SMPTE STANDARD

Essence Element Key Register Structure

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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 30MR.

Intellectual Property

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.

Introduction

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

The SMPTE metadata standards use a layered approach to convey information to describe and encode metadata and essence. A layered approach is used so that the user can select the applicable standard(s) for the level of implementation needed.

The SMPTE standards for metadata include:

- Universal Labels for unique identification of digital data (SMPTE ST 298);
- Key-Length-Value (KLV) data encoding protocol for metadata and essence (SMPTE ST 336);
- Multiple register structure documents which specify how metadata items of various kinds must be defined (SMPTE ST 400 Metadata Labels, SMPTE ST 2003 Metadata Types, SMPTE ST 335 Metadata Elements, SMPTE ST 395 Metadata Groups and SMPTE ST 2088 Essence Element Keys);
- Published registers of approved metadata definitions maintained according to the procedures defined in SMPTE AG 18.

1 Scope

This standard defines the structure of a register of essence element keys as used by essence container specifications coded according to SMPTE ST 336, e.g. SMPTE ST 379-1 and ST 379-2 and related Essence Mapping Documents.

The standard normatively defines universal identifiers, essence element names, definitions, and standardized symbols, as well as other normative and informative fields.

The associated essence element key register includes all entries which have been approved according to the specific procedures defined in SMPTE AG 18.

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

3 Normative References

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

SMPTE, ST 298:2009, “Universal Labels for Unique Identification of Digital Data”

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

SMPTE, ST 2029:2009, “Uniform Resource Names for SMPTE Resources”

World Wide Web Consortium (W3C), “Namespaces in XML 1.0 (Second Edition)”, 16 August 2006, https://www.w3.org/TR/REC-xml-names/

4 Terms and Definitions

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

4.1 Attribute

characteristic of an essence element key

4.2 Class

broad category that forms the first level of hierarchy for all registered essence element keys

4.3 Context

circumstance, purpose, and perspective under which something is defined or used

4.4 Designator

sub-identifier within a universal label

4.5 Identifier

sequence of numbers or characters, capable of uniquely identifying that with which it is associated, within a specified context

4.6 Item

object in a register that instantiates a defined set of attributes.

Note: An item in the essence element key register is a description of an essence element key or class/subclass

4.7 Item designator

last 8 bytes of the universal label, which uniquely identify a particular item within the context of the UL designator

4.8 Essence element key register

register, as defined by this standard, of approved essence element keys and the attributes of the essence elements that they identify

4.9 Leaf

entry in the register that defines an essence element key

4.10 Level number

last non-zero value of a UL of a node or leaf

Note: Which value in a UL is the level number depends on the level of the entry, i.e. how many entries are above it in the hierarchy

4.11 Essence element

essence element defined by the essence element key register

4.12 Node

entry in the register that is used to provide a hierarchical structure for leaves

Note: A node can have any number of nodes and leaves under it that are logically grouped by the node. All entries under a node share the non-zero bytes of the node's UL.

4.13 Registry

information system for registering metadata (e.g. metadata elements, types, labels, groups)

4.14 Register

information store or database maintained by a registry

4.15 Registration authority

organization responsible for maintaining a register

4.16 Top-level node

node in class 13 or 14 under which an individual or organization other than SMPTE controls the entries

4.17 Universal label

SMPTE-administered universal label having 16 bytes

Note: The syntax of the universal labels used in the essence element key register is defined in SMPTE ST 336, which describes the mechanism by which the UL is used as a key that explicitly identifies an item of essence.

4.18 UL designator

sequence of sub-identifiers (bytes 3-8 of a 16-byte universal label) designating the ISO/ITU organization, registry category, registry, registry structure, and version number

4.19 Value

instance of information

5 SMPTE Essence Element Key structure

5.1 Register overview

The essence element key register provides flexibility in capturing data and exchanging it among applications through a standardized hierarchy of universal labels (ULs) that uniquely identify the essence elements, grouped to aid their management within a small but comprehensive number of classes. Essence Element classes are collections of keys with common characteristics or attributes. Additional classes are provided for user-defined public, private, and experimental keys.

The essence element key register defined by this document provides two methods of referencing an individual item. The first is to use a unique, two-part, 16-byte universal label that is numerical (and hence language independent). The second method of referencing an item is to use its assigned symbol, which is a name that conforms to computer language syntax restrictions. Symbols are intended for use in computer languages such as the Extensible Markup Language (XML).

Note: The symbol, together with its namespace defined in Section 5.3.4, forms a unique identifier like the UL.

The exact format of the universal label shall be as defined in SMPTE ST 336. The first eight bytes of the universal label consists of the UL Header (2 bytes) and UL designator (6 bytes). The UL designator identifies the item as belonging to a specific SMPTE register of a given category, structure, and version. The second eight bytes forms the item designator as defined in SMPTE ST 336. The item designator shall be used to uniquely identify the meaning or definition of the item in the register.

The essence element key register shall be organized into nodes and leaves. The register classes form class nodes and below these are further nodes at each subclass. To aid the management of the register, these nodes and subnodes shall be assigned a universal label, so as to give clear breaks in the structure. Entries within a subclass form leaves, which are the essence element key descriptions.

Nodes shall be used to define the overall structure of the essence element key register; i.e., essence element key classes and subclasses. The normative fields that define these classes/subclasses are specified in Section 5.3.

For many essence element keys, one or more specific bytes are set by an algorithm or taken from a set of permissible values specified in a defining document. Such essence element keys shall be represented by a single leaf entry in the essence element keys register; this entry shall use “7Fh” in the registered UL for each byte which is to be set according to the defining document.

The universal labels used in the essence element key register defined by this document are constructed as shown in Table 1, which complies with SMPTE ST 336.

Table 1 – Construction of SMPTE Universal Labels

Byte Position	Description	Value	Meaning
	UL Header		
1	Object identifier	06h	Object identifier tag per SMPTE ST 298
2	UL length	0Eh	The byte length of the object identifier value is 14 bytes.
	UL designator		
3	UL code	2Bh	The administering organization is an ISO organization.
4	UL subcode	34h	The delegated organization is SMPTE.
5	Registry category designator	01h	The registry category is dictionaries.
6	Registry designator	02h	The specific register is an essence element dictionary.
7	Structure designator	01h	The register structure conforms to this SMPTE standard.
8	Version number	01h to 7Fh	This indicates the version number of the register.
9-16	Item designator	Registered by the essence element key register	This identifies a specific label within the essence element key register.

5.2 Individual classes of essence element key

Within the essence element key register, essence element keys shall be organized into a hierarchical structure, where each is assigned to an essence element key class as shown in the overview of Figure 1. The initial set of essence element key classes in this standard consists of:

Class 1-7: SMPTE reserved
Class 13: Organizationally registered for public use
Class 14: Organizationally registered as private
Class 15: Experimental

These classes are further subdivided as described in the sections below.

The number of essence element key classes can be extended in the future to a maximum of 127, and the class numbers that have not been assigned here shall be reserved for use by SMPTE.

The processes for registration of new essence element keys are specified in AG 18.

Byte 9 of the UL identifies which of these classes an essence element key belongs to. Subsequent bytes enable the hierarchical identification of subclasses.

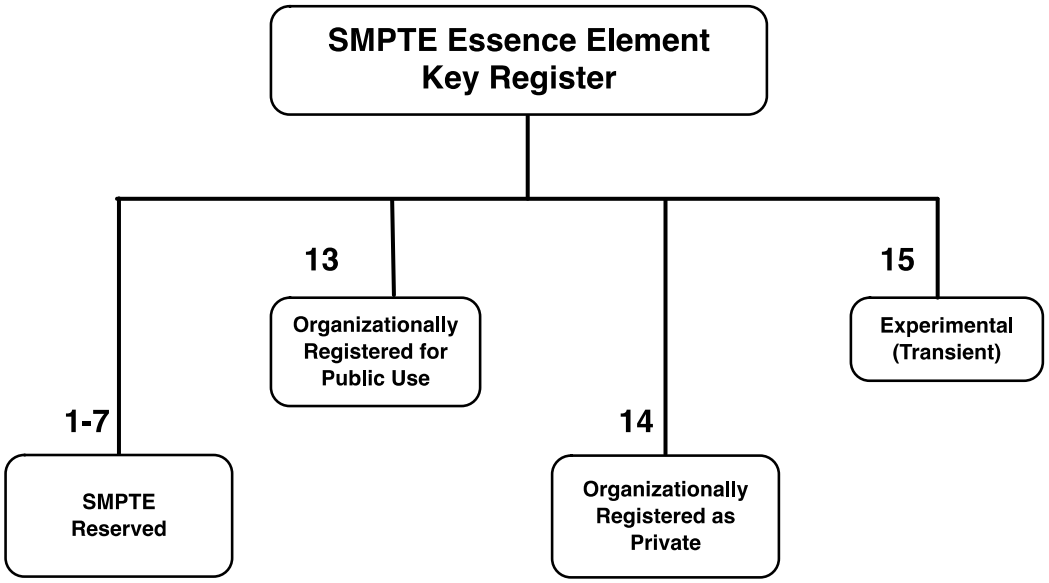

Figure 1 – Essence element key class structure

5.2.1 Class 1-7: SMPTE reserved

Class 1-7 essence element keys are managed by the SMPTE.

5.2.2 Class 13: Organizationally registered for public use

Essence element keys in this class shall consist of items that have been registered by a specific organization and are therefore reserved and managed separately from the other classes of keys.

5.2.3 Class 14: Organizationally registered as private

Essence element keys in this class shall consist of individual items whose definitions are held by a specific organization and are therefore reserved and managed separately from the other classes of keys.

5.2.4 Class 15: Experimental

Class 15 essence element keys shall only be used in multimedia research or other limited access, experimental environments where experimentation with new keys and applications does not depend on strict conformance to approved standards and which remain within a test or laboratory environment.

5.3 Register Structure and Format

Each essence element key or essence element class/subclass shall be described by a number of fields, which are classified as normative or informative.

The fields that apply to leaves or nodes are indicated in the following subsections. In the essence element key register, nodes describe classes/subclasses and leaves describe essence elements keys.

Normative fields of the essence element key register are those that are required for the description of an essence element key or class/subclass. They may be omitted only if they are not applicable.

Informative fields provide additional information that is intended to help users of the essence element key register. In the case of a conflict between an informative field and a normative field, the normative field shall take precedence.

The following sections list the specific normative and informative fields. The order in which the fields appear in the register need not reflect the order in which they are presented below.

Table 2 – Classification of fields used in the essence element key register

Field(s)	Description	Classification	Scope	Required?	Format
Register	5.3.1	Normative	nodes, leaves	Required	Text (enumerated)
Node or Leaf	5.3.2	Normative	nodes, leaves	Required	Text
URN representation of the universal label	5.3.3	Normative	nodes, leaves	Required	URN representing the UL
Namespace Name	5.3.4	Normative	nodes	Required for top-level class 13/14 node	URI
Symbol	5.3.5	Normative	nodes, leaves	Required	Text restricted to character pattern defined in 4.2.5
Name	5.3.6	Normative	nodes, leaves	Required	Text
Definition	5.3.7	Normative	nodes, leaves	Required	Text
Defining document	5.3.8	Normative	nodes, leaves	Optional	Text
Applications	5.3.9	Informative	nodes, leaves	Optional	Text
Notes	5.3.10	Informative	nodes, leaves	Optional	Text
isDeprecated	5.3.11	Normative	nodes, leaves	Required	Boolean

When any version of the register is made available for ballot, or published in any form, all fields in Table 2 shall be included. Other fields may be included.

5.3.1 Register

This normative field shall identify the register to which an item belongs, for example, “Elements”, “Groups”, “Types”, or “Labels”. For the register defined by this standard, this field shall have the value “Essence”.

5.3.2 Node or Leaf

This normative field shall define whether the item is a node or a leaf as defined in Section 4.

5.3.3 URN representation of the universal label

This normative field shall contain the Uniform Resource Name (URN) representation of the universal label for the item. SMPTE ST 2029 defines the urn:smpte:ul representation of a SMPTE ST 298 UL, which shall be used for this value.

5.3.4 Namespace Name

This normative field shall define the scope over which symbols, which are defined in Section 5.3.5, are unique.

For classes 1-7 the Namespace Name shall be identified by the Uniform Resource Identifier (URI) http://www.smpte-ra.org/reg/2088/<revision>, where <revision> shall be a string denoting the year of publication of this structure standard as 4 decimal digits, and may be appended with 2 month decimal digits in the range 01-12. For classes 13 and 14, a Namespace Name shall be specified by the registrant for the top-level node and may be specified for any sub-node.

Organizations that have defined essence element keys in classes 13 and 14 may choose any valid Namespace Name (URI) for the symbols identifying these keys in accordance with the XML-Namespace recommendation; this is subject to the restriction that this Namespace Name shall not correspond to the XML namespace used for class 1-7 symbols. The Namespace Name (URI) shall be specified as a normative field of the class 13 or 14 node to which this namespace applies. All sub-nodes shall belong to this namespace, unless another namespace has been specified. Therefore, if no Namespace Name (URI) for a node is given, it shall be inherited from the ancestor node.

5.3.5 Symbol

This normative field shall define the symbol that identifies a class/subclass or essence element key. A symbol is a name that conforms to computer language syntax restrictions, and it is intended for use in computer languages such as the Extensible Markup Language (XML). To enable the use of symbols in a wide range of computer languages, a symbol shall be a string composed only of the characters A-Z, a-z, 0-9, and _, and it shall begin with an alpha character (A-Z, a-z) or an underscore (_).

Symbols shall be defined for both nodes and leaves and shall be unique within the XML namespace identified by Section 5.3.4.

Note 1: This implies that class 1-7 and 12 symbols are unique within the essence element key register.

Note 2: The combination of Namespace Name and Symbol produces a unique identification for a label in the same way that namespace name and local name are used in W3C Recommendation - Namespaces in XML to form an expanded name.

5.3.6 Name

This normative field shall be the name for the item or class/subclass identified by the universal label or symbol. It shall be written in U.S. English. The name should use title case capitalization.

Note: SMPTE EG 2074 gives guidelines for item or node naming to ensure the name is descriptive and unambiguous.

5.3.7 Definition

This normative field shall be the human-readable description of the item or class/subclass. It shall be written in U.S. English.

5.3.8 Defining document

This normative field shall reference the primary standard or authoritative document that provides further information about an item, if such a reference is available. For example, the essence element key for an MXF essence mapping could reference the document that defines that MXF essence mapping.

5.3.9 Applications

This informative field shall be an informative listing of some known applications that use a particular essence element key.

5.3.10 Notes

This informative field may be used to provide additional information that can assist in the interpretation and correct application of the essence element key or a class/subclass of the essence element key register. This information cannot be deduced from the other normative and informative fields.

5.3.11 isDeprecated

This normative field is an indication to system designers that the label should no longer be used.

The field shall contain a boolean value that is true for essence elements keys that have been classified as deprecated according to the processes described in AG 18. All other entries shall carry the value false. Where a node is flagged as deprecated no new nodes or leaves shall be allocated under that node. Leaves under a deprecated node may be flagged as deprecated or left usable.

Note: Deprecation can be used in situations where it has been determined that the entry is erroneous or could cause compatibility problems, so great care is required to avoid them. However some situations can require use of an essence element key after it has been deprecated, such as reading from a large archive of material that contains essence that may have the value of the deprecated essence element key. In these situations developers will need to exercise great caution.

6 Essence element key register maintenance

SMPTE AG 18 specifies the processes for maintenance and administration of the essence element key register.

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