Emerging 8K services and their applications towards 2020

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Status of 4K·8K delivery in Japan

- For B to C broadcast
  - Test services via satellite launched in 2016 (with a limited number of receivers and monitors)
  - Commercial services via satellite will launch in 2018 (with widely available TV sets)
  - Terrestrial system is under study

- For B to C broadband
  - Retransmission of satellite broadcast and hybrid services are under study

- For B to B delivery
  - Technical specifications for public viewing and 4K·8K theaters are under study

Towards 2020 Tokyo Olympic & Paralympic Games, opportunities for enjoying 4K·8K will dramatically increase
Everyone enjoys 4K · 8K content all over Japan

- Receivers and monitors for test broadcast services
8K, more than resolution

- 8K offers even stronger sense of presence and realness to viewers

High dynamic range  Wide color gamut & 10-bit depth

8K 60/P, 120/P
Delivery aspect of 8K broadcasting system

- Enables hybrid services, in which broadband are used together with broadcast to deliver content
- Uses IP-based media transport for hybrid services
  - MPEG Media Transport (MMT): for media synchronization
  - IP: for common interface between broadcast and broadband
  - TLV multiplexing scheme: for efficient transport of IP packets

<table>
<thead>
<tr>
<th>4K・8K video</th>
<th>22.2 Audio</th>
<th>Closed caption</th>
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<tbody>
<tr>
<td>HEVC</td>
<td>AAC, ALS</td>
<td>TTML</td>
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*TLV: Type Length Value *TTML: Timed Text Markup Language
Related ITU-R Recommendations/Reports

- **Rec. ITU-R BS.2051**, “Advanced sound system for programme production”
- **Rec. ITU-R BT.2074**, “Service configuration, media transport protocol, and signalling information for MMT-based broadcasting systems”
- **Rec. ITU-R BT.1869**, “Multiplexing scheme for variable-length packets in digital multimedia broadcasting systems”
Benefits of MMT for broadcast and hybrid services

- Low-latency encapsulation
  - Supports real-time streaming and file-based streaming

- Synchronization of audio & video from different channels
  - UTC-based presentation timestamp
  - Identifying media components with IP address

- Combination and switching of media components
  - Self-decodable structure for audio & video signals

*MFU: Media Fragment Unit  *MPU: Media Processing Unit
<table>
<thead>
<tr>
<th>Use case</th>
<th>Technical elements</th>
<th>Media transport</th>
<th>Error resiliency</th>
<th>Session management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broadcast (fixed reception)</td>
<td>Multicast</td>
<td></td>
<td>Not required</td>
<td>IGMPv4, MLDv2</td>
</tr>
<tr>
<td>Broadband (retransmission, hybrid services)</td>
<td>Multicast</td>
<td>Rec. ITU-R BT.2074</td>
<td>AL-FEC</td>
<td>IGMPv4, MLDv2</td>
</tr>
<tr>
<td>Broadband (hybrid services) (unidirection)</td>
<td>Unicast</td>
<td></td>
<td>AL-FEC</td>
<td>RTSP</td>
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<tr>
<td>Broadband (VoD, hybrid services) (bidirection)</td>
<td>Unicast</td>
<td>ISO/IEC 23008-1</td>
<td>TCP</td>
<td>HTTP</td>
</tr>
</tbody>
</table>
Demo #1: 11-channel 8K delivery over broadband

- Used 10G-EPON as broadband
  - 10 G broadband available in limited areas
- Transmit 11 programmes on broadband and 1 programme on broadcast
  - Approx. 11x120 Mbps including AL-FEC for broadband and 100 Mbps for broadcast

11x120 Mbps = 1.3 Gbps

- 1x100 Mbps
- 10 G broadband
Channel change between broadcast and broadband

Transmitter

Receiver

One programme for broadcast and
Eleven programmes for broadband (with AL-FEC)

Selected one 8K programme is presented
Demo #2: hybrid delivery over commercial broadband

- Everyone can use this broadband about 40 US$ per month
- Picture in picture and tablet device for presentation
  - Synchronized presentation between programmes

![Diagram of hybrid delivery system]

- MMT transmitter
- MMT/IP
- Broadcast modulator
- BS-IF
- Broadcast demodulator
- MMT/IP
- MMT receiver
- Commercial broadband
- MMT/IP
- Tablet
- Additional-views programmes
Synchronization of two videos from different paths

Additional video (MMT/UDP over broadband)

Programme over broadcast

Additional video (MMT/UDP over broadband)

Additional video (MMT/HTTP over broadband)
Next Generation Contents Distribution Forum (NexCDi-F) was established in 2016

- Members include content creators, broadcasters, manufactures, teleco companies, and so on
- Developing technical specifications for delivering next-gen content including 4K・8K
- Promoting facilities having large screen for next-gen content

For B to B delivery

Various content

Platform
for 4K・8K, 3D video and audio

Applications
- Public viewing
- Theaters
- Shopping centers
- Public facilities
- Museums
- Schools
- Hospitals
Plan of NexCDi-F towards 2020

- Services will start at limited areas in 2017
- Environments for business will be prepared in 2018
- Services will start until Rugby World Cup in 2019
- Services will spread all over Japan in 2020
Conclusions

- Overview of 4K·8K satellite broadcasting system
  - MMT as media transport protocol
  - Related ITU-R Recommendations
- Demos on hybrid services
  - 11-channel 8K content delivery over broadband
  - Synchronization of multi-view videos
- B to B delivery is also being studied by NexCDi-F for public viewing and theaters

- It is expected that 4K·8K will be widely enjoyed in 2020
- The Tokyo Olympic & Paralympic Games in 2020 will be delivered out to viewers through various channels