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Contents

- 2
Technical Aspects of Analogue
Switch Off in New Zealand
- 7
Toward Evolved Broadcast Content
Search and Navigation
- 14
Broadcasters, Do We Need Spectrum?
- 17
Meet Our Host, TDM
- 18
Interview with Mr Frederico Alexandre
do Rosário, TDM
- 21
ABU Technical Committee 2014 Meeting
- 24
ABU Technology meetings and
Collaborations
- 25
Outlook and ABU Festival of
Technology Webinar 2014
- 26
HBF-ABU Regional Workshop on the
Role of Broadcast Media in Disaster
Mitigation and Management
- 28
Survey to Study Technical Training Priority
Areas of Members
- 30
UHDTV Broadcasting over DVB-T2:
Seoul, South Korea Case Study
- 36
News from the ABU Region
- 38
Digital Broadcasting Update
- 40
Equipment Trends
- 42
Distinguished Service Award
- 43
Personalities & Posts



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TDM-Teledifusão de
Macau broadcasting
facilities.**



Asia-Pacific Broadcasting Union

TECHNICAL REVIEW

From the Editor's Desk



This issue of *Technical Review* of ABU Technology carries three articles on technology. An article contributed by KBS addresses *Broadcast Content Search and Navigation*. An important case study contributed by TVNZ on Analogue Switch Off in New Zealand addresses Technical Aspects of ASO. Delivery of UHD-1 is a hot topic among all media stakeholders. Rohde & Schwarz article briefly explains the implementation of UHDTV-1 Broadcasting over DVB-T2 in Seoul, South Korea.

Spectrum issues are discussed in preparation for WRC-15. As customary, the host of this year's TC and other meetings, TDM showcase its profile. Technical Review also features an interview with Frederico Alexandre do Rosário, Director & Member of Executive Committee of TDM, Macau and who also functions as the ABU Technical Committee Honorary Vice Chairman. A meetings schedule of 2014 ABU Annual meetings is included for reference.

Reports on ABU Technology activities present on Interactive Multimedia Services Training held 9-10 September in Hanoi, HBF-ABU Regional Workshop on the Role of Broadcast Media in Disaster Mitigation and Management held 3-5 September in Kuala Lumpur.

This year Technology Webinars Draw Good Turnout and article on Prioritisation of ABU Technology Activities describes the analysis of results of the survey carried out among ABU members.

In additions to personalities and posts, an article describes the Distinguished Service Award presented to Dr Keiichi Kubota of NHK ITEC.

Now Technical Review can be downloaded as a pdf file from the ABU Website in Technical review section on http://www.abu.org.my/Technical-@-Technical_Review.aspx. Previous editions from 2012 are available to download to any platform in addition to view only edition available on Yudu.



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Technical Aspects of Analogue Switch Off in New Zealand

By Wayne Huggard,

Transmission Services Manager, Television New Zealand

abstract

The technical aspects of New Zealand's switch off of analogue television broadcasting (ASO) are described, including a band change and terrestrial to satellite transition required for some viewers.

Key words: ASO, analogue switch off, restacking, DTT, DTH, New Zealand

Introduction

Analogue Switch Off (ASO) of Broadcast Television, and the transition to digital only transmission was successfully completed in New Zealand in 2013, despite some challenging aspects. This change from analogue to digital broadcasting required a transformation from almost 100% coverage by terrestrial analogue transmission to a mix of more limited Digital Terrestrial Television (DTT) coverage with a Direct To Home (DTH) satellite overlay. Another difficulty was a change to the broadcast band from VHF to UHF. The changeover was successful with very high retention of free-to-air viewers, government satisfaction and minimal adverse publicity; thus the New Zealand experience may be of interest to other broadcasting organisations.

Geography

New Zealand is a small island nation in the South Pacific, with a population of 4,500,000. It consists of two main islands and is long (over 1,600 kilometres/990 ml) and narrow (maximum of 400 kilometres/250 ml wide). The population is biased towards the north but with a mixed urban/rural economy. Coverage is required across the whole country, including mountainous and remote areas. From a broadcast transmission perspective there is a full range of topology from plains requiring a single high site, to alpine chains and deep valleys and outlying islands. The capital, Wellington, and its surrounding region, is particularly challenging for coverage with deep recursive valleys.

Analogue

Analogue coverage reached over 99% of the population. To achieve this extensive coverage required over 500



Photo credit: Johnston, Dick and Associates (JDA)

The VHF analogue antenna being removed from the mast at Popoiti, in the lower North Island. One of the panels is on the ground.

transmission sites with long chains of relay stations in remote areas. This included sites that are only accessible by helicopter, that have limited access in winter and/or that are solar powered. Some of these sites served very small populations. Although the main transmission sites provided multiple services, provincial sites provided only three or four channels and remote sites could transmit as few as one service.

Delivering this extensive coverage is of great credit to the transmission engineers who achieved it, given the difficult topography.

Freeview

New Zealand's Freeview is a joint venture of free-to-air broadcasters which was established to facilitate the introduction of digital broadcasting by providing three key functions:

- promotion of the Freeview brand to give consumers confidence to purchase digital receivers,
- testing and certification of receivers and
- management of a common EPG.

Although Freeview has no statutory power to force compliance, its success has been that virtually no non-certified DTT receivers are sold in NZ, thus giving consumers a consistent, reliable user experience.

DTH Satellite

In 1999 Television New Zealand commenced a pilot direct to home (DTH) satellite service which was re-launched as 'Freeview' satellite in 2007, with participation of all the main Free-to-Air broadcasters. The earlier pilot service ensured there was an existing audience base when 'Freeview' satellite was launched. There is also a pay television satellite service that serves approximately 50% of homes.

DTT Launched Well Before ASO

The 'Freeview' concept was extended to terrestrial broadcast with the launch of DTT in 2008 in 8 areas from 18



On-screen ASO crawler caption.

transmission sites covering with 75% of the national population. This was extended in 2011 to a further 12 sites to increase coverage to over 87% of the population. Thus digital transmission was well established before the analogue switch off in 2013.

Terrestrial to Satellite Migration

Due to commercial constraints, the DTT service was limited to the main population areas. Because there was already a DTH service providing 100% national coverage including all the main broadcasters' channels, many viewers (beyond main population areas), had already abandoned terrestrial reception to take advantage of the wider programme choice available from DTH.

Many households had unwittingly also migrated from analogue to digital satellite when they subscribed to pay television.

However, those analogue viewers who did not have DTT coverage, and who had not already moved to DTH, were required to do so at ASO to ensure continued television reception.

Transmission Site Selection

In 2005 while we were planning the DTT network it was believed that when DTT was first launched in Britain it was at a lower transmitted power than is now broadcast and that this lower powering initially gave DTT a poor reputation as difficult to receive. In New Zealand we wished to ensure that DTT was perceived as a positive advancement and so wanted it to be perceived to be easy to receive. A somewhat novel approach to transmission site planning was therefore used.

Traditionally (in simplistic terms) the 'best' high transmission site is selected, that covers as wide an area as possible, and thus the greatest number of people. Then the next best site is selected on a people served per cost basis. Thus the greatest population is covered at the least cost.

However, this approach does not take account of local coverage variations within the area. There are typically locations that, although close to the transmission site, receive poor coverage because of local terrain or clutter effects. With the cliff edge effect in digital reception this can result in intermittent or total loss of service.

Such situations within the apparent coverage area were to be avoided, as much as possible, to ensure DTT was seen as reliable and simple to receive from launch.

The coverage design was therefore to designate desired coverage areas and then to ensure, that where viable, all locations within those areas would receive reliable coverage.

To begin with a series of polygons were drawn on maps, typically at the suburban boundaries of main population centres, to enclose the required coverage area. Then the

first area was provided with enough coverage sites to ensure reliable coverage within the polygon boundaries. This was repeated to cover as many areas as the initial funding allowed.

A Freeview website was created where the public could look up their address and be informed if they were likely to receive DTT; or they were alternatively advised to utilise the DTH satellite service.

Once DTT had become established in these initial areas and was proved to be easily and reliably received, the more conventional approach was used when the network was expanded in 2011.

DTT Band

With the large number of transmitters required to achieve a high level of coverage in challenging topography, the four national VHF services had completely filled that band. There was therefore no usable 'white space' in which DTT service could be accommodated.

The UHF band had also been fully planned but here there was deemed to be sufficient white space to commence digital services. The UHF analogue services, however, had significantly smaller audiences and were developed after the VHF services. Also, the UHF transmission sites were in some cases different to the VHF sites.

There was some concern that this change of the primary services from VHF to UHF would make the transition to DTT more difficult for viewers, because of the antenna change that may be required. In practice this was not a significant problem due to good signal saturation and because there also had previously been a UHF analogue encrypted pay television service on UHF that left a large number of installed UHF antennas.

ReStacking

At the time of ASO the Television Broadcasting section of the UHF band was reduced from 518~806MHz to 510~686MHz. Thus any continuing DTT transmitters that were in the upper part of the band had to be returned ('restacked') to operate in the remaining spectrum. This restacking was carried out as early as possible at each site, to minimise the number of viewers affected, given that the number of digital viewers was increasing over time. Much of this was completed prior to ASO, however some smaller sites are still not completed.

ASO Regions

There was initially much discussion as to how the stages of the ASO should be managed. The options ranged from a single national 'big bang' approach to closing each of 24 main (link fed) transmitter sites in turn, or a more limited number of regions; and if regions, how and where the boundaries should be drawn.

The solution adopted was to divide the country into three regions (based on regional advertising areas) plus two trial areas. The two trial areas were to test the publicity and the consumer and industry preparedness.

It was expected that many consumers would leave the acquisition of a new digital receiver and/or aerial until the last moment. By staggering the ASO across the country the retail industry was able to ensure there was sufficient stock available, with the possibility to move any excess to the next region. Similarly, it created the opportunity for aerial installers to move from region to region as demand increased.

One trial area had no DTT coverage and so required all remaining analogue viewers to switch to satellite reception. The other area had partial DTT coverage, so consumers would need to determine if DTT was an option at their location. The trial areas were successful and so there was little modification of planning for the subsequent regions.

The boundaries of the ASO areas were selected so that viewers would have no ambiguity as to when their analogue signal would end. Natural geographic boundaries were used so that there was minimal 'overspill' from one area to another of either the broadcast signal or of publicity media.



The Bald Hill analogue transmission site on the West Coast of the South Island, now closed. Its off-air input signal was from Paparoa, 230km away.

'Going Digital' Organisation

The government established a small, short term agency to manage the ASO. Called 'Going Digital' its key role was marketing and publicity in order to pull viewers to digital by showing the benefits of enhanced reception and more channels. This agency also facilitated working parties of government officials, broadcasters and receiver industry representative to manage the ASO process.

Going Digital also managed the Assistance Programme which provided a set-top-box, and antenna if required, to persons aged over 74 and with a Benefit Card and to recipients of a Veteran's Pension or Invalids' Benefit.

Targeting Notification to Analogue Viewers

Viewers may receive their signal in various ways: satellite, cable, digital terrestrial, analogue or satellite pay television. We have found that many viewers do not know how they receive their television signal.

A consumer may have purchased a new 'digital TV' but the receiver has defaulted to analogue reception; thus they think they are have digital when they are in fact watching analogue. Another household may pay for a cable service to give them high speed internet access which also provides a cable television connection; therefore they do not need to make any change at ASO; but ASO publicity may unnecessarily persuade them that they must buy a new TV set. Similarly, apartment dwellers may have an in-building television distribution system that takes a digital off-air signal, demodulates it, and re-modulates it into an analogue distribution system; thus ASO will have no impact on the building's occupants.

Where an on-screen message can be added to the analogue broadcast, this is the most effective method of notifying viewers that the service is about to end. It can directly inform viewers that they must take action to continue to receive their television service, without unsettling those viewing on another platform.

However, this is more difficult than may first appear: the same programme service will usually be simulcast on both the digital and analogue platform and it can be impossible to insert interstitial (advertising) items into one outlet only. Our solution was to insert a crawler caption on to the distribution feed to only the analogue network, although care was still taken to ensure this did not run over paid commercials.

Transmitter Disposal

Television transmitters may contain hazardous substance so care was taken to ensure that when analogue services were decommissioned the equipment was disposed of appropriately. This was a significant issue for New Zealand given the numbers of transmitters and topography involved. A specialist transmission company was therefore commissioned to carry out this work.

Summary

A robust broadcast signal, certified receivers and a common EPG gave viewers a positive digital experience prior to ASO. This, together with relevant publicity and on screen information before ASO, contributed to a smooth ASO even though some viewers were required to make significant changes to their reception arrangements.

author



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Upcoming Event

Date	Events	Venue
23 Oct	ABU Technical Bureau Meeting	Macau
24-25 Oct	ABU Technical Committee Meeting	Macau
27-28 Oct	ABU General Assembly	Macau
17-19 Nov	Pacific Media Partnership Conference	Fiji
19-21 Nov	Inter BEE 2014	Tokyo
2-10 Dec	ABU-ASBU Training in IPTV and Networking Technologies	Jordan
15-19 Dec	ABU-IPPTAR Radio and Television Engineering Basic Training	Kuala Lumpur

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Toward Evolved Broadcast Content Search and Navigation

by Yeonhee Oh*, Chulwoo Jung#, Sunghee Han*, Byunghee Jung*, Hee Jung Kim*

*KBS (Korean Broadcasting System), #Republic of Korea Saltlux Inc., Republic of Korea

abstract

This paper introduces new methods for enhancing content search and navigation, and the iLike system that provides improved accessibility to the KBS video archive for TV producers. The iLike system is developed based on our content-based search and recommendation engine. The search and recommendation engine analyzes broadcast metadata and text-based supplementary data, retrieves related information such as keywords, and provides search and recommendation results in XML or JSON. In order to improve broadcast content accessibility, a variety of content search and navigation UXs have been implemented in the iLike system. The iLike system has been running since 2012 in KBS, and continuous updates are being made for stability and usability.

Introduction

There is an increasing demand for TV programme search and recommendation, as the amount of video content is on the increase with digital archiving. Digitalisation of broadcast content denotes keeping metadata and supplementary data together with essence electronically. Systematisation of content management based on IT technologies enables easy content search, but users' requirements get more diverse. Viewers want to find content that famous celebrities appear in or content that deals with certain subjects. TV producers demand more detailed search not only in episode units but also in segment/scene units. These requirements challenge TV content search and recommendation.

It is difficult to search and recommend well with TV programmes. This comes from lack of metadata and the characteristics of broadcast content. There is not enough metadata in the system because of the cost of metadata creation. TV content varies depending on genres, units and formats, so it is more complicated to create and manage broadcast metadata. Most TV programmes are aired as daily or weekly programming, so they are in a hierarchical structure, 'programme – episode'. Most of broadcasters use a text search engine for online content search, but it does not satisfy users searching for TV content that they want. Therefore it is necessary to extract meaningful information from broadcast content and to develop a search engine specialised in broadcast content for novel content search and navigation.

There are many related works on broadcast content analysis, information retrieval, content search, and content navigation UI/UX. NHK STRL developed the CurioView system for TV recommendations related to content being viewed. [1] The PRISM project that was performed by BBC R&D includes automated and semi-automated services to index content,

enhance metadata and search for content. [2] KBS has developed a 'broadcast content search and recommendation engine' that consists of a 'content-based search and recommendation engine', and a 'user-based recommendation engine'. [3] Regarding to keywords extraction, TF-IDF(Term Frequency Inverse Document Frequency) weighting scheme is the prevalent approach. [4] As variants of TF-IDF methods for assigning a weight for each term, there are sub-linear TF scaling and maximum TF normalisation techniques. [6] Google's search results include a simple filtering menu to view a listing of locality, specific media types, and recent results. [7] According to TED.com, "every talk on TED.com now features a time-coded, interactive transcript, which allows users to select any phrase and have the video play from that point.", which is efficient UI/UX for content navigation. [8]

In this paper, we present the enhancements that have been achieved in our content-based search and recommendation engine. This paper focuses on both the enhanced text-based information retrieval for our content-based search and recommendation engine, and newly developed services for broadcast content search and navigation. The rest of this paper is organised as follows. In chapter 2, we introduce advanced broadcast content analysis for information retrieval. We describe our content-based search and recommendation engine in chapter 3. In chapter 4, the iLike system is introduced in the aspect of service applications. This paper concludes with a summary and future works.

Advanced Broadcast Content Analysis for Information Retrieval

For advanced broadcast content analysis, we make use of text-based data, including broadcast metadata, supplementary data such as closed caption and automatically

refined data. Automatically refined data include keywords and named entities such as geographic places and tourist spots. In order to extract keywords, we have built a stopwords dictionary and developed a variant of TF-IDF which is a weighted adaption to broadcast content that consists of multiple documents. Content relatedness has been realised with the characteristics of content – similarity, people or place. In order to realise ‘query by place’ and ‘query by person’, geographic information and person-role information is analyzed and indexed. Similar episodes and news items of certain content are retrieved by using top 30 keywords.

Broadcast content used in this research includes TV content and original material managed in the KBS video archive system. TV content contains programmes that are also called series, episodes and segment/news items. A programme is broadcast daily, semi-weekly, weekly or as special programming. An individual part of a programme is called an episode. In other words, all programmes contain at least one or more episodes. A segment is a subdivision of an episode. Subdivision of an episode of a news programme is called a news item. An episode of a news programme contains 10~20 news items, each with a separate news story. In order to reflect the characteristics of TV content, a news item and a segment are processed separately. Original material includes a shooting original that is for ordinary programmes and a news gathering original that is for news programs.

The text-based data used in this research includes metadata, text-based supplementary data, and automatically refined data. Table 1 shows core text-based data of broadcast content. Descriptive metadata such as programme title and subtitle are created by TV producers or metadata managers. Closed caption data is stored from closed caption broadcast for the hearing impaired, and it contains sets of a caption text and a timecode. Above this, there are more metadata related to broadcast content such as media information.

Content-based search and recommendation is to provide related content in respect of similarity or relevance, and it is realised by content profiling and analysis. Content profiling is to collect data related to content. There is not much metadata in some TV content, i.e. only programme title and on-air date, so it is necessary to make use of unstructured data such as closed captions or cue-sheets to retrieve refined data such as keywords and named entities. In order to relate content to others, it is necessary to analyze characteristics of content. We have used keywords, person-role information and geographic information as the main features of broadcast content.

The prevalent approach to automatic keyword extraction is based on TF-IDF [4]. In our content-based search and recommendation engine, the TF-IDF method was the first approach to rank candidate nouns. In this research, enhancements have been made to the way of keyword extraction. First of all, we have built a stopwords dictionary. This was required because a significant amount of errors generated during the keywords extraction are caused by stopwords. In the Korean language, a postposition is connected to nouns without a space so more errors occur when extracting nouns from a sentence. The stopwords dictionary contains both automatically generated stopwords and man-made stopwords. 430,000 stopwords are generated automatically with rule-based methods, and 80,000 stopwords are selected manually. By excluding false stopwords from candidate nouns, the quality of extracted keywords has been improved. Data sets used for the keywords extraction are descriptive metadata and closed caption data in this research. It is ideal to extract keywords from descriptive metadata. However, there is not much metadata in some content, so supplementary data such as closed caption is used for the keywords extraction together. Normally descriptive metadata such as programme title and subtitle are shorter in length, but more meaningful than supplementary data such as closed

Table 1: Core text-based data of broadcast content

Broadcast Content	Data Kind	Examples of Data
Programme (Series)	Content Metadata	programme title, genre, programme objective, on-air day, person-role information, etc.
	Episode data	each episode information
Episode	Content Metadata	programme title, subtitle, episode on-air date, start time, genre, storyline, person-role information, etc.
	Supplementary Data	closed caption, script, cue-sheet, etc.
	Refined Data	keywords, named entity (geographic places, tourist spots)
Segment	Content Metadata	segment title, segment contents, segment start time, segment end time, person-role information, etc.
	Refined Data	keywords, named entity (geographic places, tourist spots)
News item	Content Metadata	item title, item contents, person-role information, etc.
	Refined Data	keywords, named entity (geographic places, tourist spots)
Shooting Original	Content Metadata	clip title, clip contents, shooting date/time, person-role information, etc.
	Refined Data	keywords, named entity (geographic places, tourist spots)
News Gathering Original	Content Metadata	clip title, clip contents, shooting date/time, embargo information, person-role information, etc.
	Refined Data	keywords, named entity (geographic places, tourist spots)

caption. Because of the difference in length between descriptive metadata and supplementary data, we need a way to give priority to descriptive metadata. When applying broadcast content to TF-IDF, we calculate the importance of each term in content. Broadcast content has multiple documents, which are metadata or supplementary documents. We have determined which documents are used for keywords extraction on each type of broadcast content. For example, documents used for an episode are programme title, subtitle, participant names, storyline and closed caption data. Each document can be weighted in accordance with its importance. For example, when the personal name, 'Psy', appears in participant names, people consider 'Psy' an important keyword. Therefore, weight can be added to the document, 'participant names', in order that personal names can be extracted as keywords. Term frequency of content 'c' with weighted documents is calculated as follows.

$$wc - tf(t, c, n) = \sum_{i=1}^n w_i \times tf(t, d_i) : d_i \in c - (1)$$

$tf(t, d)$: Frequency of the term t in the document d
 w_i : Weight of i -th document. In case of no weighting, $w_i=1$
 n : The document count of content c

The inverse document frequency of content c is a measure of whether the term is common or rare across all content.

$$idf(t, c, C) = \log \frac{|C|}{|\{c \in C : t \in c\}|} - (2)$$

$|C|$: Cardinality of C , or the total number of content in the corpus
 $|\{c \in C : t \in c\}|$: Number of content where the term t appears.

The broadcast content TF-IDF is calculated as follows.

$$\text{broadcast content TF-IDF} = wc - tf(t, c, n) \times idf(t, c, C) - (3)$$

The named entity recogniser used in this research is based on the structural SVMs and Pegasos algorithm. [5] In order to relate broadcast content to geographic places and tourist spots, names of geographic places and tourist spots are extracted from metadata and supplementary data using the named entity recogniser. Geographic data used in this research covers the South Korea region. In the geographic data, each region is identified by a 10-digit geographic code, and the code consists of values meaning, province, city, district and sub-district in hierarchical structure. Tourist spot data consists of tourist spot code, place name, classification, and geographic information such as address and GPS data. As the consideration of connotative meanings of geographic place, upper regions of each geographic place and tourist spot have been analyzed by utilizing the hierarchical structure of geographic data. For example, the search result of 'New York' will contain content about Manhattan. Geographic places and tourist spots of broadcast content are analyzed and related place information is indexed together with the geographic code for 'query by place'.

For 'query by person', person-role information of descriptive metadata has been used. Person-role information that is

created by metadata managers includes broadcast content credits with person, role and content information. In KBS, broadcast person is classified into 3 types – participants, producers & reporters and staff. Each type of broadcast person is classified into detailed roles. Person-role information is indexed together with broadcast content information for 'query by person'.

In order to retrieve similar episodes or news items of certain content, top 30 keywords are indexed for similarity comparison. Each keyword has a weight value calculated by our broadcast content TF-IDF method, and 30 sets of a keyword and its weight value are used to retrieve similar content. People probably consider similar content helpful when they are interested in the subject of content they watch. Therefore, it is useful to retrieve similar content automatically in order to enrich content service.

Content-based Search and Recommendation Engine

Content-based search and recommendation is useful for general content services because it does not require a user log-in process and preference data. [3] Our content-based search and recommendation engine is designed to analyze broadcast content and provide a variety of general services with REST-style open APIs that include 'search', 'group', 'related', etc. for search, recommendation and navigation of broadcast content. Figure 1 shows the diagram of content-based search and recommendation system.

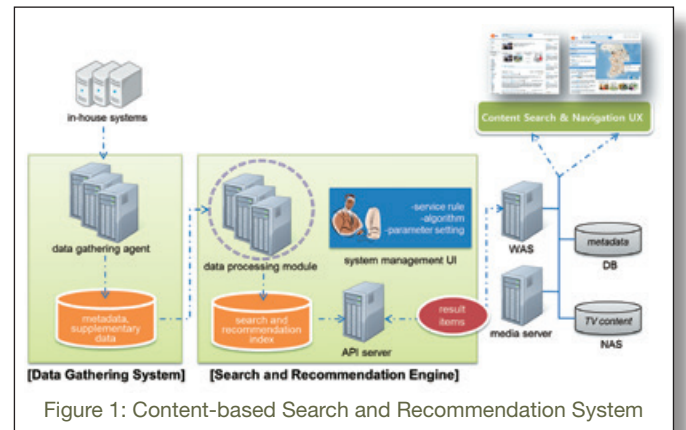


Figure 1: Content-based Search and Recommendation System

The data gathering agent collects metadata and supplementary data from in-house systems. Approximately 50 episodes are aired every day on two TV channels at KBS, so the data gathering agent is scheduled to run daily. [3] The data processing module analyzes the collected data and makes index files for search and recommendation. The API server provides result items from search and recommendation indexes. The result items are a list of broadcast content in XML or JSON. Table 2 describes a list of major open APIs serviced in our content-based search and recommendation engine. System management includes scheduling of data gathering, index configuration, algorithm setting, etc. These management functions are implemented on a service management website for easy access and management. [3]

Table 2: A list of Major Open APIs

API name	Description
search	Provide search and recommendation results. Parameter 'field' is used to indicate a search field such as person or place.
group	Provide grouped results of search API.
related	Provide similar content results for a given broadcast content.
lookup	Provide broadcast content information.
featured	Provide pre-managed featured content results.
featuredGroup	Provide grouped results of featured content.
navigation	Provide programme lists for a given genre and year condition.
autocomplete	Provide a list of auto-completed programme titles for a given word chunk.
queryLog	Provide recommended content for a given query by using log data of query and content that is checked out after searching with the query.

The iLike System for Evolved Content Search and Navigation Services

When TV producers need video material during TV production, they shoot new material or search for existing material in the archive system. The iLike system is developed in order to provide improved accessibility to KBS video archive and increase content reuse. Our content-based search and recommendation engine has been applied to the KBS video archive. The iLike system makes use of the open APIs provided by the content-based search and recommendation engine, and it provides user experiences for easy content access and navigation. One of key functionalities of content search on iLike is filtering search results, which includes 'one-click search filtering' and 'programme filtering'. Broadcast content specific 'query by person' and 'query by place' are useful for TV producers and staff to search and navigate broadcast content.

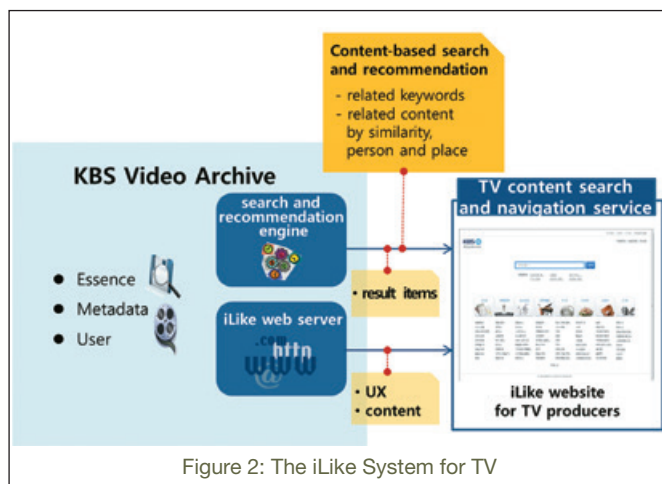


Figure 2: The iLike System for TV

When there are large amounts of content, filtering data from search results is important. There are two kinds of filtering mechanisms in the search result of iLike. 'one-click search filtering' is to provide easy content filtering with a single click, and the filtering menus are decided

based upon the interviews with TV producers and staff. 'Programme filtering' is intended to provide grouped search results that belong to a user-selected programme. With these filtering functionalities, users can narrow search results in their way. In each item of search results, automatically extracted top 10 keywords are shown together with content metadata. Related content recommendation is developed using the API, 'related', and it displays 5 similar episodes and 5 similar news items in regard to the selected item from search results. Figure 3 shows the enhanced content search UX on iLike.



Figure 3: Enhanced Content Search UX on iLike

Figure 4 shows the scenario to search for the singer, 'IU', on iLike. When a person name search word is queried on iLike, filtering options by search scope that includes 'all content', 'all person', 'participants', etc. are displayed. When 'participants' scope is selected, search results show the content that the person related to a search word appeared on. When an episode from search results is selected, a detailed page of the episode is shown. On the detailed page, scene search is provided by interlocking of video and closed caption text. After searching for a word within the closed caption text, easy navigation of video and caption text is possible with the 'previous' and 'next' button.



Figure 4: Content Search for a Singer, 'IU', on iLike

For TV producers and staff, it may be necessary to search and watch TV programmes shot in a certain place – a region or a tourist spot. By watching the scenery of the region or tourist spot from videos, producers or writers can check and decide the shooting locations in advance. Furthermore, when producers are in need of material shot in a certain place, the place search can be an easy way to

check and find video material. The place search operates with 'query by place'. When a place name is queried, the results page shows the information of related regions and tourist spots, search results of TV content, and the map of the area. Map view or content view is shown when clicking the content menu of episode search results.



Figure 5: The Place Search UXs on iLike

Conclusion

For advanced search and navigation of broadcast content, we have analyzed broadcast metadata and text-based supplementary data. Information retrieval and analysis of broadcast content is focused on keywords, person-role information, and geographic information. In this research, our content-based search and recommendation engine analyzes the KBS video archive, indexes the analyzed information and provides search and recommendation results through open APIs. For TV producers, the iLike system has been developed to provide enhanced search and navigation of broadcast content. The iLike system makes use of the data provided by the content-based search and recommendation engine. The iLike system provides enhanced search and navigation with easy filtering functionalities, automatically retrieved keywords and related content. More detailed search and navigation not only within episode units but also in segment/scene units is provided on iLike. On the place search results page it shows information on related regions and tourist spots, search results of TV content and a map of the area.

Since 2012, the iLike system has been running for TV producers in KBS. As continuous updates are made, the results of R&D have been stabilised and actually used. Further research not only on text data but also on video data will be conducted for the evolution of content search in the future.

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Broadcasters, Do We Need Spectrum?

by Amal Punchihewa

Director of ABU Technology

An Information Divide Needs to be Avoided While Digital is Accessible to all Citizens

"Access to information is a basic right of all citizens of the world. At a time when we are working hard to make sure there is no digital divide, digital access should not create an information divide by presenting barriers to the access to information". Dr Amal Punchihewa, Director Technology of ABU.

What is Spectrum?

Spectrum, as referred to in broadcasting and in the context of WRC-15 is the range of radio frequencies that are used to carry media content. It is a part of the total radio spectrum; i.e. the range of electromagnetic radio frequencies used to transmit data wirelessly. Spectrum is used to broadcast television and radio programmes. Mobile telecommunications, wi-fi and satellite communications also rely on spectrum to deliver their services. They can be described as vehicles which transport content, (radio and television programmes) to listeners and viewers of radio and television services respectively. Frequencies (precisely signals) travel over the air carrying that content and are analogous to vehicles running on roads. Different frequencies can carry different types and quantity of content.

Why Spectrum is Important for Us at ABU and WBU?

Delivery of content Over-The-Air (OTA) using frequencies is the one of the most efficient way of delivering content to large numbers of recipients. The spectrum is a natural, scarce and limited resource and today it is recognised as an economic resource. Its growth is very slow and deployments at very high frequencies are extremely expensive. For that reason, there is very high demand for services at the low end of the VHF (very high frequency) and UHF (ultra high frequency) bands. These frequencies are used, within the ever widening scope of radio and television broadcasting, to deliver content both in good times and at times of disaster, to inform, entertain and educate the public.

Digital Terrestrial Television-DTT remains the most efficient means of delivering a television programme to a mass audience. This is known as one-to-many communication and is distinct from one-to-one mobile communications focused on an individual link between a users device (e.g. mobile phone or tablet) and a content provider.

Mobile one-to-one delivery works well if you want to watch one out of many short video clips on the Internet. However,

for a live show attracting millions of viewers who want to watch at the same time (e.g. a major sports event) congestion would be inevitable and the network would not be able to support it. DTT therefore gives the best guarantee of viewer access to major live events.

Terrestrial broadcasting also has an invaluable role in terms of universal coverage. Local programming relies heavily on the secure, free-to-air (FTA) signal, and it is the only way to reach certain geographical areas and populations. Even in the case of countries, where cable and satellite television is readily available (e.g. Japan, New Zealand and Australia), terrestrial broadcasting remains an essential mechanism for universal coverage because it can be received in remote areas or sparsely populated areas, free of gate keepers to receive content. (An analogy for this being roads that do not require payment of toll charges.)

Terrestrial radio broadcasting is also crucial in emergency situations, (e.g. natural disasters) as it is often the only technology which continues to function and remain able to reach a mass audience despite difficult external conditions. (Vis. the 2011 tsunami in Japan). In such a situation, the one-to-one model used by mobile networks is much more vulnerable to both congestion and interruption.

The need for and use of spectrum for various applications seems technical and distant from our everyday lives. However spectrum allocation impacts public access to essential media platforms such as TV, radio and the internet, creating an information divide.

Public broadcasters must ensure that their audiences have access to free-to-air (FTA) TV; this being typically implemented through digital terrestrial television (DTT) – where the signal is received through a TV aerial. The delivery of DTT relies on a certain availability of spectrum.

In the Asia-Pacific region a four billion population relies on DTT. While public broadcasts are also available on pay-TV platforms, like satellite, cable and IPTV, DTT remains the key to public TV access and the most widely used means of receiving television.

DTT's popularity is largely due to the fact that it offers viewers a wide range of television channels as well as catch-up and on-demand services at a very low cost and in excellent quality. It sustains high television viewing figures in Asia-Pacific and despite the fact that Internet consumption of audiovisual services is rising, television viewing shows no signs of declining.

Who Manages Spectrum and Why?

Spectrum being a scarce and natural economic resource, it is important that it is managed well for the benefit of the society at large and in the interests of individual countries. Generally, frequency spectrum is managed by these countries under regulations agreed by all member countries of the ITU-International Telecommunication Union. The ITU handles spectrum management globally by assigning each country to one of three regions. The Asia-Pacific falls in region three where island countries can enjoy the spectrum quite freely, but countries having borders need to coordinate with their neighbours.

What are the Main Functions of a Spectrum Regulator?

There are three main functions for a spectrum regulator. These are (i) allocation, allotment and assignment of frequencies, (ii) planning for future services and (iii) enabling an environment for legitimate frequency users where interference levels due to co-existing services are maintained at acceptable levels.

Are Regulators Missing Some of These Main Functions?

In Asia and Europe, broadcasters are planning to introduce UHDTV-1 and UHDTV-2 terrestrial services. Though digitalisation did free up some frequencies due to multiplexing of a number of programme channels to a single frequency, UHDTV-1 and UHDTV-2 services require 4-fold and 16-fold increases in bandwidth respectively. Even then, these increases are based only on the consideration of the spatial improvements. If the temporal resolution and intensity range are also increased, with high dynamic range image sensing, then bandwidth requirement can escalate further. Broadcasters find it difficult or impossible to carry out trials or regular services without having sufficient access to frequencies.

Some Case Studies from Asia-Pacific:

In Asia-Pacific only three countries, viz. Japan, New Zealand and Australia, have switched off their analogue television services and none of them are considering a switch off of analogue radio.

Malaysia, Thailand, Indonesia, Singapore and Vietnam are currently working on their DTT plans. A number of them

have targeted Analogue Switch Off (ASO) after 2020. While other countries will delay this till well beyond 2030.

According to recent news, Malaysia will invest 5 billion ringgit (nearly 2 billion US\$) in next 15 years in rolling out DTT. This is a huge investment that needs to be protected over at least the next two or three decades.

In New Zealand, ASO took place in December 2013. Free-to-air (FTA) DVB-T services are operated under a consortium of both public and commercial broadcaster, known as Freeview. New Zealand is a small island nation in the South Pacific, with a population of 4.5 million. It consists of two main islands and is over 1,600 kilometres (990 miles) long, yet narrow (a maximum of 400 kilometres (250 miles)). The 'Freeview' concept was extended to terrestrial broadcasts in 8 areas from 18 transmission sites covering 75% of the national population with the launch of DTT in 2008. This was extended in 2011 with a further 12 sites to increase coverage to over 87% of the population. Thus digital transmission was well established before the analogue switch off in 2013. With the large number of transmitters required to achieve a high level of coverage over such a challenging topography, the four national VHF services had already completely filled that band. There was therefore no usable frequency in which DTT services could be accommodated. At the time of ASO the Television Broadcasting section of the UHF band was reduced from 518 ~ 806MHz to 510~ 686MHz. Thus any continuing DTT transmitters that were in the upper part of the band had to be returned ('restacked') to operate in the remaining spectrum. This restacking was carried out as early as possible at each site, to minimise the number of viewers affected, given that the number of digital viewers was increasing over time. Much of this work being completed prior to ASO.

In Japan, ASO took place on 24th July 2011 and they are now planning to leap frog to UHDTV-2 (8K) with terrestrial transmissions by 2016 while UHDTV-1 (4K) is available via satellite.

Indonesia, the country with the fourth largest population (240+ million) in the world is a vast country and has a widespread network of over 400 Transmitter stations serving 50+ million TV households, investing US\$ 40-80 million on DVB-T2. Channel 49 to Channel 68 in 694-854 MHz has been forgone as digital dividend. 2018 is the country's current ASO target year. Provision for disaster communication has been maintained by including the EWS-Early Warning Signal features in the technical specifications for standard STB and Digital TV Receivers.

Thailand adopted DVB-T2 in June 2012 according to a road map presented in Feb 2012. DSO-Digital Switch Over service licences were issued in 2014 using a 'beauty contest' approach. The technical standards for Transmission and minimum technical standards for receivers were decided in 2012. Thailand has 39 MFN-(Multi Frequency Network) main sites, 127 SFN (Single Frequency Network) sites and gap fillers. The system parameters were selected for both portable and indoor reception. Thailand is committing heavy investments to DTT and will need to operate and serve over 2 to 3 decades over life cycle of the infrastructure. It is

anticipated that a DTT coverage of 95% of households can be achieved by the year 2017.

Hong Kong entered a new digital broadcasting era when the two incumbent terrestrial broadcasters, ATV and TVB, successfully launched DTT services on 31 December 2007. Since then, ATV and TVB undertook the phased construction of a total of 29 transmitting stations, bringing the overall DTT coverage to at least 99% of Hong Kong households by September 2013. This coverage being on par with that of the previously existing analogue television broadcast infrastructure.

The HK Government has encouraged the viewing public to switch to DTT to enjoy its benefits and DTT take-up rate has grown with time. According to a public survey conducted in March 2014, about 80% of total number of households in Hong Kong (approximately 1.9 million households) is

receiving DTT. The Government launched a dedicated digital TV website (www.digitaltv.gov.hk), to raise public awareness of DTT and promote consumer education. The website contains useful market and technical information including a database of DTT service coverage and a list of registered DTT receivers under OFCA's (office of the communication authority) labelling scheme. In June 2011, in view of the actual implementation and market situation of DTT development at that time, the Government decided to defer the working target for switching off analogue television broadcasting from end 2012 to end 2015.

In summary, it is anticipated that ASEAN (Singapore, Malaysia, Indonesia, Brunei, Vietnam, Myanmar and Thailand) will enjoy economies of scale and will leapfrog to DVB-T2. The seven countries are populated by around 470 million people.

WBU-ABU position on Spectrum and Recommendations:

ABU Supports Work to Protect Broadcasting Spectrum:

The ABU declares full support for the world's broadcasters in opposing changes to the allocation of digital TV and satellite distribution spectrums.

We have worked with the World Broadcasting Union's Technical Committee's formulating recommendations on spectrum allocation to go before the World Radiocommunication Conference (WRC-15) in Geneva, Switzerland, next year.

The Union's Technology Director, Dr Amal Punchihewa, says the ABU fully endorses the work done by the WBU and its member broadcasting unions to protect important spectrum for broadcasting services. – "As radio spectrum becomes more crowded," he insists "It is vital to protect its integrity for broadcasters who serve billions of viewers and listeners around the world."

The WBU recommendations state that the use of radio-frequency spectrum by broadcasters remains, "an important vehicle for the efficient and scalable delivery of high-quality media content and emergency alerting services to both fixed and mobile audiences".

Specifically regarding DTV, the WBU does not support any change to the current spectrum allocations at UHF frequencies (470-694/ 698 MHz), stating that contiguous spectrum should be allotted in the bands assigned to the broadcast service to allow for the robust delivery of high-

quality media content, data and signalling that meets or exceeds the capabilities of current fixed and mobile reception and display devices as well as those that are expected to be deployed in the future.

The WBU does not support any change to the current spectrum allocations at C-band or extended C-band satellite distribution frequencies; Stating; "The use of downlink spectrum allocated at C-Band (3.7 – 4.2 GHz) or extended C-Band in the Fixed-Satellite Service is essential to operations of broadcasters around the world. Systems employing this FSS band have been extensively deployed over decades, primarily for the distribution of content from network centres to affiliated stations, cable head-ends and to other receiving systems."

The WBU says its position has been supported by spectrum studies of both UHF and C-band frequencies, filed with the ITU, that have demonstrated that major interference to broadcast operations would result from sharing these bands with International Mobile Telecommunications (IMT).

It adds: "The WBU will continue to participate actively in spectrum studies of the radio-frequency bands both assigned to and associated with broadcasting, in order to ensure the continued efficient use of these bands for broadcast media content distribution."

author



Dr Amal Punchihewa
Director of ABU Technology

Dr. Amal Punchihewa is the Director of ABU Technology, a position he took up in July 2013. He possess more than 28 years of experience in both academia and industry in senior broadcasting technology and ICT roles, including research and developments, academic and head of engineering of National TV-Sri Lanka, having started career as a computer engineer.

Amal graduated with Master of Electronics Engineering (Digital Video Signal Processing) at the Technical University of Eindhoven, PhD on framework for rapid objective evaluation of image and video compression artefacts. He has published over 100 scholarly articles in reputed journals and conference proceedings. Amal is a Chartered Professional Engineer-CEng, Fellow of IET, Senior Member of IEEE and Member of IPENZ, New Zealand.



Meet Our Host,

Macau's public broadcaster, Teledifusão de Macau (TDM), is the host of the ABU's 2014 annual meetings, including the Technical Committee.

TDM's radio and television programming reflects Macau's vibrant, multicultural character, with 95 percent of the population being Chinese and the other 5 percent made up of Portuguese and other ethnic groups.

Established in 1984, TDM operates six digital terrestrial free-to-air TV channels and two radio channels. They are TDM Ou Mun, TDM Information, TDM Sport, TDM HD, Canal Macau, 澳門 – MACAU satellite TV channel, and the Chinese and Portuguese language channels of Radio Macau.



A diverse range of news, culture, art, education and entertainment is served to audiences in Macau and throughout the world. The two radio channels operate round the clock, serving Chinese and Portuguese speaking listeners locally and globally via its website, www.tdm.com.mo.

TDM also carries five TV channels from mainland China: China CCTV News Channel (Chinese Language), China CCTV News Channel (English Language), China CCTV Documentary Channel (English Language), Hunan TV World Channel and Fujian Strait TV Channel.

In 2009, TDM completed the introduction of digital terrestrial TV broadcasting and the enhancement of the quality of its TV visual signal reception.



A centralised workflow was adopted in television for all recording, editing, post-production and playout, in news, production and broadcast.

The heart of this workflow consists of:

- a central storage with scalable bandwidth, capacity and processing capabilities, with a file system without bottleneck in metadata;
- a high performance network backbone;
- a media asset management (MAM) system to secure the existence of the assets (TV programmes and news).

All news and programmes production is shot with P2 camcorders and all editing and playout is processed in DVCPRO50-MXFop1a.

Connected to the MAM is the archiving system with dedicated software, digital LTO tapes motorised library and hard-disk archive. This allows faster workflows, an absolute necessary for the production of daily news.

HD became an important target. By 2012, a HDTV studio for news was built with digital signage in the background, LED lighting and robotic cameras. The two old TV studios were renovated to accommodate HD production. A small TV production studio, already operating with tapeless workflow, will also be upgraded to HD.



With a nine camera SD OB van and a five camera HD OB van, an additional six camera HD OB van and DSNG van are being delivered.

Radio also completed the transformation to a non-linear workflow with archiving system in 2012. It is aimed at ingesting all songs and music into the central storage for a proper recording of their usage.

In the rapidly developing new media era, TDM also improved the live broadcasting of TV channels on the Internet (www.tdm.com.mo) in 2012 and established the mobile platform (TDM Mobile and TDM Info App) in 2013, allowing audiences to obtain a variety of information more conveniently.

TDM is planning a new complex, on land of 40,000 square metres, to bring together all its facilities: News Centre, eight TV studios, radio studios, new media and Training Centre.

‘Free-to-air Broadcasting will always be necessary’

Frederico Alexandre do Rosário, Director and Member of the Executive Committee at Teledifusao de Macau (TDM), looks at the future of broadcasting and some of the challenges broadcasters will face.

Frederico, thank you for talking to us. I would like to ask a few questions on current developments and activities in the broadcast industry. To start with, how do you assess the current broadcast industry situation?



Standard Definition Terrestrial Television Broadcasting (SD DTTB) appeared as a solution for common problems found in the reception of analogue television. An SD reasonable quality was accepted as good, in the beginning, but it was quickly known that a higher quality was necessary, to face the challenge of other media streaming development. High Definition Terrestrial Television Broadcasting (HD DTTB) was used for some time and presently, 4K Terrestrial Television Broadcasting is the actual goal.

What do you think are the challenges currently faced by broadcasters?

To face future challenges, the protection of RF spectrum for television broadcasting is a must to avoid shifting for

other purposes, as the increase of production of diversified content requires the usage of spectrum saved during the transformation of the terrestrial television broadcasting from analogue to digital. In each day that passes, new TV channels and programmes are born.

What are your broadcast platforms in Macau? Will the spectrum be a critical issue for broadcasters?

TDM is still broadcasting television in analogue. From 2008, SD and HD DTTB started in Macau. By 2009, three additional SD DTTB programmes and a satellite TV channel started. Due to the Single Frequency Network (SFN) technology used, it wasn't felt there was any insufficiency of RF spectrum. Due to the need for better quality for golden content, like sports, additional spectrum is required, but it's not a critical issue.

Will LTE and 5G be threats to broadcasters?

Depending on the way you look at it, these can be of benefit as contribution circuits for certain type of news content delivery, with the same uncertainty as 3G. But they will help the spreading of violations of copyright of diversified content.

With diminishing over-the-air services for radio and television broadcasting, will free-to-air broadcasting cease to operate?

Why diminishing?! Free-to-air broadcasting is not data bandwidth and processing dependent! It will not collapse easily! Free to air broadcasting will always be necessary to guarantee the free access of the public to necessary information and entertainment. Mobile TV is also a free to air scheme.

How do you manage all these issues and challenges at TDM in Macau?

TDM has implemented new media platforms, with webpages and apps in iOS and Android. Technology seems easy to implement, but hidden costs are the most important issue. Just imagine how much the increase in costs in copyrights could be, if you want to stream the same programme broadcasted in a TV channel, in the new media platform.

Digitalisation has been discussed for decades. Have TDM and Macau in general gone fully digital now?

Television in Macau is not only TDM. There are two satellite TV channels, cable TV and a free basic channels TV signals distribution entity (government owned). Although it has not gone digital, Macau is very close.

Have you switched of analogue? What is the proposed date of ASO with current simulcast?

ASO is not yet done. With the recent creation of the free basic channels TV signals distribution company – MACAU BASIC TELEVISION CHANNELS, LIMITED (MBTC) – ASO can be done immediately, as everyone is connected to it.

Archives are precious assets of broadcasters. How do you maintain them? Do you have a digital archival system?

Our archive is operating with LTO tapes digital data library system and hard-disk archiving system, both managed by proper archiving software, together with Media Asset Management (MAM) Software.

What advice can you give to ABU members in preparation for the future of broadcasting?

The central storage and the MAM systems are the heart of the complete system. A central storage with scalable capacity, scalable bandwidth and scalable processing, with a dedicated file system, without risks of metadata bottleneck must be chosen, and these specifications can't be found in most storages available in the IT market. MAM will guarantee the health of your assets.



New Members

Additional Full Member

Asia Broadcasting Television Ltd. (ABTV), Thailand

Asia Broadcasting Television Limited has been established as a TV program multi-channel delivery platform since 2004. From the very beginning, the company started the business and services under the ABTV logo, delivering local news, movies and many types of programmes to cable operators throughout the country.

ABTV was formed by a group of experienced people who originally worked in fields of broadcasting such as radio, television, satellite link, networking and information technology. Their objectives are to provide opportunities and a variety of video programme windows to Free-to-Air, cable operators, corporate partners, and individual customers.

- To promote and make known local content and the TV industry in Thailand.
- To provide turnkey services for studio production, satellite channels, studio links, terrestrial links, TVRO, backhaul etc.

Vis Broadcasting (PVT) Ltd, Sri Lanka

VIS Broadcasting (Pvt) Ltd. is one of the latest entrants to the broadcasting industry in Sri Lanka. Though young, all the company's three channels, Singha FM, Red FM and Tamil FM have been able to achieve a very prominent position in a highly competitive market within a very short period of time, according to the ratings of Lanka Market Research Bureau (LMRB), Sri Lanka's First Independent Market Research Company. Additionally, the company has undertaken to broadcast programmes on behalf of China Radio International (CRI) and China Central Television (CCTV).

The Company was incorporated on 20th April, 2008 under the Companies Act No. 7 of 2007 (Company Registration No. PV 63832). The company was established for the purpose of setting up a radio/television broadcasting station and network. The registered office of the company is located in Battaramulla, Sri Lanka.

VIS Broadcasting (Pvt) Ltd. is a sister company of Carlton Sports Network (CSN), the Premier Sports Television Network in Sri Lanka, which is also a member of the ABU.

Associate Member

Radio and Television of Kosovo (RTK), Kosovo

Radio and Television of Kosovo was established in September 1999 and now functions pursuant to Law 2011/04-L-046 approved by the Parliament of the Republic of Kosovo. It is the only public media in the country broadcasting in seven languages: Albanian, Serbian, Turkish, Bosnian, Roma and lately in Montenegrin and Ashkali languages, and soon it will also be broadcasting in the Gorani language.

RTK consists of 4 television channels and 2 radio channels. It has its own webpage in the languages of all the communities and now RTK's programme can be viewed on YouTube. As a public broadcaster RTK is part of the development of the democratic society and one of the most important institutions in the Republic of Kosovo.

Radio and Television of Kosovo assists in expressing the political, ethnic, language, cultural and religious diversity pluralism and promotes the local production and social integration.

Media Service Support and Asset Management Fund (MTVA)

The Media Service Support and Asset Management Fund (in Hungarian: Médiaszolgáltatás – támogató és Vagyongkezelő Alap) (MTVA) is the umbrella organization of the Hungarian Public Service Media. Since its formation in 2011, it has unified content production, supporting services and asset management for all Hungarian public service media organisations.

MTVA with its 2500 employees has become the biggest media enterprise in Hungary exploiting the opportunities provided by five television, seven radio channels, the national news agency and all of their online surfaces as well as a print programme magazine in order to achieve its public service remit i.e. to provide globally relevant information, quality entertainment and cultural values to the public of Hungary.

In its modern production base and headquarters, the company operates digital terrestrial, satellite and online platforms offering approximately 40 thousand hours of television and 52 thousand hours of radio programming each year, transmitted to Hungary, Europe, the American continent and Australia. Contents provided by MTVA are broadcast to an estimated 99 per cent of all homes in Hungary with television or radio sets.



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ABU Technical Committee 2014 Meeting Macau SAR, China

The 2014 ABU Technical Committee Meeting will be hosted by the public service broadcaster of the China Special Administrative Region Macau - Teledifusao de Macau, S.A. (TDM) on 24 and 25 October.

The meeting is a valuable opportunity for broadcast engineers from the region and beyond to discuss key issues facing the industry in a time of rapid change. These include digitalisation and the introduction of new technologies.

The highlights of this years meeting are:

- A presentation on *NHK's Vision for Future of Broadcasting* by Mr Yasuto Hamada, Managing Director, Executive Director-General of Engineering of NHK-Japan.
- Keynote presentation by Simon Fell, Director of Technology & Innovation, European Broadcasting Union.
- The CTO Forum on *Do we need Spectrum for Future Broadcasting?*
- The Special Topic Session presented by TDM

ABU Technical Committee Meeting Macau SAR, China 24-25 October 2014

Time/Date	Day 0 Thursday, 23 October	Day 1 Friday, 24 October	Day 2 Saturday, 25 October
9.00am – 10.00am		Opening Session ABU Engineering Awards Ceremony Presentation of Engineering Awards & Technical Review Prizes	Keynote Presentation EBU
10.30am – 12.30pm		Director's Report Member Developments (based on Status Reports)	CTO Forum Do we need Spectrum for Future Broadcasting?
2.00pm – 3.30pm		Bureau Proposals Invited Presentation NHK-Japan	Summary from Topic Area Chairmen: Production, Transmission, Training & Services, Spectrum
4.00pm – 5.30pm	Technical Bureau Meeting Restricted to Members of the ABU Technical Bureau	ABU Digital Radio Forum Including Workshop	Election of TC Office Bearers
		ABU Developing Broadcasters' Forum Including Workshop	Special Topic Session TDM-Macau
			New Recommendations & Decisions of the Technical Committee
			New Member Introductions and Cooperation with International Organisations
			Information Exchange Session Presented by ABU Members
			CLOSING
		5.30PM – 6.30pm Meeting of ABU TLOs	

51st General Assembly & Associated Meetings

Macau SAR, China • 22-28 October 2014

ABU @ 50 Future-proofing Broadcasting in a Fragmenting Media World

Tuesday 21 October	Saving Lives: Preparing for Disasters	Sports Broadcast Rights Committee Meeting Sports Finance Committee Meeting	
Wednesday 22 October	Saving Lives: Preparing for Disasters	Sports Group Meeting	Planning & Strategy Group Meeting
	Programme Bureau Preparatory Meeting		
Thursday 23 October	Radio Working Party	Sports Group Meeting	
	Programme Committee	Technical Bureau Meeting (Restricted to Members of the ABU Technical Bureau)	
Friday 24 October	Programme Committee	Technical Committee	Meeting of the Presidency
Saturday 25 October	Administrative Council Meeting	Technical Committee	Women & The Wave Forum Series
			Quality Management Workshop
	Final Show for ABU TV Song Festival		
Sunday 26 October	HALF DAY EXCURSION		
	President's News Conference		
Monday 27 October	Official Opening of the 50th General Assembly 1st Plenary Session 2nd Plenary Session 3rd Plenary Session		
	ABU Prizes Night		

Tuesday
28 October

Super Panel Session

*Future-proofing broadcasting in a fragmenting media world
Where to next for Broadcasters?*

Professional Discussion

*Sports Rights Acquisition
Can Top Sporting Events Survive without Broadcasters?*

Restricted Working Session

(Full and Additional Full Members only)

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Our Services

- Establishing Radio & TV Transmitting facility including frequency and coverage planning, prediction etc.
- Setting up studio facilities for Audio & Video including connectivity for transmitting live content and data.
- Establishment of Cable TV systems and HITS (Head End in The Sky).
- Custom design of interiors and acoustics of conference rooms, auditoriums and broadcast studios to confirm to international standards.
- Turnkey Solution for Establishing Community Radio Stations.
- Electronic Media Monitoring solutions (Radio & TV Terrestrial or Satellite) and security related Surveillance Setups for GSM, CDMA & VSAT.

- Sales and support for all type of broadcast engineering equipments/ system.
- Design and integration of outside broadcast vans (DSNG) with state-of-the-art technology.
- Providing O&M services for various type of Broadcasting setups.

Major Achievements

- Establishment of Multiplexed FM Transmission at 87 centres across the country for 245 Private FM channels of Phase-II scheme as System Integrator.
- Revamping and Restoration of Print Media, Radio and Television Network in Afghanistan.
- Design and establishment of State of the Art Electronic Media Monitoring Centre for 24x7x365 monitoring and logging of 300 Satellite TV channels.
- Designed, integrated and supplied Ku/C-band DSNG Van to Doordarshan, India.
- Supply of security equipment like Laser Range Finder, Real Time Viewing System, VSAT Monitoring etc. to Para Military, Military, State Police Depts. Etc.
- Establishment of TV studio for IGNC, Edusat setup for Delhi Technical University and Sangeet Natak Academy.

- Manpower outsourcing for specialised service to Doordarshan and AIR News Unit Delhi, RNUs and EMMC.
- Establishment of Main Press Centre of Commonwealth Games 2010 for PIB.
- Designed and created broadcast compounds & facilities for Prasar Bharati, the host Broad-caster of Commonwealth Games 2010.
- Supply & installation of studios production equipment for Bangladesh TV for an amount of US \$ 2.1 Million.

On Going Projects

- Supply & commissioning of 2 nos. of 1000 kW MW AM DRM Operational Super Power Transmitters to AIR for their external services.
- Upgradation of 3 Camera T.V. Studio at Jamia Milia Islamia University.
- Supply, upgradation & commissioning of combiner cable and antenna system, including strengthening of tower aperture at 4 metro & 15 other site for DD.
- Setting up of Video Recording Studio, PCR, MCR & Post Production Facility for NIOS.
- Supply, installation, testing & commissioning of HDTV Studio setup for Rajya Sabha's RSTV Channel.
- SITC of Log Periodic Antennas between 3 to 30 MHz for monitoring setup at three (3) sites of ARC.



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ABU TECHNOLOGY MEETING AND COLLABORATIONS



ITU Asia-Pacific Centre of Excellence Training on Interactive Multimedia Services and Pay TV, 9-10 September 2014, Hanoi, Vietnam

ABU partnered the above workshop, held in Hanoi, addressing Interactive Multi-media Services. 74 delegates attended the events including ABU members from a number of countries representing a wide cross-section of broadcasters, regulators and telcos. The training course was based on a publication prepared for Interactive Multimedia Services by ITU, which was co-authored by Dr. AMAL Punchihewa, Director Technology. He contributed to the Technology and Standards chapters of this publication, which will be available soon from ITU.

Meetings During IBC-2014

CCBN Advisory Committee Meeting 13th September 2014



The CCBN Advisory committee meeting was held on 13th September in RAI, Amsterdam. Regional and global broadcast trends were discussed. SAPPRFT expressed appreciation of the contribution that the committee makes to success of CCBN.

IBC-Session:

Broadcasting Business and Technology in the MENA Region – Session produced in association with ASBU 13th September 2014



ABU with ASBU, EBU and NABA contributed to the above session held on 13th September 2014. This IBC 2014 session focused on the business and technologies of broadcasting in the region, beginning with an overview of the challenges and opportunities in the transition to HD and beyond, DVB-T2 digital terrestrial

transmission, and in the implementation of broadband, mobile, OTT & cloud technologies in broadcasting & media distribution.

The panel contrasted and compared the approach to broadcasting in the MENA region with that of countries which are, for example, totally commercially driven such as North America where the diversity of delivery challenges both the technologies and the business models,

as well as with developed & developing countries in Europe and Asia. Topics ranged from the fight for spectrum and implementation of 4k to the multiplatform strategy and the need for broadcasters to engage with the second screen audience and social media.

WBU-TC Meeting 14th September 2014

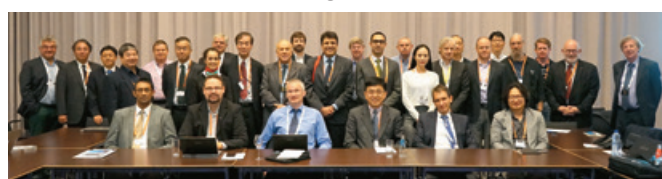
During the WBU-TC meeting held on Sunday, 14th September – further action was discussed to encourage the continued use of the 700MHz band for broadcasting, and C-band for uses associated with broadcasting. It was proposed to establish an ad-hoc group to plan steps forward. This should include the preparation of argumentation documents. The group will be led by Peter MacAvock (EBU), Amal Punchihewa (ABU) and Bob Plummer (NABA). They should convene a conference call as soon as possible. All the Unions are invited to nominate appropriate individuals for the ad-hoc group.

The FOBTv is a group investigating whether there can be a single standard for terrestrial broadcasting in the years' ahead. In a recent move, FOBTv members and other union members were asked, a) what features a common system would need for use in the next ten years, and b) in the period afterwards. The ATSC is currently considering parameter values for its ATSC 3.0 system for use in the next ten years, and the objective was to establish whether the ATSC 3.0 system could be the short term FOBTv system.

The EBU studied this, and its Technical Committee concluded that in the short term the system needs to be compatible with DVB-T2 to be useful in Europe. The longer term might allow discussion of other features. The ABU replies indicated that for many ABU members the situation would be the same as for EBU members, but there are significant differences in the ABU region with a total of four different systems in use across the region.

FOBTv Technical and Management Committee Meetings 15th September 2014

FOBTv Technical and management committee meetings were held on 15th September in RAI Amsterdam. Aim and objectives of FOBTv were reviewed and decided to accelerate research work and to share information among stakeholders.



Based on the survey carried out by ABU on features or functionalities for future broadcast technologies, it was found that 3D was rated the lowest priority.

DBS-2015 to Address Spectrum for Broadcasting

Spectrum and 'beyond HD' are hot topics that are currently discussed in many fora. As reported by the BBC the Commonwealth Games UHD broadcast (precisely, UHDTV-1, commonly known as 4K) was the first major live event to be produced and distributed entirely over Internet Protocol (IP) networks. The special R&D productions of certain elements of the Glasgow 2014 Commonwealth Games were shown live in the Glasgow Science Centre for the duration of the Games. This was truly a major milestone as we had been talking about convergence of broadcast and IT technologies over many years. In the Asia-Pacific region, UHDTV-1 is offered as a regular cable service in Korea. NHK – the national television broadcaster of Japan – produced certain games of London Olympics in UHDTV-2 (commonly known as 8K). They were shown in three locations in UK and three locations in Japan, transported via IP. NHK also produced and showed certain winter Olympics games held in Sochi. UHDTV-1 and UHDTV-2 technologies are very advanced in Asia-Pacific. UHDTV-1 television receivers are available from number of television receiver manufacturers. Korea and Japan are doing regular and test transmissions for these beyond HD resolutions. NHK is carrying out trials for UHDTV-2 transmissions over the air (OTA) rather than cable or IP backbone. One of the challenges faced by the majority of countries in Asia and Pacific regions is the penetration of broadband and its speed and bandwidth. This will affect both production and distribution over IP. Both Korea and Japan have better access to and performance of broadband but other countries need more time. In the next decade many countries in the Asia-Pacific region will make use of IP backbones to carry out live productions and distribution of both HD and UHDTV-1.

Beyond HD resolution in pictures, enhanced quality in sound to match the pictures and high fidelity, devices in media industry challenge media stakeholders to be smart and adaptive in responding to market trends and user demands. The key to performing well, sustaining and thriving in such a dynamic and challenging media environment requires stakeholders to be receptive to change and enable it smartly, mitigating inherent areas of resistance.

DBS-2015 - Enabling Change Smartly- was announced early in August 2014. It will address number of these issues including spectrum for future broadcasting by enabling changes smartly while making use of latest opportunities emerged due to Over-The-Top (OTT) and Integrated Broadband Broadcast (IBB) services. The various sessions of the Symposium will address issues relating to the diversity of media audience, UHDTV new delivery mechanisms and future transmission technologies, among others. There will also be panel discussions on whether spectrum is essential for future broadcasting.

The ABU, together with its stakeholders and sister unions, will continue to participate actively in spectrum studies that lead to efficient use of the radio-frequency bands so that they can continually be used for distribution of broadcast media content, both assigned to and associated with broadcasting.

Enabling Change Smartly will not only help broadcasters to secure spectrum but also to achieve production and distribution efficiencies that can make a marked difference in the performance their organisations.

From Amal, Nadeem, Kyaw Zaw, Nam, Geraldine, Hamidah and Farah

Technology Webinars Draw Good Turnout



THE ABU TECHNOLOGY WEBINAR FESTIVAL 2014

Nearly 300 people took part in a series of technology webinars held by the ABU in August and September.

The webinars took place five days a week between 12 August and 5 September and covered a wide range of broadcast technology topics. They were free for all ABU members and others in the industry.

The webinar sessions were grouped under four main themes: Digital Television; Digital Radio Technologies, Implementations and Updates; New Media, Applications and Implementations; and Effective Workflow and Media Management Systems. Between five and seven webinar sessions were devoted to each topic.

Conducted by engineers from the Technology Department, each session lasted around 90 minutes and featured presentations by experts followed by questions and answers. Each session was held at 0130 GMT and repeated at 0700 GMT the same day to enable people from different time zones to participate.

The content for the webinars, including PowerPoint presentations, was taken from the workshops and conference sessions of the ABU Digital Broadcasting Symposium and other events held this year.

The webinars were the fourth in a series of annual technology webinars held by the ABU with the aim of sharing information widely on some of the key challenges facing broadcasters today.



Dr Amal Punchihewa, Kyaw Zaw Lin & Nguyen Thanh Nam



HBF-ABU Workshop Report

Regional Workshop on the Role of Broadcast Media in Disaster Mitigation and Management



Tarataake Angiraoi Benetito, CEO, BPA-Kiribati

A three-day regional workshop on the Role of Broadcast Media in Disaster Mitigation and Management took place in Kuala Lumpur on 3-5 September 2014. The event was made possible by a grant from the Hoso Bunka Foundation of Japan.

A total of 41 delegates from 13 countries, with a focus on 6 ASEAN nations, took part to learn about the latest tools available to effectively communicate and inform the public during disaster situations and the central role of their media in disaster mitigation and management efforts.

A highlight of the workshop was a session on Working Together to Save Lives, a case study learnt from the Japanese experiences presented by Dr Kazuyoshi Shogen, Senior Associate Director at B-SAT, Japan who is also heads the ABU Emergency Warning Broadcasting System Task Force.



Dr Kazuyoshi Shogen, Senior Assoc Director, B-SAT, Japan

The programme included:

- Presentation of status reports by the participating countries and discussion on the Japanese experience
- Country experiences featuring Standard Operational Procedures (SOPs) and guidelines for coordination
- Exercise on developing and enhancing SOPs

The workshop included a demonstration of the ABU's Radio-in-a-Box, a portable radio system designed for use in remote or disaster-stricken areas.



Group Discussions

The Director Technology, Dr Amal Punchihewa said that the workshop provided the necessary emphasis and demonstrated the importance of coordination and working together, among all stakeholders, through the use of proven models and Standard Operational Procedures applicable to different types of disaster situations.

The ABU is grateful to the Hoso Bunka Foundation for providing the support that enabled the workshop to take place.



ABU DIGITAL BROADCASTING SYMPOSIUM 2015

ENABLING CHANGE SMARTLY

Beyond HD resolution in pictures, enhanced quality in sound to match pictures and high fidelity devices in media industry challenge media stakeholders to be smart and adaptive in responding to market trends and user demands.

The key to performing well, sustaining and thriving in such a dynamic and challenging media environment requires stakeholders to be receptive to change and enable it smartly, mitigating inherent resistances.

This year ABU's Digital Broadcasting Symposium will address how broadcasters could secure spectrum for future broadcasting by enabling changes smartly while making use of latest opportunities emerged due to Over-The-Top (OTT) and Integrated Broadband Broadcast (IBB) services. The various sessions of the Symposium will address issues relating to the diversity of media audience, UHDTV new delivery mechanisms and future transmission technologies, among others. There will also be panel discussions on whether spectrum is essential for future broadcasting.

The ABU, together with its stakeholders and sister unions, will continue to participate actively in spectrum studies that lead to efficient use of the radio-frequency bands, that can continually be used for distribution of broadcast media content, both assigned and associated with broadcasting.

Enabling Changes Smartly can not only help broadcasters in securing spectrum but also to achieve production and distribution efficiencies that could make a marked difference in the performance of a media organisation.

Your partnership, participation and fruitful discussions during the Symposium will help shape this new and dynamic media environment to the benefit of the broadcasting industry in the Asia-Pacific.

Join us and let's succeed together.

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Contact: Dr Amal Punchihewa

amal@abu.org.my

www.abu.org.my/dbsymposium



Survey to Study Technical Training Priority Areas of Members

The annual training activities of ABU Technology is closely monitored and streamlined to the requirements of the members with advice and guidance from the Technical Bureau. Every year, at its mid-year meeting, the Bureau selects four key areas where technical activities should be focused and this selection is based on the members' response to a training activity survey conducted every 3-4 years. This approach helps to align the training activities to the changing media landscape of the broadcast industry and to meet the changing training needs of the membership.

The Bureau, through its Training and Services Topic Area, requested ABU Technology to carry out such a survey in its annual meeting in Hanoi last year, as the selection of key training areas for the last couple of years was based on the survey conducted in 2009. This survey to study and understand the training requirements and priority areas of members was conducted in April this year and the results were presented and discussed at the last mid-year meeting of the Bureau in May.

Selected Training Areas for 2014/2015

Based on the results and recommendations the Bureau selected the following four key areas for technical activities to be focused for 2014/2015.

- New Media Platforms and Hybrid Technologies for Broadcast Delivery
- Training and Staff Development in skilled technical and technical management
- Digital production
- Archive and Content management including workflow and rights management

The Survey and Results

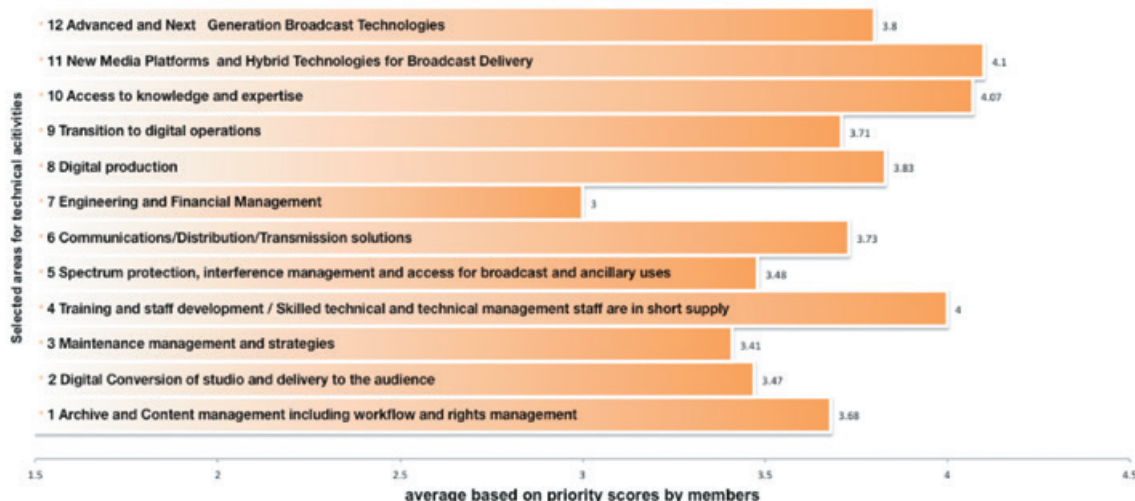
The survey was conducted for 3 weeks in April 2014. It was made available to the members via an online form as well as through email. The members were asked to give a score from 1 to 5 for each of the 12 selected areas. After analysing the responses received, i.e. looking at which topics received higher priority area scores, the ABU Technology ranked the topics in order of most to the least priorities. However, it has to be noted that some of the activities do have common elements and a single training activity could cover both areas, similarly some areas refer to information exchange and sharing through the website, newsletters and publications. This is the reason why areas 10, 6, and 12 are not part of the four areas selected for this year, where 10 is more on information sharing and parts of 6 and 12 are covered under the 'New Media Platforms and delivery' area.

The four areas selected for this year is based on the priority areas highlighted by this survey, starting from the highest priority to the lowest and also considering that some areas do overlap. It should also be noted that at least 1 or 2 areas selected every year tends to remain and continue to the next year if there tends to be more demand for activities in those specific areas.

Members' Participation is Key

On behalf of the Technical Bureau, ABU Technology would like to thank all our members who participated in this survey to help streamline the technical activities to the requirements of the members. Your participation in such surveys greatly helps in improving our services and is very much appreciated.

SURVEY RESULTS



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UHDTV Broadcasting over DVB-T2:

Seoul, South Korea Case Study

by Nik Dimitrakopoulos, Jongmyoung Kim & Hanchol Yu
Rohde&Schwarz Korea Ltd.

abstract

Korea was the first country to broadcast UHDTV (Ultra High Definition Television) at 30fps over DVB-T2 starting in 2012. Two years later, all major Korean broadcasters embarked on over-the-air (OTA) transmission of their own UHDTV programs at higher frame rates (60fps) over DVB-T2 in single frequency network (SFN) configuration covering the Seoul metropolitan area. In this paper we will discuss some of the technical challenges of delivering UHDTV over terrestrial transmission as well as the future of UHDTV.

Introduction

With major sports events taking place such as the football world cup, commonwealth games and Olympic games, UHDTV has gained a lot of momentum. Why do we need Ultra High Definition Television-UHDTV? What are the benefits for the consumers? Can we afford it? These are some of the questions that industry and people are raising. There has been and there will be a lot of speculation among various working groups, forums and panel discussions around this topic. One of issues highlighted was, in order for UHDTV to become a success, it must provide customer satisfaction beyond full high definition.

About three years ago, we visited Science and Technology Research Laboratories (STRL) of Japanese national broadcaster-NHK in Kinuta, Tokyo to have a look at their Super High Resolution demo (UHDTV-2, commonly known as 8K). I remember staring at a huge screen above some Japanese teenage girls in fancy dresses singing live on stage in a big stadium. It was all about the details, the colour, the dresses, the stage surroundings, even the peoples' faces in the massive crowd – truly immersive. Standing in front of the massive 8K screen I felt like I was inside the stadium. Honestly, though I never liked band performances but in 8K resolution it looked awesome. The truth is that UHDTV definitely provides the viewer with the “feel good” factor and virtual presence. And that's something customers would pay for.

UHDTV – Immersive Experience

What is needed for a UHDTV experience to become immersive?

1. Higher pixel resolution (spatial resolution): This is typically 3840x2160 (UHDTV-1 or commercially known

as 4K) and 7680x4320 (UHDTV-2 or commonly known as 8K). Higher resolution provides more detail in the image (figure 1), is dependent on the viewing distance, and the resolution size is proportional to the data rate.



Figure 1: Higher resolution image provides more details.
[Source: www.samsung.com]

2. Higher frame rates (temporal resolution): Provide smoother motion and details that can't be recognised at lower frame rates (figure 2). This is less dependent on the viewing distance but proportional to the data rate. Current studies have shown that for sports coverage a frame rate of at least 50/60 fps is required with NHK mentioning that 100/120 fps should be the desired frame rate. A recent study conducted under the BCF (June 2013) concluded that higher frame rates give a better impression than increased resolutions!



Figure 2: High frame rates are necessary especially for fast moving sequences (e.g. sports) [Source: www.gtxspeak.com]

3. Better colour

- Wider colour gamut: Provides more detail in the image and it is independent on the viewing distance. UHDTV-1 will still make use of rec.709 but future developments in UHD will focus on ITU-R recommendation. 2020 (figure 3 left)
- Higher bit depth: More bits are necessary when going to wider gamut (10 bit minimum). A higher bit depth can reduce banding and contouring issues and results in more efficient coding (figure 3 right). For UHDTV-2 profile 12 bit colour depth is favored which implies to 20% increase in data rate compared to 10 bit.

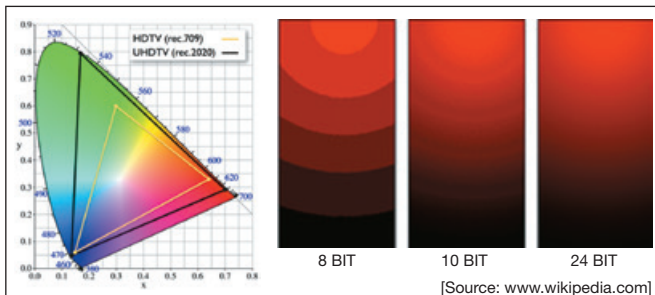


Figure 3: Colour gamut for BT Rec. 709 and Rec. 2020 on the left. A higher bit depth can reduce banding and contouring issues (right). [Source: www.wikipedia.com]

4. More audio channels: This will provide a more realistic experience. For UHD-1 a 2.0 or 5.1 channel audio is used. For UHD-2, 22.2 3D stereoscopic channel audio (figure 4) has been initially proposed by NHK and documented by the ITU-R in BS2051-0(02/2014).

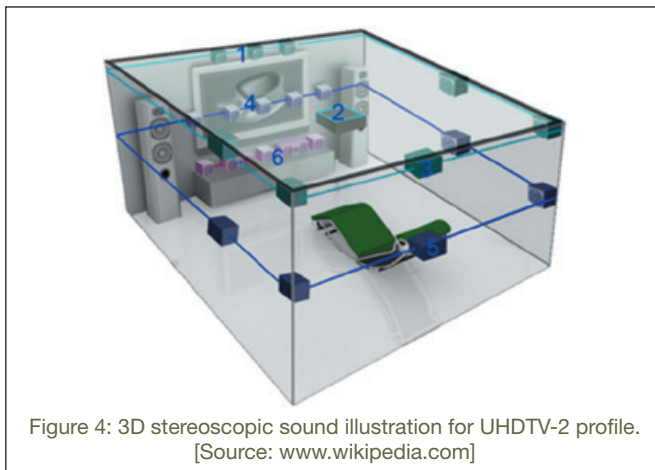


Figure 4: 3D stereoscopic sound illustration for UHDTV-2 profile. [Source: www.wikipedia.com]

Therefore in order to achieve immersive experience it is important to have as many of these improvements present as possible.

UHD Profiles and Roadmap

The table 1 shows the different UHD broadcast profiles according to the ITU [1]

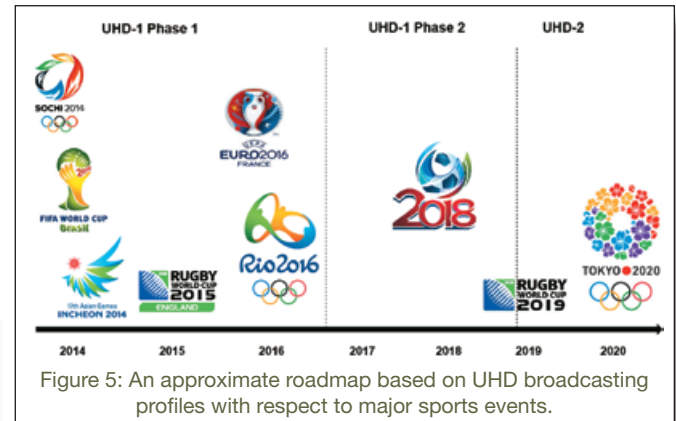


Figure 5: An approximate roadmap based on UHD broadcasting profiles with respect to major sports events.

UHDTV-1 Over DVB-T2 Becomes Reality:

Part 1 – Early stage

In Korea, the four major terrestrial broadcasters KBS, MBC, SBS and EBS (with the assistance of KCC and ETRI) demonstrated first UHD 4K back in September 2012 [2]. The content was pre-encoded at 30fps (4:2:0, 8 bit) using HEVC (HM 6.0) and depicted a Korean drama series. The transmission was based on DVB-T2 which was chosen due to its high spectral efficiency and flexibility. A Rohde & Schwarz 100W RF transmitter was installed at Kwan-ak mountain and the signal was received at the KBS R&D premises from a rooftop Yagi antenna over a line-of-sight propagation of 10km to an LG 84" UHDTV (figure 6).

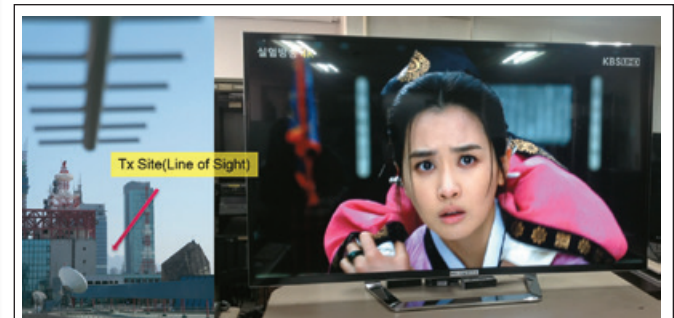


Figure 6: UHDTV broadcast trials in Seoul from KBS.

(a) On the left DVB-T2 signal is received from Kwan-ak mountain transmitter site with line-of-sight propagation.

(b) On the right TV reception of UHDTV program.

*Images are courtesy of KBS and Rohde&Schwarz.

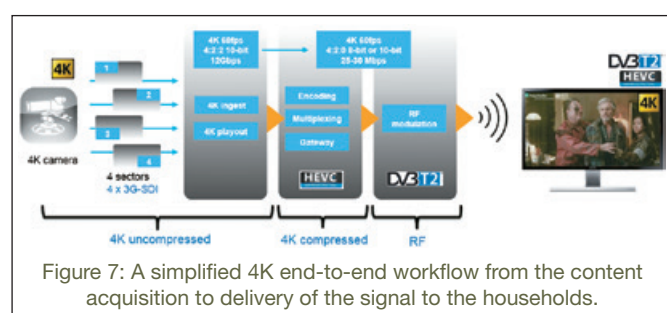
Table 1: UHD broadcasting profiles in accordance to ITU-R BT.2020

	Resolution	Frame rate	Colour sampling	Bit depth	Colour space	Audio
UHD-1 Phase 1	3840x2160	50/60	4:2:0/4:2:2	8 bit/10 bit	BT.709 BT.2020 subset	2.0/5.1
UHD-1 Phase 2	3840x2160	100/120	4:2:0/4:2:2	10 bit	BT.2020 subset	5.1/22.2
UHD-2	7680x4320	100/120	4:2:2	10 bit/12 bit	BT.2020 full	22.2

Part 2 – Recent Status

Two years later (May 2014) all major Korean broadcasters were on air with UHD TV using 60fps (4:2:0, 8 bit and 2 channel audio) in preparation of the FIFA World Cup (June 2014) and the Incheon Asian Games (Sept 2014).

A simplified 4K workflow is depicted in figure 7. The 4K cameras capture the content which is then transferred via 3G-SDI (typically) to either an ingest server (for archiving and editing) or directly to a real time HEVC encoder. The UHD content is then compressed to a desired data rate, packetised in MPEG-2 transport stream and sent to the transmitter site for broadcast.



Part 3 – Technical Challenges:

Over the past few years there have been numerous UHD TV trials all over the world. The majority of these are now focused at higher frame rates: currently 50/60 and probably 100/120 in the following years. The major drive is obviously sports where fast motion is anticipated. In 2014 the FIFA World Cup in Brazil was a good example of 4K broadcasting. At that time HEVC real time encoders were still at a prototype stage or not efficient enough. The majority of these encoders have demonstrated excellent results for UHD-1 with HEVC compression around 25-30Mbps. However these data rates might need to be reduced further due to more complex broadcast scenarios.

A good example is the UHD TV trials in Seoul over DVB-T2 SFN.

The technical challenges are summarised below:

- Delivery of UHD TV 4K with 60fps in real-time (due to live sports coverage)
- Delivery over terrestrial network with coverage of the whole Seoul metropolitan area (SFN).
- Delivery should target both rooftop and indoor reception.

A typical DVB-T2 configuration (Seoul metropolitan area case study) to satisfy the above conditions in a 6MHz bandwidth allocation is shown in Table 2.

Table 2: DVB-T2 configurations for UHD-1 broadcasting in Seoul (based on SBS)

Seoul – UHD TV DVB-T2	Constellation	FEC	GI	FFT	Pilot pattern	Data rate
Initial phase Rooftop reception	256QAM	2/3	1/16	32KE	PP2	26.3 Mbps
Final phase (Rooftop & indoor reception)	64QAM	2/3	1/16	32KE	PP2	19.8 Mbps

It is expected that over the next few years HEVC encoding will be further improved and should be able to achieve UHD-1 compression with lower data rates (below 20Mbps) with a picture perfect result. HEVC efficiency will be the key for error free indoor reception based on the Seoul case study with DVB-T2 in SFN configuration.

On the other hand, the transition from UHD-1 to UHD-2 will require a much higher data rate (over 50Mbps) making delivery of UHD-2 over DVB-T2 impossible unless MIMO (Multiple Input Multiple Output) techniques (beyond the MISO- Multiple Input Single Output techniques such as Alamouti Algorithm) are implemented.

Discussion

UHD TV broadcasting has gained a lot of momentum in the last few years and many trials have taken place around the world. The majority of these were conducted over DVB-S2 or IP networks where data rate is not an issue for UHD TV, with either HEVC or H.264 encoding. DVB-C2 on the other hand has not really taken off yet and almost no UHD TV trials have been reported. Perhaps we might see UHD-2 profile being tested in a few years from the Japanese JCTEA (over DVB-C2) as their focus is purely 8K broadcasting, but this is only speculation from the author. Finally, for DVB-T2, UHD TV broadcasting seems more challenging and more exciting at the same time. For example, in the UK, the DVB-T2 network topology is based on MFN, targeting rooftop reception. With 8MHz bandwidth allocation DVB-T2 can offer 40Mbps available data rate. This is more than enough for a UHD-1 service and we should not be surprised if we see even 2 UHD-1 services in one multiplex in the near future. In South Korea, on the other side of the world, there is a different story altogether. The RF bandwidth is limited to 6MHz, the buildings are not all equipped with rooftop antennas and the network topology as well as the frequency spectrum availability, ask for SFN configuration. As a result the Koreans might be limited to 20Mbps if they need to target indoor reception. There are still some questions remain to be answered:

- Can the HEVC encoders achieve good visual results at lower data rates? Time will tell.
- Is there spectrum to broadcast UHD-1? In case of South Korea this is still unknown. Currently the mobile operators are trying to claim the 700MHz frequency band and there is a lot of uncertainty on whether South Korea will officially adopt DVB-T2 or move to ATSC 3.0 which is believed to be very similar.

Conclusions

The UHD TV trials in Korea proved that UHD TV broadcast is possible over DVB-T2 even under the strictest conditions.

We witnessed real time UHD-1 broadcasting during the FIFA World Cup games in Brazil and even though the delay was approximately 4 seconds more compared to HD broadcasting, the experience was truly incredible. HEVC has been proven to be more efficient than H.264 and it seems to be the essential compression tool for UHDTV to be broadcasted over terrestrial networks. Back in 2012 HEVC compression was done offline and it was a lengthy process. In late 2013 the broadcast market saw the first real time encoders for UHD-1. To date, the majority of these real time HEVC encoders (software based) have demonstrated excellent picture results of UHD-1 with data rates ranging from 25-35 Mbps and processing latency ranging from 5-8 seconds. It is expected that HEVC will be furthermore improved over the following years and picture perfect results for UHD-1 will be achieved for less than 20Mbps. In addition to that the encoding latency is also expected to be reduced. In order to achieve truly immersive experience at the consumer end the frame rate, colour sampling, bit depth and audio channels need to be increased, which will demand a higher data rate.

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authors



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Nik Dimitrakopoulos received B.E. (with Honours) in Electronic & Electrical Engineering, MSc. Eng. in Modern Digital Wireless Communications (with Honors) and Ph.D. in RF MEMS from the University of Leeds, UK, in 2003, 2004 and 2008 respectively. From 2008 to 2009 he worked for Amplifier Technology in Bristol, UK designing and testing wideband amplifiers for VHF/UHF and X-Band applications. From 2009 to 2011 he worked for Digital TV Labs in Bristol, UK as an RF specialist responsible for DVB set-top-box/TV testing and field trial measurements. From October 2011 he joined Rohde & Schwarz and currently he is focused on UHDTV deployments in Japan and Korea. He is a member of the DTG RF Group, DVB-UHD group as well as FOBTv forum.



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INTER BEE EXPERIENCE, which celebrates Inter BEE's 50th anniversary, will be held on November 20th (Thur.) at the event hall. This event includes demonstrations of line array speakers for professional audio companies to take part in and live stage for new expressions fusing cutting edge technology in images, music, lighting and performance.



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INTER BEE CONTENT FORUM provides simultaneous Japanese-English interpretation services for overseas visitors.



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INTER BEE CONNECTED shares the latest trends and innovations in imaging and ICT based on themes such as links between broadcasting and communication, possibilities in media business through the Internet, use and application of clouds as contents production infrastructure and the application of big data in the contents business.



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Inter BEE has concluded partnerships with other exhibitions and international conferences relating to broadcasting and media in every region in Asia and other countries around the world.



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Inter BEE

Marks Its 50th Anniversary



1971



1980



1986



2005

Japan's leading broadcasting equipment exhibition, Inter BEE, turns 50 this year and is expanding to mark the anniversary.

Inter BEE 2014, to be held in the city of Chiba on 19-21 November, will feature six exhibition halls, one more than last year, in addition to an events hall. Several anniversary events are planned, including a hands-on event for specialised equipment and line array speakers.

The International Broadcast Equipment Exhibition is sponsored by the Japan Electronics and Information Technology Industries Association and the Japan Electronics Show Association, and supported by Japan's government and broadcasters.

The exhibition has grown dramatically over the past half-century. The first Inter BEE in 1965 featured 12 exhibitors. By 2009 the number of exhibitors exceeded 800.

In 2011, as more broadcasters completed the migration to terrestrial digital broadcasting, Inter BEE established a new cross media division to consolidate plans for new

media. It moved forward with the new goal of becoming a comprehensive media exhibition incorporating IPTV, mobile TV, digital signage, digital cinema, 3D and digital content.

The event is considered Japan's foremost exhibition for professionals in audio, video and communications, bringing together the latest in broadcasting, video, acoustic and lighting equipment, as well as ICT and cross-media solutions.



News

from the ABU Region

Afghanistan

Afghanistan Officially Launches Digital TV Broadcasting

Afghanistan's digital TV system was officially inaugurated by the second vice president of the Country in a official ceremony held in Kabul on August 31. The event was also attended by the state profiles, members of Parliament and representatives of mass media.

Expressing his pleasure the Minister of MCIT said that we are proud that our people are witness to another great step toward development in the field of communications and information technology. The opening of digital TV is a significant step towards the progress and development of the country, through this system we will get rid of the jungles of towers. He mentioned that Afghanistan had achieved remarkable advances in all aspects; and especially in communications and IT fields. The minister stated that currently 90% of the population use mobile services; and internet services are provided in 23 provinces through 3G technology and Fibre Optics and is rapidly expanding.

(Digital TV News)

Australia

Digital Radio Trials Extended

Commercial Radio Australia (CRA) has welcomed the decision by the Australian Communications and Media Authority (ACMA) to extend the DAB+ digital radio trial licences in Canberra and Darwin until 30 June 2015.

The DAB+ trial signal in both Canberra and Darwin is at low power but ongoing tests have indicated coverage at low power has been able to extend to a large part of the Canberra and Darwin areas. A boost was required to re-transmit the trial signal into Parliament House and this has provided additional testing opportunities for "in building" coverage in a challenging structure. The trial services continue to be subject to occasional interruptions and changes in power for ongoing technical testing.

(Radio Today)

Freeview Plus Officially Launches

A new era in Australian free-to-air TV has begun with the launch of FreeviewPlus, the new service that provides access to more content and services from the Freeview networks. At the core of FreeviewPlus is a broadband-

delivered free-to-air TV electronic programme guide (EPG) incorporating features that offer Australian consumers the most advanced, user-friendly free-to-air EPG experience.

The FreeviewPlus service uses hybrid TV technology, which combines broadband and broadcast TV. The technology also enables the free-to-air networks to introduce a range of new broadband services. FreeviewPlus will be available through an increasing number of new connected receivers carrying the FreeviewPlus logo including panel TVs, set top boxes and recording devices, which will be in stores between now and Christmas.

(C+T News)

Australia's SBS Launches OTT Service for HbbTV Televisions

SBS's dedicated catch-up viewing service, SBS ON DEMAND, will now be available to the public in beta (pre-release test version) via HbbTV enabled televisions, which are launching in Australia in coming months.

From today, users with new HbbTV-enabled televisions which are connected to the internet will see a 'Red Button' appear on screen when tuning into SBS's three free-to-air channels – SBS ONE, SBS2 and NITV.

Pressing the red button on the remote control will then launch the new SBS ON DEMAND application on the television screen and allow viewers to access to the vast range of content on offer from SBS.

(DigitalTVNews)

Japan

NHK to Showcase 8K Camera Images

In a world first, NHK will give a public display of images taken by its 120Hz frame frequency 8K Super Hi-Vision camera at the IBC 2014 event in Amsterdam. 8K provides 33 megapixel ultra high-definition images, which lets viewers feel as if they are right where the action is taking place. The frame frequency has been standardized for 120Hz as the video parameters, as well as 60Hz.

NHK collaborated with FIFA to produce 8K images of the 2014 FIFA World Cup in Brazil. The finest moments of play were captured with 120Hz frame frequency miniaturised 8K Cube Camera. The resulting images were clearer and smoother than those obtained by existing 60Hz frame

frequency cameras. Viewers can get a real sense of the fast-moving play and the thrill of when goals are made.

(OnScreenAsia)

Malaysia

CNA to Launch Satellite Studio in Malaysia

Regional broadcaster, Channel NewsAsia (CNA), announced plans to expand its Kuala Lumpur bureau to a fully functional High Definition (HD) satellite studio. The move will boost the channel's production capability in Malaysia and its 24-hour rolling news coverage of Asia. The studio will be directly connected to the channel's headquarters in Singapore and take live interviews with guests in a studio environment.

The channel has made it a priority to report on developments in Malaysia first-hand, not just political and economic news, but also on its people, society and culture. Malaysia will play a significant role in the world's fastest growing region, and we will play a role in helping the rest of the world understand Malaysia.

(NexTVAsia)

Philippines

Philippines Issues Updated DTV Transition Regulations

The Philippines National Telecommunications Commission (NTC) has released a draft of revised Implementing Rules and Regulations (IRR) for the transition to digital terrestrial television broadcasting (DTTB) in the country.

The draft highlights that; The ISDB-T standard shall be the sole standard in the delivery of DTTB in the country. The frequency bands, 512-698MHz (Channels 21-51) are allocated for DTTB and the bandwidth of 6MHz shall be assigned for each authorised DTTB service per service area, and where it is technically feasible, single frequency network (SFN) shall be allowed. A common middleware shall be used for the smooth implementation of an Emergency Warning Broadcast System (EWBS) function. The transition to digital broadcasting shall be based on a transition plan formulated by the NTC in consultation with the broadcast industry and all analogue TV broadcasting shall be terminated on the analogue switch-off date specified in the plan. It also specifies that dealers of new TVs shall indicate on each television set whether it can receive analogue signals only and will require a set-top box, or if it can receive ISDB-T programmes directly.

(Digital TV News)

Singapore

Singapore Drives TV White Space Regulation

Singapore's Infocomm Development Authority (IDA) has announced a regulatory framework for unlicensed access

to unused radio spectrum in the broadcast TV frequency bands, known as TV White Spaces.

The regulations will make available for use approximately 180MHz of spectrum when it takes effect from November 2014, and follow a public consultation in 2013. It rejected complaints that the use of the 700MHz UHF band would detract from international 4G availability, although this particular band will be returned for licensed cellular use after Singapore's analogue TV switch off in 2020. It will also allow devices to operate on a licence-exempt basis.

(C+T)

Thailand

THAICOM-7 Successfully Launched

Thaicom Public Company Limited's THAICOM-7 satellite was successfully launched into orbit on September 7 by Space Exploration Technologies Corporation (SPACE X) from Florida, USA. THAICOM-7 will expand the company's broadcasting service platform from its orbital position at 120° East and will provide a full range of media and data services tailored to the communication needs of the entertainment industry and telecom operators across Asia and Australasia.

Satellites THAICOM-5 and THAICOM-6 which serve Thailand are now at full capacity; the launch of THAICOM-7 will also provide additional satellite capacity to serve Thailand's fast growing broadcasting industry. Transponder capacity on THAICOM-7 has been fully booked at the time of launch, made up of approximately 50 percent pre-launch sales, with the remainder in the final contract stages. Since its establishment in 1991, the THAICOM Public Company Limited has launched seven satellites, with four satellites in operation

(Satellite Today)

MCOT Thailand Adds Five HD Channels

Thai state-owned television broadcaster MCOT has chosen a PlayBox Technology digital playout system as the core of a new five-channel high-definition service. The new system was designed, installed and commissioned at the MCOT's Bangkok headquarters by PlanetComm, the Thai partner of PlayBox Technology.

PlayBox's playout out module, AirBox, provides automated content playout for satellite channels, cable head-ends, over-the-air broadcasters and corporate TV users. In its automated playout mode, AirBox allows fixed-time scheduling for weeks ahead. AirBox can be used for live production as well as automated playout. Every clip in the playlist, except the one currently playing, can be trimmed, edited or repositioned seamlessly without stopping the current playout session. In addition to AirBox the system includes CaptureBox for ingest, TitleBox for graphics and AlarmBox for automated distribution of alarm messages and Multi Playout Manager a fully assignable monitoring and control system with rights management for multiple connected AirBox channels.

(C+T)

Digital Broadcasting Update

Broadcasting Unions Defend Spectrum

The World Broadcasting Unions (WBU) have stated their support for maintaining the allocation of UHF frequencies (470 to 694 MHz) currently used for terrestrial TV broadcasting.



Broadcasters from all over the world are resolved about the importance of the UHF band because it provides the only set of air waves which are globally available for digital terrestrial broadcasting. Long term certainty about the availability of the UHF band is also necessary to ensure continued investment and innovation by broadcasters. Whether or not UHDTV will be available to the general public will, for example, heavily depend on the sufficient availability of radio spectrum for television broadcasting.

The statement also outlines support for the preservation of the C-band frequencies (3.7 to 4.2 GHz), which is used for fixed satellite services essential to broadcasters' operations around the world. The unions are united in this statement in the run up to the International Telecommunication Union's (ITU) World Radio Conference in 2015.

(EBU)

The World's First Field Trial of Wide-area TV Broadcasting Using a Single LTE Frequency within UHF Spectrum

LTE Broadcast technology promises new revenue sources for operators by distributing TV over existing mobile broadband infrastructure. Subscribers would be able to watch TV on their devices without eating into their mobile data plan and independent of network load. LTE Broadcast allows for a free-to-air or pay-TV service that can be received by anybody with a suitable device, similar to traditional TV broadcasting. Broadcasters and content providers could extend their reach to mobile users and open the door for a multitude of interactive services.

Current LTE Broadcast applications focus on delivering media content to contained locations, such as stadiums and concert halls, over limited periods of time. The Munich trial is the first to apply the technology on UHF spectrum, using part of the 700 MHz band to broadcast over a 200 km² area. To maximize the efficiency of the LTE Broadcast, the SFN has been optimized for tighter synchronization of neighbor cells to increase interference robustness. The trial aims to show that LTE could be used to complement and in the long run, even provide another option to regional digital TV distribution standards, such as DVB-T in Europe.

'World's Highest Power' Solid-State Transmitter Goes On-Air

80 kW from a solid-state transmitter breaks previous UHF record.



This is the actual 80 kW solid-state transmitter installed at this UHF broadcaster. It is now on the air.

CINCINNATI – GatesAir has delivered what the company claims is the world's highest-power digital TV solid-state transmitter. Now on air at a major-market TV station in the U.S., the new unit replaces an older, less-efficient tube transmitter that had escalating costs. Engineered to produce 80kW ATSC output, the transmitter reduces the footprint, monthly power and maintenance costs associated with tube transmitters of this scale, without the common hefty upfront price tag of very high-power solid-state transmitters.

(GatesAir)

DVB Confirms Specs For UHDTV and OTT in Europe

This new DVB-UHDTV Phase 1 specification sets the minimum requirements for the next generation of television transmission overseas.

Details of which include accommodations for a new UHDTV Delivery Profile using HEVC compression, a new Content Identification & Media Synchronization For Companion Screens & Streams, and a new MPEG-DASH Profile. The three new specifications will now be sent to ETSI for formal standardisation and publication in the organisation's relevant "Blue Books."

The specification, unanimously adopted by the DVB Steering Board at its recent 77th meeting in Geneva, includes an HEVC Profile for DVB broadcasting services and also updates the ETSI TS 101 154 specification – for the use of Video and Audio Coding in Broadcasting Applications based on the MPEG-2 Transport Stream.

Another specification to gain approval from the Steering Board was the MPEG-DASH Profile for Transport of ISO BMFF Based DVB Services over IP Based Networks. This specification defines the delivery of TV content via HTTP adaptive streaming. MPEG-DASH covers a wide range of use cases and options. The new specification will facilitate implementation and usage of MPEG-DASH in a DVB environment.

(*tvtechnology.com*)

OTT to Reach Nearly Half the World's TV Households by 2020

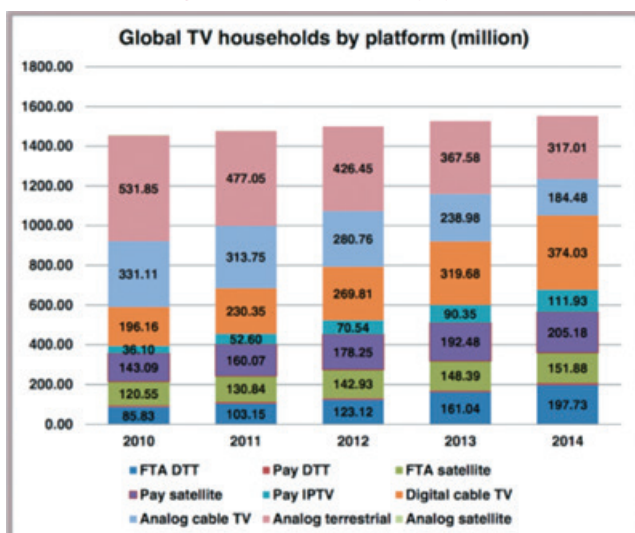
The number of households watching online TV and video (over fixed broadband networks and across 51 countries) will reach 706.53 million in 2020, up from 196.90 million in 2010 and the 374.43 million expected in 2014, according to a new report from Digital TV Research.

Asia Pacific will gain 231 million more OTT TV homes between 2013 and 2020 – or 61% of the global additions over the same period, according to the Global Online TV & Video Household Forecasts report. China alone will add 140 million, taking its 2020 total to 206 million – or more than the whole of Europe. China will overtake the US in 2014 to take top slot.

By 2020, 47.6% of the world's TV households will view online television and video, up from 15.4% in 2010. South Korea (79.8%) will have the highest proportion by country by 2020, with India (21.9%) at the other end of the scale.

(*DigitalTVresearch*)

One Billion Digital TV Homes by year-end



There will be more than 1 billion digital TV households across 138 countries by end-2014, up by 130 million on 2013 and by 461 million from the 590 million recorded in 2010, according to a new report from Digital TV Research. The Digital TV World Household Databook estimates that digital cable TV has become the most popular platform, with 374 million subscribers expected by end-2014. Digital cable overtook analogue cable in 2013 and analogue terrestrial in 2014. The number of homes paying for IPTV will more than triple between 2010 and 2014.

Global digital TV penetration will reach two-thirds of TV households by end-2014; up from 40.5% at end-2010.

Digital TV penetration will range from 97.1% in North America down to 51.5% in Latin America.

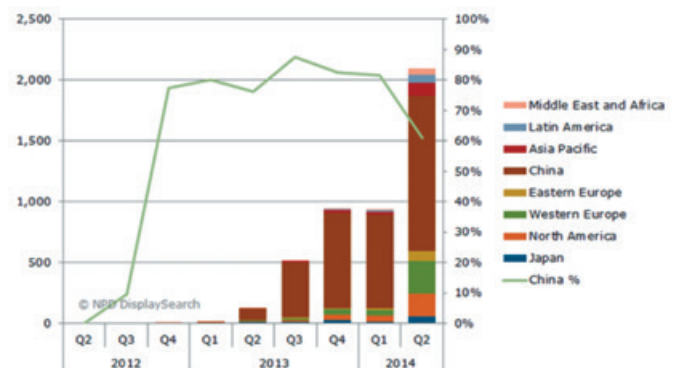
Thirteen countries will have 100% digital TV penetration by end-2014, with a further 25 over 90%. However, penetration will be lower than 50% of TV households in 45 countries. Digital TV penetration will more than double in 68 countries between 2010 and end-2014.

Of the 461 million digital TV households to be added between 2010 and 2014, 292 million (nearly two-thirds of total additions) will be in the Asia Pacific region, bringing its total to 517 million.

(*DigitalTVresearch*)

More 4K Sets Shipped In Q2 Than All Of 2013

Roughly 2.1 million 4K sets were shipped in the second quarter of 2014, surpassing the 1.6 million that were shipped in all of 2013, NPD DisplaySearch found in its latest 4K study.



The research firm noted that many brands introduced their 2014 models in the second quarter, "with a clear focus on 4K as the 'must-have' consumer feature for high-end television viewing."

China's share of 4K TV shipments dropped to 60% in the second quarter, off from 80% for all of 2013. NPD DisplaySearch noted that China lacks sources of 4K content, so TV-makers were largely marketing higher pixel counts to consumers.

(*Multichannel*)

EBU to Demo on Demand UHD through HEVC

Highlighting the increasing importance of broadband distribution for broadcasters, the EBU is to demonstrate a new combination of two emerging formats, DVB-DASH and HEVC, the H.265 codec.

One element of the demo shows how content providers can upgrade their on demand services to UHD frame sizes using H.265 (HEVC) codec in a full open source workflow. The maximum quality shown end-to-end is 3840x2160 pixel frame size at a speed of 25 full frames per seconds.

Another available solution is the encoding and end-to-end playout on a connected TV of a live feed using HEVC and DVB-DASH. With both requiring real time encoding the EBU demo shows how this can be done through a software based (fast) generic server.

(*BroadbandTVnews*)

Equipment Trends

Panasonic New HC-X1000 4K Semi-pro Camcorder



The new consumer-4K camcorder is packed with pro-level features. The camera allows you to record in 4K, UHD, or Full HD 1080p in a variety of frame rates and codecs, and is meant to be a bridge for consumers entering into the Prosumer world of 4K videography. The camera features a single 1/2.3" sensor design that always shoots in 4K and internally scales down the video when recording at Full HD. The professional features include ND filters, zebra pattern, histogram display, and focus assist functions such as peaking. The 20x optical zoom lens features two different O.I.S. systems, and three independent manual adjustment rings – one each for zoom, focus, and iris. Two XLR audio inputs with either manual or automatic level adjustments provide professional inputs and control.

(cinema5d)

Marshall Electronics QVW-2710 Quad-Viewer Monitor



The QVW-2710 has four independent 3G-SDI inputs to enable users to view full 4K (4096 x 2160) or UHD (3048 x 2160) formats. The wide gamut 10-bit panel is easily calibrated using Spectra Cal CalMan 5.2 software or equivalent. A Pixel-to-Pixel function allows viewing each quarter of the screen in full, original, resolution. Additionally, the QVW-2710 may be used as a quad-view display with each input coming from a different source.

The On Screen Display shows embedded time code, embedded audio presence indicator and closed caption presence indicator for 608/708 captions. Stereo audio can be monitored for the selected SDI input through a front panel headphone jack as well as through a rear panel Line Out jack for use with an external amplifier. The QVW-2710

supports audio bars and markers. In addition, it has USB and Ethernet ports and an RS-422/485 port with pass-through.

Additional features include colour temperature adjustment, aspect ratio settings, blue-only mode, and monochrome mode. Pixel-to-Pixel mode allows native display of any incoming image format. Users can set four function buttons to their desired settings for quick access and adjustment.

(lcd racks)

LVM-095W-N/SRM-095W: 9" FHD Multi-purpose Monitor



The LVM-095W-N / SRM-095W, the new 9" released from TVLogic displays full HD resolution of 1920x1080. It also corresponds with a wide range of image sources (3G HD/SD-SDI, HDMI) and provides a wide viewing angle (176 degrees). For maximised efficiency and economic feasibility, LVM-095W-N / SRM-095W is constructed from aluminum for an extra-light body weight and holds a built-in V-Mount. Upgraded with new FHD panel with accurate colour reproduction capability that exactly meets the HDTV standards, LVM-095W-N / SRM-095W gives super clear picture quality with powerful features.

(tvlogic)

SK-UHD4000, a Broadcast 4K Ultra-HDTV Camera System

Hitachi Kokusai Electric has developed the SK-UHD4000, a broadcast 4K Ultra-HDTV camera system which can use the 2/3-inch B4 mount lenses used in conventional HD broadcast cameras.

The use of standard HD lenses with the SK-UHD4000 eliminates the need for special conversion adapters. This



feature allows broadcasters to effectively use their existing lenses and shoot video in 4K resolution, while at the same time retaining the easy handling and operability of broadcast cameras currently in use. The SK-UHD4000 is an innovative broadcast 4K Ultra-HDTV camera system that makes it easy to produce programs shot in 4K resolution, which is projected to become the industry standard in the near future. It provides effective solutions to the challenges of live sports broadcasts outdoors, such as sensitivity and depth of field.

The SK-UHD4000 is equipped with a newly developed 2/3-inch MOS sensor. This sensor makes it possible to produce video images with high sensitivity and high resolution. It also helps to significantly reduce the amount of power consumed.

(hitachi-kokusai)

Switronix TorchLED Bolt 220W On-Camera Light

The TorchLED Bolt 220 On-Camera LED Light from Switronix has a bright 220W-equivalent output and provides full dimming and variable colour temperature control. Mount the light on top of your camera for event work, or position it on a light stand for indoor interviews. The 16 LED light is also bright enough to be used as a fill light when shooting outdoors.



Colour temperature is adjustable from tungsten (3200K) to daylight (5600K) and is controlled by a single dial. For controlling brightness, a second dial gives you full dimming control from 0 to 100% output, with no noticeable colour shift. Because it has a separate on/off switch, you can power off the light while maintaining your previous lighting settings.

The Bolt 220 features an integrated battery sled for powering the light with a Sony L-series battery. You can also use a 14.4V brick-style battery with PowerTap output for powering the light via the included PowerTap cable. The light also includes a 1/4"-20 swivel shoe mount, PowerTap cable, snap-on filter tray, diffusion filter, and a carrying pouch.

(Switronix)

HDMI Fibre Optic Extender

The DVI-7360 is a high-speed, HDCP compliant fibre optic transport system capable of distributing high resolution HDMI or DVI signals over cable lengths up to 350 meters (1,150 ft.) while maintaining flawless image quality. An HDMI input signal from a source device such as a set-top box or Blu-Ray player is converted into light pulses by an

optical transmitter module for transmission over two (2) strands of fibre optic cable. On the display side, an optical receiver module converts the light pulses back to an HDMI signal for display on a monitor or projector.



The DVI-7360 supports optical links using either multi-mode or single-mode fibre. In applications where HDCP support is not needed, this extender supports long-haul optical links up to 4.5 kilometers (2.8 miles) using single-mode fibre optic cables. These features make the DVI-7360 a powerful solution for digital display applications that require flawless signal quality over extremely long cable runs.

(dvicegear)

HC-HD300 Studio/Field Camera



Ikegami Electronics has introduced the HC-HD300 CMOS Studio HDTV camera system. The newest addition to Ikegami's Unicam HD product line is a flexible, docking-style camera that represents the company's first affordable HD studio camera system. Ready for the studio or field, it features a newly-developed 1/3-inch three-CMOS optical block design.

CMOS sensors are now meeting and exceeding the performance of CCDs in sensitivity, signal-to-noise ratio and resolution. They continue to offer low power consumption, no vertical smear and a high degree of format flexibility. With extensive ongoing research and development in this technology, the adoption of CMOS for broadcast camera use is now the trend.

The lightweight and compact size (1.5RU) BSF-300 is easily integrated into any studio, mobile truck or portable flypack. When using hybrid fibre camera cable, the base station provides power to the fibre adapter and the camera itself.

Other key features of the Ikegami HC-HD300 include a high-performance sensor block with f 10 sensitivity, 58 dB SNR, and 1,000 TVL resolution, native 1,920 x 1,080-pixel HD resolution, multi-video format 1080i, 720p, 480i (NTSC), 576i (PAL) switchable; quick EZ focus (focus assist) function, and built-in automatic lens aberration correction function.

(governmentvideo)

Dr Keiichi Kubota

Honoured with Distinguished Service Award

The ABU is to confer a Distinguished Service Award on Dr Keiichi Kubota, President & CEO, NHK Integrated Technology Inc.

The award will be presented to him at the ABU Technical Committee Meeting in Macau SAR, China on 24 October.

The award is being bestowed on Dr Kubota in recognition of his leadership in innovation and outstanding contributions to the broadcasting industry.

Dr Kubota received his B.S. and Ph.D. Degree from the University of Tokyo in 1976 and 1987 respectively.

Dr Kubota joined NHK in 1976. In 1980 he began working in NHK's laboratories in the areas of satellite transmission systems of HDTV and signal processing for HDTV. From 1989 until 1993, he was the Senior Scientist at NHK's New York Office. During this period he participated in various HDTV standardisation activities in SMPTE, ATSC and the FCC Advisory Committee on Advanced Television Service.

From 1993 he was in charge of R&D in digital coding of HDTV and digital broadcasting systems at the laboratories, and was responsible for starting NHK's digital satellite broadcasting service and the nationwide rollout of terrestrial digital broadcasting services at the Engineering Headquarters.

From 2008 he served as Director-General of NHK's Science and Technology Research Laboratories for four years, playing a leading role in the research of 8K UHD TV.

Dr Kubota served as Managing Director and Executive Director-General of Engineering at NHK for two years from April 2012. During this period he was responsible for every aspect of NHK's engineering including R&D, planning, the introduction of advanced equipment and facilities, and daily technical operations.

He has been President of NHK Integrated Technology Inc. since July 2014.

Dr Kubota is a recipient of the 2013 SMPTE Progress Medal and is a fellow of SMPTE and IEEE.



Personalities & Posts

Changes in ABU Technical Bureau Members

Terence Yiu Shun Tat

Phoenix TV, Hong Kong

Mr Terence Yiu Shun Tat has replaced Mr Wicky Law Man Hoi representing Phoenix Satellite Television Co Ltd on the ABU Technical Bureau. Mr Law has represented Phoenix TV on the Bureau since 2010 and played an active role in the ABU study projects in the Production Topic Area. We are grateful for Mr Law's contributions and we welcome Mr Yiu.



Tsutomo Shimizu

TBS, Japan

Mr Tsutomo Shimizu of TBS-Japan will replace Mr Shuji Inaba as Bureau member and Technical Liaison Officer. We thank Mr Inaba for his contributions as the Chairman of the Production Topic area since 2010 and we welcome back Mr Shimizu. Mr Shimizu holds a degree of Bachelor of Engineering (in the field of Electronics) from Tokyo University, and joined TBS in 1983. After working in music programme production as a Lighting Director for the first five years, he joined the department of standards and technology development. He has been involved mainly in the development of studio standards and digital interfaces for HDTV and UHDTV in ARIB, SMPTE and ITU-R.

N A Khan

Doordarshan, India

Mr N A Khan has replaced Mr A K Dixit as the ABU Technical Liaison Officer and member of the ABU Technical Bureau representing Doordarshan India. Mr Khan took up the post of Engineer-in-Chief at Doordarshan in August 2014. Before this he was Additional Director General (Engineering) looking after the work of the design wing and HRD at Doordarshan headquarters. Mr Khan also worked on deputation to the Bhutan Broadcasting Corporation for special projects between the Indian and Bhutan governments. He has 35 years of experience in broadcasting engineering, in the fields of operation, maintenance, design and training.



Newly Appointed ABU Technical Liaison Officers

Radeep Maharjan

Association of Community Radio Broadcasters' Nepal

Mr Radeep Maharjan has been appointed the ABU Technical Liaison Officer of ACORAB Nepal. Mr Maharjan received his B.E degree in Electronics and Communication Engineering from Tribhuvan University. He is Senior Technical Officer of the Association of Community Radio Broadcasters' Nepal (ACORAB-Nepal) where he provides counseling to establish community radios, facilitates obtaining licences from the Ministry of Information and Communication, installs transmitters, designs studios and resolves technical problems.



Robert Zaal

Radio Netherlands Worldwide

Mr Robert Zaal is the new Technical Liaison Officer for Radio Netherlands Worldwide. He has been CEO of RNW and the international training institute RNTC since 2012. Mr Zaal has broad experience in media broadcasting and production organisations. Before joining RNW he headed the Dutch media group RTV North Holland. RNW is an international media production company with the mission to improve free speech through independent journalism in countries where press freedom is severely restricted.

Chinta Mani Baral

Nepal Television Corporation

Mr Chinta Mani Baral has been appointed Technical Liaison Officer for Nepal Television Corporation. He is Head of the Engineering Division at NTV, a post he took up in February 2013. Before that he was Chief of Terrestrial Transmission, Earth Station & Satellites, and the OB Van Section. Mr Baral began his career as a TV studio engineer in 1997. He holds a BE (Electronics and Communication), an M.Sc. (Information Technology) and an MBA (Information System).



Sunil Bhatia

All India Radio

Mr Sunil Bhatia is the new Technical Liaison Officer for All India Radio (AIR). Since March 2014 he has been Director (Spectrum Management & Synergy) at AIR Headquarters in New Delhi. From 2007 until Feb 2014, he headed AIR stations in Jhansi and Shimla.

During his career Mr Bhatia has worked closely with the ABU Technology Department on many activities. He received his Bachelors degree in Electrical Engg. from NIT Allahabad & Masters degree from IT-BHU, Varanasi.

**Unutoa Auelua-Fonoti**

Office of the Regulator, Samoa

The Technical Liaison Officer for the Office of the Regulator, Samoa is Ms Unutoa Auelua-Fonoti. Ms Unutoa is the Manager of Technical Services for the OOTR. Her main responsibility is to advise the Regulator on all technical and spectrum related matters and

to manage day-to-day activities within the Spectrum Management & Technical Division of the Office of the Regulator. Ms Unutoa holds a Bachelor of Engineering (Electronics) and a Masters of Engineering (Engineering Management).

**Thorsten Becher**

TRANSRADIO, Germany

Mr Thorsten Becher has been appointed Technical Liaison Officer for TRANSRADIO of Germany. He received a master's degree in RF engineering from TU Darmstadt, Germany. Mr Becher has 23 years of experience in technical product management and international sales. Having joined TRANSRADIO in 2010, his key activities as Vice Director Sales are the marketing and project management of TRANSRADIO's new TRAM LCD line of AM/DRM broadcasting transmitter systems.

**Mark L Prah**

Voice of America

Voice of America's new Technical Liaison Officer is Mr Mark L Prah. As VOA's Associate Director for Operations, Mr Prah is responsible for planning, directing and coordinating VOA's radio and television broadcast infrastructure and technical operations, and

for the overall management of the financial, and human resources employed in the Operations Directorate. He is also the senior advisor to the VOA Director on matters pertaining to broadcast engineering and operations.

**Supatrasit Suansook**

National Broadcasting and Telecommunications Commission, Thailand

Mr Supatrasit Suansook is the Technical Liaison Officer for the Office of the National Broadcasting and Telecommunications Commission, Thailand. He is Senior Engineer in NBTC's Broadcasting Technology and Engineering Bureau. Mr Suansook is experienced in both the telecom and broadcast sectors. He is responsible for technical regulations/policy of digital terrestrial television including technical specifications, conformity assessment framework, frequency planning/coordination, and spectrum management of broadcasting services.

**Clive Morton**

Special Broadcasting Service (SBS), Australia

Clive has worked in the Australian broadcasting industry for over 15 years, and currently heads the Transmission team at SBS. Prior to this Clive held a number of executive positions at Broadcast Australia and was instrumental in

leading the implementation of nationwide DTV transmission infrastructure development. Before migrating to Australia in 1999, Clive led the Arqiva (then ntl) team in the 1998 launch of the national DTV multiplex and transmission infrastructure for two of the UK DTV licencees.

Gerald Sandfort

Deutsche Welle, Germany

Gerald Sandfort has more than 20 years of experience with audio production in broadcast media. He joined Deutsche Welle in 1991 and is currently responsible for multimedia production in Bonn/Germany. Over the last few years, Mr Sandfort has been instrumental in the technical realization that was required for the transformation from traditional radio workflow to the multimedia production process.

**Lim Yong Poo Calvin**

Media Development Authority, Singapore

Calvin Lim received a B. Eng in Electrical & Electronic Engineering from Nanyang Technological University. He is currently Technology Engineer to spearhead new media technology initiatives and digital broadcasting. In this role he has been involved in projects including DVB-T2 specification and DVB-T2 coverage prediction, DVB-T2 FTA network deployment, STB/antenna measurement, IPTV and OTT analysis.



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