Oki Electric Industry, Japan

REPORT OF IPTV TESTING AND SHOWCASING
Report of IPTV Testing & Showcasing

7 September 2015

Source: Oki Electric Industry Co., Ltd., Japan

Contact: Hideki Yamamoto
Tel: +81 48 420 7012
Oki Electric Industry Co., Ltd.
Fax: +81 48 420 7138
Japan
Email: yamamoto436@oki.com

Contents

1. IPTV Testing & Showcasing general information
2. Introduction to ITU IPTV standards and 4k broadcasting
3. IPTV Testing & Showcasing Conceptual Configuration
4. IPTV Testing
5. IPTV Showcasing
6. Conclusions
IPTV Testing & Showcasing General

- **Purpose**
  - **Testing**
    - Confirm conformance on H.721(2015) and its test specification, ITU-T HSTP-CONF-H721(V3) between server (OKI) and test terminal.
  - **Showcasing**
    - Demonstrate the latest 4k IPTV and popular 2k IPTV.

- **Participating Organizations**
  - Oki Electric Industry Co., Ltd. (OKI)

---

IPTV defined in ITU IPTV standards

- **IPTV ≠ Internet Video**
- Defined as “multimedia services, such as Television; Video; Audio; Text; Graphics; Data, delivered over IP based networks managed to provide the required level of QoS/QoE, security, interactivity and reliability”.

<table>
<thead>
<tr>
<th>Study period: 2005-2008</th>
<th>Study period: 2009-2012</th>
<th>Study period: 2013-</th>
</tr>
</thead>
</table>

**Phase 1**

- **Basic Model**
  - 2008
  - 2009

**Phase 2: Advanced Services**

- 2010
- 2011
- 2012
- 2013
- 2014

**Advanced service standardization**

- H.721 basic model standard
- 1st IPTV-GSI in Jan., 2008

**Basic service standardization**

- Interop / Showcasing
- Jul, Sep, Dec, Jul, Sep, Oct, Nov, May, Sep, Oct, Aug, Oct, Sep
- APT/ITU(Thai), Rwanda, South Africa, Uzbekistan

---

H.721(2015)
IPTV Services overall

- IPTV is a killer service of broadband infrastructure.
- By using of IP, IPTV provides interactive TV services.
- IPTV can be used as a platform of lots of TV base services.

- **Basic entertainment services**
  - Linear (Channel Service) Broadcast TV
  - Video On Demand (VoD)
  - Accessibility: captioning, descriptive audio
  - Audio services
  - Karaoke, gaming

- **Public Services**
  - Billboards, disaster alerts, traffic news, etc

**E-***
- E-government
- E-publishing (e-Books, Newspaper)
- E-commerce (banking, etc.)
- E-learning (distance learning)
- E-health (telemedicine, tele-healthcare)

- **Private and Community Broadcasting** (sharing videos)
- **Photo albums** (sharing photos with your friends)
- **TV yellow pages**
  - Managed IP NW
  - Server

Overview of ITU-T Recommendations for IPTV

- **End-user functions and Application functions** are hot topics now.
- **Draft recommendation about IPTV terminals for H.265, 4K services**, and convergent service with sensor devices are hot topics.

<table>
<thead>
<tr>
<th>Applications and end-systems</th>
<th>Quality of Experience</th>
<th>Security and Content Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>H.750: Metadata for IPTV Services</td>
<td>H.701: Content Error-Recovery</td>
<td>X.1191: Req &amp; Arch for IPTV security</td>
</tr>
<tr>
<td>H.721: IPTV Terminal (Basic)</td>
<td>H.1080: IPTV QoE</td>
<td></td>
</tr>
<tr>
<td>H.770 : IPTV Service discovery</td>
<td>H.1081: Performance Monitoring</td>
<td></td>
</tr>
<tr>
<td>H.741.x: Audience Measurement</td>
<td>H.1082: Improving robustness of IPTV performance</td>
<td></td>
</tr>
<tr>
<td>H.763.1: Cascading style sheets for IPTV services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H.764: video</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H.765: video</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Next generation high quality television – 4K/8K

- HDTV (High definition television, current digital TV) is 2K. UHDTV (Ultra HDTV) enables 4 times higher resolution by 4K, and 16 times resolution by 8K. 8K realizes outstanding clear and realistic image/video services.

- ITU-T H.265 is suitable for 4k / 8k video coding method.

<table>
<thead>
<tr>
<th>Resolution</th>
<th>Screen size</th>
<th>Broadcasting service</th>
</tr>
</thead>
<tbody>
<tr>
<td>2K</td>
<td>2 million pixels 1,920 x 1,080 = 2,073,600 About 2,000 + 2K</td>
<td>32 inches</td>
</tr>
<tr>
<td>4K</td>
<td>8 million pixels 3,840 x 2,160 = 8,294,400 About 4,000 + 4K</td>
<td>50 inches</td>
</tr>
<tr>
<td>8K</td>
<td>33 million pixels 7,680 x 4,320 = 53,117,600 About 8,000 + 8K</td>
<td>85 inches</td>
</tr>
</tbody>
</table>

(*) This table is excerpted from "Director for Digital Broadcasting Technology" by Information and Communications Bureau, MIC, Japan, in Thailand-Japan Round Table on Next-generation Broadcasting.

ITU-T H.721 (2015) – IPTV basic terminal (1)

**Profile of video codec**

<table>
<thead>
<tr>
<th>Category</th>
<th>Implementation</th>
<th>Optionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>V1 compatible (MPEG-2 and H.264)</td>
<td>ITU-T H.262 Mandatory, ITU-T H.264 Mandatory</td>
</tr>
<tr>
<td>2</td>
<td>H.264 is mandatory</td>
<td>ITU-T H.262 Recommend, ITU-T H.264 Mandatory, ITU-T H.265 (4Kまで) Option</td>
</tr>
</tbody>
</table>
ITU-T H.721 (2015) – IPTV basic terminal (2)

- High quality lossless audio codec are adopted in the audio codec list.

<table>
<thead>
<tr>
<th>Category</th>
<th>Rec. Ver.</th>
<th>Optionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPEG-2 AAC</td>
<td>V1</td>
<td>Option</td>
</tr>
<tr>
<td>MPEG-1 Layer II</td>
<td>V1</td>
<td>Option</td>
</tr>
<tr>
<td>MPEG-4 AAC</td>
<td>V2</td>
<td>Option</td>
</tr>
<tr>
<td>MPEG-4 HE AAC v1</td>
<td>V1</td>
<td>Option</td>
</tr>
<tr>
<td>MPEG-4 ALS</td>
<td>V2</td>
<td>Option</td>
</tr>
<tr>
<td>Dolby AC-3</td>
<td>V1</td>
<td>Option</td>
</tr>
<tr>
<td>DTS-HD</td>
<td>V2</td>
<td>Option</td>
</tr>
</tbody>
</table>

ITU-T H.721 (2015) – IPTV basic terminal (3)

- Regarding audio – video multiplexing, MPEG-2 TS is only mandatory.

<table>
<thead>
<tr>
<th>Category</th>
<th>Rec. Ver.</th>
<th>Optionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>MPEG-2 TS</td>
<td>V1</td>
<td>Mandatory</td>
</tr>
<tr>
<td>TTS</td>
<td>V1</td>
<td>Option</td>
</tr>
<tr>
<td>MP4</td>
<td>V2</td>
<td>Option</td>
</tr>
<tr>
<td>MMT</td>
<td>V2</td>
<td>Option</td>
</tr>
</tbody>
</table>
IPTV Testing Configuration (1)

- Testing ----- OKI and Multimedia expert
  - C&I testing was conducted based on the following documents:
    - Technical paper ITU-T HSTP-CONF-H.721 Conformance testing specification for H.721 (V3)
    - Measurement equipment was used to examine protocols and data between contents the server and a terminal.

IPTV Testing Configuration (2)

- In the 3rd event, the different points between H.721(2010) and H.721(2015) were tested.

<table>
<thead>
<tr>
<th>Items</th>
<th>ITU-T H.721</th>
<th>H.721 (2015)(*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video codec</td>
<td>MPEG-2, H.264</td>
<td>MPEG-2, H.264, H.265</td>
</tr>
<tr>
<td>Audio codec</td>
<td>AAC,…</td>
<td>AAC, ALS, DTS-HD,…</td>
</tr>
<tr>
<td>Resolution</td>
<td>Up to HD</td>
<td>Up to 4K</td>
</tr>
<tr>
<td>VoD protocols</td>
<td>RTP/RTSP</td>
<td>RTP/RTSP, HTTP, DASH</td>
</tr>
<tr>
<td></td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

(*) Red words mean the new technologies in H.721(2015)
IPTV Testing Photo

- Testing was conducted in the same room as showcasing on 7 September 2015.
- The report was created by participants

IPTV server Measurement PC

IPTV Showcasing Conceptual Configuration

- Showcasing

C&I Venue

```
+----------------+             +----------------+
| TV             | ONU            | Optical network |
| IPTV Terminal  | IPTV Head-end  | Contents server |
| (STB or PC)    |                |                 |
+----------------+             +----------------+
```

© Copyright 2015 Oki Electric Industry Co., Ltd.
Contents for Showcasing

- In showcasing, Linear TV that supports ITU-T H.264, H.265, and H.721(2015)) are being exhibited.
- 4K UHDTV contents, “Fantastic Winter in Sapporo” and “Toyota big air”, were created by HTB(*).
- Contents are encoded both 4K / H.265 and 2K / H.264 format.

IPTV showcasing photo

- 4K displays connecting with 4K STB showed 4K (30Mbps) and 2K (8Mbps) linear TV contents.
- Audiences could distinguish the difference between 2K and 4K.

Video contents were provided by HTB

IPTV Head-end by OKI

- **OKI MEDIA SERVER** is an ITU IPTV reference server used in I3GT

- Integrated IPTV Platform
  - VOD, live streaming, IP broadcasting (linear TV) and their combined services such as time shift service (pause-livé, catch-up, and start-over)

- Standard based system
  - ITU-T IPTV standards and de-facto standard, IETF HLS, H.265

- Large scale system
  - It supports distributed VOD system for large scale system
IPTV STB by Mitsubishi Electric

Features
- Multiple services (currently deployed STB)
  - Terrestrial and satellite TV broadcast
  - Premium channel TV broadcast
  - VoD, Revenue-generating interactive services: Karaoke, portal services
- Personal video recorder, Remote scheduled recording

Specifications
- Full-HD H.264, MPEG2
- LAN 10/100 Base-TX x1
- USB 2.0 x2 ports for HDD PVR
- HDMI digital Audio/Video
- Stereo audio
- Composite/Component video
- Digital audio
- IR interface (for remote controller)

ITU-T Recommendations supported
- H.721 IPTV Terminal devices – Basic model
- H.762 Lightweight interactive multimedia environment (LIME) for IPTV services
- H.770 Mechanisms for service discovery and selection

IPTV STB by Sumitomo Electric

Features
- StreamCruiser 4K IP Set Top Box Series support Next Generation
- Video Service Standard "4K H.265 (HEVC) 60P"

Specifications
- DRM (Marlin / Microsoft PlayReady DRM / Widevine / Verimatrix)
- Hybridcast (a part of ITUT J.205)
- Android 5.0 later
- HTML5 Browser
- Wireless network 2×2 IEEE 802.11ac (5GHz) / n (2.4GHz)
- Bluetooth 4.0
An APT-J2 1024 project, "Broadband Wireless for Disaster Operations: Resilient Networks and Reconfigurable Information Systems for Rapidly Deployable Disaster Response", developed a disaster risk reduction system in Ateneo de Manila University in Philippines by using of IPTV network and ISDB-T one seq broadcasting.

### Resilient system architecture

- **Installed system by APT-J2**

### Installed system by APT-J2

- **Use case for Resilient system**

#### Local broadcast over ISDB-T

- **(*) Ateneo de Manila University, DOST, PLDT, Mitsubishi Electric, and OKI practiced this project founded by APT HRD**

### Conclusions

- **In APT/ITU C&I event:**
  - **IPTV Testing**
    - Conformance test based on H.721(2015) and HSTP.CONF-H721(V3) was conducted by OKI and multimedia experts.
    - The report of this event may be reported to ITU-T SG16 as liaison statement after EG MA discussion in ASTAP-26.
  - **Showcasing**
    - Demonstrate state of the art technology, IPTV with 4k/H.265 video streaming and current standard based products were exhibited.

- **Future directions**
  - More participants, new testing based on the new or popular standards, and more exhibitions will be expected in future events.
Thank you

※ All names of companies and products generally referred to herein, are the trademarks or registered trademarks of their respective owners.
※ The contents of this presentation are subject to change for enhancement without prior notice.