XML in the air –
Changing subtitle workflows with TTML

Balisage 2016

Andreas Tai, IRT

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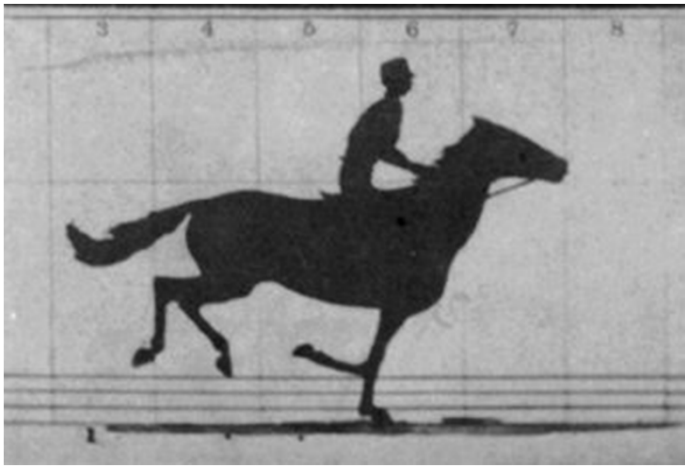

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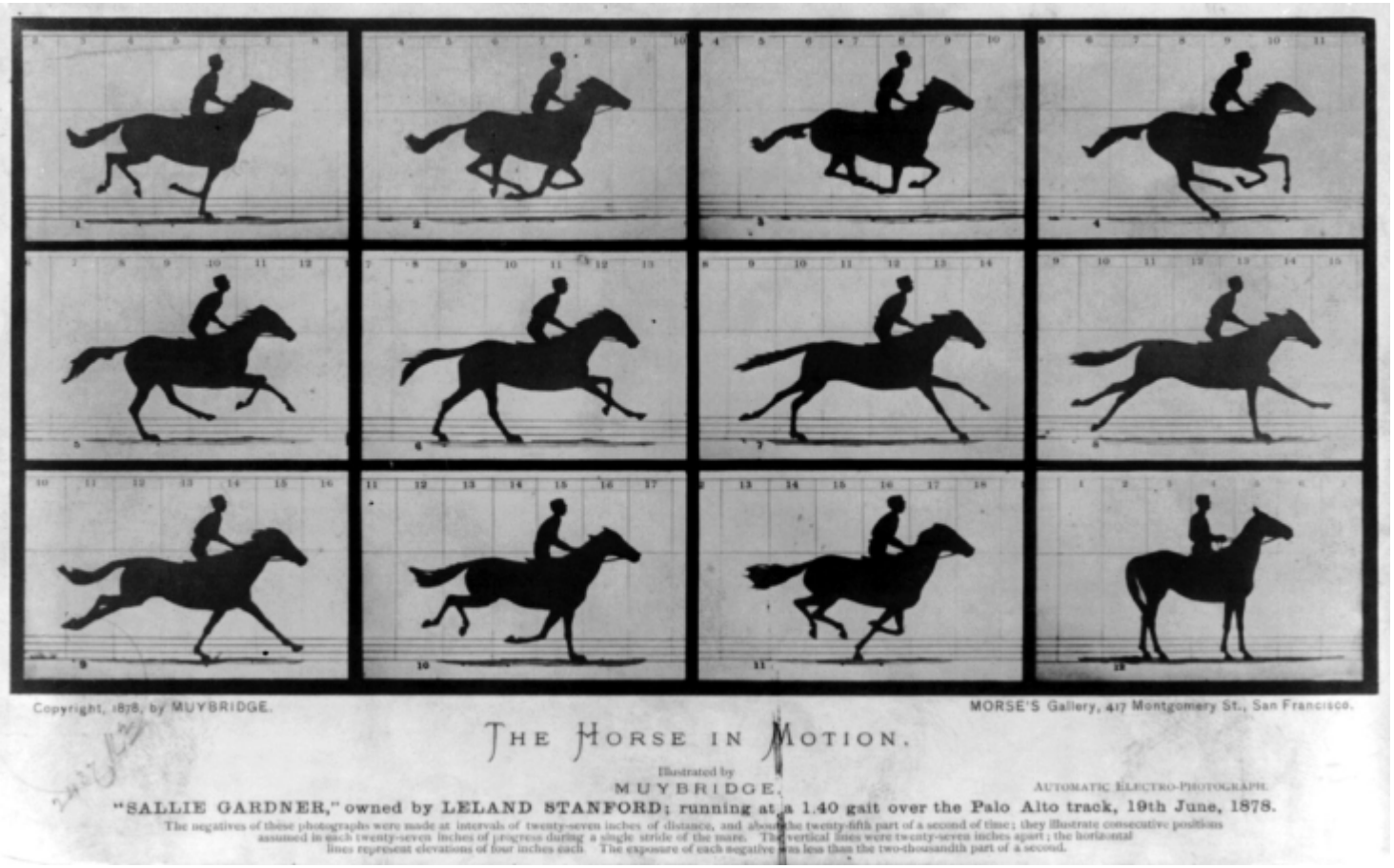
Copyright, 1878, by MUYBRIDGE.
MORSE'S Gallery, 417 Montgomery St., San Francisco.
THE HORSE IN MOTION.
Illustrated by
MUYBRIDGE.
AUTOMATIC ELECTRO-PHOTOGRAPH.
"SALLIE GARDNER," owned by LELAND STANFORD; running at a 1.40 gait over the Palo Alto track, 19th June, 1878.
The negatives of these photographs were made at intervals of twenty-seven inches of distance, and about the twenty-fifth part of a second of time; they illustrate consecutive positions assumed in each twenty-seven inches of progress during a single stride of the mare. The vertical lines were twenty-seven inches apart; the horizontal lines represent elevations of four inches each. The exposure of each negative was less than the two-thousandth part of a second.

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Black thunder is winning
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Subitles are images and text…

- Picture Frame 1 has text "Black thunder […]"
- Picture Frame 2 has text "Black thunder […] "
- Picture Frame 3 has text "Black thunder […]"
- Picture Frame 4 has text "Black thunder […]"
- …

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…and could be Images and XML

```
<subtitle color="yellow" start="1f" end="12f">
    Black thunder is winning
</subtitle>
```


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TTML = W3C Timed Text Markup Language

```
<p begin="1s" end="2s">
   <span color="yellow" … >
            Nein, und wir waren eine
   </span>
   <br />
   <span>
      von den ersten am Kreuzeck unten.
   </span>
</p>
```


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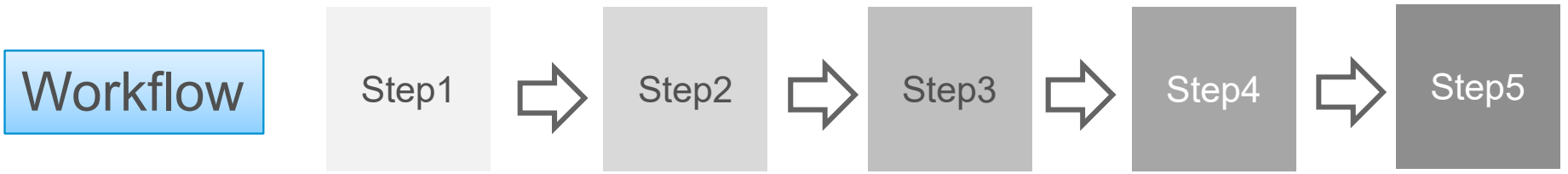
Use of TTML for broadcast



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HBB4all uses EBU-TT = TTML

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Production

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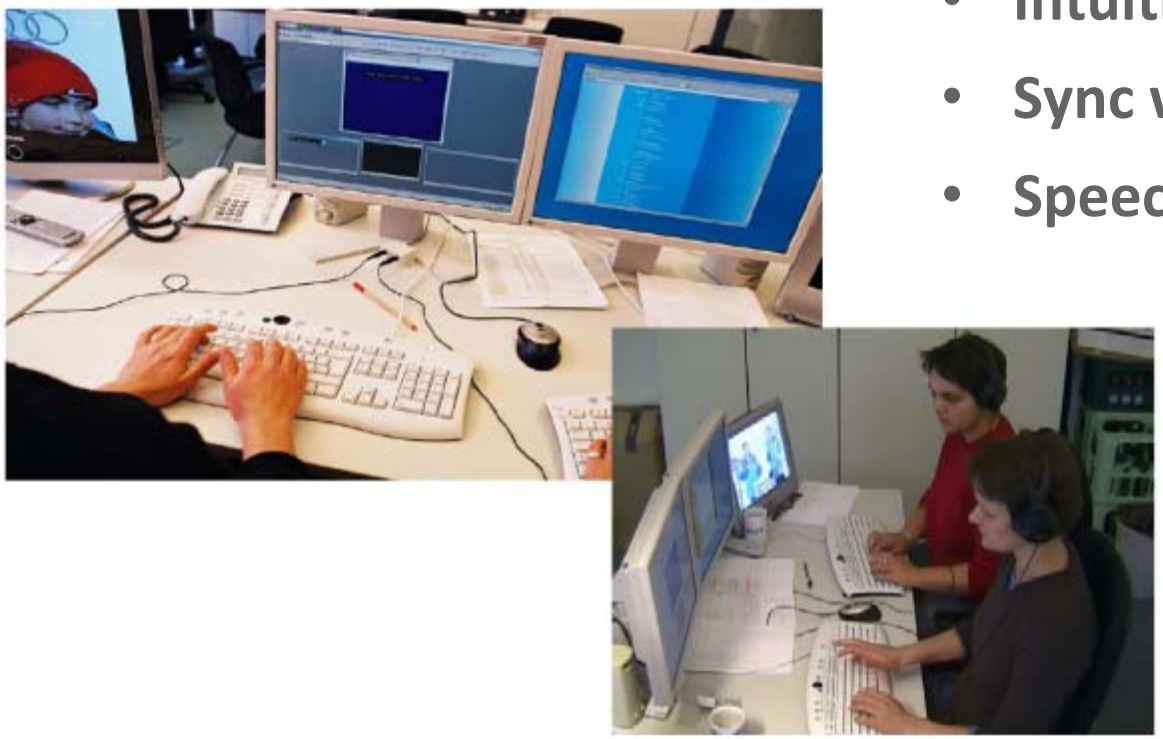
Current subtitle preparation systems



- **Intuitive for Speed**
- **Sync with Video**
- **Speech to Text**

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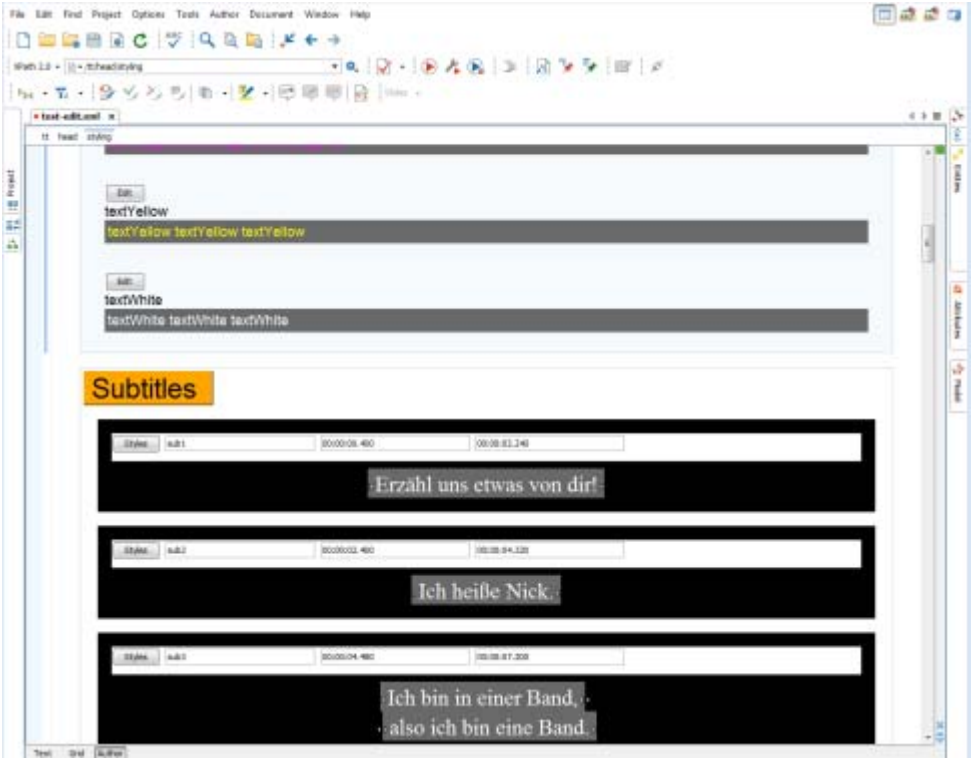
Native TTML editing



- Customization
- Vailidity
- Cost

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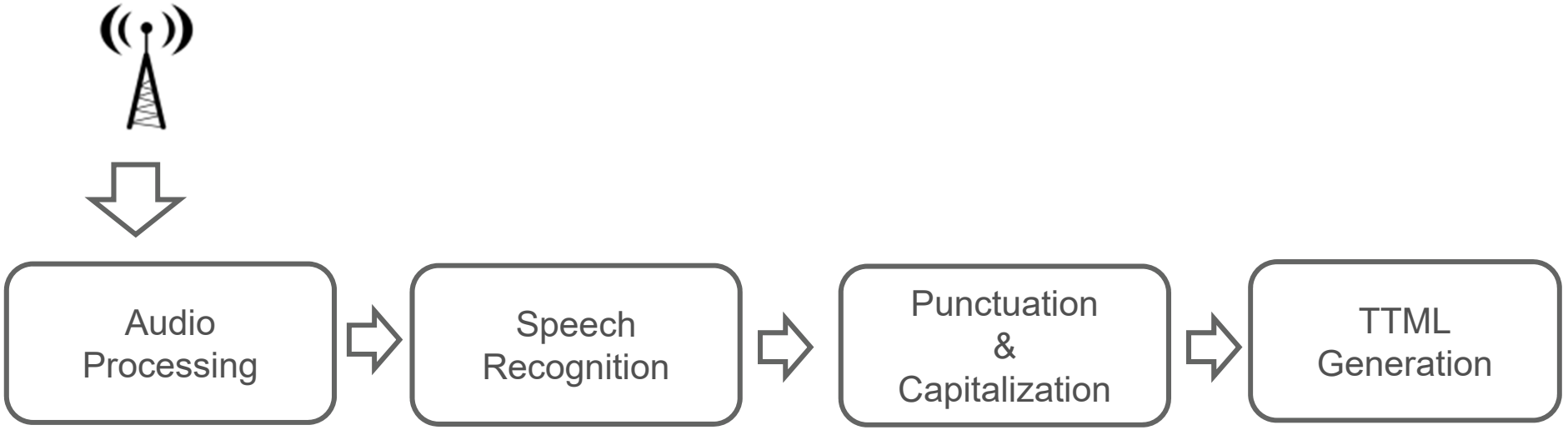
Automatic production of subtitles



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RATING - TTML and **PRODUCTION**

- **XML Stack** ★
- **Conformance** ★
- **Wish** TTML as view data model !
- **Perspective**: open, but promising..

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Production

Contribution
(Archive,Exchange)

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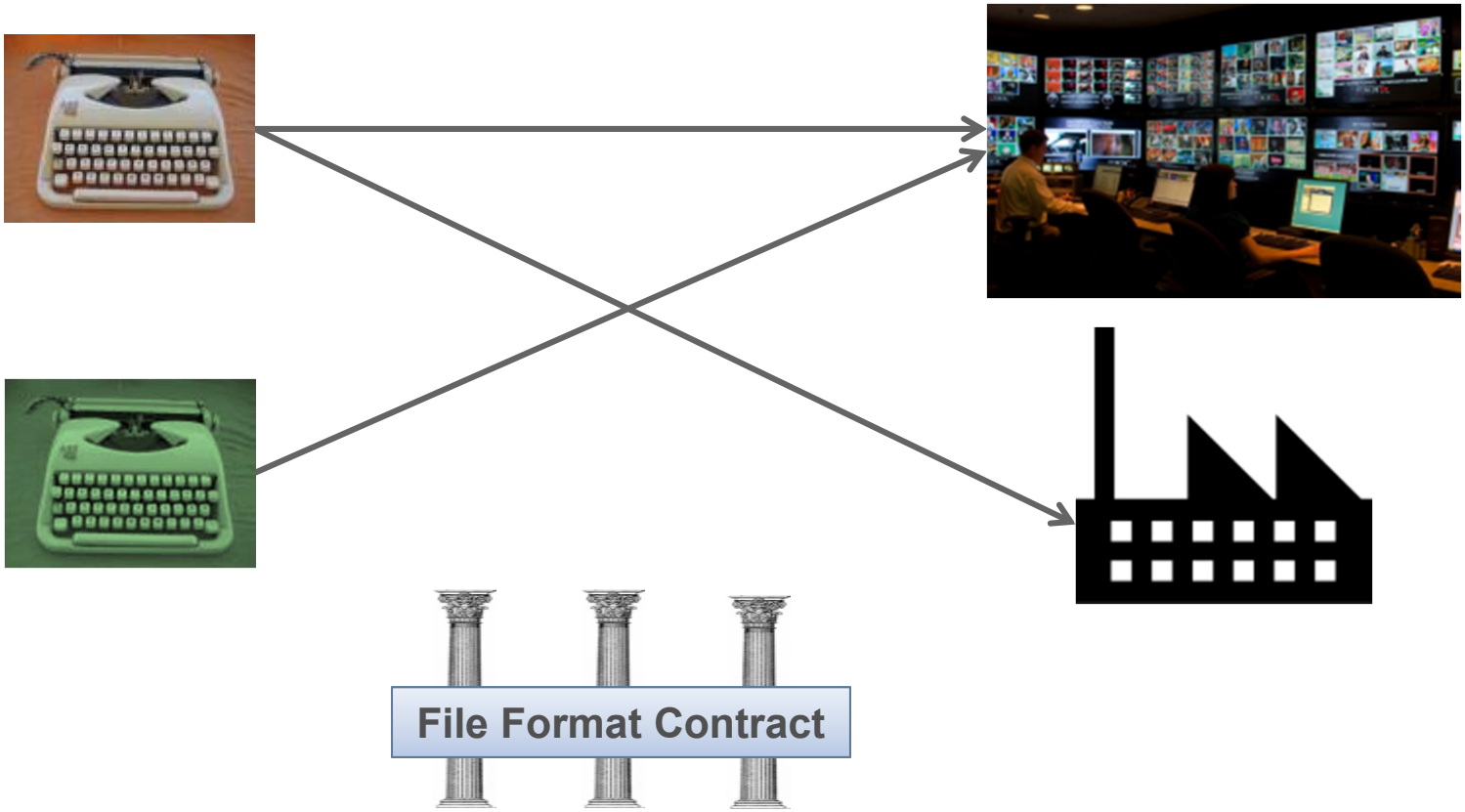
Subtitle Contribution



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Subtitle Exchange format EBU STL (Binary)

Metadata

Subtitle Data

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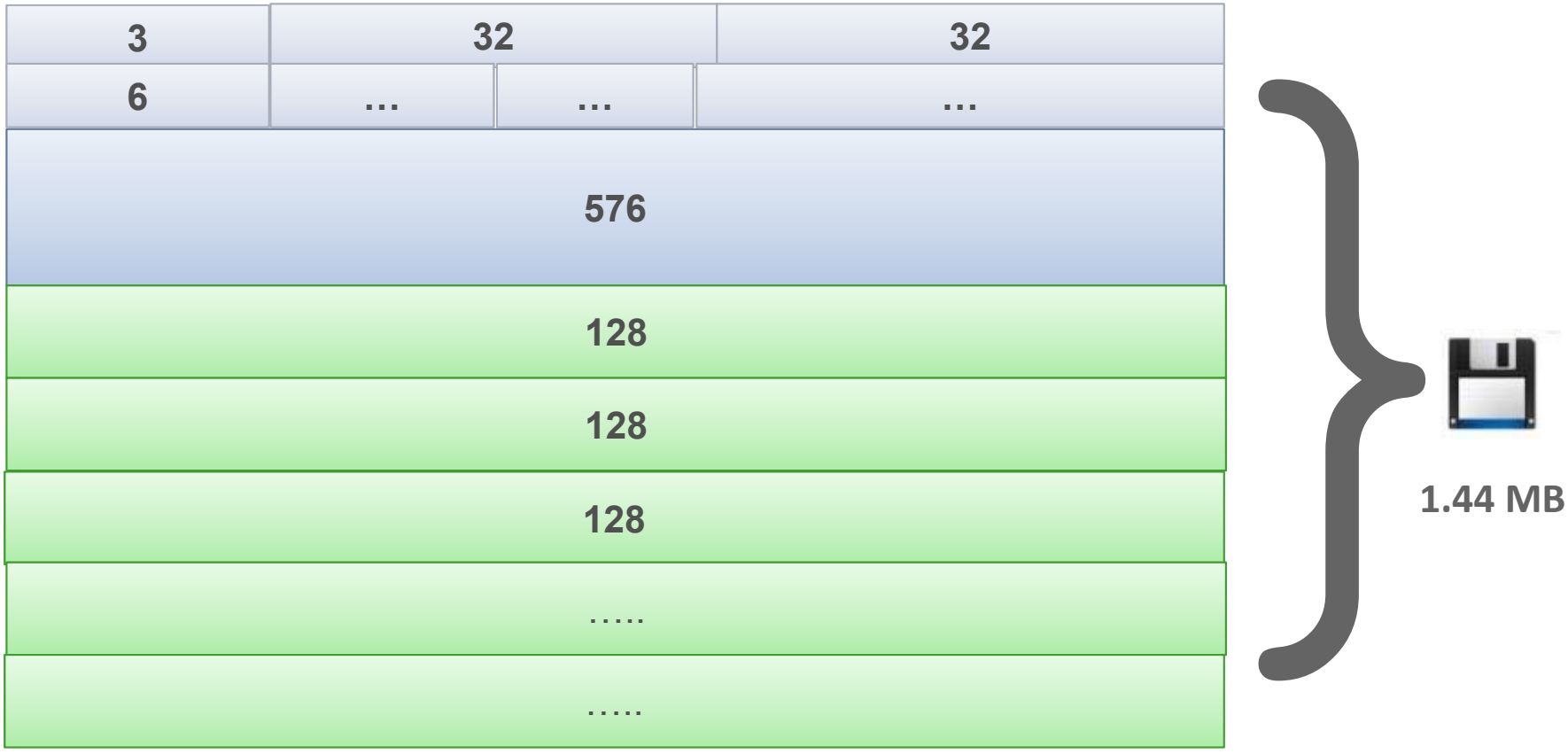
EBU STL – "Byte Layout"



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EBU-STL ist popular

interoperability

lack of extensibility!!

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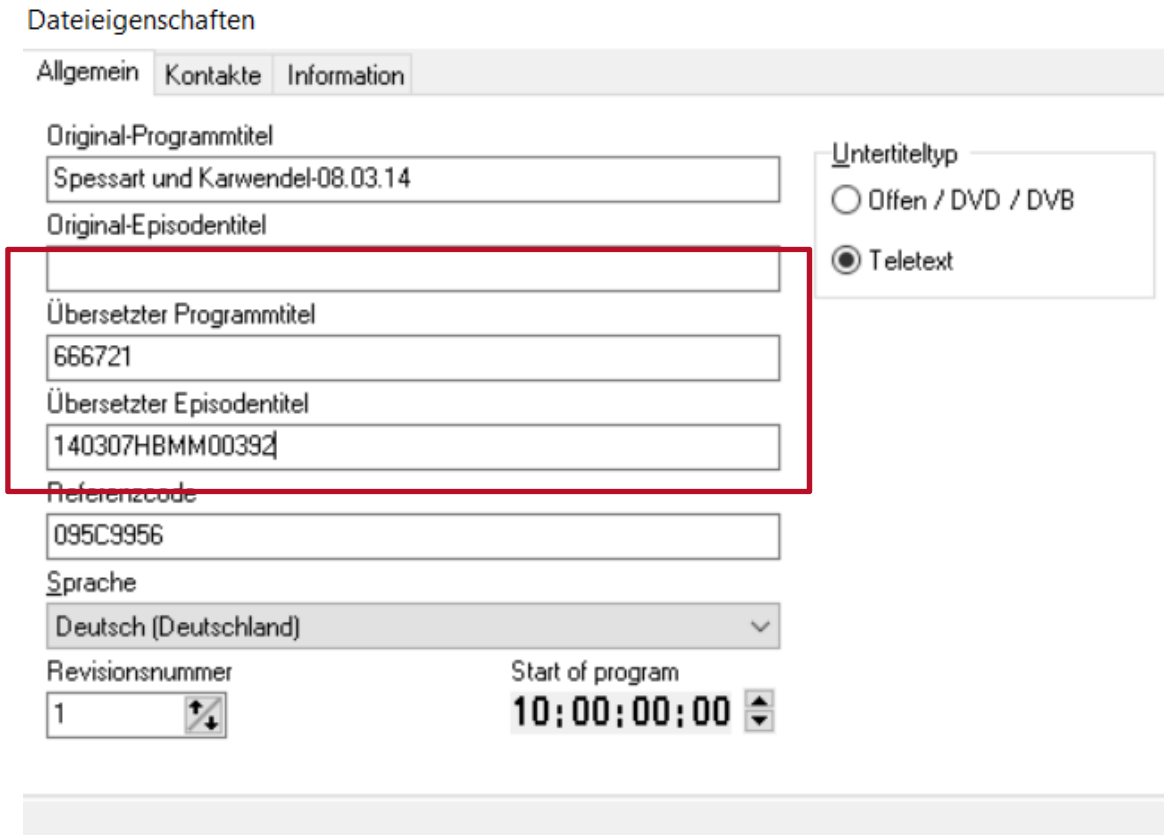
Users are creative…



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…TTML gives creativity some structure….

```
<head  ... >
<metadata>
    <title>…</title>
    <foo:bar1>…</foo:bar1>
    <foo:bar2>…</foo:bar2>
      ...
  </metadata>
</head>
```

..but…

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…too many choices can kill creativity.

TTML variations – TTML timing

```
<p begin="1s" end="3s">
   Black Thunder wins!
</p>

<p begin="1s" dur="2s">
   Black Thunder wins!
</p>
```


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Variation to express timing

```
<div begin="0s">
    < p begin="2s">
        <span begin="1s" end="3s">
            <span begin="0s">Black </span>
            <span begin="2s"> Thunder </span>
         </span>
        <span begin=„5s“>wins!</span>
    </p>
</div>
```


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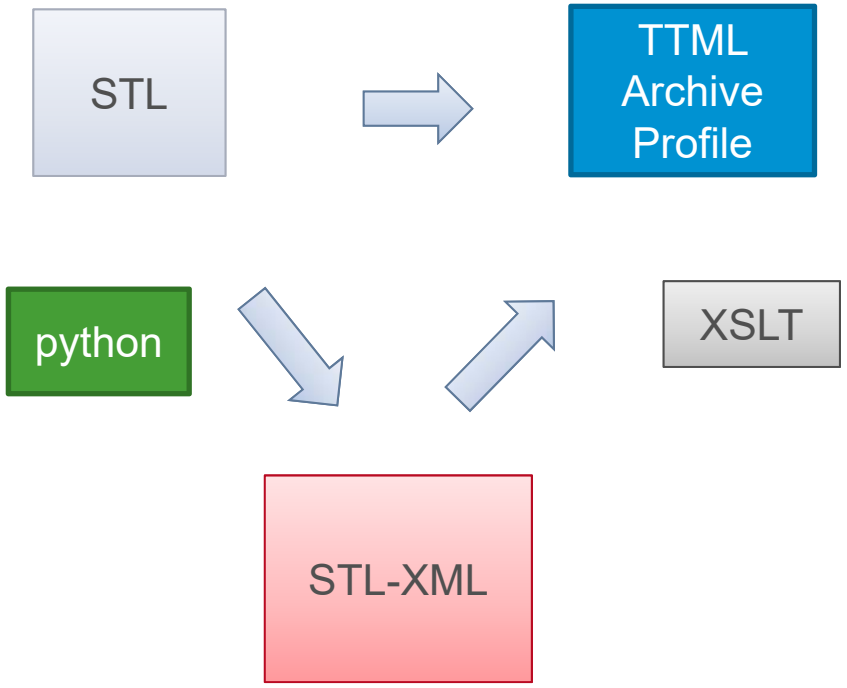
…implement and test all possibilities.

TTML Implementation - Subitle Conversion Framework



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UTMS – Subtitle Management - BaseX & BaseX

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Use of the XML Stack

SCF

- **XSLT 1** for Transformation
- **Schematron** for Unit-Testing
- **XPROC** for transformation pipe lines and to trigger unit tests
- **Dita** for documentation

UTMS (BaseX)

- **XQuery**, **RestXQ**

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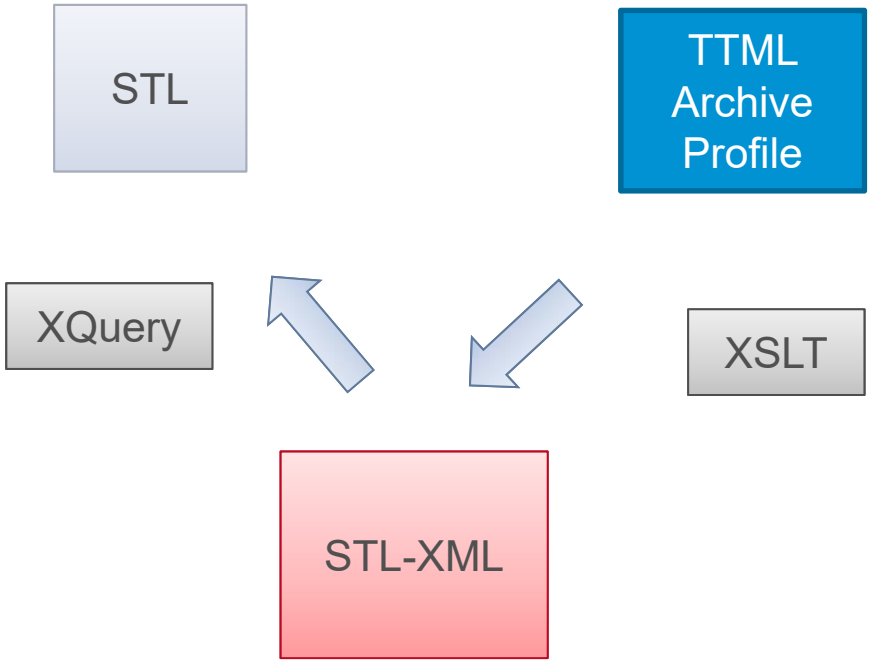

STLXML2STL module

EXPath Binary Module

+

EXPath File Module

by BaseX

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RATING - TTML and **Contribution**

- **XML Stack** ★
- **Conformance** ★
- **Perspective**: good … there is no alternative!

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Production

Contribution
(Archive,Exchange)

Embedding

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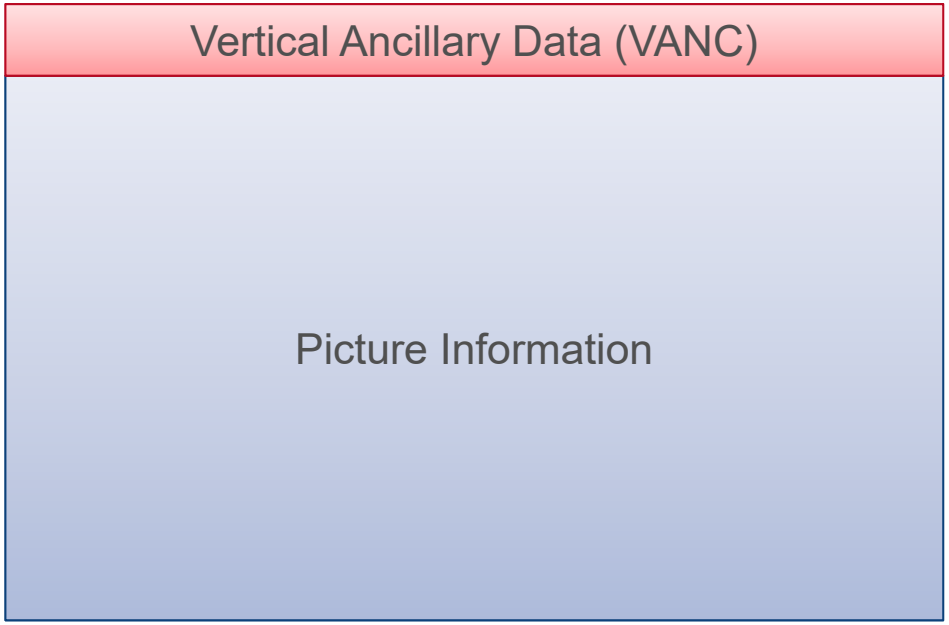
HD-SDI – Serial Digital Interface for High Definition



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Ancillary Data in SDI

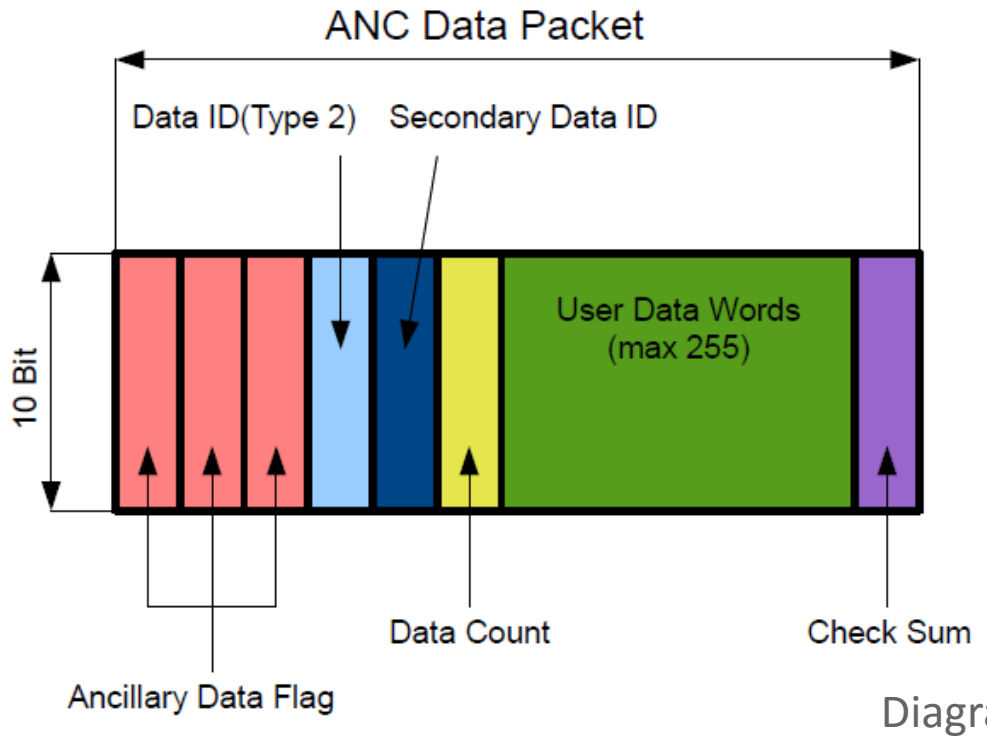

Diagram: Larrisa Görner

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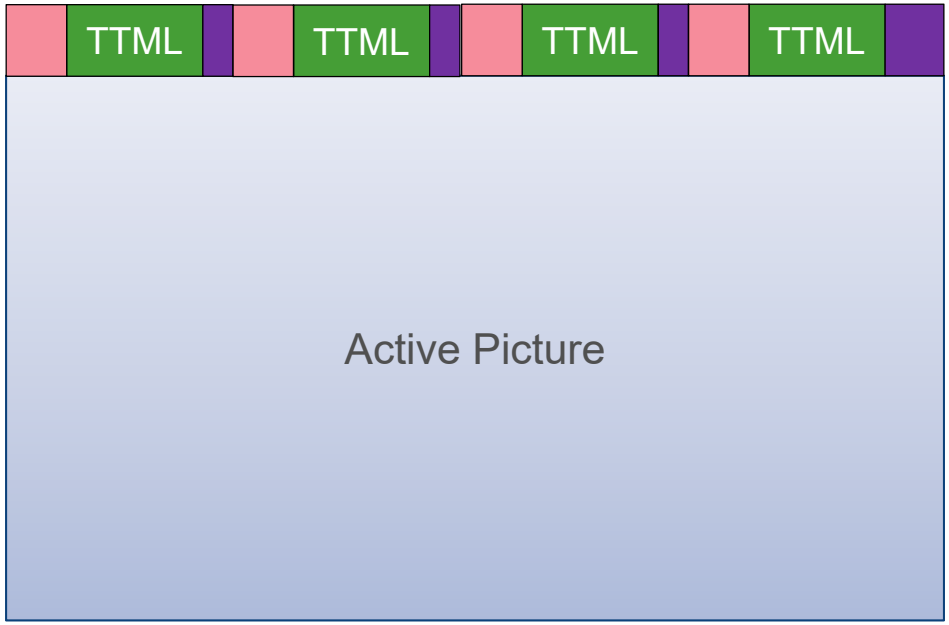
TTML in SDI



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RATING - TTML and **Embedding**

- **XML Stack** -
- **Conformance** -
- **Wish** a standard
- **Perspective** hope

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Production

Contribution
(Archive,Exchange)

Embedding

Distribution

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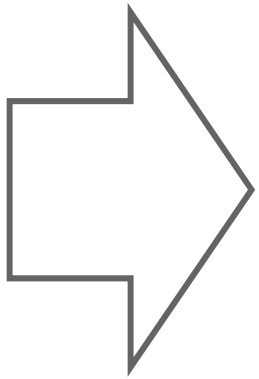
Distribution Broadcast



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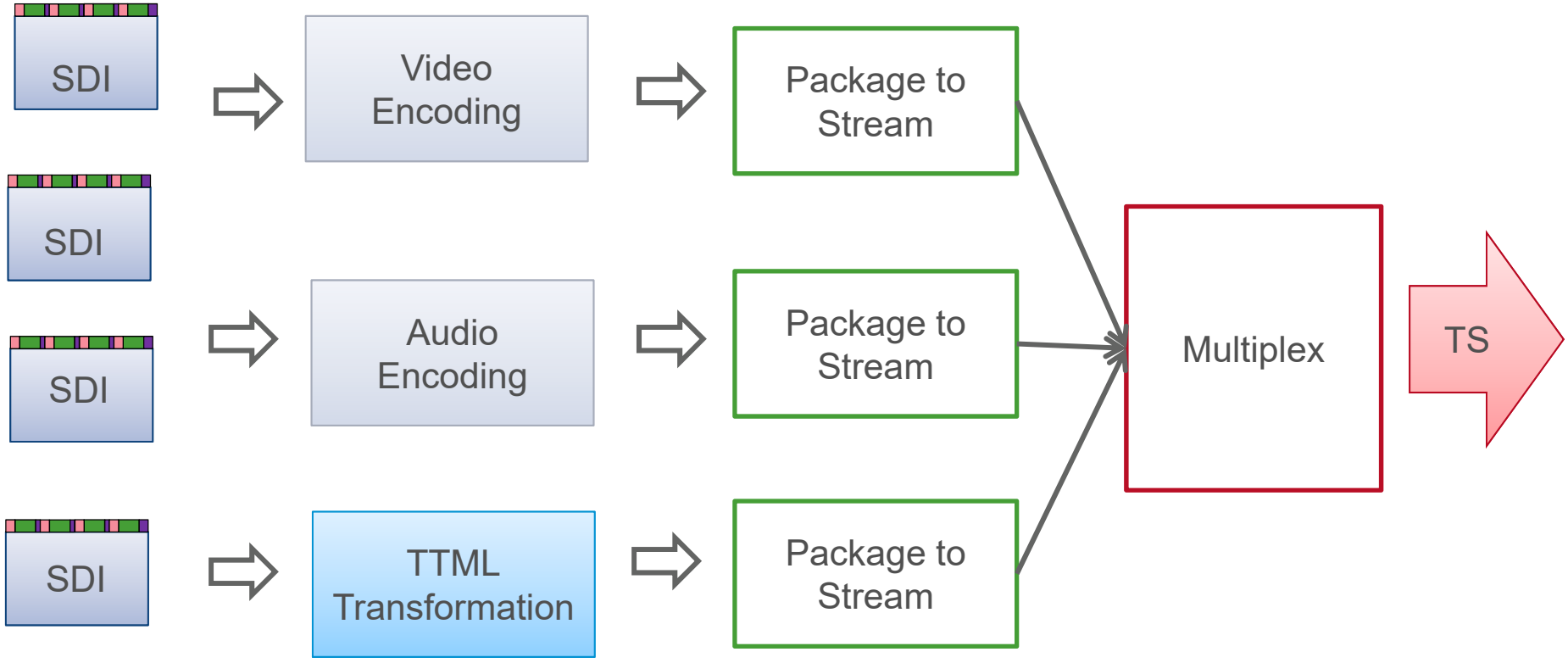
Distribution for Broadcast – TTML in MPEG TS



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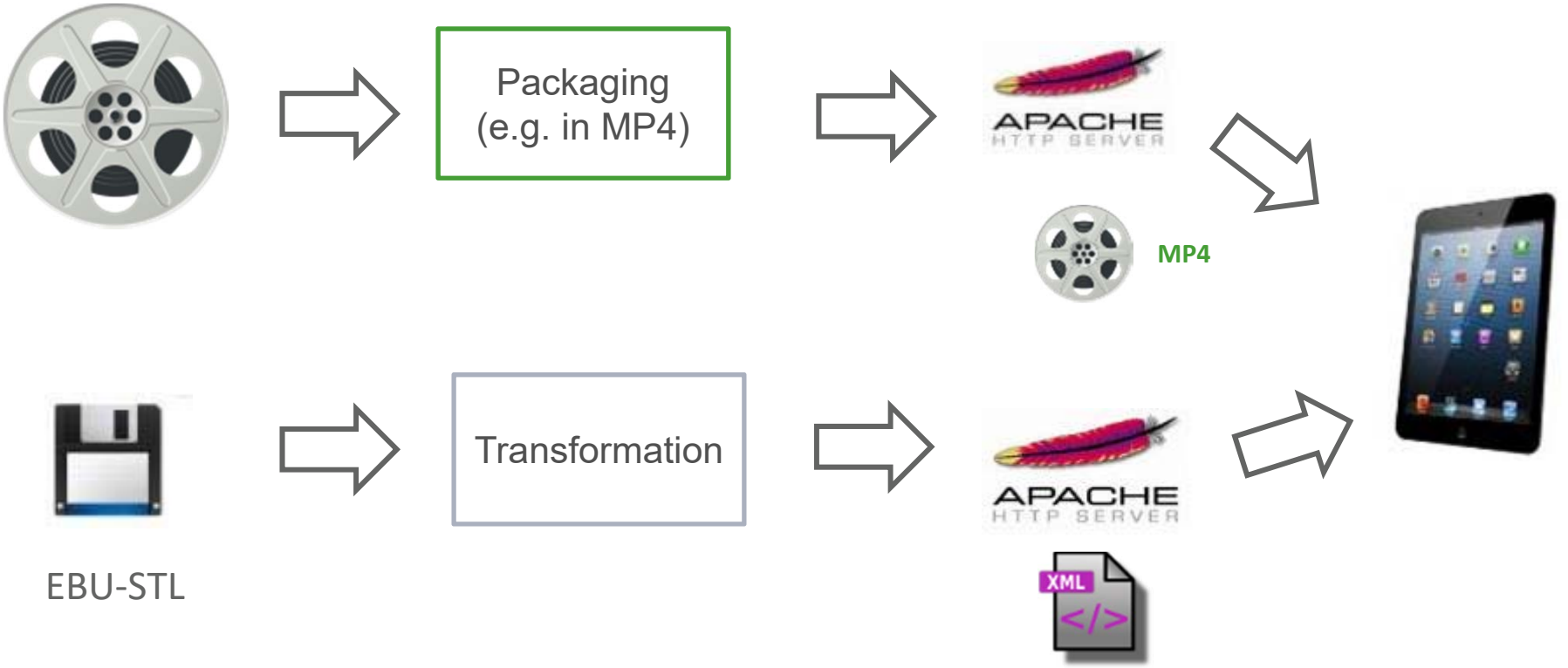
Distribute for Internet – TTML for VoD



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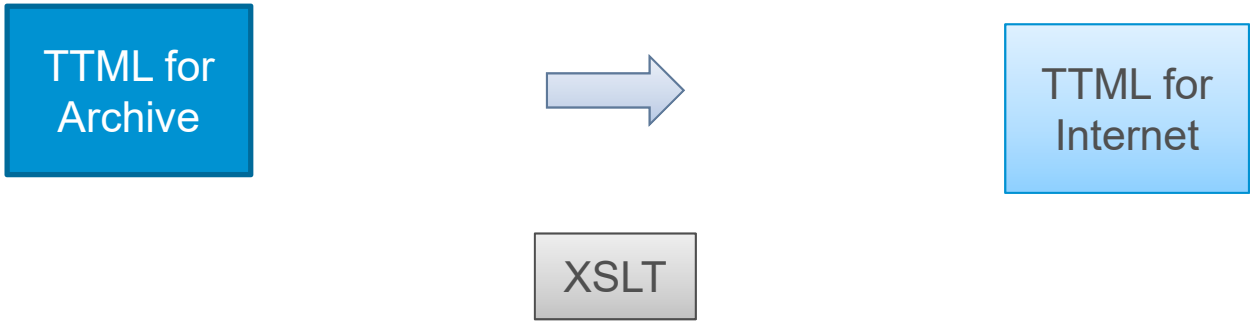
TTML for VoD - Subitle Conversion Framework



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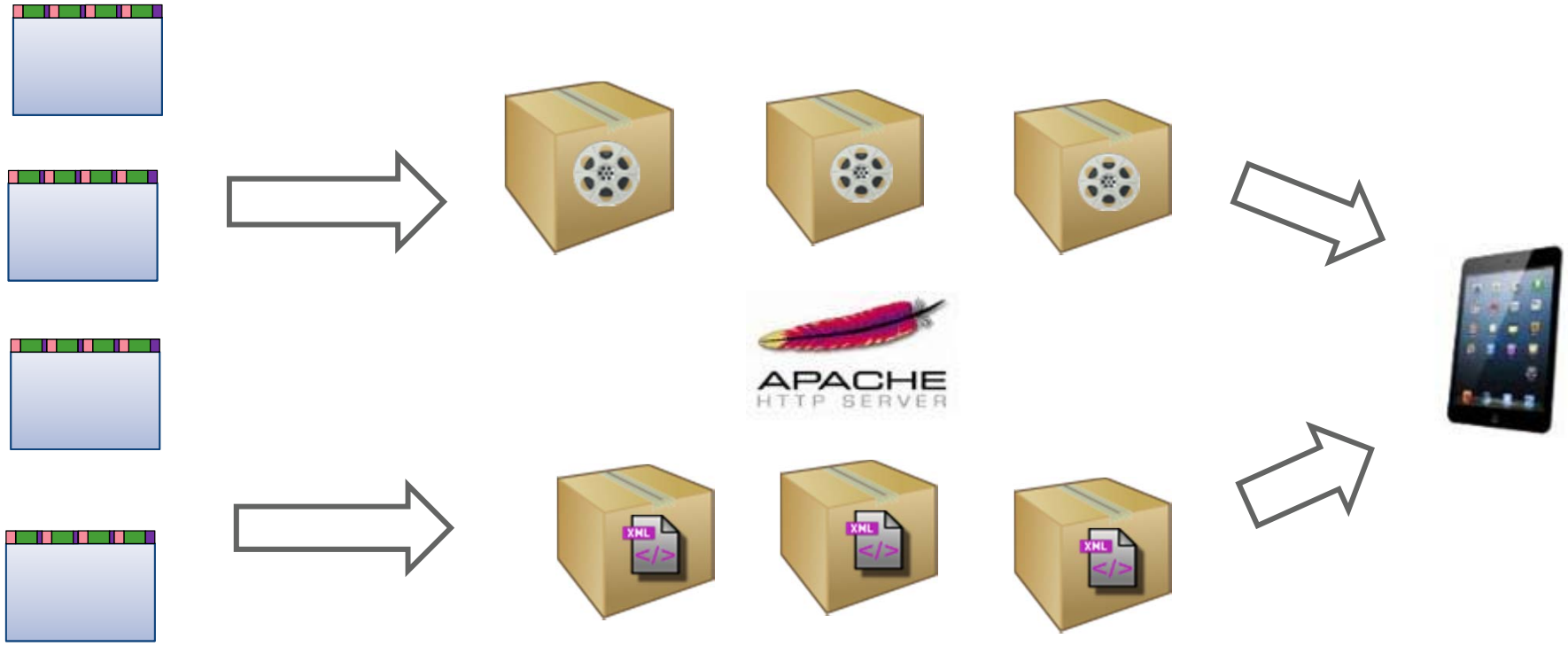
TTML for Live Streaming



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RATING - TTML and **Distribution**

- **XML Stack**
- **Conformance**
- **Perspective** **properous future**

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Production

Contribution
(Archive,Exchange)

Embedding

Distribution

Presentation

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Presentation - TTML on all devices?

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About 100 different combinations…

TTML will not be in every of them

…but in a lot!

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TTML Player Implementations in HBB4ALL

Connected TV Apps

Plugins Video Players

Native Implementation

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TTML Player Implementations in HBB4ALL

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Handling of TTML namespaces in web players (DASH.js)

```
var newKey = key.replace('ebutts:', '');
newKey = newKey.replace('xml:', '');
newKey = newKey.replace('tts:', '');
```


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Handling of TTML namespaces in web players(Video.js Plugin)

```
$($tt_div).find('tt\\:p').each(function(){
    ...
}
```


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RATING - TTML and **Presentation**

- **XML Stack**
- **Conformance**
- **Perspective** **mixed**

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Concluding remarks

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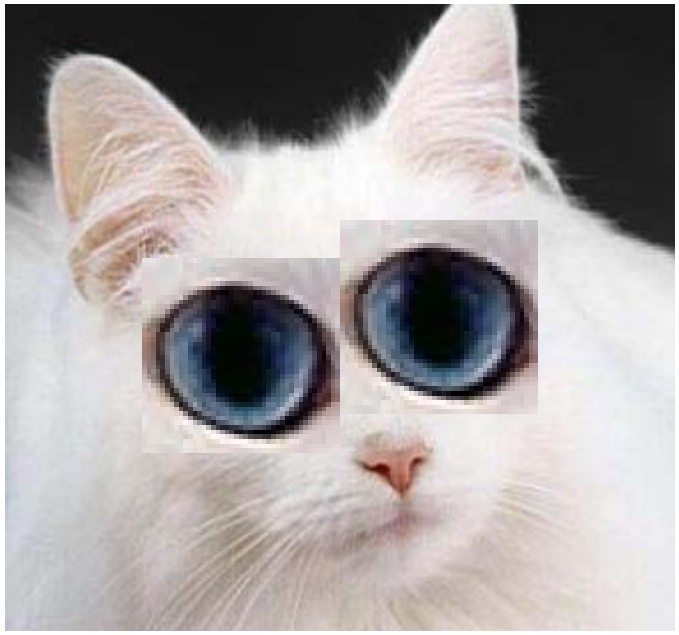
XML Standards Size



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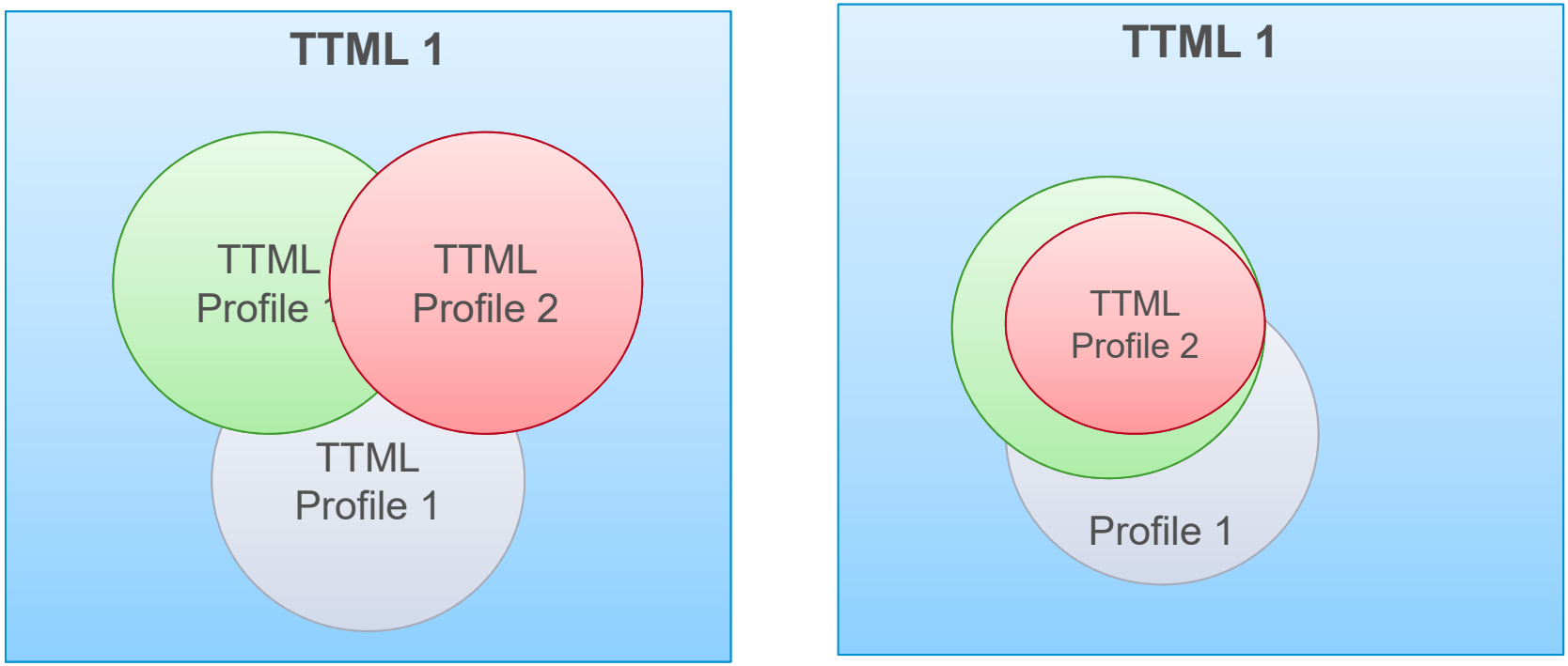
Standard Convergence



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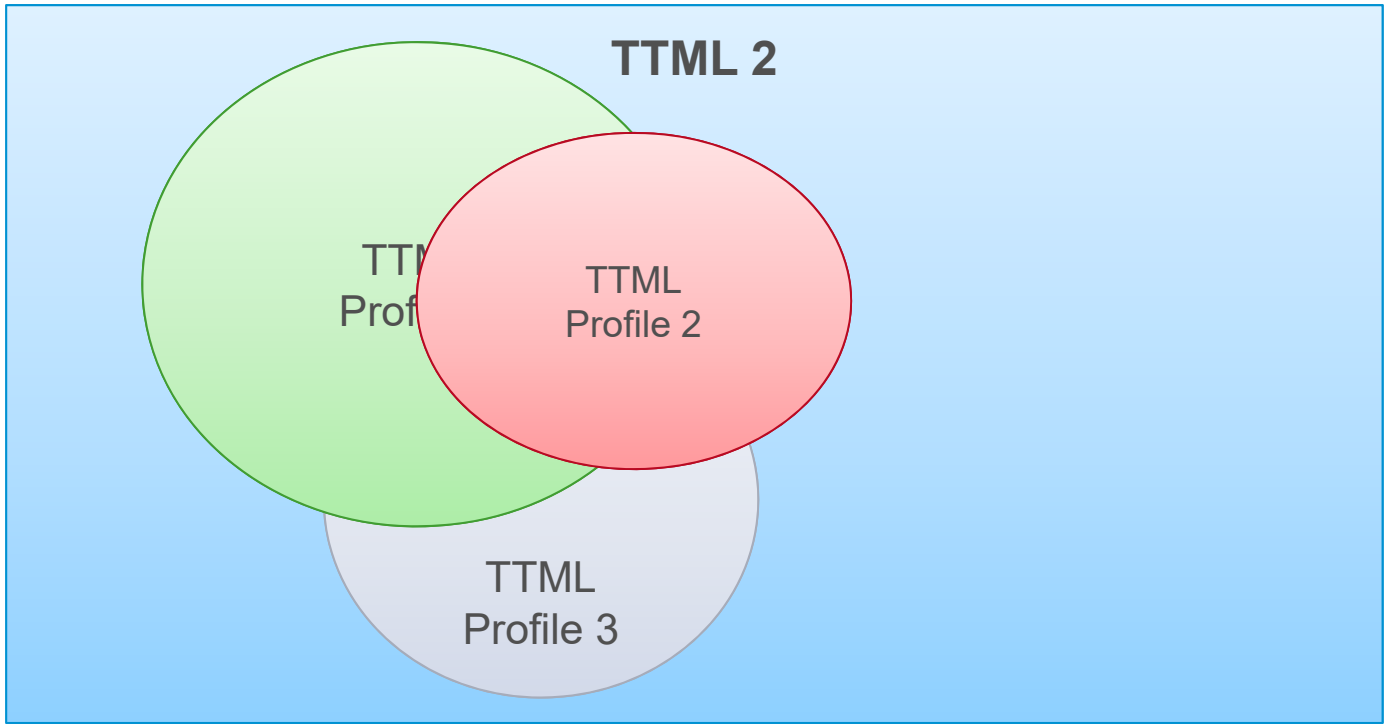
Standard Convergence



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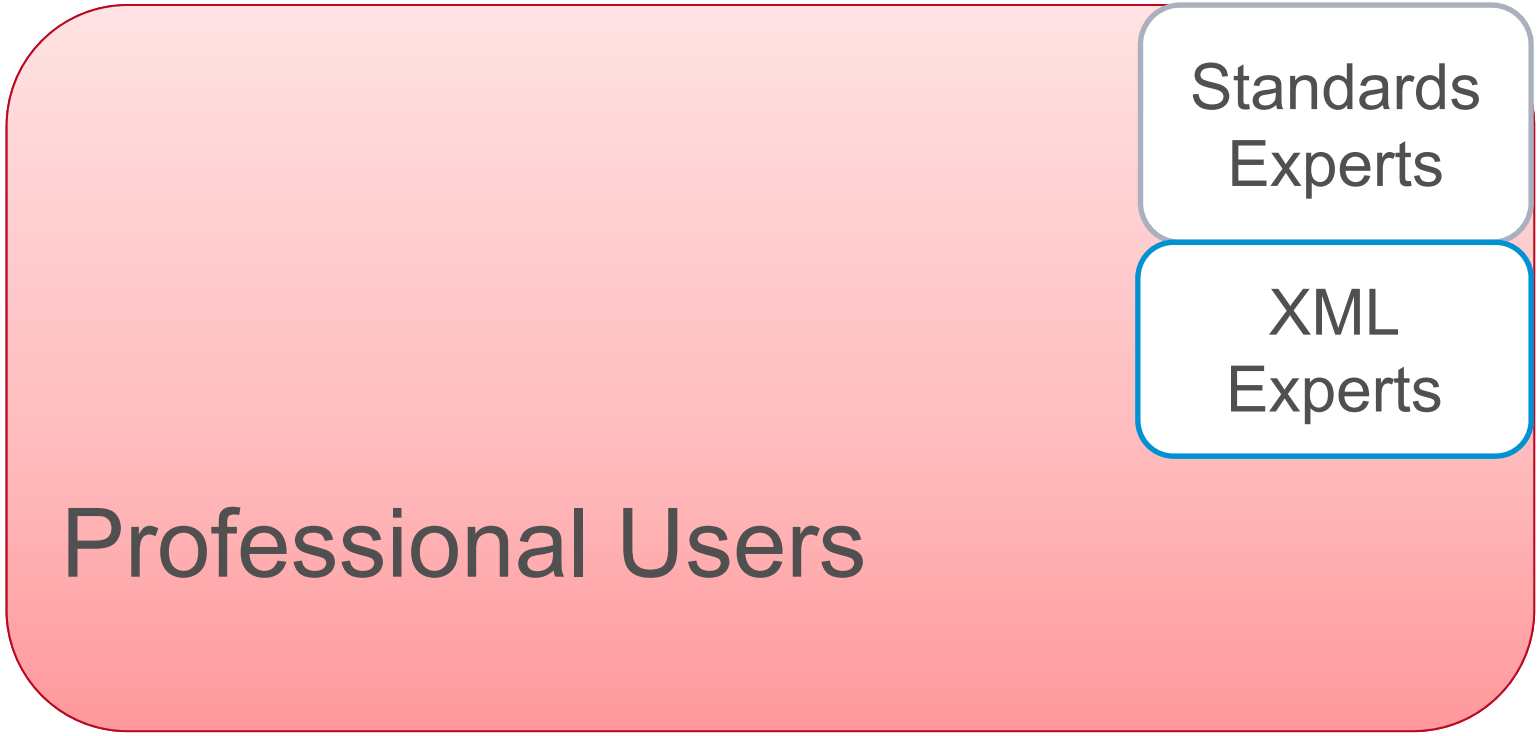
Who uses TTML?



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Thanks for your attention!

Experts in audio-visual media

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