RP 217-2001

SMPTE RECOMMENDED PRACTICE

Nonsynchronized Mapping of KLV Packets into MPEG-2 Systems Streams

1 Scope

This practice describes a means for mapping SMPTE metadata and other data essence, encoded in the SMPTE KLV protocol, into MPEG-2 systems streams. Use of synchronized streams and their syntax and semantics is beyond the scope of this practice.

2 Normative references

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

SMPTE 336M-2001, Television — Data Encoding Protocol using Key-Length-Value

ITU-T H.222.0 / ISO/IEC 13818-1:2000, Information Technology — Generic Coding of Moving Pictures and Associated Audio Information: Systems

3 Introduction

This practice describes a means for mapping SMPTE metadata and/or essence encoded in the SMPTE 336M KLV protocol into MPEG-2 systems streams. A strong interest exists to carry audio/visual data, metadata, and/or essence multiplexed together within the same digital stream. The use of one data stream facilitates delivery of the overall multimedia presentation to the consumer. Metadata is classified as information about the content or essence. An example of metadata is information such as camera angle, scene identifier, or property rights. Other essence is supplemental content to the audio and video such as closed captioning, sports statistics, or hyperlinked advertisements.

For some applications, it may not be appropriate for large amounts of data essence and metadata to be mixed together in the same stream. For example, applications intended for simple realtime decoders may wish to carry data essence and metadata in separate streams using the specifications in this practice.

4 Transport and program stream mapping

The MPEG-2 systems specification describes a transport stream and a program stream. The transport stream is tailored for communicating or storing one or more programs of coded video and other data in environments where significant errors may occur. Examples include wireless communications, broadcast, and Internet delivery. Alternatively, the program stream is tailored for communicating or storing one program of coded video and other data in environments where errors are very unlikely. Examples include DVD, video archives, Intranet, and FTP.

Both protocols allow for the multiplexing of other data with the audio and video stream.

The MPEG-2 systems stream protocol is primarily a methodology for multiplexing multiple streams of audio/visual/data information into a single program. Data may be carried in MPEG-2 systems streams similar to the way video and audio data are carried.

The value of the ISO/IEC 13818-1 *stream_id* field associated with an SMPTE KLV program element shall be equal to 0xBD (private_stream_1).

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4.1 Integration of KLV streams into a program

4.1.1 Transport streams

For transport streams, each KLV encoded stream shall be part of an MPEG-2 program and hence shall be listed as an entry in one ISO/IEC 13818-1 program in the program map table (PMT) for that program. Multiple KLV streams may belong to an MPEG-2 program. For each, the *stream_type* field is set to PES private data (0x06).

In addition, the program element loop in the PMT shall contain a *registration_descriptor* as defined in ISO/IEC 13818-1, and the *format_identifier* field shall be set to 0x4B4C5641 (KLVA).

As needed to aid in the discovery of KLV encoded streams and as allowed by MPEG-2 systems, additional descriptors may be included in the program element loop of the PMT, such as an *association_tag*. An example of the use of the *association_tag* is to allow the rediscovery of the program element carrying the KLV metadata after a PID remapping operation during remultiplexing.

4.1.2 Program streams

In the case of a program stream, only one SMPTE KLV program element may be part of an MPEG-2 program stream since a program stream can only include one program element with a *stream_id* field value equal to 0xBD.

In the case when the program stream includes a program stream map (PSM) conveyed in a PES packet with *stream_id* value 0xBD, the descriptor loop of the PSM may include descriptors similar to the ones mentioned in 4.1.1.

4.2 PES encoding

Each KLV item shall be placed into one or more PES packets. Multiple KLV items may be placed into a single PES packet as long as they fit wholly in a single PES packet. The first KLV item in a PES packet shall be aligned with the beginning of the PES packet. Subsequent KLV items shall be appended without filler through to the size of the PES packet as advertised by the *PES_packet_length* field. If KLV items are smaller than a PES packet, they shall not span multiple PES packets.

NOTE – The term *item* applies herein to any individually coded KLV data including metadata and data essence components, data sets, and data packs as specified in SMPTE 336M.

The value of the *PES_packet_length* field in the header of a PES packet conveying SMPTE KLV metadata shall be greater than zero.

The value of the *PTS_DTS_flags* shall be set to 00, and the *ESCR_flag* shall also be set to zero.

The value of *data_alignment_indicator* shall be set as described below.

4.3 Segmentation

A single KLV item may span more than one PES packet. This shall be done for any KLV item that exceeds the maximum PES packet length (65535 minus headers). The *data_alignment_indicator* shall be set to one when the PES packet contains the beginning of a KLV item, and shall be set to zero otherwise. Use of the *data_alignment_indicator* for this purpose is allowed under ISO/IEC 13818-1 although it has in the past been used for video and audio packets. When a KLV item is segmented into more than one PES packet, all the PES packet segments of the item shall contain only the one KLV item. Each KLV item is mapped into a single PES stream and shall not be split onto multiple streams.

When segmented KLV items are inserted into a single PES stream, the individual PES packets of different KLV items shall not be interleaved.

Annex A (informative)
Organization of references

The organization of standards addressing essence and metadata is illustrated in figure A.1. No single standard can contain all of the information needed to describe and encode essence and metadata. The encoding implementation standard (SMPTE 336M) and the metadata dictionary standard (SMPTE 335M) form the SMPTE normative standards for metadata. Normative SMPTE documents, such as this one, supplement the standards for encoding with examples and administrative instructions on managing the standardization and registration process.

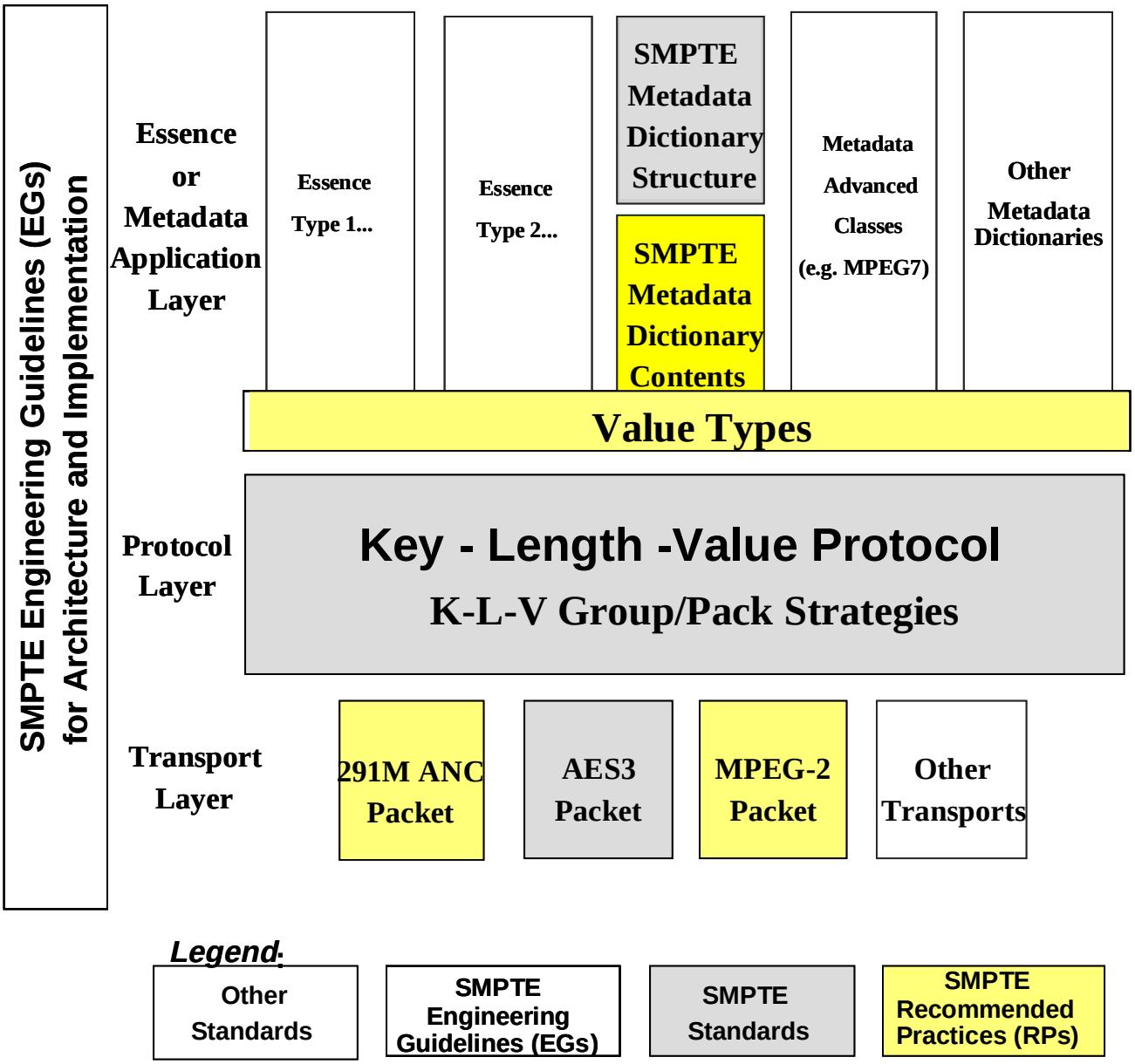

Figure A.1 – Organization of references

Annex B (informative)
Synchronized MPEG data streams

This practice addresses only nonsynchronized MPEG streams and, thus, only the use of private_stream_1 *stream_id* without PTS or DTS. The reason for this is that the design for full synchronization is complex and nontrivial when dealing with arbitrary KLV data items and is the subject of future work.

Users are cautioned that private use of PTS or DTS may be incompatible with future applications or standards.

Annex C (informative)
Bibliography

SMPTE 335M-2001, Television — Metadata Dictionary Structure