

SMPTE STANDARD

MPEG TS Packets Carried in VANC



Page 1 of 12 pages

Table of Contents	Page
Foreword	2
Intellectual Property	2
Introduction.....	2
1 Scope	3
2 Conformance Notation	3
3 Normative References	3
4 Definitions and Acronyms	4
5 System Overview (Informative).....	4
5.1 Use Cases for MPEG-2 TS in VANC Services (Informative).....	4
5.2 Breaking the Prior MPEG TS Clock Domain (Informative)	5
5.3 Additional Considerations for DVB Subtitles (Informative)	6
5.4 Table Handling (Informative).....	6
5.5 Data Carousels (Informative)	6
6 Format of TS Carriage Data Packets.....	6
6.1 TSCD Structure Syntax.....	7
6.2 TS Carriage Data Structure Semantics.....	8
7 Immediate Placement Messages	10
8 Frame Aligned Placement Messages	10
8.1 DVB subtitle streams.....	10
9 Cyclic Placement Messages	10
9.1 Carousel Removal State	11
10 PSI/SI Tables	11
Annex A Bibliography (Informative)	12

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 Administrative Practices.

SMPTE ST 2056 was prepared by Technology Committee 24TB.

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.

In many digital systems, subsystems which historically were physically co-located needs to be now separated by sometimes a significant distance. Many of these subsystems produced MPEG-2 Transport Stream (TS) packets, carried over ASI or IP, which were then multiplexed with other compressed video and audio signals for emission to home viewers.

Examples of these subsystems include DVB bitmapped subtitle generators and EBIF carousels. In both cases the earliest implementations assumed close proximity of the generator to the emission multiplexer. Over time it has become necessary in some cases to have the generator either remotely located or to take an original compressed signal, decode it to baseband, switch/route that signal, and re-compress it for emission. In either case, the system design will be greatly simplified by carriage of the low-bandwidth MPEG-2 TS packets in the VANC of their associated video.

1 Scope

This Standard defines a standardized wrapper for the carriage of low bit rate MPEG-2 TS packets, in the 10-bit vertical ancillary data (VANC) space of a standard definition or high definition serial digital link in accordance with SMPTE ST 291. Examples of such low bitrate services are EBIF and DVB bitmapped subtitles.

Note: Low bit rate means typically 1-20 TS packets per video frame.

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

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

SMPTE ST 291:2010, Ancillary Data Packet and Space Formatting

ISO/IEC 13818-1:2007, Information Technology – Generic Coding of Moving Pictures and Associated Audio Information: Systems

ISO/IEC 13818-6:1998, Information Technology – Generic Coding of Moving Pictures and Associated Audio Information – Part 6: Extensions for DSM-CC

4 Definitions and Acronyms

carousel: A term referring to a technique defined by MPEG and other standards where one or more TS packets are multiplexed into a TS by cyclically repeating the contents of those packets. See Section 5.5.

DTS: An abbreviation for Decode Time Stamp. (Note: See ISO/IEC 13818-1.)

EBIF: An abbreviation for Enhanced TV Binary Interchange Format (Note: See CableLabs OC-SP-ETV-BIF1.0-I04-070921.)

IRD: An abbreviation for Integrated Receiver Decoder.

NOT: The logical function NOT is the logical inverse of the bit or bits designated.

PCR: An abbreviation for Program Clock Reference. (Note: See ISO/IEC 13818-1.)

PSI: An abbreviation for Program Specific Information tables. (Note: See ISO/IEC 13818-1.)

PTS: An abbreviation for Presentation Time Stamp. (Note: See ISO/IEC 13818-1.)

SI: An abbreviation for Service or System Information tables. (Note: See relevant ATSC, DVB, and SCTE standards.)

STB: An abbreviation for Set-Top Box.

TS: An abbreviation for (MPEG-2) Transport Stream. (Note: See ISO/IEC 13818-1.)

TSCD: An abbreviation for TS Carriage Data.

UDW: An abbreviation for “user data words.” (Note: See SMPTE ST 291.)

uimsbf: An abbreviation for Unsigned integer, most significant bit first. Note: The byte order of multi-byte uimsbf words is most significant byte first.

VANC: An abbreviation for Vertical Ancillary. As used in this document it is an acronym for vertical ancillary data space.

5 System Overview (Informative)

A number of system architectures have assumed co-location of some type of data generator (such as a bitmapped subtitle generator) with the system multiplexer. In the particular case of subtitles, this was due to the necessity of obtaining the MPEG-2 Systems' PCR timestamp samples from the associated video bitstream, thus permitting correct values of PTS in the subtitle TS packets.

As “digital turn-around” architectures became commonplace, the need to “bridge” data services between an IRD and a downstream encoder arose. System operators desire a “one-wire” system architecture, and thus the requirement for placing the subtitle or EBIF TS packets into the VANC of their associated video frame. This standard provides that mechanism.

5.1 Use Cases for MPEG-2 TS in VANC Services (Informative)

There are three general types of services using this Standard: one is for TS packets which bear a definitive relationship to a given frame of video (which might be termed “frame synchronous”); the second is where the