

SMPTE STANDARD

Material Exchange Format (MXF) — Mapping SDTI-CP Essence and Metadata into the MXF Generic Container



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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 Part XIII of its Operations Manual.

SMPTE ST 385 was prepared by Technology Committee 31FS.

Intellectual Property

At the time of publication no notice had been received by SMPTE claiming patent rights essential to the implementation of this Standard. However, attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. SMPTE shall not be held responsible for identifying any or all such patent rights.

Introduction

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

The MXF Generic Container is a stream-able data container structure that can be placed on any suitable transport and potentially stored. The concept of this container was based on the work done by the EBU/SMPTE Task Force in the Wrappers and Metadata subgroup. In March 1998, a SMPTE ad-hoc group was formed to study the Content Package (CP) format based on an initial strawman proposal. The CP format was developed from the ground up to carry picture, sound and data essence together with metadata in a structured manner primarily over the SDTI (SMPTE ST 305) transport and is known as SDTI-CP. SDTI-CP comprises two SMPTE engineering documents:

- SMPTE ST 326 (SDTI-CP format) which defines the container format as applied to the SDTI; and
- SMPTE ST 331 (SDTI-CP element and metadata definitions) which defines the data that can be placed into the SDTI-CP container.

The MXF Generic Container is an abstraction of the CP data structure that can be made fully compatible with SDTI-CP by using the System Item data defined in this standard together with the appropriate essence mapping document where it is compliant to SMPTE ST 331.

This standard specifies a version of the System Item in the MXF Generic Container that is compatible with SMPTE ST 326 noting that Auxiliary Items and elements in SMPTE ST 326 are synonymous with data items and elements in the MXF Generic Container.

This standard also specifies how to map SMPTE ST 331 SDTI-CP elements and items into the MXF Generic Container.

Note that in tables within this standard, some properties are SMPTE Universal Labels (ULs). A list of appropriate values for these properties is provided in SMPTE RP 224.

1 Scope

This standard specifies the mapping of essence and metadata conforming to SMPTE ST 326 to the MXF Generic Container. The MXF Generic Container is the native Essence Container for use in an MXF file body.

This standard specifies an SDTI-CP compatible System Item as a sequence of metadata elements in the MXF Generic Container. The standard then describes how the SDTI-CP System Item, conforming to SMPTE ST 326, can be mapped into the SDTI-CP compatible System Item of the MXF Generic Container as defined by both SMPTE ST 379-1 and SMPTE ST 379-2.

This standard also specifies how SDTI-CP picture, sound and Auxiliary Items conforming to SMPTE ST 326 can be mapped into the MXF Generic Container. This includes mapping of SDTI-CP elements conforming to SMPTE ST 326.

Where required, this standard also defines how the MXF Generic Container containing the appropriate metadata and Essence Elements can be mapped into SMPTE ST 326.

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 section explicitly labeled 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; followed by formal languages; then figures; and then any other language forms.

3 Normative References

Note: All references in this document to other SMPTE documents use the current numbering style (e.g. SMPTE ST 326:2000) although, during a transitional phase, the document as published (printed or PDF) may bear an older designation (such as SMPTE 326M-2000). Documents with the same root number (e.g. 326) and publication year (e.g. 2000) are functionally identical.

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below.

SMPTE ST 326:2000, Television — SDTI Content Package Format (SDTI-CP)

SMPTE ST 331:2011, Element and Metadata Definitions for the SDTI-CP

SMPTE ST 336:2007, Data Encoding Protocol Using Key-Length-Value

SMPTE ST 377-1:2011, Material Exchange File (MXF) — File Format Specification

SMPTE ST 379-1:2009, Material Exchange File (MXF) — MXF Generic Container

SMPTE ST 379-2:2010, Material Exchange File (MXF) — MXF Constrained Generic Container

4 Glossary of Acronyms, Terms and Data Types

The general glossary of acronyms, terms and data types used in the MXF specification is given in SMPTE ST 377-1. Supplementary glossaries of terms and acronyms used in the Generic Container are given in SMPTE ST 379-1 and SMPTE ST 379-2. They are not repeated here to avoid any divergence of meaning.

4.1 Acronyms used in this Standard

SMB: System Metadata bitmap

CPR: Content Package rate

CPT: Content Package type

CH: Channel handle

CC: Continuity count

4.2 Terms used in this Standard

Little-endian: Any multi-byte value with the least significant byte first.

5 SDTI-CP Compatible System Item

The SDTI-CP compatible System Item contains metadata which describes the operation of the Content Package in various modes and provides key metadata items related to the whole package. It can include metadata linked to Essence Elements in the picture, sound and data items. Finally, the SDTI-CP compatible System Item includes an optional downstream control element for future possible extension.

This section defines the data structure of the SDTI-CP compatible System Item.

The SDTI-CP compatible System Item shall be a combination of fixed-length pack data and local set data elements, KLV coded according to SMPTE ST 336. Throughout the remainder of this document, the SDTI-CP compatible System Item will be called simply the “System Item”.

5.1 System Item Elements

The System Item shall be coded as a sequence of up to six KLV packets where each packet comprises metadata elements for different aspects of the Content Package.

Figure 1 illustrates the System Item data structure.

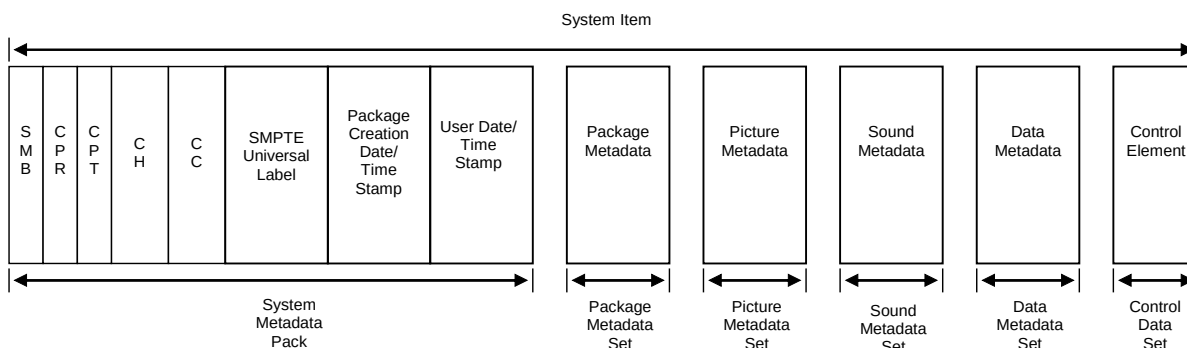


Figure 1 – Elements of the SDTI-CP compatible System Item

This System Item shall be divided into the following elements according to Figure 1:

- A System Metadata pack comprising a first 7 bytes and up to 50 further bytes (as defined by the first byte of the pack).
- A package metadata set that provides metadata for all Essence Elements in the Content Package.
- A picture metadata set that provides metadata for any Essence Element in the Picture Item. The set includes identification to link the metadata item to a specific Essence Element in the Picture Item.
- A sound metadata set that provides metadata for any Essence Element in the Sound Item. The set includes identification to link the metadata items to a specific Essence Element in the Sound Item.
- A data metadata set that provides metadata for any Essence Element in the data item. The set includes identification to link the metadata items to a specific Essence Element in the data item.
- A control data set comprising of only one data item that defines a downstream control element for the Content Package.

Where the System Metadata pack is present in the MXF Generic Container it shall be the first KLV packet in every Content Package. As defined in SMPTE ST 326, the Content Package metadata set immediately follows the System Metadata pack. If there are no items of Content Package metadata, then the length field of the packet shall be zero. Also per SMPTE ST 326, the possible presence of each of the picture, sound and data metadata sets and the control data set is determined by bits b3 to b0 of the first byte of the System Metadata pack.

Where present, the order of the picture, sound and data metadata sets shall be the same as the order of the picture, sound and data items in the MXF Generic Container.

Where present, the control data set shall be the last KLV packet of this System Item.

There shall be a maximum of one system, package, picture, sound, data or control set/pack in any CP-compatible System Item.

5.2 System Metadata Pack

Figure 2 illustrates the first 7 data words of the System Metadata pack.