

**CNSA Conference –**

**Re-Formatting Audio for  
Access**

**Part1:**

**What is analog and why does it limit access?**

# What is analog?

- Analog means analogy
- Different energies represent each other
- Transduction
- Continuous signal

# Types of records and technology

- Vinyl records
- Reel to reel tape
- Cassette tape
- Others

# Technical requirements of analog

- Machines and calibration
- Cleaning
- Technicians
- Archiving the equipment

# Analog robustness and fragility

- signal loss – detectable over time
- generation loss – copy limit
- records can be damaged physically
- if properly stored - very robust

# Other analog

- Photos

- Video

- Film

**Part2:**

**What is digital and why does it make access easier?**

# What is digital?

- Analog signal is represented by numbers instead of constant signal
- The numbers are stored as magnetic or optical energy – so this is still analog in a way
- Digital storage is pulses of electricity instead of a continuous signal

# Why does digital make access easier?

- Cheap

- computers and storage are cheap and abundant

- Easy

- many systems are "plug and play" or mouse driven
- graphical interfaces

# Why does digital make access easier?

## ■ Storage

- storage is efficient and quick
- optical media and hard drives are cheap and abundant
- remote storage and access

## ■ Digital copies

- No generation loss

# Why does digital make access easier?

## ■ Transmission

- biggest benefit of digital is transmission
- multi-format support
- remote control of records over LAN and internet
- playback is on the computer itself

# Digital robustness and fragility

- because of pulses - easy to recover from signal loss and interference
- error checking and correction makes for awesome transmission integrity
- All or nothing – when digital fails it fails completely – usually unexpectedly
- Optical media and hard drives are very robust – but back up is still needed

**Part3:**

Re-formatting analog audio  
to digital

# The “blocks” of the audio digitizing chain

- Playback device
- Analog to digital converter – (ADC)
- Storage
- Monitoring – digital to analog - (DAC)
- Data capture – optional
- Back-up - optional

# Scalability

- Modern digital audio systems are very scalable
- There is a wide range of equipment to fit most budgets
- Systems can range from \$700-\$70,000
- Simultaneous systems are available

# Setting it up – In-house or Outsource

- In-house advantages:
  - no moving of the source records
  - use own equipment
  - Use own staff
  - Staff will be familiar with source material and will be able to make better data entry

These are also disadvantages

# Setting it up – In-house or Outsource

- Outsource:
  - expert staff
  - no need to purchase equipment
  - responsibility is shifted

## Disadvantages:

- Costly
- Source records need to be moved

# The transfer

- Cleaning both the source record and the playback equipment
- Levels - proper calibration of machine
- Careful Use of pitch control if available
- **DO NOT ADD NOISE!!!!!!**

# The final records

- Importance of Hi-res master
  - Many copies in different formats will sound much better when made from the hi-res
  - Extra bits captured help with re-mastering and “lossy” compression
- Normalize – “allowable”
  - This is more than just turning it up

# The final records

- To re-master or not?
- Very subjective
  - Each person has an opinion and style
  - Each person has a way they think it should sound
- Selecting your filters
- Avoid cheap digital
- **Don't add noise!!!!**

# The final records: to re-master or not?

- Some quick filtering tips:
  - Hi-pass or low-rolloff – start at 100-120Hz. Select a 12dB per octave slope – this will take out rumble and other low frequency noise
  - Low-pass or High roll off – start above 12kHz, maybe 10 if there is lots of hiss
  - If a recording sounds “muddy” – take out 250Hz with about -3 to -6 dB
  - If the speech seems unintelligible – boost 3kHz by about 2 to 4 dB. This is the speech range

# The final records: to re-master or not?

## ■ No-Noisers

- Be very careful with these
- Work on the principle of “learning” the noise
- Can be very effective
- Can also be over done very easily
- A very dynamic background can limit the effectiveness

# The final records: Formats

## ■ Hard Drives

- Very cost effective – almost too cheap
- Very space efficient – density is so high
- Avoid single drives – catastrophic failure is risky
- If hard drives chosen as format, operate in RAID – specifically RAID1 or RAID 5
- Look into the manufacturers reputation for quality

# The final records: Formats

- Optical media
  - CD-R
  - DVD-R the "+ and -" debate
- Error correction and analysis
- Gold vs. Silver
- Invest in good stock!!

# The final records: Formats

- Magnetic data tape
  - Very cost effective
  - LTO tape is 400Gb for <\$50
  - Maybe back where you started in terms of having your records on magnetic tape again
  - Systems are very robust – major companies and banks use such systems for back up of critical data

# Capturing the data

- Very important to have a database
  - Usually the only time to capture the data is during the transfer stage – make sure to over capture – going back is time consuming
  - Relational database is usually better
- Metadata
  - Imbedded in CDtext, DVD-R titles, Broadcast .Wav, MP3 id tags, etc.

# Other formats of digital

- Photographs

- Use of a scanner

- Video

- Uses much the same system as audio – captured with an ADC and stored

- Film

- Film is converted to video and captured