Introduction to Digital Audio

Colorado Digitization Project
University of Denver, Penrose Library
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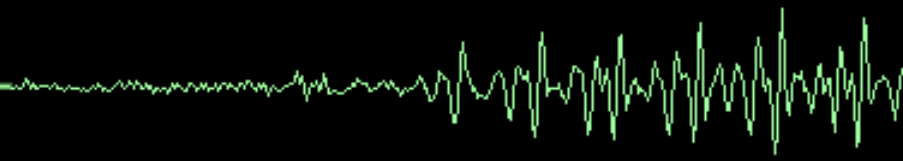
Denver, CO 80208-2007
http://coloradodigital.coalliance.org

Courtesy Ira M. Beck Memorial Archives, Penrose Library, University of Denver



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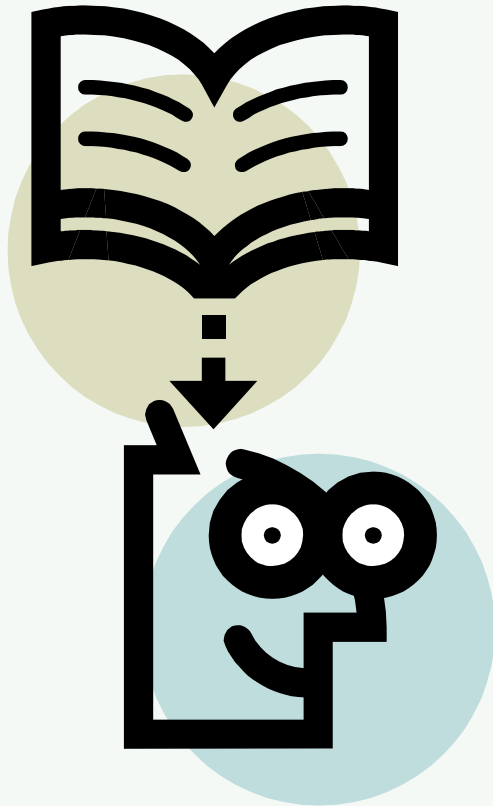
Introductions

- Name
- Organization
- Digitization experience
- Outcomes for today

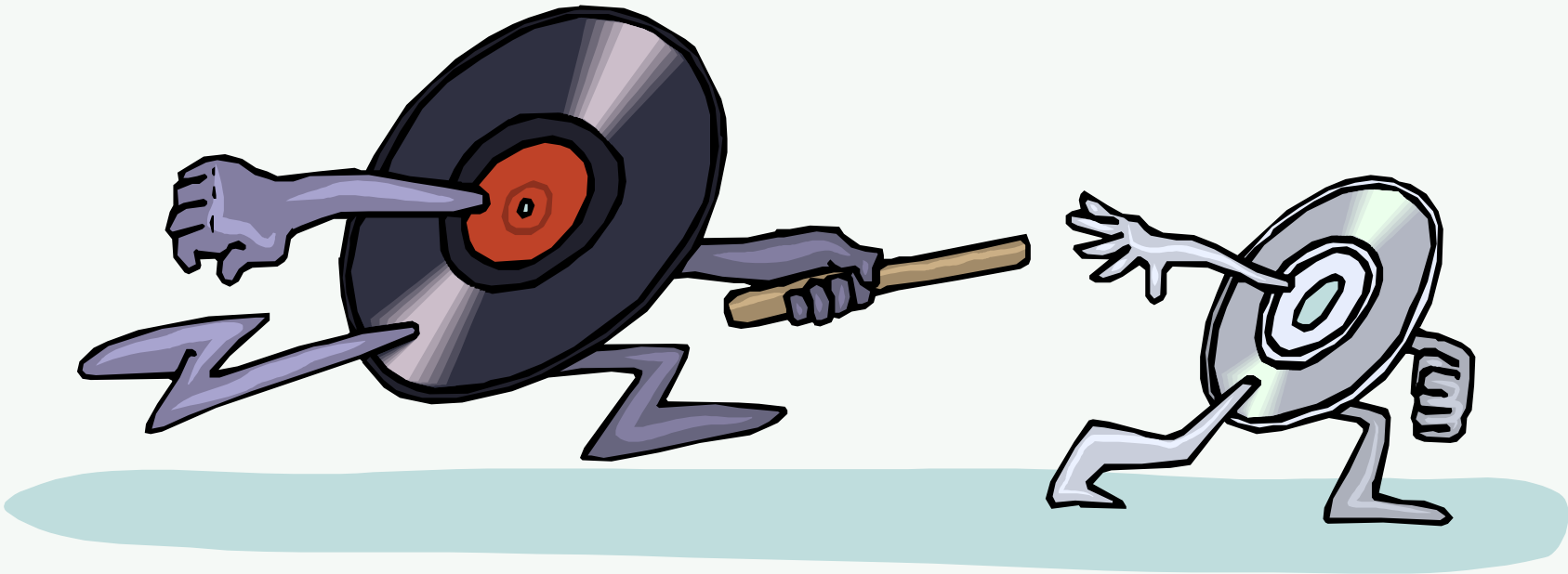
Agenda

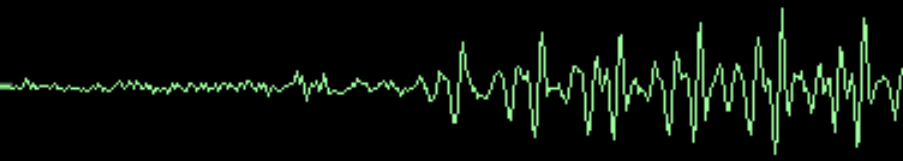
- Selection
- Analog to Digital Conversion/Capture
- Quality Control
- Case Study
- Storage/Sustainability
- Metadata for Digital Audio
- Access
- Playback/Delivery
- Outsourcing



Selection

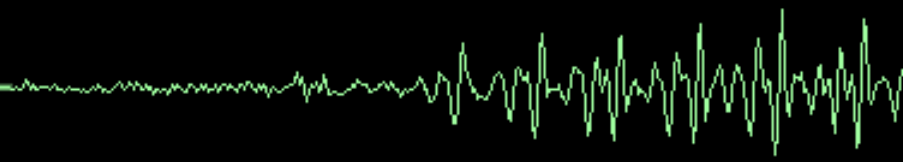
- What is your purpose for digitizing audio collections?





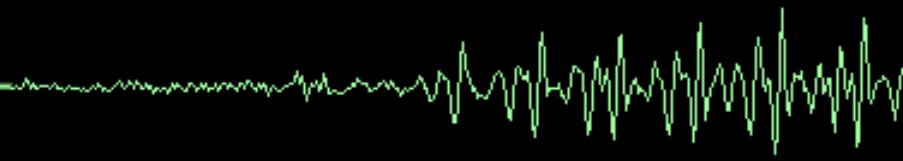
Selection - Audience

- **Who is your Audience?**
  - Who will use the collection?
  - Will users be in-house or online?
  - Do current users listen, or just read transcripts?
  - How can you best serve users?
  - How are materials cataloged?
  - Will materials become more available after project is complete?



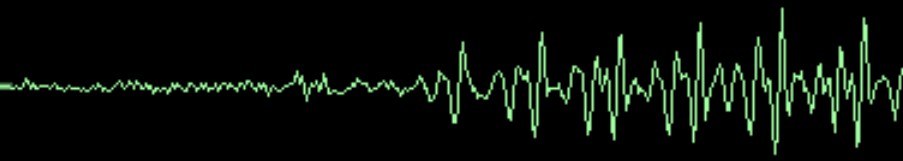
Selection - Ownership

- **Who Owns the Collection?**
  - Who owns the copyright to materials?
  - Did interviewees sign a release form? Does it limit use of collections outside the repository?
  - Duplication restrictions?
  - Can you obtain permission for commercial recordings?



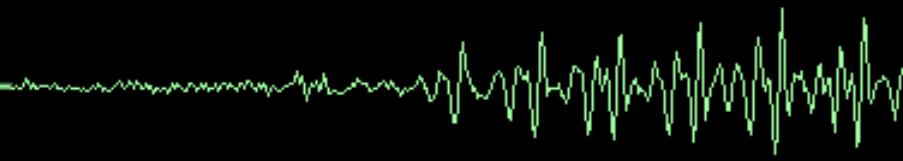
Selection - Collections

- **What are the characteristics of the collection?**
  - Is the content worth converting?
  - Is it a quality recording?
  - Is the collection on an obsolete format?
  - What level of cataloging or indexing available?
  - Are transcripts available?
  - Does the entire collection need to be digitized or just portions?



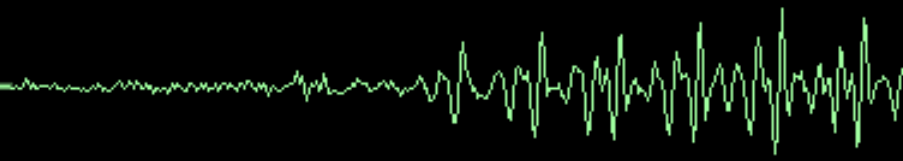
Selection - Preservation

- **How will you preserve the original?**
  - What is the physical condition of the recording?
  - How was the recording stored?
  - How much has the recording been handled – was it handled properly?
  - Can the original be played more than once?
  - What format is appropriate for an archival master?



Conversion/Capture - Definitions

- What is Audio?
- Analog vs. Digital
- Sampling Rate
- Sampling Size - Bit Depth

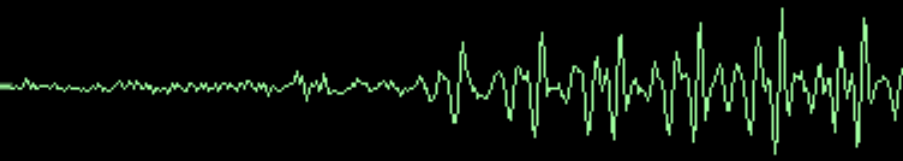


Conversion/Capture – What is Audio?

- Audio is a flowing series of pressure waves.

Conversion/Capture – Analog vs. Digital

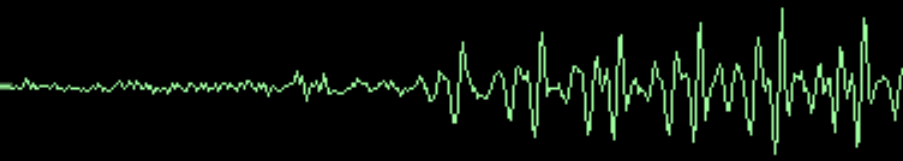
- Analog recording converts the audio wave in the air to an ANALOGous electrical signal on tape, record, etc.
- Digital Recording takes measurements (digital snapshots) of the audio wave in the air.



Conversion/Capture – Sampling Rate

Sampling rates are measured in Kilohertz (kHz) or “thousands of samples per second”.

Most commercial CDs are recorded at a sampling rate of 44.1 kHz. This means that for each second of audio 44,100 separate amplitude measurements are taken.



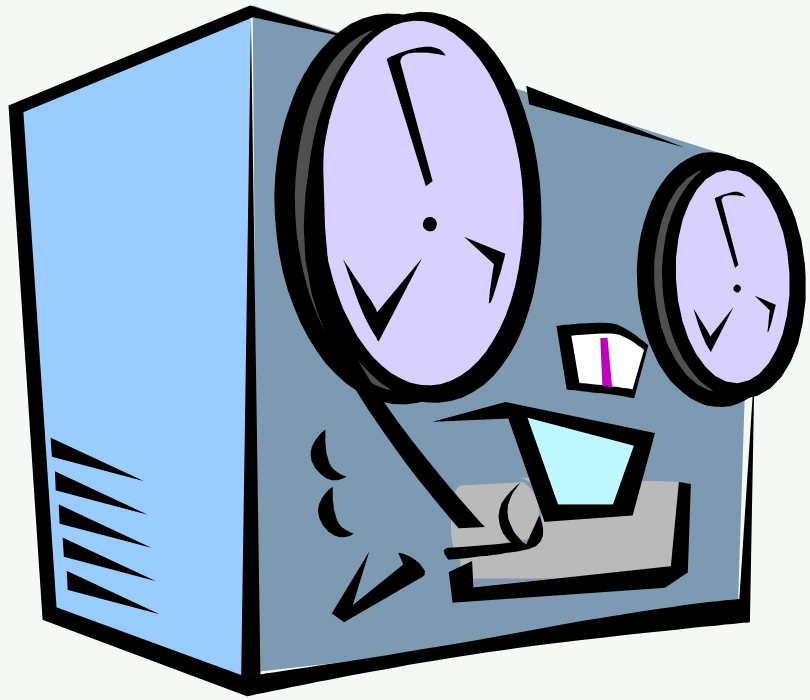
Conversion/Capture – Sampling Size

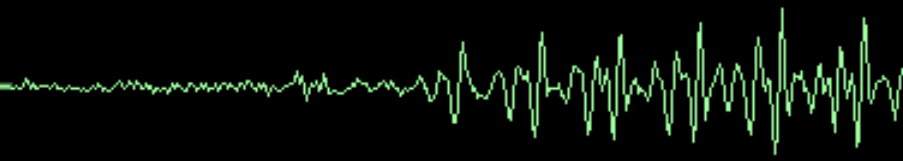
Sample size/bit depth describes how wide the range of numbers is that is used to measure each sample.

Sample size is measured in bits. The more bits, the greater the capability to record and reproduce the full dynamic range (loud to soft) of the audio.

Conversion/Capture - Equipment

- Analog playback device (tape player, turntable, reel-to-reel player)



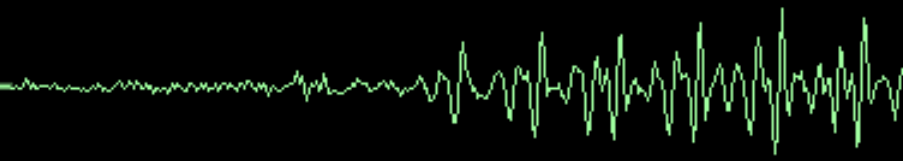


Conversion/Capture - Equipment

- Mixing Board
- Analog/Digital converter

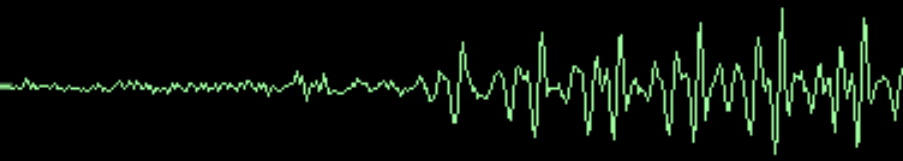
Conversion/Capture - Equipment

- Computer
- Digital Sound Card
- CD burner



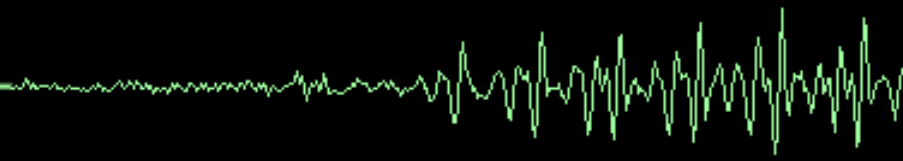
Conversion/Capture - Software

- Sound Forge (www.sonicfoundry.com)
- Cool Edit Pro (www.syntrillium.com)
- Pro Tools (http://www.digidesign.com)



Quality Control

- What is the level of sound quality you want?
- Criteria for acceptable sound quality
- Who will test for sound quality of the original?



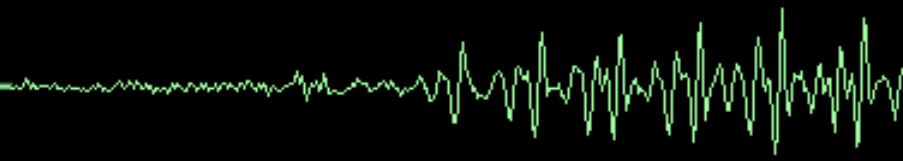
Quality Control - Optimization

- Will you use digitization as an enhancement tool?

Workflow

Simplified Steps to Digitizing and Distributing Digital Audio

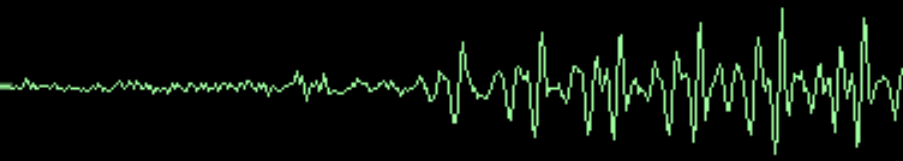
	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6
	Analog Source Material	**Analog to Digital Conversion**	**Digital Conversion**	**Digital Storage**	**Delivery/ Distribution**	**Playback**
Examples:	• Audio Cassettes • Soundtrack from Video Recording • Reel to Reel Tape • Other Audio Source	• Computer with Audio Card • Stand-alone Digital Audio Recorder	• wav/aiff • mp3 • streaming format • Real Audio	• Computer Hard Disk • CD-R • Digital Audio Tape • Other Digital Media	• On-Line (Internet or Intranet) • Portable Media	• Computer • Audio CD Player • Portable Digital Audio Player
Decision:	How do you plan to play back your original recording? Is special equipment required?	Do you want to digitally "archive" material, or solely make it available in digital format?	How will your users be playing back or using the material?	What medium do you want to store your audio files on?	How will you make your material available to your users?	What hardware will your users need to play back the material?



Case Study: Source and Objective

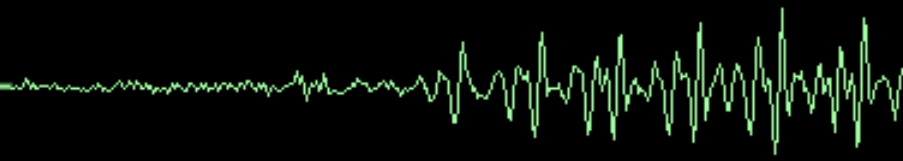
- Source: Oral History Audio Cassette

- Objective: Digitize audio and create two versions for access: Audio CD and Web



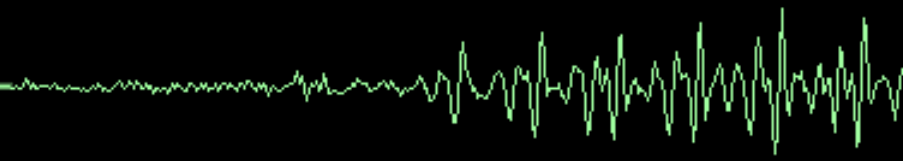
Case Study: Equipment

- Audio Cassette Deck
- Adaptors and cables
- Computer Audio Interface
- Laptop Computer
- Monitoring System



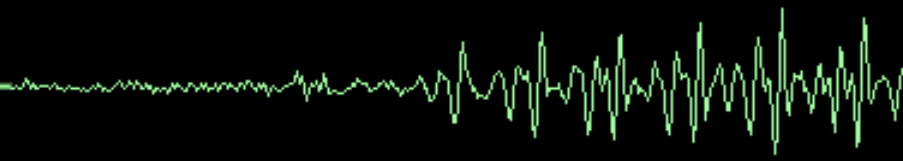
Case Study: Component: Audio Cassette Deck

- If possible, use the same unit that the original piece was recorded on
- If original is not available, use the best unit you can afford/find (adjustable heads, speed control, etc.)
- Clean and demagnetize heads before use, other maintenance is necessary.



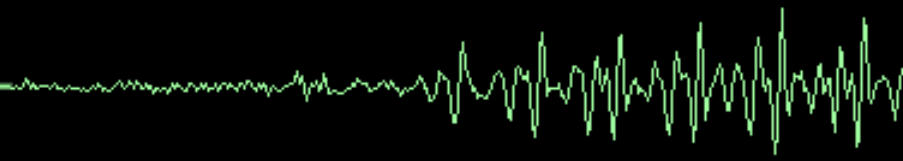
Case Study: Component: Cables and Adaptors

- High Quality – what does that mean?



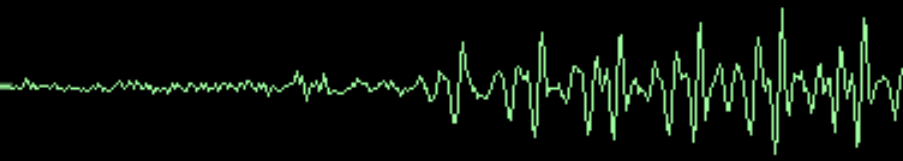
Case Study: Components: Computer Audio Interface

- Not a “soundcard” (i.e. “Soundblaster 16”)
- At minimum, should be able to record stereo signals at CD quality (44.1 kHz sampling rate, 16-bit depth)
- Physical interface should be easy to use and connect to
- Types: PCI cards, PCI cards w/ external boxes, etc.



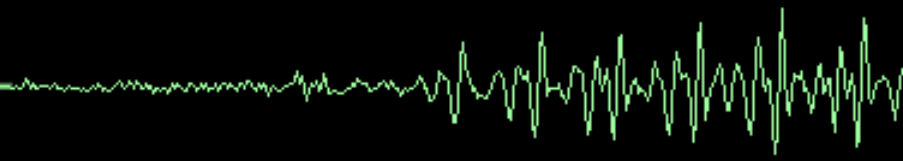
Case Study: Components: Computer

- Processor, RAM, Hard disk, CD-R
- Be sure to disable any audio “jupe” such as SRS, surround sound, “wide” sound, etc



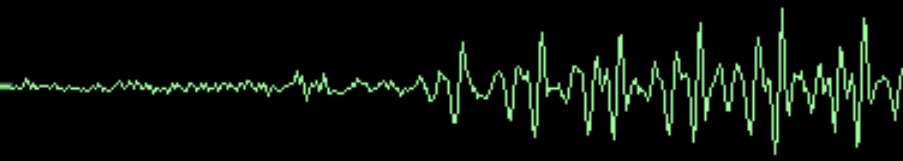
Case Study: Components: Software

- Many, many good products available
- Be sure software will import and export cross-platform audio files (.wav to .aiff and visa versa)
- Try to find a primary audio software that will meet your digitization, processing, and conversion needs.
- What is a plugin?
- What is destructive/nondestructive processing?



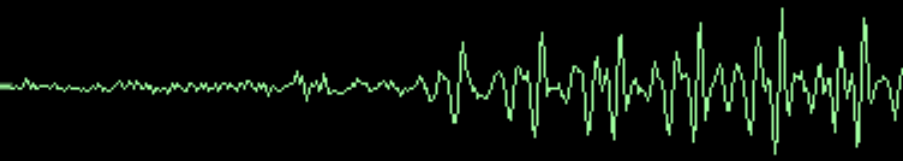
Case Study: Components: Monitoring Environment

- Good quality audio monitors; NOT standard computer speakers.
- Be especially wary of inexpensive speakers with subwoofers or surround sound setups.
- Find speakers and other audio components that do not “color” the sound. You want a fairly flat frequency response.



Case Study: Digitization Process

- Lets record some audio onto the hard drive!
- Pay attention to levels; avoid adding distortion.

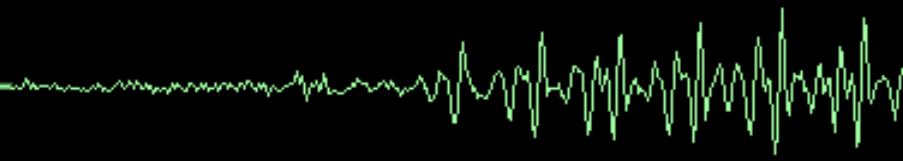


Case Study: Digitization Process

- Discussion of different processing options

- Normalize
- Compression/Limiting
- EQ (Equalization)

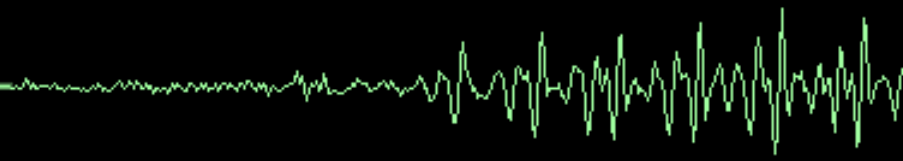
- RTAS/VST/similar vs. destructive processing



Case Study: Digitization Process

- Exporting Audio

- .wav (PC) or .aiff (Mac) for CDs
- Mp3 for downloading or streaming

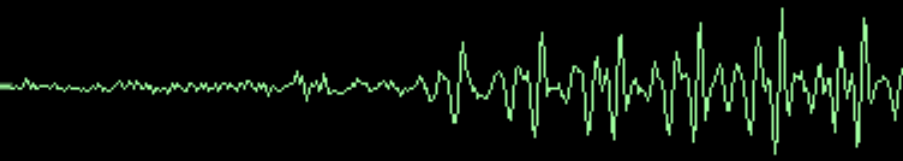


Case Study: Digitization Process

- Burning CD-R (CD-Recordable)

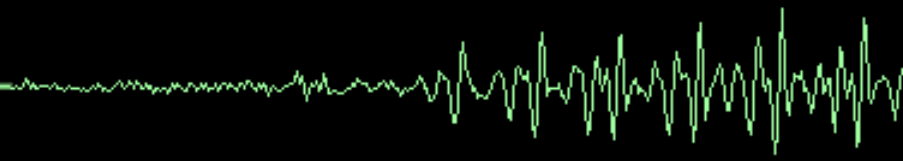
- CD Burning software
- CD-R blanks: quality vs. price

- Prep:
- Continuous
- Segments/DAO (Disk At Once) for indexing



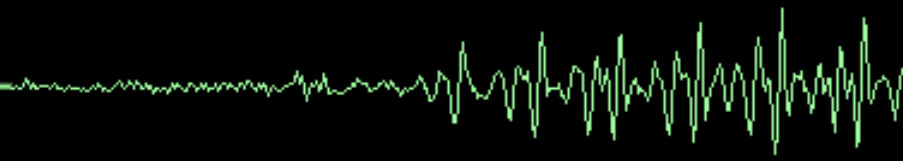
Metadata

- **What is Metadata?**
  - Metadata is “structured data about data.”
  - Metadata aids in identification, description and location of networked resources
  - Similar to information in a library catalog
  - Similar to registrar information for museums
  - Similar to finding aids for archives



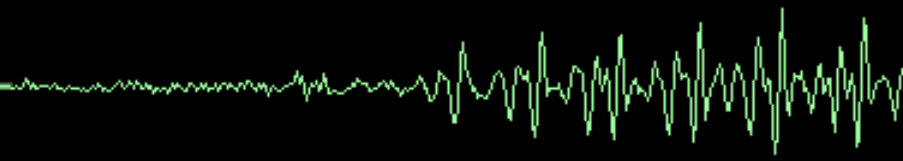
Metadata - Schemes

- Dublin Core
- Encoded Archival Description (EAD)
- Library of Congress Audio/Visual Prototype – METS
- Audio Engineers Society (AES)
- MPEG-7 (ISO/IEC 15938)



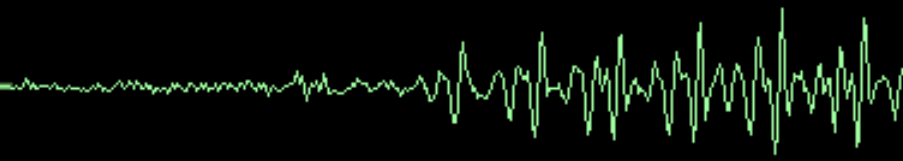
Metadata –Dublin Core Elements

- Title
- Creator
- Publisher
- Contributor
- Description
- Identifier
- Date
- Format
- Subject terms/classification
- Rights Management
- Source
- Type
- Language
- Relation
- Coverage



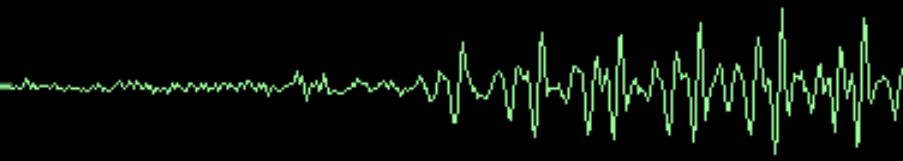
Metadata – CDP Dublin Core Recommendations

- **Format.Use:** include the recommended Internet Media Type (IMT). Due to the larger size of audio files best practice is to include the ***File size*** (8Mb) and ***Duration*** (14 min.) of the resource.
- **Format.Creation:** Sample rate, Sample size (bit depth), information about transfer equipment, and any optimization applied to the resource.



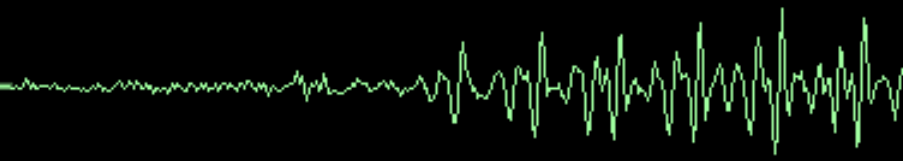
Metadata - Sustainability

- Resource Discovery vs. Local Needs
- Why technical metadata is important for sustainability/longevity



Access

- OPAC
- EAD
- Off-the-shelf (i.e. ContentDM)
- Custom solutions



Access - Transcripts

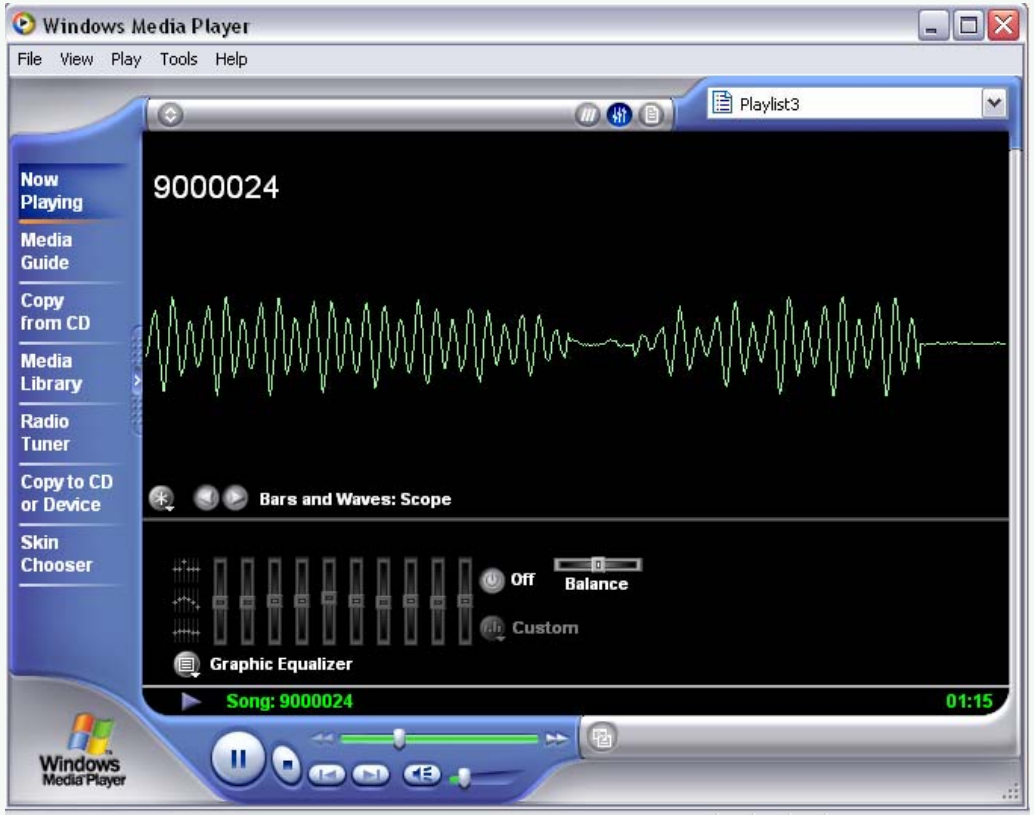
- **Why create transcripts?**
  - Difficult to understand dialog
  - Technology barriers – not all remote users have the bandwidth to listen to audio
  - Researchers may wish to skim text rather than listen to lengthy audio segments

Playback

- CD/MP3 Player
- Computer workstation

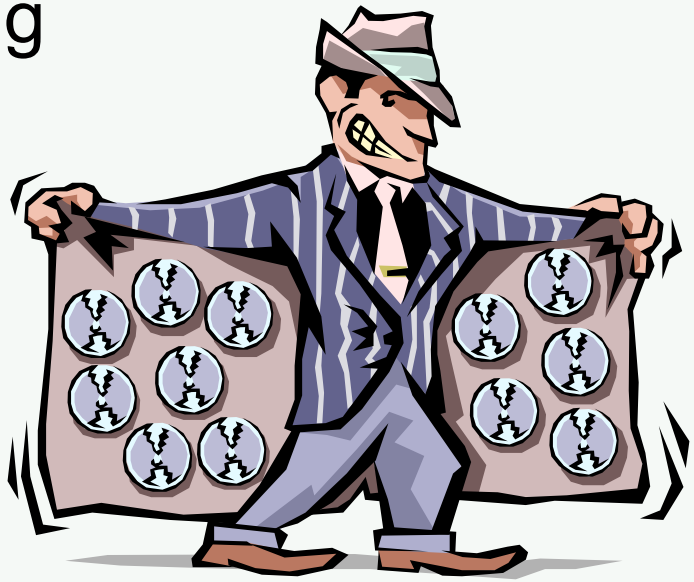
Online Delivery

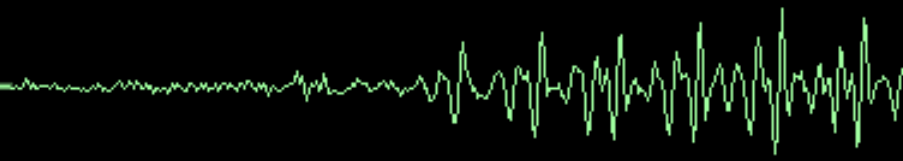
- Streaming media
  - Windows Media
  - Real Media
  - Quicktime



Outsourcing

- Ask questions
  - Do not assume anything
  - Put your questions in writing
  - Ask for a written response
- Get references
  - View previous work





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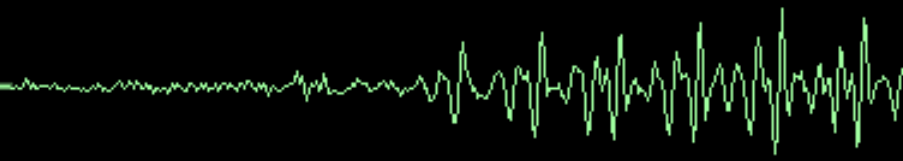
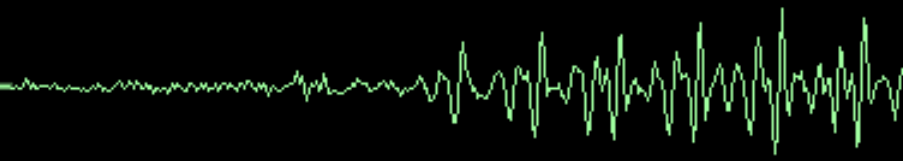


Credits

- CDP Audio Workgroup
  - Nicolle Alida, National Center for Atmospheric Research
  - Bridget Burke, Colorado Historical Society
  - Carson Block, High Plains Regional Library System
  - Lance Christensen, Colorado State Archives
  - John Culshaw, University of Colorado, Boulder
  - Wendy Hall, Carnegie Branch Library for Local History, Boulder Public Library
  - Sue Kriegsman, Colorado Digitization Project
  - Diane Rabson, National Center for Atmospheric Research



Credits

- CDP Audio Metadata Taskgroup
  - Dawn Bastian, Colorado State University Libraries
  - Carson Block, High Plains Regional Library System
  - Nancy Chaffin, Colorado State University Libraries
  - Judi Hoffman-Bashant
  - Mark Shelstad, American Heritage Center, University of Wyoming
  - Richard Urban, Colorado Digitization Project