SMPTE STANDARD

Mapping Metadata-Guided Audio (MGA) signals with S-ADM Metadata into the MXF Constrained Generic Container

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Foreword

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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; then formal languages; then figures; and then any other language forms.

Introduction

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

The serial representation of the Audio Definition Model (S-ADM) is a format for Audio Metadata segmented into a time-series of frames. S-ADM is based on the Audio Definition Model (ADM). ADM is specified in Recommendation ITU-R BS.2076, S-ADM is specified in Recommendation ITU-R BS.2125.

This document is a specialization of SMPTE ST 2127-1 which defines the framework for mapping Audio Essence and associated Audio Metadata (Metadata-Guided Audio or MGA) into an MXF file.

At the time of publication, no notice had been received by SMPTE claiming patent rights essential to the implementation of this Engineering Document. 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.

1 Scope

This document specifies the mapping of Metadata-Guided Audio (MGA) signals containing S-ADM metadata into the Constrained MXF Generic Container, as specified in SMPTE ST 379-2. S-ADM is the serial representation of the Audio Definition Model (S-ADM) metadata, as specified in Recommendation ITU-R BS.2125.

This document defines a specialization of the generic framework specified in SMPTE ST 2127-1.

2 Normative References

The following standards contain provisions that, through reference in this text, constitute provisions of this standard. Dated references require that the specific edition cited shall be used as the reference. Undated citations refer to the edition of the referenced document (including any amendments) current at the date of publication of this document. All standards are subject to revision, and users of this engineering document are encouraged to investigate the possibility of applying the most recent edition of any undated reference.

SMPTE ST 377-1:2019, Material Exchange Format (MXF) — File Format Specification

SMPTE ST 2109:2019, Format for Non-PCM Audio and Data in AES3 — Audio Metadata

SMPTE ST 2127-1:2022, Mapping Metadata-Guided Audio (MGA) signals into the MXF Constrained Generic Container

Recommendation ITU-R BS.2076, Audio Definition Model

Recommendation ITU-R BS.2125, A serial representation of the Audio Definition Model

Internet Engineering Task Force RFC 1952 (May 1996), GZIP file format specification version 4.3

World Wide Web Consortium (W3C) (26 November 2008), Extensible Markup Language (XML) 1.0 (Fifth Edition)

3 Terms and Definitions

For the purposes of this document, all terms and definitions from SMPTE ST 2127-1 apply.

4 MGA with S-ADM metadata mappings

The mappings shall be as defined in SMPTE ST 2127-1.

5 Key-length-value coding

The Key-length-value coding shall be as defined in SMPTE ST 2127-1.

6 SMPTE Label Values

The SMPTE Label Values shall be as defined in SMPTE ST 2127-1.

The Sound Essence Coding Label (as defined in SMPTE ST 377-1) shall be constrained to the value `MGAAudioEssenceUncompressedSoundCoding` (as defined in SMPTE ST 2127-1).

7 Index Table Usage

The Index Table Usage shall be as defined in SMPTE ST 2127-1.

According to ITU-R BS.2125, the type attribute of the `frameFormat` element of an S-ADM frame defines whether the respective metadata payload can be used for random access. More precisely, only S-ADM frames of type ‘full’ can be used to initiate the decoding process.

Thus, according to SMPTE ST 2127-1, the Random Access flag bit of the Index Entry Array structure, as defined in ST 377-1, is set to 0 if the corresponding Edit Unit and its associated Audio Metadata sections contain an S-ADM frame that is not set to type ‘full’.

8 Essence Descriptors

The Essence Descriptors shall be as defined in SMPTE ST 2127-1.

As specified in SMPTE ST 2127-1, one MGA Audio Metadata SubDescriptor instance is present for each Audio Metadata section of the MGA signal. Exactly one S-ADM Audio Metadata SubDescriptor shall be present for each UL in `MGAAudioMetadataPayloadULArray` that is equal to the `SerialAudioDefinitionModelMetadataPayload` UL within all present MGA Audio Metadata SubDescriptor instances. The S-ADM Audio Metadata SubDescriptor instances shall be strongly referenced by the MGA Sound Essence Descriptor.

NOTE The number of S-ADM Audio Metadata SubDescriptors present depends on the Audio Metadata format. Audio Metadata Packs (Identifier value per SMPTE ST 2127-1 equals 0x01) can contain multiple S-ADM Audio Metadata Payloads, each of which requires an S-ADM Audio Metadata SubDescriptor to be present.

9 Audio Labeling

Audio Labeling shall be as defined in SMPTE ST 2127-1 and extended as defined in Section 10.6.

10 MGA Application using S-ADM Metadata

10.1 General

This standard shall be applied to wrap MGA Signals containing Serialized Audio Definition Model (S-ADM) metadata, as defined in Recommendation ITU-R BS.2125.

For the purposes of this document, MGA Frames, as specified in SMPTE ST 2127-1, shall contain one or more Audio Metadata sections carrying S-ADM metadata using Identifier Value 0x01 or 0x02 according to Table 2 of SMPTE ST 2127-1:2022. The Identifier Value 0x03 shall not be used for S-ADM metadata.

S-ADM metadata shall be encoded as Audio Metadata Payload as defined in SMPTE ST 2109, and shall be further constrained by the provisions in Sections 10.2, 10.3 and 10.4.

10.2 SMPTE ST 2109 S-ADM Payload UL

The S-ADM payload is uniquely identified by a Payload Tag, as defined in SMPTE ST 2109, and an associated SMPTE Universal Label (UL). The Payload Tag and the assigned UL for the S-ADM payload shall be as shown in Table 1. When the S-ADM payload is mapped into an MGA Frame using Identifier Value of 0x01 or 0x02 the S-ADM payload shall be identified with an assigned (static) SMPTE ST 2109 Payload Tag corresponding to the assigned UL.

Table 1 — S-ADM Payload Tag and UL

Item Name	Payload Tag	Symbol	Kind	Item UL
Serial Audio Definition Model Metadata Payload	`0x12`	`SerialAudioDefinitionModelMetadataPayload`	LEAF	`urn:smpte:ul:060e2b34.0401010d.04040212.00000000`

NOTE Assigned (static) SMPTE ST 2109 Payload Tags are listed in the SMPTE ST 2109 Administrative Register at https://smpte-ra.org/smpte-st-2109-ar

10.3 SMPTE ST 2109 S-ADM Payload Length

The Payload Length shall be encoded as specified in SMPTE ST 2109.

10.4 SMPTE ST 2109 S-ADM Payload Value

The Data Structure, as defined in Table 2, shall be used for the carriage of S-ADM payloads. The sequence of items within the data structure shall not be modified.

The duration attribute of the S-ADM `frameFormat` element shall be equal to one Edit Unit.

S-ADM timing information should match the MXF timeline, which shall take precedence.

Table 2 — S-ADM Payload Syntax

Item Name	Type	Length	Required?	Value	Note
Version	UInt8	1	Req	0x00	
Format	UInt8	1	Req.	0x00	UTF-8
				0x01	gzip (as defined in IETF RFC 1952)
Data	UInt8	Var.	Req.	S-ADM XML metadata compressed by the method indicated by the Format field. S-ADM XML metadata shall be an XML document, as specified in W3C XML 1.0, that consists of a single `frame` element. The `frame` element is defined in ITU-R BS.2125.	

10.5 S-ADM Audio Metadata SubDescriptor

The S-ADM Audio Metadata SubDescriptor, which shall be a concrete subclass of the abstract SubDescriptor as specified in SMPTE ST 377-1, shall consist of the properties as shown in Table 3 and Table 4. An example for the usage of the S-ADM Audio Metadata SubDescriptor is given in Annex A.

Table 3 — Specification of the values of the S-ADM Audio Metadata SubDescriptor

Symbol	Type	Len	Req ?	Meaning	Default
SADMAudioMetadataSubDescriptor	Set UL	16	Req	S-ADM Audio Metadata SubDescriptor	
Length	BER Length	Var	Req	Set length	
All items from the abstract SubDescriptor as specified in SMPTE ST 377-1:2019 Annex B.3					
SADMMetadataSectionLinkID	UUID	16	Req	MGA Link ID of the metadata section carrying the Serial Audio Definition Model Metadata Payload UL described by this SubDescriptor. The MGA Link ID is defined in SMPTE ST 2127-1.	
SADMProfileLevelULBatch	Batch of UL	8+16*n	Opt	A batch of n ULs, each representing a Profile and a Level to which the S-ADM metadata stream complies. This item is purely informative. The specification of individual ULs representing a Profile and a Level are out of scope of this standard. Application specifications referencing this standard may define such ULs.	

Table 4 — S-ADM Audio Metadata SubDescriptor ULs

Item Name	Symbol	Kind	Item UL
S-ADM Audio Metadata SubDescriptor[1]	SADMAudioMetadataSubDescriptor	LEAF	urn:smpte:ul:060e2b34.027f0101.0d010101.01018109
S-ADM Audio Metadata Coding Parameters	SADMAudioMetadataCodingParameters	NODE	urn:smpte:ul:060e2b34.0101010e.04020307.00000000
S-ADM Metadata Section Link ID	SADMMetadataSectionLinkID	LEAF	urn:smpte:ul:060e2b34.0101010e.04020307.01000000
S-ADM Profile Level UL Batch	SADMProfileLevelULBatch	LEAF	urn:smpte:ul:060e2b34.0101010e.04020307.02000000

10.6 Audio Labeling Extensions

The additional items as defined in Table 5 and Table 6 may be used for S-ADM applications.

Table 5 — Specification of additional values of the MGA Soundfield Group Label SubDescriptor

Symbol	Type	Len	Req ?	Meaning	Default
All items from the MGA Soundfield Group Label SubDescriptor as specified in SMPTE ST 2127-1					
ADMAudioProgrammeID	UTF16String	Var.	Opt.	audioProgrammeID of the associated audioProgramme, as defined in ITU-R BS.2076	
ADMAudioContentID	UTF16String	Var.	Opt.	audioContentID of the associated audioProgramme, as defined in ITU-R BS.2076	
ADMAudioObjectID	UTF16String	Var.	Opt.	audioObjectID of the associated audioObject, as defined in ITU-R BS.2076	

Table 6 — MGA Soundfield Group Label SubDescriptor ULs

Item Name	Symbol	Kind	Item UL
ADM Audio Programme ID	ADMAudioProgrammeID	LEAF	urn:smpte:ul:060e2b34.0101010e.04020306.02000000
ADM Audio Content ID	ADMAudioContentID	LEAF	urn:smpte:ul:060e2b34.0101010e.04020306.03000000
ADM Audio Object ID	ADMAudioObjectID	LEAF	urn:smpte:ul:060e2b34.0101010e.04020306.04000000

Annex A (Informative) MGA and S-ADM SubDescriptor Example

Figure A.1 illustrates the usage of the MGA Audio Metadata SubDescriptor as defined in SMPTE ST 2127-1 and the S-ADM Audio Metadata SubDescriptor as defined in Section 8 and Section 10.5 for an MGA Signal containing three Audio Metadata sections.

The metadata section with index one contains a single Audio Metadata Pack which itself contains five individual Audio Metadata Payloads as defined in SMPTE ST 2109. Two of those Audio Metadata Payloads contain S-ADM Payloads identified by a SMPTE UL or the associated SMPTE ST 2109 Payload Tag as defined in Section 10.2. The associated S-ADM Audio Metadata SubDescriptor provides a batch of three profiles and levels to which the present S-ADM metadata sections comply. If an Audio Metadata Pack contains more than one S-ADM metadata section, the `SADMProfileLevelBatch` item can only provide an unordered list of compliant profiles and levels. Note that each S-ADM metadata section can comply to one or more profiles and levels.

The metadata section with index two contains a single Audio Metadata Payload identified by the SMPTE UL associated with the SMPTE ST 2109 Payload Tag for S-ADM as defined in Section 10.2. The associated S-ADM Audio Metadata SubDescriptor provides no information on profile(s) and level(s) to which the present S-ADM metadata section complies.

The metadata section with index three contains a single UL defined metadata payload which does not contain an S-ADM metadata section.

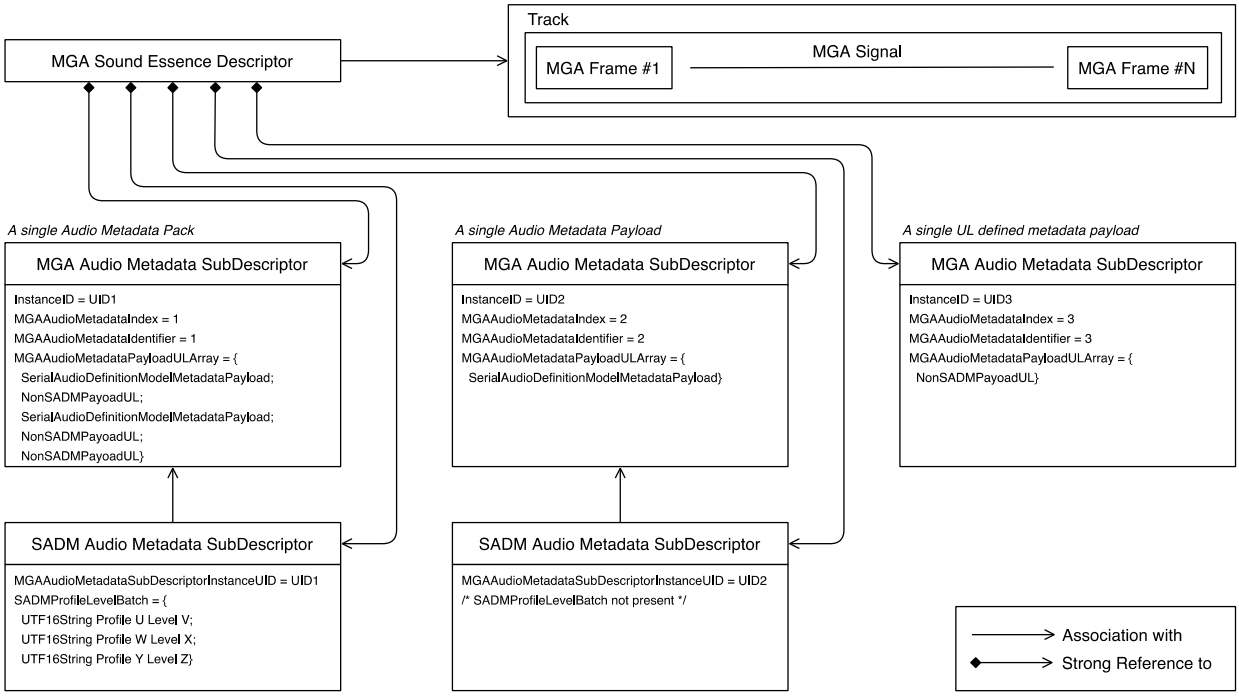

Figure A.1 — Example for MGA and S-ADM SubDescriptor Usage

Bibliography (Informative)

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