

# Audio-Visual Archiving

## Comparing Memory Institutions and Commercial Industries

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## Sound recordings

- digital practices somewhat established

## Video recordings

- digital practices still emergent

## Film

- digital practices still emergent

I'd like to give you a snapshot of current activities that bear on sound recordings, video recordings, and film.

I'll spend more time on sound than video or film, partly because digital practices are more fully realized for sound, and partly because some issues and solutions that pertain to sound also pertain to video and film.

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## Digital Preservation

### The National Digital Information Infrastructure and Preservation Program

Information is being produced in greater quantities and with greater frequency than at any time in history. Electronic media, especially the Internet, make it possible for almost anyone to become a "publisher." How will society preserve this information and make it available to future generations? How will libraries and other repositories classify this information so that their patrons can find it with the same ease that they can locate a book on a shelf?

- [Learn more about the Digital Preservation Program.](#)

#### Highlights

Two new reports on recent NDIIPP meetings are now available. The first report covers the July 18 meeting of the National Digital Strategy Advisory Board, and the second provides details of the July 19-20 meeting in Washington of the original NDIIPP preservation partners.

- [Read the NDIIPP newsletter](#)
- [More News and Events](#)

<http://www.digitalpreservation.gov/>

I'll also spend some time on born digital content. Most memory institutions are focused on older content, but born digital is part of everyone's future, very much so for the Library of Congress and the National Digital Information Infrastructure and Preservation Program, or NDIIPP, as we call it.

## *Simplifications*

- Video
    - *Today's focus:* broadcast content
  - Film
    - *Today's focus:* theatrical film
- 
- Memory Institutions
    - *As if* older analog content only
  - Commercial media producers
    - *As if* born digital only

This topic is complex and I have made some simplifications for this short talk. For video, I focus on broadcast content; for film, on content for theaters.

In addition, I characterize memory institutions--public sector libraries and archives--as if they only reformatted older analog content, and I characterize commercial record labels, broadcasters, and movie studios as if they confronted only born-digital content.

## Problem Space - Sound - Memory Institutions

- Programmatic thrust
  - Reformatting analog recordings on cylinders, discs, and tapes

I'll start with sound recordings and memory institutions.

In my simplified picture, their business is reformatting older analog recordings on cylinders, discs, and tapes.



Transcription disk on Keith Monks cleaning device  
M/B/RS lab, Library of Congress

This source material is absolutely central, challenging to play back with some items in deteriorated condition.

Sound Directions
Digital Preservation and Access  
for Global Audio Heritage

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### Overview

Sound archives have reached a critical point in their history marked by the simultaneous rapid deterioration of unique original materials, the development of expensive and powerful new digital technologies, and the consequent decline of analog formats and media. It is now clear to most sound archivists and archival organizations that our old analog-based preservation methods are no longer viable and, for a variety of technical and economic reasons, that new strategies must be developed in the digital domain. The [Indiana University Archives of Traditional Music \(ATM\)](#) and the [Archive of World Music \(AWM\)](#) at Harvard University have received a grant from the [National Endowment for the Humanities](#) to undertake a joint technical archiving project—a collaborative research and development initiative with tangible end results—that will create best practices and test emerging standards for digital preservation of archival audio.

There are few published standards or best practices for audio preservation, and no published reports that cover in detail all parts of the audio digitization process. The analog to digital conversion process is not complete until safe and secure storage is attained and a way to insure readability over time is developed. In addition to developing best practices in a number of areas, Sound Directions will contribute the critical final step to a complete digital audio preservation process: the creation of interoperable audio preservation packages.



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» [soundir@indiana.edu](mailto:soundir@indiana.edu)

<http://www.dlib.indiana.edu/projects/sounddirections/>

Mike Casey, the lead audio engineer at the Indiana University Archives of Traditional Music, said, “Playback is the most critical part of the preservation chain.” Casey is a key member of the *Sound Directions* project, executed by Indiana and Harvard, funded by the National Endowment for the Humanities.



Digital transfer is also part of the problem space -- goals for audio preservation are provided by the IASA: they call for an *unaltered* copy of the original.



NAVCC Site Overview & Construction Components

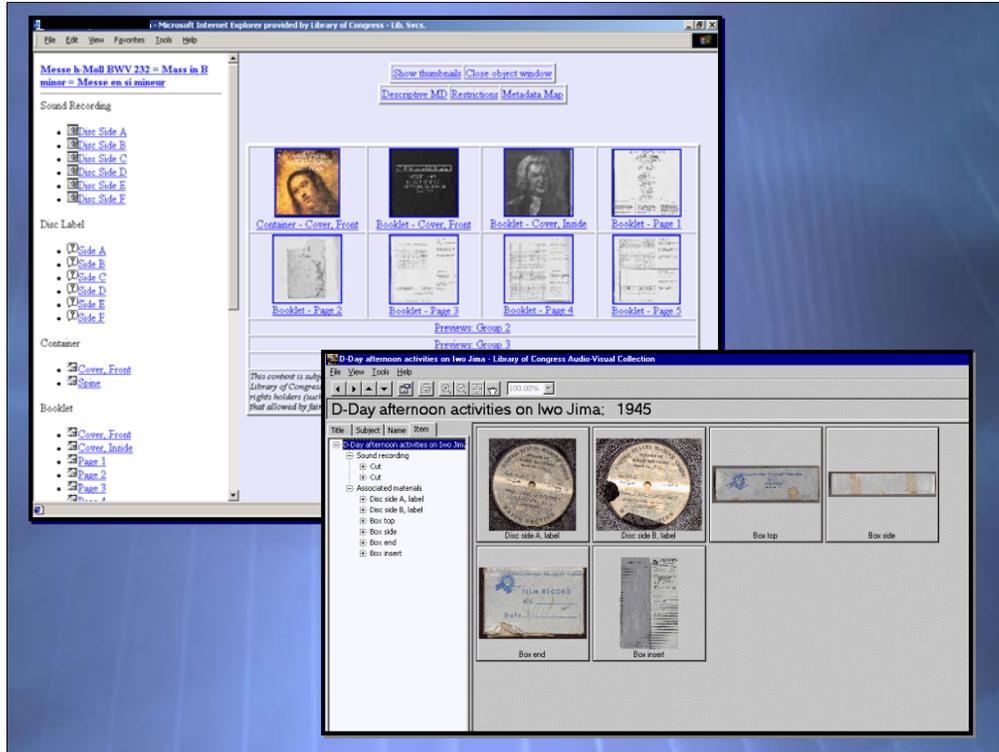
Construction, 2005

Architect's rendering of Conservation Building

National Audio-Visual Conservation Center, Culpeper, Virginia



Preservation workflows have other desired features. High throughput, for example, will be central to the new Library of Congress National Audio-Visual Conservation Center (NAVCC).



Another part of the problem space has to do with the structure of typical items. Some sound items are singular but many are multipart: a disc with two sides and labels and a box to be imaged, or a longer item in segments.

## Problem Space - Sound - Memory Institutions

- Identifier and metadata issues
  - Shared with digital library activities in general
  - Identifiers
  - Metadata including “technical” administrative metadata
- Preservation object issues
  - Shared with digital library activities in general

Some parts of the audio problem space are ubiquitous in the digital library environment:

identifiers,

metadata, including administrative metadata tailored to each form of content, and the packaging of preservation objects for a repository.

## Strategy & Solutions - Sound - Memory Institutions

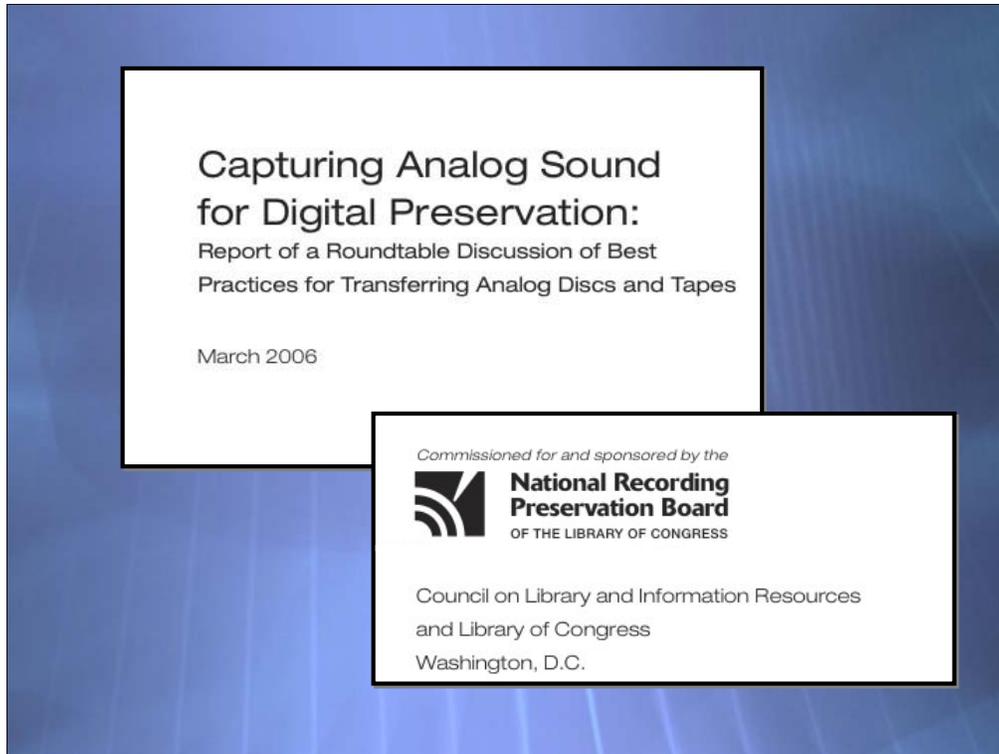
- Programmatic thrust
  - Digital-file approach established
  - Analog preservation tapes discontinued
  - Analog tape and recorders no longer manufactured

What strategies and solutions have memory institutions developed? First and foremost is the general acceptance of digital files as preservation masters for sound. The production of analog preservation tapes has pretty much stopped.

## Strategy & Solutions - Sound - Memory Institutions

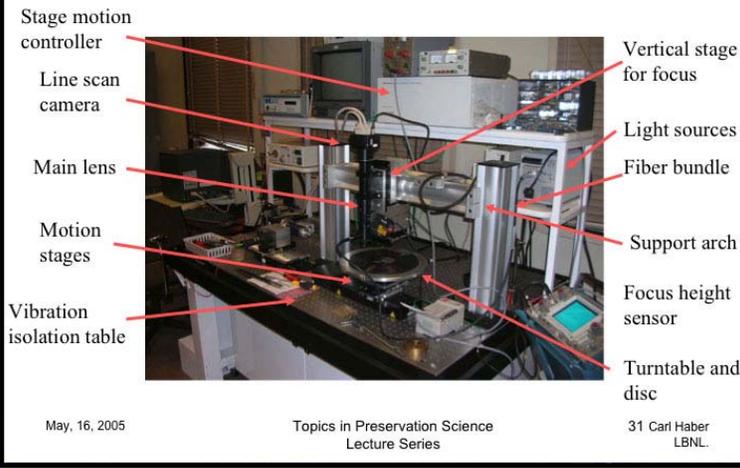
- Playback issues
  - Art and science
  - Science: calibrate & set up equipment
  - Science: proper workspace for critical listening
  - Science: microscope, oscilloscope, other tools
  - Art (and experience): engineers, golden ears

The creation of an unaltered copy depends upon correct playback. How much of this is art, and how much science? Mike Casey named a few science items, including the calibration of equipment and starting the process of picking a stylus by examining an old disc with a microscope. But the importance of art brought him back to the engineer's *ears* and experience: "We would not use student labor to do playback."



A recent report published by CLIR offers good information on playback. This study was sponsored by the National Recording Preservation Board, based at the Library of Congress and administered by the Motion Picture, Broadcasting, and Recorded Sound Division (M/B/RS).

## IRENE Test Platform



From a slide show by Carl Haber  
Lawrence Berkeley National Laboratory  
<http://www-cdf.lbl.gov/~av/LOC-2005-Public.pdf>

Meanwhile, this division is testing the IRENE optical system for extracting sound from discs—nothing physical touches the disc—still in its early development.

## Strategy & Solutions - Sound - Memory Institutions

- Digital transfer issues
  - File/wrapper formats: WAVE or Broadcast WAVE (“B-Wave”), AIFF also used
  - Encoding format: linear Pulse Code Modulated encoding, linear PCM or LPCM at high resolution (96/24)
  - National Recording Preservation Board /CLIR report on digital issues anticipated in 2007

The preferred computer file formats include WAVE, its variant called Broadcast WAVE, and Apple’s AIFF. Inside the wrapper, there is a consensus in favor of linear Pulse Code Modulated encoding, *linear PCM*, and for very high resolution preservation masters, typically sampled at 96 kilohertz with a word length of 24.

Roughly speaking, LPCM encoding can be thought of as the audio equivalent of an uncompressed image bitmap.

## Strategy & Solutions - Sound - Memory Institutions

- Digital transfer issues
  - Professional gear, esp. A-to-D converter



- 
- More . . . .
    - Quality review
    - Sound Directions produces two masters at high resolution: preservation master (unaltered) and production master (reduced noise, reassembled segments, etc.)
    - High-volume, efficient production via parallel streams still very exploratory

Professional devices are as important as the engineer's ears, and the most important of these is the analog-to-digital converter. High end professional models tend to be external, not built into a workstation. There is more to say about transfer, no time today . . . .

## Strategy & Solutions - Sound - Memory Institutions

- Item-structure issues
  - Several digital library audio projects use METS
    - Examples: Sound Directions and *Library of Congress Presents Music, Theater & Dance*  
<http://www.loc.gov/rr/perform/ihas/index.html>
  - Sound Directions: AES31-3 to bind multiple sequential segments

Sound Directions packages its content using METS, with subsidiary use of AES31-3 from the Audio Engineering Society to bind (or virtually bind) segments into a single, continuous recording.

## Strategy & Solutions - Sound - Memory Institutions

- Identifier and metadata issues
  - AES standards for administrative metadata (still in draft)
  - AES-X098B: Audio Object Schema
  - AES-X098C: Process History Schema

AES metadata is also in play. Sound Directions, like the prototyping effort I directed a few years ago, makes use of two draft AES standards for administrative metadata: *audio object* and *process history*, what METS calls *digital provenance*. These specifications owe a great debt to Dave Ackerman from Harvard, also on the Sound Directions team.

## Sidebar - CDs, DVDs, and IT Infrastructure

- Writeable optical disks
  - Life expectancy is a concern
  - Future migration likely to require greater effort than server-based approaches
  - Audio CDs offer moderate resolution
    - 44.1/16 instead of 96/24
  - Not the best solution

These big projects put content onto servers in a robust information technology infrastructure. But not everyone has this, and some archives have put their audio masters on compact disks or DVDs. But writeable CDs and DVDs have a relatively short life expectancy and future migrations will be labor intensive. Audio CDs have a second drawback: they only support moderate levels of resolution.

## Sidebar - CDs, DVDs, and IT Infrastructure

- Multiple copies, multiple disks, multiple locations
- Discussion of small-server ideas from Phonogrammarchiv in Vienna
  - [www.tape-online.net/docs/kickoff/schuller.pdf](http://www.tape-online.net/docs/kickoff/schuller.pdf)
- Related ideas from John Spencer, presented at Association for Recorded Sound Collections (ARSC) workshops
- Need for consortial, stewardship-network model

What's a small archive to do? Careful use and storage of redundant disks is always wise. Meanwhile, Dietrich Schüller of the Phonogrammarchiv in Vienna has written about what he calls "personal" Digital Mass Storage Systems. There is clearly a need for consortial networked support for preservation, a topic being investigated by NDIIPP at the Library of Congress.

## Problem Space - Sound - Music Industry

- Programmatic thrust
  - Managing a multi-party workflow:
    - Studio or studios create
    - “Redneck Woman” — more than 100 WAVE files
    - Record label receives, publishes, and archives
  - Record labels wish to archive the project as a whole, as well as the final mixes

For the music industry, the problem space is a little different. For one thing, there are multiple parties in the production process. To create a CD, an independent producer may record and then mix the tracks, building a *project* that may include hundreds of files. The project is delivered to the label that publishes and archives the content.

## Strategy & Solutions - Sound - Music Industry

- Digital transfer
  - Archive digital files as created; native formats
  - WAVE or B-Wave files
  - Mostly LPCM encoding
  - Some DSD (one-bit-deep) encoding

Strategies for the music industry? They archive the digital content as created, joining memory institutions in embracing high resolution LPCM encoding, wrapped in WAVE or Broadcast WAVE. However, there is also some use of DSD encoding.

## Strategy & Solutions - Sound - Music Industry

- Identifiers for commerce:

- GRid for “releases”



- ISRC for “tracks” (individual recordings); iTunes requires ISRC



The industry also has identifier schemes to support commerce and to track licensing. These specifications are new, however, and may not be widely implemented.

## Strategy & Solutions - Sound - Music Industry

- Item-structure issues
- Options for multi-track “project” content:
  - Existing - AES31-3
  - Draft new - AES31-4
  - Existing - NARAS Producer and Engineers Wing delivery recommendations, not widely adopted
  - Borrow from moving images - AAF and MXF
- Preservation object issues
  - Objects for multiple party exchange may also serve as OAIS submission information packages

The adoption of packaging options for multi-track content is less settled. I gather that AES31-3 is not sufficient in and of itself, so there is talk of AES31-4. There is also talk about the AAF and MXF formats initiated by moving image folks. However it gets done, objects packaged for industry exchange are likely to be suitable as preservation packages.

## Sound - Potential Shared Interest

- Memory institutions and industry both:
  - Archive digital files
  - Embrace LPCM encoding
  - Could benefit from AES specifications
  - May wish to evaluate DSD

I have mentioned some synergies between memory institutions and industry: digital-files that contain LPCM encoding, a potential role for metadata standards from AES, curiosity about DSD encoding.

## Sound - Potential Shared Interest

- Packaging specifications:
  - Digital library community drawn to specifications like METS & MPEG-21
  - Professional audio community drawn to specifications like those from AES, AAF, or SMPTE (MXF)

Should we work together on packaging? The digital library community is drawn to METS or MPEG-21, while the professional audio community is drawn to specifications like those from AES, AAF, or SMPTE. These are not exactly in conflict . . . but neither are they “the same.” What the recording industry does is a matter of considerable interest for libraries and archives that receive content from outside, as LC does through copyright deposit.

## Problem Space - Video - Memory Institutions

- Programmatic thrust
  - Reformatting older and obsolescent videotapes

Video. The memory institution problem space for video also features reformatting older content.

## Problem Space - Video - Memory Institutions

- Playback issues
  - Source items on analog, composite-signal tape media
  - Key types: 2-in tape, 1-in tape, ¾-in U-matic cassettes
  - Hardware obsolete or obsolescent, parts hard to obtain
  - Thin staffing in term of video engineers
  - Bright spot: content produced by broadcast professionals can be played back with more science and less art
  - Desired: high-volume, efficient production for big collections

Most holdings consist of analog *composite* videotapes. Many types of tape players are no longer manufactured and parts are hard to find. Specialized engineering knowledge is needed to maintain equipment.

One bright spot for archives with holdings of broadcast content is the legacy of FCC engineering rules; these tapes play back with a bit more science and a bit less art.

## Problem Space - Video - Memory Institutions

- Digital transfer issues
  - Target formats up in the air

But what to copy to? Target formats--whether a new generation of videotape or a digital file--are somewhat up in the air.

## Strategy & Solutions - Video/Conservative - Memory Institutions

- Programmatic thrust
  - Conservative strategy, sometimes called hybrid approach
  - Master copies are transfers to new generations of conventional videotapes (not files)
  - Viewing or service copies take the form of lossy-compressed computer files

On the solution side, there are two strategies afoot in memory institutions. At the Library of Congress, the American Folklife Center recently acted out the conservative solution for a collection of half-inch PortaPak videotapes from the 1970s. The master copy was made on videotape, while the viewing copy took the form of a computer file: a hybrid approach.

## Strategy & Solutions - Video/Conservative - Memory Institutions

- Playback issues
  - Compared to audio, more frequent use of outsourcing
  - Some archives purchase and maintain old hardware



From 1961: Ampex VR-1000-B  
2-inch quadruplex VTR

Image from Wikipedia

To address the problem of obsolete equipment and missing engineers, the Folklife Center outsourced their job.

## Strategy & Solutions - Video/Conservative - Memory Institutions

- Digital transfer issues
  - Videotape target formats:
    - Analog Betacam SP and digital DigiBeta
    - Re-copying analog SP leads to generation loss
    - DigiBeta - small amount of lossy compression
    - Beta formats obsolescent, tape still available
  - Folklife project end-user service file:
    - MPEG-2 at 3 mb/s

The target videotapes for most hybrid projects are analog Betacam SP or digital DigiBeta. Neither is perfect; Beta SP is analog (you get generation loss in future migrations) and DigiBeta includes a small amount of lossy compression. The Folklife Center hedged their bets by making copies on both types.

## Strategy & Solutions - Video/Future - Memory Institutions

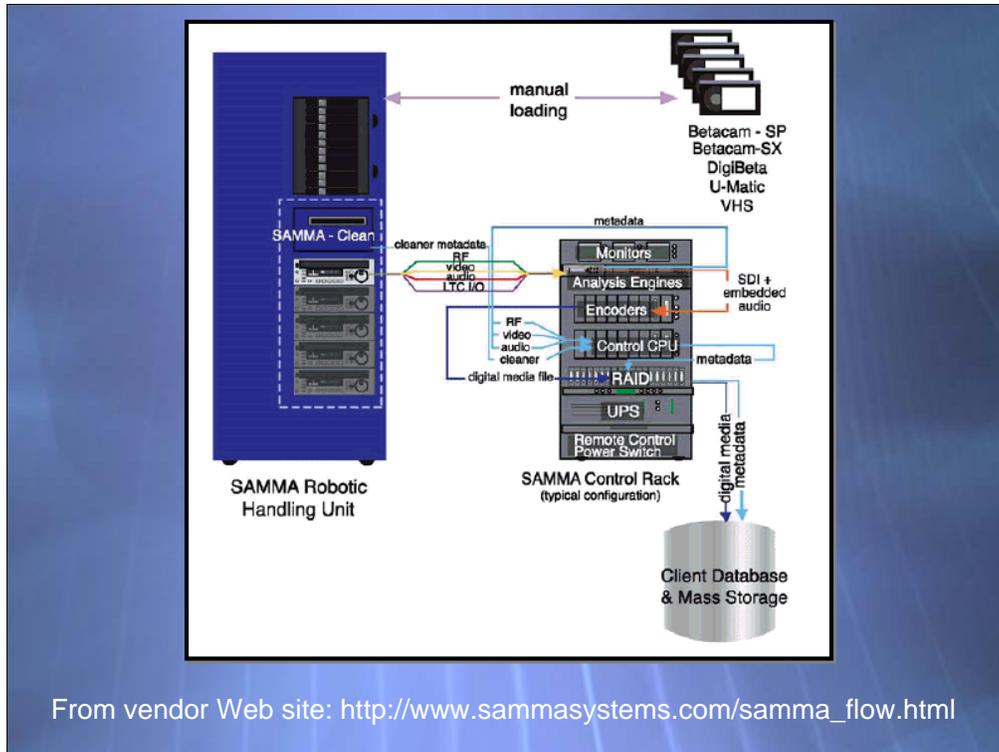
- Programmatic thrust
  - Future strategy: reformat to digital files
- Playback issues
  - Same as conservative strategy

Making a videotape as the preservation master is today's conservative approach but memory institutions also foresee a future in which they produce an exceedingly high quality digital file as a preservation master.

## Strategy & Solutions - Video/Future - Memory Institutions

- Digital transfer issues
  - Target format not fully established
  - Least-altered copy: encoded without compression or compressed in a lossless manner

Ideally, the target format ought to contain uncompressed or losslessly compressed data. The leading advocate for this approach is Jim Lindner.



His company, Media Matters, is developing a system called SAMMA that can be configured to produce preservation *tapes* in a hybrid mode or to make *files* as the master copy.

## Strategy & Solutions - Video/Future - Memory Institutions

- Digital transfer issues
  - SAMMA - lossless JPEG 2000 compression applied to each frame of video
  - Frame images and soundtrack object to be wrapped in MXF or Motion JPEG 2000
  - To be field tested for the LC NAVCC.
  - Approx 25 GB per hour of program content
  - Operator oversees multiple simultaneous playback streams

In the file-making configuration, the system applies lossless JPEG 2000 compression to each frame of video. These frame images and an accompanying soundtrack object are then wrapped in MXF or Motion JPEG 2000. Each hour of video comes to something like 25 GB.

This technology will soon be field tested by the Library's planning team for the National Audio-Video Conservation Center. One virtue of the copying system is that it can play back three or four tapes in parallel, thereby increasing throughput.

A project funded by the Library of Congress

# PRESERVING DIGITAL PUBLIC TELEVISION

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"Public television has been responsible for the production, broadcast and dissemination of programs which form the richest audiovisual source of cultural history in the United States."

*Television and Video Preservation 1997:  
A Study of the Current State of American Television and Video Preservation  
Report of the Librarian of Congress*

**Digitally-produced public television programs are at great risk of being lost** because rapid changes in technology make new video formats and equipment obsolete quickly, and there is little experience in how to save digital video productions over a long period of time. There is no clear mandate within public television for who has responsibility to preserve national programs, and with no specific allocations, the system has little funding on hand to invest in preservation activities.

Yet stations, producers, users and distributors all have a vested interest in seeing that programs are saved. The Library of Congress, charged with the long-term preservation of America's history and cultural heritage, is greatly concerned about saving our cultural heritage in this era when information is being created solely in digital forms. They have singled out public television for special attention, because they believe it is so important in documenting and reflecting our social evolution. The Library has funded this project -- **PRESERVING DIGITAL PUBLIC TELEVISION** -- specifically to design an archive for long-term preservation of public television programs being produced in a 'born-digital' environment.

<http://www.ptvdigitalarchive.org/index.htm>

What is the problem space for broadcasters? My insights come from my work with the public television team in an NDIIPP partnership project.

## Problem Space - Video - Broadcasters

- Programmatic thrust
  - Born digital production & post-production
  - Archive finished programs
  - Archive acquisition footage (what is shot to go into a program), often valuable as stock footage

For broadcasters, slowly but surely, cameras move into a no-tape mode for the *acquisition* of footage. And the *post-production environment* is now largely file based. Producers wish to archive both the finished programs and the acquisition footage, which has stock shot value.

## Problem Space - Video - Broadcasters

- Playback issues
  - Few or none, formats are those in common current use
  - High definition beginning to have an impact, same issues

There are no particular playback problems: the formats and playback systems are both of the here and now.

## Strategy & Solutions - Video - Broadcasters

- Programmatic thrust
  - Archive digital files as created, native formats
  - Finished programs encoded as MPEG-2
  - Acquisition footage in mainstream professional formats like DVCPRO50 and IMX
  - Strategy means that target format is not an immediate issue

Solution strategy? The public television broadcasters articulate a file-based approach, but one that differs from the future file-oriented strategy for memory institutions. The public television project team plans to hold their content in native formats.

Finished programs generally end up with MPEG-2 encoding, which is specified for broadcast under the new digital television rules. Acquisition formats vary but, for broadcasters, generally fall into professional categories.

## Strategy & Solutions - Video - Broadcasters

- Playback issues
  - Wait to transcode/migrate/normalize, even for several years
  - Technology for transcoding will improve
  - Normalized files are likely to be bigger, wait as long as possible to minimize storage impact
  - Meanwhile, *don't* wait to copy obsolete videotapes

It is not that transcoding will never be needed: their position is that it is not needed now. If files are normalized to, say, an uncompressed video bitstream or a set of compressed JPEG 2000 frames, the size increases significantly. Why transcode now, they ask, when the native compressed formats are good for a few more years? Then we will have better transcoding tools and storage will be cheaper.

Regarding older videotapes, however, these experts agree with memory institutions: obsolete tape formats need to be copied (and thus transcoded) now.

The image shows a screenshot of the AAF Association website. At the top, there is a logo for 'Advanced Authoring Format' and the text 'AAF Association'. Below this is a navigation menu with links: Home, Policies, Technical, Join AAF, Members, FAQ, Downloads, and Contact. A banner image shows a film set. Below the navigation is a section for the Society of Motion Picture and Television Engineers (SMPTE), with the tagline 'Setting the standard in motion imaging.' and a 'Membership Engineering' link. A table lists three SMPTE documents for purchase:

<b>SMPTE 377M-2004</b>	Television Material Exchange Format (MXF) File Format Specification (Standard)	\$90.00 - <a href="#">Purchase this Document</a>
<b>SMPTE 378M-2004</b>	Proposed Material Exchange Format (MXF) — Operational pattern 1A (Single Item, Single Package)	\$26.00 - <a href="#">Purchase this Document</a>
<b>SMPTE 379M-2004</b>	Material Exchange Format (MXF) — MXF Generic Container	\$30.00 - <a href="#">Purchase this Document</a>

In the NDIIPP-funded project, wrapper and packaging formats are a focus. Industry-wide, the AAF and MXF formats are beginning to be adopted, and some vendor systems include them.

## Strategy & Solutions - Video - Broadcasters

- Item-structure issues
  - AAF and MXF are flexible ways to package content
  - Profiles & application specifications (AS) are important
  - Public Broadcasting System (PBS) is developing MXF application specifications
- Preservation object issues
  - PBS AS for higher resolution content will define an object that could serve as an OAIS submission package

AAF and MXF are flexible and variable--you might compare them to PDF; you can make a lot of subtypes. The smart move is to develop profiles--what MXF calls an *application specification* or *AS*--a set of rules that governs the specifics for your implementation.

PBS is developing application specifications; one of these could define a package for submission to a repository.

## Strategy & Solutions - Video - Broadcasters

- Identifier and metadata issues
  - PBCore as community specification for metadata, not yet widely implemented
  - SMPTE metadata registry (RP 210), very extensive list of terms
  - No equivalents to AES Audio Object Schema and Process History Schema
  - Several professional systems use SMPTE UMID identifiers

Public television descriptive and administrative metadata is defined in the PBCore schema, now in the early throes of implementation. Meanwhile, in the commercial broadcast sector, SMPTE has provided a *registry* of metadata terms, but no discrete schema comparable to the AES specifications mentioned earlier.

## Video - Potential Shared Interest

- Packaging standard development
  - Professional community drawn to specifications like AAF and MXF
  - Digital library community drawn to specifications like METS and MPEG-21
- Administrative metadata
  - *video object*
  - *process history*

Where might memory institutions and industry make common cause? Perhaps wrapping and packaging. Broadcasters see AAF and MXF as exchange objects that are reasonably complete. At the same time, digital library folks may see these objects as filling the niche occupied by TIFF for images or WAVE for sound recordings: as parts of larger digital objects further defined by METS or MPEG-21.

Meanwhile, another common concern is administrative metadata, certainly the techy sub-category.

## Problem Space - Film - Memory Institutions

- Programmatic thrust
  - Reformat historical content on film
    - 35mm, 16mm, other sizes
- Playback issues
  - Source items may be in poor condition
    - Deteriorating nitrate, vinegar syndrome (safety film)
    - Film may be shrunken or torn
    - Faded colors
    - Sound track challenges
    - More . . .

Now, regarding film. For memory institutions, we again have older historical content that can be difficult to play back; for example, nitrate originals.

## Strategy & Solutions - Film - Memory Institutions

- Programmatic thrust
  - Continue to emphasize traditional photochemical reproduction (film to film)
  - Explore digital scanning and "film recording" (printing back to film) on a small scale
  - Digital scanning may be more friendly to damaged or shrunken film than conventional film printers.

At the Library of Congress--like other memory institutions--photochemical film-to-film reformatting continues to carry the day: film stock and equipment can still be purchased. In the background, there is a modest exploration of digital reformatting.

## Strategy & Solutions - Film - Memory Institutions

- Digital transfer issues
  - Digital target formats up in the air, for both essence encoding and wrapping
  - SMPTE formats to consider: DPX and MXF
  - Technical issues:
    - Bit depth ("extended data range"), linear/log representations of intensity, color gamut and color space
    - Much more critical for film than for video

But there are uncertainties about the essence bitstreams and the file wrapper, and about the representation of density and color. The result is that public-sector film archives play a waiting game for now.

## Problem Space - Film - Commercial Producers

- Programmatic thrust
  - Production may be film or digital or hybrid
  - Editing and mastering ("post-production") is generally digital
  - Most important end product is called the Digital Source Master (DSM) in the digital cinema specification
  - DSM is used to generate multiple outputs: theatrical release, DVD, television

The contrast with Hollywood is striking, where some production processes and virtually all post-production are digital. Even if film goes through the camera, it is scanned once back in the lab. No longer is camera negative lovingly spliced to produce film printing masters. Today's film printing masters emerge at the end of a digital production line.

**DCI** Digital Cinema Initiatives, LLC

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### Digital Cinema Initiatives

ABOUT DCI

Digital Cinema Initiatives, LLC (DCI) was created in March 2002, as a joint venture of Disney, Fox, MGM, Paramount, Sony Pictures Entertainment, Universal and Warner Bros. Studios. DCI's primary purpose is to establish and document voluntary specifications for an open architecture for digital cinema that ensures a uniform and high level of technical performance, reliability and quality control.

#### **DIGITAL CINEMA INITIATIVES (DCI) ANNOUNCES COMPLIANCE TESTING PROCESS FOR DIGITAL PROJECTORS AND THEATER EQUIPMENT**

##### **Compliance Process Furthers the Goal Towards One Universal Standard in Creating the Next Generation of Digital Cinema Projection Systems**

❖ (Hollywood, CA - Sept 06, 2006)  
Digital Cinema Initiatives (DCI) has announced its compliance testing process for digital cinema to exhibitors, equipment suppliers and deployment entities.  
[\[read full release\]](#)  
[\[get a pdf of press release\]](#)

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#### StEM Information

##### Mini-movie Access Procedure

The following is the procedure for gaining access to the ASC/DCI StEM material. Be advised there are different versions of this material. (E.g. 4k, 2k, RGB and wide gamut RGB files) A list is provided at the end of the PDF document.

[StEMAcce.pdf \[click here\]](#)  
UPDATED 7/20/05

<http://www.dcimovies.com/>

Soon, even film printing masters will no longer be required. Distribution to theaters is moving to high resolution digital. The development of the DCI specification included sophisticated analyses of resolution and color space, necessary for successful theatrical projection.

## Problem Space - Film - Commercial Producers

- Digital transfer issues
  - Digital mastering or DI formats are proprietary, obsolescent, and not openly documented.
  - Great extent of data per title
  - *Superman Returns* produced about 200 TB

The move to digital has produced anxieties for industry archivists: the formats used in post-production digital mastering are proprietary and obsolescent. And production outputs are extensive: the digital harvest from *Superman Returns* came to 200 TB.

## Strategy & Solutions - Film - Commercial Producers

- Identifier and metadata issues, preservation object issues
  - Digital Cinema Initiatives (DCI) specification now being standardized by SMPTE
  - Nearly half of the pages in the digital cinema specification has are devoted to security

Looking at the strategy and solution side, the most fully realized packaging scheme is the digital cinema distribution specification, developed by the DCI industry group and now being standardized by SMPTE.

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SCIENCE AND TECHNOLOGY COUNCIL

- About the Science and Technology Council
- History of the Council
- Council Activities

*Science and Technology Council*

The Academy Science and Technology Council was created by the Academy Board of Governors in 2003 in response to the major technological developments taking place in the motion picture industry.

Not since the introduction of sound over 75 years ago has the industry faced such monumental technological advances, and the Academy is responding with the formation of a new structure whose mission is:

- To advance the science of motion pictures and foster cooperation for technological progress in support of the art
- To sponsor publications and foster educational activities that facilitate understanding of historical and new developments both within the industry and for the wider public audience
- To preserve the history of the science and technology of motion pictures
- To provide a forum and common meeting ground for the exchange of information and to promote cooperation among divergent technological interests, with the objective of increasing the quality of the theatrical motion picture experience

The members of the Science and Technology Council for the 2006-2007 year are:

- Bill Taylor, Co-Chairman
- Ray Feeney, Co-Chairman
- Andrew Maltz, Director
- Peter Anderson
- Clay Davis
- Richard Edlund
- Jonathan Erland
- Phil Feiner
- Richard Glickman
- David Gray
- Douglas Greenfield
- Richard Hollander
- Rob Hummel
- Brad Hunt
- David English
- George Joblove
- Mark R. Kimball
- Bill Kroyer
- Tad Marburg
- Tak Miyagishima
- Daryn Okada
- Richard Patterson
- Donald C. Rogers
- Rick Sayre
- Garrett Smith

The Council does not administer the Scientific and

<http://www.oscars.org/council/index.html>

Meanwhile, the Academy of Motion Picture Arts and Sciences is examining the preservation of production and mastering materials.

## Strategy & Solutions - Film - Commercial Producers

- Digital transfer issues
  - Uncertain about long-term accessibility of the digital master, studios or other producers print back to YCM separations on film

### ■ Film Recording for digital intermediates

Cinetech and Ascent Media build on their leadership in the digital and film preservation worlds to meet new preservation demands for the emerging digital intermediate (D/I) market. The only accepted standard for long term motion picture asset protection, YCM separation masters are an important component for the digital future, too.

Film will be around far longer than many digital media. That's why Cinetech developed its new Digital YCM service. The future for D/I finished assets is now assured.

Advertising brochure from Cinetech: "*new Digital YCM service*"

[www.ascentmedia.com/solutions/onesheets/Cinetech%20restoration-F.pdf](http://www.ascentmedia.com/solutions/onesheets/Cinetech%20restoration-F.pdf)

Given the uncertainties, most studios output their digital masters not only as film printing elements but also as a trio of on-film color separations that can be archived in the conventional manner--a hybrid approach, if you will.

## Film - Potential Shared Interest

- Standardized encoding format for mastering elements or camera acquisition footage
- Industry analysis of resolution and color gamut/color space
- Application of DCI packaging specification concepts to other categories of material
- Shared interest in administrative metadata?

Shared topics? I believe that the industry's investigation of digital technologies in general has been and will continue to be instructive to memory institutions.

Will standardized encoding formats emerge in the industry for mastering elements or for camera footage? Will such encodings be appropriate for memory institutions? What can be learned from the industry's investigation of resolution and color?

Are the packaging concepts applied to digital cinema distribution more widely applicable?



Thomas Jefferson Building  
Library of Congress

For film, as for sound and video, I think archives and industry have common interests. Making the inter-community connections, however, may not be easy--and that's a topic for another day. Thanks for listening today!