

# The Task: *Preserving Digital Public Television*

*You are probably familiar with this tale ....*

**In the world of digital television, our program content lives in two dimensions:**

- 1. The “*essence*” is the actual moving image content of the program**
- 2. At the same time, living on its own but attached to the essence, is the “*metadata*” that captures technical, descriptive and other information about the program**

**One of the biggest problems we must solve in our repository design is the *'wrapper'*.**

**What is the best way to 'wrap' the essence and the metadata together, so that over time, the content can be successfully retrieved?**

***What to do???***

First, we went to the Library.  
We figured they had a solution, because *The National Audio Visual Conservation Center* is scheduled to open in Spring 2007 and would be storing vast quantities of video.

**Surprise!** They didn't have a plan.

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story, 131,500

structure is completely underground.

# Then we thought the network 'big guys' were working on this problem, and we could just tag along with them...



Bruce Devlin  
Snell & Wilcox

*"We are on the verge of a metadata revolution. Get your data models clean and prepare for an interesting ride"*

Tim Berners-Lee, 1999

The Material eXchange Format is an open file format, aimed at the interchange of AV material along with associated data and metadata. It establishes interoperability of content between various applications used in the television production chain. This leads to operational efficiency and creative freedom through a unified networked environment.

## What is MXF?

The Material eXchange Format (MXF) is an open file format, targeted at the interchange of audio-visual material with associated data and metadata. It has been designed and implemented with the aim of improving file-based interoperability between servers, workstations and other content-creation devices. These improvements should result in improved workflows and in more efficient working practices than is possible with today's mixed and proprietary file formats.

MXF has been designed by the leading players in the broadcast industry – with an enormous amount of input from the user community – to ensure that the format really meets their demands. It is being put forward as an Open Standard which means it is a file transfer format that is openly available to all interested parties. It is not compression-scheme-specific and it simplifies the integration of systems using MPEG and DV as well as future, as yet unspecified, compression strategies. This means that the transportation of these different files will be independent of content, and will not dictate the use of specific manufacturers' equipment. Any required processing can simply be achieved by automatically invoking the appropriate hardware or software code. However, MXF is designed for operational use and so all the handling processes are seamless to the user. It just works quietly in the background.

Besides offering better interoperability – working with video and audio between different equipment and different applications – its other major contribution is the transport of metadata. By developing MXF from the beginning as a new file format, considerable thought has gone into the implementation and use of metadata. Not only is this important for the proper functioning of MXF files, it will also enable powerful new tools for media management as well as improving the content-creation workflows by eliminating repetitive metadata re-entry.

The changing technologies in television production, and in transmission to the viewers, means that the traditional methods for moving the content – programme video and audio – within studios is changing too. Not

FILE EXCHANGE FORMATS  
In a move towards early standardization, as mentioned above, MXF already adheres to the SMPTE KLV guidelines (Key, Length, Value – a method for wrapping data for transport over networks) and has extensively used and tested the SMPTE dictionary and other registries.

Interoperability is the prime objective of Pro-MPEG and MXF. This has been implemented in three

forms. It will work across different network protocols and across operating systems including Windows, Mac, OS, Unix and Linux.

**non-independent.** It does not convert between compression formats; it does make it easier to use than one format in a single environment. It can handle uncompressed video.

**transfer bridging.** MXF interoperates seamlessly with streaming media – especially in the case of fully-transparent interchange is achieved. This performance is bi-directional: it is possible to stream from MXF to streaming and vice versa, and means that SDTI fits easily into a file-based environment. This is true convergence.

## How does MXF work?

A MXF file looks quite different to a standard file. The first inspection (see

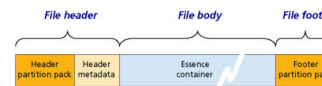


Figure 3  
Simple MXF file structure

at the head of the file, the first inspection (see

This means that the file is identified by a 16-byte key and

defining the length of the file (including the

owns simple MXF processing engines to handle the file they don't

allows the file and for extra features as new compression and metadata

area of the file here much of the data is added, and the synchronization of the file are defined. Location and description is controlled by

sents the output file. The actual

REVIEW – July 2002

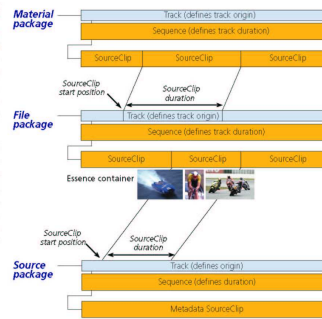


Figure 4  
The essence container comprises packages and tracks

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FILE EXCHANGE FORMATS

greater use of computers and IT-related products such as servers, but also the reliance on auto-use of material have expanded. Besides the need to carry metadata, file transfers are needed for other operations and they must be capable of being streamed for real-time operations.

One of the Material eXchange Format (MXF) is a remarkable achievement of collaboration between major organizations such as Pro-MPEG, the EBU and the AAF Association. It represents a convergence of content between various applications used in the television production chain. It offers operational efficiency and creative freedom through a unified networked environment.

## How can MXF improve my workflow?

An open industry-wide, metadata-aware, file format will have a big impact on the way in which content is created and managed. The typical stages in creating a TV programme are shown in Fig. 1. At present, the stages to the next comprises a mix of videotape, proprietary multi-media files, Word documents, spreadsheets, sticky labels, Post-It™ notes and word-of-mouth metadata transfer. In fact, the metadata is often handled in a reasonably universal way is timecode. Experienced professionals will

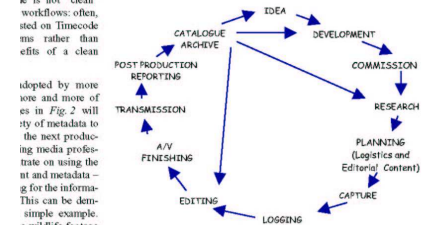


Figure 1  
Stages in creating a TV programme

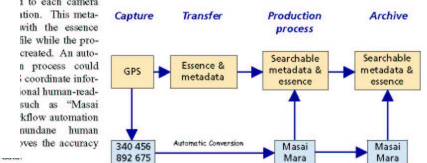


Figure 2  
Use of MXF to transfer metadata

MXF has the added benefit that it allows a common object model with the Advanced Authoring Format (AAF).

***Surprise!***

***They didn't have a plan, either!***

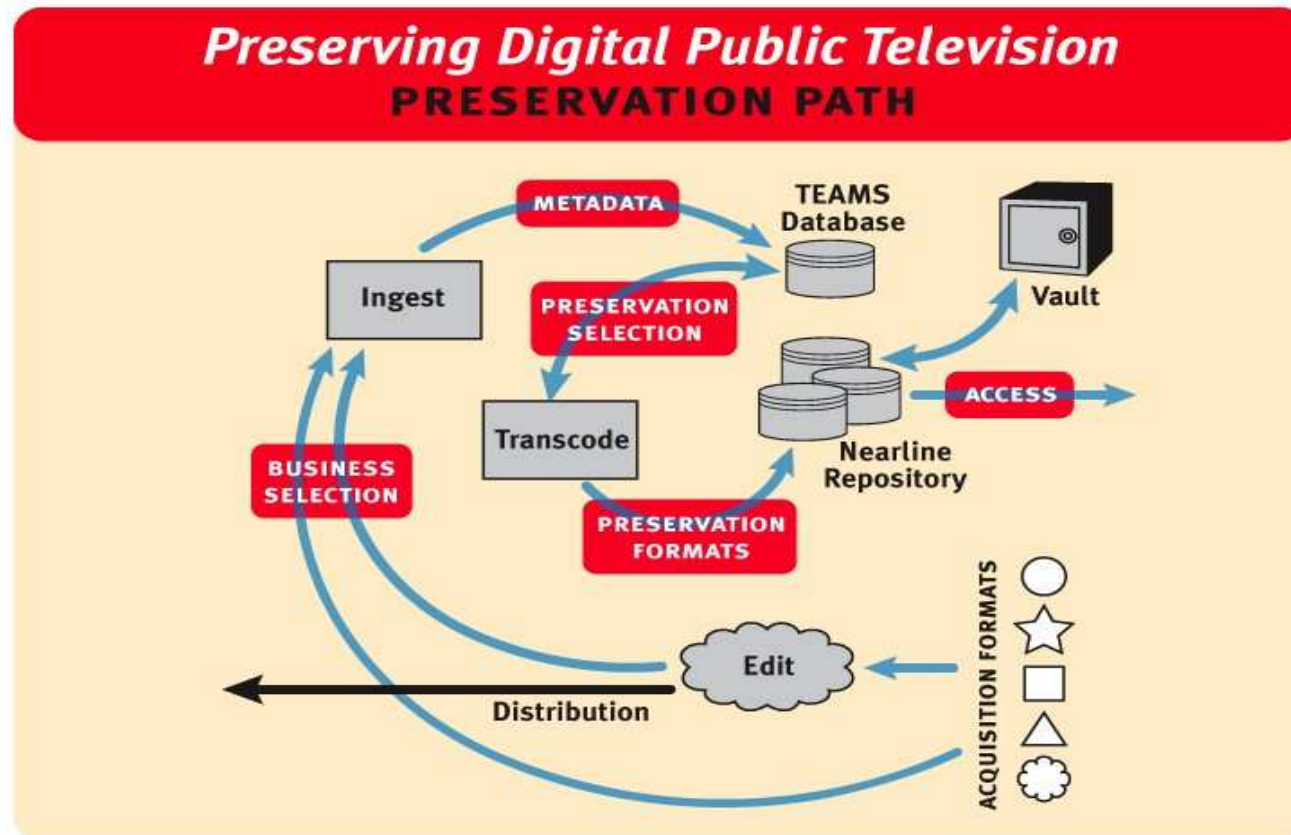
So we called a meeting ourselves. We invited some of the big guys, and threw out the challenge.

Now, in part through our leadership, there is an industry 'user group' that is working to solve the wrapper problem together.



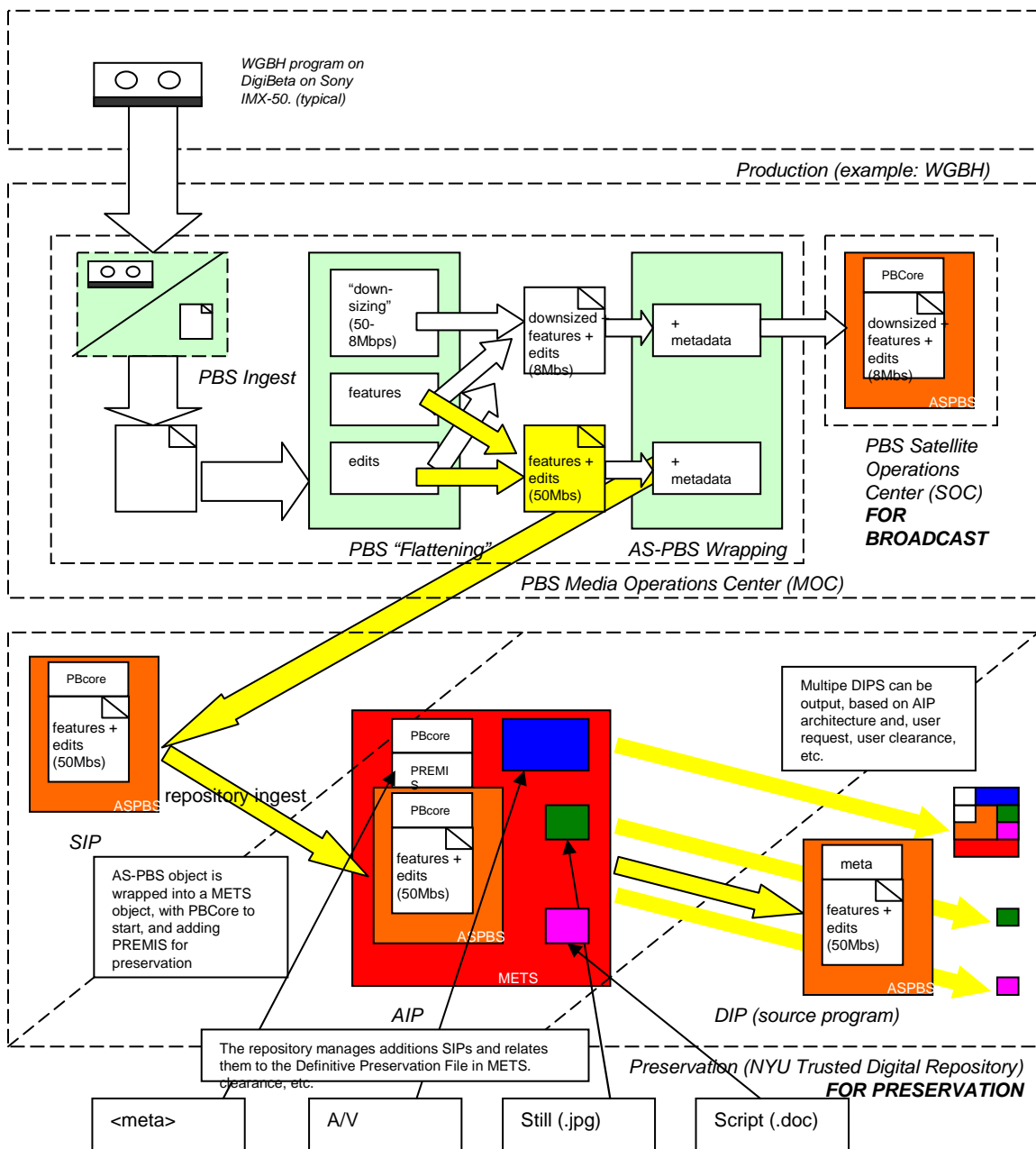
We started with the idea that we would do a small test, to see if we could get a mere 20 hours of video in and out of the repository.

The picture was simple...



But positive leadership changes at PBS have given us the opening to integrate preservation planning into a *much larger project* –

One that is rolling out digital program distribution to every public television station across the country.



NOVA

AUSTIN  
CITY  
LIMITS

***The implications are very exciting.***

- **It has given us a hook for engaging dozens of stations directly in our work !**
- **We are starting to plan a new entity for public broadcasting that can operate a cooperative repository !**
- **Preservation is going to be included in the package that public broadcasting is taking to Congress this year !**



**As for me, there is one thing in particular  
that I never expected ...**



**In our search for a wrapper, I hosted a breakfast for a  
group of technologists.**

## ***Five were from the Department of Defense!***

**(They liked meeting us PTV folks, but they were especially happy to meet people from the Library.)**



***Nan's breakfast***