AUDIOVISUAL
PRESERVATION
SOLUTIONS

A Primer on the Use of TimeReference:

A field in the bext chunk of BWF files

Presented by

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AUDIOVISUAL PRESERVATION SOLUTIONS

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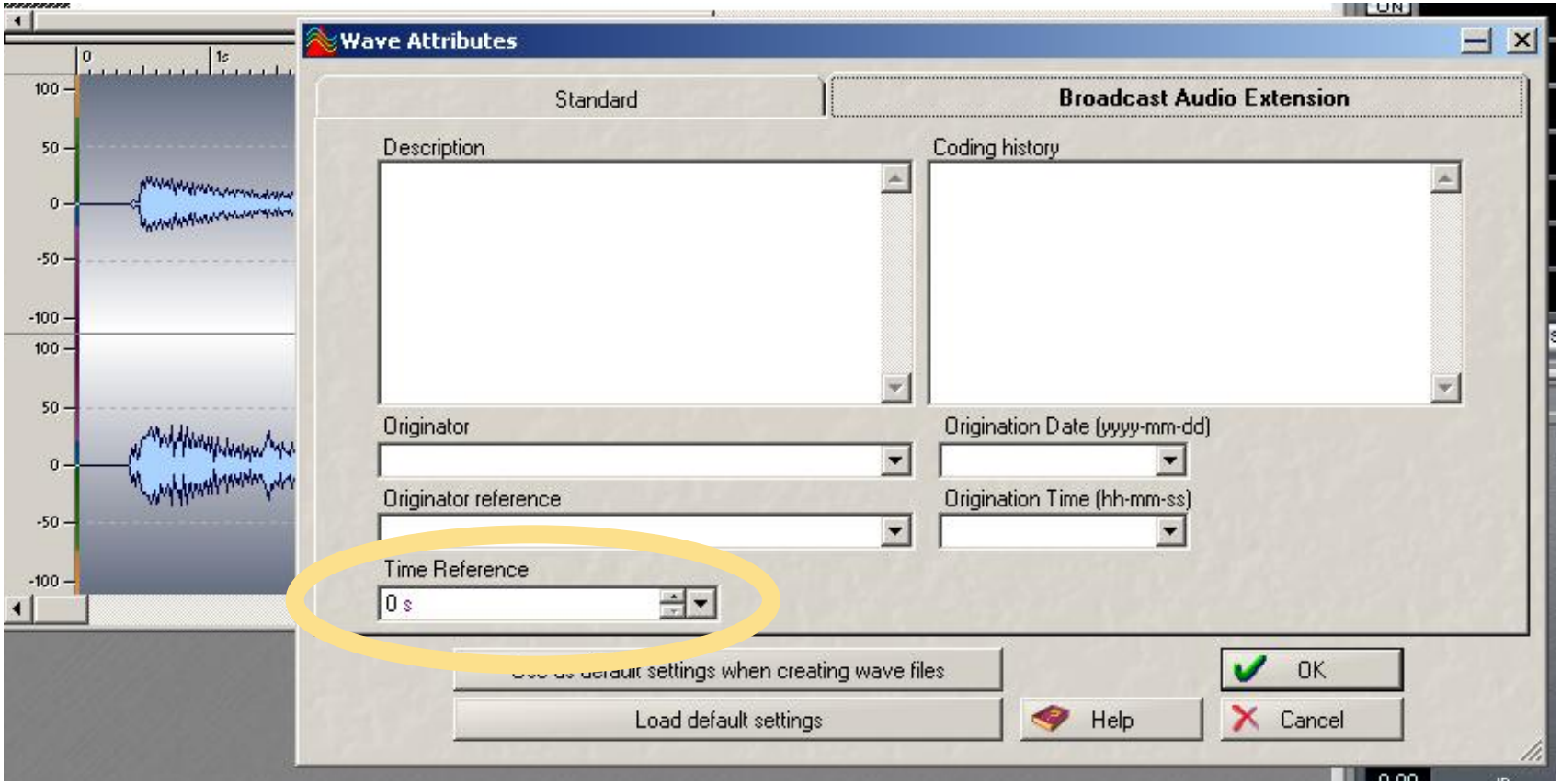
Introduction

This presentation focuses on TimeReference within the bext chunk of BWF files because it is often a source of confusion for people. Other fields in the bext chunk, and embedded metadata standards in general offer equally significant technical, administrative and access benefits.

Example of WaveLab bext Display



Definition of TimeReference Field

- From BWF Specification, Tech Doc 3285

http://www.ebu.ch/CMSimages/en/tec_doc_t3285_tcm6-10544.pdf

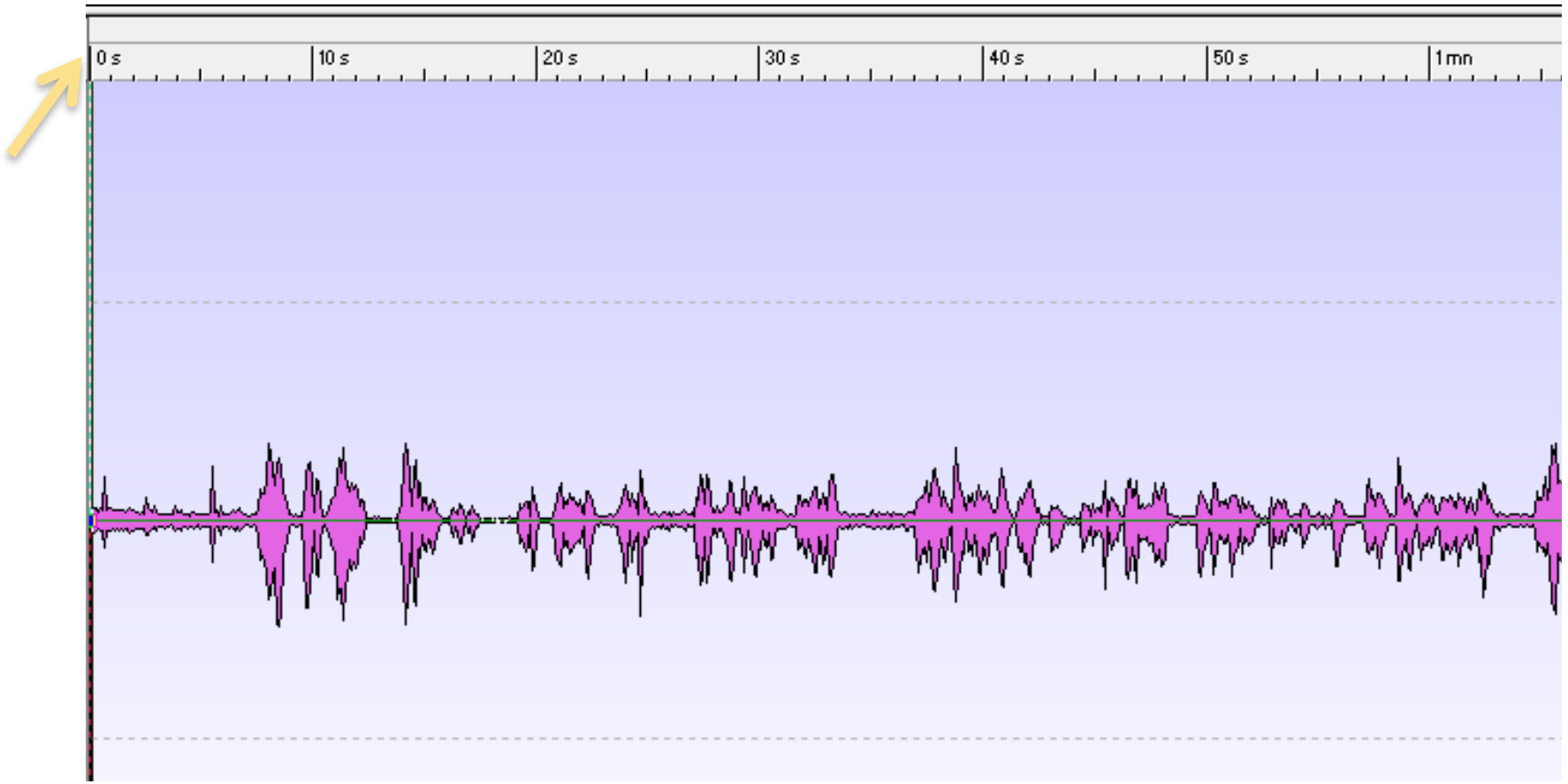
"This field contains the timecode of the sequence. It is a 64-bit value which contains the first sample count since midnight. The number of samples per second depends on the sample frequency which is defined in the field <nSamplesPerSec> from the **<format chunk>**."

Huh?

"the first sample count since midnight"

Oh!

- Midnight is 0 on the timeline



Huh Again?

" The number of samples per second depends on the sample frequency."

The value for TimeReference is stored as a sample count. In order to convert this into time, knowledge of the sample rate is required.

Sample Count to Time Conversion

The unit for the TimeReference value is stored as samples, so the sample rate of the audio file is required to determine the time.

48000 samples / ? = ?

Sample Count to Time Conversion

If the sample rate is 48000 samples per second…

48000 samples/48000 samples per second = 00:00:01.000

Sample Count to Time Conversion

If the sample rate is 96000 samples per second…

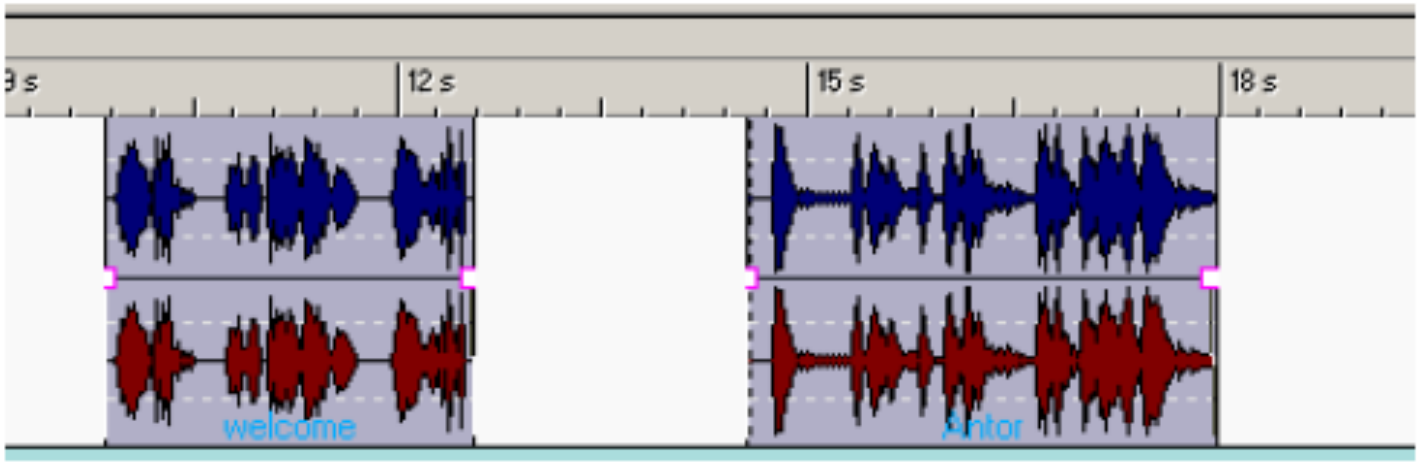
48000 samples/96000 samples per second = 00:00:00.500

So…

TimeReference states the position of the first audio sample of a file when placed on a timeline.

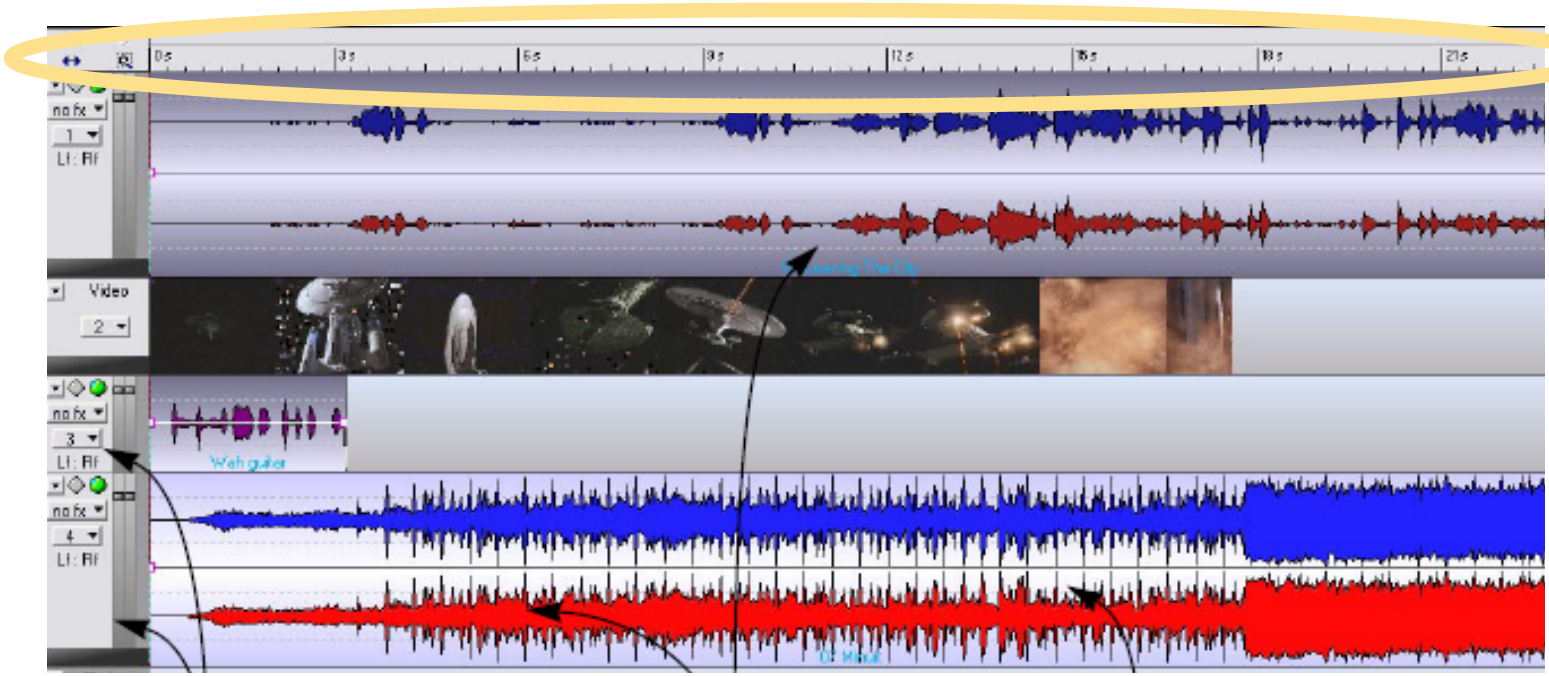
What Timeline?

- Every Digital Audio Workstation displays a timeline. This image shows audio clips on part of a timeline.



The Timeline

- This image shows a much more complex array of video tracks and multiple audio tracks all on one timeline together.



In Practice:
Reformatting Scenario

Analog Original

Side 1

In Practice:
Reformatting Scenario

avps

Analog Original

Side 1

Reformatted Digital Files

3044S1PM.wav

In Practice: Reformatting Scenario

Analog Original

Side 2

Reformatted Digital Files

3044S1PM.wav

In Practice: Reformatting Scenario

Analog Original

Side 2

Reformatted Digital Files

3044S1PM.wav

3044S2PM.wav

In Practice:
Reformatting Scenario

Reformatted Digital Files

3044S1PM.wav

3044S2PM.wav

TimeReference: Maintaining Sibling Relationship

Without additional metadata reliance for defining the structural relationship between these files is dependent on the filename. The same base of "3044" with the choice of notation for side – in this case "S1" and "S2" - is the only structural information conveyed.

The only time stamp for these files is absolute time, for which both begin at 00:00:00:00

End result is dependence on filename and knowledge management of particular notation to indicate Sides, Parts, Regions, etc. within organization.

3044S1PM.wav

Absolute Time:
00:00:00:00 – 00:30:00:00

3044S2PM.wav

Absolute Time:
00:00:00:00 – 00:30:00:00

TimeReference: Maintaining Sibling Relationship

TimeReference embeds a timestamp in each of these files which effectively identifies how they relate to each other and the original object from which they were derived.

Software which recognizes TimeReference will automatically place them on the timeline accordingly.

3044S1PM.wav

Time Reference:
00:00:00.000 – 00:30:00.000

3044S2PM.wav

Time Reference:
00:30:00.000 – 00:60:00.000

TimeReference:
Maintaining Parent-Child Relationship

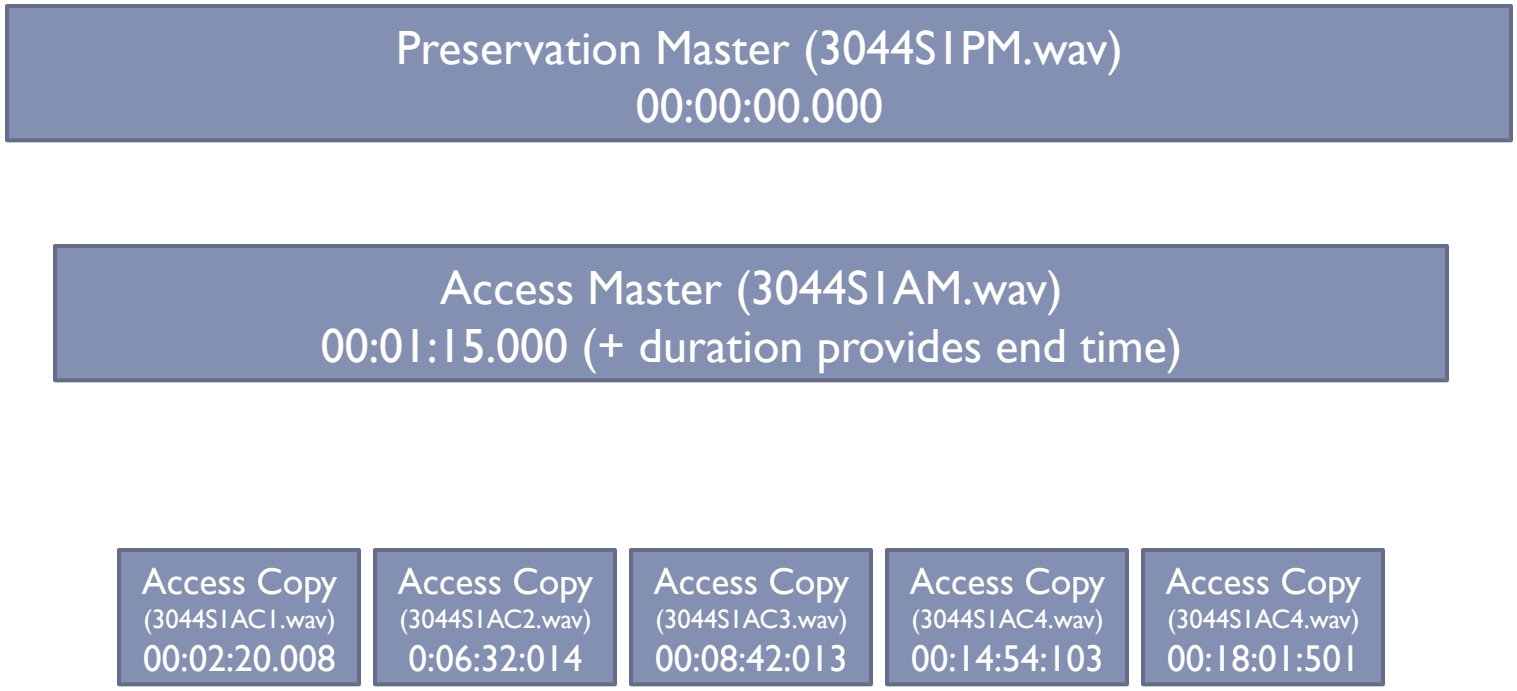
Preservation Master (3044S1PM.wav)
00:00:00.000

TimeReference: Maintaining Parent-Child Relationship

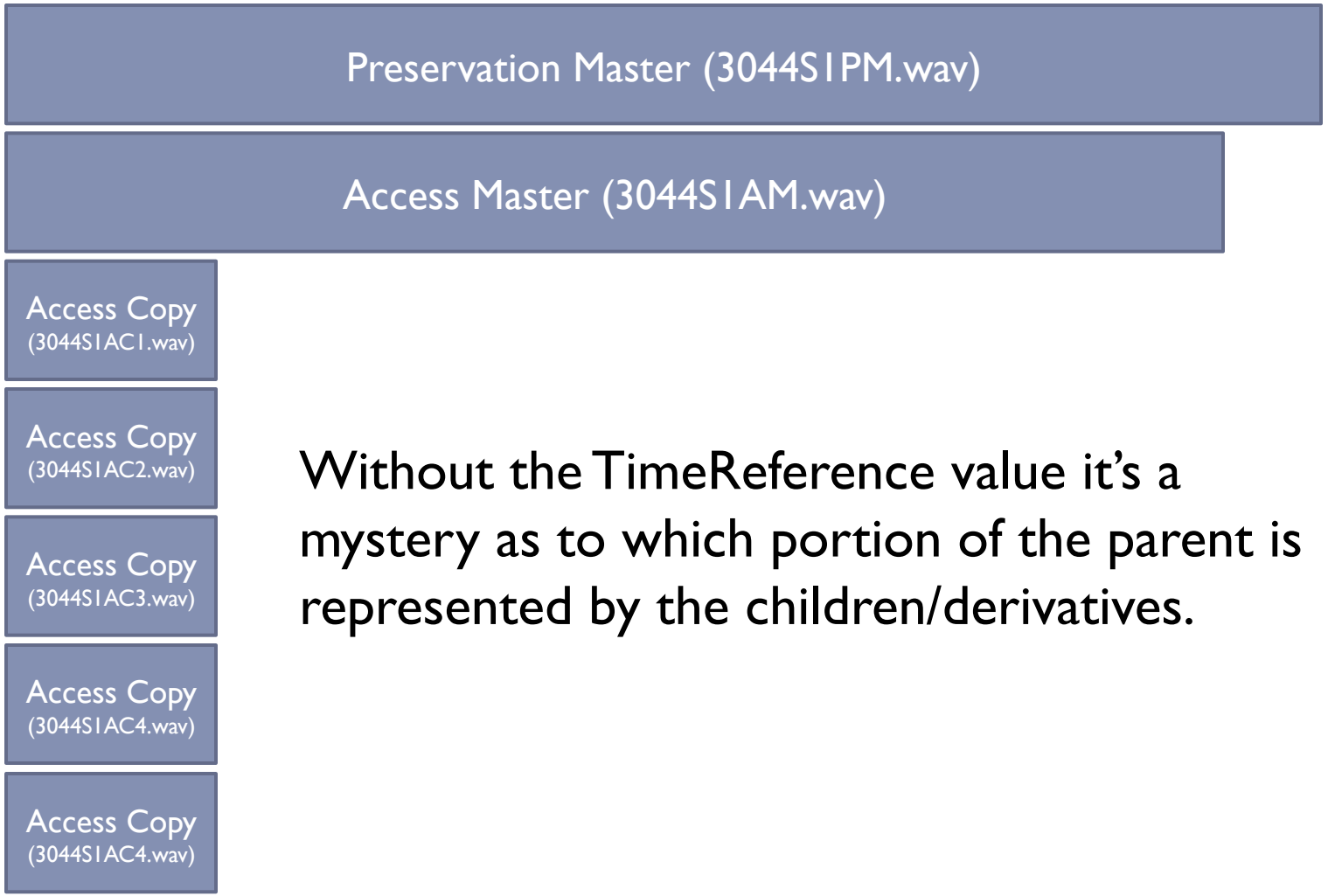
Preservation Master (3044S1PM.wav)
00:00:00.000

Access Master (3044S1AM.wav)
00:01:15.000 (+ duration provides end time)

TimeReference:
Maintaining Parent-Child Relationship

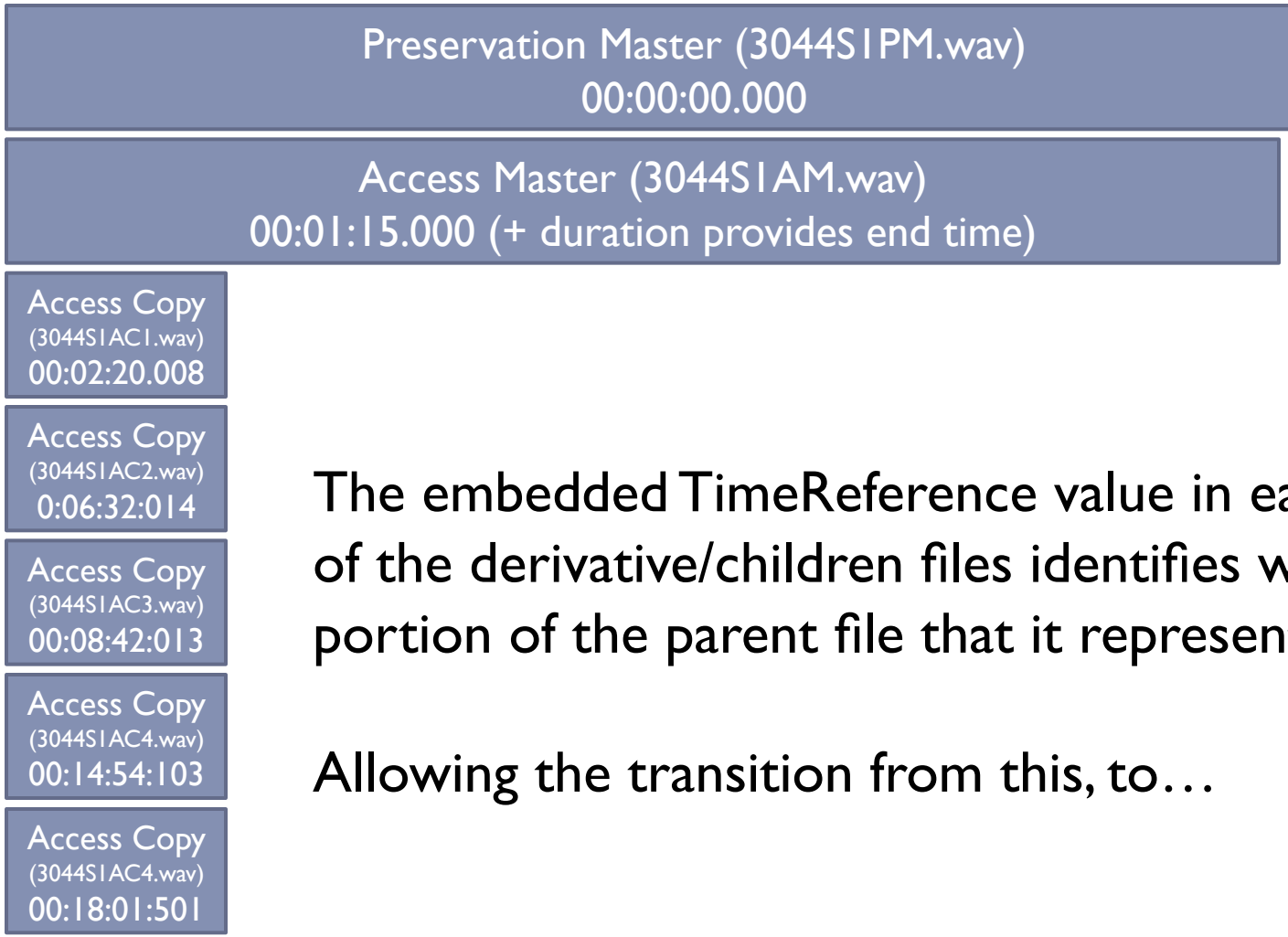


TimeReference: Maintaining Parent-Child Relationship



Without the TimeReference value it's a mystery as to which portion of the parent is represented by the children/derivatives.

TimeReference: Maintaining Parent-Child Relationship

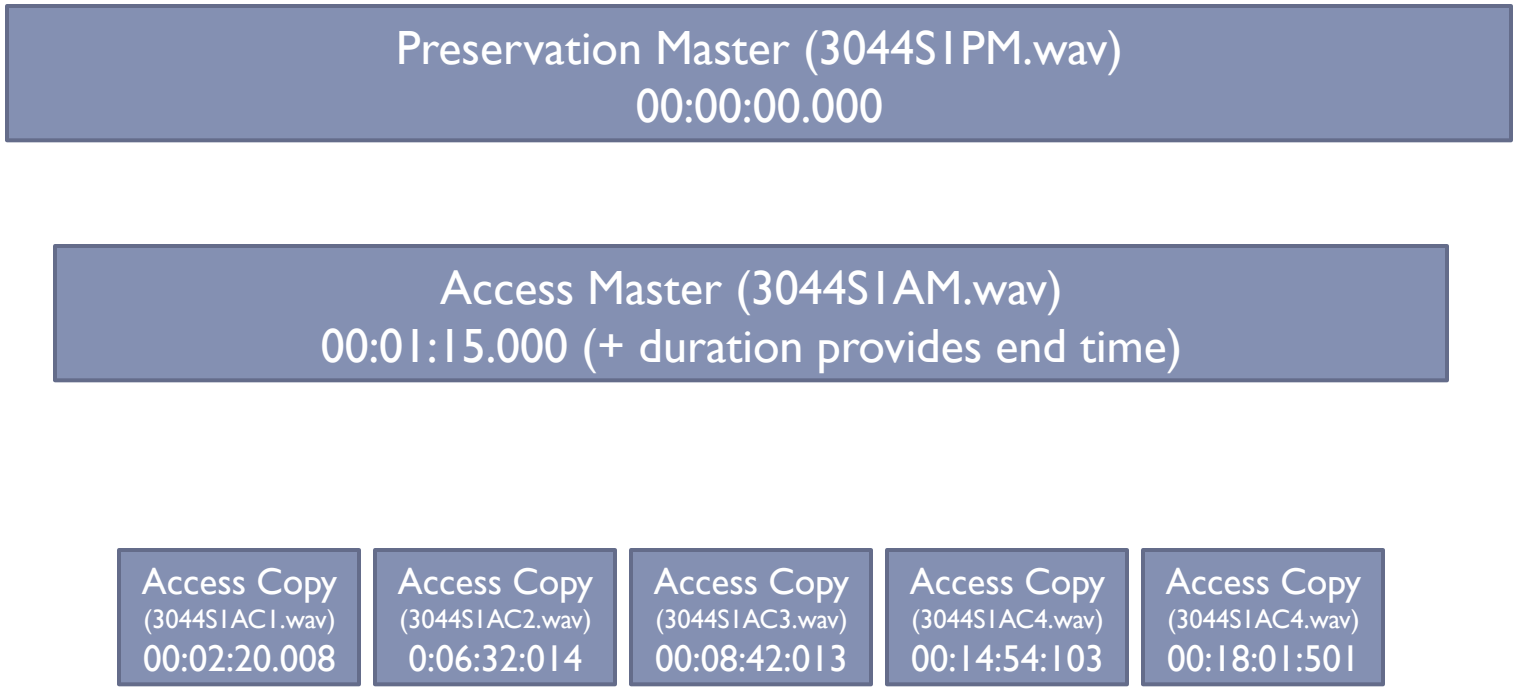


The embedded TimeReference value in each of the derivative/children files identifies which portion of the parent file that it represents.

Allowing the transition from this, to…

TimeReference:
Maintaining Parent-Child Relationship

this



Example: Speed Change

Analog Original

Side 1

3.75ips

Reformatted Digital Files

Example: Speed Change

Analog Original

Side 1

3.75ips

Reformatted Digital Files

3044S1R1PM.wav

Example: Speed Change

Analog Original

Side 1

7.5ips

Reformatted Digital Files

3044S1R1PM.wav

Example: Speed Change

Analog Original

Side 1

7.5ips

Reformatted Digital Files

3044S1R1PM.wav

3044S1R2PM.wav

Example: Speed Change, Multiple Sides

Analog Original

Side 2

Reformatted Digital Files

3044S1R1PM.wav

3044S1R2PM.wav

Example: Speed Change, Multiple Sides

Analog Original

Side 2

Reformatted Digital Files

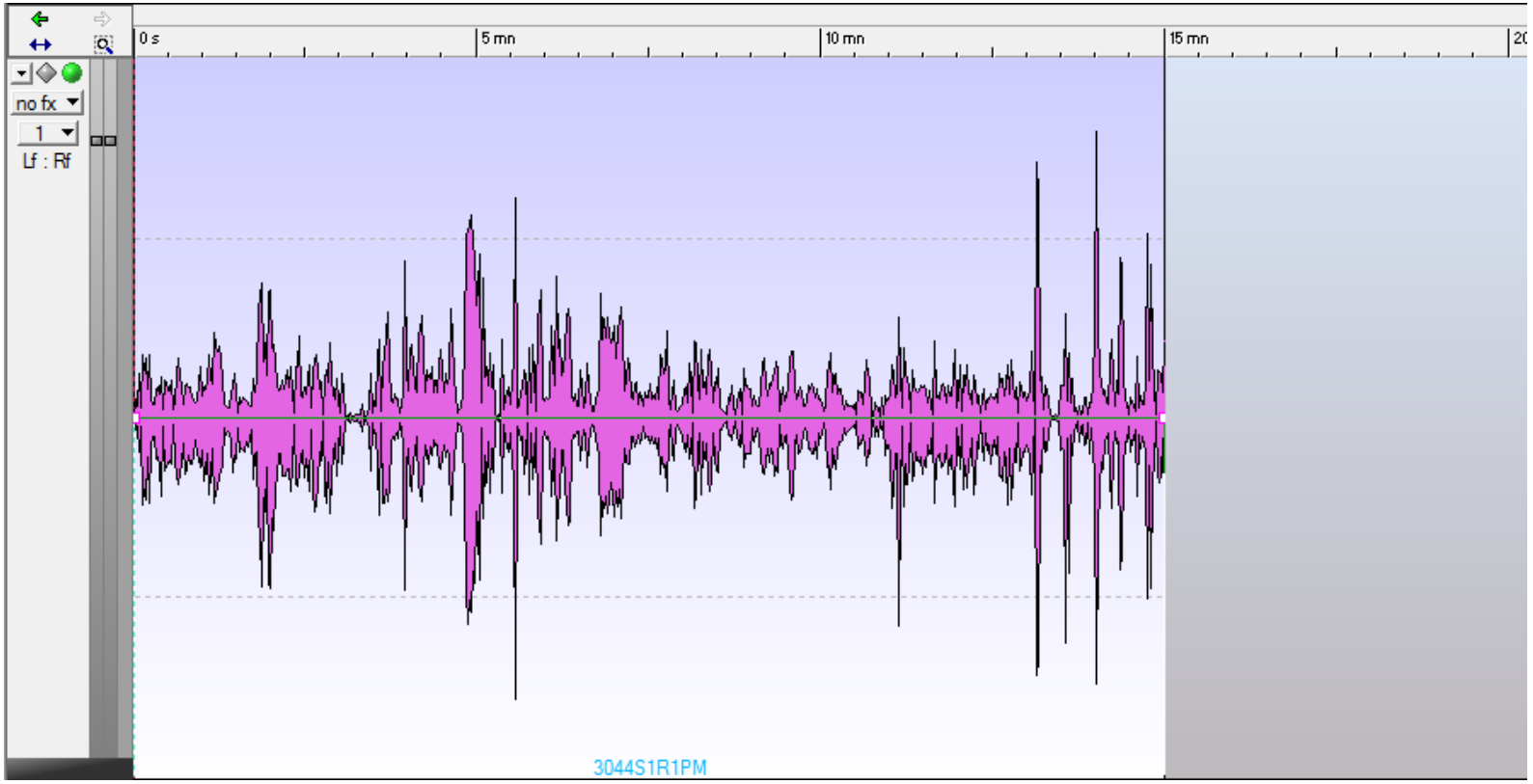
3044S1R1PM.wav

3044S1R2PM.wav

3044S2PM.wav

Example: Speed Change, Multiple Sides On a Timeline

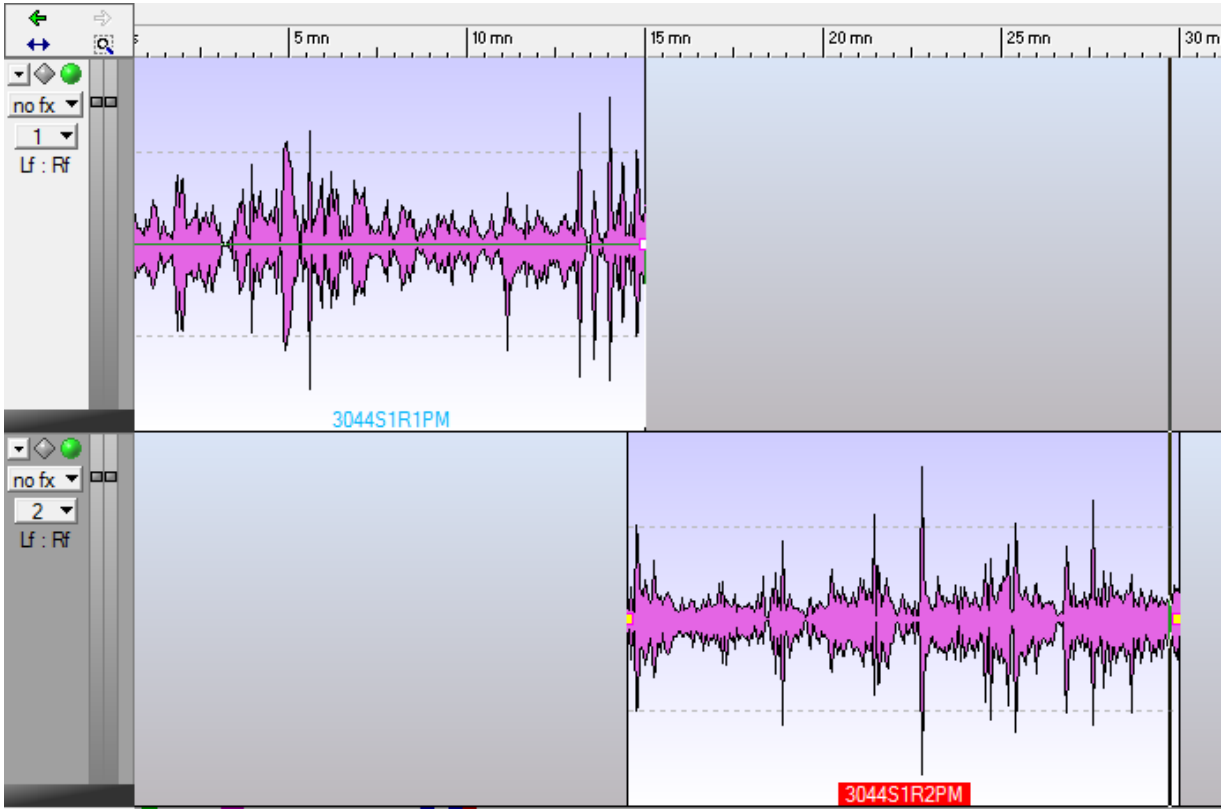
3044S1R1PM.wav
00:00:00.000 – 00:15:00.000



Example: Speed Change, Multiple Sides On a Timeline

3044S1R1PM.wav
00:00:00.000 – 00:15:00.000

3044S1R2PM.wav
00:14:30.000 – 00:30:00.000

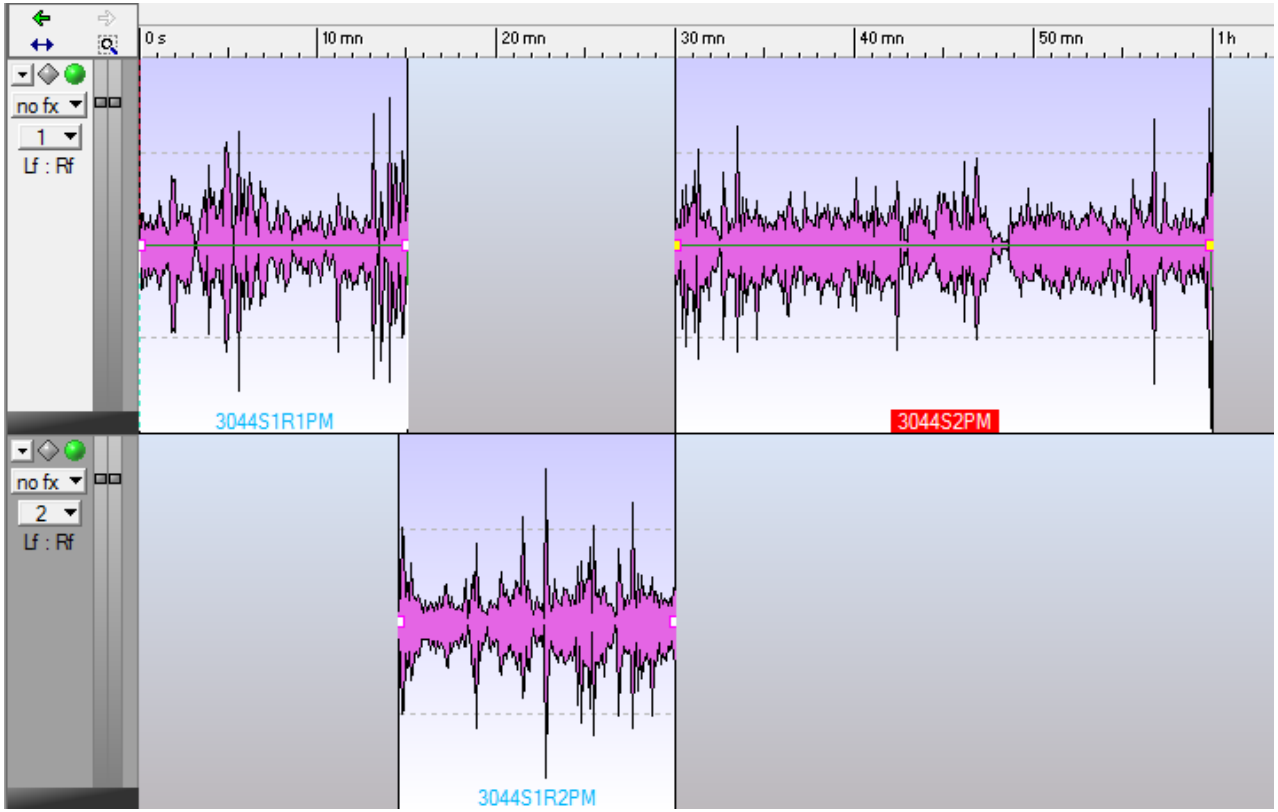


Example: Speed Change, Multiple Sides On a Timeline

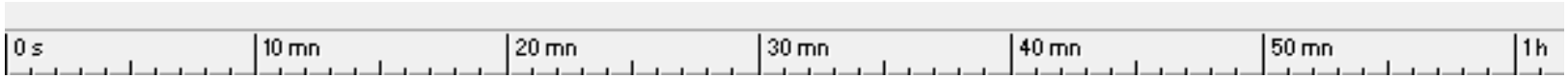
3044S1R1PM.wav
00:00:00.000 – 00:15:00.000

3044S1R2PM.wav
00:14:30.000 – 00:30:00.000

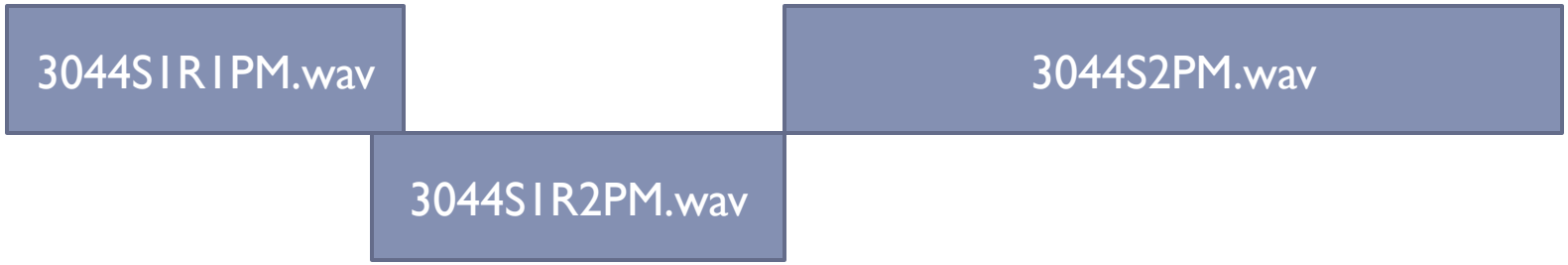
3044S2PM.wav
00:30:00.000 – 00:60:00.000



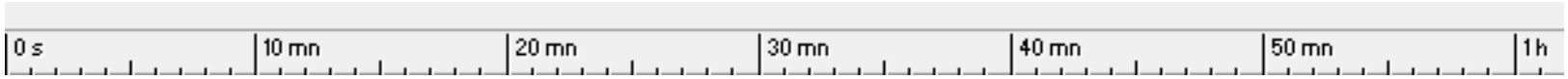
Example: Speed Change, Multiple Sides On a Timeline



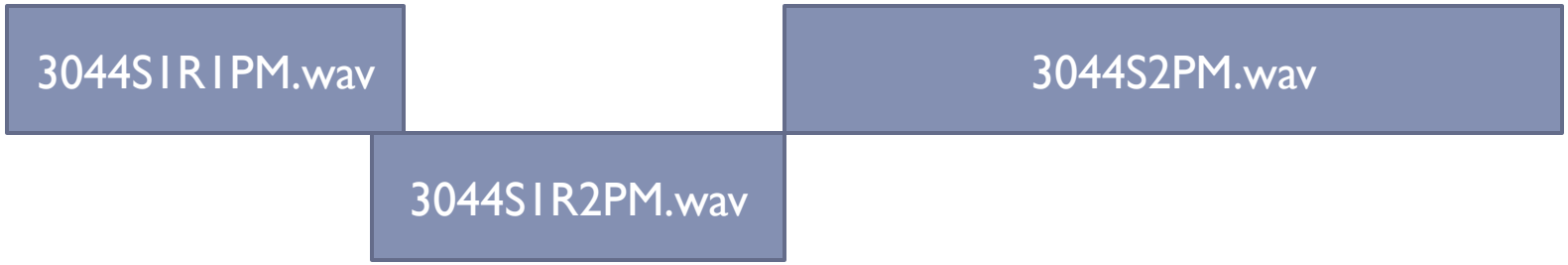
Preservation Masters



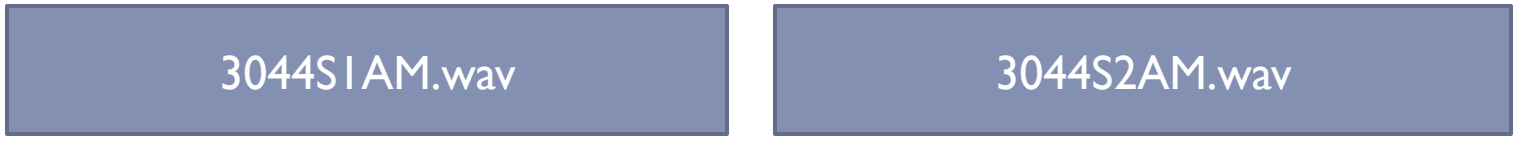
Example: Speed Change, Multiple Sides & Derivatives On a Timeline



Preservation Masters

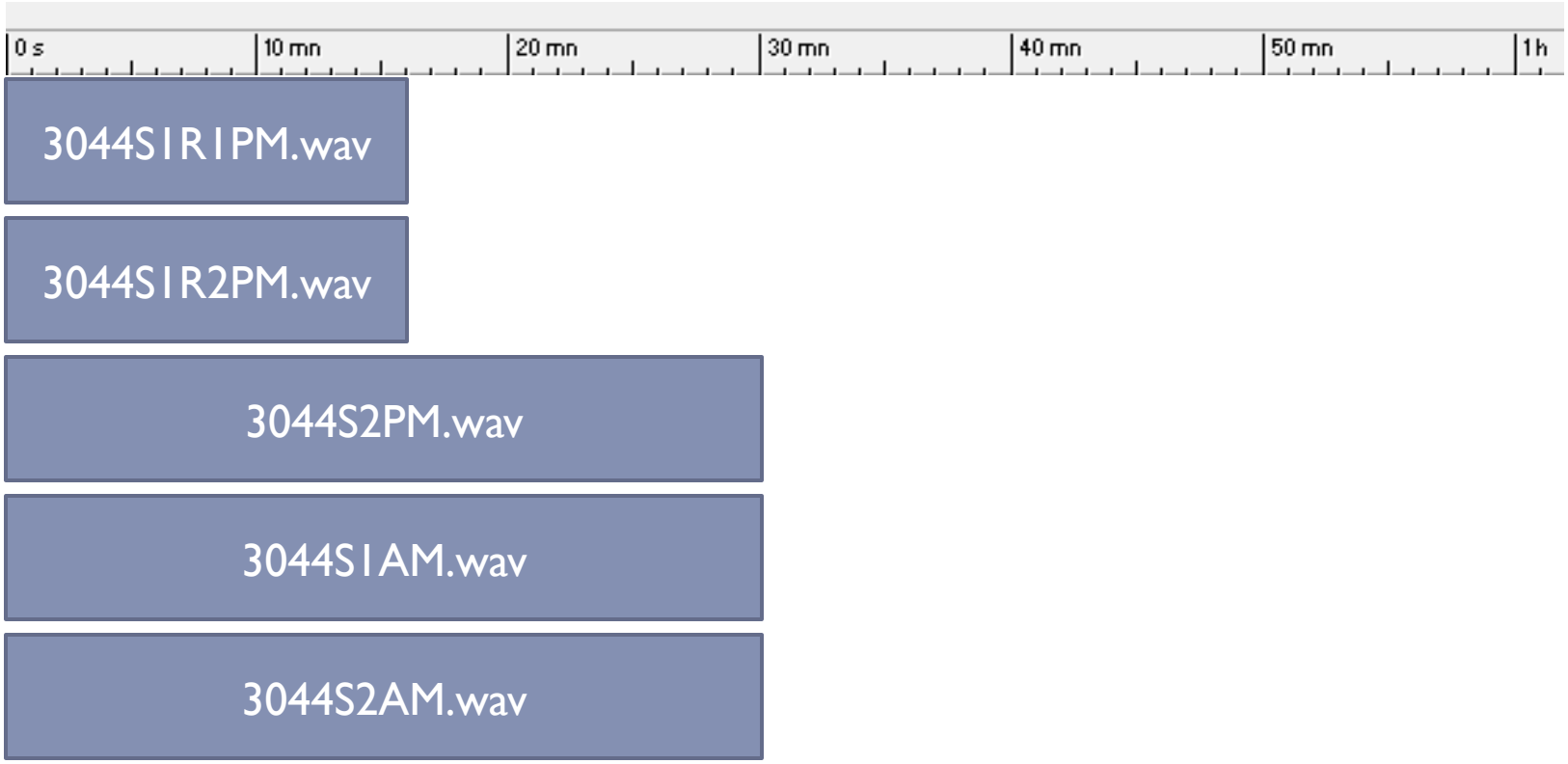


Access Masters – Edits Performed for listening



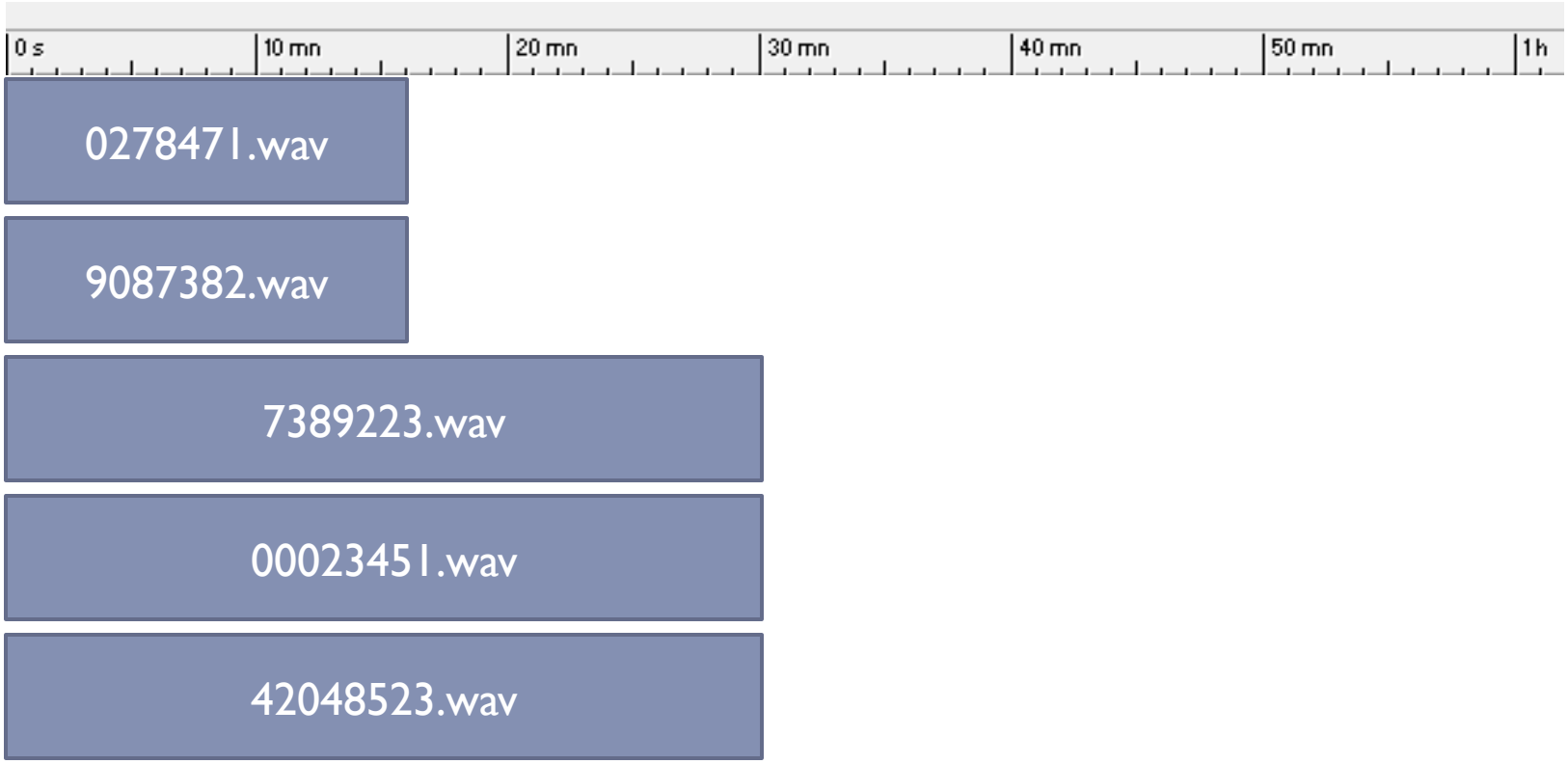
Without TimeReference On Timeline

- This is the result, and it depends on the persistence of the filenames.



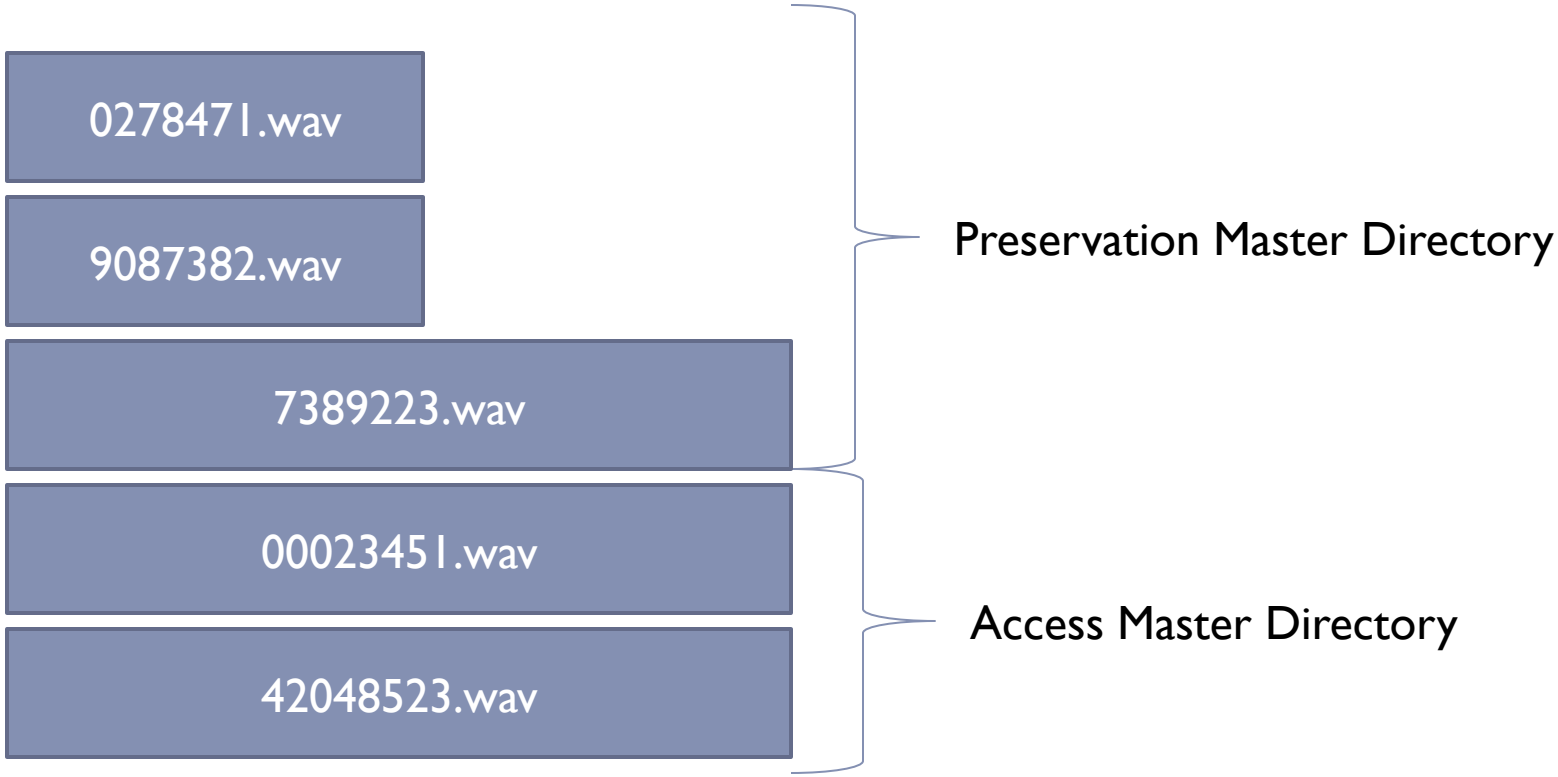
Without TimeReference & Original Filenames On Timeline

- This is the result, and it's a total mystery.



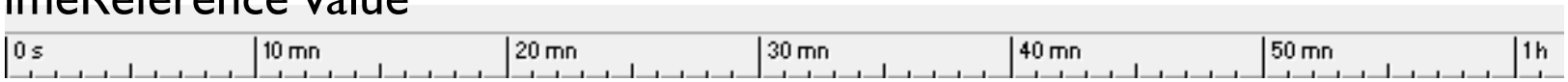
Without TimeReference & Original Filenames in Directories

- This is also a total mystery

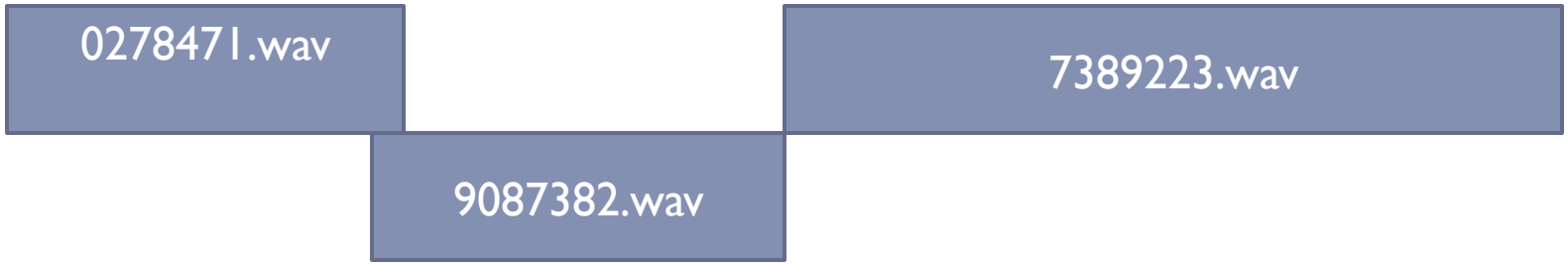


With TimeReference On Timeline

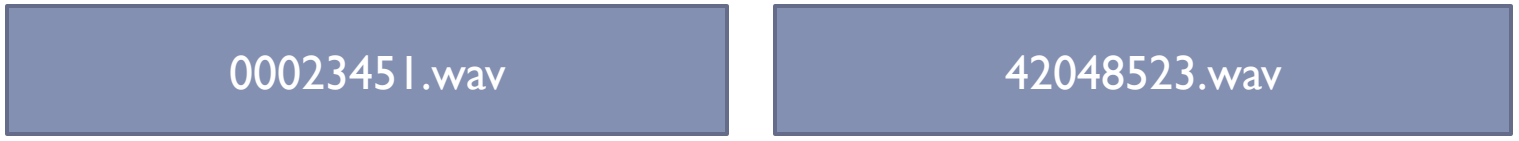
- The first audio sample of each file is placed according to the TimeReference value



Preservation Masters

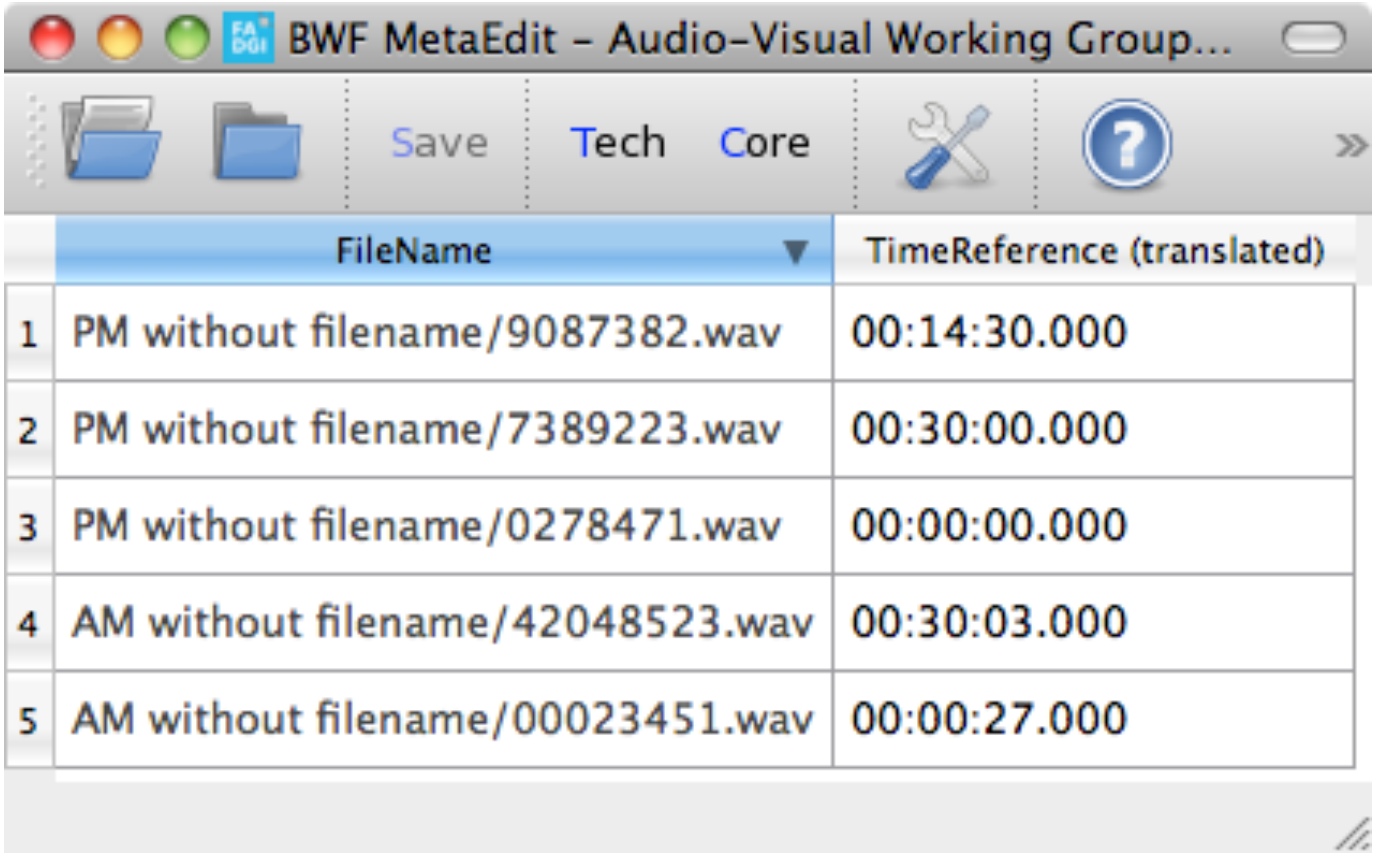


Access Masters – Edits Performed for listening



With TimeReference In Directories

- Showing a screen shot of the files within BWF MetaEdit, an open-source freely available tool found at http://sourceforge.net/projects/bwfmetaedit/



	FileName	TimeReference (translated)
1	PM without filename/9087382.wav	00:14:30.000
2	PM without filename/7389223.wav	00:30:00.000
3	PM without filename/0278471.wav	00:00:00.000
4	AM without filename/42048523.wav	00:30:03.000
5	AM without filename/00023451.wav	00:00:27.000

Further Reading

- http://www.avpreserve.com/wp-content/uploads/2011/02/AVPS_Lacinak_Embedded_Metadata_MLA_2011.pdf
- http://www.avpreserve.com/news/chris-lacinak-published-in-iasa-journal/
- http://www.digitizationguidelines.gov/guidelines/digitize-embedding.html
- http://www.iptc.org/site/Photo_Metadata/Embedded_Metadata_Manifesto_%282011%29
- http://www.photometadata.org/

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