IMSC IN STREAMING MEDIA
What / Why / How?

Jerome Blanc – COO at Keepixo. Keepixo is now Anevia group.
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**Scope:** live video encoders and packagers for OTT TV.

**Focus:** how to offer the same quality of experience on OTT TV than that we were used to on Broadcast TV.

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**Traditional TV**
“*The Broadcast & IPTV world*”

- Broadcast TV
- Broadcast or IPTV boxes

**OTT TV**
“*The Internet world*”

- Live video multirate encoder or transcoder, and OTT packager
- HbbTV
- PC/Mac
- Apple devices, Android devices, OTT boxes

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IRT Symposium on Subtitling Technology – May 24-25 2018
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**Points to consider?**

- **Codec & “Broadcast”-tier video quality**
  - With low latency, short zap times
  - Handling legacy interlaced contents

- **Services & metadata**
  - Subtitles & hearing impaired, Content Advisory (= Parental Rating), EPG, loudness, ad insertion, EAS (= Emergency Alert Service in US)...
  - For added value, or for regulatory compliance

- **Rock-solid delivery chain**
  - Continuity of service
  - Redundancy. Seamless?
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GENERATING OTT TV FEEDS
The transcoding & packaging stages

Traditional TV
“The Broadcast & IPTV world”
- Live linear feeds (= traditional TV)
- SDI, MPEG-2, H.264, HEVC
- Subtitles: SMPTE 2031, OP47, CC608/708, DVB-Teletext, DVB-Subtitle, SCTE-27

OTT TV
“The Internet world”
- Live OTT feeds (= Internet TV)
- “Formats that can be read by OTT TV players”: H.264 or HEVC, over HLS or DASH/CMAF.
- Subtitles:
  - Apple devices: previously WebVTT, now IMSC-Text.
  - Other players: some sort of TTML (which is IMSC’s foundation). Some support IMSC-Image.

live video multirate encoder or transcoder, and OTT packager

...so what we see is convergence under IMSC.
TECHNICAL BACKGROUND

Closed Caption

Aka CC608 or CC708, or EIA-608/708

• Originally two bytes per video frame, in “line 21”
• One byte being one alphanumeric character, i.e. one plain letter
• Can be carried in analog, or in SDI
• Based on “channels”: CC1, CC2, CC3, CC4

Later: “DTVCC”

• Provides a way to carry those 2 bytes in compressed video: in the codec itself.
• Those 2 bytes can be handled as just binary data (not letters), concatenated to form a binary stream, that is a binary language (CC708)
• In that language, we can define screen regions, better scroll types, character colors or other attributes, etc.
• 608 and 708 are widely used in broadcast TV (US)
TECHNICAL BACKGROUND

DVB-Teletext

- Very similar in essence to Closed Caption:
  - In uncompressed video (SDI), text & binary data are passed on ancillary (invisible) video lines
  - As per SMPTE-2031 or OP47
- Based on "pages", with many character sets
- Used for full-text pages, and for subtitles
- One major difference: in compressed video, it’s not carried in the codec itself, rather as a separate track in MPEG-Transport Stream.
- Used in broadcast TV
TECHNICAL BACKGROUND

DVB-Subtitle

- Like DVB-Teletext: in compressed video, it’s not carried in the codec itself, only as a separate track in MPEG-Transport Stream.
- One major difference: it’s a **bitmap**
- DVB-Subtitle’s language allows to define regions, logos can be defined then transmitted “as characters”
- Used in DVDs and Blu-ray discs
- Also used in broadcast
- A similar thing: SCTE-27 (Latam)

This is bitmap, and so any character set can be used. Arabic, Chinese, Japanese..., work natively.
TTML (Timed Text Markup Language) is a generic XML-based language for describing timed text.

IMSC defines two profiles of TTML:

- text-only: “Lorem ipsum dolor sit amet.”
- image-only: “iVBORw0KBAgQIAAABJRU5ErkJggg==”

It is a W3C recommendation

- Full name: TTML Profiles for Internet Media Subtitles and Captions 1.0.1 (IMSC1)
- Other benefits: (as per N. Megitt, P.-A. Lemieux, A. Tai)
  - “Independent of video frame rate, resolution, aspect ratio
  - Supports left-to-right and right-to-left scripts
  - Forced subtitles
  - Specifies reference fonts for consistent rendering
  - Recommends character sets per language
  - Constrains document complexity using an hypothetical render model (HRM)“
TECHNICAL BACKGROUND
IMSC: Text profile

Example from https://www.w3.org/TR/ttml-imsc1/#sample-instance

```xml
<?xml version="1.0" encoding="UTF-8"?>
<tt xml:lang="en"
xmlns="http://www.w3.org/ns/ttml"
xmlns:tt="http://www.w3.org/ns/ttml#metadata"
xmlns:ss="http://www.w3.org/ns/ttml#styling"
xmlns:ttmpl="http://www.w3.org/ns/ttml#parameter"
xmlns:profile="http://www.w3.org/ns/ttml/profile/imsc1/parameter"
 aspectRatio="4 3"
 profile="http://www.w3.org/ns/ttml/profile/imsc1/text">
  <head>
    <layout>
      <region xml:id="areal" tt:origin="10% 10%" tt:extent="50% 10%"
          tt:backgroundColor="black" tt:displayAlign="center" tt:color="red"/>
    </layout>
  </head>
  <body>
    <div>
      <p region="areal" begin="0s" end="6s">Lorem ipsum dolor sit amet.</p>
    </div>
  </body>
</tt>
```
TECHNICAL BACKGROUND

IMSC: Image profile

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OUR GOAL: PRESERVE SUBTITLES WHEN GOING OTT TV

Shall we convert?

- Closed Caption and DVB-Teletext are text-based.
- DVB-Subtitle is image-based.

- IMSC is the only recommendation that unifies text- and image-based subtitles.
- Most OTT players read ISMC-text, some read ISMC-image.
- Good news, even Apple devices now do (since 2017)! They even say it’s the best format.

=> We shall target IMSC to reduce fragmentation.
=> Video encoders and packagers for OTT TV shall convert their incoming traditional TV feeds to IMSC.
OUR GOAL: PRESERVE SUBTITLES WHEN GOING OTT TV

How to convert?

DVB-Teletext’s captions contain:

- The text itself
- Its position (line number on the screen)
- 4 character sizes
- 7 character colors
- 7 different subsets (of 13 special characters)
- Special characters, when needed, for: Czech, English, Finnish, French, German, Hungarian, Italian, Portuguese, Slovak, Spanish, Swedish...

=> those attributes are converted to IMSC-Text syntax e.g. “tts:color=red”

DVB-Subtitle’s captions contain:

- A reduced color map
- A line-by-line image, with minimalistic lossless compression (RLE)

=> that image is converted to IMSC-Image syntax e.g. “iVBORw0KBAgQIAAABJRU5ErkJggg="
A SHORT DEMO (CAPTURED)
if time allows
WRAP-UP

What have we discussed?: a typical OTT TV workflow
WRAP-UP

What have we discussed?: IMSC in Streaming Media

- When converting live TV feeds to OTT TV, we need to preserve subtitles.
  - This is a legal requirement, and also an added value for broadcasters/telcos
  - Live TV feeds are natively text-based, or image-based.
  - Closed Caption, DVB-Teletext: text-based
  - DVB-Subtitle: image-based

- IMSC allows to deliver both formats, and thus to preserve all sorts of subtitles.

- What makes a good encoder-packager in this respect, is its ability to convert existing Closed Caption, DVB-Teletext, DVB-Subtitle, to IMSC-Text and IMSC-Image.
THANK YOU!
Questions?