NOTICE

Digital Cinema Initiatives, LLC (DCI) is the author and creator of this specification for the purpose of copyright and other laws in all countries throughout the world. The DCI copyright notice must be included in all reproductions, whether in whole or in part, and may not be deleted or attributed to others. DCI hereby grants to its members and their suppliers a limited license to reproduce this specification for their own use, provided it is not sold. Others should obtain permission to reproduce this specification from Digital Cinema Initiatives, LLC.

This document is a specification developed and adopted by Digital Cinema Initiatives, LLC. This document may be revised by DCI. It is intended solely as a guide for companies interested in developing products, which can be compatible with other products, developed using this document. Each DCI member company shall decide independently the extent to which it will utilize, or require adherence to, these specifications. DCI shall not be liable for any exemplary, incidental, proximate or consequential damages or expenses arising from the use of this document. This document defines only one approach to compatibility, and other approaches may be available to the industry.

This document is an authorized and approved publication of DCI. Only DCI has the right and authority to revise or change the material contained in this document, and any revisions by any party other than DCI are unauthorized and prohibited.

Compliance with this document may require use of one or more features covered by proprietary rights (such as features which are the subject of a patent, patent application, copyright, mask work right or trade secret right). By publication of this document, no position is taken by DCI with respect to the validity or infringement of any patent or other proprietary right. DCI hereby expressly disclaims any liability for infringement of intellectual property rights of others by virtue of the use of this document. DCI has not and does not investigate any notices or allegations of infringement prompted by publication of any DCI document, nor does DCI undertake a duty to advise users or potential users of DCI documents of such notices or allegations. DCI hereby expressly advises all users or potential users of this document to investigate and analyze any potential infringement situation, seek the advice of intellectual property counsel, and, if indicated, obtain a license under any applicable intellectual property right or take the necessary steps to avoid infringement of any intellectual property right. DCI expressly disclaims any intent to promote infringement of any intellectual property right by virtue of the evolution, adoption, or publication of this document.
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).

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.

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 SMPTE that is interoperable with the DCSS architecture. Said OBAE format shall be interoperable amongst OBAE rendering systems, independent of a specific rendering system.

---

2 Society of Motion Picture and Television Engineers.
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.

3.3. Security

Consistent with DCSS 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.

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.

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.

3.5. Output

Audio 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.