



Quantum

# New LTO Linear Tape File System Helps Make Video Storage Easier

## Introducing

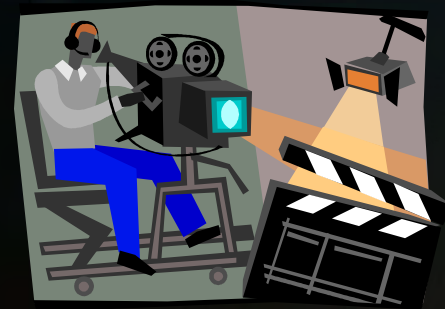


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# Agenda

- Video Content Storage Issues
- What do I need to make video storage, sharing and archiving easier?
  - What is needed?
  - What can LTFS do? How does it work?
  - Can it save costs?
- LTFS Developments...some who offer products using LTFS?
- LTO Ultrium Roadmap
- What do I do next?
- User Experience



# Video Content Storage Issues

- Files are huge (HD, 3D) and growing
- Budgets are tight
- Some current tape is comparatively slow, costly
- Must protect and preserve video assets





# What do I need to make video storage, sharing and archiving easier?



Self describing format



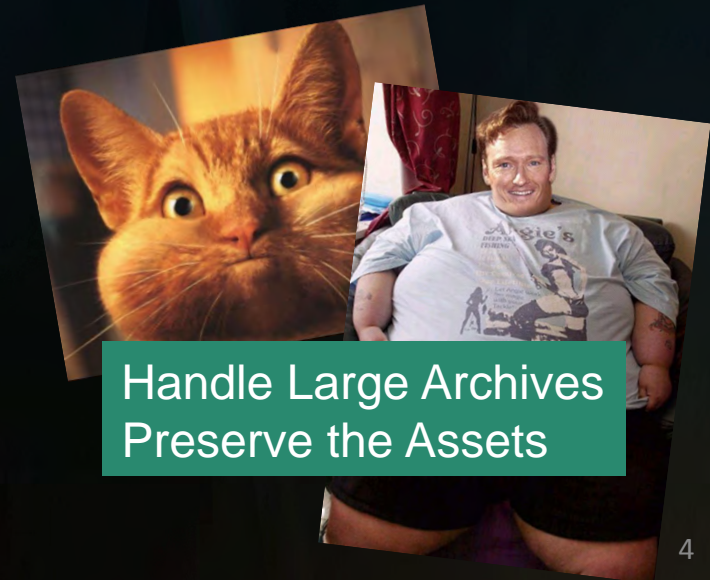
Application Independent



Lower Cost



Share across platforms



Handle Large Archives  
Preserve the Assets

# Self Describing Tape Format



Self describing format

- Linear Tape File System

- A open data format that doesn't rely on external software to read / interpret what is stored on tape
- Provides file system access to data on a cartridge at the operating system level
- Can allow viewing /access of tape files in a fashion like disk or other removable media

- Potential user benefits:

- Ideal support for workflow applications by providing 'direct-like access' to files at rates up to 140 MB/sec
- Ideal for archive of essence assets; tape tells you what's on it
- Ease of use with directory tree access; drag and drop

# Linear Tape File System (LTFS)

## What is it - How does it work?

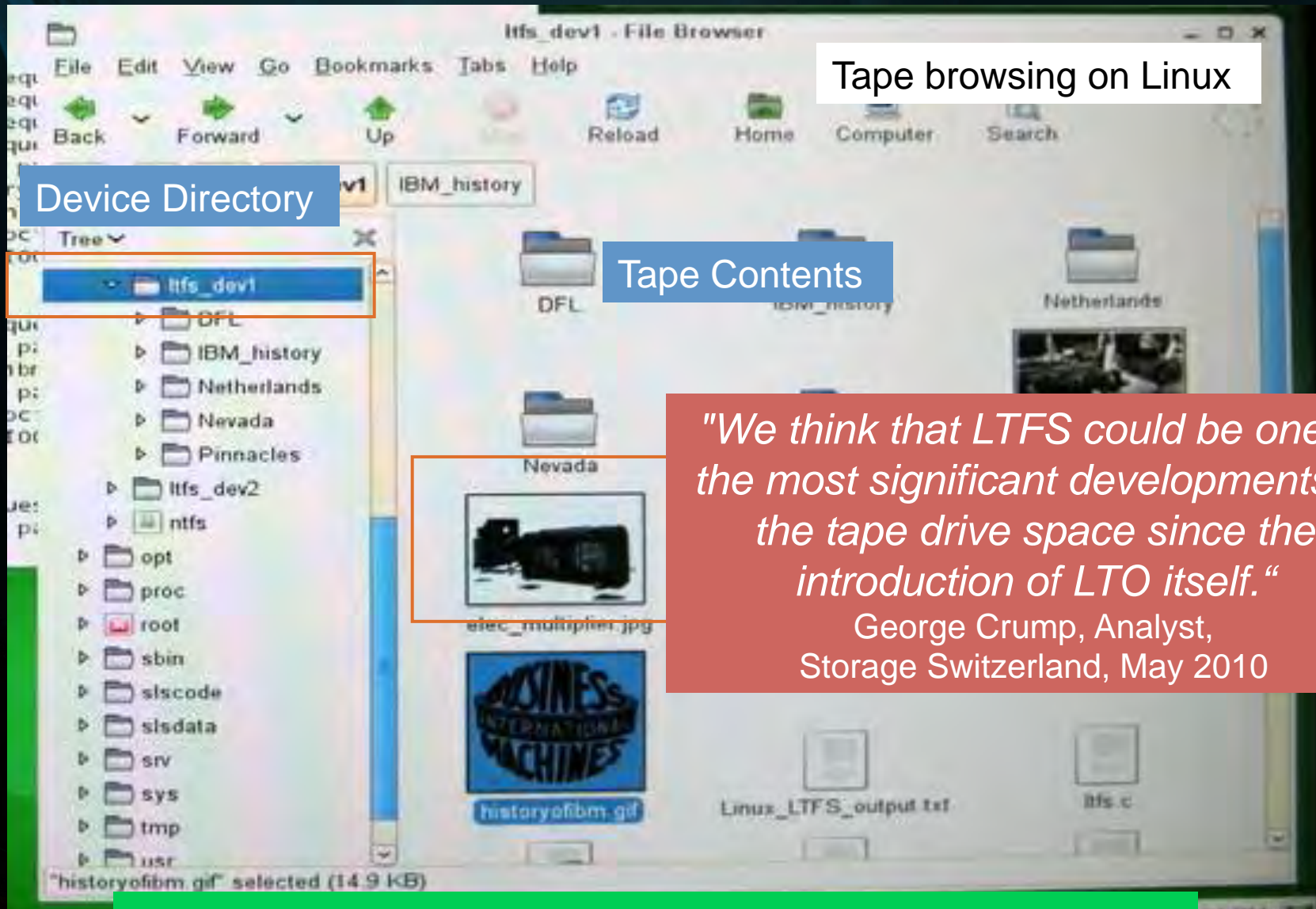
- Tape drive shareware that is downloaded on to Linux, MAC, Windows
- Utilizes the new LTO-5 dual-partitioning capability; Extension to OS
- Index partition & content partition: Mount a tape as if it was a hard drive
- Partition 0 (37GB): Stores index and metadata describing the contents
- Partition 1: Stores the contents and backups of the index
- During operations index is updated on PC ; backed up to tape





# LTFS in Action with File Browser

Files can be accessed on tape directly from any application



Tape browsing on Linux

Device Directory

Tape Contents

*"We think that LTFS could be one of the most significant developments in the tape drive space since the introduction of LTO itself."*

George Crump, Analyst,  
Storage Switzerland, May 2010

See LTFS in Action -1 Min. Movie Clip at: [www.ultrium.com/ltfs](http://www.ultrium.com/ltfs)

# Client Reactions at NAB Show

After Viewing LTO-5 Drive and Linear Tape File System in Action

"I am shocked! This is exactly what we need!"

"You have made my dreams come true!"

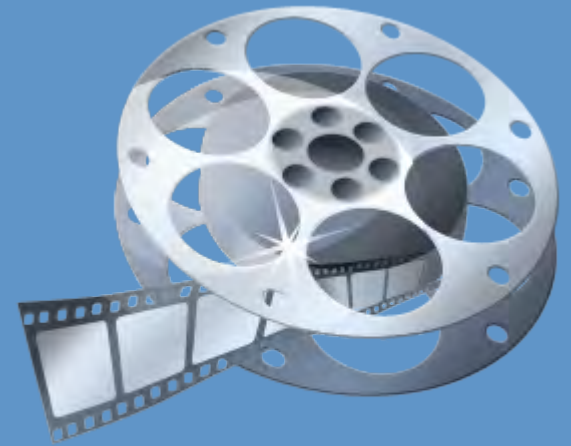
"You can't see it, but I am dancing inside!"

"LTO-5 technology gives tape-less work-flow....with tape!"

"We are going to get this (LTO-5 tape and LTFS)."

"Now I can offer an LTO-5 archiving service to my movie clients."

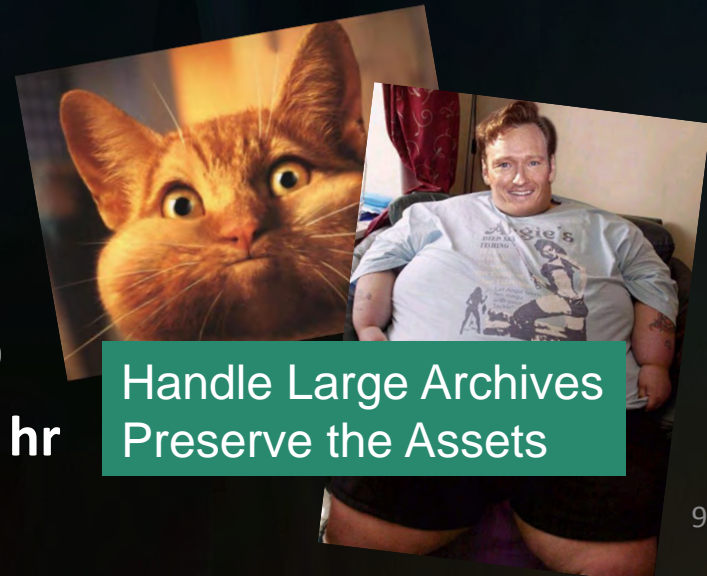
"We have LTO-3 and are now going to go to 5 with the file system"





# Handle and Preserve Large Archives

- LTO-5 Tape is Huge and Reliable
  - 1,500 GB (1.5 TB) per cartridge native
  - That's about 30 DVD movies per cartridge
  - 50Mb/s bit rate => 70 hours (XDCAM50 HD quality) on LTO-5 tape
  - Automation offerings from 20-1,000s of cartridge slots
  - Highly Reliable: Servo Tracking, Read after Write Verification, 250K MTBF Hours, up to 30 year shelf life
- LTO-5 Drives are Fast
  - Up to 140 MB / sec. native
  - Up to 280 MB / sec. (2:1 compressed)
  - That's > 1TB of saved data per drive / hr (2:1 compressed)



# No Application Dependencies

- No Application Dependencies

- No additional backup applications needed to store files on LTF5 formatted tape
- Until now a proprietary application was needed to store to tape
- LTF5 stores data independent of specific software applications
- You can think of it as a giant 1.5TB (uncompressed) memory stick



Application Independent

- Can provide the ability to recover from corruption or loss of centralized index database
- Years from now you can simply put the tape in the drive and view/access its contents – tape is self describing
- Tarring of files is not needed

# Make Sharing Tapes Easier



- Share Across Platforms

- Supports versions of Linux, MAC OS, MS Windows
- Can share tape across platforms
- Supports metadata and MXF
- Can unify across organizations to a single storage media for video content



# FotoKem uses LTFS for Reality TV Archive

- **FotoKem background**

- 700+ employees; HQ in Burbank, California USA
- Film lab & post production facility

- **Business Need**

- Must have reliable long term archive from XDCam disks
- TAR Tapes not self describing
- Need ease of use, reliable technology, low cost

- **Solution**

- LTO-5 tape library and LTFS; Open standard; Cross O/S platform compatibility
- Self describing LTO tapes: Can easily determine tape contents with browser
- Offers long term reliable archive, easy to use, cost effective
- Can store 100 XDCAM disks on 1 LTO-5 tape; Saves considerable space
  - Allows reuse of XDCAM disks
  - Can make 2 LTO tape copies inexpensively (keep one copy offsite)

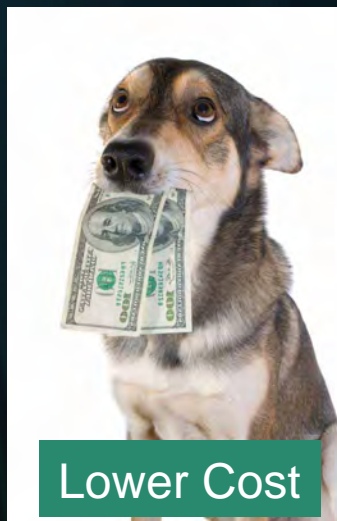


# Reduce Storage Costs

## LTO-5 Tape vs SR Tape<sup>1</sup>

	LTO-5	SR
Min. ✓	3126	155
Cost/✓ Tape	\$75	\$164
Cost/✓ Min.	2.4 cents	\$1.06

Difference in cost/min of SR vs. LTO-5 tape is 44:1



## TCO: SATA Disk System vs. LTO-5 Tape Library System<sup>2</sup>

- 12 Year TCO Archiving Study
- Back-end storage costs covering hardware, maintenance, floor space and energy
- Disk storage is **15x** Tape TCO
- **The cost of energy alone for the average disk-based solution exceeds the entire TCO for the average tape-based solution**

<sup>1</sup>Tape prices per internet, March. 2011.

<sup>2</sup>Clipper Notes report "In Search of the Long-Term Archiving Solution - Tape Delivers Significant TCO Advantage over Disk", The Clipper Group, Dec.23, 2010. This was a general TCO study and did not specifically focus on LTFS or video storage.

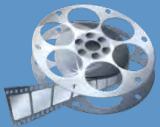
# Some LTFS Developments



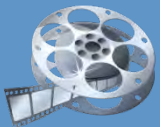
- **1Beyond**: high performance video production and post production, tapeless workflow and storage systems
- **Arkivum**: assured archiving, 100% guaranteed safe data storage service
- **Cache-A**: archive appliances serving the digital video industry
- **Crossroads**: online, file-based archive, combining disk storage with LTFS tape storage for a fast, cost effective, long-term data archive
- **FOR-A**: innovative products and advanced video and audio technology
- **Panasonic**: this product can easily archive P2 content and preview P2 content from LTO tape directly like video tape
- **SGL**: content archive and storage management solutions to the media and entertainment
- **Storage DNA**: Intelligent LTO-5/LTFS archiving for file-based workflows, application archiving (Avid, Final Cut etc.) and continuous backup
- **Thought Equity**: large scale archive management and “smart content” metadata tools
- **TOLIS Group Inc.** Bru Backup Software-Producers Edition version 2.3.0 provides native LTFS support for OS X users



# Why the excitement for LTO-5 tape and LTFS?



**Archive and Protect:** ideal for the archive of rich media assets; tape tells you what's on it with self describing format



**Ease of Use:** it is camera format and file agnostic; and, users can see what is on the tape with a directory tree structure – use like a removable disk drive....drag and drop!



**Reliable Huge Capacity:** can store long term with 1.5TB native for up to 30 year shelf life



**Low Cost Savings:** at about 5 cents/GB\* uncompressed LTO-5 tape can cost up to 44X less than other tape storage media

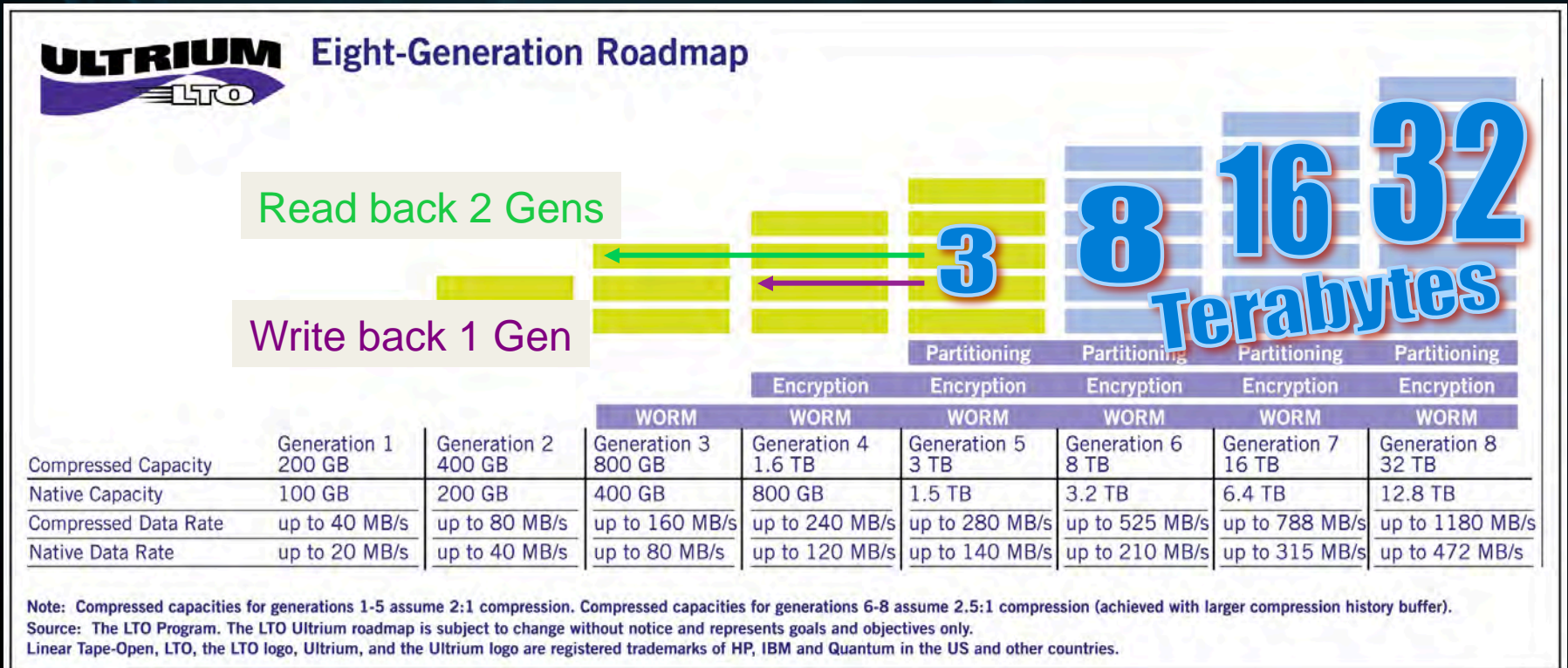


**Sharable:** can share a tape across platforms without the need for proprietary applications



**New use cases:** ability to help address long term archive for video assets, digital video surveillance, medical and legal records, cloud apps and more

# LTO Ultrium Roadmap to the Future



Nearly 4M LTO Tape Drive Shipments  
 Nearly 200M LTO Cartridge Shipments

# LTO Ultrium Technology and Linear Tape File System Helps Make Video Storage Easier

THANK  
YOU

Come to the LTO Ultrium  
Booth for a Live Demo of  
LTO-5 Tape and LTFS



[www.ultrium.com/ltfs](http://www.ultrium.com/ltfs)