SMPTE STANDARD

Professional Media Over Managed IP Networks: Timed Text Markup Language for Captions and Subtitles

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Foreword

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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 32NF Network/Facilities Architecture.

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.

Timed Text Markup Language is used to describe closed captions, subtitles or other text or metadata that changes over time. An RTP payload format has been defined in IETF RFC 8759. This Standard provides additional specifications to ensure interoperability when used for captions and subtitles in the SMPTE ST 2110 environment.

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 standard specifies the real-time, RTP-based transport of Timed Text Markup Language for captions and subtitles in systems conforming to SMPTE ST 2110-10.

2 Normative References

The following documents 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.

Timed Text Markup Language 2 (TTML2), Glenn Adams; Cyril Concolato, W3C, 08 November 2018, W3C Recommendation, https://www.w3.org/TR/ttml2/

TTML Profiles for Internet Media Subtitles and Captions 1.2 (IMSC1.2), Pierre-Anthony Lemieux, W3C. 04 August 2020, W3C Recommendation, https://www.w3.org/TR/ttml-imsc1.2/

IETF RFC 3550 Schulzrinne, H., Casner, S., Frederick, R., and V. Jacobson, "RTP: A Transport Protocol for Real-Time Applications", STD 64, DOI 10.17487/RFC3550, July 2003, https://www.rfc-editor.org/info/rfc3550

IETF RFC 4566 Handley, M., Jacobson, V., and C. Perkins, "SDP: Session Description Protocol", DOI 10.17487/RFC4566, July 2006, https://www.rfc-editor.org/info/rfc4566

IETF RFC 8759 Sandford, J., "RTP Payload for Timed Text Markup Language (TTML)", DOI 10.17487/RFC8759, March 2020, https://www.rfc-editor.org/info/rfc8759

SMPTE ST 2110-10:2017 Professional Media Over Managed IP Networks: System Timing and Definitions

3 Terms and Definitions

3.1. Session Description Protocol
SDP

As defined in IETF RFC 4566.

3.2. Real-time Transport Protocol
RTP

As defined in IETF RFC 3550.

4 Transport of Timed Text Markup Language

4.1.   General

Timed Text shall be expressed in Timed Text Markup Language 2 (TTML2) as defined in W3C TTML2.

The Timed Text Markup Language shall be transported using RTP with the payload format and SDP defined in IETF RFC 8759.

The RTP stream and its SDP shall be in conformance with SMPTE ST 2110-10.

4.2.   Additional constraints

The Timed Text Markup Language shall conform to one of the Profiles of TTML2 defined in W3C IMSC1.2.

The RTP Clock used to generate the RTP timestamp shall have a frequency of 90 kHz.

Note: IMSC1.2 contains provisions regarding the relationship between the Timed Text Markup Language and a Related Video Object.

4.3.   Keep alive mechanism

Packets with Length field set to zero and Marker bit set to 1 may be sent between TTML2 documents if required.

5 (Informative) Timing

5.1. TTML2 document

RFC 8759 requires the `timeBase` attribute to have the value `media` and requires processors of the document to support the `#rtp-relative-media-time` feature. In combination, these mean that time expressions in the document denote a coordinate on the RTP Clock timeline and that within a document the time expressions are relative to the RTP timestamp in the packets containing the document.

The TTML2 document becomes active at the point on the RTP Clock timeline given by its RTP timestamp.

5.2. Synchronization with related media streams

The SDP and RTCP Sender Reports (if present) contain information about the relationship between the RTP Clock and the Reference Clock. If a Common Reference Clock is used at senders and receivers, related media streams can be synchronized using the Reference Clock values corresponding to the RTP Timestamp values. If the RTP Clock is directly derived from the Reference Clock with a zero offset (SDP `a=mediaclk:direct=0`), packets from related media streams are synchronized when their RTP timestamps are equal.