Data Storage and Data Migration, or: to do nothing is not an option

Reto Kromer • AV Preservation by reto.ch

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Magnetic Tape

- in use since the 1950s by IT

- cartridges are always on polyester base (old open reels can be on triacetate base)

LTO

- Linear Tape-Open

- answer from the IT industry to the banc and insurance sector

- in 2000 LTO-1

- currently LTO-8

- currently Hewlett Packard Enterprise, IBM, and Quantum form the LTO Consortium

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Formatting

TAR

- from LTO-1 to LTO-4 only possibility
- still possible possible today

LTFS

- possible (and recommended) since LTO-5

TAR

- standard TAR
  - → bloc size
  - → number of archives per cartridge
  - → archives needing more than one cartridge
- TAR with a proprietary data encoding (e.g. BRU, Retrospect)

LTFS

- different versions
- almost one implementation per vendor, but…
- … "ltfs" and "mkltfs" common commands
- lossless compression (default) or uncompressed data
- unencrypted (default) or encrypted data

Drive

- internal or external unit
- library

Storage of the Tapes

- in a tape library
- on a shelf

Software

- proprietary or open source
- graphical user interface (GUI) and/or command-line interface (CLI)

Plan the Next Migration

- file naming
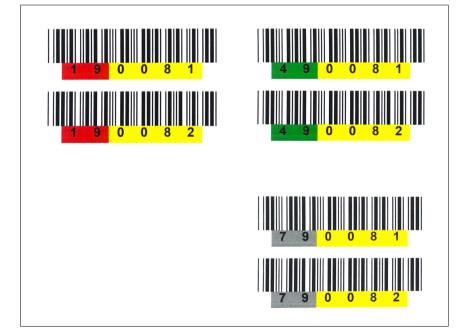- code bars
- checksums
- write the full index to the cartridge
- technical metadata
- code to retrieve the files

#1: Film

FILM

- FILM_TIFF/Film_nnnnnn.tif
- Film_PCM.wav
- Film_ProRes.mov
- Film_H264.mp4

#2: Video

VIDEO

- Video_YUV422.mkv
- Video_ProRes.mov
- Video_H264.mp4

Longterm

- storage of the cartridges
- three copies…
- … in geographically distant locations
- data integrity check
- data migration
- availability of LTO desks

Reading

Reto Kromer: **On the Bright Side of Data Migrations**, in «IASA Journal», n. 49 (December 2018), IASA, p. 18–22

→ retokromer.ch/publications/IASA_49.html

read | script | write

script to modify

- container
- codec
- both container and codec
- metadata
- filename

#1: ProRes-born Content

from:
- ProRes stored in a QuickTime (.mov) container

to:
- ProRes stored in a Matroska (.mkv) container

Update the Container

→ read file from source LTO
→ demultiplex file

- ProRes 422, 10 bit [yuv422p10le]
- ProRes 4444, 10 bit [yuv444p10le or yuva444p10le] or 12 bit [yuv444p12le]

→ multiplex file
→ write file to destination LTO

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#2: Video

from:
- AVI / 8-bit and 10-bit uncompressed
- MOV / 8-bit and 10-bit uncompressed
- MP4 / 8-bit and 10-bit uncompressed

to:
- Matroska / FFV1

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Slide 23:

Container and Codec

→ read file from source LTO
→ demultiplex file
→ decode file
- $Y'C_BC_R$, 4:2:2, 8 bit, «raw» [uyvy422]

→ encode file
→ multiplex file
→ write file to destination LTO

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Slide 24:

Container and Codec

→ read file from source LTO
→ demultiplex file
→ decode file
- $Y'C_BC_R$, 4:2:2, 10 bit, «raw» [yuv422p10le]

→ encode file
→ multiplex file
→ write file to destination LTO

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#3: Filename

from:

- Title_YUV422.mkv

to:

- Title_YCbCr422_9d5084b5b0a08d5022b3
9e0e75241d12.mkv

To do nothing
is **not** an option!

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