

SMPTE STANDARD

Open Binding of Distribution Channel
IDs and Timestamps (OBID-TLC)



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Foreword

SMPTE (the Society of Motion Picture and Television Engineers) is an internationally recognized standards developing organization. Headquartered and incorporated in the United States of America, SMPTE has members in over 80 countries on six continents. SMPTE's Engineering Documents, including Standards, Recommended Practices and Engineering Guidelines, are prepared by SMPTE's Technology Committees. Participation in these Committees is open to all with a bona fide interest in their work. SMPTE cooperates closely with other standards-developing organizations, including ISO, IEC and ITU.

SMPTE Engineering Documents are drafted in accordance with the rules given in its Standards Operations Manual. This SMPTE Engineering Document was prepared by Technology Committee 24TB.

Intellectual Property

SMPTE draws attention to the fact that it is claimed that compliance with this Standard may involve the use of one or more patents or other intellectual property rights (collectively, "IPR"). The Society takes no position concerning the evidence, validity, or scope of this IPR.

Each holder of claimed IPR has assured the Society that it is willing to License all IPR it owns, and any third party IPR it has the right to sublicense, that is essential to the implementation of this Standard to those (Members and non-Members alike) desiring to implement this Standard under reasonable terms and conditions, demonstrably free of discrimination. Each holder of claimed IPR has filed a statement to such effect with SMPTE. Information may be obtained from the Director, Standards & Engineering at SMPTE Headquarters.

Attention is also drawn to the possibility that elements of this Standard may be subject to IPR other than those identified above. The Society shall not be responsible for identifying any or all such IPR.

Introduction

This clause is entirely informative and does not form an integral part of this Engineering Document.

This document specifies a means of binding distribution channel identifiers (identifying entities involved in the distribution of the content) and timestamps (identifying the timeline of the content) to audiovisual content in such a way that it survives processing encountered on the way to the viewer, allowing the distribution channel and the content was distributed to be accurately identified, regardless of how it got to the viewer. This is collectively known as OBID-TLC (Open Binding of IDs – Timestamp and Labeling with Content distribution identifier)

1. Scope

This standard describes a method of binding Distribution IDs and Timestamps to media, utilizing audio watermarking, allowing this information to be detected both electronically and acoustically.

2. Conformance Notation

Normative text is text that describes elements of the design that are indispensable or contains the conformance language keywords: "shall", "should", or "may". Informative text is text that is potentially helpful to the user, but not indispensable, and can be removed, changed, or added editorially without affecting interoperability. Informative text does not contain any conformance keywords.

All text in this document is, by default, normative, except: the Introduction, any clause explicitly labelled as "Informative" or individual paragraphs that start with "Note:"

The keywords "shall" and "shall not" indicate requirements strictly to be followed in order to conform to the document and from which no deviation is permitted.

The keywords, "should" and "should not" indicate that, among several possibilities, one is recommended as particularly suitable, without mentioning or excluding others; or that a certain course of action is preferred but not necessarily required; or that (in the negative form) a certain possibility or course of action is deprecated but not prohibited.

The keywords "may" and "need not" indicate courses of action permissible within the limits of the document.

The keyword "reserved" indicates a provision that is not defined at this time, shall not be used, and may be defined in the future. The keyword "forbidden" indicates "reserved" and in addition indicates that the provision will never be defined in the future.

A conformant implementation according to this document is one that includes all mandatory provisions ("shall") and, if implemented, all recommended provisions ("should") as described. A conformant implementation need not implement optional provisions ("may") and need not implement them as described.

Unless otherwise specified, the order of precedence of the types of normative information in this document shall be as follows: Normative prose shall be the authoritative definition; Tables shall be next; then formal languages; then figures; and then any other language forms.

3. Normative References

The following documents, in whole or in part, as referenced in this document, contain specific provisions that are to be followed strictly in order to implement a provision of this Standard.

ISO 26324:2012, Information and documentation -- Digital object identifier system, International Organization for Standardization

4. Terms and Definitions

For the purposes of this document, the following terms and definitions apply.

4.1 acoustic path

transmission of sound from a loudspeaker through the air to a microphone

4.2 audio program

set of audio signals intended to be rendered simultaneously, such as a stereophonic audio program or 5.1 multichannel audio program

4.3 audio signal

single monophonic audio channel

4.4 audio watermark

data embedded in an audio stream such that it is minimally perceptible to a listener but detectable by a watermark decoder

4.5 decoder

device used to detect and extract an audio watermark embedded in a marked audio signal

4.6 Distribution Channel ID

unique identifier associated with an entity involved in the distribution of the content. This ID can overlay one or more advertising and/or programming elements.

4.7 Distribution Mark

a Distribution Channel ID and its associated Timestamp that are embedded together in the audio signal at a certain point of the distribution chain

4.8 distribution order

position of the embedder in the distribution chain

4.9 EIDR

Entertainment Industry Data Registry. Industry standard identifier for program content

4.10 embed

modify the audio signal by adding the audio watermark

4.11 embedder

device used to embed the audio watermark in the audio signal

4.12 marked audio

audio that has an audio watermark embedded in it

4.13 stuffing packet

sequence of 10 contiguous stuffing symbols that are used to fill time slots that do not contain a distribution mark

4.14 symbol

a phase sequence corresponding to an audio block of T audio samples

4.15 synchronization symbol

specific symbol that defines the start of a packet

4.16 time slot

Time interval that can contain a watermark packet or a stuffing packet

4.17 Timestamp

time instant at which the content was generated and broadcast

4.18 watermark cell

sequence of four contiguous packet time slots

4.19 watermark packet

sequence of 10 contiguous symbols that contains independently recoverable data.

4.20 whitening

linear transformation that transforms a vector of random variables with a known covariance matrix into a set of new variables whose covariance is the identity matrix, meaning that they are uncorrelated and each have variance 1.

Note: The transformation is called "whitening" because it changes the input vector into a white noise vector.

5. System Overview (Informative)

Audio watermarking is a signal processing technology that enables the embedding of data into the audio signal itself.

This standard enables the binding of distribution related information (Distribution Channel ID and Timestamps) to the content. The distribution information binding occurs separately from the binding of OBID marks defined in SMPTE ST2112-10 standard and does not interfere with it.

Up to four independent Distribution Marks (each consisting of a Distribution Channel ID and its associated Timestamp) can be bound successively to the audio content by the various entities involved in its handling, prior to its reception by the viewer who is receiving the media. Refer to Figure 1 for guidance on where in the distribution chain these Distribution Marks (labelled "channel/timestamp" on the figure) can be bound to the media.

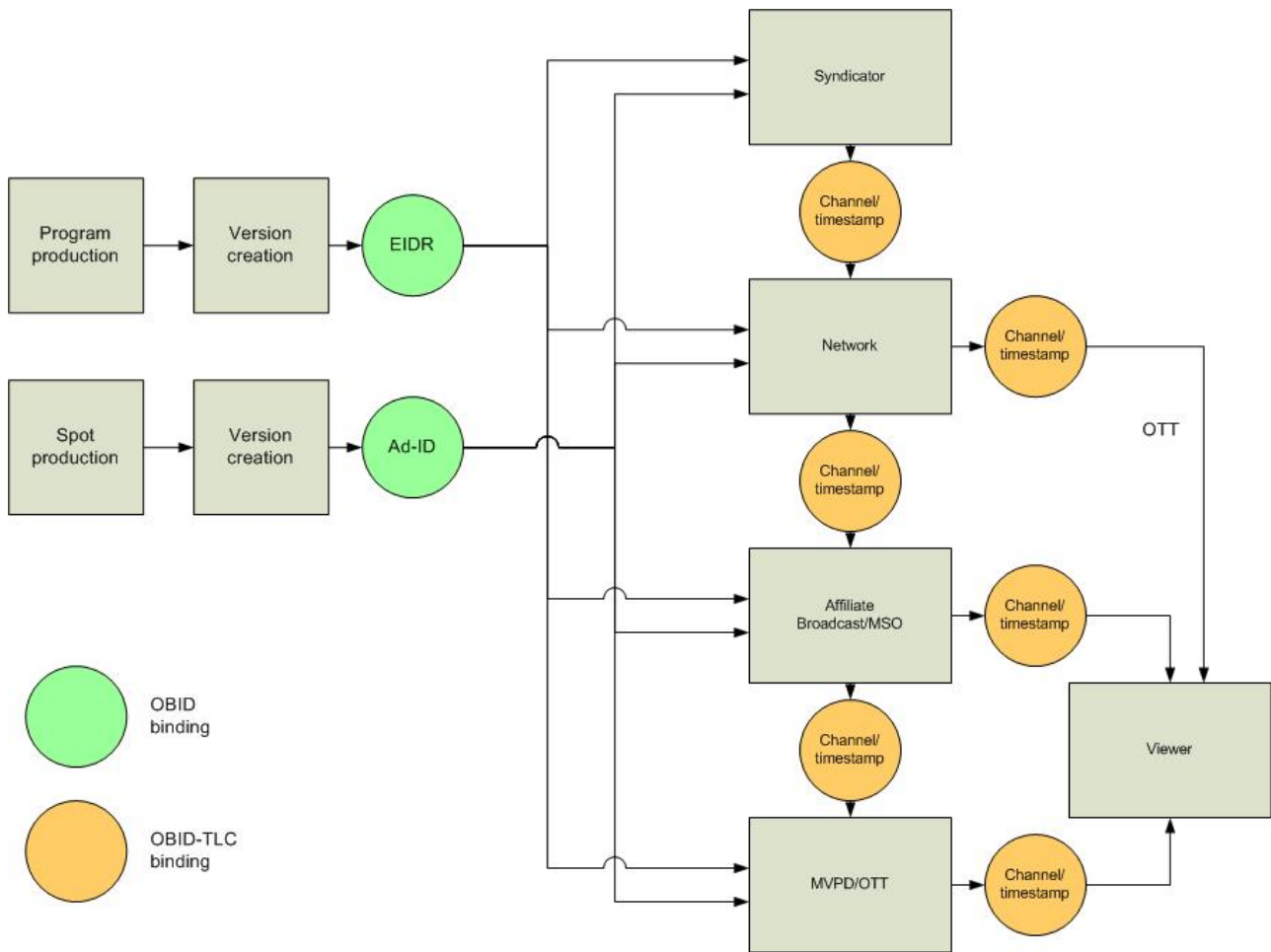


Figure 1: Binding of OBID and OBID-TLC marks in the media distribution chain

The audio watermark is embedded in the linear PCM audio before its distribution. Thus, this embedding is performed before any bitrate reduction.

The audio watermark data is decoded from the linear PCM audio. If audio is received in another format, it is decoded to PCM audio prior to audio watermark decoding.

The audio watermarking system is also designed to support watermark detection and decoding on acoustically captured audio signals. An example application is the use of a mobile device such as a smartphone to detect watermarked information in an audio signal reproduced through a TV set or loudspeakers in a living room. This example is depicted in Figure 2.