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## Digital Video Broadcasting (DVB); TTML subtitling systems

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**EBU**  
OPERATING EUROVISION

**DVB<sup>®</sup>**

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# Foreword

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The Digital Video Broadcasting Project (DVB) is an industry-led consortium of broadcasters, manufacturers, network operators, software developers, regulatory bodies, content owners and others committed to designing global standards for the delivery of digital television and data services. DVB fosters market driven solutions that meet the needs and economic circumstances of broadcast industry stakeholders and consumers. DVB standards cover all aspects of digital television from transmission through interfacing, conditional access and interactivity for digital video, audio and data. The consortium came together in 1993 to provide global standardization, interoperability and future proof specifications.

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## Introduction

Today's broadcast content can be distributed in many forms and via many different paths. Whilst broadcast services traditionally relied on bitmap-based subtitles because of processing simplicity, advanced processing and text rendering have made text-based approaches feasible. These offer more flexibility and better options to improve the user experience. TTML (Timed Text Markup Language) is established as a common solution for IP-based platforms, but multiple profiles exist.

In Europe, the EBU Group 'Subtitles in XML' published the EBU-TT-D TTML profile [20] which was adopted by the DVB DASH specification as defined in ETSI TS 103 285 [6] and by HbbTV® as defined in ETSI TS 102 79 [5]. The W3C later published the IMSC1 TTML profiles [4], which were adopted by ATSC.

There are only minor differences between EBU-TT-D [3], [20] and IMSC1 Text Profile.

The present specification builds on the existing widespread device support for EBU-TT-D [20], in particular through support for HbbTV®, to enable the distribution of TTML subtitles together with audio/video content via broadcast.

Clause 4 specifies TTML subtitle constraints for a default conformance point, to be supported by both EBU-TT-D [3], [20] and IMSC1 Text Profile compatible processors.

Clause 5 specifies subtitle delivery, including PSI/SI signalling, TS packetisation, TTML segmentation and synchronization requirements.

Finally clause 6 specifies IRD requirements.

# 1 Scope

The present document specifies the transport of TTML [2] **subtitle streams** in DVB MPEG-2 **transport streams**, based on the MPEG-2 system described in ISO/IEC 13818-1 [1]. TTML is an XML-based representation. The present document provides syntax for delivery of TTML **subtitle streams** over MPEG-2 **transport stream**, and is based on EBU-TT-D [3] compatible with the IMSC1 [4] Text Profile of W3C TTML [2].

## 2 References

### 2.1 Normative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

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The following referenced documents are necessary for the application of the present document.

[1] ISO/IEC 13818-1: "Information technology -- Generic coding of moving pictures and associated audio information -- Part 1: Systems".

[2] W3C Recommendation (TTML): "Timed Text Markup Language 1 (TTML1) (Second Edition)".

NOTE: Available at <http://www.w3.org/TR/2013/REC-ttml1-20130924/>.

[3] EBU Tech 3380 "EBU-TT-D Subtitling Distribution Format", version 1.0.1.

NOTE: Available at <https://tech.ebu.ch/publications/tech3380>.

[4] W3C Recommendation (IMSC1): "TTML Profiles for Internet Media Subtitles and Captions 1.0.1 (IMSC1)".

NOTE: Available at <http://www.w3.org/TR/ttml-imsc1.0.1/>.

[5] ETSI TS 102 796: "Hybrid Broadcast Broadband TV".

[6] ETSI TS 103 285: "Digital Video Broadcasting (DVB); MPEG-DASH Profile for Transport of ISO BMFF Based DVB Services over IP Based Networks".

[7] DVB BlueBook A038: "Digital Video Broadcasting (DVB); Specification for Service Information (SI) in DVB systems".

NOTE: Available at [http://www.dvb.org/resources/public/standards/a038\\_dvb\\_spec\\_december\\_2017.pdf](http://www.dvb.org/resources/public/standards/a038_dvb_spec_december_2017.pdf).

[8] ISO 639-2: "Codes for the representation of names of languages -- Part 2: Alpha-3 code".

[9] ISO/IEC 8859-1: "Information technology -- 8-bit single-byte coded graphic character sets -- Part 1: Latin alphabet No. 1".

[10] W3C Working Group Note: "TTML Media Type Definition and Profile Registry".

NOTE: Available at <http://www.w3.org/TR/ttml-profile-registry/>.

[11] ETSI EN 301 192: "Digital Video Broadcasting (DVB); DVB specification for data broadcasting".

[12] ETSI TS 102 809: "Digital Video Broadcasting (DVB); Signalling and carriage of interactive applications and services in hybrid broadcast/broadband environments".



- [13] ETSI TS 102 851: "Digital Video Broadcasting (DVB); Uniform Resource Identifiers (URI) for DVB Systems".
- [14] IETF RFC 1952: "GZIP file format specification version 4.3".
- [15] DVB BlueBook A126: "Digital Video Broadcasting (DVB); Allocation of identifiers and codes for Digital Video Broadcasting (DVB) systems".
- NOTE: Available at [https://www.dvb.org/resources/public/standards/a126\\_allocation\\_identifiers.pdf](https://www.dvb.org/resources/public/standards/a126_allocation_identifiers.pdf).
- [16] W3C Recommendation (XML): "Extensible Markup Language (XML) 1.0 (Fifth Edition)".
- NOTE: Available at <https://www.w3.org/TR/2008/REC-xml-20081126/>.
- [17] EBU Tech 3381: "Carriage of EBU-TT-D in ISOBMFF", version 1.0.
- NOTE: Available at <https://tech.ebu.ch/publications/tech3381>.
- [18] W3C Recommendation 13 December 2012 (WOFF): "Web Open Font Format (WOFF) 1.0".
- NOTE: Available at <http://www.w3.org/TR/2012/REC-WOFF-20121213/>.
- [19] ISO/IEC 14496-22:2015: "Information technology -- Coding of audio-visual objects -- Part 22: Open Font Format".
- [20] EBU Tech 3380: "EBU-TT-D Subtitling Distribution Format", version 1.0.
- NOTE: Available at <https://tech.ebu.ch/publications/tech3380>.
- [21] IETF RFC 3986: "Uniform Resource Identifier (URI): Generic Syntax".

## 2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or non-specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

- [i.1] W3C Recommendation (WCAG): "Web Content Accessibility Guidelines (WCAG) 2.0".
- NOTE: Available at <https://www.w3.org/TR/2008/REC-WCAG20-20081211/>.
- [i.2] W3C Candidate Recommendation (CSS): "CSS Fonts Module Level 3: Font matching algorithm".
- NOTE: Available at <https://www.w3.org/TR/css-fonts-3/#font-matching-algorithm>.
- [i.3] IEC 61966-2-1:1999: "Multimedia systems and equipment - Colour measurement and management - Part 2-1: Colour management - Default RGB colour space - sRGB".



## 3 Definitions and abbreviations

### 3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

**Intermediate Synchronic Document (ISD):** temporally bounded (possibly empty) subset of TTML content during which no elements change state between active and inactive

NOTE: A TTML document can conceptually be considered as a contiguous sequence of ISDs.

**maximum period of activation (MPA):** maximum duration a single **TTML segment** can be active, referred to as  $T_{MPA}$

**Packet Identifier (PID):** transport stream packet identifier

NOTE: See ISO/IEC 13818-1 [1].

**PES packet:** See ISO/IEC 13818-1 [1].

**Presentation Time Stamp (PTS):** See ISO/IEC 13818-1 [1].

**reserved\_zero\_future\_use:** when used in the clause defining the coded bit stream, indicates that the value may be used in the future for ETSI defined extensions

NOTE: All "reserved\_zero\_future\_use" bits are set to "0".

**subtitle segment:** basic syntactical element of a **subtitle stream**

NOTE: The present document is structured to allow other types of subtitle segments to be defined in the future. In this version of the specification, all **subtitle segments** are **TTML segments**.

**subtitle service properties:** properties defined by TTML subtitling descriptor which include but are not limited to language, purpose, TTS\_suitability, font usage, and qualifier

**subtitle service:** service that provides subtitling for an MPEG program (DVB service) with a set of **subtitle service properties**

**subtitle service qualifier variants:** set of **subtitle services** whose **subtitle service properties** are identical except for the `qualifier_present_flag` and `qualifier_fields` in the TTML subtitling descriptor

**subtitle stream:** stream of **subtitle segments** carried in **transport stream packets** identified by the same **PID**, containing a single **subtitle service**

**transport stream packet:** See ISO/IEC 13818-1 [1].

**transport stream:** stream of **transport stream packets** carrying one or more MPEG programs

NOTE: See ISO/IEC 13818-1 [1].

**TTML document chunk:** self-contained and temporally bounded subset of a TTML document [2]

NOTE: Self-contained in this context means that the document chunk contains all elements to render this subset except the actual fonts used.

**TTML segment:** **subtitle segment** whose payload is an XML serialization of a TTML document chunk, concretely encoded as a well-formed XML 1.0 [16] document

## 3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

ATSC	Advanced Television Systems Committee
BAT	Bouquet Association Table
bslbf	bit string, left bit first

NOTE: The rightmost bit of a bslbf field is always referred to as  $b_0$ . This will be the last bit of the field transmitted.

CRC	Cyclic Redundancy Check
CSS	Cascading Style Sheets
DASH	Dynamic Adaptive Streaming over HTTP
DFIS	Downloadable Font Information Section
DFIST	Downloadable Font Information sub_table
DFIT	Downloadable Font Information Table
DSI	Download Server Initiate
DSM-CC	Digital Storage Media - Command and Control
DVB	Digital Video Broadcasting
DVB URI	Uniform Resource Identifiers for DVB systems

NOTE: As defined in ETSI TS 102 851 [13].

EIT	Event Information Table
-----	-------------------------

NOTE: As defined in DVB BlueBook A038 [7].

HbbTV <sup>®</sup>	Hybrid broadcast broadband TV
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NOTE: As defined in ETSI TS 102 796 [5].

HDR	High Dynamic Range
HRM	Hypothetical Render Model
HTTP	Hypertext Transfer Protocol
HTTPS	Hypertext Transfer Protocol - Secure
IP	Internet Protocol
IRD	Integrated Receiver Decoder
ISD	Intermediate Synchronic Document
MPA	Maximum Period of Activation
MPEG	Moving Pictures Experts Group
NIT	Network Information Table

NOTE: As defined in ISO/IEC 13818-1 [1].

PES	Packetized Elementary Stream
-----	------------------------------

NOTE: As defined in ISO/IEC 13818-1 [1].

PID	transport stream Packet Identifier
-----	------------------------------------

NOTE: As defined in ISO/IEC 13818-1 [1].

PMT	Program Map Table
-----	-------------------

NOTE: As defined in ISO/IEC 13818-1 [1].

PSI	Program Specific Information
PTS	Presentation Time Stamp

NOTE: As defined in ISO/IEC 13818-1 [1].

RGB	Red Green Blue
-----	----------------

SDT            Service Description Table

NOTE: As defined in DVB BlueBook A038 [7].

SI            Service Information

NOTE: As defined in ISO/IEC 13818-1 [1].

sRGB            standard Red Green Blue

NOTE: As defined in IEC as IEC 61966-2-1:1999 [i.3].

TLS            Transport Layer Security

T<sub>MPA</sub>            Time period equal to the maximum period of activation

TS            Transport Stream

NOTE: As defined in ISO/IEC 13818-1 [1].

TTML            Timed Text Markup Language

NOTE: As defined in W3C "Timed Text Markup Language 1 (TTML1)" [2].

TTS            Text-To-Speech

uimsbf            unsigned integer, most significant bit first

NOTE: When a uimsbf field is broken down into bit fields, the least significant bit is always referred to as  $b_0$ . This will be the last bit of the field transmitted.

URI            Uniform Resource Identifiers

NOTE: Generic form of DVB URI as defined in IETF RFC 3986 [21].

UTF            Unicode Transformation Format

UTF-8            Unicode (or Universal Coded Character Set) Transformation Format - 8-bit

WOFF            Web Open Font Format

NOTE: As defined in W3C Web Open Font Format (WOFF) 1.0 [18].

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## 4 Default DVB TTML subtitle conformance point

### 4.1 Introduction

In order to maximize interoperability DVB has chosen a default DVB TTML document conformance point that can be processed by either of two commonly used TTML processor profiles, EBU-TT-D [3] and IMSC1 [4] Text Profile.

### 4.2 Document Constraints

#### 4.2.1 General

A DVB TTML subtitle stream conformant to the default conformance point shall be authored such that it can be processed by an IRD supporting any of the following DVB TTML processor profile combinations:

- only EBU-TT-D [3], configured to meet the additional IRD requirements for the default conformance point in clause 6.6;
- only IMSC1 [4] Text Profile;
- both EBU-TT-D [3] and IMSC1 [4] Text Profile.