



## MXF

### Joined-Up Workflows & Business Efficiencies

Supplied courtesy of Metaglue Corporation

*How to realize savings in investment through the evolution of the MXF AS-02 and AS-03 application standards and operational cost reductions from effective, integrated Quality Control of content.*

The Material Exchange Format (MXF) was developed as a wrapper for the interchange of audio-visual content in current formats, yet retains the flexibility to support future file formats.

Its adoption as a file format by both manufacturers and media companies delivers the potential for significant business efficiencies. This is possible from two main areas:-

- It permits a degree of systems integration that was difficult to achieve before file based workflows, enabled by the reliable interconnection of products from different vendors.
- More processes can now be automated, which leads to more efficient use of staff resources. Skilled staff can carry out only the tasks which really need human intervention.

### Application Specifications

Since the outset of file-based broadcasting there has always been a concern within media companies that one manufacturer's product would not interface with another's. The standard analog composite interconnection had no ready equivalent in the file domain. This understandable worry about interoperability has been a potential barrier to the widespread adoption of file-based workflows.

MXF was developed to meet this need, but along the road of its development it spawned such flexibility that any goals of simple system integration fell by the wayside.

This problem led to collaboration between media companies and vendors through the Advanced Media Workflow Association (AMWA) to draw up some Application Specifications (AS) as the basis for simple, easy interoperability. Who says vendors don't talk to each other?

And although the specification for MXF allows it to be used anywhere in the program path, it became clear from a number of media companies that there were some areas where it could immediately support their changing business requirements.

The Application Specifications are not specific to one vendor or media company. They define a set of con-

straints on how the file is constructed to match the operational and technical requirements at a particular point in the workflow.

This naturally tailors the use of the AS to a single requirement. The purpose of the constraints is to minimize the number of options that must be considered by implementers of individual devices within the system. This helps both vendors and system architects and increases the reliability and interoperability of the overall system.

This is ideal for an industry where every media company implements slightly different operation practices to their competitors - and where contributions to the creation of a program now come from many companies, often physically distant from the "broadcaster".

If even tighter constraints are required for, say, a specific broadcaster's technical practices or a particular program genre or distribution channel, these can be defined as "shims". (Note the comparison with mechanical design where a thin shim is used to make something fit exactly!) For example, there is a shim for the PBS application of AS-03 for program delivery to its member stations that has come out of their Next Generation Interconnection System (NGIS) program.

This has been developed for the distribution of programs to member stations across a network.

To ensure widespread support across the industry the AMWA works in conjunction with both SMPTE and the EBU.

Here are practical examples of three such specifications.

### For program versioning – AS-02

For many years, we have seen a steady increase of new distribution channels and the realization of archive material as a financial asset. As a consequence there is an increasing need to create multiple versions of a program for distribution and delivery.

It is not unusual for a program to have multiple versions with video in SD and HD for television delivery and lower resolution for online and mobile consumption. Audio may be needed as stereo and Dolby 5.1, and in any number of languages. Those different languages are all likely to need subtitles.

Also, versions will need metadata for automated control of the workflow or distribution and metadata used to describe the material for later re-use.

To satisfy this demanding business and operational requirement, AS-02 was developed. Often material for international distribution is translated, dubbed and subtitled by the country that is the ultimate destination of the content.

However, the playout is often from a centralized facility that delivers by satellite to many countries. So the management and movement of the material is a complex task, with language tracks and subtitles files transferring across continents, requiring all parties to work to the same standards.

So how can cost savings to be achieved with such a complex workflow?

Traditionally, multiple versions of a program require the video material to be duplicated for each version. This creates cost through the effort required for dubbing and the extra space used on servers for storage - plus the fact that any transfer operation has the potential for technical or operational errors to occur. Use of AS-02 allows just one copy of each piece of material to be stored - along with data which describes the elements which make up of each of the final versions (see figure 1). This ensures that each version is correct and avoids unnecessary costs for both labour and storage.

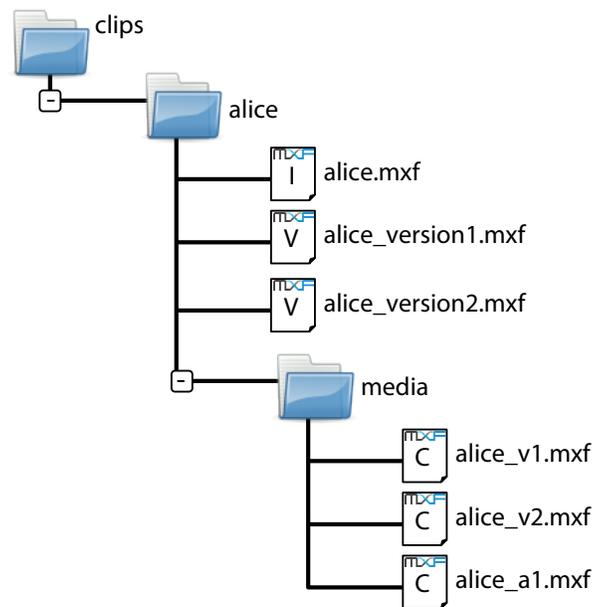


Figure 1. An AS-02 file wrapping two versions of a program

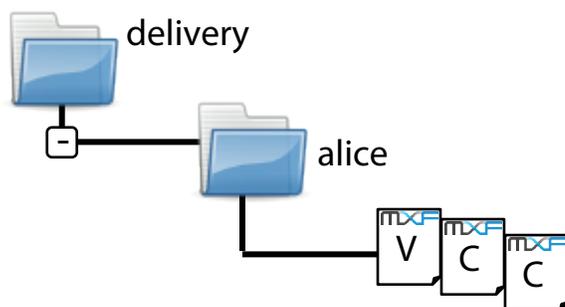


Figure 2. The structure of an AS-03 file

### For the delivery of finished content – AS-03

An AS-03 file is always a single file containing a single program. The content of these files is for direct play-out from any server and is not intended for further processing before delivery to the viewer. The file would contain a finished program or program segment with its associated metadata and would typically contain video, audio and captions/subtitles plus the technical and descriptive metadata for, say, aspect ratio descriptors or parental control rating (see figure 2).

### For a multi-language environment – AS-04

Effective language tagging of the audio is vital when one item of video has a number of associated audio tracks for international and multi-lingual distribution. AS-04 has been defined to satisfy this requirement and of course, integrates with the AS-02 specification.

## Quality Control along the workflow

In a world where content is now stored as files, these valuable assets appear less tangible than the tape that they replace and quality control of the content may appear more difficult to achieve.

But in practice, the opportunity to automate some parts of the process becomes much more achievable. It is easy to define the technical and operational requirements for program flow through the system. For example, at ingest how many audio tracks are expected? What compression standard should be used for the video? What metadata should be present? And at the point of distribution, is the correct version of the program being sent to its final destination?

Every media company's workflow differs but there will be some points where that material must be correct. For these crucial points in the program chain a set of requirements can be defined. They may even be different for each program genre. With multiple versions of content entering, moving around, and leaving the system, the QC task is as much about checking the process as about checking the technical quality of the material.

By defining a template for the known requirements at each check point in the workflow, it is possible to describe exactly what is needed and make a quality check against this. This will vary for different media

businesses and vary depending on location in the workflow.

Once a comparison is made against the template, the automatic verification can trigger the next action, which will in the majority of cases be "pass = send the material to the next process". However, when "fail" or even "possibly fail" occurs, further checking or corrective action can be applied.

Of course, it is unwise to rely entirely on automated processes. But a good system can reliably indicate that there might be a problem, allowing a skilled person to check and confirm whether this is true. So the tedious, time consuming part of the job can be done by software and the operator can intervene to make a human judgement and add value where it is most important.

The QC metadata can be embedded in the MXF file for use by other processes downstream. Thus, as the file follows through the program path, an "audit trail" of editorial / technical changes to the material and the QC verification can be built up – and tracing back to fix a problem becomes much easier.

It is already possible to view a range of MXF files in real time on a traditional style of display. So using this QC technology in conjunction with a simple operational MXF file player makes it possible to have much greater

confidence that the correct material with the correct quality in the correct version is going to the correct destination.

### **Self-propelled content**

It becomes possible to implement “rules based” control of the content management when the program content is accurately and reliably defined and quality checked. This can deliver even greater speed and efficiency in the movement of material and thus reduce human intervention and cost.

But that’s a whole separate subject!

### **In summary**

These developments move MXF from “a powerful but complicated toolset” to “a proven, reliable means to deliver sophisticated program services with real business efficiency”.

So while our ever-changing industry demands new business models, cost savings and efficiencies can still be achieved in a wide number of areas if the correct investment decisions are made!

Neil Dunstan, Head of Sales & Marketing, Metaglue

For further information on any of these subjects, please visit [www.metaglue.com](http://www.metaglue.com).

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Further white papers on MXF, AAF, XML and SOA applied to advanced media workflow can be downloaded from the AMWA website at [www.amwa.tv](http://www.amwa.tv).

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