to tape is nearly the same $/GB
- Shelf life is much more limited compared to tape.
- … and there are a few things that need planning.

HDD Archival Issues

- Drives should be marked with a migration date, File system format, OS.
- Store in anti-static bags, and reflex packaging
- Anti-stat protective measures should be incorporated to protect controller boards. Wear wrist straps.
- Include some extra SATA, IDE cables
- Scheduled spin-ups to keep spindle bearings from seizing
- Migration strategy should address translation of data at the 5-7 year mark.
- Spare drives for controller board swaps may not help.

More Information…

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Thank You