



**APT/ITU Conformance and  
Interoperability Event 2015**  
7 – 8 September 2015, Bangkok, Thailand



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**Document C&I-3/INP-09**  
**07 September 2015**

Oki Electric Industry, Japan

**REPORT OF IPTV TESTING AND SHOWCASING**

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## Report of IPTV Testing & Showcasing

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7 September 2015

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6. Conclusions

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## 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)

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## 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”.

Study period:  
2005-2008

Study period: 2009-2012

Study period:  
2013-

Phase 1 Basic Mode		Phase 2: Advanced Services						
2008	2009	2010	2011	2012	2013	2014	15-	
Basic service standardization 1 <sup>st</sup> IPTV-GSI In Jan., 2008 H.721 basic model standard		Jul Geneve	Sep Singapore	Dec India	Jul Brazil	Sep Dubai, UAE	Oct Telecom (Geneve)	Nov WTSA (Dubai, UAE)
		Interop / Showcasing May South Africa Sep APT/ITU(Thai) Oct Rwanda Aug APT/ITU(Thai) Oct Uzbekistain Sep APT/ITU(Thai)						
		Advanced service standardization H.721(2015)						

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## 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  
... and much more

Entertainment      E-learning      Managed IP NW      Server

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## 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.






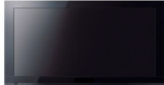
<p><b>Home networking</b></p> <ul style="list-style-type: none"> <li>H.622.1: Req &amp; Arch for IPTV Home networks</li> </ul>	<p><b>Applications and end-systems</b></p> <ul style="list-style-type: none"> <li>H.750: Metadata for IPTV Services</li> <li>H.721: IPTV Terminal (Basic)</li> <li>H.770: IPTV Service discovery</li> <li>H.761: Ginga-NCL</li> <li>H.741.x: Audience Measurement</li> <li>H.762: LIME</li> <li>H.763.1: Cascading style sheets for IPTV services</li> <li>H.264: video</li> <li>H.265: video</li> </ul>	
<p><b>Architecture, requirements, network</b></p> <ul style="list-style-type: none"> <li>Y.2007: NGN Capability Set 2</li> <li>Y.Sup 5: IPTV Service use cases</li> <li>Y.Sup 7: NGN Release 2 Scope</li> <li>Y.1910: IPTV Functional Architecture</li> <li>Y.1901: IPTV Service Requirements</li> <li>Q.3010: Authentication protocol</li> </ul>	<p><b>Quality of Experience</b></p> <ul style="list-style-type: none"> <li>H.701: Content Error-Recovery</li> <li>G.1080: IPTV QoE</li> <li>G.1081: Performance Monitoring</li> <li>G.1082: Improving robustness of IPTV performance</li> </ul>	<p><b>Digital signage</b></p> <ul style="list-style-type: none"> <li>H.780: Digital Signage</li> <li>H.785.0: Digital signage: Requirements of disaster information services</li> </ul>
	<p><b>Security and Content Protection</b></p> <ul style="list-style-type: none"> <li>X.1191: Req &amp; arch for IPTV security</li> </ul>	

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## 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.

	Resolution	Screen size	Broadcasting service
2K	 <p><b>2 million pixels</b>  <math>1,920 \times 1,080</math>                      = 2,073,600                      About 2,000 = 2K</p>	32 inches- 	HDTV
4K	 <p><b>8 million pixels</b>  <math>3,840 \times 2,160</math>                      = 8,294,400                      About 4,000 = 4K</p>	50 inches- 	Practical broadcasting
8K	 <p><b>33 million pixels</b>  <math>7,680 \times 4,320</math>                      = 33,177,600                      About 8,000 = 8K</p>	85 inches- 	Trial operation (e.g. public viewing)

(\*) 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

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

### Profile of video codec

Category	Implementation	Optionality		
<b>0</b>	V1 compatible (MPEG-2 and H.264)	ITU-T H.262 ITU-T H.264	Mandatory Mandatory	
	<b>1</b>	H.264 and H.265 Upto 2K resolution	ITU-T H.262 ITU-T H.264 ITU-T H.265 (2Kまで)	Recommend Mandatory Mandatory
<b>2</b>		H.264 is mandatory	ITU-T H.262	Recommend
			ITU-T H.264,	Mandatory
	ITU-T H.265 (4Kまで)		Option	
<b>3</b>	H.264 and H.265 Upto 4K resolution	ITU-T H.262	Recommend	
		ITU-T H.264,	Mandatory	
		ITU-T H.265 (4Kまで)	Mandatory	

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### ITU-T H.721 (2015) – IPTV basic terminal (2)

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

Category	Rec. Ver.	Optionality
MPEG-2 AAC	V1	Option
MPEG-1 Layer II	V1	Option
MPEG-4 AAC	V2	Option
MPEG-4 HE AAC v1	V1	Option
MPEG-4 ALS	V2	Option
Dolby AC-3	V1	Option
DTS-HD	V2	Option

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

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

Category	Rec. Ver.	Optionality
MPEG-2 TS	V1	Mandatory
TTS	V1	Option
MP4	V2	Option
MMT	V2	Option

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## IPTV Testing Configuration (1)

- Testing ----- OKI and Multimedia expert
  - C&I testing was conducted based on the following documents:
    - Recommendation ITU-T H.721(2015) "IPTV terminal devices: Basic model"
    - 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.

C&I Venue

ITU-T H.721 (2015)

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## IPTV Testing Configuration (2)

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

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


(\*) Red words mean the new technologies in H.721(2015)

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### 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

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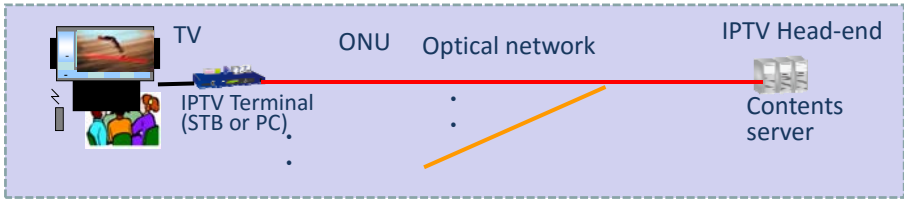
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### IPTV Showcasing Conceptual Configuration

- Showcasing

C&I Venue



TV      ONU      Optical network      IPTV Head-end

IPTV Terminal (STB or PC)      Contents server

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## IPTV Testing & Showcasing Layout Image

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## Contents for Showcasing

- In showcasing, Linear TV that supports ITU-T H.264, H.265, and H.721(2015)) are being exhibited.
- **4K UHD TV 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.

**Fantastic Winter in SAPPORO**

**Toyota big air**

(\*) HTB: Hokkaido Television Broadcasting, <http://www.htb.co.jp/en/>

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## 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

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## IPTV Head-end by OKI

- **OKI MEDIASERVER** 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-live, 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

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## 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


### 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

### 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)





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Changes for the Better

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## IPTV STB by Sumitomo Electric

### Features


- ◆ StreamCruiser 4K IP Set Top Box Series support Next Generation
- ◆ Video Service Standard “**4K H.265 (HEVC) 60P**”

- 4K (3840×2160, 60fps) decode and output (HDMI)
- H.265 HEVC (High Efficiency Video Coding) Hardware Decoder
- MPEG2-TS / MPEG2-TTS / MMT (option)
- IP VoD: Unicast, Linear TV: Multicast
- IP Triple Tuner (Simultaneous Live channel viewing and Dual channels recording) and Dual transcoder
- Multistreaming of recorded contents to Tablets and Smart Phones with DLNA (Digital Living Network Alliance)

- 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





\*Actual device may be different from one in the photo



**SUMITOMO ELECTRIC**

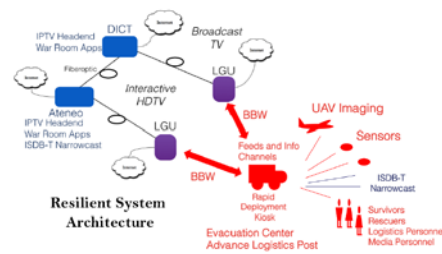
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## Broadband Wireless for Disaster Operations

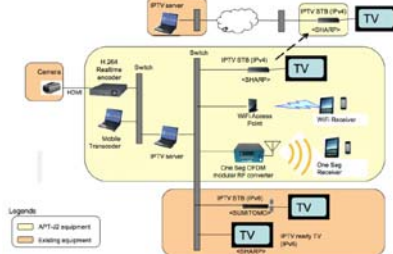
An APT-J2 1024 project, "Broadband Wireless for Disaster Operations : Resilient Networks and Reconfigurable Information Systems for Rapidly Deployable Disaster Response", developed a disaster risk reduction system in **Ateneo de Manila University in Philippines** by using of **IPTV network** and **ISDB-T one seq broadcasting**.

### Resilient system architecture



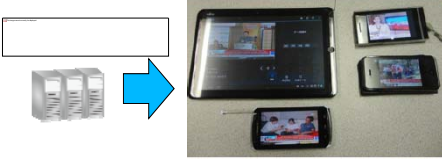
**Resilient System Architecture**

### Installed system by APT-J2



**Use case for Resilient system**

### Local broadcast over ISDB-T



**Pre-Disaster Preparedness**

- Social Network information - Learned Experience ✓
- Assets Prepositioned And Ready And Resilient ✓
- Assist The Young And Disabled in Disasters ✓



**Decision Support Systems**

- Resilient Information Sharing Across Multiple Platforms ✓

**Post Disaster Response**

- Support System for Victims, Survivors and Families ✓
- Support the Long Term Recovery and Reconstruction ✓

(\*) Ateneo de Manila University, DOST, PLDT, Mitsubishi Electric, and OKI practiced this project founded by APT HRD Program. © Copyright 2015 OKI Electric Industry Co., Ltd. 21

## 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.**

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