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Standards for File-Based Workflows

The convergence of the television, computer and communications industries is well under way, having been anticipated for quite some time. Video and audio compression methods, server technology and digital networking, are all making a significant impact on television production, post-production, and distribution. Accompanying these technological changes are potential benefits in reduced cost, improved operating efficiencies and creativity, and increased marketability of material. Countering the potential benefits are threats of confusion, complexity, variable technical performance, and higher costs if not properly managed. “The technological changes will dramatically alter the way in which television is produced and distributed in the future.”¹ This quote from the Joint EBU/SMPTE Task Force for Harmonized Standards for the Exchange of Programme Material as Bitstreams final report, published almost 20 years ago, predicted the revolutionary changes that digital technology would bring to television industry over the next decade and beyond.

Today, we see the realization of many of those forward-looking aspirations for our industry, and we find ourselves right in the midst of the technological change predicted 20 years ago. As predicted, there would be a lot of standards work to

do to make this a reality, and indeed much has been accomplished, but there is still more to be done.

I would like to highlight three significant areas where we can see the benefit of standards, particularly in the area of file-based workflows.

The first of these is the Material eXchange Format (MXF), originally standardized as SMPTE ST 377. MXF has become a workhorse of the industry, providing a container that supports different streams of coded “essence,” encoded in any of a variety of video and audio compression formats, together with a metadata wrapper that describes the material contained within the MXF file. This widely-used file-based media format does not stand still, and there are always projects adding features and mappings to the MXF suite of standards or creating constraints for improved interoperability in a variety of application areas. There are currently 11 MXF projects in process.

In March 2011, SMPTE created a new technology committee 35 PM, which was specifically focused on the packaging of media elements, to facilitate interchange and interoperability. The primary output of this committee has been the Interoperable Master Format (IMF) documented in the ST 2067 suite of standards. IMF is a global standard for the file-based interchange of multiversion, finished audio/visual works. The current version is more geared toward studios and less toward broadcasting because of the codecs it does and does not support. Currently, there are 12 standards in the suite, with several new ones in drafting. In July, SMPTE announced it is working together with the Digital Production Partnership

on a joint pilot specification project to create an IMF specification for broadcast and online. The joint pilot project will deliver a technical specification for IMF in broadcast and online applications as a breakdown of different elements—video and audio packages, composition playlists, and output profile lists—with references to all relevant SMPTE standards. “This specification pilot project breaks new ground at SMPTE,” said SMPTE Director of Engineering and Standards Howard Lukk. “This project will establish a streamlined specification framework that complements our wide range of other due-process engineering documents such as standards.”

The ever-increasing data requirements of modern media due to higher image quality, higher spatial resolution, higher temporal resolution, and with more audio channels, have dramatically increased demand on media archive systems. In 2017, SMPTE published a revision to ST 2034-1, “Archive eXchange Format (AXF)—Part 1: Structure & Semantics,” which was originally published in 2014. AXF is an open format that supports interoperability among disparate data storage systems and ensures long-term availability of data, no matter how storage or file system technologies evolve. At the most basic level, AXF is a file container that can encapsulate any number, size, and type of files in a fully self-contained and self-describing package. AXF is the key in modern archive formats, allowing easy migration of the archive from one technology to another, as required. It is even applicable to other applications beyond media archiving.

¹EBU/SMPTE Task Force for Harmonized Standards for the Exchange of Programme Material as Bitstreams—Final Report: Analyses and Results, <https://tech.ebu.ch/docs/techreview/ebu-smpte-tf-bitstreams.pdf>