

Audio Preservation

What is going on?

Recorded sound has become one of the most significant formats to relay cultural, historic and scientific information.

- The Model is shifting
- Technologies are changing faster all the time.
- We can't fall behind!

The Big Debate

- The big debate is that we do not yet know the longevity of digital formats .
- experts still feel that we should back up to analogue formats like tape and keep them in a secure place.
- They can be damaged by a variety of elements and upon playback, these tapes can break down and become unplayable.
- In the past dubbing from one analogue format to another much of the quality of the original recording was lost.
- With digital formats we are able to make exact copies and provide metadata to ensure copies are exact replicas in every way.
- The general consensus now is that digital is the way to go.

“Digital Revolution”

Audio recordings have gone through a rapid amount of change in the past 25 years.

New formats and ways of distributing information allow these organizations access to greater amounts of information faster but how do we handle this increase in information and the need to preserve it?

Analog and Player Obsolescence

While libraries and other cultural organizations are working to preserve their digital collections they are still faced with challenges of preserving older analogue formats.

Maintaining of machines for playback and the implementation of efforts to reformat these recordings to migrate them into a format that can be played back in the future are still a challenge.

Analogue Formats Have a Few Steps To Go Through Before They Can Be Digitized.

- Inspecting
- Preparing and cleaning the source material
- Configuring and calibrating playback equipment
- Transfer
- Collect detailed metadata
- Post-transfer quality control, which includes running check sums and checking the metadata for consistency.

CALIPR, AVDb and Other Prioritization Survey Tools.

A survey instrument with its ability to prioritize preservation needs for reformatting and preservation.

- condition
- Use
- value to the collection.

It is a classic matrix set up that ranks a collection on a scale of 0 to 5 based on which items need to preserve due to risk of loss and value of materials.

FADGI

- Federal agencies digitization guidelines initiative was established to “identify, establish, and disseminate information about standards and practices for the digital reformatting of audio-visual materials by federal agencies.”
- The main focus of the work is on older materials, with the formatting born-digital content to be considered where strong synergy exists.
- Topic areas include formatting, metadata, and related practices and methodology.

Metadata

- Proper collection of metadata is extremely important in the preservation of audio recordings.
- descriptive (e.g., track listings), administrative, and technical (e.g., a description of audio hardware used in digital transfer, hardware settings, and data compression used)
- Whenever possible the individual responsible for the transfer should note all documentation including box notations that accompanies the analog source. During the preservation transfer process, transfer engineers should note anomalies in tape such as splice problems/repairs, speed variations, blocking/shedding, etc. Metadata to accompany the digital preservation copy could be embedded, eye legible, or both

Embedded Metadata

- Embedded Metadata provides information to support the functionality of an object at various stages of its preservation life cycle.
- A subgroup from the federal agencies initiative is developing a set of use cases that pertain to embedded metadata. The overall use-case effort is intended to be generic, representing both the still image and the audio-visual Working Groups
- The current audio visual group is now focusing on a few particular aspects of different topics such as Format type, content lifecycle, master files more than derivative files, administrative and descriptive metadata including identifiers.

Best Way To Embed Metadata For Audio?

- Embedding metadata is limited by the WAVE and BWF specifications and formats.
- Chunks are fragments of information which is used in many multimedia formats, such as PNG, MP3, and AVI. Each chunk contains a header which indicates some parameters

Chunk Examples

Chunk ID

- IARL
- IART
- ICOP
- IMED

Description

Archival Location. Indicates where the subject of the file is archived.

Artist. Lists the artist of the original subject of the file. For example, Michelangelo.

Copyright. Records the copyright information for the file. For example, Copyright Encyclopedia International 1991. If there are multiple copyrights, separate them by a semicolon followed by a space.

Medium. Describes the original subject of the file, such as, computer image, drawing, lithograph, and so forth.

Dublin Core, METS, MARC, PBCore or other formats for embedding metadata are also useful in cataloging and describing audio files BUT....

- will the use of one cataloging or imbedded metadata format be enough?
- Do we need to find a system to embed metadata and catalog audio and audiovisual formats that contains more detailed information and multiple ways of identifying an item?
- Are some of the formats used like MARC creating work flow problems by having too many blank and irrelevant field for audio works?

So Much Metadata

Since there is a good chance that a given object or file will be associated with multiple identifiers, there will be considerable value in having a metadata encoding that allows for repeating elements and/or attributes.

METS Floccat, LOCTYPE, DLF wiki Best Practices for OAI Data Provider Implementations and Shareable Metadata states the following: multiple versions of a digital object may exist, looking from external Dublin Core, PBCore metadata toward the digital content in the case of digital objects, if the identifiers resolve to multiple versions of the resource, it is important to identify a single primary identifier that a service provider can label or use as the primary link to the resource.

Coming Soon: From the Audio Engineering Society (AES)

- **AES-X098A: Descriptive Metadata for Audio Objects**
 - These elements constitute the basic level of description required to define an audio digital object for archiving and use purposes. AES has essentially decided to use EBUCore as its descriptive metadata schema.
- **AES-X098B: Administrative and structural metadata for audio objects**
 - vocabulary to be used in describing digital and analog audio formats, including both those formats that exist in some tangible form such as a reel of tape and those that exist only as a stream of bits, united to a single audio carrier, such as a broadcast WAVE file. This vocabulary takes the form of an Extensible Markup Language (XML) schema.
- **AES-X098C: Administrative metadata for audio objects**
 - vocabulary to be used in describing the processing and handling of audio objects in audio preservation work. This metadata, sometimes referred to as 'process history' or 'digi-prov', describes the details of how audio objects are treated and/or migrated. Essentially it provides the 'who', 'where', 'what' and 'how' information that clarifies the provenance of the audio object with regard to the work that has been done to restore and/or preserve the object.

Sum it up

- Embedding
- Technical
- Administrative
- Descriptive metadata

Considering which formats give them the most options and flexibility for migration to future formats, help to create and maintain work flow and that will be able to deal with multiple forms of metadata, and allow for cohesive information retrieval for now and in the future.

STAFF

What do we need to look for?

strong working knowledge of programs and policies needed to create digital repositories as well as access to funds to develop, coordinate and run these programs and repositories over an extended period of time.

Build The Best Staff You Can and Encourage Them To Get In The Know.

- digital preservation efforts have guidelines set by librarians that have not consulted or do not know about audio engineering
- the engineers that are not aware of particular institutional requirements
- as whole they are all unaware of the proper management and facilities needed to manage digital storage and repositories.
- smaller institutes often due to financial constraints utilize whom ever they feel seems to have some minor working knowledge of audio equipment.

OH NO!!!

Poor staffing = Poor collections

- audio recordings are to be migrated again
- stovepiping projects
- Waste money and time
- loss of a collection

Collaboration and Education

The need to develop audio preservation programs that include the knowledge of :

- Librarians
- Engineers
- Archivist
- System Administrators

This is extremely important to the proper preservation, migration and future access of these audio files.

I Hate To Admit This

- The problem is that most library schools do not offer the proper technical training for audio preservation efforts.

(that's why I came to you all. Thanks MIAP!)

On the technical education side:

- engineers not being taught methods and practice for proper administrative procedures to develop a preserved collection that can be utilized efficiently.

Copyright Laws

First and foremost, archives have an obligation to comply with copyright and related law.

- The problem is that following these laws closely can cause dark archives.
- The current law often cause material to be lost since it cant be touched in anyway until it is in imminent danger.

Copyright Law Reform PLEASE.

- Copyright law and copyright ownership can become extremely complicated when dealing with certain typed of recorded information.
- The laws dealing with copyright often vary from country to country but almost always they favor the owner of the copyrighted material to allow them to do with it as they please and to deny use of the material by others.
- Some exceptions are made for educational and archiving purposes but, not many.

Play It Safe?

- Archives should obtain as much information about the ownership of intellectual parties.
- Limit distribution and streaming
- Preserve only public domain works, abandoned or older works that are not under copyright sanctions.
- Measures need to be taken to ensure that the archive is not put at risk for breaching copyright agreements.

Ethics

Ethics are always a tricky place to tread

- Not only are we talking about the handling of private and sensitive materials:
 - Issues with deaccessioning of the materials
 - Preserving their players
 - Supporting materials such as:
photographs or writings.

Archives have an ethical obligation to ensure that a recording is conserved using the safest most current forms of technologies and that their original content and physical representation shall be safeguarded from being modified, truncated, extended, falsified or censored in any way.

\$ Financial Issues \$

- Yes we can all collaborate and utilize our experts in each field to create safe and accessible audio archives but how do we fund it? The cost in some areas are declining like that of storage but all other cost seem to rising.
- The need to consider the length of time an archive will exist and cost of up keep need to be re evaluated.

Strong Collections Can Help Themselves.

- Strong collection generates interest and often donors will come forward to help with cost.
- Grant writing and fundraising
- Community interest: show them a collections relevance and importance.

Who Else Is Paying Attention?

- The extensive amount of audio recordings throughout the world that are rare and or unique are in serious peril due to their carriers deteriorating and the players becoming obsolete.
- satellite and public radio or television networks? Are they putting as much emphasis into making sure that their audio artifacts are properly stored and protected?

3 “case studies”

- Cyrus Shahmir and Lear Bunda that work with Adult Swim at Turner Broadcasting in Atlanta Georgia.
- Jamie Bush who is Music/Media Manager at Sirius XM Satellite Radio in Washington, DC.
- Andy Lanset who is Music/Media Manager an archivist and audio preservation specialist New York Public Radio.

1. What Storage technologies or systems do you have in place for your audio archives?

- Shahmir & Bunda: *Analog master tapes (1/4", 1/2", CD), Digital hard drive, DVD back ups, cassette and vinyl copies (of material that is completed)*
- JB: *Our audio content is stored using Dalet 5.1 (Digital Media System for TV/Radio). The storage network is an Isilon system.*

2. What measures are you taking for protection of your collections?

- Shahmir & Bunda: *Back up to DVD, print to tape, master to CD/vinyl, wav and mp3 stereo masters*
- JB: *All our digital media is backed up as part of our redundant Isilon storage network. Our physical CD collection is shelved using standard methods for CD storage. There is a mirrored system that is off-site.*

3. What do you take into consideration when you are planning for “disaster” situations?

- Shahmir & Bunda: *That DVDs are a pretty good digital back up, haven't had any analog snafu's yet*
- JB: *Our offsite-mirrored system would be used for data recovery. There are disaster protocols in place but I am not familiar with them.*

4. What plans do you have for migration?

- Shahmir & Bunda: *Our goal is to keep my stuff back up in stereo formats (worst case) on CD and hard drive. A major goal is to also get mass duplication through vinyl, CD or cassette so that many final copies exist.*
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- JB: *We are currently upgrading our Dalet 5.1 Media system to Dalet Plus Enterprise. The migration of data is built into that upgrade plan.*

5. Do you handle analogue and your born digital audio information differently? And if yes how?

- Shahmir & Bunda: *Analog is stored on tapes in a safe location. Digital information is back up on desktop, hard drive and DVD.*
- JB: *Not really.*

6. What was your biggest obstacle in creating this collection?

- Shahmir & Bunda: *Money, time and forethought.*
- JB: *I was not part of the original acquisition of the collection. However, it is my understanding that the ingestion of the music content into Dalet was a challenge. The initial building of each channel's library was also challenging.*

7. What do you see as your biggest obstacle for the future of the collection?

- **Shahmir & Bunda:** *Reading mechanisms (standardization) and durability of electronic devices.*
- **JB:** *This is directly tied to our companies business objectives and the future of current broadcast systems, which I really can't speak about. However, from a music library perspective, delivery of music content is slowly moving toward digital only. Our systems for ingestion and storage will need to keep pace with that trend. We have workflows and processes in place that are directly tied to the ingest and shelving of physical CDs. We will also need to consider what we will do with the physical music CD collection once digital delivery has become the norm. In terms of the digital music content itself, metadata will always be one of our biggest challenges. Because of the requirements of RIAA and DMCA we must report and maintain certain metadata for this content. Digital delivery makes this challenging because of the minimal metadata that accompanies the digital content as well as the lack of a physical CD. Traditionally, the physical CD has always been the primary source for metadata when ingesting. If satellite radio is held to the strict standards of reporting as it now, then digital delivery of music will need to provide richer metadata for us to fulfill our reporting requirements.*

WNYC

- Part of the reason that Andy Lanset was not able to fully answer my questions is that WNYC is currently involved in a huge project to digitizes and preserve its entire archive.
- Andy Lanset sent me WNYC Radio - Proposal to the NEH (Humanities Collections and References Resources) WNYC Audio Preservation and Access Project July 15, 2009.

Throughout its 85-year history, WNYC, New York Public Radio, has faithfully observed and documented the political, historical, scientific, and cultural events, both large and small, that have shaped New York City and the entire nation. Outside of the federal government, the WNYC Collection is the largest non-commercial collection of archival audio recordings and ephemera from an individual radio broadcaster.

Project Time Line

The project will begin on September 1, 2010 and run for two years until September 30, 2012.

- September 1-30, 2010.....Catalog and Software installations and testing
- October 1, 2010.....Reformatting of material begins
- March 31, 2011.....193 hours of material has been transferred
- October 1, 2011..... 386 hours of material has been transferred
- March 31, 2012.....579 hours of material has been transferred
- September 30, 2012775 hours of material has been transferred

Criteria for Selection of Materials:

The total number of items to be considered will be well above the project limit of 775 hours of running time.

The decision will be made based on the following criteria:

- Overall value to the humanities and local/national history
- Cultural/sociological significance with regard to the popular culture of the nation and New York City
- Significance of content and usefulness/relevance of material to humanities-based research, teaching/education, and news/journalism
- Uniqueness of subject matter with regard to content
- State of deterioration or endangerment
- Availability of similar recordings at other sound archives
- The available means to provide a proper conservation treatment

Priority will be given to:

- High-value, at-risk transcription discs and tapes
- Discs and tapes of national as well as New York City cultural, political, and social history interest
- Discs actually cut by WNYC (numerous discs in the collection were commercially produced and were bought or given to WNYC; presumably these discs are available at other sound archives)
- Recordings that document the growth and development of WNYC and its role in city/regional/federal government
- Items singled out by project advisors as having particular historic or literary importance

Editorial Process for Writing Entries and Verifying Information:

The full-time, library school trained cataloger will do the entry work after auditioning a duplicate of the CD reference copy or an MP3 derivative of the original BWF. Wav file. This work will include the MARC 21 record copy for the cooperating institutions as well as the PBCore entry for the WNYC catalog (samples in appendices). The cataloger will also scan photocopied catalog cards from the original old catalog and organize the listings into manageable word-searchable text files.

Hardware and Software for Preparing, Processing, or Disseminating Materials:

- The hardware and software and software we currently employ and expect to use for this project has selected in consultation with WNYC's professional engineering staff as well as consultation with other sound preservationists and archivists. This includes:
- Rosetta -Apogee 200 A-D converter for 94k/24bit conversion (BWF wav)
- Rosetta – Apogee A-D converter for 44.1/16bit conversion (CD copies)
- M-Audio Delta AP192 Sound Card
- Technics SP-15 Turntables with Shure 44-M cartridges and styli on SME 3012 tone arms
- KAB Souvenir EQSMK12 phono preamps
- Studer A-80 Tape Recorders
- Studer B-67 Tape Recorders
- Keith Monks Record Cleaning Machines
- Digital Asset Management System – DAVID (Digital Audio Visual Integration & Development) -ProTools Ingest Software
- PlexTools CD duplicating software

Methods for formatting the material and ensuring quality control:

Data reduction and file formats:

- For archival purposes a linear lossless digital BWF.wav format will be used to avoid compromising the integrity of the recording.

Audiopath:

- The equipment used for conveying the source material will have specifications that equal or exceed the digital audio at 96 kHz and 24 bit rates. The specifications of the analog replay equipment and path will exceed the original carrier. We will also be implementing MD5 checksums using “Fastsum” or equivalent software to ensure the quality and integrity of the BWF over time or simply when moved or transferred.

Organization of and Access to the Materialize structure, system capabilities, user access, and documentation:

- collection level MARC21 catalog records for the discs and tapes for the four institutions that will be receiving CD copies of each digitized item. Those items sent to the NYPL and the University of Maryland will also become part of the Research Libraries Network (RLIN). The cataloger will also create individual entries for WNYC's in-house database of sound recordings according to the criteria outlined for PBCore.

- Along with the descriptive metadata about the given item, the cataloger will indicate the structural metadata concerning multiple files of a single item.
- Administrative metadata concerning the ownership of the original item (the NYC Municipal Archives) and rights status.
- Technical metadata describing the file type, bit depth and sample rate. The technical metadata for material transferred from disc will be added to WNYC's PBCore entry and will include speed, condition, transfer issues/problems and styli used. This information will be logged and supplied by the technicians doing the transfers.

Describe the metadata scheme(s) that will be used to describe the materials

- Describe and justify the metadata scheme(s) that will be used to describe the materials: Although it is currently in a trial and comment stage, we plan to use PBCore XSD (XML Schema) for the master BWF.wav files created at 96 kHz sampling rate and 24 bit resolution because it readily addresses the needs of public radio programming for descriptive, structural, technical and administrative metadata. We will also use the BEXT chunk of the BWF to hold a limited amount of metadata as recently outlined by the Federal Agencies AV Digitization Group and Library of Congress. These include title/description, originator, originator reference, originator date, originator time.

Plans for storing, maintaining, and protecting the data:

- Once ingested by the archives digital audio work station (DAW), the digitized audio is immediately sent to a clustered storage solution by Isilon Systems, a storage provider who WNYC Radio was the catalyst for forming a partnership with DAVID digital asset management system (DAM). Now known as Silex Media's DAVID (Digital Audio Visual Integration and Development) system

National Public Radio is in the process of implementing DAVID into their work flow. Our specific system is the model IQ6000i which includes nine nodes to connect with our broadcast VLAN, each with two GB network connections and eight 6TB storage arrays (48TB total raw storage) tied together with the company's InfiniBand intracluster network; together the system gives us high availability with a fully symmetrical clustered architecture. There are no single points of failure and the redundancy creates self-healing systems against node or disk failure; all files are striped across nodes in the entire cluster. There are several self-monitoring features of the system: the system allows environmental system monitoring as well as data integrity and node monitoring. Per the latter the system employs a continuous media scan in the background of all drives for proactively analyzing and healing file- level data.

Back-up:

- WNYC Radio will employ CommVault back-up software in conjunction with a fiber- connected Rorke Data/Qualstar RTL8466 2-drive, 66-slot, LTO4 stand alone tape carousel for backing up all data on the Isilon clustered storage array. This media will follow WNYC Radio's enterprise back-up DR strategy of moving and storing tapes to an off-site data storage vault.

Technical and administrative provisions for ensuring the preservation of and long-term access to the information:

- The digital asset management system (DAVID) affords WNYC several options for archival storage. These include; on-line, near on-line and off-line storage.

Last Minute Email From Andy Lansit

- The only thing I would add to the NEH proposal is that the approach to the disc transfers has changed slightly. Since all of the material we're dealing with is mono and there seems to be some debate within the community about doing only flat transfers we have decided to simultaneously do a flat transfer along with a transfer that will to the best of our estimation match the original playback equalization curve originally intended for the recording. So we will end up with two mono BWF files - one flat and one EQed instead of just a two track mono flat transfer.

- Beyond that, we are in the midst of working with AVPS (Audio Visual Preservation Solutions) on the integration of our databases so that the archives database will communicate with the digital asset management system (DAVID) and the web CMS. My goal is to have all of the current/contemporary material automatically cataloged so that we can turn our attention to the sizeable backlog.