

Digital Cinema Initiatives, LLC

Digital Cinema Object-Based Audio Addendum

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Digital Cinema Initiatives, LLC, Member Representatives Committee

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Digital Cinema Object-Based Audio Addendum

1. Introduction

Object-based audio formats that utilize new methods for delivering audio essence to the theater have come to market. This document is a specification for packaging, distribution and theatrical playback of object-based motion picture D-Cinema audio content that exceeds the delivery capability of the Digital Cinema Package (DCP) audio track file as defined in DCI's *Digital Cinema System Specification* (DCSS)¹.

This specification provides requirements that will assure interoperability of object-based audio content while maintaining the current DCSS compliant architecture and KDM structure, recognizing that the D-Cinema industry is necessarily constrained by an existing installed base of equipment.

The rendering of object-based audio into a specific sound reproduction format is proprietary to manufacturing companies and is not addressed in this document. *Though object-based audio rendering may be carried out differently by individual systems, it is required that said audio in the DCP be interoperable within all DCSS compliant architectures that support object-based audio.*

This document shall be integrated into DCI's Digital Cinema System Specification.

DCI continues to study the long-term needs for object-based audio content and may expand upon the parameters contained herein.

2. Object-Based Audio Essence Definition

Object-Based Audio Essence (OBAE) is any audio essence that is comprised of both PCM audio essence and associated descriptive metadata, including temporal and spatial metadata. The associated descriptive metadata, combined with the audio essence to which it refers, allows the "object" to be reproduced from any desired location in the sound field and with the desired characteristics.

3. Requirements for DCSS Compliance

The following five sections establish the requirements to assure interoperability with and continued compliance to this DCSS.

3.1. Essence Format

~~The OBAE shall be represented in a common format standardized by SMPTE² that is interoperable with the DCSS architecture conform to SMPTE ST 2098-2 Immersive Audio Bitstream~~

¹ ~~Digital Cinema System Specification, Version 1.32 with Errata as of 30 August 2012 Incorporated, approved 10 October 2012 27 June 2018.~~

² ~~Society of Motion Picture and Television Engineers.~~

Specification. Said OBAE format shall be interoperable amongst OBAE rendering systems, independent of a specific rendering system.

3.2. Packaging

OBAE shall be carried in a dedicated track file ~~consistent with DCSS section 5.3.1. Said track file shall be carried within the DCP in a non-proprietary manner using existing DCSS packaging methodology per SMPTE ST 429-18 D-Cinema Packaging – Immersive Audio Track File and shall be packaged consistent with all provisions of SMPTE ST 429-19 D-Cinema Packaging – DCP Operational Constraints for Immersive Audio.~~

3.3. Security

Consistent with DCSS ~~s~~Section 5.3.1.8, OBAE track files are required to provide for encryption if the content provider chooses to use such methods.

In accordance with the security methodology defined in the DCSS, OBAE content keys shall be KDM-borne, not leave the Media Block, and OBAE decryption shall occur within the Media Block.

OBAE content keys shall be associated with the “MDEK” KeyType per SMPTE ST 430-1.

3.4. Forensic Marking

Forensic marking of audio created from OBAE shall be permanently associated with the Media Block that decrypts the OBAE. Such forensic marking shall adhere to the same requirements as non-OBAE audio as given in ~~this specification~~the DCSS.

In all cases of audio forensic marking, the forensic mark shall be recoverable from the recording pursuant to the audio security forensic requirements of the DCSS.

All audio signals derived from encrypted OBAE that exit the Media Block shall have audio forensic marking applied, unless disabled pursuant to the following:

The application of forensic marking to audio created from OBAE shall be disabled by the presence of the appropriate flag defined in SMPTE ST 430-1 D-Cinema Operations – Key Delivery Message. The use of said flag shall be determined by the Rights Owner.

3.5. Output

~~Audio~~OBAE shall be rendered within the type 1 SPB perimeter of the Media Block and shall be output from the Media Block to the theater audio system using the AES3 audio links, Ethernet or specific links for object-based audio.