MXF Unwrapped

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Table of Contents

Introduction

Avid strives to develop and adopt leading industry standards so our customers can easily integrate Avid® products into workflow solutions that are tailored to the needs of their businesses. The company's mission is to engineer solutions that enable true nonlinear workflows, so the post-production process can be as flexible, dynamic, and creative as each of the individuals who interact within the collaborative environment.

The MXF (Material eXchange Format) standard plays a critical role in the Avid nonlinear workflow strategy, providing the core media container technology deployed in Avid solutions. MXF is used natively by Avid applications to store video and audio "essence" with associated metadata. MXF has also become the preferred file format for interchange of media files between Avid solutions and products developed by other vendors.

The promise of MXF

MXF is a powerful, flexible file format that has been developed by the Pro-MPEG Forum, a consortium of prominent industry users and vendors, including Avid. MXF has been designed to address all stages of the media content lifecycle—from acquisition to authoring to distribution and archive. Through the SMPTE standardization, MXF has become a widely-recognized international standard.

For more information about MXF, please visit www.pro-mpeg.org or www.SMPTE.org.

Avid and MXF

Avid is fully committed to advancing MXF adoption in the industries we serve, and has played an active role in the continued development of MXF. Avid contributed the core object model that drives the powerful metadata capabilities of MXF and ensures compatibility with AAF (Advanced Authoring Format) projects and media.

During the past two years, Avid has been building MXF support into many facets of Avid solutions. With SMPTE ratification now in place, recent versions of Avid products have begun shipping with increasing levels of MXF support. MXF is now a supported native file format in many Avid systems and software, including Avid Xpress® Pro, NewsCutter® XP, NewsCutter Adrenaline™, Media Composer®, Media Composer Adrenaline, Symphony™ Nitris®, Avid DS Nitris, Avid Unity™ TransferManager, Avid Unity MediaManager, Digidesign® Pro Tools® and SOFTIMAGE®|XSI®. Many Avid products also support exchange of MXF files with products developed by other vendors.

Avid has made it a company-wide goal to implement MXF in an open, comprehensive way, delivering end-to-end MXF workflows that span media acquisition, authoring, delivery, and archive.

MXF and the Avid technology strategy

Content creators are moving away from traditional videotape and baseband signals in favor of nonlinear workflows based on exchange of digital files over standard IP networks. MXF provides the key content container technology in Avid solutions, delivering several workflow benefits to Avid customers.

Interoperability

As more manufacturers support MXF, it has become easier to exchange media files between products from different manufacturers. Avid has been working closely with manufacturers such as Sony, Panasonic, and Ikegami to support MXF-based file interchange with a wide range of acquisition and storage devices. While simply creating MXF files does not guarantee interoperability, MXF does provide a powerful starting point for interchange between products from different vendors.

File Sharing

By implementing MXF file support and common codecs in products like Media Composer Adrenaline, Avid Xpress Pro, Avid DS Nitris, Symphony Nitris, Digidesign Pro Tools, and SOFTIMAGE|XSI, Avid has enabled workflows in which these applications can share the same files without any conversion steps.

Metadata Preservation

MXF files can "wrap" media content with useful metadata starting at the very beginning of the production process. Source metadata can then be accumulated, processed, and extended during the content authoring process. As programs are completed and stored in new MXF files, historical metadata can be preserved to feed asset management, digital rights management, and media archive systems with critical information about the finished content.

Longevity

Because MXF is a codified international SMPTE standard, users and developers can be confident that media files created by Avid applications will always be accessible with or without Avid equipment.

Accessibility

The Avid MXF implementation has been developed directly within the AAF toolkit, ensuring metadata compatibility with AAF multimedia files. Avid is making these MXF extensions public by contributing them to the open source AAF toolkit as part of the AAF v1.2 project. This development project will result in a highly accessible reference implementation for MXF, with the ability to read and write SMPTE-compatible MXF files that are also fully consistent with Avid MXF implementations.

Innovativion

Transitioning to MXF as a native file format has enabled Avid to provide new and innovative workflows, giving multiple users the ability to preview, annotate, and edit material even while it is being captured. This powerful capability of Avid solutions is a direct result of our MXF implementation and dramatically improves production efficiency while reducing turn-around times.

MXF Operational Patterns

Because MXF can be used in a broad range of media applications, the MXF file format is extremely versatile. The breadth of the MXF standard makes MXF a powerful technology, but it also means that MXF files from one product may not be accepted by another product without modification or data mapping.

There are more than ten formalized structural variants of MXF called Operational Patterns ("OP" for short). They are designed to meet the diverse needs of different stages in the lifecycle of media assets. While many rules apply to all Operational Patterns, the building blocks may be assembled somewhat differently.

For example, OP-1A files may include multiple tracks of audio and video essence that are interleaved into a single file. This approach makes the files nicely self-contained and can work well in applications where each file represents a complete program or take. But OP-1A may be less applicable to content authoring steps such as nonlinear editing, where programs are created by slicing and layering different sections of source material.

Not surprisingly, Avid products natively support OP-Atom (SMPTE 390M), the operational pattern that was designed to address the specific needs of nonlinear video and audio editing. Benefits of OP-Atom include the separation of essence into multiple files while retaining common "clip" metadata across related files.

Native OP-Atom support

Many vendors have announced MXF support in their products, but many MXF implementations require an import/export step because most products continue to use a proprietary native file format.

By contrast, Avid products now support MXF natively. New media files created in MXF-enabled Avid applications are stored on disk as MXF files which comply with the MXF File Format specification (SMPTE 377M) as well as the specification for OP-Atom (SMPTE 390M). Native support for MXF has several key benefits to Avid customers, including:

- Avid has implemented direct integration with other OP-Atom native products like Panasonic P2. Avid editing solutions can directly edit files captured on these devices because they support OP-Atom natively and also support common essence codecs.
- MXF production assets created by Avid solutions can be made accessible to other tools because they are stored in an open, industry-standard file format.
- Customers can archive MXF production assets created by Avid solutions safe in the knowledge that those files will be meaningful and accessible in the future.
- Mapping of user metadata is more easily accomplished in an all-MXF workflow. Metadata collected upstream can flow easily into the Avid authoring environment.
- Innovative workflow capabilities like "edit during capture" are enabled by the extensible file structure defined by the MXF specification.

OP-1A import/export

Successful MXF interchange between two products depends on the relative compatibility of their MXF implementations. But interoperability may also depend on other factors, including essence compatibility and metadata compatibility. So MXF is not a panacea. Avid has determined that files created by products from different manufacturers may vary significantly in their structure and contents, even if they comply with the same Operational Pattern specification.

Fortunately, it is possible to translate between OP-1A files and OP-Atom without "lossy" consequences. Avid products such as Avid Unity TransferManager can easily translate OP-1A files from devices such as Sony XDCAM into OP-Atom files that can be edited in the Avid environment. And Avid Unity TransferManager can exchange "generic" OP-1A with third-party products that recognize an FTP connection.

MXF and OMF

Historically, Avid nonlinear editing systems have utilized the OMF (Open Media Framework®) standard as the native media file format for containing video and audio essence. Avid products will continue to support OMF media into the future for legacy compatibility. Many Avid products, such as Media Composer Adrenaline, even support the intermixing of legacy OMF media with newly captured MXF media.

While Avid will continue to support both OMF and MXF natively for legacy essence codecs such as JFIF, DV, and IMX, new codecs introduced by Avid may only support MXF. For example, Avid products will store Avid DNxHD® essence only in MXF files, not in OMF files.

MXF and AAF

MXF and AAF are designed to work together, but they are targeted at different applications. MXF is a container format that is designed to "wrap" media files and carry associated metadata. AAF is a metadata file format that can describe how to assemble a program from original sources. Unlike MXF, AAF is focused primarily on the content authoring process and can be used to describe complex arrangements of source material including effects information.

Although MXF and AAF are used for different purposes, they share the same core metadata components. AS a result, the metadata embedded in an MXF file can be easily mapped into an AAF file. Avid is fully committed to implementing MXF in an AAF-compatible way and is the primary contributor to the AAF v1.2 project, the goal of which is to deliver meaningful compatibility between AAF and MXF.

For more information about AAF, visit www.AAFassociation.org.

Conclusion

Avid continues to implement a technology strategy rooted in the principle that adopting leading industry standards is critical to delivering customer value. Avid products must be meaningfully open and extensible so our customers can build unique workflow solutions that integrate Avid products with a wide array of other components.

From individual workstations to enterprise-scale collaborative environments, Avid offers more ways to extend and customize our solutions than any other manufacturer. The company's leadership and expertise with industry standards like MXF will continue to differentiate industry-leading solutions from Avid.

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