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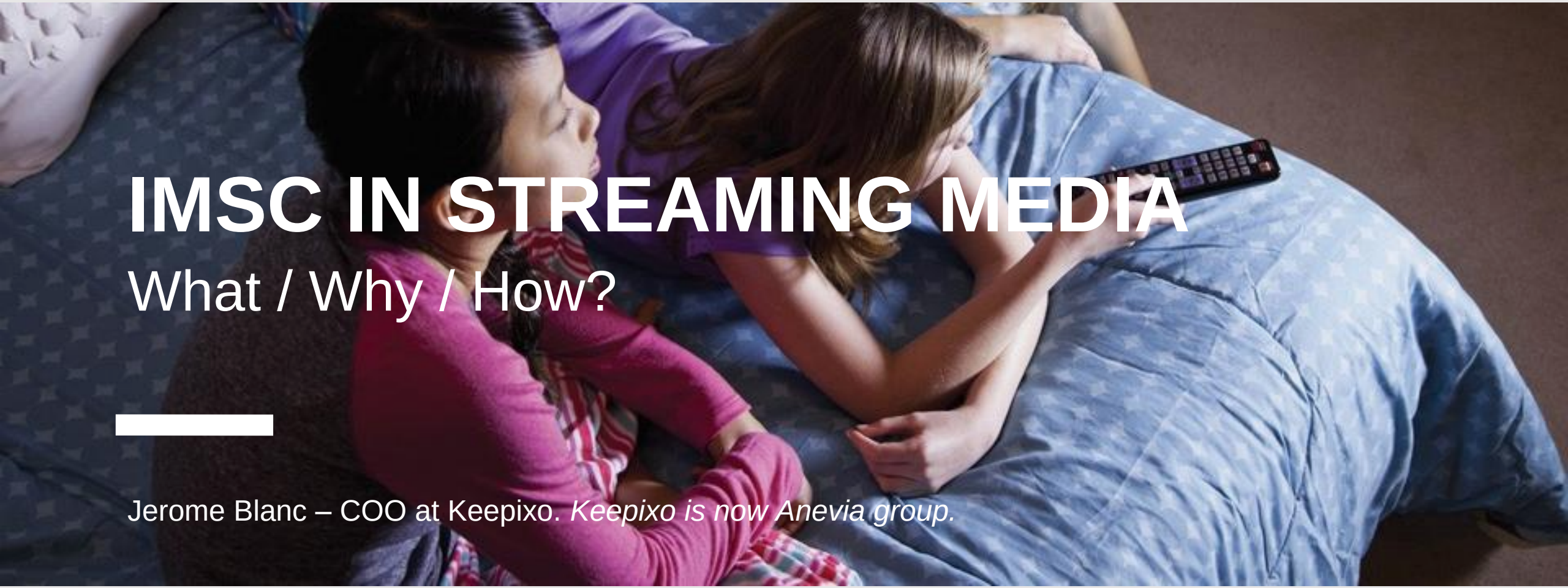
YOUR NEXT GENERATION TV, NOW



IMSC IN STREAMING MEDIA

What / Why / How?

Jerome Blanc – COO at Keepixo. *Keepixo is now Anevia group.*

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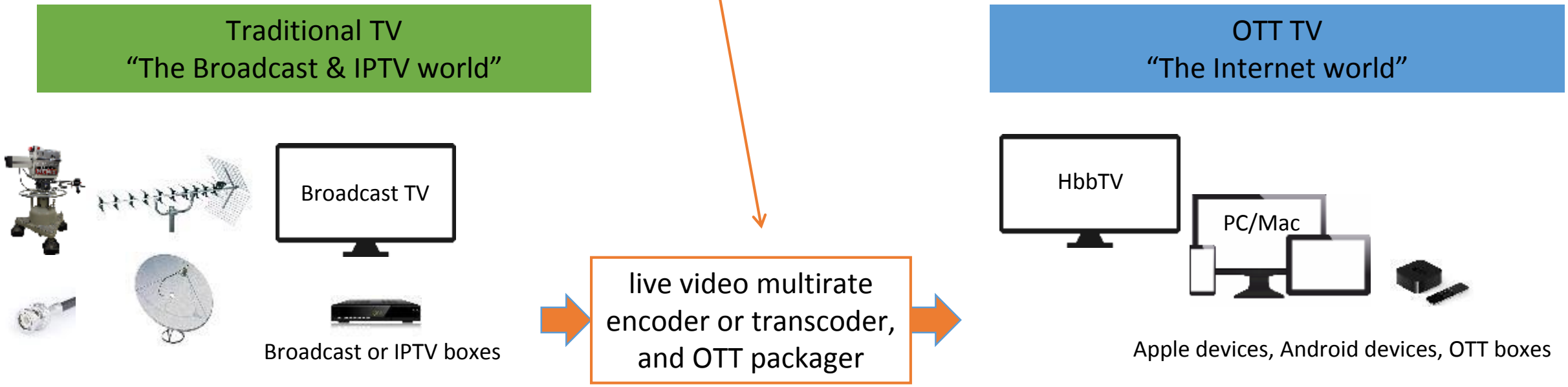
Scope: live video encoders and packagers for OTT TV.

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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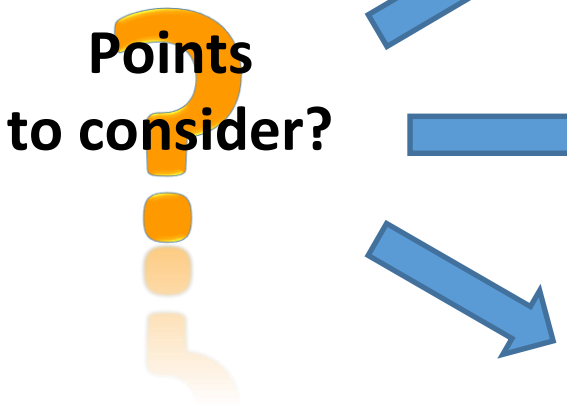

Codec & “Broadcast”-tier video quality

- 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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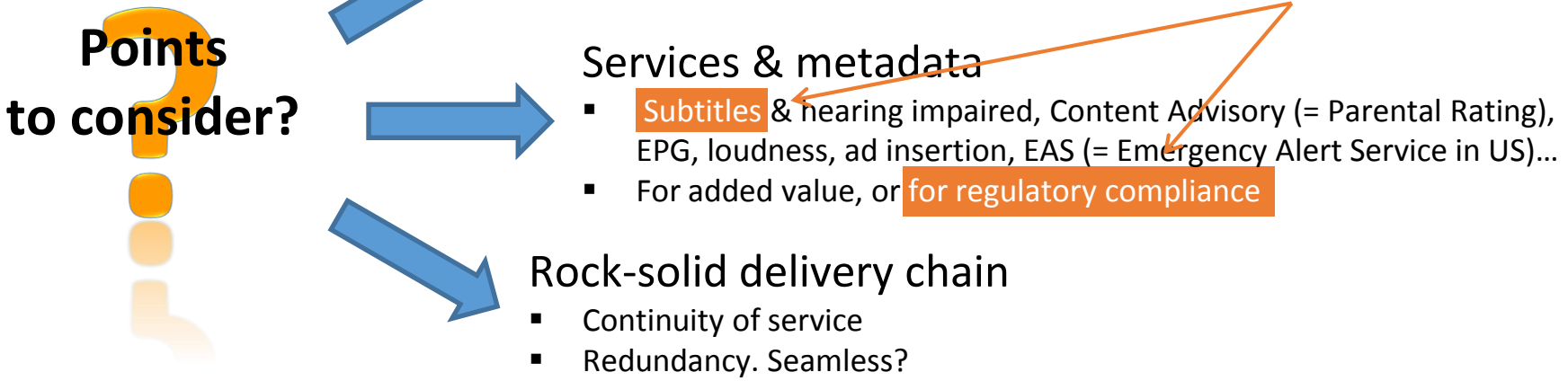
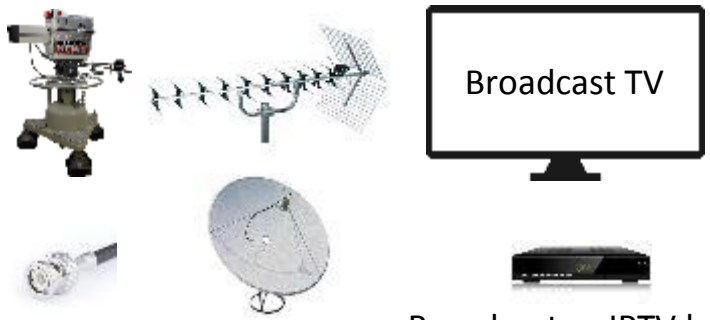


GENERATING OTT TV FEEDS

The transcoding & packaging stages

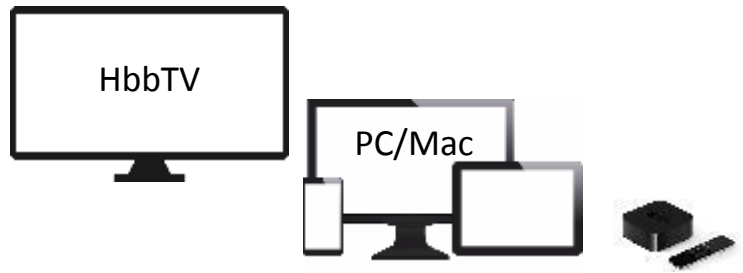
Traditional TV
"The Broadcast & IPTV world"



Broadcast or IPTV boxes

live video multirate encoder or transcoder, and OTT packager

OTT TV
"The Internet world"



Apple devices, Android devices, OTT boxes

- Live linear feeds (= traditional TV)
- SDI, MPEG-2, H.264, HEVC
- Subtitles: SMPTE 2031, OP47, CC608/708, DVB-Teletext, DVB-Subtitle, SCTE-27

- 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.

…so what we see is convergence under IMSC.

TECHNICAL BACKGROUND

Closed Caption

ancillary (invisible) line #21 ⟶

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
- Base

TEXT-BASED

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 s
- Used f
- 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

TEXT-BASED

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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 reg
  - an be defined then transmitted "as characters"
- Used in DVDs and Blu-ray discs
- Also used in broadcast
- A similar thing: SCTE-27 (Latam)

IMAGE-BASED

This is bitmap, and so any character set can be used.
Arabic, Chinese, Japanese…, work natively.

TECHNICAL BACKGROUND

IMSC brief

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==”`

```
<body>
  <div>
      <p begin="00:00:00.000" end="00:00:02.000">
        This is a subtitle<br/>
      on two lines
      </p>
  </div>
</body>
```

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 version="1.0" encoding="UTF-8"?>
<tt xml:lang="en"
    xmlns="http://www.w3.org/ns/ttml"
    xmlns:ttm="http://www.w3.org/ns/ttml#metadata"
    xmlns:tts="http://www.w3.org/ns/ttml#styling"
    xmlns:ttp="http://www.w3.org/ns/ttml#parameter"
    xmlns:ittp="http://www.w3.org/ns/ttml/profile/imsc1#parameter"
    ittp:aspectRatio="4 3"
    ttp:profile="http://www.w3.org/ns/ttml/profile/imsc1/text">
    <head>
        <layout>
            <region xml:id="area1" tts:origin="10% 10%" tts:extent="80% 10%"
             tts:backgroundColor="black" tts:displayAlign="center" tts:color="red"/>
        </layout>
    </head>
    <body>
        <div>
            <p region="area1" begin="0s" end="6s">Lorem ipsum dolor sit amet.</p>
        </div>
    </body>
</tt>
```

TECHNICAL BACKGROUND

IMSC: Image profile

```
<?xml version="1.0" encoding="UTF-8" ?>
<tt xml:lang=""
    xmlns="http://www.w3.org/ns/ttml"
    xmlns:tt="http://www.w3.org/ns/ttml"
    xmlns:ttm="http://www.w3.org/ns/ttml#metadata"
    xmlns:tts="http://www.w3.org/ns/ttml#styling"
    xmlns:ttp="http://www.w3.org/ns/ttml#parameter"
    xmlns:smpte="http://www.smpte-ra.org/schemas/2052-1/2013/smpte-tt"
    xmlns:ebutts="urn:ebu:tt:style"
    xmlns:ebuttm="urn:ebu:tt:metadata"
    ttp:timeBase="media">
  <head>
    <metadata>
      <smpte:image xml:id="Subtitle_0" imagetype="PNG" encoding="Base64">iVBORw0KG
      goAAAANSUhEUgAAAtAAAAJACAYAAACkMVHfAAAAAXNSR0IArs4c6QAAAARnQU1BAACxjwv8YQUAA
      AAJcEhZcwAADsMAAA7DAcdvqGQAACcISURBVHhe7dlRtqu2QbQk0Qk0FlSnlpJ5GXTiT5SQyntuLc
      yGyLNAvIQ4Y76x1VtJiQGwJ9CEL/PXlHwIECBAgQIECBAgQIECBAgQIECBAgQIECBAgQIECBAgQIECBAQ
      IAAABJRU5ErkJggg==</smpte:image>
      <ebuttm:documentMetadata>
        <ebuttm:conformsToStandard>urn:ebu:tt:distribution:2014-01</ebuttm:conformsToStandard>
      </ebuttm:documentMetadata>
    </metadata>
    <styling />
    <layout>
      <region tts:extent="1280px 720px" tts:origin="0% 0%" xml:id="Region"/>
    </layout>
  </head>
  <body>
    <div smpte:backgroundImage="#Subtitle_0" region="Region" begin="00:00:01.400" end="00:00:02.112" />
  </body>
</tt>
```

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…

- Flash / Steady
- Mosaic red / green / yellow / blue / magenta / cyan / white
- Conceal
- Contiguous / separated mosaic graphics
- ESC
- Black / new background
- Hold / release mosaics

=> 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)

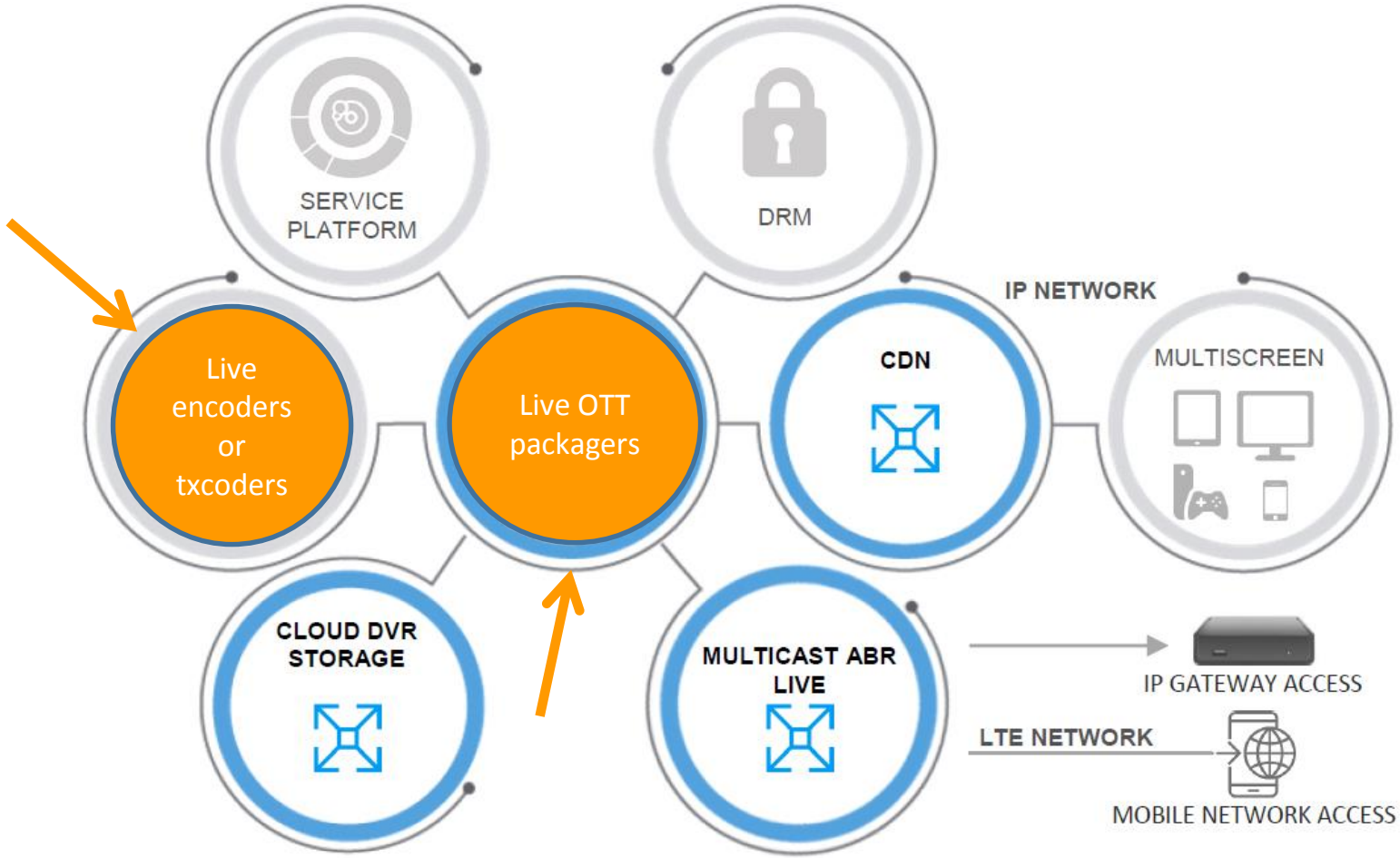
=> that image is converted to IMSC-Image syntax *e.g. "iVBORw0KBAgQIAAABJRU5ErkJggg="*

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?