

InterOP vs SMPTE DCP

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London and Hollywood
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Today's Guest Speaker

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Agenda

- Review of Important Acronyms
- File name changes *.xml
- CPL differences
- PKL differences
- AssetMap differences
- Image Track File differences
- Subtitles
- Audio Track File differences
 - Audio Labeling

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Definition of Terms

- DCP (Digital Cinema Package)
 - ASSETMAP.xml
 - VOLINDEX.xml
 - Packing List (PKL) – an XML document
 - Composition Play List (CPL) – an XML document
 - One or more *.mxf Image Track Files
 - One or more *.mxf Audio Track Files
 - Possibly Subtitle Track files
 - For InterOp an XML document
 - For SMPTE an XML document wrapped in an *.MXF track file

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Definition of Terms

- **CPL (Composition Play List) an XML document**
 - Defines how a movie is played
 - Defines the order of play of the track files (Reels)
 - Defines which portions of the track file is played
- **MXF (Material eXchange Format)**
 - SMPTE Standard for encapsulating audio visual data into standard file formats

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Definition of Terms

- **Packing List (PKL) An *.XML document**
 - List of assets or elements within a Digital Cinema Package
 - Identifies type of files: image, audio, xml ...
 - The size of each file
 - Message Digest – allows for the system to determine if an asset or element was received without errors
 - Multiple PKL per DCP allowed

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DCP vs. CPL

- One **Delivers** or **Distributes** a Digital Cinema Package (DCP)
- You **Play** a Composition (CPL)
- You do NOT distribute a Composition (CPL)
- You do NOT play a Digital Cinema Package (DCP)
- If you learn nothing else from this presentation – remember this

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History of InterOp & SMPTE

- Society of Motion Picture Television Engineers (SMPTE)
- Responsible for developing, writing and approving all Digital Cinema Standards.
- SMPTE started the Digital Cinema work in 2000 with seven study groups
- DCI specification completed in August 2005
- The Digital Cinema "rollout" started in the Spring of 2006 but the SMPTE Standards were still work in progress
- The Industry took a "snap shot" of existing standards and called it InterOp (2006) and away we went
- In ~2009 SMPTE finish the basic Digital Cinema Standards

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SMPTE Standards completed in 2009

ST 429-2	ST 429-5	ST 379-1
ST 428-1	ST 429-6	ST 390
ST 428-10	ST 429-7	ST 336
ST 428-2	ST 429-8	MXF
ST 428-3	ST 430-2	applications
ST 428-7	ST 429-9	ST 422
ST 429-10	ST 430-1	ST 382
ST 429-12	ST 430-3	ST 410
ST 429-3	Core MXF	
ST 429-4	ST 377	

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AssetMap: InterOp vs. SMPTE

- Both MUST be named as follows:
 - And it is Case Sensitive
- ASSETMAP (InterOP DCP)
- VOLINDEX (InterOP DCP)
- ASSETMAP.xml (SMPTE DCP)
- VOLINDEX.xml (SMPTE DCP)
 - No longer used, it is always set to one volume, the file is just a place holder

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InterOP Digital Cinema Package (DCP)

```
ASSETMAP
VOLINDEX
Title_EN_Composition.xml
Packing_List.xml
Title_r1_image.mxf
Title_r2_image.mxf
Title_r3_image.mxf
Title_r4_image.mxf
Title_r5_image.mxf
Title_EN_r1_audio.mxf
Title_EN_r2_audio.mxf
Title_EN_r3_audio.mxf
Title_EN_r4_audio.mxf
Title_EN_r5_audio.mxf
```

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SMPTÉ Digital Cinema Package (DCP)

```
ASSETMAP.xml
VOLINDEX.xml
Title_EN_Composition.xml
Packing_List.xml
Title_r1_image.mxf
Title_r2_image.mxf
Title_r3_image.mxf
Title_r4_image.mxf
Title_r5_image.mxf
Title_EN_r1_audio.mxf
Title_EN_r2_audio.mxf
Title_EN_r3_audio.mxf
Title_EN_r4_audio.mxf
Title_EN_r5_audio.mxf
```

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CPL: InterOp vs. SMPTÉ

- Name Space changes

```
<?xml version="1.0" encoding="UTF-8"?>
<CompositionPlaylist xmlns="http://www.digicine.com/PROTO-ASDCP-CPL-20040511#">
  <Id>urn:uuid:78e47299-2517-4b7b-b408-0b8adb2a8556</Id>
  <IssueDate>2014-06-12T11:28:37+01:00</IssueDate>
  <Issuer>Doremi Labs, Inc.</Issuer>
  <Creator>orca_wrapping 3.7.4-0</Creator>
  <ContentTitleText>BookOfLife_TLR-4-2D-Enc_F_EN-FR-
  AR_AE_51_2K_TCF_20140612_DUK_IOP-DOREMI_OV</ContentTitleText>
```

```
<?xml version="1.0" encoding="UTF-8"?>
<CompositionPlaylist xmlns="http://www.smpte-ra.org/schemas/429-7/2006/CPL">
  <Id>urn:uuid:91270e3f-454b-46ce-85be-03d26aebc5fb</Id>
  <IssueDate>2014-06-12T12:40:10+01:00</IssueDate>
  <Issuer>Doremi Labs, Inc.</Issuer>
  <Creator>orca_wrapping 3.7.4-0</Creator>
  <ContentTitleText>BookOfLife_TLR-4-2D-Enc_F_EN-FR-
  AR_AE_51_2K_TCF_20140612_DUK_SMPTÉ-DOREMI_OV</ContentTitleText>
```

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Packing List

- Name Space changes

```
<PackingList xmlns="http://www.smpte-ra.org/schemas/429-8/2007/PKL">
  <Id>urn:uuid:61c28230-41cb-4de5-9cec-e0783936e99e</Id>
  <AnnotationText>flat_behind-screen_bottom-center</AnnotationText>
  <IssueDate>2015-04-29T16:49:32+01:00</IssueDate>
  <Issuer>Doremi Labs, Inc.</Issuer>
  <Creator>orca_wrapping 3.8.3-0</Creator>
  <AssetList>
```

```
<PackingList xmlns="http://www.digicine.com/PROTO-ASDCP-PKL-20040311#">
  <Id>urn:uuid:a1d82c3f-b336-48e5-a019-96dbd87d9718</Id>
  <AnnotationText>Intern_FTR_F_EN-
  XX_OV_51_2K_WR_20150617_DLA_IOP_OV</AnnotationText>
  <IssueDate>2015-06-17T13:07:52-07:00</IssueDate>
  <Issuer>Doremi Labs, Inc.</Issuer>
  <Creator>orca_wrapping 3.8.3-0</Creator>
  <AssetList>
```

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Asset Map

- Name Space changes

```
<AssetMap xmlns="http://www.smppte-ra.org/schemas/429-9/2007/AM">
<Id>urn:uuid:fd5f41c4-4f8c-4653-83fe-da7c6ff2d98c</Id>
<Creator>orca_wrapping 3.8.3-0</Creator>
<VolumeCount>1</VolumeCount>
<IssueDate>2015-04-29T16:49:32+01:00</IssueDate>
<Issuer>Doremi Labs, Inc.</Issuer>
<AssetList>
```

```
<AssetMap xmlns="http://www.digicine.com/PROTO-ASDCP-AM-20040311#">
<Id>urn:uuid:d804f450-ecd0-43c5-a9d4-986114787dc4</Id>
<VolumeCount>1</VolumeCount>
<IssueDate>2015-06-17T13:07:52-07:00</IssueDate>
<Issuer>Doremi Labs, Inc.</Issuer>
<Creator>orca_wrapping 3.8.3-0</Creator>
<AssetList>
```

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Image & Audio MXF track files:

- Image and audio *.mxf track files are binary files – you cannot easily look at them or read them
- There is a small difference in how the binary data is organized between InterOp and SMPTE *.mxf track files and therefore image and audio track are NOT interchangeable between InterOp and SMPTE DCPs
- If you are doing mastering work it is important that you must re-wrap track when converting from InterOp to SMPTE.
 - Unwrap the InterOp track to essence data, then wrap the essence data into a SMPTE compliant *.mxf track
- It is also important to note that if the essence data is encrypted, you must decrypt and re-encrypt essence (image and audio) data when converting from InterOp to SMPTE

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Composition Play List

- It is an XML Document
- Defines the order in which track files are played
- Defines what portion of a track file is played by specifying the frame entry point into the track file and the duration of frames played
- CPL can be used as a simple EDL to remove sections of a track file
 - Note: any “edits” to an image track must also be applied to the corresponding audio track file the subtitle track files ☹

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SMPTE CPLs

- Addition new meta data
- Markers – although Markers were a part of InterOp , they were never tested and consequently never used. There is an effort within the industry to start using Markers
- So SMPTE DCPs are testing Markers to verify they work as defined

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InterOp Subtitles

- InterOp DCP have a separate *.xml file that control the on screen subtitles. This *.xml file is based on a standard called Cine Canvas from TI.
- There is a True Type font file to support Timed Text subtitles
- There are *.png file(s) to support PNG Subtitles
- All these files were kept in a separate folder/directory, typically one folder per reel

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InterOp DCP with Subtitles

```

ASSETMAP
VOLINDEX
Composition_JN_subtitle.xml
Packing_List.xml
title_r1_image.mxf           Subtitle_directory1/
title_r2_image.mxf           title_r1_subtitle.xml
title_r3_image.mxf           arial.ttf
title_r4_image.mxf           Subtitle_directory2/
title_r5_image.mxf           title_r2_subtitle.xml
title_r1_audio.mxf           arial.ttf
title_r2_audio.mxf           Subtitle_directory3/
title_r3_audio.mxf           title_r3_subtitle.xml
title_r4_audio.mxf           arial.ttf
title_r5_audio.mxf           Subtitle_directory4/
                               title_r4_subtitle.xml
                               arial.ttf
                               Subtitle_directory5/
                               title_r5_subtitle.xml
                               arial.ttf
    
```

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SMPTe Subtitles

- SMPTe also use an *.xml file
 - see SMPTe ST428-7 2014
- There is a True Type font file to support Timed Text subtitles
- There are *.png file(s) to support PNG Subtitles
- All of the above are wrapped into a Subtitle *.mxf track file much like image and audio essence
- The Subtitle *.mxf file can be encrypted same as image and audio *.mxf track files
 - SMPTe supports rendering of 3D (stereoscopic) subtitles

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SMPTe DCP with Subtitles

```

ASSETMAP.xml
VOLINDEX.xml
Composition_JN_subtitle.xml
Packing_List.xml
title_r1_image.mxf           title_r1_subtitle.mxf
title_r2_image.mxf           title_r2_subtitle.mxf
title_r3_image.mxf           title_r3_subtitle.mxf
title_r4_image.mxf           title_r4_subtitle.mxf
title_r5_image.mxf           title_r5_subtitle.mxf
title_r1_audio.mxf
title_r2_audio.mxf
title_r3_audio.mxf
title_r4_audio.mxf
title_r5_audio.mxf
    
```

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Audio

- Currently the standard allows for up to 16 channels of audio
- Currently supported are:
 - 5.1 – L, R, C, Sub, LS, RS
 - SDDS 7.1 – five screen channels
 - 7.1 – four surround channels
- Audio channels may be used to carry “other data”
 - “HI” +20db for Hearing Impaired
 - “VI” Narrative Channel for Visually Impaired
 - D-Box motion control
 - Sync signal

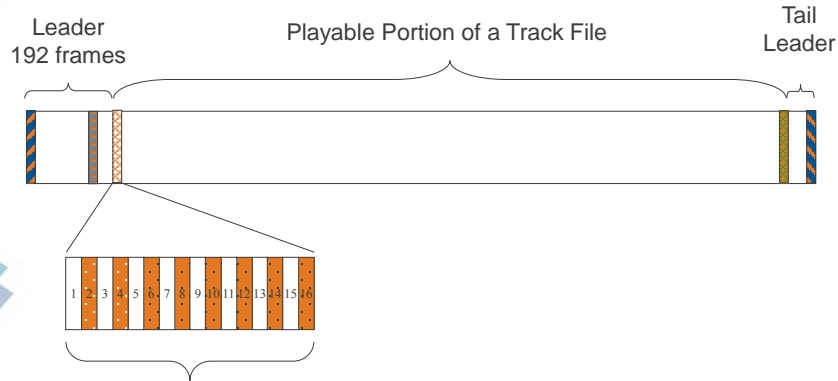
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Audio channels assignment for InterOp DCPs

- Audio channels are *hard wire* to to an ISDCF agreement
- Reference to
 - <http://isdcf.com/papers/ISDCF-Doc4-Interop-audio-channel-recommendations.pdf>
- It is a one to one correlation: channel 1 in the *.mxf track file is routed to channel 1 of the server with the understanding it is wire to the auditorium's left speaker(s) and so on
-

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Anatomy of an Audio mxf Track File



Expanded out - ONE Film Frame or 1/24 second
The 1 thru 16 are channel assignment numbers

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SMPTE DCP audio

- In a SMPTE audio track file there is a UL that defines the audio configuration, such as 5.1 and 7.1
- The UL Wild Track Format is currently the supported audio configuration
- Wild Track Format is the same audio channel mapping at InterOp.

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The future: Immersive Audio

- Dolby ATMOS, Multi-Dimensional Audio (MDA), Auro
- This is work in progress with in SMPTE
- It will include an additional *.mxf track called the Aux Data track file – this file will carry the Immersive Audio data
- It will also require changes to the CPL to reference this new Aux Data *.mxf track file
- The Aux Data track file can be encrypted

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Review InterOp vs. SMPTE

- Big difference is subtitles
 - Subtitle are wrapped in an MXF file structure
 - SMPTE allows for render 3D (stereoscopic) subtitles
- Audio
- Small changes to CPL XML schema
- ASSETMAP and VOLINDEX must have *.xml file extensions
- In the future SMPTE DCPs will support Immersive Audio

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SMPTE Test content

- SMPTE test DCPs are available at:
 - www.isdcf.com
 - If you are manufacturer of digital cinema equipment that has been through the Compliance Test Plan (CTP), then you can get some of the SMPTE DCPs test content from the CTP
 - SMPTE offers the Digital Cinema Leader – it is mastered as DCPs in SMPTE format

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Sources of Information

- InterOp documents maybe downloaded at
 - ftp://ftp.digicine.com/Document_Release_2.0
- SMPTE Info
 - www.smpte.org
- Inter-Society Digital Cinema Forum (ISDCF)
 - www.isdcf.com
- European Digital Cinema Forum edcf.net
 - Digital Cinema Initiatives
www.dclimovies.com

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That's all folks!

Thanks

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Questions



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