Avid Viewpoint: The Promise of AS-02

9 September, 2011

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Introduction

An unprecedented content creation explosion is changing the face of the media production industry. More and more media is being produced; consumer attention spans are shortening, and an ever-increasing array of channels is rising to facilitate its distribution. The key is how to leverage the opportunities these trends represent to develop a consolidated, overarching framework in which media is more efficiently created, managed, and distributed.

This is the nexus of a vision Avid has evolved with our customers to define a next-generation convergence of technology and business processes called the Integrated Media Enterprise (IME).

One of the first steps toward fulfilling that vision has been the creation of industry standard operating formats like Advanced Authoring Format (AAF) and Material eXchange Format (MXF)—developed by a collaboration of several companies, including Avid. A founding member of the Advanced Media Workflow Association (AMWA), Avid has also participated in the creation of AS-02, a file format specification designed to streamline versioning of content for multiple distribution channels.

This paper will describe how AS-02 is evolving in the context of file-based workflows, provide an overview of the format, and offer a preview of how it will serve as a cornerstone of the future content creation paradigm.

Migration from physical to file-based workflows

Media workflows are completing their migratory path from physical media, such as film and videotape, to file-based workflows, affording customers:

- Easier access to media assets

- Enhanced collaboration

- Lower operating costs

- Increased flexibility

- More comprehensive workflow automation

- Risk containment

Replacing physical media with file-based media has also given rise to new business requirements. These, in turn, have driven media companies to implement new workflows previously unavailable to the world of physical media.

Such a format is AMWA's AS-02, which extends the MXF standard to address the challenge of versioning for multi-channel distribution.

Replacing tape with multi-essence mxf

The MXF family of SMPTE standards (S377) is a key enabler of the physical to file-based workflow transition, providing a common foundation for many digital media workflows, from digital cinema distribution, electronic news gathering (ENG), and nonlinear editing (NLE), to media asset management.

OP-1A files offer a basic replacement for tape in many workflows by enabling all the elements of a single clip to be contained in one file. Specifically, OP-1A files can be structured to carry interleaved audio and video, or "multi-essence" files, as well as program metadata and ancillary data such as closed captions.

Figure 1: Physical to file-based format transition

Video Tape   Multi-Essence
                              OP-1A File
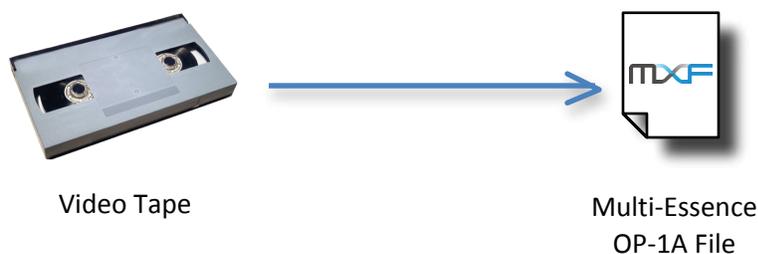
Multi-essence OP-1A files can be effective when replacing tape in content acquisition workflows, where one file corresponds to a single capture session or "take." For broadcast production workflows, multi-essence OP-1A files also enable basic clip interchange between video servers and editorial systems.

However, distribution workflows are becoming increasingly complex. As versioning requirements increase, new challenges are emerging such as:

- How to assemble different program versions from a collection of audio, video, and metadata elements

- How to add new versions to an existing master without duplicating content

- How to store and share the instruction set for different versions of a program

- How to specify technical parameters for file-based masters, such as codecs, bit rates, frame rates, audio channel configuration, and program metadata fields

AS-02 is a file format specification that meets these new challenges. Incorporating standard technologies like MXF and XML to achieve flexible versioning, AS-02 specifies a "component" methodology for bundling program information in contrast to the singular file structure of an OP-1A file.

AS-02 overview

The primary goal of AS-02 is to enable unique versions of a program to be readily assembled from a shared set of elements. To accomplish this, AS-02 serves as a collection point for all of the media and metadata necessary to assemble multiple versions in what is referred to as a "bundle".

Figure 2: AS-02 bundle
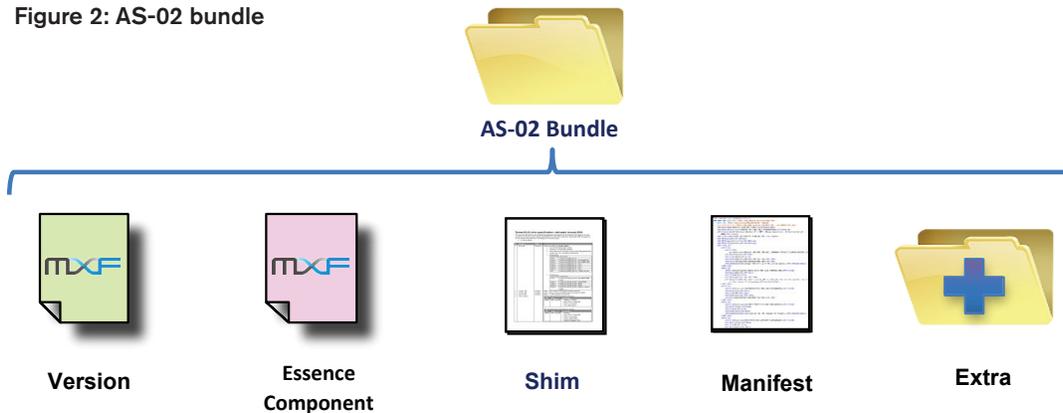
Media is stored in an AS-02 bundle as individual essence component files, each containing a single stream of audio, video, or data, from which program variations are assembled, based on instructions spelled out in the version files.

In this context, version files are like recipes, while essence files containing the playable media are like the individual ingredients in those recipes.

Figure 3: Assembling program variations from components within an AS-02 bundle
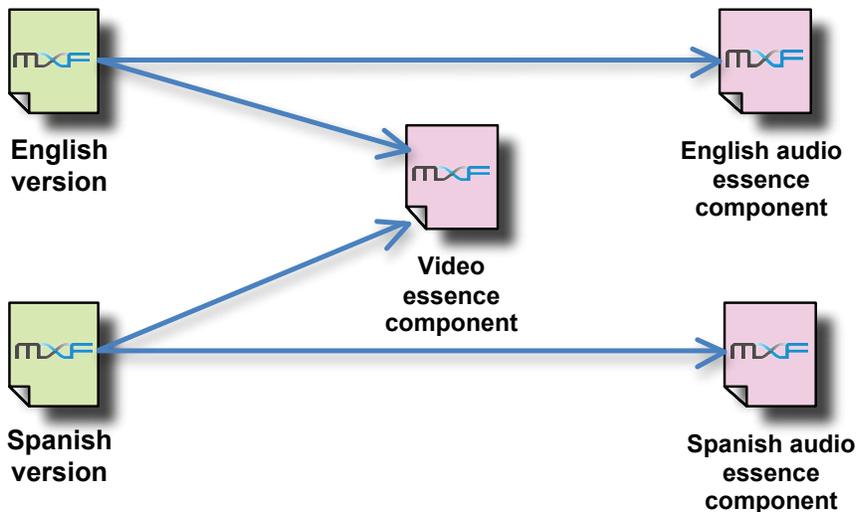
The diagram above illustrates how variations of a program can be assembled from the components in an AS-02 bundle. We see two versions of a program, one with English dialog and one with Spanish—they share the same video essence component file, but a different audio track is used for each. Both versions are represented independently within the AS-02 bundle—without duplicating the shared video asset. Thus, AS-02 is able to efficiently encapsulate multiple versions of a program, with variations in picture, sound, editorial content, and data streams.

AS-02 bundles also include other important elements such as shim files that specify how assets are encoded and represented in each bundle, including video codec preferences, configuration of audio tracks, closed caption formatting and other data.

AS-02 bundles contain manifest files comprised of a machine-readable inventory of all items in the bundle, as well as an extra folder, providing a place for information that should be carried with the bundle, such as quality control reports or other non-MXF vendor-specific data.

Lastly, AS-02 is codec agnostic. So any video essence format that can be wrapped in MXF can also be used as media in AS-02 essence component files. When Avid introduces AS-02 product support, any codec included in Avid's shared codec library will be supported natively in AS-02 workflows—including Avid DNxHD® (VC-3), uncompressed, AVC-Intra, and XDCAM HD.

AS-02 and Avid

AS-02 is envisioned to be a key element of the Integrated Media Enterprise, part of a robust framework for uniquely identifying assets, organizing source and asset relationships, and representing compositional and descriptive metadata, based on the foundation of the AAF class model.

Rather than offering AS-02 as merely an export format, AS-02 will be deeply integrated into the Avid production and media asset management ecosystem—making it possible for AS-02 bundles to be mapped directly into Avid bins and managed by Avid asset management solutions.

AS-02 is envisioned as a standard means of interchange between Interplay® Production and Media Asset Management, and will be built on a common software component that can ultimately be integrated into a range of products, enabling parsing, display, processing, modification, and transformation of AS-02 bundles. This services-oriented approach (SOA) also provides a streamlined path for third-party integrations.

Industry efforts to standardize on core file-based workflow technologies are fundamental to the future development of content creation, management, and distribution. Currently, the Interoperable Master Format (IMF) is progressing through early stages of standardization at SMPTE—Avid is participating in that process, focusing on harmonization between AS-02 and IMF specifications where appropriate.

Conclusion

With migration of physical to file-based workflows largely complete, the coming phase of media enterprise consolidation will be predicated upon technologies like AS-02. These technologies constitute the next wave of workflow innovation aimed at solving new business challenges, accelerating the convergence of business and technological functionality, and ultimately bringing the promise inherent in the Integrated Media Enterprise substantially closer to reality.