UHD Immersive Media Service Status and Product Preparation

JAN 24th 2018

Taeil Chung
4K UHD Terrestrial Broadcasting Started

2017, May, 31
4K UHD TV

- Ultra High Quality Video
- Immersive Audio
- Indoor Reception and SFN
- IP Interactive  ...
### Broadcasting Service spec. : FHD Broadcasting to UHD Broadcasting

**MPEG-H Std. is adopted to new UHD broadcasting**

<table>
<thead>
<tr>
<th></th>
<th>ATSC1.0 FHD Broadcasting of Korea</th>
<th>ATSC3.0 UHD Broadcasting of Korea</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>System</strong></td>
<td>MPEG2 TS</td>
<td>MPEG DASH Route / MMT</td>
</tr>
<tr>
<td><strong>Video</strong></td>
<td>MPEG2 8bit 60i 2K/4K SDR</td>
<td>HEVC 10bit 60~120P 2K/4K SDR/HDR</td>
</tr>
<tr>
<td><strong>Audio</strong></td>
<td>AC3</td>
<td>MPEG-H 3D Audio</td>
</tr>
<tr>
<td><strong>Terrestrial Broadcasting Start</strong></td>
<td>2001 Nov. ~</td>
<td>2017 May ~</td>
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</tbody>
</table>
4K UHD Broadcasting Service
- Government led initiative to launch ATSC 3.0 → `16.12 Standardization and `17.05 live broadcasting, nationwide in progress
  - `17 in Seoul region, nationwide by `21

Additional Broadcasting Service
- In addition to UHD broadcasting, government and broadcasters are collaborating add additional services
  - Basic Service:
    4K UHD + MPEG-H Audio + AESG + Caption
  - Added Service:
    2-way IP, HD mobile broadcasting, EAS
  - 2-way IP broadcasting was started in `17.10 and expecting HD mobile broadcasting and EAS by `19
Immersive Viewing Experience

High Spatial Resolution (4K, 8K)

High Dynamic Range

10-bit Sampling

Wide Color Gamut

8b = Visible Banding

High Frame Rate

Immersive Audio

Muti-Channel Object Based Interactive
Summary of current immersive media status

- 4K TV Product 2014~ : with OTT application service of smart TV
- Netflix, Amazon, YouTube ... : 4K service 2014 ~
- Cable TV, IPTV, Salttlite 1 or 2 Channel service started 2015~
- Test Broadcasting : Brazil Worldcup 2014 ~, Several Country 2015~
- HDR : Service from 2016 / 2017
- HFR : Some Product Ready 2018
- 8K Broadcasting : JAPAN ARIB2.0 4K/8K Broadcasting would be started 2018/12~
THE TIME IS NOW TO MOVE BEYOND HDTV!

"Peak of inflated expectations" In 2012 the industry introduced «4k» as the next big thing for beyond HDTV leading to a huge hype and unrealistic expectations.

"Trough of disillusionment" In 2014 the industry realized that 4K only provides limited immersive experience for the viewers. Understanding what makes better pixels was deemed as a necessary step.

"Slope of enlightenment" In 2014 investigations made by EBU and others showed that HDR and HFR could be the game changers to go successfully beyond HDTV. Four possible scenarios are now considered.

"Plateau of productivity" The industry has reached an agreement on standards on HDR and HFR. It is now time for broadcasters to produce content accordingly.

<table>
<thead>
<tr>
<th>Production</th>
<th>1080p advanced 1</th>
<th>1080p advanced 2</th>
<th>UHD phase 2a</th>
<th>UHD phase 2b</th>
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<tbody>
<tr>
<td>Cameras</td>
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<td>Studio Interfaces</td>
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<td>Wireless links</td>
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<td>Mixers</td>
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<td>Graphic engines</td>
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<td>Professional monitors</td>
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<td>Decoders</td>
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<td>Modulators</td>
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<td>TVs</td>
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<td>Portables devices</td>
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<td>Set Top Boxes</td>
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<td>Consumer interfaces</td>
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Legend:
● Product available for purchase
● Specification/standard available - prototype available
● No agreed standard nor product available

Full EBU Document at EBU Site
'18 OLED TV with Alpha9 Processor

- **4K**
- **10 bit**
- **HDR**
- **120Hz**

- 2013 H2~
- 2016~
- 2018~

+ 4K Picture Quality Enhancement Post-Processing (incl. WCG Mapping)

- **NGA1)**
- MPEG-H 3D Audio
- Dolby AC4/ATMOS

- 2017~

1) NGA : next generation audio

- HDR Prepared:
  - HDR10
  - HLG
  - Dolby Vision
  - Technicolor Prime

- 2K 120P
- 4K 120P

- SFR (60Hz)
- HFR (120Hz)
MPEG coding standard and media service

ITU-T
VCEG

H.263 (1995/96)

ISO/IEC
MPEG

MPEG-1 (1993)
MPEG-2 (H.262) (1994/95)
MPEG-4 v1 (1998)
MPEG-4 v2 (1999)
MPEG-4 v3 (2001)
MPEG-4/SVC (2007)
MPEG-4/MVC (2008)
MPEG-H/HEVC (H.265) (2013)

FVC Beyond HEVC


video telephony

coding efficiency

increasing contents size & traffic
To make 8K 60P or 8K 120P solution we expect MPEG-I video more than coding efficiency

Bitrate < x 2
Computing Power x 4
Memory Bandwidth x 4
Memory Area x 4 (about)

4K DEC
4K DEC
4K DEC
4K DEC

8K 10bit 120Hz (4:2:0)
Ex) 1 Read and 1 Write

15+α Gbyte /Sec

63+α M Byte / frame

+ Parameter Buffer, CPB And Picture Post Processing

α : map alignment cost
• Korea UHD broadcasting and many other immersive services have been preparing well

• 4K, 10bit, HDR, HFR immersive viewing can be experienced now.

• Many MPEG standards are adopted in Immersive service diversely

• For 8K, beside coding efficiency, we also expect memory usage and computing power reduction to next standard.
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