A Closer Look at MXF

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Introduction

At Avid, we strive to develop and adopt leading industry standards so our customers can integrate Avid products into unique workflow solutions that are tailored to the needs of their businesses. Our mission is to continually advance Avid solutions to enable truly 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.

MXF plays a critical role in Avid's Nonlinear Workflow strategy, providing the core media container technology deployed in Avid solutions. Going forward, MXF will be used natively by Avid applications to store video and audio essence with associated metadata. MXF will also be 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 file format that has been developed by the Pro-MPEG Forum, a consortium of prominent industry end-users and vendors, including Avid. MXF has been designed to flexibly 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 development of MXF from its very inception. Avid contributed the core object model that drives MXF's powerful metadata capabilities and delivers compatibility with AAF, the Advanced Authoring Format.

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 varying levels of MXF support. MXF is now a supported native file format in many Avid products including Avid Xpress® Pro, Avid NewsCutter® XP, Avid NewsCutter FX Adrenaline™, Avid Media Composer® Adrenaline HD, Avid Symphony™ Nitris®, Avid DS Nitris, Avid Unity™ TransferManager, Avid Unity MediaManager, Digidesign® Pro Tools® and SOFTIMAGE®|XSI.® Several Avid products also support exchange of MXF files with products developed by other vendors.

Avid's goal is to implement MXF in an open, comprehensive way, delivering end-to-end MXF workflows that span media acquisition, authoring, delivery and archive.

MXF and Avid's Technology Strategy

Avid's vision for Nonlinear Workflow embraces a transition away from traditional videotape and baseband signals. Content creators have increasingly adopted 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 will become easier to exchange media files between products from different manufacturers. Avid has been working closely with other manufacturers like 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 guaranty interoperability, MXF does provide a powerful basis for interchange between products from different vendors.

File Sharing

By implementing MXF file support and common codecs in products like Media Composer Adrenaline HD, Avid Xpress Pro HD, Avid Symphony Nitris, Avid DS Nitris, Digidesign Pro Tools and SOFTIMAGE|XSI, Avid has enabled workflows in which these applications can share the exact 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 if desired, feeding 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 rest assured that media files created by Avid applications will always be accessible with or without Avid equipment.

Accessibility

Avid's MXF implementation has been developed directly within the AAF toolkit, ensuring metadata compatibility with AAF. Avid plans to make public these MXF extensions by contributing them to the open source AAF toolkit during 2005 by participating in the AAF v1.2 project. This development project will result in a highly accessible reference implementation for MXF that can be utilized to read and write SMPTE-compatible MXF files that are fully consistent with Avid's MXF implementations.

Innovativion

Transitioning to MXF as a native file format has enabled Avid to provide new and innovative workflows such as the ability for multiple users to preview, annotate and edit material 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 flexible. The breadth of the MXF standard means that MXF is 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), that 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 surgically slicing and layering different sections of source material.

Not surprisingly, Avid products will natively support OP-Atom (SMPTE 290M) the operational pattern that was designed to specifically address the 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 most MXF implementations require an import/export step because most products continue to use a proprietary native file format.

By contrast, Avid products will support MXF natively. That is, 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 and Ikegami EditCam. The Avid DNA™ product line will 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 besides MXF compatibility, including essence compatibility and metadata compatibility. So MXF is not a panacea. In Avid's experience, 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. It will take some time for common practices to emerge among MXF vendors.

Fortunately, it is possible to losslessly translate between OP-1A files and OP-Atom. 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 is actively developing generic OP-1A import/export capabilities in both Avid Unity TransferManager and the Avid DNA product line of Avid nonlinear editors.

MXF and OMF

Historically, Avid nonlinear editing systems have utilized OMF 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 HD, 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. So 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's technology strategy is rooted in the principle that adopting leading industry standards is critical to delivering customer value. We know that 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.

Avid's commitment to delivering open solutions is embedded into every product we sell. From individual workstations to enterprise-scale collaborative environments, Avid offers more ways to extend and customize our solutions than any other manufacturer.

Avid's leadership and expertise with industry standards like MXF will continue to differentiate Avid's industry-leading solutions.

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