



The Academy Digital Source Master A Future-Proof Deliverable

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Agenda

- What problem are we going to solve?
- IMF – quick primer
- IMF Application #5 ACES
- The Academy Digital Source Master Specification
- Conclusion

What problem are we going to solve?

For a given product you've got:

- Final ACES master files (textless) - ST 2065-4 (OpenEXR)
- Final ACES master files (localized) - ST 2065-4 (OpenEXR)
- Related metadata - ODT, RRT, LMT
- Audio soundfields - WAV, Immersive soundfields
- Data essence - Timed Text...

...and you want to deliver and archive all of that in one consistent package?

The Academy Digital Source Master specification, built on IMF App#5, does the job!

IMF – quick primer



- In the industry, we are facing a “version explosion”: Localized versions, multiple audio systems, HDR in many flavors
- A component-based workflow avoids the replication of assets and allows for creating deliverables on-the-fly
- IMF supports component-based workflows:
 - All components of a product are stored only once
 - Composition Playlists represent the versions: Domestic, international, immersive audio, airline, etc.

IMF – quick primer



- The Composition Playlist is the key element of IMF
 - It defines the timeline for a specific version
 - The timeline contains image, audio and data tracks
 - The tracks reference MXF files which contain the actual essence
 - Supports inserts
- MXF track file can be re-used in multiple compositions
 - Avoids replication of essence
 - Easy re-use of identical track files
 - Reduces the time to create new versions

IMF – quick primer



- IMF Applications
 - The image essence format is defined in “IMF Applications”
 - Different applications exist, based on specific business requirements
- Select currently published IMF applications
 - Application #2 / #2E: JPEG 2000, up to 4K resolution, designed for home video masters
 - Application #4 Cinema Mezzanine: JPEG 2000 lossless, X'Y'Z', max 48 nits, lossless DCP equivalent
 - Application #5 ACES: ACES image essence, no compression, no additional constraints

Outline of IMF App #5 ACES

- IMF Application #5 ACES is published as SMPTE ST 2067-50
 - Specifies SMPTE ST 2065-5 MXF wrapping for Image Track Files
 - Any frame rate and any spatial resolution is supported
 - Defines metadata structures

Metadata in IMF App #5 ACES

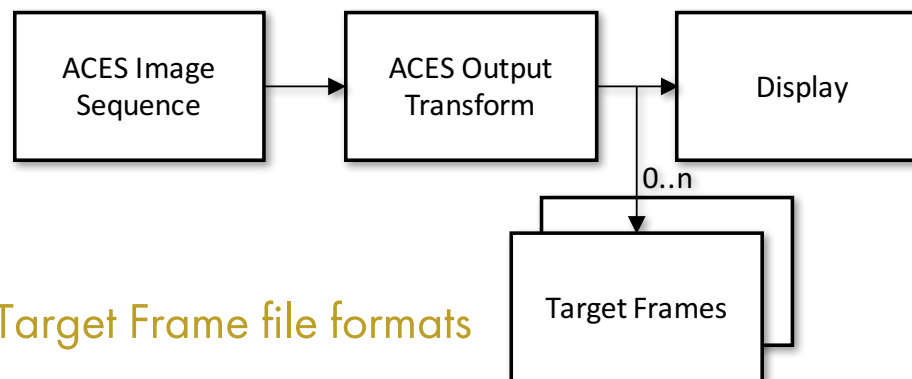
- ACES files are presented by means of an Output Transform



- The challenge: How to document the Output Transform used in Mastering for delivery and archiving?
- The solution in IMF Application #5:
 1. ACES Authoring Information metadata
 2. Mastering Display metadata
 3. "Target Frames" – Essence frames rendered in a display-referred color space

Metadata in App #5: Target Frames

- Target Frames are provided to calibrate the IMF package “playback” display system and environment to match the original mastering display system and environment



- PNG and TIFF supported as Target Frame file formats
- If the Target Frames visually or mathematically match the rendered images obtained from a particular workflow, it ensures that the particular playback display system and environment recreates the artistic intent applied during the mastering process of the original ACES Image sequence

Constraining and enhancing IMF App #5

- A normative requirement to provide Output Transform metadata
- A specification for Look Modification Transform metadata

Introducing...

The Academy Digital Source Master Specification



Specification

S-2018-001

**Academy Color Encoding System -
The Academy Digital Source Master**

The Academy of Motion Picture Arts and Sciences
Science and Technology Council
Academy Color Encoding System (ACES) Project Committee

August 24, 2018

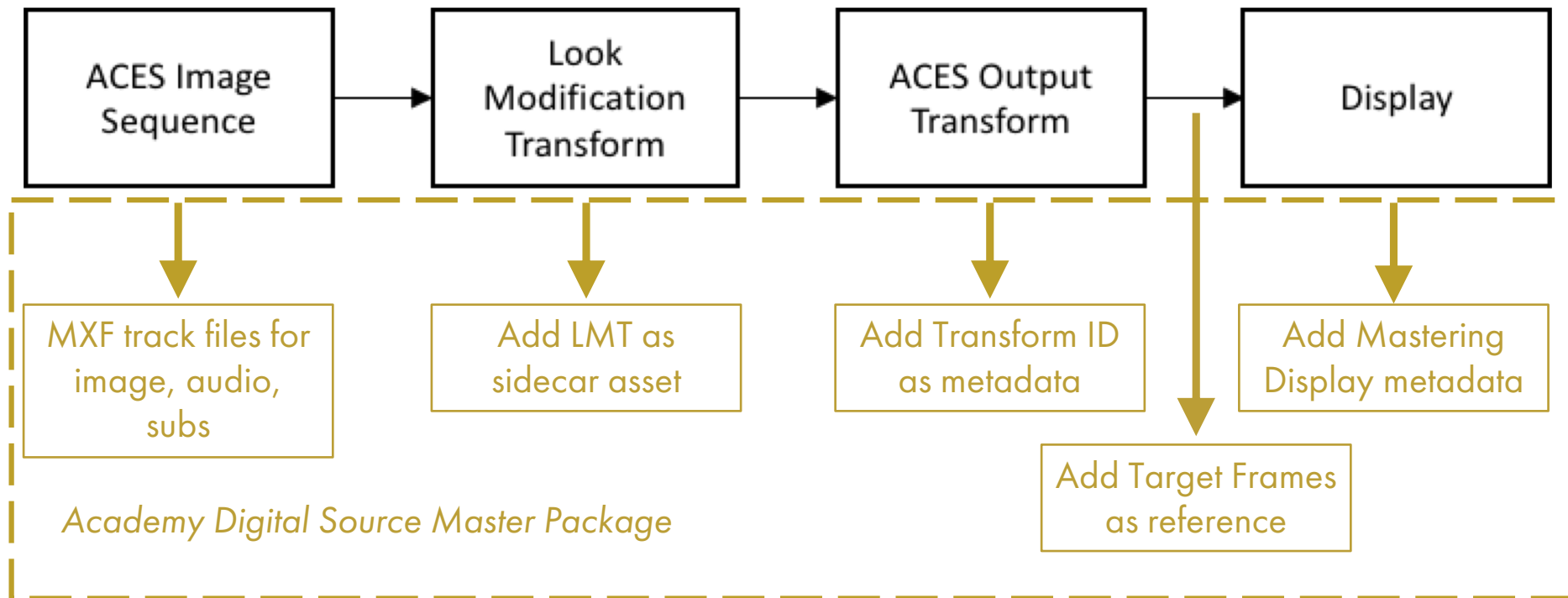
Summary: This document specifies an application for the exchange and archiving of final ACES 1.0 master files along with an arbitrary number of soundfield group tracks and timed text tracks

The Academy Digital Source Master specification

- Based on IMF Application #5 ACES (SMPTE ST 2067-50)
- Requirement to specify one (or more) Academy-provided Output Transform IDs as metadata
 - Example: `ODT.Academy.Rec2020_1000nits_15nits_ST2084.a1.1`
- Option to provide one (Global) Look Modification Transform in addition to an Output Transform
 - Technically, LMTs will be added to the IMF package as “sidecar assets”

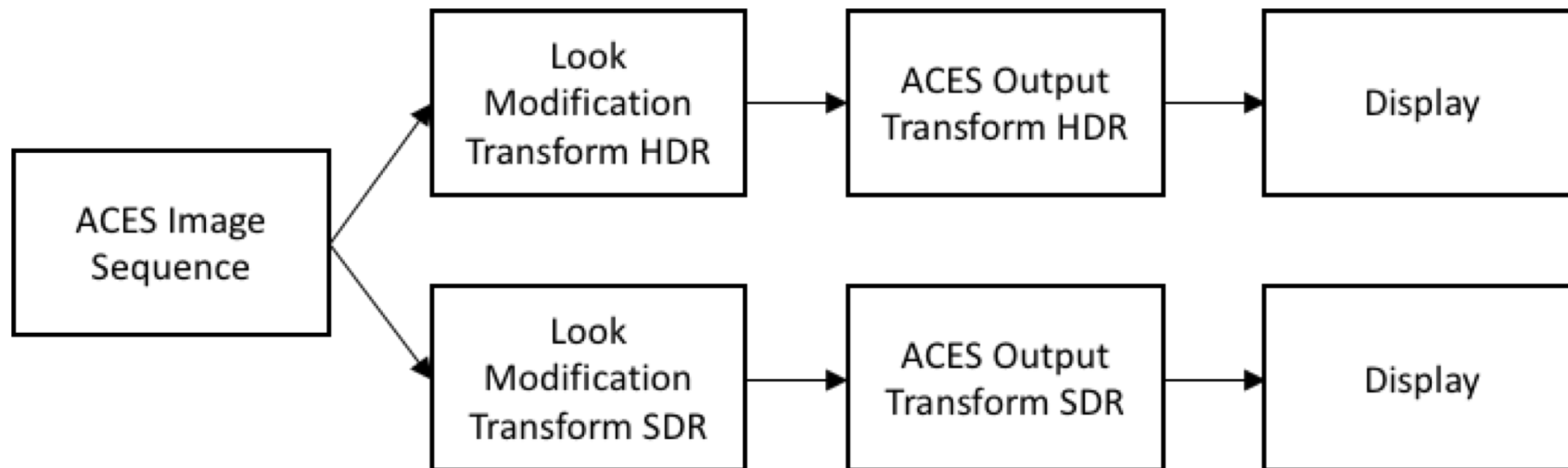
The Academy Digital Source Master specification

Enhanced workflow using Look Modification Transform (LMT)



The Academy Digital Source Master specification

Future-proof, prepared for multiple device ACES master file sets (“Über-Master”)



Open Source software: IMF Tool

The screenshot displays the IMF Tool interface, which is used for managing and editing IMF (Interchange File Format) assets. The interface is divided into several panels:

- File Browser:** Located on the left, it shows a directory tree of files. A callout "Add new track" points to the "Add Track" button in the main timeline area.
- Content Metadata:** Located at the top left, it displays information about the current composition, including the title, issuer, and content kind. A callout "Set edit" points to the "Edit" button in the main timeline area.
- Video Preview:** The central area shows a video preview of the current segment. A callout "Add segment" points to the "Add Segment" button in the main timeline area.
- IMP Browser:** Located on the right, it lists all the assets contained within the IMF. A callout "The IMP Browser shows all the assets an IMF contains. Double clicking a Composition Playlist opens the editor." points to the "Add Asset" button.
- Timeline:** The bottom area shows a timeline with various tracks (main image, main audio, ancillary data, subtitles, commentary, hearing impaired captions, visually impaired text data, karaoke). A callout "Move and add marker" points to the "Add Marker" button in the main timeline area.

The main timeline area also displays a video preview of the current segment, with a callout "Set edit" pointing to the "Edit" button. The timeline shows various tracks (main image, main audio, ancillary data, subtitles, commentary, hearing impaired captions, visually impaired text data, karaoke) and a callout "Move and add marker" pointing to the "Add Marker" button.

The IMP Browser shows all the assets an IMF contains. Double clicking a Composition Playlist opens the editor.

The assets can be dropped into the Composition Playlist

Conclusion

- Academy Digital Source Master is the solution for delivery and archiving of ACES master file sets
- The Academy Digital Source Master specification defines a future-proof data structure
- Based on Industry Requirements of all Major Hollywood studios
- Vendors will test interoperability at a plug-fest in October
- Open Source software (IMF Tool and C++ libraries) enables sustainable archiving and broad access

Resources

- The Academy Digital Source Master Specification
 - [ACESCentral.com](https://www.acescentral.com)
- IMF Tool (ACES-ready Q4 / 2018)
 - <https://github.com/IMFTool/IMFTool>
- asdcplib C++ Library (ACES-ready by mid September)
 - <https://www.cinecert.com/asdcplib/>



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