



# **FORMAT AND FILE ISSUES FOR VIDEO ARCHIVING**

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# Video footage

- Broadcasting companies
- Professional sources  
(commercial, industrial or  
academic institutions)
- Consumer sources

# Formats

- 50+ analogue formats  
(composite, component)
- 15+ digital formats  
(4:4:4, 4:2:2, 4:1:1, .....

# Analogue formats

- U-Matic (different versions)
- VHS, Betamax, V2000
- Hi-8, S-VHS
- Betacam
- .....

# Digital formats

- D1, D2, .....D11
- Digi-Beta, Beta SX, IMX
- DV (miniDV, Digi8, DVCam, DVC-Pro)
- .....

# Archiving procedure

- Preservation of original media  
and/or
- Transfer of content (data)

# Original media (mostly tapes)

- Ageing process well known
- Experience in storage procedures
- Original content (?)

# New archiving strategy

- Transfer of analogue footage to the digital level
- Check for data integrity
- Refreshing
- Periodic transfer of content to new media

# Analog to digital conversion

- Loss or distortion of information minimised
- Resolution (RGB from 6 to 16bit)
- Accuracy
- Linearity

# Digital benefits

- Lossless data transfer
- Regeneration
- (Post processing, especially restoration and data extraction)

# Technological challenges

- Transfer speed (up to 250 Mb/s - SD)
- Storage space (up to 100 GB/h - SD)
- Quality control

resulting in

- High costs

# Archiving issues

- Compression?
- Storage media?
- File?

# Compression

- Popular strategy, widely used (200+ coding schemes)
- Advanced algorithms (MPEG)
- Cost effective
- Constantly improved

however.....

# Compression

- NO (or lossless) compression for archiving analogue footage!  
issues:  
artefacts, post-processing, decoding
- Compression OK for browsing, user copies, streaming etc.

# Media

- Optical disks (today mostly CD, DVD)
- Magnetic disks (hard disk arrays)  
with easy access, speed
- Magnetic tapes (durability, extensive know-how in storage methods)

# Media

- Optical disks for author copy, browsing
- Hard disks for selected footage, with quick access on different quality levels
- Tapes for long-time archiving

# Properties for universal file

- Platform and operating system independent
- Accepts all types of „essence“
- Includes extensive metadata support (both structural and descriptive)
- Usable for acquisition, storage and exchange  
and....

# Properties....

- Expandable (formats, metadata)
- Preferably IT-based (not proprietary)
- Tested, approved, standardised by relevant organisations
- Accepted by manufacturers
- Accepted by users

# **MXF (Material Exchange Format)**

„Filewrapper and packaging format capable of encapsulating video, audio, single pictures etc., plus associated metadata“

# MXF

- Developed by Pro-MPEG Forum and G-FORS Group (EU)
- Supported by AAF-Association
- Supported by major AV - vendors and - institutions
- Already standardised (SMPTE, EBU)
- Introduction phase now

# MXF features

- Wrapper for multi-media container  
(e.g. for Video: „Body“ may vary:  
MPEG, DV, uncompressed.....)
- „Mappings“ already available for  
IMX(D10), HD-CAM (D11);  
MPEG2, DV and uncompressed  
in preparation

# MXF features

- KLV (Key/Length/Value) format

Key: defines data type (metadata, system data, video, audio,.....)

Length: size of following block

Value: actual content

# MXF features

- KLV plus optional index table provides fast (or partial) access without downloading the complete file
- UMID-compatible (Unique Material Identifier), enables remote metadata
- Partial file retrieval possible, random access to clips within a large single file

# MXF features

- Interoperability (working between different equipment and different applications)
- More information:  
[www.pro-mpeg.org](http://www.pro-mpeg.org)  
[www.AAFAssociation.org](http://www.AAFAssociation.org)

*(Warning: 600+ pages !)*

# Video archiving system

- Hardware
- Software
- Workflow

# Video archiving system

- Hardware:

Analogue/digital player

Capture station

Storage devices

# Video archiving system

- Analogue players:  
well-serviced used hardware  
(e.g. surplus of broadcasting  
institutions)
- Digital players:  
multi-format players available,  
camcorders for consumer material

# Video archiving system

- Capture station:  
Reasonable cost/performance ratio  
with PC-based solutions plus additional  
dedicated hardware  
(high-speed acquisition, harddisk-  
array, computer-tape recorder)

# Video archiving system

- Storage:  
Archiving: best quality, computer tape  
Browsing (now): VHS-tapes and DVD,  
eventually replaced by file-server,  
selected files in high quality – 10Mb/s,  
„all“ files: standard quality – e.g. 1Mb/s,  
streaming formats (legal matters!)

# Video archiving system

- LTO-Tape:
  - IT product (computer backup tape)
  - developed by industry consortium
  - defined for 4 generations (compatible)
  - now: 100 GB – 15 MB/s
  - introduced: 200 GB – 30 MB/s
  - 3rd (400 GB) and 4th generations to come within 3 years

# Video archiving system

- LTO Tape:
  - highly reliable
  - designed for self-checking (n.y. verified)
  - highly accepted
  - rapidly decreasing costs (50€/100GB)
  - capable: 60 to 75 min uncompressed  
or  
5-6 hours DV on 100 GB

# Video archiving system

- Software:

Lack of dedicated video archiving software > use of editing software;

if software prepared for and vendor committed to MXF:

temporary use of proprietary files and supporting descriptive files acceptable (?)

# Video archiving system


- Essence-related data:  
Temporary solution: external database,  
only basic information on descriptive  
„notes“  
Final solution: use of MXF-internal  
metadata structures, optional UMID-  
structure (link to external database)

# Alternative solution

- „Rent an archiving system“
- For a relatively large number of cassettes with only a few standard formats
- Checking, cleaning, parallel recording and transfer to destination format
- Permanent media-, online system-check
- Reasonable costs, fast (if applicable)

# Problems

- Analogue players
- Archiving software (MXF preference for production and distribution, see IMX)
- Workflow (1 h video/10 hs archiving)
- Quality control (migration?)
- High definition



*Thank you for your attention!*