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Broadcasters urged to adopt new technologies

Embrace new technologies – this was the message from Malaysia’s Minister of Communications and Multimedia when he opened the 2021 ABU Digital Broadcasting Symposium on 5 April.



YB Dato' Saifuddin Abdullah, Minister of Communications & Multimedia, Malaysia

Dato' Saifuddin Abdullah said media professionals knew that going digital was a journey for the development of a better world.

Broadcasters were facing unprecedented times, he said, with new players, formats and usage patterns continuing to evolve daily.

“We not only face a technology boom, but we also face the democratisation of creative content, where content can be produced by anyone, anywhere, at any time, far cheaper than ever before. There are so many more alternatives to TV and radio with a plethora of products and platforms available for entertainment

on a global basis, with consumers using a variety of devices to enjoy new forms of over the top (OTT) video and music streaming services. All this, while also facing a global pandemic where the spread and broadcast of reliable, accurate and trusted information has never before been more crucial for our survival.”

He said the global pandemic was forcing many broadcasters to move more quickly to digital platforms. Malaysia’s national broadcaster, Radio Televisyen Malaysia, had embarked on its own digital plan.

“Transformation plans at RTM are designed every decade to ensure services are up-to-date, with research conducted

to serve changes in the broadcasting industry especially when it concerns users and audience preferences.”

Dato’ Saifuddin said the Malaysian government had recently launched MYDIGITAL, a new and comprehensive approach designed to anchor the country’s digital economy by 2030.

Over the next five years, a total of RM70 billion (US\$17 billion) was expected to be invested in digital infrastructure. This included local and international connectivity, cloud services and data centres.

The minister praised the ABU for making DBS 2021 happen despite the pandemic.

“It is timely that we come together this week to discuss our experiences after just over a year of having experienced the new normal.”

The ABU Secretary-General, **Dr Javad Mottaghi**, said broadcasters around the globe, big or small, public or commercial, were going through a difficult time because of the pandemic.

“However, regardless of all challenges that media professionals are facing, our responsibility as broadcasters to inform, educate and entertain our audiences has not been changed. We have to think of creative and innovative ways to continue our services to our audiences in such a competitive media environment. We have to trust our most valuable asset, our staff and colleagues, who were able to quickly turn to virtual solutions to keep the show running and to serve the public. By this, we can win the trust of the people which is the most important asset for any broadcaster.”

Dr Mottaghi said the ABU had delivered more than 150 online events since the pandemic began, including training, sports, webinars and a music exchange service. ■

(Thank you to Mr Tan Sian Hoo, Press Secretary, KKMM and Mr Alex Reza Shariman, Head - International Relations Department, RTM)



Dr Javad Mottaghi, Secretary-General, ABU

INSPIRE, ENGAGE AND ENHANCE

The 2021 ABU Digital Broadcasting Symposium was held virtually on 5-8 April 2021 and streamed to participants worldwide from the Asia-Pacific Broadcasting Union (ABU) building in Kuala Lumpur.

This annual symposium, which is usually held physically in Kuala Lumpur, had to be conducted virtually this year because of the ongoing pandemic.

Welcoming remarks were made by **Dr Javad Mottaghi**, Secretary-General, ABU, and the opening address was delivered by Dato' Saifuddin Abdullah, Minister of Communications and Multimedia, Malaysia.

The four-day symposium, aptly the themed, '**Inspire, Engage and Enhance**', provided a unique opportunity for participants to gain access to information on a wide variety of aspects of broadcasting, ranging from terrestrial to IP. The symposium attracted many participants representing broadcasters, telcos, regulators, manufacturers and other industry players.

ADVANCED TECHNOLOGIES AND INDUSTRY DEVELOPMENTS

The first session was moderated by **Masashi Kamei**, NHK Science & Technology Research Laboratories and the panellists were **Yukihiro Nishida**, NHK; **Lindsay Cornell**, BBC Digital; and **Mardhiah Nasir**, IPSB Technology.

The International Telecommunication Union Radiocommunication Sector (ITU-R), through its Study Group 6, plays a major role in the international standardisation of the end-to-end broadcast chain, from the production of programmes to the delivery of content to the user. The activities of ITU-R Study Group 6 are conducted by three working parties (WP) and a task group (TG). WP6A covers areas of terrestrial broadcast delivery, including channel coding, antennas and emergency broadcasting. WP6B encompasses the domains of

broadcast service assembly and access, such as metadata and file formats. WP6C studies areas of programme production and quality assessment, including recording and archiving. TG 6/1 was established to review the spectrum utilisation of existing services in the Band 470-960 MHz in Region 1. TG 6/1 is also considering regulatory actions in the Band 470-694 MHz, in that region, on the basis of a review in accordance with resolution 235 of the World Radiocommunication Conference 2015 (WRC-15).

Broadcasting has been continuously improved in order to offer better services to the end user. Terrestrial TV broadcasting started with analogue standards in the forms of NTSC, PAL and SECAM. In the early 1990's, migration to Digital Terrestrial TV Broadcasting (DTTB) began in the forms of 1st generation



Moderator, **Masashi Kamei**, NHK Science & Technology Research Laboratories, **Mardhiah Nasir**, IPSB Technology, **Yukihiro Nishida**, NHK and **Lindsay Cornell**, BBC Digital.

ATSC, DVB-T, ISDB-T and DTMB standards specified under ITU-R BT.1306 Recommendations. Those DTTB standards have now evolved into 2nd generation ATSC 3.0, DVB-T2 and DTMB-A standards specified under ITU-R BT.1877 Recommendations. Proposed extension to the 2nd generation DTTB standards is envisaged, to accommodate 5G.

Terrestrial Sound and Multimedia Broadcasting have evolved from analogue AM and FM Radio into Digital Sound Broadcasting specified under ITU-R BS.1514 Recommendations for the LF/MF/HF Bands and ITU-R BS.1114 Recommendations for the VHF/UHF Band. In the case of Multimedia Broadcasting, ITU-R BT.2016 Recommendations have been drawn up to include standards such as T-DMB, AT-DMB and ISDB-Tmm.

Video Systems have made progress from analogue to digital standards as laid out in Rec. ITU-R BT.601 for Standard Definition TV (SDTV) and Rec. ITU-R BT.709 for High Definition TV (HDTV). Progress in video systems still continues, with Rec ITU-R BT.2020 for Ultra High Definition TV (UDTV) and Rec ITU-R BT.2100 for High Dynamic Range TV (HDRTV). The ITU is also studying immersive user experience, by specifying Rec ITU-R BT.2123 for Advanced Immersive Sensory Media. Sound systems progressed from monophonic to stereo sound, and later to 5.1 surround channels as laid out in Rec ITU-R BS.775. The advanced sound systems from 7.1 channels to 22.2 three-dimensional surround channels are specified under Rec ITU-R BS.2051.

During World Radiocommunication Conference 2023 (WRC-23), the ITU will discuss the protection of spectrum for broadcasters, as the UHF Band (470-698 MHz) is under threat from IMT and mobile services. Furthermore, additional spectrum is needed for new broadcast services such as 3DTV and UHD TV.

Most DAB receivers were tested using ETSI standard ES 103 461 which was drafted in 2017. However, DAB expansion beyond Europe and progress in technology, required an update in this standard, and a new version was published in October 2020. The European Union (EU) has mandated the installation of DAB receivers in cars and the All-Europe regional profile is specifically mentioned. Cars are also making longer journeys through the European continent, thus requiring the receivers to respond accurately to emergency alarm announcements. As DAB spreads to countries outside Europe, extra core technology tests ensure that receivers are able to display non-Latin text. In the

case of Digital Radio Mondiale (DRM), hierarchical modulation modes have been removed from the technical specifications and a new simplified version of ETSI ES 201 960 has been published.

BUSINESS STRATEGIES AND APPROACHES FOR BROADCAST AND MEDIA

The Moderator was **Mardhiah Nasir**, IPSB Technology with the panellists comprising, **Joan Warner**, Commercial Radio Australia; **Ruxandra Obreja**, DRM Consortium; **Prashant Butani**, MEASAT Satellite Systems and **Wang Lei**, NRTA-China.



Moderator, **Mardhiah Nasir**, IPSB Technology

Commercial Radio in Australia reached a record high audience with 95% of Australians listening to radio each week. Radio stations have evolved into multiplatform content providers which enable users to access radio anytime and anywhere. This strategy has delivered strong results during the pandemic, when listeners have turned to their car receivers or home receivers to obtain the latest news. There has been substantial increase in radio listeners using smartphones, tablets and smart speakers.

Key partnerships with Google and Amazon have improved the accessibility of radio. Artificial Intelligence (AI), makes radio easier to listen on mobile phones; voice assisted devices like smart speakers and cloud based assistants. More than 400 Australian AM, FM and DAB+ digital radio stations are easily accessible on Google Nest devices via voice command. In 2019, time spent listening to podcasts overtook owned music for the first time. The Australian Podcast Ranker was launched in October 2019 in order to increase podcast consumption. In 2020, there was a total of 420.8 million podcast downloads with radio show catch ups being the most popular genre.

There are an estimated six billion radio sets in use globally but there still remains 3.5 billion people who are 'not connected' in any way and cannot access the latest news. DRM can reach audiences without relying on local infrastructure, as it can cross borders and

offer lifeline services. This has resulted in India, Pakistan, South Africa and Brazil adopting DRM to reach their populations, not only in the cities but also the rural communities in distant areas. Using a single technical standard is a logical solution for local, regional, national and international radio coverage. This is due to the fact that DRM operates in the AM bands for medium/large area coverage as well as the FM Band for local/regional coverage. It is also possible to activate a DRM receiver to receive emergency alert warning of an impending disaster. During these times of pandemic, DRM can extend education to remote areas.

In 1992, Malaysia East Asia Satellite (MEASAT) was founded and has since launched seven satellites reaching over 150 countries, with a global population of 5.8 billion. MEASAT forms an integral part of Malaysia's ICT infrastructure and the future launch of MEASAT 3d will mark a tenfold increase in satellite broadband capacity. In 2020, TV consumption increased significantly, as viewers had to stay at home during the pandemic.



Prashant Butani, MEASAT Satellite Systems

The market size of linear TV remains large, but OTT is catching up. Although linear TV providers are facing increasing competition from OTT video services, nearly two thirds of all residential TV households still subscribe to linear TV services. As broadband penetration increases, so does peak traffic congestion, hampering the viewing experience. Linear TV and OTT are converging and becoming extension of each other, with similar content options and features.

OTT & IBB TECHNOLOGIES

The session was moderated by **Prashant Butani**, MEASAT Satellite Systems and the panellists were **Shinya Abe**, NHK Science & Technology Research Laboratories; **Ivan Verbesselt**, Mediagenix and **Maryam Sedaghat**, IRIB-Iran.

Integrated Broadcast Broadband System (IBB) or Hybrid Broadcast System is comprised of two different standards, namely Hybridcast in Japan and Hybrid



Broadcast Broadband TV2 (HbbTV2) in Europe. Hybridcast and HbbTV2 are both HTML5 based IBB systems and similar in structure, but their applications are incompatible. The incompatibilities originate from additional Application Programming Interfaces (APIs) making it essential to have applications that operate on both Hybridcast and HbbTV2. IBB services can then be accessible to more viewers, and useful software can be shared easily. Hence, harmonisation of additional APIs defined in each system is a key requirement. Since both systems are based on HTML5, multilingual capability is ensured, for use in other countries.

OTT- Broadcast (OTT-B) is being developed as a specification for native IP over DVB-x2 (2nd generation DVB-T2, DVB-S2/S2-x and DVB-C2). The main purpose of OTT-B is to use IP capabilities in DVB-T2 and it is based on existing standards and web technologies. OTT-B offers new interactive broadcast services that reach all types of screens at home, personalised content on multiple devices, and emergency alerts.

ATSC 3.0 inspired the development of OTT-B to attain an all-IP system offering new opportunities for broadcasters and ad-based models. ATSC3.0 incorporates advanced techniques in form of error correction coding, compression algorithms, higher modulation schemes and exploits the convergence of broadband and IP connectivity. DVB-T2 is widely used but its full potential has not been realised. DVB- Generic Stream Encapsulation (DVB-GSE) has the capability to deliver native IP but has been underutilised and only used for certain professional satellite tracking systems. In OTT-B, native IP over GSE is expected

to replace the MPEG-2 Transport Stream (MPEG-2 TS).

GSE is a data link layer protocol where network layer packets are encapsulated in one or more GSE packets. The encapsulation process adds control information, such as network protocol type and address label. DVB-Internet (DVB-I) is a recent addition to the DVB family and allows the receiver to display the complete list of broadband and broadcast services. Since OTT-B is IP based, it can support DVB-I and take advantage of it. OTT-B also supports Low Latency HTTP Live Streaming (LL-HLS) by Apple Inc. and Dynamic Adaptive Streaming over HTTP –Low Latency by DASH Industry Forum. Both these recent standards achieve low latency transmission by dividing content into chunks. Low latency reduces delay when viewing OTT live content.

Standards supported by OTT-B are, Real Time Object Delivery Over Unidirectional (ROUTE), Multicast Adaptive Rate (mABR)

and Quick UDP Internet Connection (QUIC). Traditional HTTP/TCP works well for broadband delivery but is not appropriate for broadcast. ROUTE offers a better solution for hybrid broadcast and broadband services and it can deliver Real Time (RT) and Non Real Time (NRT) through broadcast channels. Multicast Adaptive Rate (mABR) decreases the load of servers when the same content is delivered to some viewers simultaneously. It enables network operators to better manage congested traffic whilst meeting viewer demands. QUIC is a transport layer network protocol designed by Google, to make HTTP traffic more efficient, secure and faster. QUIC has combined the best qualities of TCP connections and TLS encryption and implemented it on UDP.

CLOUD REVOLUTION IN THE MEDIA INDUSTRY

The Moderator was **Hamid Dehghan Nayeri**, IRIB-Iran and the panellists were **Lars-Peder Lundgren**, Paneda; **Colin Prior**, ENENSYS Technologies and **Shweta Jain**, Amazon Web Services, Singapore.



A DAB+ headend consists of several audio encoders, a data generator and a multiplexer. The audio signals are connected to the audio encoders, whilst metadata, text and pictures are connected to the data generator. The basic principle of the headend is to multiplex these separate signals into a single output which is then channelled to the transmission network. There are 3 ways to realise a DAB headend, namely by traditional hardware setup with complete all-in-one hardware system; a server based platform which is an in-house cloud system or a cloud system using Google or Amazon Data centres installed around the world. The cloud system is secure, cost effective and requires no hardware. At present 10% of broadcasters are using the traditional hardware setup, 80% are using an in-house cloud system and another 10% are using an external cloud system.

The DAB Headend can be centralised, in which case the encoders and multiplexer are located in one place. The advantages are that it is simplified, requires less maintenance and existing IP infrastructure can be used. The disadvantage is maintaining the signal quality when feeding the audio over long distances. The other method is the decentralised approach, where the multiplexer is centralised, but the encoders are decentralised and located at the studios. This approach offers the best quality, as the audio is directly connected to the encoder. However, it has the disadvantage that more equipment is needed and therefore requires more maintenance.

DTTB can be considered a fragmented market, with many different incompatible standards in the form ATSC 3.0, ATSC 1.0, DVB-T2, DVB-T, ISDB-T, and DTMB. In France, DTTB with IPTV STB has a market share of 49.6 % whilst DTTB only has a market share of 21.9 %. There are 7 multiplexes with a total of 57 services. Upgrading from DVB-T to DVB-T2 is taking place in Italy, with 20 national multiplex and 450 local multiplexes. The infrastructure caters for National TV with 120 programmes on SD and 20 programmes on HD, as well as Local YTV with 3000 programmes. On the other hand, Switzerland has switched off its terrestrial transmission in favour of cable distribution. In the USA, 'cord cutting' consumers are unsubscribing from Pay TV and switching to streaming services using internet, but still watch live TV via terrestrial TV.

The key drivers for Artificial Intelligence (AI) in the media industry are lower costs, improved customer experience and drive revenues. Machine Learning (ML) is utilised in creating a rich metadata



search index and can offer content-based recommendations. ML is used in addressing subtitling and accessibility requirements, boosting user engagement. Another category of ML application is compliance and moderation, as it is necessary to detect inappropriate content and automate quality control. In order to have content monetisation, ML can increase revenue with metadata, optimise advertising and provide reporting with analytics.

MEDIA SECURITY & DISASTER PREPAREDNESS

The session was moderated by **Dr Veysel Binbay**, ABU Technology and the panellists were **Ben Vandenberghe**, Skyline Communications; **Yasuji Sakaguchi**, Japan Telecommunications Engineering and Consulting Service and **Negin Ayoughi**, IRIB-Iran.

With the digital transformation of ICT media & broadband service providers, security has emerged as a serious issue. Threats arise on many fronts, including state-sponsored organisations, campaigning organisations, terrorist organisations, hacker collectives and lone wolves. Attacks can be politically, economically or ideologically motivated, but in all cases the end result can be a disaster for the media company. The threat level can range from silent information collection to deliberate maximum damage to reputation, data and infrastructure or paying a huge ransom for release. Cyber threats are growing more sophisticated in tandem with geo-political evolutions. Security is not only about external bad intent, but also about protecting the media from internal threats.

Hackers regard media broadcast stations as high-profile targets which can gain the public's attention almost instantly. The level of exposure is increasing continuously and very rapidly with the technology evolution of media & broadcast industry technologies such as all-IP and cloud services. The impact of security incidents can be massive and may take a station days to recover from. This

was demonstrated when hackers almost destroyed France's TV5 with a well-prepared and highly targeted attack. All 12 channels were instantly taken off-air, accompanied by the posting of a message on TV5 social media. The attack, which was targeted at the encoding systems, resulted in five million Euro in direct damages, with no identifiable motive. ISDB-T has been adopted in more than 20 countries including Latin America and one of its main points of attraction is the incorporation of an Emergency Warning Broadcast System (EWBS). EWBS is easy to install as it uses existing ISDB infrastructure, which has wide coverage, robust transmission and mobile reception. Public media broadcasting is accessible to everyone and transmissions reach the most remote part of a nation. It is reliable one-way communication that has no traffic congestion and is resistant to cyber threats. A joint project between Latin America and Japan is connecting EWBS with Earthquake Early Warning in Central America (ERWANICA). Another method of sending emergency alert signals is by Data Radio Channel (DARC) which is transmitted as part of the existing analogue FM Stereo multiplex.

One of the standards for Public Warning Systems is ITU-T X. 1303 Common Alerting Protocol (CAP), which is a digital format for exchanging emergency alerts, allowing a consistent alert message to be disseminated over various networks. The CAP data structure can convey flexible geographic shapes in three dimensions, multilingual and multi audience messaging. An example of a broadcasting alarm system is Alert4All which improves the effectiveness of alert and communication to the population during crises, within the context of the European Union. The Alert4All Project includes communications system architecture and protocols allowing dissemination of alert messages over diverse means of communication, such as satellite and new media. Another system from Japan is J-Alert, a satellite-based system that allows authorities to quickly broadcast alerts to local media and citizens directly, via a system of nationwide television,



Asaad Sameer Bagharib, Director, Thinking Tub Media



Joe Goddard, James & Wilkinson Media



Sam Bogoch, axle ai

radio and cell broadcast. J-Alert provides citizens with evacuation instructions or advice from local governments, flood alerts and radiation reports in the event of a nuclear accident.

AI AND BIG DATA APPLICATIONS IN MEDIA

The moderator was **Asaad Sameer Bagharib**, Director, Thinking Tub Media and the panellists comprised, **Mohammad Nozari Pak**, IRIB-Iran; **Sam Bogoch**, axle ai; **Michael Moss**, Promo Mii; **Joe Goddard**, James & Wilkinson Media and **Amir Lakizadeh**, IRIB-Iran.

AI is being continually researched in many parts of worlds and one prominent aspect is the interpretation of full-body human movements for human computer interaction (HCI). This is undertaken by tracking the reconstructive skeleton of a user's body parts, and recognising the motion. Three processes must be solved in real time, namely user and computer vision algorithms; kinematical 3D skeleton and interpretation of patterns, using AI techniques. The motivation is to build machines capable of emulating human behaviours so that they can replace the work of real people.

Deep learning (DL) is part of a broader family of machine learning methods based on artificial neural networks with learning which can be supervised, semi supervised or unsupervised. DL is also considered as a class of machine learning algorithm, using multiple layers to progressively extract higher level features from the raw input. In image processing, lower layers may identify edges, while higher layers may identify digits, letters, or concepts relevant to humans, such as faces.

Deep Learning is also used to improve voice conversion techniques. Voice conversion is a technique for transferring non-linguistic information contained in speech while preserving its linguistic information. The idea of speaking in someone else's voice is fascinating in movies and it has found practical application in the creative industry. Voice conversion involves modifying speech from a source speaker to match the vocal qualities of a target speaker. Voice conversion refers to digital cloning of a person's voice, in which the audio



Michael Moss, Promo Mii



Amir Lakizadeh, IRIB-Iran

waveform is modified so that it appears as if spoken by someone other than the original speaker.

Using conventional methods, up to 40% of total video editing time is wasted in locating the right material. AI searches for video content efficiently, using various techniques, including face recognition, object recognition and speech transcription. As an added bonus, AI also enables editors to work remotely, especially in these times of pandemic, and works with existing formats and storage media.

TECHNOLOGIES AND STRATEGIES FOR SUCCESSFUL DIGITAL RADIO ROLLOUT

The session was moderated by **Steve Ahern**, ABU Media Academy and the panellists were **Dr Les Sabel**, WorldDAB ; **Alexander Zink**, Fraunhofer; **Yogendra Pal**, DRM India Chapter and **Philipp Schmid**, Nautel.

Smart radio or Hybrid Radio is the latest evolution of radio, using digital broadcasting coupled with IP connectivity

to deliver advanced features. DAB+ Smart radio provides all the benefits of standard DAB+, which are high quality audio, text and images, announcements and emergency warnings. All these features are delivered in a one-to-many delivery system that is not only cost efficient, but also acts as a green broadcast system.

Strategies for the implementation of DAB+ Smart radio depend on the current capabilities of the radio industry in each country. New markets, without existing DAB infrastructure should plan to include hybrid radio delivery alongside DAB+ broadcast rollout. This maximises the impact of digital radio service delivery from day one, and at the same time minimises the cost of implementation, as both DAB+ and IP infrastructure are developed simultaneously. The plan should be to adjust existing workflows so that metadata is provided for DAB+ smart radio. However, this approach may involve repurposing existing data and workflows that can service existing IP stations.

DRM offers more choice for listeners,





as up to 3 programmes are delivered on a single frequency channel. Stereo and 5.1 surround sound can be offered with excellent audio quality and with no distortion. Multimedia applications provide great listener benefits and extra revenue opportunities for broadcasters. DRM covers a wide area and supports Single Frequency Network (SFN), which is spectrum efficient and results in a green and energy efficient broadcast system. Automatic tuning is available by station name and no longer by frequency, enabling the receiver to retune when leaving the coverage area.

DRM is an appropriate choice to replace analogue FM Radio as it offers many advantages. It can reach all citizens in a country, whether they live in bigger cities, in villages, on hills or in valleys. Using a single technical standard is the optimum solution for local, regional, national and international radio services. This results in efficient spectrum usage at much reduced cost and, with multilingual and on demand content, makes radio the digital media hub for modern listeners.

India has one of world's largest DRM deployments with 35 Medium Wave transmitters and 3 Short Wave transmitters providing coverage for 0.9 billion people. The car industry in India has rolled out digital radio with the fitting of DRM sets in the assembly line of 3 million cars. Chipsets can accommodate all standards and the car manufacturers are not charging extra to consumers for DRM receivers. The fact that more international car brands are adding DRM in their cars is another encouraging sign.

DRM is best suited to the FM band in India for several reasons. Digitalisation

can be implemented without disturbing existing analogue FM services. Existing DRM receivers catering for the AM band can be easily firmware upgraded to receive signals in the FM band. Android phones can receive DRM in the FM band using off the shelf dongles and radio Apps. Lastly, a made-in-India chipset is another plus factor given the country's vast knowhow, especially in digital radio design.

IP TECHNOLOGIES AND REMOTE PRODUCTION

The session was moderated by **Aale Raza**, Whiteways Systems and the panellists were **Rahul Goyal**, Dalet; **Peter Bruce**, Elevate Broadcast and **Yew Jin Cheong**, Rohde & Schwarz.

The pandemic has triggered the move to remote productions. During the pre-Covid era, remote workflow was a nice-to-have feature, allowing employees the option of working from home. However, the Covid era has forced remote operations to become an immediate requirement to keep business continuity. After a year, it is now a standard requirement to make a businesses more agile and lower the total cost of operations and infrastructure.

Remote production can be conducted with the media on-premise, in cloud storage or online. The media can be located in several storage spaces, spread over different regions of the globe and the editors themselves may be at different locations, working in high resolution and operating with a mix of local and remote content. The media might be scalable, with access requirements from production teams who want to immediately edit the first phases of their projects. An editing project

might begin in a certain location and be completed in another. Agility is needed, with access to editing suites with simple browse and search content catalogues. Both on premise and remote editing are required to support high resolution and proxy editing.

There are many real-life instances of remote production innovation, especially during Covid-19. For example, when pandemic caused lockdown in the Philippines, problems were created for a sports presenter who was required to operate his programme, 'On the Ball', as a YouTube channel. The aim was also to make the live show more exciting than the standard "Zoom" interviews, but with minimum costs. The successful solution was to stream the event directly to the internet and target it to mobile phones.

Also during the pandemic, Philippine Government regulations implemented restrictions on audience and production staffing, with only the setup crew and camera people allowed in a stadium. OB vans were also banned from the stadium grounds, making broadcast of an event a tough proposition. The solution used was to locate the OB Van 20 km away and to arrange seamless remote connectivity via fibre, with the production facilities at the stadium.

The business model for broadcasters is changing with IP becoming the trend. IT and cloud technology have brought more benefits and opportunities to the broadcasters. UHDTV has brought not only innovations, but new demands on infrastructure. IP allows for greater flexibility as it adapts to changing workflows more easily and scales up



solutions more seamlessly. IP improves manpower efficiency, hence lowering the total cost of ownership. An IP environment is also future proof, as it allows for upgrading to emerging technologies as they are brought to the market.

ADVANCED AUDIO & STREAMING TECHNOLOGIES

The session was moderated by **Dr Les Sabel**, WorldDAB and the panellists were **Mohammad Reza Hasanabadi**, IRIB-Iran; **Aditya Summanwar**, Triton Digital and **Geoffrey Low**, Dolby.

The concept of Object Based Audio occurs when sound sources are regarded as separate sound objects. Next Generation Audio (NGA) features personalisation, where NGA allows a choice of what and how to hear the content or Interactive Media. Dialogue enhancement, Immersive 3D audio and interaction with audio objects are among aspects subject to personalisation. Personalisation can be used for persons with auditory inabilities, allowing them to select and adjust the sounds they want to hear. It can also be used by viewers who prefer to prioritise certain sounds, such as a commentator's voice, in a noisy, crowded stadium.

At present, the conventional approach is channel-based audio, in which later adaptation is not possible and production is limited to only a single format. This happens when the audio signals from the microphones are mixed before being sent to the audience. The process of mixing is fixed and done at the production end. There is no possibility for the audience to select the preferred sound sources. In the new approach, two

extra elements, namely Renderer and Metadata are added to the audio system. Metadata is a vector representation of the sounds and shows the position of the signal. The renderer distinguishes the different signals and chooses the audio object. The hardware and software of Object Based Audio consists of the Serial Digital Interface (SDI) containing up to 16 channels and each audio object comprises two parts, Signal and Metadata.

MPEG-H, Dolby ATMOS and Dolby AC-4 are examples of Next Generation Audio (NGA) Systems. MPEG-H has been in operation in South Korea since 2017 whereas Dolby AC-4 has been on air since ATSC 3.0 started on air, in 2020. A relevant document on both standards is available as EBU BPN117 entitled Comparative Analysis of Next Generation Audio (NGA) Systems. MPEG H audio is not currently implemented in any TV sets in Europe, however basic AC-4 support is

available in more than 80% of UHDTVs. If immersive audio delivery is the target for a broadcaster, both systems offer convincing solutions.

Object Based Audio offers a richer immersive experience with better control by audiences, who can use a variety of set-ups, from simple headphones to the 22.2 audio format. The disadvantages of OBA is its complexity as it needs extra components, which in turn leads to more power consumption.

5G DEVELOPMENTS AND APPLICATIONS IN MEDIA

The session was moderated by **Peter Bruce**, Director of Business Development, Elevate Broadcast and the panellists were **Dr Peter Siebert**, IEEE BTS; **Parag Naik**, Saankhya Labs and **Sepideh Ghandali**, IRIB-Iran.

A topic currently being debated is whether 5G Broadcast can be a



replacement for DVB T2. The 3GPP Release 14/16 enables features relevant to broadcasters and are received only without SIM card and Multimedia Broadcast Multicast Service (MBMS). Other features are increased Inter-site distance, mobile reception at high speeds and MBMS bearer type, which support MPEG2 Transport Stream (MPEG2-TS).

5G Broadcast enables High Power High Tower (HPHT) broadcast and can be regarded as a 2nd generation DTT solution, similar to DVB T2 or ATSC3.0. However, it is not as spectrally efficient as DVB T2 or ATSC 3.0, and the service layer is not specified by 3GPP. 5G Broadcast does not perform better than either DVB T2 or ATSC3.0 for reaching handheld devices with a HPHT network. However, this drawback can be partly compensated by using more robust modes that result in lower data rates.

At present, 5G Broadcast has specified bandwidths of 1.4, 3, 5, 10, 15 and 20 MHz with European 5G services to be offered in designated frequency bands of 700 MHz, 3.4 GHz, 3.8 GHz, and 26 GHz. For broadcast applications 700 MHz is the best choice while in ITU Region 1, 470-694 MHz band is allocated for broadcast services with a channel raster of 8 MHz. A recent work item was created in 3GPP to add 6/7/8 MHz bandwidths for 5G Broadcast.

A service layer for 5G Broadcast is yet to be defined by 3GPP and the missing elements include Video and Audio codecs, multiplexing and service information. DVB is looking into specifying a 5G Broadcast service layer

starting with DVB-Internet (DVB-I) for service discovery and selection. Spectral performance of 5G is less than DVB T2 or ATSC3.0 and handheld indoor reception from HPHT network is critical. Although 8 MHz bandwidth is not specified for the time being, this is subject to change by 3GPP. Service Layer is left open by 3GPP, but DVB may be able to provide this layer. Consumer-level receive devices are not yet available and 5G Broadcast cannot replace DVB T2 completely.

6G research is starting even before we have 5G because each standard roughly takes a decade to develop, and so the formalisation of 6G standards is being targeted for 2030. 6G will be better than 5G in all performance related aspects as the peak data rate proposed for 5G is 20 Gb/s whereas it is 1Tb/s for 6G. The 5G latency of 1ms would be further reduced to the order of μ s in 6G, while device densities and IoT connectivity will be much denser. More AI and machine learning applications will be installed in 6G. Security is expected to be much better in 6G when compared with 5G, as quantum communication and cryptography are expected to be deployed. A new service that is envisaged is holographic communication. This would employ multiple view cameras, demanding data rates in the order of Tera bps, which are not supported by 5G.

NEXTGEN TECHNOLOGY IMPLEMENTATION

The Moderator was **Hamdhoon Rashad**, ABU with the panel comprised of **Dr Mohieddin Moradi**, IRIB-Iran; **Yoshi Tsurimaki**, T-NET JAPAN and **Anuradha Agarwal**, Prasar Bharati, India.

There are many different types of video artifact in the baseband and compressed domain, ranging from blockiness to noisiness. Video Quality Measurement (VQA) can be measured subjectively by the human eye or objectively by machine. Subjective measurement consists of two metrics, namely Mean Opinion Score (MOS) and Differential Mean Opinion Score (DMOS).

MOS is obtained from the observation of a sample of invited viewers who are asked to rank the quality of a video clip. The ranking is on a scale of 1 to 5, from which the average value of the score is calculated. In MOS, only a distorted video clip is shown to the viewers. The second, and preferred, method is DMOS where the viewers are first shown an undistorted reference video clip and then later the distorted video. They are asked to compare and allocate the scores based on the difference between the raw quality of the reference and the distorted video. Objective measurement is conducted by machines utilising algorithms such as Peak Signal to Noise Ratio (PSNR) and Structural Similarity Index (SSIM).

Broadcasting is undergoing a revolutionary change due to digitalisation which is affecting every part of the broadcast chain. Broadcasters are undertaking either a total digital makeover or progressive upgradation of their chains, such as newsrooms, non-linear editing facilities, and play out facilities. The workflow changes needed with introduction of digitalisation, contribute to the lengthy time taken for conversion. The biggest change



comes from the impact of convergence of broadcast and telecommunication technologies. Today's broadcasters now have access to new telecommunication-based platforms such as mobile TV, internet, broadband IP networks and cellular networks, in addition to their traditional terrestrial and satellite broadcast platforms.

Prasar Bharathi, India has completed digitalisation of its TV Broadcasting network. All the studios at New Delhi, which host international & national channels, are being migrated for full-fledged HD capable stations. HD Mobile Production Facilities and DSNs have also been provided at Major Kendras. All 127 AIR studios have been digitised and streaming of 271 AIR channels has started on the News on AIR app. MW and SW transmitters are being digitised but the receiver ecosystem is yet to be developed, due to non-availability of affordable receivers.

Cloud broadcasting is another emerging technology and is available in the form of public, private and hybrid infrastructure. Public cloud infrastructure is available in the form of utility services, that are used by businesses to buy computing, storage and bandwidth resources on-demand. Private clouds are for companies that want to manage their data and processes in an environment with exclusive access to their own resources. Hybrid clouds are a mix of both public and private clouds with business functions split across their infrastructure, depending on the security needs of the various functions.

High resolution content is sourced from multiple locations into a broadcaster's content store for processing and distribution. Post-production of content uploaded to a secure cloud is performed on low-resolution versions sent to post-production locations where the editing is done. Once the edits on the low-resolution version have been reviewed and accepted, these changes are applied to the high-resolution version and restored in the cloud. The edited content is connected to public Internet connections and controlled remotely. Play-out content is delivered to multiple platforms for distribution.

ADVANCES IN MEDIA DELIVERY – PLATFORMS AND STRATEGIES

The session was moderated by **Bernie O'Neill**, WorldDAB and the panellists were **Emily Dubs**, DVB; **Yin Loong CHAO**, Akamai and **Greg Armshaw**, Brightcove.

DVB is a market driven, industry led consortium, initially created for the standardisation of digital media



Bernie O'Neill, WorldDAB



Emily Dubs, DVB



Greg Armshaw, Brightcove



Yin Loong CHAO, Akamai

distribution as replacement for analogue TV. The start of the millennium saw the migration from analogue TV to digital TV with the initial introduction of DVB-S, DVB-T, DVB-C and followed by second generation DVB-S2, DVB-T2 and DVB-C2. During the 2010's, Standard Definition TV (SD) was upgraded to High Definition (HD) with the aid of second-generation DVB family of standards. During the 2020's, the move will be from fragmented distribution, where the industry is working in silos, to a unified and seamless system enabling hybrid modes.

Before the Internet was used for delivery of services, the main market issue was the need for reliable and efficient distribution pipes for digitalisation or Digital Switchover (DSO); more programmes and increasing resolution from SD to HD or UHD. DVB used to define physical layers for the first and second generation of Digital TV standards. Solutions have been launched throughout the world and these distribution platforms have relied on the MPEG2 Transport Based Layer. Such services have been typically accessed via DVB Set Top Boxes, but this has recently changed.

With the advent of the Internet, fragmentation has shaken the industry and forced it on the migration road to all-hybrid. However, access to the services is a now real issue in this new context. New distribution paths have arisen, each having its own fragmentation, strengths and weaknesses. Various formats such as MPEG based, and IP based with their disparate encoding and packaging standards have had to coexist. Thus, service is now a central issue and broadcasters must address many challenges in reaching the new devices and competing with streaming platform

services. Broadcasters must ensure their own service prominence in a competitive industry as well tackle the transition towards a truly seamless hybrid offering.

A unified hybrid delivery ecosystem enables Intelligent use of the unique characteristics of both broadcast and broadband networks. Seamless switching of bearers, including Native IP over broadcast, is achievable. New prospects for broadcasting exist in the form of targeted advertising and personalised content. This where DVB-Internet (DVB-I) comes in by DVB-I breaking down the barriers between broadcast and broadband worlds.

DVB-I is an Internet-based replacement of traditional linear TV based services. Broadcasters are able to deploy common services across a wide range of devices without the need for dedicated integrations. Italy is considering adopting DVB-I as the means to clear channels from the DTT platform and using the freed capacity for UHD broadcasting. It is noteworthy to mention that DTG of UK has commissioned Ofcom to survey the feasibility of using DVB-I for the migration of DTT towards IP-based delivery. ■



Report on DBS by **Jeewa Vengadasalam**, Specialist II, Department of Electrical & Electronic

Engineering, Lee Kok Chiang, Faculty of Engineering & Sciences, University Tunku Abdul Rahman, Malaysia.

Industry Debate

How Asian broadcasters faced the pandemic

In a highlight of the **Digital Broadcasting Symposium**, senior broadcasters from across Asia have described how they tackled the challenges of the pandemic. Broadcast engineers from Hong Kong-China, India, Singapore, Sri Lanka, Turkey and Vietnam – all members of the ABU Technical Bureau – spoke of fulfilling their obligations to their audiences while dealing with staff restrictions, falling revenue and other issues.



Shivane Thapa Basnyat, Senior News Editor, Nepal Television

Nepal Television journalist and presenter, **Shivane Thapa Basnyat** moderated the Industry Debate, held virtually on 8 April. The topic was Overcoming the Pandemic and Learning from Experience.

Describing the pandemic as one of the greatest crises of modern times, she said it had had a multi-dimensional impact on the broadcasting industry. She invited the panelists to talk about how their organisations had coped.



Mr Sunil, Additional Director General (Engineering) & Head International Relations, Prasar Bharati – India & ABU Technical Committee Vice-Chairman

Sunil of Indian public broadcaster, **Prasar Bharati** said that as the pandemic spread, broadcasting had been the only way to keep people properly informed. This had forced broadcasters to reinvent and transform themselves. "All the meetings used to be physical. We could never have thought of any progress on any development without a physical meeting," he said. Meetings were now held in video conference mode and staff had quickly adapted to the change, regardless of their age or work roles.

Since TV production in India had been curtailed, Prasar Bharati had been replaying iconic TV episodes recorded almost 3 decades years earlier. The shows attracted a huge audience and kept people entertained during the lockdown.



Dr Tharaka Mohotty, Director Engineering, MBC Networks & MTV Channel, Sri Lanka

Dr Tharaka Mohotty of MBC-Sri Lanka said the organisation had learned to operate with limited staff and little income. It had given priority to news coverage of the pandemic. "We fulfilled our duties rather than thinking of the financial aspects," he said. Normal advertisers left but new ones came in, such as the health sector. MBC tried to manage its expenses, at least to break even.



Peh Beng Yeow, Lead, Technology Operations, Mediacorp, Singapore

Peh Beng Yeow of Singapore's Mediacorp said that for safety reasons the broadcaster set up three teams of staff who were not allowed to meet each other. He said technology upgrade was a constant regardless of whether there was a pandemic or not, so switching to more online work was not difficult. "Most people in Singapore have a computer or some other connected device at home. So

remote meetings can be arranged quite easily." Asked whether cyber security had been an issue during the pandemic, he said it had been a top priority at Mediacorp for several years. There was a procedure to prevent threats to the system. The challenge during the pandemic had been arranging staff.



Terence Yiu, Deputy Director of Engineering, Phoenix Satellite Television, Hong Kong-China

Terence Yiu of Phoenix Satellite Television, Hong Kong-China, said the most important challenge was maintaining broadcast continuity. Staff had to learn new skills quickly. "Our first priority was staff safety," he said.

The broadcaster set up a small, temporary, live studio in case its main live studio became infected and needed to close for one or two days for cleaning.

Revenue dropped, he said, but the broadcaster was able to reduce some of its operating costs, including those of overseas travel.

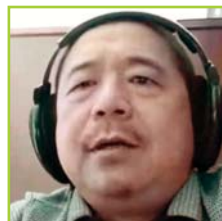


Kazim Pektas, Chief Engineer, Studio Planning Department, Turkish Radio Television Corporation, Turkey

Kazim Pektas of Turkish Radio Television Corporation said the national broadcaster had been hard hit by the pandemic despite having emergency plans in place. "The worst case was worse than we had imagined," he said.

"As a public broadcaster, we have more responsibilities than others. We should consider all of our audience's requirements and expectations."

As part of its aim of providing trusted and accurate information, TRT set up three new TV stations at the start of the pandemic for online education.



Nguyen Duc Tue, Deputy Director, Technical Centre, Vietnam Television

Nguyen Duc Tue of Vietnam Television said the broadcaster had had to change and adapt to the new normal, which included a reduction in income. It increased its remote producing and set up two teams to avoid an outbreak of the virus. One worked in the field and the other in the office. Those in the office were not allowed to go out to work.

The moderator, Ms Basnyat, said that for broadcasters, agility had become a byword during the pandemic. "We are in the process of adapting and evolving and innovating."

She said Nepal Television had faced a lot of challenges because of the health risks for its staff and the relatively unsophisticated technological setup.

It had cut down on the number of staff working each day and introduced a rotation system. It had been unable to shoot some programmes because of the lockdown. The movement of news reporters had been restricted.

The good thing was that it had opened new opportunities on an individual level. "Individual workers are awakened to the fact that we have to adapt to technology and upgrade our skills," she said. ■

DBS 2021 WORKSHOPS

DAB+, DRM+ and Dalet workshops, that were conducted in conjunction with the conference, provided in-depth knowledge of some of the latest developments and opportunities in the digital broadcast industry.

BUILDING RADIO AUDIENCES WITH DAB+



DAB+ is about planning for a sustainable future for the radio industry, particularly in light of the global pandemic, together with very real threats from large global digital platforms. The update from Australia is that 77% of new cars were sold with DAB+, up from the figure of 60% in 2018. Vehicle sales increased because of pent-up demand and consumers purchasing cars for interstate road trips, as result of a ban on international travel. Australia's first major highway tunnels supporting DAB+, the M4 and NorthConnex in Sydney were opened in 2019. This was a result of New South Wales state government passing legislation requiring all new tunnels to have DAB+.



Joan Warner, WorldDAB Vice President and Chair of the WorldDAB Asia-Pacific Committee

In Thailand, the Bangkok DAB+ trial continues with a DAB+ rollout by the National Broadcasting Telecommunications Commission (NBTC) Thailand. The 20-month trial commenced in April 2019 with 11 radio stations and is still in operation today. The NBTC plan is to extend the DAB+ trial in Bangkok for a further 3 years. The aim is to expand DAB+ trial services and coverage to regional areas in the North, North-East, Central, and South Thailand. Full national coverage planning has been completed with commercial rollout plans to be determined.



Patrick Hannon, President, WorldDAB and VP Corporate Development, Frontier Smart Technologies

Effective from December 2020), all new car radios in the European Union (EU), must be able to receive digital terrestrial radio. DAB receivers are now a mass market product and 90 million receivers have been sold with prices as low as US\$20. DAB+ is emerging as a global standard for radio, with many

countries adopting it. The key drivers are that DAB+ offers greater choice, as there is six times more service capacity than analogue FM. Since a single DAB multiplex can deliver more than 6 programmes, there is an opportunity to innovate, with brand extensions catering for different types of music, ranging from classic rock to jazz.



Lindsay Cornell, Principal Systems Architect, BBC Digital and Chairman, WorldDAB Technical Committee



Dr Les Sabel, Chair, WorldDAB Asia Pacific Technical Group, and S-Comm Technologies



Ron Schifflers, Senior Director Program Management, NXP Semiconductors

DAB drove commercial revenues in UK by more than 30% over the past six years, reaching £702million in 2019 compared to £537million in 2013. DAB+ offers 80% lower annual operating cost compared to FM, with a key factor being that DAB+ consumes less energy. This has been confirmed by a BBC study that showed DAB to be 33% more efficient than FM. DAB+ is also reliable in times of emergency, with alarm announcements specified as part of DAB+ standards.

There is a need for each country to develop a local DAB receiver industry and a cost-effective DAB engine should be chosen. A good DAB engine must be fully compliant with ETSI EN 300 401 standards with a high integration of the basic components comprising the OFDM decoder, AAC+ decoder and Peripheral Controllers. Built in processors must be available for customers to design codes and there should enough General-Purpose Input/Output (GPIO) pins to accommodate various customer needs.

DIGITAL RADIO DRM ENABLES DISTANCE LEARNING



Due to COVID-19, there has been education disruption from school closures in 105 countries, affecting 1 billion students. Alternative teaching methods in the form of online education has been hampered by technology divide and poor infrastructure which are lack of internet as well as poor or no mobile coverage. However, DRM can be used as it provides access to information, education, entertainment and Emergency Warning Functionality (EWF).

DRM offers more than audio as its data transmission possibilities gives it an extra dimension. DRM incorporates multimedia applications that provide great listener benefits, bringing extra revenue opportunities for broadcasters. It can offer free information to people wherever they are, without the need for Internet. DRM receivers can cache information for convenient

access at any time, which is convenient for school documents collected over night. Lessons and textbook content via Journaline are always available on demand. There are options for student interactivity with Journaline quizzes and Questions & Answers rebroadcast.

The Journaline text-based information service supports all classes of receivers with interactivity and geo-awareness. Journaline is specifically designed for digital broadcast services restricted by low bitrate requirement for example 200 kbps. Existing data sources are reused for broadcasters (RSS, XML) and are internationally applicable (Unicode/UTF-8). Journaline is optimised for inexpensive consumer receivers which have low decoder and user interface requirements. Besides free distance-learning education, there are commercial benefits because of innovative targeted advertisement placements taking into account language preference, region selection and topic of Interest.

The role of the broadcaster is to define the overall Journaline service structure with menus, and topics. Lesson materials are converted to Journaline XML and the DRM broadcast signal is configured and scheduled. As such DRM can provide education to remote areas or during a pandemic.



Ruxandra Obreja, *Chairman, DRM Consortium*



Markus Tauber, *Professional System Engineer, DRM/DAB ContentServer (CS)*



Alexander Zink, *Senior Business Development Manager, Digital Radio & Streaming Applications, Fraunhofer IIS*



Guido Leisker, *Consultant Engineer*

DALET REMOTE EDITING – EDIT & COLLABORATE FROM ANYWHERE



Dalet provides several options for broadcasters to expand the current system to include remote operations, especially in pandemic circumstances, where work at home is the rule. In order to overcome the challenges of remote operation, Dalet has provided a cloud-based workflow with the concept of intermediate media which can help to increase efficiency and allow users to work from home. This is a game changer as it

allows users to address performance issues at home when there is a disconnection.

Dalet has multiple tools to allow users to browse an entire media catalogue based on rights to access the content and directly work on it. In addition, a mobile app is available by which the user can browse content while he is on the move, at any time or any place around the globe. The idea behind the solution is to provide agility, which means deploying and supporting various types of cloud solutions, and mobility, which means allowing the user direct access through mobile or web interfaces. The end result is that business is flexible and total cost of ownership is lowered.

The Dalet virtual workshop was conducted in a practical hands-on demonstration mode with visual presentations of the workflow. ■

