Workshop on Immersive Services

24 January 2018, Gwangju, Korea
Gwangju Kimdaejung Convention Center

Chaired by
José Roberto Alvarez, Huawei
Co-chair MPEG Roadmap Activity
Welcome!
<table>
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<tr>
<th>Time</th>
<th>Speaker</th>
<th>Affiliation</th>
<th>Subject / Title</th>
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<tbody>
<tr>
<td>14:00</td>
<td>Jose Alvarez</td>
<td>MPEG (Director, Huawei)</td>
<td>Welcome</td>
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<tr>
<td>14:05</td>
<td>Rob Koenen</td>
<td>MPEG (Principal, TNO)</td>
<td>MPEG Roadmap update</td>
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<td>14:10</td>
<td>Jeong Ho Choi</td>
<td>Director, Ministry of Science and ICT (PyeongChang ICT Olympic Preparation Team)</td>
<td><strong>Keynote</strong> Introduction to PyeongChang ICT Olympic</td>
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<td>14:35</td>
<td>KyungGeun</td>
<td>Lab Leader, Samsung Media Standard Lab.</td>
<td>Perspective view of VR/MR technology development</td>
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<td>15:00</td>
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<td>OMAF Developer Day Pitches <em>(1 minute each)</em></td>
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<tr>
<td>15:10</td>
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<td><em>Break</em></td>
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<td>15:30</td>
<td>Taeil Chung</td>
<td>Research Fellow, LG SIC R&amp;D Center</td>
<td>Introduction to Global broadcasting service and Media immersive products</td>
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<tr>
<td>15:55</td>
<td>Dillon Seo</td>
<td>Founder and CEO, Voler Creative</td>
<td>Why should you care about VR?</td>
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<td>16:20</td>
<td>Jongmin Lee</td>
<td>Lab Leader, SKT Media Laboratory</td>
<td>Next generation media platform and technologies</td>
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<td>16:45</td>
<td>Kei Kawamura</td>
<td>Senior Manager, KDDI Cooperation (Home Product Development Department)</td>
<td>Introduction to KDDI’s 5G network service</td>
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OMAF Developers’ Day
Pitch Session

Fraunhofer HHI
Fraunhofer IIS
Shanghai Jiao Tong University
Samsung
SK Telecom
TNO
Tiledmedia
Fraunhofer HHI @ OMAF Developers’ Day

• HEVC-based viewport-dependent OMAF video profile:
  • Beyond 4K resolution in viewport based on HEVC Motion Constrained Tile Sets
  • Supports native viewport resolution of latest HMDs

• Reference software contributions:
  • ISOBMFF: Extractor implementation and player app in libisomedia
  • HEVC: Motion-Constrained Tile Set encoding in HM
  • Testvectors available in MPEG

• Mobile player app demonstration at Gwangju

• Live 360° chain in preparation for NAB 2018
MPEG-H Audio
OMAF 3D Audio Baseline Profile

➢ Omnidirectional media presentation of VR content using different audio formats:
  ➢ Channel-based audio (e.g., 7.1+4H)
  ➢ Object-based audio
  ➢ Higher Order Ambisonics (HOA)

➢ Content authored and encoded according to VRIF Guidelines

➢ OMAF Viewport-Dependent Baseline Presentation Profile
OMAF over MMT

- 360° VR media streaming service based on MPEG OMAF and MPEG MMT standards providing an enriched immersive media experience

**Achievements**
- Developed standard-based 360° media delivery based on OMAF and MMT
- Ultra high quality and low delay 360° VR live streaming

**Features**
- 360° media delivery with ultra high quality based on MPEG OMAF
  - OMAF improves the quality of 360° media per same unit bandwidth through a packing process which results in bandwidth consumption reduction
  - Real-time stitching of 4K captured video for live streaming
- OMAF delivery over MPEG MMT for live streaming
  - MMT minimizes delivery delay of OMAF based 360° media
  - Smooth and seamless switching of streams

**Demo System**
VR Streaming with OMAF Timed Text and WebVR

- **WebVR-based Viewport-dependent VR streaming**

  with MPEG OMAF Timed Text and MPEG MMT

**Achievements**
- Web-based 360° media delivery and playback compatible with OMAF
- Demonstration of OMAF-based VR with timed text, using WebVTT
- Integration of OMAF and MMT standard-based VR streaming service into WebVR

**Features**
- 360° media delivery featuring timed text with MPEG OMAF
  - Developed OMAF timed text through WebVTT on transparent 3D plane
  - Rendering equirectangular projected (ERP) video texture to sphere
- 360° media delivery through Web for large scale OMAF media service
  - Node.js for streaming server to provide large scale OMAF content delivery
  - Browser-based client solution provides easy consumption of OMAF content for users

**Demo System**

- Stitched ERP OMAF VR content
- Node.js Server
- OMAF Player
- User #1
- User #N

SAMSUNG
MPEG OMAF and MMT streaming for low-latency 360 video streaming

- The world’s first commercially deployed MMT-based mobile live video streaming
- MMT-based Ultra-low latency and Perfect playback synchronization on Mobile Live Video Streaming

Demo Configuration

- Chunk Size: 1sec
- Minimum No. of Chunks: 6
- Client Buffer Size: 3sec

Check Point

- Real-Live Video Experience
- End-to-End Delay Reduction
- Playback Synchronization

Deployed in
- Mobile TV of SKT
- 8.1M Subscribers
- 3.3M MAUs

MPEG OMAF Developers Day @MPEG121, Gwangju, Korea
VR Streaming with OMAF

Content delivery server

Packing

Time

Syn

ERP projection

Gear VR

Screen response

Tile

Sending module

Scheduling decision (client)

Gear VR

Buffer

Video streaming

ERP projection

Packing

Time Syn

single decoder

parallel decoder

Playback module

Transfer module

Broadband and 4G/5G network

single streaming

multi streaming

FoV prediction

Screen response
TILED MEDIA
THE VR STREAMING COMPANY

Next-generation viewport-dependent streaming

Bandwidth

4K: 5 Mbps
6K: 10-12 Mbps
8K: 14-15 Mbps

Motion-to-high-res latency
less than 2 frames (92%)

Demo streamed from Akamai

As showcased at CES, IBC, NAB by:
Akamai, Harmonic, Ericsson, Viaccess Orca, DTS
SOCIAL VR

› Watch a movie together with Virtual Rob

VR MAGNIFIER

› Zoom in VR without nausea
Thanks to the sponsors, hosts and organizers of this MPEG meeting and Roadmap Workshop
And special thanks to:

• All our Speakers!

• Gun Bang – Electronics and Telecommunications Research Institute
• Jihun Cha – Electronics and Telecommunications Research Institute

• Yaeseul (Angela) Park – Telecommunications Technology Association