

Digital Cinema Applications (21DC)

Dave Schnuelle, Chair; John Hurst, Co-chair

The charter of 21DC is to develop the standards for D-Cinema as they apply to the application of mastered essence to theatrical digital distribution and exhibition, including compression, encryption, wrapping, marking, packaging, media, logging, playout, projection, reproduction, and related topics. 21DC is organized into two broad-based working groups and several more narrowly focused ad hoc groups. The working groups are Mastering, which covers preparing the distribution master, and Exhibition, which covers those aspects inside the cinema, including projection and security. Within the past year, a third working group on distribution was closed down, its work being nearly complete; its remaining tasks were assumed by the Packaging ad hoc group.

Over the past year, more standards for D-Cinema were published, culminating in the April 2008 Standards CD from the SMPTE Store, which for the first time includes all standards necessary to implement an interoperable D-Cinema system. Keeping in mind that D-Cinema is an entirely new application of technology, the lack of interoperability issues in the ongoing deployments is remarkable. We continue to see active participation in the standards-setting process by at least 10 playback server manufacturers and 4 projector manufacturers, as well as many end users representing exhibitors and content owners. This active participation by manufacturers and end users is indispensable to making standards that work.

In the previous progress reports, the publication of the initial core standards for creating and distributing a D-Cinema program was described. Over the past year, those standards have been extended to include a set of subtitle and captioning standards, and ancillary standards including additional frame rates for D-Cinema presentations. Those standards are listed in the following sections.

SERIES 428: D-CINEMA DISTRIBUTION MASTER

Part 6: RP Digital Leader
Part 10: STD Closed Caption and Closed Subtitle
Part 11: STD Additional Frame Rates for D-Cinema

SERIES 429: D-CINEMA PACKAGING

Part 2: STD DCP Operational Constraints
Part 4: STD MXF JPEG 2000 Application Amendment 1
Part 12: STD Caption and Closed Subtitle

SERIES 430: D-CINEMA OPERATIONS

Part 1: STD Key Delivery Message Amendment 1
Part 7: STD Facility List Message

STAND-ALONE DOCUMENTS

427: STD Link Encryption for 1.5 Gb/s Serial Digital Interface

STUDY GROUP REPORTS

White Gamut Practices Study Group Report

With these basic documents being proven in field implementations, 21DC continues to work on revisions and enhancements to the main standards. Studies and development are under way, especially in the area of stereoscopic subtitles. Also, with the completion of demonstrations of the impact of the recommendations of the White Gamut Practices Study Group, work on revising the Reference Projector recommended practice can begin.

Considering that D-Cinema technology is beginning to mature, the basic goal of the standards is to ensure interoperability in D-Cinema presentations, with the key tenet that a single distribution method can be exhibited in any theater, just as in film exhibition. Realizing that the technology may change, we consider it our responsibility to provide a stable set of standards to which equipment can be built, with critical attention to backwards compatibility: new standards or revisions of standards must provide the desired new features while not making thousands of units in the field obsolete.

The technology committee on Digital Cinema Applications will continue to provide standards and recommendations to ensure interoperability, compatibility, performance and support for future innovation in the D-Cinema industry.



Dave Schnuelle represents Dolby Laboratories as senior director image technology, and is responsible for guidance in Dolby's efforts in the television, cinema, and consumer imaging areas. He began his career in 1969 as an engineer on television outside broadcasts while attending Purdue University. Schnuelle later held positions as chief engineer and director of engineering at various post-production facilities such as Image Transform and Modern VideoFilm in Los Angeles. Working with Lucasfilm's THX Division, beginning in 1991, Schnuelle was responsible for founding the THX Digital Mastering Program for quality assurance of home video masters and duplicated software. As director of technology for THX, he directed research efforts into new technology for cinemas. During that period, he directly supervised the international digital cinema exhibition of the new *Star Wars* movies—*Episode 1* (1999) and *Episode 2* (2002). Schnuelle holds four patents on imaging and audio technology and has been deeply involved with film and television standards activities for 30 years, publishing and presenting many papers over that period. Schnuelle is a SMPTE Fellow.



John Hurst is co-founder and chief technology officer of CineCert, LLC, an internationally recognized developer of digital cinema technology, where he is currently engaged in the development of the D-Cinema Comprehensive Test Plan for Digital Cinema Initiatives (DCI). Hurst has been an active participant in the SMPTE DC28 Technology Committee, and has served as editor of several of the standards published by that committee. He has over 25 years of experience in sound recording and post-production, including the design and construction of well-known recording studios and post-production sound facilities in the Los Angeles area. He has technical responsibility for many location recordings and live-to-air broadcasts. Hurst is a member of the Audio Engineering Society and is an active radio amateur and community volunteer.

Television Applications (22TV) **Michael Dolan, Chair**

OVERVIEW

The 22TV technology committee covers the application of mastered essence to television distribution, including compression, encryption, wrapping, marking, packaging, media, control, display presentation, reproduction, and related topics.

ORGANIZATION

Most work to date has been organized as individual, project-oriented study groups, or ad hoc groups that are somewhat transient.

ACTIONS AND PUBLICATIONS

The following projects concluded in the past year and the work has been published: RP 201 (Lambhead) was revised to add support for 2-perf 35mm format. RP 215 (Lambhead) was revised to add support for progressive video formats, ASC color decision list, and alternative mapping for non-film applications. 2038 (Goldman) was created to define the mapping of VANC data packets to the MPEG-2 Transport. 370M (Wus) was amended to correct a few errors in a table. RP 168 (Bancroft) was revised to enhance and harmonize it with SMPTE 425 and 318. 273M, RP 197, and EG 25 have all been archived. 2016-1, 2016-2, 2016-3, 2016-4, RP 2007, and RP 2027 were all re-affirmed.

An Advisory Note was published clarifying ambiguous language in SMPTE 2016-1 and 2016-3 regarding VANC carriage.

WORK IN PROGRESS

Lip Sync Standards and Practices (Jones)

This group is preparing a report on the status of the industry on lip sync (audio/video synchronization) and is starting to draft new standards to address some of the facility domain issues.

Image Formatting Amendments (Jones)

This group is amending 2016-1 and 2016-3 to address VANC carriage issues outlined in the Advisory Note published on the SMPTE website.

RP 168 Amendment (Bancroft)

This group is amending the new RP 218 to address interim progressive timing.

RDD on Dolby-E (Lyman)

This new RDD provides recommendations on the carriage of Dolby-E with more video frame rates.