

Introduction from the Standards Vice President

By Florian Schleich

Welcome to the SMPTE Standards Community progress report 2022. Due to travel restrictions, our quarterly plenary meetings have continued to be conducted entirely virtually. We are, however, planning to get back to our usual hybrid mode starting in September at the European Broadcasting Union (EBU) in Geneva. The Technology Committees were able to progress/complete ongoing work and start new projects, and you will find an overview of each Technology Committee (TC) in the following sections.

My top priority as Standards Vice President is to make our Standards (and other publications of the Standards Community) more accessible. I believe it is of critical importance that interested folks can discover and access our publications with as little friction as possible, using the tools they are used to. To make this a reality, members of the Standards Community and SMPTE staff collaborated on a landing page¹ for the Interoperable Master Format (IMF) standards suite. The landing page contains direct links to the core standards, associated GitHub issue trackers, related open-source software projects, user groups, and more. With this landing page in place, I am happy to report that searching the internet for “SMPTE IMF” followed by three clicks is all it takes to review the IMF standard for which you are looking. In this particular case, we also worked with IEEE to remove the paywall for the entire IMF standards suite, and we will collect data to understand, if and how, this impacts the consumption of our standards.

Accessibility of standards, however, is not only about access to published documents. Users and/or implementers of our standards should have defined channels to provide feedback. The Standards Committee established the Public Committee Draft (Public CD) process a few years ago to allow for public review of draft standards before finalizing them. This process is now widely adopted across several Technology Committees and documents currently posted for feedback are listed on the SMPTE website.² For published documents, we have GitHub repositories in place for ongoing issue tracking for some standards, for example, ST 2067-21,³

but more work and alignment are needed to establish a consistent approach.

To allow folks (within and outside the Standards Community) to stay up-to-date on ongoing projects, we continue to publish detailed Technology Committee outcome reports⁴ following our quarterly plenary meetings. Additionally, SMPTE Home Office is working on a public website⁵ that provides searchable information on current Standards Community projects and their status. This website will eventually also serve information on how projects are carried out in the Standards Community and provide means to get in touch to discuss proposals for new work.

The following sections will provide an overview of the work of the individual technology committees over the past 12 months. Make sure to monitor projects of interest through the mentioned project website, keep an eye out for related Public CD reviews, and consider joining the Standards Community to help create the standards of the future.

References

1. SMPTE, ST 2067–Interoperable Master Format (IMF) [Online]. Available: <https://www.smppte.org/standards/st2067>
2. Standards Document Index [Online]. Available: <https://www.smppte.org/public-committee-drafts>
3. SMPTE, ST 2067-21 [Online]. Available: <https://github.com/SMPTE/st2067-21>
4. SMPTE Technology Committee Outcome Report [Online]. Available: <https://www.smppte.org/outcome-report>
5. Standards Current Progress [Online]. Available: <https://www.smppte.org/projects>

About the Author



Florian Schleich is the SMPTE Standards Vice President and a senior software engineer at Netflix, where he develops cloud media systems to support Netflix’s studio and streaming use cases.

Essence (10E)

Co-Chairs: Lars Borg and Fred Walls

Overview

The scope of the 10E Technology Committee applies to electronic capture, generation, editing, mastering, archiving, and reproduction of images, audio, subtitles, captions, and 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.

Recent Publications

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

- RDD 58:2021 Carriage of Live Production Metadata.

Work in Progress

VC-2 Video Compression

VC-2 intraframe mezzanine video compression is based on the BBC's DIRAC pro. Revisions of RP 2047-1 VC-2 Level 64 1080p and RP 2047-3 VC-2 Level 65 high-definition (HD) with SD Infrastructure are underway. Revisions of ST 2042-1 VC-2 Video Compression, RP 2042-3 VC-2 Conformance Specification, and RP 2047-5 VC-2 Level 66 Compression of Ultrahigh-definition Video are in queue to be published.

VC-3 Picture Compression

VC-3 is an intraframe video compression format, based on Avid's DNxHD compression system. A project is underway to create an amendment to ST 2019-1:2016 VC-3 Picture Compression and Data Stream Format to add alpha support for HD profiles.

VC-5 Video Essence

VC-5 is based on the Cineform/GoPro intraframe video compression system. Revisions of RP 2073-2 VC-5 Conformance Specification and ST 2073-7:2019 VC-5 Video Essence Part 7 metadata are in queue to be published.

VC-6 Multiplanar Picture Format

VC-6 is an intraframe video compression system proposed by V-Nova. A revision to ST 2117-1 VC-6 Elementary Bitstream is underway.

Apple ProRes Format

A revision to RDD 36 ProRes Bitstream Syntax and Decoding Process is underway.

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:

- 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)
- Proposed a new document regarding display screen reflectance.

Measurement Methods for Resolution Characteristics of Camera Systems

RP 2130 Measurement Methods for Resolution Characteristics of Camera Systems will define procedures, conditions, and rules applicable to measuring the spatial resolution of camera systems. It will reflect current measurement technology, independent of the image format, and will replace IEEE 208.

IPT-PQ-C2

ST 2128 Colorimetry of IPT-PQ-C2 Color Space for High Dynamic Range and Wide Color Gamut Images defines an alternative color representation similar to $IC_{T}C_{P}$ that is used by some over-the-top (OTT) distributors. Comment resolution is underway.

Other Projects

ST 96 Scanned Image Area is being revised to improve usability and allow for future maintenance.

Revisions to ST 2046-1 Safe Action Area and Safe Title Area for Television and RP 2046-2 Safe Areas for Protection of Alternate Aspect Ratios are underway.

About the Authors



Lars Borg is a principal scientist in digital video and audio engineering at Adobe. He is a SMPTE Fellow, active in SMPTE standards committees, and chairs the SMPTE group on dynamic metadata for color transforms.



Fred Walls is a Fellow at Advanced Micro Devices working on display system architecture. He is an active standards contributor in SMPTE as well as in the High Definition Multimedia Interface (HDMI) Forum and Video Electronics Standards Association (VESA).

Film Applications (20F)

Co-Chairs: David Richards and Julian Pinn

No report—TC did not meet as of 1 June 2022

Digital Cinema (21DC)

Co-Chairs: Steve Llamb and Jack Watts

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. Three subgroups have been active at various times during the past year.

Recent Publications

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

- ST 430-14:2022—Digital Sync Signal and Aux Data Transfer Protocol
- *RDD 57 SMPTE ST 2098-2 Immersive Audio Bitstream and Packaging Constraints: IAB Application Profile 1.*

Work in Progress

21DC Document Maintenance

Given the volume of documents under the TC 21DC umbrella, a document maintenance group has been set up to manage the varying one- and five-year revision cycles required. Meeting once a month, the group focus includes new feature requests, amendment reviews to documents based on new technologies, reference dependencies, and interoperable issues encountered through practice in the field.

Drafting Group (DG)—RDD 53 DCP Hybrid Tone Mapping

A working group has been formed to address technology committee comments on both the project proposal and initial draft. This document aims to define the transportation mechanism for multiple image dynamic ranges in a Digital Cinema Package as used with a hybrid tone mapping (HTM) process.

PCD ST 429-20

This document specifies constraints on SMPTE ST 377-1 for use in D-Cinema applications. It is intended to replace references to SMPTE ST 377:2004, allowing D-Cinema to benefit from the improvements of ST 377-1:2019 while retaining compatibility with ST 377:2004.

PCD RP 428-22

The recommended practice is to create a “blank” ST 428-7 Digital Cinema Distribution Master (DCDM) Subtitle file (Minimal Timed Text XML Requirements).

Closed Group

ST 428-7 Revision (Subtitle DCDM)

ST 428-7 specifies the format of a DCDM Subtitle file, an integral component of a subtitled 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. Unfortunately, due to a lack of proponent activity and general interest within the TC, the decision was made to close the working group.

About the Authors



Steve Llamb is currently the VP, media technology standards at Deluxe. Over the past 17+ years during his time at both Deluxe and Technicolor, he has been heavily involved in the development and rollout of concepts, workflows, and standards for both D-Cinema and IMF mastering, packaging, exhibition, distribution, and key management. He helped to manage the global alignment of 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 for both Deluxe’s internal personal and Hollywood clients, as well as within various industry standards organizations and technology committees, such as SMPTE, IMFUG, EDCF, and ISDCF. He is a current co-chair of SMPTE TC 21DC (Digital Cinema), the chair of the Document Maintenance DG in TC 21DC, and the Convenor of ISO TC-36/WG 1 (Production Technology).



Jack Watts is currently an independent media technology solutions architect through his own brand Trench Digital. Having worked for globally recognized brands such as Technicolor and Deluxe, he has gathered over 15 years of experience in the media and entertainment industry and

has aided in cultivating multiple workflows and implementations still relied upon today. He has a specialist discipline in advanced formats such as Digital Cinema and IMF along with a complete understanding of their underlying and peripheral industry standards. He participates on a number of technology committees. He is based in London, U.K.

Television and Broadband Media (24TB)

Co-Chairs: Bill Miller and Bruce Devlin

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.

During this period, the work of the TC was diminishing, Bill Miller stepped down as TC chair and Bruce Devlin picked up the role as soon as he had stepped down from his role as Standards Vice President. The TC agreed to reallocate the Committee's documents to other TCs based on the following guidelines: Tape and file mapping documents moved to TC 31FS (because they are file-like), Control and Identifier data documents moved to TC 34CS (because they are control-like), Serial Digital Interface (SDI) and Internet Protocol (IP) mapping documents moved to TC 32NF (because they are network-like), and Subtitle and Essence description documents moved to TC 10E (because they are essence-like). A full list of mappings is available in the (closed) TC 24TB Team on the SMPTE Standards Knowledge Network (SKN).

The historical work of the TC remains accessible in the SKN.

Recent Projects

Active Format Description

The current revision of ST 2016-1—Format for Active Format Description and Bar Data was deemed ready for the ballot and includes UHD TV formats.

Care and Preservation of Audio Magnetic Recordings

RP 190:1996—SMPTE Recommended Practice—Care and Preservation of Audio Magnetic Recordings needs revision. The work has been moved to TC 10E and liaise with the Audio Engineering Society (AES) was started to ensure good collaboration on an update.

Future Work

Will be conducted in other technology committees.

About the Authors



William C. Miller is the president of Miltag Media Technology, LLC, a consultancy specializing in technical standards for television and related industries. He is a SMPTE Fellow and has served as an officer and governor of the Society for many years.



Bruce Devlin is the past SMPTE Standards Vice President, the founder of Mr MXF, and has enjoyed C-level positions in media companies over the years. He is known for his work on Material Exchange Format (MXF) and is a recognized world expert in media files, formats, and IP transport systems.

Cinema Sound Systems (25CSS)

Chair: C. J. Flynn

Overview

The 25CSS technology committee addresses standards for cinema sound. Topics include:

- Theater acoustics
- Sound system architecture and performance
- Measurement techniques
- Calibration specifications
- Immersive audio, immersive sound systems, and their interoperability.

The overall goal is to improve the quality, consistency, and interoperability of sound in cinema spaces.

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.

Work in Progress

ST 2095-1:2015 Calibration Reference Wideband Digital Pink Noise Signal Revision Project (Chair: C. J. Flynn)

This project is currently in the FCD process after 11 meetings. Purpose: Revise a number of language and technical grammar issues in the standard, most notably in the recognition of a known 3 dB difference between two different industry use cases of the dBFS units. The associated python script available with the Standard has been modified to work properly with Python 3. The actual Pink Noise Signal was not revised.

ST 2098-2:2021 Immersive Audio Bitstream Specification Revision Project (Chair: C. J. Flynn)

This project is through the ST Review, advancing to the publishing process. The actual Immersive Audio Bitstream was not changed, though 18 major and minor errors and inconsistencies have been corrected.

Cinema B-Chain Characteristics and Expectations Working Group (Chairs: Brian Vessa, C. J. Flynn)

The purpose of the B-chain Characteristics and Expectations Working Group is to specify the parameters and values required for a cinema sound system to faithfully play back modern movie soundtracks in dubbing theaters and cinemas, especially given the now common sustained high levels and transients. The planned output is an RP and possibly an EG for cinema audio systems similar to ST 431-2 D-Cinema Quality—Reference Projector and Environment which defines the characteristics necessary of a reference projector that displays D-Cinema image content.

Using the report of a previous SG as input, the WG now consists of three interacting DGs:

- *B-Chain Characteristics Technical Documents DG*, chaired by Neil Shaw, researches and organizes existing and developing audio perception and measurement literature, citing relevant text to inform the overall work.
- *B-Chain Characteristics Clip Analysis DG*, chaired by Brian Vessa, subjectively analyzes and documents the playback of licensed audio clips from modern soundtracks that are known to be difficult to reproduce with standard systems, but have great nuance in review rooms. The task is to subjectively listen, name, and catalog the characteristics of both the excellent qualities and the various failures that we hear against the expectations of the director's intent.
- *B-Chain Characteristics In-Situ Analysis DG*, (Chair: vacant), using the Characteristics and Expectations Report from Clip Analysis, and other new techniques researched from Tech Documents, this group determines what relevant cinema sound system parameters can and should be measured, and how to best perform these measurements on an installed system. It will also determine a set of measurement techniques that can be performed with reasonably priced equipment by reasonably trained technical staff.

About the Author



The analog-to-digital transitions that evolved into D-Cinema began in earnest with recording studio technology in the mid-1970s, where *Charles 'CJ' Flynn* began his apprenticeship. Since then, he has managed companies, marketed, sold, installed, trained customers on, and supported high-tech audio, picture, and automation products, which have ridden upon that digital conversion wave—from Shenzhen to Sligo.

Metadata and Registers (30MR)

Co-Chairs: Dean Bullock and Phil Warren

Overview

The scope of the 30MR technology committee applies to the definition and implementation of the SMPTE Registration Authority, used to identify digital assets and associated metadata. Additionally, the common definition of metadata semantic meaning across multiple committees.

Recent Publications

WG Project: ST 2123 SMPTE Metadata Registers

ST 2123 is the normative publication of the SMPTE Metadata registers published at www.smpre-ra.org. The “Sriracha” version was published as ST 2123:2021-08.

DG Project: ST 330 Unique Material Identifier (UMID)

ST 330 defines the format for the SMPTE UMID. The UMID provides a method of identification for instances of audiovisual material allowing the material to be linked with its associated metadata. ST 330 was revised to specify new methods of the generation of UMID material and instance numbers, update the description of a shooting direction of a camera, and to apply changes noted in the document review process.

Work in Progress

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: “Vindaloo” is currently in the ballot process.

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 minimal interoperability issues.

WG Projects: ST 335, ST 395, and ST 400 Revision

This set of projects will produce updated versions of ST 335, ST 395, and ST 400. The documents will be updated to normalize each of them with the new process described in AG-18.

Status: ST 335 has entered the ballot phase and work is ongoing for the other documents in the set.

Business impact: The current revisions of ST 335, ST 395, and ST 400 include prose that is no longer relevant and possibly confusing. Updating these documents supports the transition to the new register publication process.

DG Project: RP 205 UMID Applications Revision

This project will produce an updated version of RP 205, titled “Application of UMIDs in Production and Broadcast Environments.” The document will be updated to add UMID application examples in accordance with the recent ST 330 revision.

Status: Work is ongoing.

DG Project: ST 2029 Uniform Resource Names for SMPTE Resources

This project will revise ST 2029 to add a method of representing the YANG data model in the SMPTE URN space.

Status: The DG has provided a revised copy of ST 2029 to TC 30MR for pre-FCD review, and the document is expected to enter the ballot phase shortly.

Business impact: This change supports work ongoing in 32NF.

DG Project: ST 331 Element and Metadata Definitions for the SDTI-CP

This project will revise ST 331 to add a definition for PTP Timestamp as specified in IEEE 1588-2019.

Status: Work is ongoing.

Business impact: Applications producing essence and/or metadata created at times that cannot be represented using either SMPTE ST 12-1 or SMPTE ST 209 metadata, but that could be represented using a standard PTP timestamp, will be able to carry that timestamp as SDTI-CP metadata once this work is complete.

SG Project: UMID Applications

The SG will examine the current use of UMID in the industry and propose projects to modify existing UMID standards.

Status: Work is ongoing.

SG Project: UUID File Naming

The SG will examine the use of 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 SG is meeting regularly and reported at the last TC 30MR plenary that they are considering a proposal to increase the scope of the project due to early findings by the group.

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 Universal Unique Identifiers (UUIDs) to files despite those files already being associated with assigned UUIDs.

About the Authors



Dean Bullock works for Dolby Laboratories in the Office of the CTO as Director, Media Technology & Standards. He started working in the cinema industry in 1996 as an engineer on the Dolby Cinema Processor product line. He has been participating in SMPTE committees since 2009 and currently chairs the 30MR Technology Committee and serves as a Standards Director.



Phil Warren is an engineer in the field of image research and has been with Dolby Labs since 2010. He is fascinated by the development of the visual medium as an art form via technology and enjoys exploring the application of hyperspectral capture in photography.

File Format and Systems (31FS)

Co-Chairs: Tatsuji Yamazaki and Wolfgang Ruppel

Overview

The 31FS technology committee 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 DPX, MXF, GXF, Archive eXchange format (AXF), and ACES have been studied within this TC.

Organization

TC 31FS has a number of subgroups, notably DGs for MXF mappings, KLV extensions for MXF, reference materials for HDR DPX, and a Working Group concerned with defining and drafting the Archive eXchange Format.

Recent Publications

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

- ST 377-4:2021 MXF Multichannel Audio Labeling Framework
- ST 377-41:2021 MXF Multichannel Audio Controlled Vocabulary
- ST 377-42:2021 MCA Label Controlled Vocabulary

- Public CD RP 268-3 Reference Materials for DPX 2.0 HDR Implementations, <https://github.com/SMPTE/rp268-3>.

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. Active projects include mapping VC-6 (ST 2117-1) codestreams into MXF and mapping metadata-guided audio (MGA) signals into MXF. The work on two MGA-related standards has been completed, and the documents are expected to be published soon: ST 2127-1 defines the generic metadata format-agnostic MGA mapping, and ST 2127-10, which is a specialization for the mapping of MGA with S-ADM metadata. An amendment to ST 2019-4 is underway to add alpha support to the VC-3 mapping to MXF. Two ACES documents have been revised to conform to ISO guidelines: ST 2065-4, describing the ACES container file format; and ST 2065-5, describing the mapping of ACES images to MXF. RDDs have been developed that describe ARRI camera metadata and map ARRIRAW essence to MXF, both documents are close to publication. Additionally, RDD 48 is being extended to support mapping FFV1 bitstreams to MXF, a related amendment is about to be published. Revisions are in progress for ST 380 MXF Descriptive Metadata Scheme 1, ST 2057:2011 Text-Based Metadata Carriage in MXF, ST 2094-2 KLV encoding and MXF mapping of DMCVT metadata, ST 382 AES3 and Broadcast Wave Audio MXF mapping, ST 422 JPEG 2000 MXF mapping and ST 377-1 MXF File Format Specification. Also, an amendment is in progress for ST 385 SDTI-CP in MXF.

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 has continued during the reporting period, particularly in the area of expanding the carriage of metadata.

An amendment for ST 268-2 HDR DPX to add the IANA MIME Type registration template has been almost finished, and a Public Committee Draft of RP 268-3, Test Materials for HDR DPX, has been published.

About the Authors



Tatsuji Yamazaki has been working at Sony since 1990. He is currently the standards manager. He has worked as a hardware design engineer, a software design engineer, and a software project leader of professional video products.



Wolfgang Ruppel is a digital technology expert and industry consultant with more than 20 years of experience in broadcast and media. His current research areas include mastering workflows and file formats, artificial intelligence for video production, and streaming technologies.

Network/Facilities Architecture (32NF)

Co-Chairs: Bruce Devlin 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.

During this period, the core work on Video, Audio, Metadata, & Timing of ST 2110 is largely completed. Work on SDI interfaces is reducing and this results in some structural rearrangement of the working groups. New IP payloads continue to be mapped, the importance of live metadata appears to be increasing and interoperability with other organizations such as the IEEE for PTP is increasingly important.

Organization

The committee is divided into standing working groups, each focused on one of these four areas:

- All 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:

- ST 2038:2021—SMPTE Standard—Carriage of Ancillary Data Packets in an MPEG-2 Transport Stream
- EG 2111-3:2021—SMPTE Engineering Guideline—10G-SDI Standards Roadmap
- EG 2111-1:2021—SMPTE Engineering Guideline—SD-SDI and HD-SDI Standards Roadmap
- ST 2059-1:2021—SMPTE Standard—Generation and Alignment of Interface Signals to the SMPTE Epoch
- ST 2059-2:2021—SMPTE Standard—SMPTE Profile for Use of IEEE-1588 Precision Time Protocol in Professional Broadcast Applications

- SMPTE ST 2110-43:2021—SMPTE Standard—Professional Media Over Managed IP Networks: Timed Text Markup Language for Captions and Subtitles.

Work in Progress

32NF Document Maintenance WG (Chair: Thomas Kernen)

This working group collects and recommends dispositions for, issues reported against published documents managed by TC 32NF. Issues include defects as well as potential improvements.

32NF-40 SDI Interfaces WG (Chair: Kent Terry)

This working group creates and maintains engineering documents for SDI interfaces and SDI-related standards. The activities from 32NF-70 UHD-SDI interfaces have been merged into this working group. Five-year revisions of the 6G-SDI and 12G-SDI electrical standards are now required and are underway.

32NF-60 Video Over IP WG (Chair: John Mailhot)

This working group concentrates on live video-over-IP documents, including the ST 2110 suite for live production uncompressed elementary essence flows over IP. The group is currently working on the one-year review of many of the ST 2110 publications. Work has begun on the Protocol Implementation Conformance Statement (PICS) project for ST 2110-10, -20, -21, -30, -31, -40.

- ST 2110-10 System Timing and Definition: One-year review
- RP 2110-11—SMPTE 2110 System Timing Planes
- ST 2110-20 Uncompressed Active Video: One-year review
- ST 2110-21 Traffic Shaping and Delivery Timing for Video: One-year review
- ST 2110-22 Constant Bit Rate Compressed Video: One-year review
- RP 2110-24 Standard Definition Video in ST 2110
- RP 2110-25 Measurement Considerations for 2110-20 streams
- ST 2110-30 PCM Digital Audio
- ST 2110-31 AES Transparent Transport: One-year review
- ST 2110-40 SMPTE ST 291-1 Ancillary Data: One-year review
- ST 2110-41 Fast Metadata eXpress (FMX)
- ST 2110-42 FMX Payload for ST 2110 Technical Metadata
- ST 2127 Mapping MGA Audio Metadata to ST 2110-41.

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

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

- Conducting a review of the published ST 2059 documents against IEEE 1588-2019

- Drafting EG 2059-14 on best practices for large-scale PTP implementations
- Drafting RP 2059-15 PTP Monitoring YANG data model. Two Public Committee Drafts were issued
- Planning additional interoperability tests for ST 2059-based equipment
- Drafting the Extensible Time Label (TLX)
 - ST 2120-1—Extensible Time Label—TLX Structure
 - ST 2120-2—Extensible Time Label—TLX Items (includes a JSON schema element ST 2120-2a)
 - ST 2120-3—Extensible Time Label—TLX Profiles
 - ST 2120-4—Extensible Time Label—TLX KLV Encoding and MXF Mapping.

32NF-90 WG Data on AES3 (Chair: Kent Terry)

This working group has responsibility for protocols utilizing AES3 for the transport of data with a focus on the ST 337 family of audio interface standards. Work is pending on defining the transport of MPEG-H audio data in AES3.

32NF SG on Security in ST 2059 (Chair: John Naylor)

This SG was established in Q4 2018 to study security issues in the IP-based studio synchronization system of ST 2059. Current work is on the third report on new security features.

32NF DG Inter Entity Trust Boundary (Chair: Daniel Lynch)

This DG was established in Q4 2020 to define a Recommended Practice to securely exchange IP flows between third-party networks in a predefined architecture using existing IP protocols.

About the Authors



Bruce Devlin is a leading technologist at SMPTE, founder of Mr MXF, and has enjoyed award-winning C-level positions at media companies over the years. He literally wrote the book on MXF and is a recognized world expert in media files, formats, and IP transport systems. Check out his free Bruce's Shorts video series to improve your skills in the business of

media technology.



Leigh Whitcomb is an architect for Imagine Communications, Toronto, ON, Canada, having joined the company in 1991. He participates in SMPTE, Alliance for IP Media Solutions (AIMS), Institute of Electrical and Electronics Engineers (IEEE), and Video Services Forum (VSF)

standards committees.

Media Systems, Control, and Services (34CS)

Co-Chairs: Paul Gardiner and Karyn Reid

Overview

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

Organization

The work of TC 34CS currently covers four areas of activity. Three DGs are dealing with the Broadcast Exchange Format (BXF), Media Microservices, and a UMID Resolution Protocol respectively. In addition, there is an SG on Required Application Protocol Standards for IP-Based Media Production.

Recent Publications

Over the past 12 months, TC 34CS has published revisions of Broadcast Exchange Format (BXF) documentation to add a wide range of schema improvements in BXF 8.0:

- ST 2021-4:2022 BXF Schema Documentation—Revision (BXF 8.0)
- EG 2021-3:2022 BXF—Revision (BXF 8.0).

Work in Progress

The BXF DG is considering a new phase of work to develop additional functionality for a prospective BXF 9.0.

Work in conjunction with the Open Services Alliance for Media (OSA) is ongoing to create a standardized suite of microservices standards and related resources, including registers and controlled vocabularies to target interoperability of media systems. Former Public Committee Draft ST 2125 IMF Registration API has resumed its journey through the standardization process, taking into account issues raised during its Public CD phase. Draft ST 2126 Microservices Status Reporting and Logging Work is to remain a Public Committee Draft until the planned new ST 2132 Media Microservices Terminology is closer to maturity. Also in development is ST 2133 Job Processing Architecture, while future microservices activity is anticipated in the areas of privacy and security.

With a business focus in mind, the SG on Required Application Protocol Standards for IP-Based Media Production has been considering standards requirements for interoperability of production applications running on IP-based media networks. The group has developed a high-level media services capability model alongside a range of production application use cases, with the objective of producing a media industry

layering model to categorize and evaluate standards and interoperability opportunity gaps. An Engineering Report is nearing completion.

There are also plans to work towards a new SMPTE standard to specify a UMID resolution protocol as a method for converting a given UMID into the corresponding URL of its audiovisual (AV) material uniquely identified by the UMID.

About the Authors



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

projects. He has also participated in the work of the International Telecommunication Union—Radiocommunication (ITU-R) for many years and is the Chairman of ITU-R Working Party 6B—Broadcast service assembly and access. He is a chartered engineer and a member of the U.K.'s Institution of Engineering and Technology and is a SMPTE Fellow.



Karyn Reid worked at several TV networks and local TV and radio stations before moving to the broadcast vendors VCI and later Peter Storer and Associates. She has implemented traffic systems across North America, focusing on integration with playout systems and broadcast

workflows. She later joined the Cognizant Media and Entertainment practice as a broadcast consultant working with major media companies. Karyn is an original member of the SMPTE BXF committee. She has presented at industry conferences including NAB, MFM, the PBS Tech conference, and various vendor client conferences.

Media Packaging and Interchange (35PM)

Co-Chairs: Mitch Jacobs and Raymond Yeung

Overview

The 35PM technology committee on media packaging and interchange 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 audiovisual masters. IMF is specified in the ST 2067 family of documents.

TC 35PM has ~270 members.

New Projects

- ST 2067-205 IMF Auxiliary Image Sequence Plug-in: IMF Plug-in for Auxiliary Image Sequences as Track Files in IMF Compositions.

Public Committee Drafts

Pioneered by TC 35PM, the Public CD process was established to allow for a public review period before engineering documents reach Final Committee Draft status (after which making substantial changes becomes increasingly complex).

- RDD 59-1/59-2 IMF Application Constraint DPP: Transitioning of the TSP 2121 document series to a series of RDDs, which specifies IMF Applications that satisfy the business requirements of the DPP membership.
- ST 2067-21 IMF Application #2E (Revision): To add support for image codestreams in High Throughput J2K (HTJ2K) and rollup an Amendment to include Hybrid Log-Gamma (HLG).

Documents in Development

The following Engineering Documents are being developed as standards by the assigned DGs.

- ST 2067-60 IMF Application #6 UHD TV program workflow: A specialization of the IMF framework to improve UHD TV program workflows in broadcasting stations.
- ST 2067-70 IMF Application of ST 2019-1 (VC-3): IMF Application with support for image essence that conforms to VC-3 as specified in SMPTE ST 2019-1 and ST 2019-1 Amd1.
- ST 2067-203 IMF Audio with Frame-based S-ADM Metadata Plug-in: IMF Plug-in for adding MGA with S-ADM metadata as Virtual Tracks to IMF Compositions.
- ST 2067-204 IMF Audio with ADM Metadata Plug-in: IMF Plug-in for adding Audio Definition Model (ADM) metadata to PCM essence as Virtual Tracks to IMF Compositions.

Document Maintenance

The document maintenance DG continuously tracks issues against published IMF documents and is currently preparing revisions for the following documents:

- ST 2067-102 IMF OPL Common Image Pixel Color Schemes: To support additional pixel color schemes introduced in the revision of IMF Application #2E.

Output Profile List (OPL)

The TC 35PM OPL DG is working on the following projects:

- ST 2067-101 Common Image Definitions and Macros (Revision): To add common image processing operators to the OPL suite of macros.
- ST 2067-104 Composite and Blend Macros: OPL operators for image compositing and blending.
- ST 2067-105 Output Macros: OPL operators to export industry file formats such as ISO BMFF, TTML, AMWA AS-11, PCM essence in ISO BMFF, and immersive audio in BWF+ADM.
- ST 2067-106 Essence Type Transform Macros: OPL operators to transform essences such as timed-text rasterization and IAB rendering.
- ST 2067-202 Isochronous Stream of XML Documents Plug-in: Conversion of SMPTE RDD 47 to a standard for frame-based XML documents as Virtual Tracks in IMF Compositions.

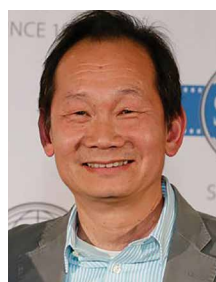
Plugfests

Plugfests are organized on an ad-hoc basis to allow verification of interoperability between implementations and to identify errors or ambiguities in specifications. The plugfest DG is accepting test vector submissions year-round.

About the Authors



Mitch Jacobs is an executive director at Disney Studios, where he guides mastering and finishing technologies, with a focus on enhancing existing and future production and post-production technologies/processes through engineering and technology innovation.



Raymond Yeung is the head of tech standards at Amazon Studios Technology, where he serves in the Media Engineering and Innovation Group. For the last two decades, he has been actively engaged in the technical and production advancement of digital mastering for feature films and television—from digital intermediates to theatrical and home distribution. He is a member of the Academy of Motion Picture Arts and Sciences and a SMPTE Fellow.

Joint ETC Task Force on Artificial Intelligence and Media (JT-AI)

Co-Chairs: Yves Bergquist and Fred Walls

Overview

The Joint ETC Task Force on Artificial Intelligence and Media is an exploratory group interested in identifying and pursuing opportunities for standardization around artificial intelligence (AI) and its potential applications throughout the media ecosystem.

Organization

The Joint Task Force was formed in 2020 in cooperation with the Entertainment & Technology Center (ETC) at the University of Southern California. The ETC is a research center that brings together senior executives, innovators, thought leaders, and catalysts from the media, entertainment, consumer electronics, technology, and services industries along with the academic resources of USC to explore and act upon topics and issues related to the creation, distribution, and consumption of entertainment content. Participation in the Task Force is open to any interested standards-participating SMPTE members.

Recent Publications

AI Ethics Primer (white paper).

Work in Progress

The Joint Task Force is primarily working toward two goals:

- Identifying areas where new AI standards might provide significant value as far as enabling greater or better use of AI in the media ecosystem
- Drafting and publishing an Engineering Report that details the findings of the Task Force.

In late 2020, the Joint Task Force conducted an industry-wide survey to assess application areas and pain

points of AI and machine learning in the production, distribution, and consumption of media. Concurrently, the Task Force also reached out to a number of other standards organizations to assess what kind of standardization activities are underway in this area.

The ETC has facilitated a number of roundtable discussions with industry thought leaders in the areas of data, ontologies, AI ethics, platform performance and interoperability, and organizational and cultural integration. As a product of those discussions, the ETC has published a white paper on AI ethics that will eventually be integrated into the Engineering Report.

It is hoped that the Task Force can also provide a launching point for future SMPTE standards and recommended practices related to AI and media. We are actively looking for use cases where SMPTE can play a role in improving interoperability for AI-enabled systems.

About the Authors



Yves Bergquist is an AI researcher and the director of the “AI & Neuroscience in Media” Project at the University of California’s (USC’s) Entertainment Technology Center (ETC), where his team is researching new methods and applications drawn from AI and neuroscience for the media and

entertainment industry.



Fred Walls is a Fellow at Advanced Micro Devices working on display system architecture. He is an active standards contributor in SMPTE as well as in the High Definition Multimedia Interface (HDMI) Forum and Video Electronics Standard Association (VESA).