Avid Executive Report

The Promise of AS-02

A new standard that promotes open interoperability
and extends creative workflows

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 content distribution. For media companies, the key is how to capitalize on the opportunities these trends represent.

Avid has a long history of supporting industry efforts to create technology standards that promote open interoperability and extend creative workflows. Over the years, Avid has contributed to important specifications that have seen widespread adoption, including the Advanced Authoring Format (AAF) and the Material eXchange Format (MXF). As a founding member of the Advanced Media Workflow Association (AMWA) Avid has participated in the creation of AS-02, a file format specification designed to streamline versioning of content for multiple distribution channels. It is expected that the media and entertainment industry will adopt AS-02 in the same manner it has embraced the AAF and MXF precedents.

This paper will describe how AS-02 enables new file-based workflows and provide an overview of the format.

The Evolution to File-based Workflow

During the last decade, media workflows have gradually transitioned away from linear physical media, such as film and videotape, towards file-based workflows. This evolution holds many potential benefits.

File-based Workflow Key Benefits

- Lower storage and maintenance costs

- More ubiquitous access to media assets

- Increased flexibility to customize and repurpose assets

- Deeper workflow automation

- Enhanced collaboration

- Mitigation of risks

The first phase of this evolution has focused on replacing physical media with file-based media in the context of existing workflows. During this same time span, however, new business requirements have arisen that are driving media companies to implement new workflows that extend beyond the metaphor of physical media. Distribution workflows have become especially complex due to the explosion of new formats and distribution channels. In an effort to make these workflows more manageable, new mastering formats such as AMWA's AS-02 are emerging that extend the MXF standard to address the challenge of versioning for multi-channel distribution.

AS-02 and Avid

Avid envisions AS-02 as a key element of a framework reflecting the media enterprise production infrastructure. The philosophy and data model behind AS-02 are highly complementary to Avid's data model, since both are based on the foundation of the AAF class model, a robust framework for uniquely identifying assets, organizing source and asset relationships, and representing compositional and descriptive metadata. Further, Avid has extensive experience with MXF and was one of the first companies to adopt the format as a native media container for professional media production workflows. Rather than offering AS-02 as merely an export format, AS-02 is being deeply integrated into the Avid production and media asset management ecosystem, making it possible for AS-02 bundles (defined below in the Technical Details section) to be mapped directly into Avid bins and managed by Avid asset management solutions.

Avid is implementing AS-02 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.

AS-02 and the Integrated Media Enterprise

Avid's approach to AS-02 is integral to the philosophy of the Integrated Media Enterprise (IME) framework. Predicated on holistic media lifecycle management, IME encompasses the tracking and management of asset-based workflows from the moment the ideas are conceived, through program creation, distribution, and repurposing of content. Avid is embedding AS-02 within the IME framework, facilitating automated workflows that streamline the creation, management and distribution of content across multiple platforms.

Industry efforts to standardize on core file-based workflow technologies are fundamental to the future development of content creation, management, and distribution. Currently, Avid is participating in that process, focusing on harmonization between AS-02 and IMF specifications where appropriate.

AS-02 Technical Details

Replacing tape with multi-essence MXF
The MXF family of SMPTE standards (S377M) has helped enable the transition from physical to file-based media. MXF adoption has been widespread in many media workflows, from digital cinema distribution, electronic news gathering (ENG), and nonlinear editing (NLE), to media asset management.

MXF OP-1A files offer a basic replacement for tape in many workflows by enabling all elements of a single clip to be contained in one file. For example, OP-1A files can be structured as 'multi-essence' files, containing interleaved audio and video, 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.

**Complex Versioning Challenges**

- Assembling different program versions from a collection of audio, video, and metadata elements

- Adding new versions to an existing master without duplicating content

- Storing and sharing the instruction set for different versions of a program

- Specifying 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 encapsulated 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 incorporates a folder structure that contains all the media and metadata necessary to assemble multiple versions in what is referred to as a bundle.

Figure 2: AS-02 bundle

AS-02 Bundle

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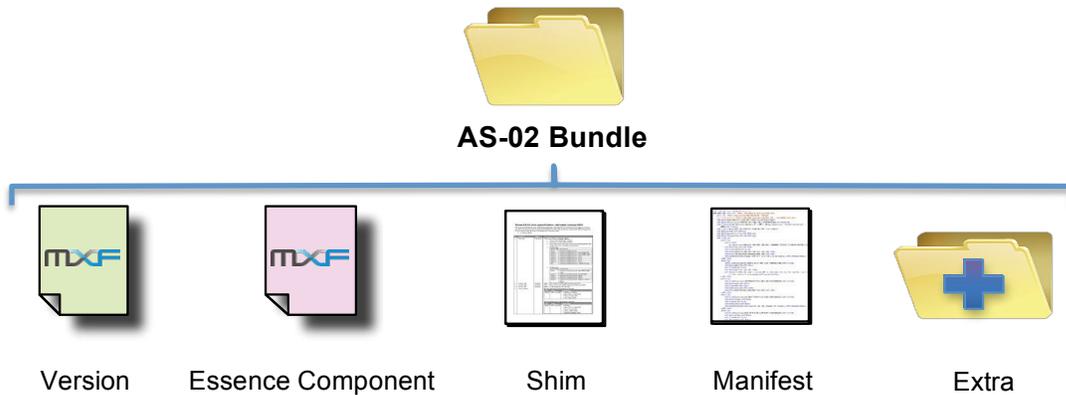
Media is stored in an AS-02 bundle as individual essence component files, each containing a single stream of audio, video, or data, from which program variations are assembled, based on instructions spelled out in the version files.

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

English version

Spanish version

Video essence component

English audio essence components

Spanish audio essence components
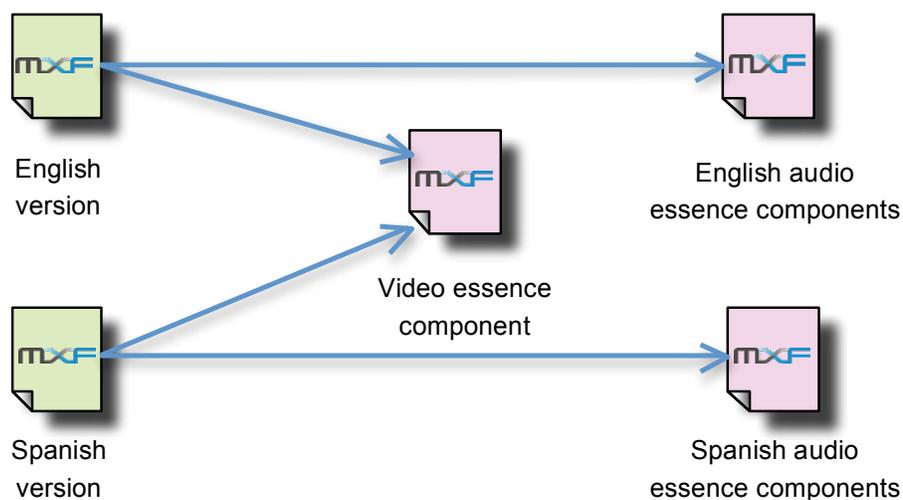
This diagram illustrates how variations of a program can be quickly assembled from the components in an AS-02 bundle. Here, there are two versions of a program, one with English dialog and one with Spanish. They share the same video essence component file, but a different audio track is used for each. 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 ancillary 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 parameters.

AS-02 bundles contain a machine-readable XML manifest file, listing all the elements in the bundle. The extra folder provides a place to store additional files that should be carried along with the bundle, such as quality control reports or scripts.

AS-02 is codec agnostic, so any video essence format that can be wrapped in MXF can be used to encode AS-02 essence component files. Popular production codecs as well as mezzanine codecs can be used to encode AS-02 essence files, including Avid DNxHD® (SMPTE VC-3), JPEG2000, DV based codecs, MPEG-2 variants and AVC-based codecs. In future software releases, Avid plans to support a wide variety of codecs in AS-02 bundles, including Avid DNxHD.

Conclusion

With migration of physical to file-based workflows accelerating rapidly, media production will increasingly be predicated upon file format specifications like AS-02. Such specifications constitute the next wave of workflow innovation aimed at solving the challenges of the rapidly evolving file-based workflow era. Avid sees AS-02 as core to future-proofing your Integrated Media Enterprise.

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