

Essence (10E)

Co-Chairs: John Snow and Michael Zink

Overview

The scope of the 10E technology committee applies to electronic capture, generation, editing, mastering, archiving, and reproduction of image, audio, subtitles, captions, and any other master elements required for distribution across multiple applications.

Organization

The committee is organized into drafting groups (DGs) and study groups (SGs) covering specific tasks and areas of activity. About ten subgroups have been active at various times during the past year.

Recent Publications

Over the past 12 months, 10E has published the following documents:

- ST 2115:2019: Free Scale Gamut and Free Scale Log Characteristics of Camera Signals
- ST 2113:2018: Colorimetry of P3 Color Spaces

Work in Progress

VC-2 Video Compression

VC-2 mezzanine video compression is based on the British Broadcasting Corporation's (BBC's) Dirac Pro. All parts of the document suite have been published, and a revision of RP 2042-3 Conformance Specification is in progress.

VC-5 Video Essence

VC-5 is based on the Cineform/GoPro video compression system. All parts have been published, except ST 2073-7 Metadata, which is in progress. RP 2073-2 VC-5 Conformance Specification is being revised and several of the documents in this suite are also undergoing their mandatory one-year reviews.

VC-6 Picture Compression

The VC-6 project is a new codec that uses a hierarchical representation of compressed data to allow decoders to flexibly recreate uncompressed imagery. The DG is making progress on what will become the ST 2117 VC-6 document suite.

Reference Display and Environment for Critical Viewing of Television Pictures

This project is developing a suite of documents dealing with the use of fixed pixel matrix reference displays. The documents in this suite are as follows:

- ST 2080-1: Reference White Luminance Level and Chromaticity (published, and currently in revision)
- ST 2080-2: Measurement and Calibration Procedure for HDTV Displays (published, and currently in revision)
- ST 2080-3: Reference Viewing Environment for Evaluation of HDTV Images (published)
- RP 2080-4: Full Measurement/Calibration (in progress)

Dynamic Metadata for Color Transforms of HDR and WCG Images

This DG is working on a revision of ST 2094-40 Dynamic Metadata for Color Volume Transforms—Application #4. Significant activities in this DG are reported to the Advanced Television Systems Committee (ATSC) and the Society of Cable Television Engineers (SCTE) via a Standards Committee liaison activity.

Television Lighting Consistency Index

Work continues on RP 2093 Television Lighting Consistency Index (TLCI). The introduction of light-emitting diode (LED) technologies has led to unintended and expensive consequences, including poor color matching between different light sources, and very hard-to-correct color reproduction issues. This document will provide a standard method to quantify the quality of lighting with regard to color reproduction for television.

Study Group on Virtual Reality/Augmented Reality

This group is studying the current and projected approaches to capture and post produce images and sound to create a distribution master for virtual reality (VR) and augmented reality (AR) distribution and display systems and recommend potential areas for future standardization.

Academy Spectral Similarity Index (SSI)

This is a newly created project in 10E. Existing color rendering indices assume a spectral sensitivity of either an International Commission of Illumination (CIE) Standard Observer or of a defined camera response. Single-sensor cameras extensively used in motion picture production have spectral sensitivities that are considerably different from each other. This results in a lack of predictability of rendered colors, particularly when using light sources such as LEDs. The spectral similarity

index (SSI) metric is independent of spectral sensitivity and can provide predictability of the color rendering from digital and film cameras.

About the Authors



John F. Snow represents Cobalt Digital, where he is a senior field programmable gate array (FPGA) architect. He began his career at Evans & Sutherland Computer Corporation, where he held various positions including the director of engineering. In 2001, he joined Xilinx, Inc. as a video architect and

was responsible for the development of serial digital interface (SDI) and other audio and video interfaces for Xilinx FPGA devices. Snow holds a BSc degree in electrical engineering from Brigham Young University, Provo, UT. He is an SMPTE Fellow and a Senior Member of the IEEE. He holds two patents related to high-speed serial interfaces. He has been an active member of the SMPTE Standards Community for many years and now serves as a co-chair of the 10E committee and the chair of 32NF-80 Working Group.



Michael Zink is the vice president of technology at Warner Bros. (WB), where he is responsible for exploring emerging technologies to enhance WB's capabilities for production, post-production, and distribution. This includes assessing new technologies and assisting with the setup and integration of

digital workflows. Zink also participates in several standards associations, including Blu-ray Disc Association, Consumer Technology Association (CTA), Digital Cinema Initiatives (DCI), and SMPTE; he also serves as the chairman for the UHD Alliance. Before joining WB in 2014, he worked at Technicolor for more than ten years, most recently as the vice president of Technology Strategy, where he was responsible for launching the production efforts around various new optical disk formats. In addition, he was responsible for the promotion and adoption of Technicolor technology solutions within industry groups. Earlier in his career, he worked for several media production facilities in Germany.

Film Applications (20F)

Co-Chairs: Dave Schnuelle and John C. Miller

Overview

This committee supports all aspects of film and its applications including general audio and projection cinema presentation.

Organization

The work of the 20F committee has been organized into broad-based working groups (WGs), each maintaining their specific application with recommendations to 20F for action. Most standards are mature, and most have been made stable.

TC-20F.10 Film Production Technology (Chair: John C. Miller)

Dimensional specifications for cutting, perforating, and identification of motion picture films and components. This includes camera use, original image areas, sound application areas, and interchangeability.

TC-20F.20 Laboratory Services (Chair: Michel Golitzinsky)

All phases of laboratory services include preparation, processing, and duplication of motion pictures.

TC-20F.30 Audio Technology (Chair: Ioan Allen)

The production, processing, recording, reproduction, distribution, and presentation of sound records for motion picture systems, including the mechanisms and practices relating to acoustic issues for the audio presentation of all media in screening rooms and commercial theaters.

TC-20F.40 Theatrical Projection (Chair: Jess Daily)

Non-television presentation of motion pictures, including specifications for image areas intended for projection and image measurement practices for theatrical presentation. Dimensions for projection reels and containers, and print identification and leaders are also included.

Our last Plenary was held on 3 April 2019, and the next will be at the SMPTE Annual Technical Conference in October.

Work in Progress

Our 2018 one- and five-year review process resulted in 12 documents being made stable.

The DG for the on-screen light measurement is chaired by Dave Schnuelle, who has also taken over as the document editor. The pre-FCD review has been completed, and final edits will be circulated prior to FCD ballot.

RP 200—Relative and Absolute Sound Pressure Levels for Motion-Picture Multichannel Sound Systems. This 20F.30 document is under revision. Julian Pinn is chairing this effort and is the document editor. This revision is to accommodate industry practice with new object-based sound systems. To offer a minor revision of the provisions that define the level relationships between surround channels and the reference level in object-based immersive sound systems to bring the document in line with modern practice. Currently determining how far to go with harmonization with ST 2095-1.

RP 141—Background Acoustic Noise Levels in Theaters and Review Rooms. Ioan Allen will work with

Neil Shaw to make a revision and to update to the current nomenclature and industry practice.

The 20F committee will move efforts forward to have SMPTE maintain the availability of certain test films based on importance to the industry.

These test films are vital to supporting motion picture film audio and projection in the future. We have an institute interested in helping to produce test films. The committee has drafted an initial list of critical films and will solicit the Board of Governors for support of this effort. Bill Hogan and Glen A. KnickKrehm are currently working to establish the path to move this forward.

New Items of Work

ST 157:1999, For Motion Picture Film (8-mm Type S) Camera Aperture Image and Usage

Minor correction needed in Table 1, “A” dimension specifications. John Miller will be the document editor.

About the Authors



Dave Schmueller is the vice president of technology for Dolby Laboratories, where he is responsible for guidance and outreach in Dolby’s efforts in both digital cinema and consumer imaging areas. At Dolby, he has received various awards for the development of the Dolby Professional Reference Monitor and

the Dolby 3D stereoscopic cinema system. Prior to joining Dolby Laboratories, he was the director of technology for Lucasfilm Ltd.’s THX Division, where he established the THX Digital Mastering Program for quality assurance of home video masters and duplicated software, and designed the international digital cinema exhibition of the new *Star Wars* movies—Episode 1 and Episode 2. Schmueller has received five patents for his work during that period and is active in image technology research and the perception of images. He participates in several standards organizations—SMPTE for image characteristics and interface standards, International Electrotechnical Commission (IEC) TC100 and TC110 for display standards, and is the U.S. National Committee Chair for the International Organization for Standardization (ISO) TC36 on cinema technology. Schmueller is a Fellow of the SMPTE and a member of The Academy of Motion Picture Arts and Sciences.



John C. Miller is a technical support specialist in the Consumer and Film Division, Eastman Kodak Company. He has 40 years of experience with motion picture films. Miller started his career in film manufacturing, where he quickly moved into process and product quality. Miller’s work contributed

to the introduction of Keykode barcode print as seen on the edge of Kodak motion picture films, which dramatically simplified film editing for the industry. Miller also participated in many film product development teams including the Kodak Vision family of films. He has been active in SMPTE standards work since 2003 and has chaired the 20F.10 Film Production Technology working group since 2005. Miller became an SMPTE Fellow in 2008. He is also active in ISO TC36 Cinematography standards work.

Digital Cinema (21DC)

Co-Chairs: Steve Llamb and Chris Witham

Overview

The scope of the 21DC technology committee applies to the mastered essence of theatrical digital distribution, including compression, encryption, wrapping, marking, packaging, media, logging, playout, projection, reproduction, and related topics.

Organization

The committee is organized into DGs and SGs covering specific tasks and areas of activity. About four subgroups have been active at various times during the past year.

Recent Publications

Over the past 12 months, 21DC has published the following documents:

- ST 428-1 D-Cinema Distribution Master - Image Characteristics: Revision - Frame Rate Integration
- ST 429-18 D-Cinema Packaging - Immersive Audio Track File
- ST 429-19 D-Cinema Packaging - DCP Operational Constraints for Immersive Audio
- ST 430-12 D-Cinema Operations - FSK Synchronization Signal: Amendment 1 - UL and Label

Work in Progress

ST 429-2 Revision (DCP Operational Constraints)

ST 429-2 describes operational constraints that apply to the combined set of structures that comprise a Digital Cinema Package (DCP). This revision adds constraints related to the addition of stereoscopic timed-text to ST 428-7 (*Subtitle DCDM*) in addition to new constraints consistent with known behavior and limitations of deployed equipment.

ST 428-7 Revision (Subtitle DCDM)

ST 428-7 specifies the format of a DCDM Subtitle file, an integral component of a subtitled Digital Cinema (D-Cinema) composition. A DCDM Subtitle file contains a set of instructions for placing rendered text

or graphical overlays at precise locations on distinct groups of motion picture frames. This revision focuses on improving the rendering of Japanese timed text subtitles during playback.

ST 430-1 KDM Amendment for Immersive Audio

ST 430-1 defines a Key Delivery Message (KDM) for use in D-Cinema systems. The KDM is used to deliver security parameters and usage rights between D-Cinema content processing centers (e.g., from post-production to distribution, or from distribution to exhibition). This revision adds a new Key Type and Forensic Marking Flag to the KDM for encryption of the Immersive Audio track file defined in the recently published ST 429-18.

ST 429-4 Revision - Frame Rate Integration

ST 429-4 defines and constrains mapping of a compliant JPEG 2000 codestream into the Material eXchange Format (MXF) generic container for D-Cinema applications. This revision updates the JPEG reference in the document to the latest version (ISO IEC 15444-1) to support additional frame rates.

SMS OMB Comm. Protocol

This document will define a standardized method of communications for exchanging information between a Screen Management System (SMS) and an Outboard Media Block (OMB) that supports the decryption and playback of an Immersive Audio Track File from a compliant DCP. The document will specify the communication, messages, and syntax used to communicate KDMs, status, and other commands between an SMS and an OMB.

ST 430-14 Revision - Digital Sync Signal and Aux Data Transfer Protocol

ST 430-14 defines a Transfer Protocol that allows data Items from an Aux Data Track File to be transmitted to a Processor for reproduction, and a Synchronization Signal that allows a processor to reproduce data Items synchronously with the D-Cinema presentation. This revision adds support for messaging that allows the processor to indicate the ability to accept plaintext or encrypted data items in addition to correcting outstanding issues identified through implementation experience.

About the Authors



Steve Llamb is currently the vice president of media technology standards at Deluxe. Over the past 15+ years, during his time at both Deluxe and Technicolor, he has been heavily involved in the development and roll-out of concepts, workflows, and standards for both D-Cinema and Interoperable

Master Format (IMF) mastering, packaging, exhibition, distribution, and key management. He helped manage the global alignment all of Deluxe's processes for D-Cinema delivery, including launching their global proprietary Mastering and Packaging toolset currently in use, CIPHER. He serves as a top-level subject matter expert (SME) for both Deluxe's internal personal and Hollywood clients, as well as within various industry standards organizations and technology committees, such as SMPTE, IMF User Group, EDCF, and the Inter-Society Digital Cinema Forum (ISDCF). He is a current co-chair of SMPTE 21DC, chair of the Immersive Audio Drafting Group in 21DC, and convenor of ISO TC-36/WG 1 (Production Technology).



Chris Witham has been involved in many aspects of post-production since 1986. Witham was the chief engineer at Technicolor Video Services and Vidfilm International Digital. He launched D-Cinema mastering operations at Technicolor before moving on to head mastering operations at Ascent Media and Deluxe Digital Cinema. He is presently the director of emerging technology at The Walt Disney Studios.

Television and Broadband Media (24TB)

Chair: Bill Miller

Overview

The 24TB technology committee covers the application of mastered essence for television and broadband distribution (both separately and for hybrid television/broadband environments), including compression, encryption, wrapping, marking, packaging, media, tracking/control, presentation, reproduction, and related topics.

Organization

The current work is organized as individual projects and project-oriented DGs.

Work in Progress

Lip Sync Standards and Practices DG (Chair: Paul Briscoe)

This project is to develop standards to enable distribution systems to keep video and audio tracks time synchronized. The DG previously completed its work on the project's core standards: ST 2064-1, Fingerprint Generation and ST 2064-2, Fingerprint Stream Transport.

The latter includes Vertical Ancillary Data (VANC) in SDI/HD-SDI, Internet Protocol (IP), and Motion Picture Experts Group (MPEG) Transport. These documents have completed a one-year review.

Open ID Binding (Chair: Chris Lennon)

The standards in this project define an open binding technology (e.g., watermarks, fingerprints, metadata sidecars, etc.) for embedding persistent content identifiers into audio/video essence in a way that survives compression and distribution through the supply chain. After two request for proposals and evaluation of responses, the selected technology has been documented in the 2112 series of SMPTE engineering documents. The following have been published: ST 2112-10:2018, Open Binding of Content Identifiers (OBID), SMPTE RP 2112-11:2018, Open Binding of Content Identifiers (OBID)—Conformance Test Materials, SMPTE ST 2112-20:2018, Open Binding of Distribution Channel IDs and Timestamps (OBIDTLC), SMPTE RP 2112-21:2018, Open Binding of Distribution Channel IDs and Timestamps (OBIDTLC)—Conformance Test Materials, SMPTE RP 2112-1, Audience Measurement Using OBID and OBID-TLC and SMPTE EG 2112-2, Audience Measurement Ecosystem. All of these are currently undergoing a one-year review.

AFD Revision (Chair: Bill Miller)

This is a maintenance revision of ST 2016-3:2009, “Format for Active Format Description and Bar Data” to add support for ultrahigh-definition (UHD) formats. Liaisons are being exchanged with the ATSC, CTA, and DVB. Past investigation is focused on the impact of defining some previously reserved bits. This activity has spawned discussion about older formats using interface standard line numbering starting at “1” and newer formats using image line numbering starting at “0”, which may result in a new project, for while SMPTE practice has been consistent on this issue, it has never been formally documented.

About the Author



William C. Miller is the president of Miltag Media Technology, LLC, a consultancy specializing in technical standards for television and related industries. He has been a broadcaster for nearly 50 years and has been actively involved in the development of television standards for over 30 years. Miller is a SMPTE Fellow and has served as an officer and Governor of the Society for many years. He is currently the chairman of Technology Committee 24TB (Television and Broadband). He was awarded the Society’s Progress Medal in 2002 and its Presidential

Proclamation in 2013. He and his wife sponsor the society’s Excellence in Education Medal. Miller is a member of IEEE and of the IEEE Broadcast Technology Society (BTS). He serves as the chairman for the BTS AV Measurements Techniques Standards Committee.

Cinema Sound Systems (25CSS)

Co-Chairs: Brian Long and Bill Redmann

Overview

The TC-25CSS technology committee is addressing new standards for cinema sound and the interoperability of immersive sound systems in D-Cinema. Topics include measurement techniques, calibration specifications, sound system architecture and performance, theater acoustics, immersive audio, and immersive sound systems. The overall goal is to improve the quality and consistency of sound in cinema spaces while improving the efficiency and interoperability of audio delivered to theaters.

Project Plan

The Technology Committee project plan is as follows:

- optimize and codify current best cinema sound practices
- lay the groundwork for new standards
- ensure interoperability among sound systems
- set a higher bar by creating new standards, recommended practices, and engineering guidelines
- set the stage for the future.

Interoperability of Immersive Sound Systems in Digital Cinema Working Group (Chair: Pete Ludé)

The TC 25CSS Working Group on Interop Immersive Sound for Cinema has continued its work to enable the next-generation sound for movie theaters worldwide publishing a suite of documents regarding standardization to achieve interoperability of audio for systems with a capability greater than 7.1 channels. These documents include: ST 2098-1 Immersive Audio Metadata, ST 2098-2 Immersive Audio Bitstream Specification, ST 2098-5 D-Cinema Immersive Audio Channels and Soundfield groups. After being published, the SMPTE Immersive Audio Bitstream standard, known as ST 2098-2:2018, was revised in early 2019, adding capabilities to support consumer content distribution (such as fractional frame rates) and clarifications to the pseudo-code describing the bitstream. This new revision passed DP ballot in March and is expected to be published shortly. The SMPTE Immersive Audio Bitstream is in the process of being adopted in the industry, with a separate industry group conducting a plug-fest test

in February to exercise all the legacy and new features enabled by the standardized bitstream, with excellent results. Work on EG 2098-3 Immersive Audio Renderer Expectations and RP 2098-4 Immersive Audio Renderer Interoperability Testing procedure continues.

B-Chain Characteristics and Expectations ***(Chair: Brian Vessa)***

The SG continues work to lay the groundwork to produce the documents needed to specify the B-Chain characteristics required to playback modern movie soundtracks in dubbing theaters and cinemas with the sustained high levels and transients that are now common. Per the TC, the SG is preparing a final report on its findings and is preparing to transition its work to a DG to pursue the creation of the necessary documentation.

Looking Forward

The Technology Committee continues with projects that are designed to bring the cinema sound industry up to date, with a focus on interoperability between systems and greater consistency in presentation. Projects have moved from the conception phase into drafting work and also from published standards into real-world integration and use.

About the Authors



Bill Redmann attended the University of California, Los Angeles (UCLA) while working at Universal Studios as a special effects propmaker. He received a master's degree in engineering from UCLA, having specializing in computer architecture and artificial intelligence (AI). Rolling

into Walt Disney Imagineering, Redmann worked on interactive theme park attractions for cumulatively over a dozen years, including virtual reality (VR) attractions that opened in 1998 and ran for almost 20 years. At Technicolor, another dozen years was initially directed to digital cinema, but more recently working on the standardization of high-definition range (HDR) technologies and, again, VR. Redmann holds 62 issued U.S. patents.



Brian Long has more than 20 years of experience in professional audio with a diverse and extensive knowledge regarding the design and implementation of infrastructure for sound reinforcement and playback systems for all types of scenarios ranging from simple single speaker events to massive show

spectaculars and multichannel media presentations. Long holds a master's degree in fine arts from the University of

Southern California School of Cinematic Arts. He spent a number of years at Meyer Sound in systems design support along with product development and implementation. Currently, he is a member of the engineering team at Skywalker Sound.

Metadata and Registers **(30MR)**

Co-Chairs: Dean Bullock and Michael DeValue

Overview

The application of the general scope as it applies to definition and implementation of the SMPTE Registration Authority was used to identify digital assets and associated metadata. Additionally, the common definition of metadata semantic meaning across multiple committees.

Topic: TC-30MR Documents Published in the Last Quarter

The third edition of the new XML-based Registers is available online at <https://smpte-ra.org/smpte-metadata-registry>.

DG Project: Revision ST 335: Metadata Element Dictionary Structure

DG Project: Revision RP 2079 DOI-EIDR

TC Project: RDD-49: Professional Metadata PMD

DG Project: ST 330 Revision

This project will produce an updated version of ST 330, titled "Unique Material Identifier (UMID)," based on the recommendation of "Study Report on UMID Applications Part 2-2" created by the TC-30MR SG UMID Applications. Specifically, it additionally defines new methods for the generation of UMID Material and Instance Numbers. It also specifies an extension of the Source Pack to accommodate a shooting direction of a camera in addition to its position information.

Status: The group has produced a Working Draft.

DG Project: Draft ST 2088: SMPTE Essence Element Key Register Structure

This project creates a controlling standard for SMPTE ULs used as essence keys in MXF standards.

Status: The project has passed DP ballot and will proceed to ST audit.

Business Impact: Completes the set of SMPTE UL Registers.

DG Project: Revision ST 335: Metadata Element Dictionary Structure

An error was introduced which was not present in previously published versions and is in conflict with other standards.

Status: The document has been published.

WG Project: Metadata Definition

This Working Group (30MR10) coordinates a number of DG projects for adding or maintaining metadata items in registers. The registers are updated frequently to maintain accuracy as new Engineering Documents are published. As the project matures, the group is now achieving twice-yearly publication.

Status: Edition 3 of the XML registers “Ponzu” was published in July of past year. Edition 4 “Tabasco” has passed FCD ballot. Edition 5 “Sriracha” is currently collecting new entries.

Business Impact: Interoperable MXF dictionaries offer a vastly improved environment for a new generation of interoperable, table-driven MXF parsers and generators. Projects such as IMF will be able to rapidly introduce new capabilities with a minimum of interoperability issues.

SG Project: UUID File Naming

The SG will examine the use of universally unique identifiers (UUIDs) in all SMPTE Engineering Documents that currently apply them and develop an approach for both harmonizing the use cases and providing for the application of UUIDs as file names to the extent possible going forward. The Project also will provide recommendations on follow-up work needed to implement in SMPTE Engineering Documents the approach developed.

Status: The project has been approved.

Business Impact: UUIDs are widely used as identifiers in SMPTE Engineering Documents and, in some cases, are prescribed to serve as file names. In other cases, they serve as unique identifiers of files. Often, implementations of SMPTE Engineering Documents attach new UUIDs to files despite those files already being associated with assigned UUIDs.

About the Authors



Dean Bullock has been working in the cinema industry since joining Dolby Laboratories in 1996 as an embedded systems engineer working on the Dolby D-Cinema processor product line. As an engineering director, Bullock led Dolby’s Digital Cinema engineering team and then the cinema engineering quality assurance group. Currently, he is the director of technology strategy for Dolby’s Cinema Group. He has worked to implement SMPTE and other standards since starting at Dolby, and he has been actively participating in SMPTE committees since 2009. Bullock holds a BS degree in computer and electrical engineering from Purdue University, West Lafayette, IN.



Michael DeValle is the director of technology standards and strategy at the Walt Disney Studios, where he provides oversight and strategy for all standards efforts across the studio, including those related to the deployment of new technologies, such as 3D and HDR. He has been an active participant in SMPTE since 2008, having chaired or co-chaired several standards groups within SMPTE. He is a current member of the board of governors and served as a SMPTE education director from 2014 to 2016. In addition to his standards work at SMPTE, DeValle has served as the chair of the DCI Technical Committee and chairman of the Advanced Imaging Society. He is also a member of the Board of Directors of the Blu-ray Disc Association, where he has chaired several technical committees and acted as liaison to MPEG, High-Definition Multimedia Interface (HDMI) Forum, and the CTA.

File Format and Systems (31FS)

Co-Chairs: Paul Gardiner and Fred Walls

Overview

Technical Committee (TC) 31FS concerns itself with file formats and structures. This applies to the definition of the common wrapper and file structures for storage, transmission, and use in the carriage of all forms of digital content components. Well-known formats such as Digital Picture Exchange (DPX), MXF, General eXchange Format (GXF), Academy Encoding Color System (ACES), and ProRes have been studied within this TC.

Organization

TC 31FS has a number of subgroups; notably, DGs for MXF mappings, key length value (KLV) extensions for MXF, HDR extensions for DPX, and a Working Group concerned with defining and drafting the Archive eXchange Format (AXF).

Recent Publications

Over the past 12 months, TC 31FS has published the following documents:

- ST 2042-4:2018—Mapping a VC-2 Stream into the MXF Generic Container
- ST 268-2:2018—Digital Moving-Picture Exchange (DPX)—Format Extensions for High Dynamic Range and Wide Color Gamut

- RDD 48:2018—MXF Archive and Preservation Format Registered Disclosure Document

Work in Progress

Much of the recent work in the TC has involved the mappings of various codecs and metadata into the MXF wrapper format, which continues to demonstrate the ongoing significance of SMPTE's MXF standard ST 377-1. Nearing completion is a mechanism for defining new MXF KLV labels within an MXF file and a revision of ST 377-4 - Multichannel Audio Labeling Framework. Revisions in progress also include ST 380 MXF Descriptive Metadata Scheme 1 and a constrained revision of ST 2057:2011 Text-Based Metadata Carriage in MXF. Work has also taken place on a Registered Disclosure Document (RDD) on DNxUncompressed for the lossless wrapping of image essence in MXF files.

A full revision of ST 377-1 is planned so as to align it with the new SMPTE registers. Close liaison with other committees, particularly the 30MR Metadata Registries committee, ensures that the specifications form a coherent SMPTE ecosystem for media professionals.

The AXF continues to be an active, major project defining a standardized structure, semantics, and format for long-term archival of media. Work to extend and evolve AXF is on-going.

Recent new projects under way include mapping HEVC streams into the MXF Generic Container, and a Recommended Practice to provide a reference implementation and test images in support of the ST 268-2 HDR extensions to DPX.

About the Authors



Paul Gardiner studied electronic engineering at the University of Southampton before joining the U.K. Independent Broadcasting Authority in 1974. His roles in successor bodies Independent Television Commission (ITC) and Ofcom have included television technical regulation and managing

international collaborative research projects. He has also participated in the work of the International Telecommunications Union - Radiocommunication (ITU-R) for many years and has been chairing the Rapporteur Group on HDR since early 2016. He is chairman of ITU-R Working Party 6B—Broadcast Service Assembly and Access. Since joining Sony in 2007, Gardiner has been an active member of the SMPTE standards community. He is a chartered engineer and member of the U.K.'s Institution of Engineering and Technology and is an SMPTE Fellow.



Fred Walls has been working on video algorithms and architectures for set-top box ASICs with Broadcom for more than 20 years. He is recognized in the industry for his contributions to the VESA Display Stream Compression (DSC) standard, a lightweight video compression standard that has enjoyed widespread adoption in Mobile Industry Processor Interface (MIPI), DisplayPort, HDMI, and other consumer electronic interfaces. He has authored eight papers and is a named inventor on 25 issued patents. He also chairs the SMPTE 31FS HDR DPX drafting group and participates in a number of other standards organizations on behalf of Broadcom. Walls received BS and MEng degrees in electrical engineering and computer science from the Massachusetts Institute of Technology, Cambridge, MA. He enjoys volunteering with kids STEM activities and collects and repairs pinball machines.

Network/Facilities Architecture (32NF)

Co-Chairs: Thomas Kernén and Leigh Whitcomb

Overview

The 32NF technology committee covers matters supporting the infrastructures of content production and distribution facilities, including file management, transfer protocols, switching mechanisms, synchronization systems, and physical networks that are both internal and external to the facility, including final distribution methods.

Organization

The committee is divided into standing WGs, each focused on one of the following five areas:

- 6G-SDI and 12G-SDI interfaces
- All other SDI interfaces and SDI related standards
- IP interfaces
- Time labeling and synchronization
- Data on AES3.

Work Completed

The following new documents were completed during the previous year:

- OV 292-0:2018—SMPTE Overview Document—SMPTE Bit-Serial Interfaces at 1.5 Gbits/s—Roadmap for the 292 Document Suite
- ST 292-1:2018—SMPTE Standard—1.5 Gbits/s Signal/Data Serial Interface

- ST 425-5:2019—SMPTE Standard—Image Format and Ancillary Data Mapping for the Quad Link 3 Gbits/s Serial Interface
- ST 425-3:2019—SMPTE Standard—Image Format and Ancillary Data Mapping for the Dual Link 3 Gbits/s Serial Interface
- ST 2022-7:2019—SMPTE Standard—Seamless Protection Switching of RTP Datagrams
- ST 2022-8:2019—SMPTE Standard—Professional Media Over Managed IP Networks: Timing of ST 2022-6 Streams in ST 2110-10 Systems
- OV 2081-0:2018—SMPTE Overview Document—6G-SDI Bit-Serial Interfaces Roadmap for the SMPTE ST 2081 Document Suite
- ST 2081-10:2018—SMPTE Standard—2160-line and 1080-line Source Image and Ancillary Data Mapping for 6G-SDI
- OV 2082-0:2018—SMPTE Overview Document—12G-SDI Bit-Serial Interfaces—Overview for the SMPTE ST 2082 Document Suite
- ST 2082-10:2018—SMPTE Standard—2160-line and 1080-line Source Image and Ancillary Data Mapping for 12G-SDI
- RP 2091-2:2018—SMPTE Recommended Practice—Ruggedized Fiber-Optic Connectors for HDTV and UHDTV SDI—Mapping of SMPTE ST 2036-4 Data
- ST 2036-3:2018—SMPTE Standard—Ultra High Definition Television—Mapping into Single-link or Multi-link 10 Gbits/s Serial Signal/Data Interface
- ST 2108-1:2018—HDR/WCG Metadata Packing and Signaling in the Vertical Ancillary Data Space
- OV 2110-0:2018—SMPTE Overview Document—Professional Media over Managed IP Networks Roadmap for the 2110 Document Suite
- ST 2110-40:2018—SMPTE Standard—Professional Media Over Managed IP Networks: SMPTE ST 291-1 Ancillary Data

Work In Progress

32NF-40 SDI Interfaces WG (Chair: John Hudson)

Work is under way to create an engineering guide on SDI electrical interfaces and a standard for high dynamic range and wide color gamut signaling on streaming interfaces.

32NF-60 Video over IP WG (Chair: Thomas Edwards)

This WG is developing a new suite of documents (ST 2110) for live production uncompressed elementary essence flows over IP.

32NF-70 UHD-SDI Interfaces (Chair: Nigel Seth-Smith)

This WG is drafting a set of standards for aggregating multiple HD-SDI or 3G-SDI streams onto single 6G-SDI interfaces and multiple HD-SDI, 3G-SDI, and 6G-SDI streams onto single 12G-SDI interfaces.

32NF-80 Time Labeling and Synchronization (Chair: John Snow)

This WG continues its efforts on the new IP-based studio synchronization system (ST 2059) by:

- holding a series of interoperability tests ST 2059 based equipment;
- continuing to draft several engineering guides to help the industry adopt this new synchronization system;
- conducting the mandatory 1-year reviews of the ST 2059 documents.

In addition, the WG is looking at future time labeling methods. To further this effort, SMPTE conducted a series of time code summits to gather user input on a future time label.

32NF-90 WG Data on AES3 (Chair: Stan Cossette)

This WG covers all the work regarding Data on AES3 including a focus on the ST 337 family of audio interface standards.

32NF SG on Security in ST 2059

This SG was established in Q4 2018 to study security issues in the IP-based studio synchronization system of ST 2059.

About the Authors



Thomas Kernen is a staff architect at Mellanox. His main area of focus is defining architectures for transforming the broadcast industry to an All-IP infrastructure. He serves as the co-chair for SMPTE's 32NF committee and is a member of the IEEE Communications and Broadcast Societies. Kernen has served for seven years as the editor of the Digital Video Broadcasting (DVB) for the TS 101 154 Specification for the Use of Video and Audio Coding in Broadcasting Applications Based on the MPEG-2 Transport Stream supported by millions of digital receivers worldwide. In addition, he has authored over more than 20 publications in leading journals, holds 6 patents that cover both network and video coding optimizations for media transport and delivery. Kernen is a frequent speaker at leading events such as the SMPTE Annual Technical Conference, the National Association of Broadcasters, IBC and European Broadcasting Union (EBU) Network Technology Seminar. Prior to joining Mellanox, Kernen spent more than 20 years in the IP industry, including driving Cisco's entry into live media production, co-founding internet service providers, telecom carriers, and architecting fiber to the home networks.



Leigh Whitcomb is an associate architect for Imagine Communications, having joined the company in 1991. He participates in Alliance for IP MediaSolutions (AIMS), SMPTE, and Video Services Forum (VSF) standards committees, including active involvement on SMPTE ST 2110 Professional

Media over IP Networks, the SMPTE ST 2022 family of standards, and SMPTE ST 2059 Genlock over IP. A manager in the Toronto SMPTE Section, Whitcomb's other professional affiliations include VSF, IEEE, and Professional Engineers Ontario (PEO). He holds a bachelor's degree in computer engineering from the University of Waterloo, Waterloo, ON, Canada, and a master's degree in electrical and computer engineering from the University of Toronto, Toronto, ON, Canada.

Media Systems, Control and Services (34CS)

Co-Chairs: Chris Lennon and Karl Paulsen

Overview

The 34CS technology committee is responsible for matters in the areas of media services, methods of managing and controlling hardware devices and software systems, and the management of media workflow processes, including associated signaling and control mechanisms.

Work in Progress

BXF

Work on BXF 7.0 is progressing nicely. It includes J2K and UHD content delivery specification support for NABA, a comprehensive HDR structure, and many enhancements requested by a variety of participants. The group's goal is the publication of this collection of enhancements by the end of 2019. The final BXF 6.0 documents are going through their final Standards Committee audit and are expected to be published by June.

Microservices

This group's focus is on enabling interoperability among media systems using microservice-based approaches. This is a critical activity, as many media applications move to the cloud and rely on microservices to fully capitalize on this. After excellent progress on developing four potential documents, the group decided it made sense to recruit additional members to help ensure its future direction was correct,

and that it was focused on the key items required for interoperability. This has been a success. The group conducted a pair of Media Microservices Summits, held in Los Angeles on 23 May 2019 and New York on 28 May 2019. These events help to set the course for this group going forward.

Media Device Control Over IP (TC 34CS)

The TC 34CS Media Device Control Over IP DG does not work in isolation. The SMPTE ER 1003:2017 *Flow Management* SG's report urges, "... that SMPTE ... provides clarification on what the different standards and specifications apply to, what differences exist, and where they complement each other." The report also says, "Harmonization across the different industry organizations is needed." Therefore, to make the ST 2071 Media Device Control (MDC) suite more meaningful to the industry, our DG reexamined the underlying presumptions and structure of the existing ST 2071-3:2014 Media Device Control Discovery document.

Our group's part in this inter-SDO harmonization effort has been to work closely with the AES SC-02-12-L and SC-02-12-N task groups. The style and substance of our forthcoming rewrite of ST 2071-3 make it easier to see that enterprise-class device control over IP calls for a complementary stack of layered protocols. MDC complements the atomic functional controls facilitated by the 2018 re-release of AES 70. Together, these Standard suites can augment the routing functionality of the AMWA IS-04, IS-05, and IS-06 stack.

About the Authors



Chris Lennon serves as the president and chief executive officer of MediAnswers, industry experts in media software systems. MediAnswers assists suppliers, system integrators, media organizations, standards bodies, and nonprofit groups in creating, integrating, and optimizing complex software and workflow solutions. Lennon is a SMPTE Fellow and a recipient of its 2009 Society Citation.



Karl Paulsen is chief technology officer at Diversified, a full-service systems and media technology integration firm addressing the broadcast, audio/visual, IT, medical, and security market segments. Paulsen is a SMPTE Fellow, SBE Life Member, a Certified Professional Broadcast Engineer, and a feature columnist for TV Technology's section on Media and Storage Technologies.

Media Packaging and Interchange (35PM)

Chair: Pierre-Anthony Lemieux and Florian Schleich

Overview

The 35PM technology committee oversees standards for the interchange of complete audiovisual work in professional fields related to media creation, production, and post-production archiving.

The current focus of TC-35PM is the Interoperable Master Format (IMF), a suite of standards for the worldwide interchange of high-quality, component-based audio-visual masters. IMF is specified in the ST 2067 family of documents.

TC-35PM has 370+ members.

Recent Publications

ST 2067-9 Sidecar Composition Map. Defines an XML document that allows arbitrary assets, e.g., QC reports, to be associated with one or more Compositions.

ST 2067-200 DMCVT plug-in. Adds support for Dynamic Metadata for Color Volume Transform (DMCVT) to IMF applications, improving the conversion of HDR images into SDR images.

TSP 2121-1 Application DPP (ProRes). Defines an application based on SMPTE ST 2067-21 (Application #2E) and SMPTE RDD 45 Application ProRes.

Plugfests

In addition to developing engineering documents, TC 35PM organizes regular plugfests through its Plugfest DG. During a typical plugfest, participating implementations create and process IMF content defined by a set of test vectors. The objective is to identify errors in specifications, generate test content, and provide an opportunity to exercise their implementations.

A plugfest was recently held on 14 and 15 May 2019 in London, U.K.

Document Maintenance

The IMF Document Maintenance DG continuously tracks reported issues and feature requests against published IMF documents.

The DG is preparing revisions and amendments for several documents, including ST 2067-2, ST 2067-3, ST 2067-5, ST 2067-21, and ST 2067-40.

New Documents

ST 2067-201 IAB plug-in level 0. Adds support for Immersive Audio to IMF applications. The standard defines a baseline method for the carriage of SMPTE

ST 2098-2 sound essence for use with feature and episodic content in IMF compositions.

TSP 2121-4 Application Constraint DPP (JPEG 2000). Defines constraints against SMPTE ST 2067-21 (Application #2E) intended for use in the DPP domain.

Public amendment #1 to ST 2067-21. Adds support for Hybrid Log Gamma (HLG) colorimetry to SMPTE ST 2067-21 (Application #2E), under a pilot process that allows the public to experiment with proposed features.

Audio Content and Element Kind Definition. The accurate labeling of audio material is critical to allow automated processing of masters into deliverables. This effort intends to create a controlled vocabulary describing the contents of audio material, e.g., Music and Effect.

About the Authors



Pierre-Anthony Lemieux is a partner at Sandflow Consulting, where he works with both Hollywood and Silicon Valley clients on worldwide standards, proof-of-concept development, and product architecture. His expertise covers the entertainment technology ecosystem, from content authoring to playback, including audio and video and timed text, file formats, and content protection. His recent engagements include representing clients at industry forums (including SMPTE and W3C) developing standards for file-based post-production workflows, and implementing audio processing algorithms. Lemieux is an SMPTE Fellow and currently serves as a document editor for multiple SMPTE projects, in addition to chairing TC 35PM. He has a PhD degree in physics from the University of California at Los Angeles (UCLA), Los Angeles, CA, and a BSc degree from McGill University.



Florian Schleich is a technical integrations manager at Netflix, where he supports Netflix' post technology partners in their efforts to implement innovative workflows. He previously spent more than ten years at Fraunhofer, where he developed software for Digital Cinema and IMF mastering, worked with industry forums like ISDCF and IMF User Group and contributed to efforts within SMPTE TC 21 DC and TC 35PM. He holds degrees in computer science from the Nuremberg Institute of Technology and the University of Hagen, Hagen, Germany. 