SMPTE REGISTERED DISCLOSURE DOCUMENT

Interoperable Master Format – Isochronous Stream of XML Documents (ISXD) Plugin

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Introduction

This document defines a method for wrapping an Isochronous Stream of XML Documents (ISXD) in an Interoperable Master Format (IMF) Essence Component file. An ISXD Track File is appropriate for reference by an IMF Composition Playlist or Packing List, and in any other context where reference to an abstract IMF Essence Component is appropriate.

An isochronous stream of XML documents is a contiguous, ordered collection of discrete data items, where each item is a well-formed and valid XML document, and where all of the documents in the collection conform to a defined data model. The items are also related temporally, with the first item occurring earliest, and with the temporal distance between each item being inversely proportional to Edit Rate. The ISXD items are frame-wrapped as a single MXF Source Clip having only Data Elements.

An ISXD Track File can also contain one or more static XML documents, which may be used, e.g., to provide global context for the ISXD data.

This document also defines a Virtual Track structure compatible with the IMF Composition Playlist. This structure provides a method of reference to an ISXD Track File from within an IMF Composition Playlist instance.

1 Scope

This SMPTE Registered Disclosure Document (RDD) specifies a method for wrapping isochronous streams of XML documents in a manner consistent with the Interoperable Master Format (IMF) Essence Component. Only a Frame Wrapping method is defined. Clip Wrapping is not considered.

This document defines:

- an ISXD Track File to carry ISXD data as specified in an application;
- an ISXD Virtual Track for use in an IMF Composition Playlist.

2 References

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

SMPTE ST 377-1:2011 Am1:2012, Material Exchange Format (MXF) – File Format Specification – Amendment 1

SMPTE ST 377-1:2011 Am2:2012, Material Exchange Format (MXF) – File Format Specification – Amendment 2

SMPTE ST 379-2:2010, For Television – Material Exchange Format (MXF) – MXF Constrained Generic Container

SMPTE ST 429-17:2017, XML Constraints

SMPTE ST RP 2057:2011, Text-Based Metadata Carriage in MXF

SMPTE ST RP 2057:2011 Am1:2013, Text Based Metadata Carriage in MXF – Amendment 1

SMPTE ST 2067-2:2016, Interoperable Master Format – Core Constraints

SMPTE ST 2067-3:2016, Interoperable Master Format – Composition Playlist

SMPTE ST 2067-5:2013, Interoperable Master Format – Essence Component

SMPTE ST 2067-5:2013 Am1:2013, Interoperable Master Format – Essence Component – Amendment 1

[XML] World Wide Web Consortium (W3C) (2004 February 4). Extensible Markup Language (XML) 1.0 (Third Edition)

World Wide Web Consortium (W3C) (28 October 2004). XML Schema Part 1: Structures (Second Edition)

World Wide Web Consortium (W3C) (28 October 2004). XML Schema Part 2: Datatypes (Second Edition)

ISO/IEC —10646:2017 Information Technology — Universal Coded Character Set (UCS)

3 XML Schema Definitions

This section shall apply whenever a data structure is specified using XML schema definitions as specified in W3C XML Schema Part 1: Structures and W3C XML Schema Part 2: Datatypes.

In order to avoid duplication between text and schema, the cardinality and default values of elements are specified in the schema definitions only.

In the event of a conflict between schema definitions and the prose, the prose shall take precedence

4 Terms and Definitions

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

4.1 constrained XML document

a UTF-8 ISO 10646 character string as defined in [XML] and as constrained by ST 429-17

4.2 ISXD

Isochronous Stream of XML Documents – an ordered collection of discrete data items, one per edit unit, where each item is a constrained XML document, and where all of the documents in the collection conform to a common data model, defined by the application

4.3 static XML document

a constrained XML document pertaining globally to the entire track file

5 ISXD Track File

5.1 General

An ISXD Track File shall conform to section 5.1 of SMPTE ST 2067-2 and section 5 of this document.

5.2 Wrapping

An ISXD Track File shall conform to section 7 of this document.

5.3 Essence

Each frame-wrapped data item in an ISXD Track File shall contain a constrained XML document. Each constrained XML document in the collection of an ISXD Track File shall have identical root element name and namespace name. This namespace shall be indicated using the NamespaceURI item of the ISXD Data Essence Descriptor defined in section 9.2.

5.4 Static XML Document Instances

An ISXD Track File may contain one or more static XML document instances. When present, the following constraints apply:

- Each static XML document shall be contained within a Generic Stream Partition for Text-based Metadata, as specified by RP 2057.

- When more than one static XML document is present, each Descriptive Metadata Segment which contains a Text Based Descriptive Metadata Framework object corresponding to a static XML document shall be referenced by the same Sequence object, and will thus belong to the same Static Track. The Static Track which contains the respective Text Based Descriptive Metadata Framework object(s) shall be strongly referenced by the top level file package as defined by ST 2067-5.

- Generic Stream Partitions containing static XML documents shall be ordered immediately before the start of the footer partition (i.e., all Body partitions containing ISXD content packages or index table segments shall occur before any static XML documents).

6 ISXD Virtual Track

A Composition, as defined in 2067-3, that references an ISXD Track File, shall contain one or more ISXD Virtual Tracks.

Each ISXD Virtual Track shall consist of one or more instances of `ISXDSequence` elements as specified in Table 1.

Table 1. ISXDSequence element schema definition.

```
<xs:schema
  targetNamespace="http://www.dolby.com/schemas/RDD-47/2018"
  xmlns:cpl="http://www.smpte-ra.org/schemas/2067-3/2016"
  xmlns:xs="http://www.w3.org/2001/XMLSchema"
  elementFormDefault="qualified"
  attributeFormDefault="unqualified">
  <xs:import namespace="http://www.smpte-ra.org/schemas/2067-3/2016"/>
  <xs:element name="ISXDSequence" type="cpl:SequenceType"/>
</xs:schema>
```

Each `ISXDSequence` element shall contain Resource elements, as defined in SMPTE ST 2067-3, of type `TrackFileResourceType`. As defined in SMPTE ST 2067-3, each Resource element shall reference a single ISXD Track File. The Edit Rate of an ISXD Virtual Track shall be equal to the Edit Rate of the Main Image Virtual Track as defined in SMPTE ST 2067-2.

All ISXD Track Files referred by an ISXD Virtual Track shall have identical value for the `NamespaceURI` item. This namespace shall be indicated using the `NamespaceURI` property of the ISXD Data Essence Descriptor defined in section 9.2.

7 ISXD Mapping to MXF Generic Container

7.1 Frame Wrapping

The "Frame Wrapping" method for data essence is illustrated in Figure 1. Frame wrapping as specified in ST 379-2 shall be used for the ISXD Track File.

Figure 1 shows a series of data elements, each wrapped in a single Content Package Data Element with no other Generic Container Elements in the Container. Each Content Package has the duration of one edit unit.

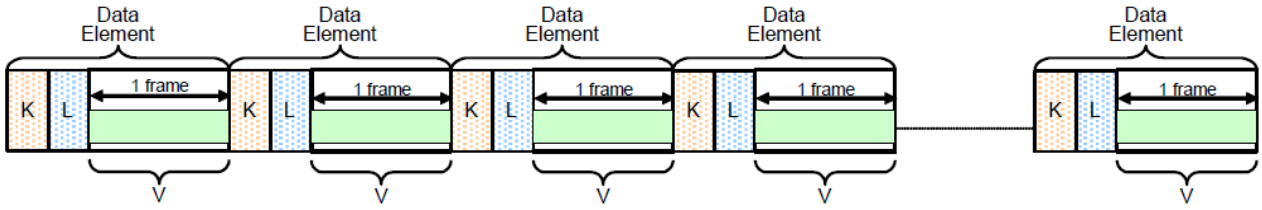

Figure 1. Simple Representation of Frame Wrapping (Informative)

The Frame Wrapping method enables frame-by-frame access by MXF applications which process at the KLV level. Sufficient Information is provided to allow individual frames to be identified at the KLV level without an MXF decoder having to parse or decode the Essence Data. Each data frame shall be KLV wrapped using a Generic Container Data Element Key.

7.2 Clip Wrapping

Clip wrapping shall not be used in an ISXD Track File.

7.3 Custom Wrapping

Custom wrapping shall not be used in an ISXD Track File.

7.4 Wrapping Constraint

The ISXD Track File shall be constrained to comply with SMPTE ST 2067-5, IMF Essence Component, with respect to pattern, header metadata and asset identity constraints.

7.5 Element and Item Constraints

Only Data Elements shall be carried in an ISXD Track File. Each Data Item shall contain only a single Data Element.

8 KLV Coding of ISXD Data Elements

8.1 Data Element Key

The value for the ISXD Data Element Essence Key UL shall be as given in Table 2.

Table 2. Essence Key.

Name	Frame Wrapped ISXD Data
Item UL	urn:smpte:ul:060E2B34.01020105.0E090502.01nn01cc
Definition	Identifies Frame Wrapped ISXD Data Essence

Note: nn = Element Number, cc = Element Type

8.2 Length

The length field and its application shall comply with SMPTE ST 377-1.

8.3 Value

The frame-wrapped value field shall be a UTF-8 character string, comprising a well-formed and valid XML document. The XML document shall be encoded with a default namespace name, which shall be equal to the value of the NamespaceURI item. The temporal duration of the value shall be 1 / Edit Rate.

9 Essence Container Label and Essence Descriptor

9.1 Label for ISXD Essence Container Identification

The value for the Essence Container UL shall be as given in Table 3.

Table 3. Essence Container UL.

Name	Frame Wrapped ISXD Container
Symbol	FrameWrappedISXDContainer
Namespace	http://www.smpte-ra.org/reg/400/2012/14/9
Item UL	urn:smpte:ul:060E2B34.04010105.0E090607.01010103
Definition	Identifies Frame Wrapped ISXD Container

The Essence Container UL is used within a batch of ULs in Partition Packs and the Preface set and on its own in the Essence Descriptor.

9.2 ISXD Data Essence Descriptor

The File Descriptor sets are those structural metadata sets in the Header Metadata that describe the essence and metadata elements defined in this document. The ISXD Data Essence Descriptor shall be a sub-class of the Generic Data Essence Descriptor defined in SMPTE ST 377-1. File Descriptor sets shall be present in the Header Metadata for each Essence Element. Implementations that carry specific data types may extend the ISXD Data Essence Descriptor using a sub-descriptor. Implementations complying with this specification shall ignore unrecognized sub-descriptors.

Table 4. ISXD Data Essence Descriptor definition.

Item Name	Type	Len	Local Tag	UL	Req?	Meaning
ISXD Data Essence Descriptor	Set UL	16	dyn	060E2B34.02530105.0E090502.00000000	Req	Identifies an ISXD Data Essence Descriptor
Length	BER length	var			Req	Set length
All items from the Generic Data Essence Descriptor in SMPTE ST 377-1 to be included. Data Essence Coding usage is modified as specified below.						
Namespace URI	UTF 8 String	var	dyn	060E2B34.01010105.0E090400.00000000	Req	Identifies the default namespace of the essence XML documents

9.3 Label for ISXD Data Essence Coding

The **DataEssenceCoding** item shall be present in the ISXD Data Essence Descriptor. The value of the **DataEssenceCoding** item shall be as given in Table 5.

Table 5. Data Essence Coding UL.

Name	UTF-8 Text Data Essence Coding
Symbol	UTF-8-Text_DataEssenceCoding
Namespace	http://www.smpte-ra.org/reg/400/2012/14/9
Item UL	urn:smpte:ul:060E2B34.04010105.0E090606.00000000
Definition	Identifies UTF-8 Text Data Essence Coding

All other items shall use the default value as specified in SMPTE ST 377-1.

Annex A XML Schema (informative)

This specification is accompanied by the following element, which is an XML schema document as specified in XML Schema Part 1: Structures.

rdd47-2018.xsd

This element collects the XML schema definitions defined in this document. It is informative and, in case of conflict, this document takes precedence.