

Project Report

26.07.2013 | XML-Format for Distribution of Subtitles in the
ARD Mediathek portals (EBU-TT-D-Basic-DE)

Project Sponsor:

Josef Lipp, NDR

IRT Contacts:

Andreas Tai (tai@irt.de)

Peter tho Pesch (thopesch@irt.de)

Editors:

Andreas Tai

Peter tho Pesch

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XML-Format for Distribution of Subtitles

in the ARD Mediathek portals (EBU-TT-D-Basic-DE)

Introduction

This document describes the format for subtitle distribution in the ARD Mediathek portals. The required XML elements, attributes and data types of this format are a subset of the EBU-TT standard EBU Tech 3350 [1] and define the minimal requirements. The format does not preclude a more advanced implementation of EBU-TT. It has been defined with an approach to enable an easy and prompt implementation.

To support the implementation, following material is provided:

- a descriptive document (this document)
- samples that demonstrate the transformation from STL to EBU-TT
 - sample files in the STL format
 - corresponding EBU-TT files
- a list of TTML features, that need to be implemented in order to support this format (minimal requirements)

Informative parts of the document will appear in a box and have a grey background.

If import or export features are implemented for this format the name of the format should be as follows: „EBU-TT-D-Basic-DE“¹.

1 Format description

The description of the format follows the structure of an EBU-TT document. If not mentioned otherwise, the format specification of EBU Tech 3350 [1] shall apply and shall be taken into account.

¹ The short name refer to the distribution format that is currently specified by the EBU group „Subtitles in XML“ (“EBU-TT-D”). Furthermore it indicates that with this format basic features for subtitles are covered and that it is based on the requirements of the ARD Mediathek portals for the german region (“DE”).

1.1 Root-element tt:tt

The attribute `ttp:timebase` shall have the value „media“.

Although EBU-TT allows timecodes based on frames (timebase “smpte”), this format only allows milliseconds. With timebase “media” the timecodes should not be interpreted as markers but refer directly to the playtime of the related video object. According to the recommendation in EBU-TT the syncbase is “00:00:00.000”. No offset to the start of the related video has to be taken into account (e.g. an offset of 10h).

The attribute `ttp:cellResolution` is mandatory and shall have the value „50 30“.

It is assumed that teletext subtitles will remain the reference of subtitle production for the time being. Therefore a grid of rows and columns is defined to simplify the transformation of teletext subtitle positions into positions for online distribution.

EBU-TT recommends a grid-size of 50 horizontal columns with equal column width and 30 vertical rows with equal row height. This virtual grid is applied to the full active video.

The subtitles are positioned in the “safe area”. The dimension of the safe area corresponds to 80% of the width and 80% of the height of the active video. The safe area is horizontally and vertically centered.

Together with the `cellResolution` of “50 30” for the full active video this “80% safe area” results in a “safe area grid” of 40 columns and 24 rows (which corresponds to the teletext grid).

The value of the attribute `xml:lang` shall correspond to the language the subtitles were authored for.

For German subtitles the value would be „de“.

An XML comment shall specify the profile to which this document conforms to:

```
<!-- Profile: EBU-TT-D-Basic-DE -->
```

1.2 Metadata

The EBU-TT document shall specify the version number of the EBU-TT standard it was authored for. This version number shall be specified with the `ebuttm:documentEbutttVersion` element.

```
<tt:metadata>
  <ebuttm:documentMetadata>
    <ebuttm:documentEbutttVersion>v1.0</ebuttm:documentEbutttVersion>
  </ebuttm:documentMetadata>
</tt:metadata>
```

XML-Example: Metadata

The EBU-TT document may transport a key that allows the unique identification of the document. This key or identifier may be specified with the `ebuttm:documentIdentifier` element. Depending on the text pattern the key may be used as hint to the related video.

The `tt:metadata` element allows to include additional metadata.

1.3 Styling

1.3.1 Default Style

A default style shall be defined. The default style contains the style attributes listed below.

Style Attribute	Value
<code>tts:fontFamily</code>	„Verdana, Arial, Tiresias“ ²
<code>tts:fontSize</code>	„160%“
<code>tts:lineHeight</code>	„125%“

² The fallback font-family “Tiresias” was added because it is used in the broadcast environment (e.g. HbbTV). Therefore the font-family can be chosen by TV platforms when Verdana or Arial are not available..

```
<tts:style
  xml:id="defaultStyle"
  tts:fontFamily="Verdana, Arial, Tiresias"
  tts:fontSize="160%"
  tts:lineHeight="125%"/>
```

XML-Example: Default Style

The specification of the font size and line height applies to the whole safe area where the subtitles are positioned.

In the defined grid with 30 horizontal rows, one row corresponds to the normal height in teletext. In operation teletext subtitles usually have double height. In teletext the font size is calculated with reference to the line height. In double height mode the font size is chosen to fit in two teletext rows.

Note that the values of font size and line height do not match exactly. The difference results from the vertical space between two text lines. To get the line height that space needs to be added to the font size. Therefore the size of the font is smaller than the height of the row.

For online subtitles this relation between line height and font size has to be taken into account. In contrast to teletext, in TTML and EBU-TT the calculation of the line height depends on the font size and not vice versa.

The percentage value of the font-size refers to the defined cell grid. A font-size of 100% corresponds to the height of one cell ("1c"). To leave space between the text in adjacent rows, the font size for double height is not 200% but 160%. The value of 125% for `tts:lineHeight` defines a line-height that is 125% of the computed font-size.

With respect to the defined grid size of 50 columns and 30 rows, the font size can be calculated according to the following formula:

$$(Height\ of\ the\ video / 30) / 100 * 160$$

1.3.2 Styles for “block elements” (tt:p)

A `tt:p` element generates a textblock for subtitles. The „style templates” that are referenced by the `tt:p` element set the horizontal positioning of the text. The `tts:textAlign` attribute of these styles shall be set to either “left”, “centered” or “right”. A `tt:p` element shall always refer to one of these style templates.

Alignment	Value for <code>tts:textAlign</code>
Left	„left“
centered	„center“
Right	„right“

```
<tt:style  
  xml:id="textLeft"  
  tts:textAlign="left" />
```

XML-Example: Block Style for the presentation mode “normal textbox”

The presentation mode of the subtitle is „normal textbox“. In this presentation mode the “block style” shall not specify a background color.

In the presentation mode “normal textbox” the background applies just to the text.³

³ A description of „normal textbox“ can be found in the report “DTV4All: Abschlussbericht rbb-Feldtest DVB-Untertitel“ [3].

1.4 Styles for “inline elements” (tt:span)

Subtitle text shall always be enclosed by a `tt:span` element. The color of the font is applied via a style that shall be referenced by a `tt:span` element.

For each font color that is used in the document one style shall be defined. A background color with the value “#000000c2” shall be applied to the inline styles.

The background color is always black with an opacity of 76% and a transparency of 24%⁴ respectively. The corresponding color value is “#000000c2”.

The last two characters of “#000000c2” define the alpha value. “c2” in hex notation corresponds to a decimal value of “194”. Since in TTML the value of “255” corresponds to a fully opaque background, the value “c2” results in a 76% opaque background.

Where text with `tts:backgroundColor` is applied at the span level, the filled area should extend the width of a space character to the left of the first rendered character on each line and to the right of the last rendered character on each line.

```
<tt:style xml:id="textYellow"
  tts:color="#ffff00"
  tts:backgroundColor="#000000c2"
/>

<tt:style xml:id="textWhite"
  tts:color="#ffffff"
  tts:backgroundColor="#000000c2"
/>
```

XML-Example: Span Style

⁴ This corresponds to the opacity of DVB subtitles for „Das Erste“.

Colors shall be set to the following hexadecimal values:

Color	Hex Value
black	"#000000"
white	"#ffffff"
red	"#ff0000"
green	"#00ff00"
blue	"#0000ff"
yellow	"#ffff00"
magenta	"#ff00ff"
cyan	"#00ffff"

1.5 Positioning with regions

Every `tt:p` element (and therefore every subtitle block) shall be positioned in the safe area. In EBU-TT the safe area is implemented with the help of regions. Two `tt:region` elements are defined as child elements of the `tt:layout` element. These regions shall have a vertical and horizontal margin of 10% to the top left corner of the active video. Hence the attribute `tts:origin` shall be set to the value „10% 10%“.

Relative length values refer to the width and height of the active video.

Both regions have a height and width of 80%. The attribute `tts:extent` is therefore set to “80% 80%”.

For both regions the attribute `tts:displayAlign` is mandatory.

In one of the two regions the value of `tts:displayAlign` shall be set to „after“. A `tt:p` element allocated in this region is aligned to the bottom of the safe area.

The `tts:displayAlign` of the other region shall be set to „before“. A `tt:p` element allocated in this region is aligned to the top of the safe area.

```
<tt:region
  xml:id="bottom"
  tts:origin="10% 10%"
  tts:extent="80% 80%"
  tts:displayAlign="after"/>

<tt:region
  xml:id="top"
  tts:origin="10% 10%"
  tts:extent="80% 80%"
  tts:displayAlign="before"/>
```

XML-Example: Regions

1.6 Content elements

1.6.1 tt:div element

The `tt:div` element is a wrapper element for all subtitle blocks (`tt:p` elements). The `tt:div` element shall reference the default style (see chapter 1.3.1). The template of the default style is applied to all subtitle blocks (`tt:p` elements) enclosed by the `div` element.

```
<tt:div style="defaultStyle">
...
</tt:div>
```

XML-Example: tt:div element

1.6.2 tt:p element (block)

A `tt:p` element is a container for a single subtitle block⁵. Every text content in a `tt:p` element shall be enclosed by a `tt:span` element (see 1.6.3). Therefore a `tt:p` element shall not have a text node as an immediate „child“ element.⁶

Every `tt:p` element has a unique identifier through the `xml:id` attribute. Values for the `xml:id` attribute shall not start with a number.

It is recommended that the identifier should correspond to the subtitle number (SN) of the corresponding TTI block in STL. As the value of the `xml:id` attribute must not begin with a numeric value, the subtitle number should contain a prefix (e.g. "sub").

```
<tt:p xml:id="sub9"..>..</ tt:p>
<tt:p xml:id="sub10"..>..</ tt:p>
```

XML-Example: tt:p element and xml:id

The `tt:p` refers to a style template that sets the horizontal alignment of the subtitle block.

```
<tt:p ... style="textCenter">...</tt:p>
```

XML-Example: tt:p element and reference of a style template

⁵ In general this corresponds to one TTI Block in STL.

⁶ Therefore "mixed content" is not allowed in a `tt:p` element. This is more restrictive than in EBU Tech 3350.

Sometimes the source file from which a document is created does not provide any information about the horizontal text alignment. In such cases a style template with centered text alignment shall be used.

In STL a TTI block can have a justification code with "0" which translates to "unchanged presentation". This value is used to position a subtitle block with spaces. In this case spaces at the beginning and the end of a subtitle row are trimmed and the text block is centered.

The time values when a subtitle shall be displayed are set by the attributes `begin` and `end`.

The values shall be in the following Full-Clocktime Format: "hh:mm:ss.ms".

The values relate to the playtime of the video. The sync base for the start of the video is "00:00:00.000".

```
<tt:p ... begin="00:00:04.440" end="00:00:06.560" ...>...</p>
```

XML-Example: tt:p element and the timecode values for fade in and fade out

Every `tt:p` element is allocated in a defined region. If the top border of a subtitle block is above the middle of the active video, then the `tt:p` element shall refer to a region that has the value of `tts:displayAlign` set to „before“. All other subtitles are allocated in a region where the value of `tts:displayAlign` is set to "after".

According to this rule all subtitles that have a teletext position up to and including teletext row 12 are allocated in the top region. All other subtitles are allocated in the bottom region.

```
<tt:p ... region="top">...</tt:p>

<tt:p ... region="bottom">...</tt:p>
```

XML-Sample: The tt:p element and references to regions

Note on cumulative subtitles

If in a translation the format of the source makes use of the of the feature 'cumulative subtitling', then the mapping should be as follows: A group of adjacent cumulative subtitles shall be translated to one single subtitle block. For this subtitle block one `tt:p` element will be generated. The value of the `begin` attribute of the `tt:p` element corresponds to the start of the first "cumulative" subtitle and the `end` attribute corresponds to the end time of the last cumulative subtitle of the grouping.

1.6.3 `tt:span` element (inline)

Every subtitle text is enclosed by a `tt:span` element. The `tt:span` element refers to a style template with the corresponding text color of the text enclosed by the span element. With every change of the font color the `tt:span` element is closed and a new `tt:span` that refers to a style with the new font color is opened.

```
<tt:p ...>
  <tt:span style="textWhite">a </tt:span>
  <tt:span style="textRed">red </tt:span>
  <tt:span style="textWhite"> word in one row</tt:span>
</tt:p>
```

XML-example: `tt:span` element and referencing of style templates

Additional rules for the `tt:span` elements:

- Leading and trailing spaces in a subtitle row shall be trimmed.
- At the moment there will be just one background color.
- An open span shall always be closed before a line break and a new span is opened after a line break (see sample below).
- There is no line break in a `tt:span` element.
- Spaces in the text are normalized (multiple spaces between words are replaced by one space).

```
<tt:span style="textWhite">row 1</tt:span>
</tt:br>
<tt:span style="textWhite">row 2</tt:span>
```

XML-Example: `tt:span` element and line breaks

References

[1] **EBU Tech 3350** EBU-TT Part 1 Subtitling format definition.

<http://tech.ebu.ch/docs/tech/tech3350.pdf?vers=1.0>

[2] **STL** EBU Tech 3264 Specification of the EBU Subtitling data exchange format.

<http://tech.ebu.ch/docs/tech/tech3264.pdf>

[3] **Projekt DTV4All**: Abschlussbericht rbb-Feldtest DVB-Untertitel.

[4] **Original German copy of this document**: XML-Format für die Distribution von Untertiteln in den ARD Mediatheken, Version 1.2, 26.07.2013.

Appendix A: Required TTML features

The following table shall give more clarity on what TTML features must be supported for the EBU-TT-D-Basic-DE profile. The list is meant to be a minimum set of required features and does not preclude a more advanced implementation of EBU-TT.

TTML feature name	Comment
#backgroundColor-inline	The following background-color shall be supported: <ul style="list-style-type: none"> • Black with 76% opacity ("000000c2")
#cellResolution	The cell resolution should be "50 30"
#color	Following foreground colors and values (in parentheses) shall be supported: <ul style="list-style-type: none"> • Black ("#000000") • Red ("#ff0000") • Green ("#00ff00") • Yellow ("#ffff00") • Blue ("#0000ff") • Magenta ("#ff00ff") • White ("#ffffff") • Cyan ("#00ffff")
#content	-
#core	-
#displayAlign	The values "before" and "after" shall be supported.
#fontFamily-non-generic	The value "Verdana" or "Arial" or "Tiresias" shall be supported.
#fontSize	The expression of length in percentage shall be supported.
#layout	-
#length-percentage	-
#length-positive	-
#lineHeight	-
#metadata	-
#structure	-
#styling	-
#styling-inheritance-content	-
#styling-referential	-

#textAlign-absolute	-
#timeBase-media	The time expressions shall have the format "00:00:00.000"

EBU-TT extends the #tt:metadata feature to map additional metadata. Therefore the following extension shall be supported.

#ebu-tt-metadata

Appendix B: Complete XML Example

```
<?xml version="1.0" encoding="UTF-8"?>
<!-- Profile: EBU-TT-D-Basic-DE -->
<tt:tt
  xmlns:ttp="http://www.w3.org/ns/ttml#parameter" xmlns:tts="http://www.w3.org/ns/ttml#styling"
  xmlns:tt="http://www.w3.org/ns/ttml" xmlns:ebuttm="urn:ebu:tt:metadata"
  ttp:timeBase="media"
  xml:lang="de"
  ttp:cellResolution="50 30">
  <tt:head>
    <tt:metadata>
      <ebuttm:documentMetadata>
        <ebuttm:documentEbuttmVersion>v1.0</ebuttm:documentEbuttmVersion>
      </ebuttm:documentMetadata>
    </tt:metadata>
    <tt:styling>
      <tt:style xml:id="defaultStyle" tts:fontFamily="Verdana, Arial, Tiresias"
        tts:fontSize="160%" tts:lineHeight="125%"/>
      <tt:style xml:id="textWhite" tts:color="#ffffff" tts:backgroundColor="#000000c2"/>
      <tt:style xml:id="textRed" tts:color="#ff0000" tts:backgroundColor="#000000c2"/>
      <tt:style xml:id="textCenter" tts:textAlign="center" />
    </tt:styling>
    <tt:layout>
      <tt:region xml:id="bottom" tts:origin="10% 10%" tts:extent="80% 80%" tts:displayAlign="after"/>
    </tt:layout>
  </tt:head>
  <tt:body>
    <tt:div style="defaultStyle">
      <tt:p xml:id="sub1"
        region="bottom"
        begin="00:00:00.000" end="00:00:02.120"
        style="textCenter">
        <tt:span style="textWhite">A </tt:span>
        <tt:span style="textRed">red</tt:span>
        <tt:span style="textWhite"> Word</tt:span>
        <tt:br/>
        <tt:span style="textWhite">in a two row subtitle</tt:span>
      </tt:p>
    </tt:div>
  </tt:body>
</tt:tt>
```

Appendix C: List of supported „Style-Templates” and regions:

The following style elements may be used in an EBU-TT-Basic-DE document:

```
<tt:styling>
  <!-- This style shall be referenced by the tt:div element -->
  <tt:style xml:id="defaultStyle" tts:fontFamily="Verdana, Arial, Tiresias" tts:fontSize="160%"
tts:lineHeight="125%"/>
  <!-- One of the following styles should be referenced by every tt:span element -->
  <tt:style xml:id="textBlack" tts:color="#000000" tts:backgroundColor="#000000c2"/>
  <tt:style xml:id="textRed" tts:color="#ff0000" tts:backgroundColor="#000000c2"/>
  <tt:style xml:id="textGreen" tts:color="#00ff00" tts:backgroundColor="#000000c2"/>
  <tt:style xml:id="textYellow" tts:color="#ffff00" tts:backgroundColor="#000000c2"/>
  <tt:style xml:id="textBlue" tts:color="#0000ff" tts:backgroundColor="#000000c2"/>
  <tt:style xml:id="textMagenta" tts:color="#ff00ff" tts:backgroundColor="#000000c2"/>
  <tt:style xml:id="textCyan" tts:color="#00ffff" tts:backgroundColor="#000000c2"/>
  <tt:style xml:id="textWhite" tts:color="#ffffff" tts:backgroundColor="#000000c2"/>
  <!-- One of the following styles should be referenced by every tt:p element -->
  <tt:style xml:id="textCenter" tts:textAlign="center"/>
  <tt:style xml:id="textLeft" tts:textAlign="left"/>
  <tt:style xml:id="textRight" tts:textAlign="right"/>
</tt:styling>
```

The following regions may be used in an EBU-TT-Basic-DE document:

```
<tt:layout>
  <!-- One of the following regions shall be referenced by every tt:p element-->
  <tt:region xml:id="top" tts:origin="10% 10%" tts:extent="80% 80%" tts:displayAlign="before"/>
  <tt:region xml:id="bottom" tts:origin="10% 10%" tts:extent="80% 80%" tts:displayAlign="after"/>
</tt:layout>
```

The listed identifiers of the `xml:id` attributes are not normative. Other values can be used as long as they conform to the type of `xml:id`. The use of an identifier that represents the semantic of a specific color could be one example (e.g. “speaker”).



Institut für Rundfunktechnik GmbH
Floriansmühlstraße 60
80939 Munich
Germany
www.irt.de
Phone +49 (0) 89 | 323 99 - 300
Fax +49 (0) 89 | 323 99 - 620
marketing@irt.de

Register Court Munich HRB 5191