

# Digital Cinema Multiple Media Block (MMB) Architectural Description

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Digital Cinema Initiatives, LLC, Member Representatives Committee

The existing DCI Digital Cinema System Specification (DCSS) security architecture is based on a single Image Media Block (IMB) per projector per auditorium. This memo is an introduction to an alternative to the current model referred to as the Multiple Media Block (MMB) architecture, which will be added to the DCSS in the near future. MMB operation enables multiple Media Blocks (MB), each containing a Security Manager (SM), to be used in DCSS compliant projection booths. A new MB type – the Outboard MB (OMB) – is defined for use in MMB configurations. An exemplary diagram is shown below.

The MMB architecture allows for playout to be distributed across multiple MBs, each of which is dedicated to decrypting, forensic marking and rendering one or more essence types. Each MB receives via the SMS the same Composition Playlist (CPL) and a targeted Key Delivery Message (KDM) to unlock its designated essence type(s). During playout the MBs are synchronized using a SMPTE standardized sync signal. This architecture has the flexibility of utilizing MBs that are designed specifically to process certain essence types (and are not required to process all essence types). This architecture also maintains the same level of security currently found in the DCSS.

## **MMB Features and Functionality:**

- Enable multiple IMBs to support multiple projectors within the projection booth (one IMB per projector). Existing IMBs will require upgrades to support MMB operation (see CPL/KDM relationships, cross-MB sync and KDM-borne Forensic Mark identifier information below).
- While the IMB is currently capable of processing Object Based Audio Essence (OBAE), MMB adds the option of utilizing a dedicated OMB to process this essence type.<sup>1</sup>

## **KDM Creation and Content Key Usage:**

- Each MB receives its own KDM and, except for synchronization, operates independently of other MBs.
- All KDMs for a given Composition shall be created with the same set of content keys.
- Each MB receives the same CPL, but performs content decryption of essence only for which it has a Media Decryptor (other essence and associated keys are ignored).
- A MB or Media Decryptor not participating in a showing will be dormant.

## **Cross-MB Synchronization:**

- Only one IMB in a set of participating MBs is in control of the CPL timeline and generates a SMPTE standardized synchronization signal that conveys positional and timing information. Locate, Play and Shuttle continue to be supported in the MMB architecture.
- Synchronization of audio and on-screen text to image shall be frame accurate.
- Synchronization of audio objects shall be accurate to within 10 microseconds (sample accuracy at 96 kHz).
- The synchronization signal shall include information that represents the current position within the show timeline and must be accurate to within 10 microseconds.

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<sup>1</sup> Other essence types may be accommodated in the future.

**Preparing for and Playing the Show:**

- Each SM/MB performs CPL and KDM validation checks.
- The SMS is responsible for confirming that each MB has completed its validation process and that each essence type will be processed.
- If multiple SMSs are present, only one is designated for Transport Layer Security (TLS) identity logging with the SMs.

**Log Collection:**

- Upon request, the SMS must collect the logs from all participating MBs for a specified showing, engagement, etc. If multiple SMSs are present, the one designated for TLS identity logging shall collect the logs from all MBs.
- All logging requirements for an OMB are the same as those for an IMB in the DCSS.

**Synchronization Of Image Forensic Marking (FM) For Multiple IMB Projection:**

- Each projector shall insert a Forensic Mark (FM) into the image.
- Each FM embedder may be seeded with an identical FMID parameter (replacing the normal FM-unique embedded ID). The seed shall be carried in the KDM as a new key type to be specified in DCSS errata.
- In the case of the previous bullet, corresponding frames as output by each projector shall be embedded with identical FMs.

# MMB Example: Dual Projectors + OMB

(Schematic View-For Illustrative Purposes Only)

